

**PHASE 2
PLANNING
STUDY**

Rio Salado

JULY 1974

FLOOD CONTROL DISTRICT
OF
MARICOPA COUNTY
3325 W. DURANGO
PHOENIX, ARIZONA 85009

Rio Salado PHASE 2 PLANNING STUDY

MARICOPA ASSOCIATION OF GOVERNMENTS

G. KENNETH DRIGGS, Executive Director MAG

JOHN J. DEBOLSKE, Secretary

The Hon. Dessie M. Lorenz
Vice Mayor
Avondale

The Hon. William Gentry
Councilman
Box 506
El Mirage, Arizona 85335

The Hon. Max Klass
Mayor of Glendale
3620 North 3rd Avenue
Phoenix, Arizona 85012

The Hon. Oscar Palmer
Councilman of Paradise Valley
6401 East Lincoln Drive
Paradise Valley, Arizona 85253

The Hon. B. L. Tims
Mayor of Scottsdale
3939 Civic Center Plaza
Scottsdale, Arizona 85251

The Hon. J. H. Rodriguez
Councilman
9354 West Polk
Tolleson, Arizona 85353

The Hon. Henry Haws
Maricopa County Board
of Supervisors
111 South 3rd Avenue
Phoenix, Arizona 85003

The Hon. Jackie Meck
Mayor of Buckeye
802 Clanton
Buckeye, Arizona 85325

The Hon. John Laird
Vice Mayor of Gila Bend
Box M
Gila Bend, Arizona 85337

The Hon. Charles Salem
Mayor of Goodyear
105 La Canada Boulevard
Goodyear, Arizona 85338

The Hon. Ronald S. Travers
Councilman
Box 492
Peoria, Arizona 85345

The Hon. George Cumbie
Mayor of Surprise
Box 1307
Surprise, Arizona 85345

The Hon. Curt Arnett
Mayor of Wickenburg
Box 1073
Wickenburg, Arizona 85358

Mr. Francis N. Connolly
Highway Commissioner, Dist. 1
State of Arizona
607 Mill Avenue
Tempe, Arizona 85281

The Hon. Raul Navarrete
Mayor of Chandler
200 East Commonwealth
Chandler, Arizona 85224

The Hon. Dale Hallock
Mayor of Gilbert
Box 523
Gilbert, Arizona 85234

The Hon. Eldon Cooley
Mayor of Mesa
1409 East 1st Place
Mesa, Arizona 85201

The Hon. Timothy Barrow
Mayor of Phoenix
251 West Washington — 900
Phoenix, Arizona 85003

The Hon. Dorothy Nelson
Councilman
342 East Concora
Tempe, Arizona 85281

The Hon. Frank Brown
Mayor of Youngtown
12030 Clubhouse Square
Youngtown, Arizona 85363

Property of
Flood Control District of MC Library
Please Return to
2801 W. Durango
Phoenix, AZ 85009



VALLEY FORWARD ASSOCIATION

EXECUTIVE COMMITTEE

G. Clarke Bean
William H. Benzel
Ralph Burgbacher
Junius E. Driggs
George E. Leonard
Sam Mardian, Jr.
Rod J. McMullin
Donald Myers
Mrs. Glenn D. Overman
James E. Patrick, Sr.
Dr. Lincoln J. Ragsdale
Clark Rorbach
Mason Walsh
J. Don Willis

OFFICERS

Clark Rorbach, Chairman of the Board
Ralph Burgbacher, President
Sam Mardian, Jr., Vice President
Donald Myers, Vice President
Mrs. Glenn D. Overman, Vice President
William H. Benzel, Treasurer
Frank Bosh, Executive Director

RIO SALADO STEERING COMMITTEE

James Elmore, Chairman
Cal Baskerville
James Bobbett
Dr. Herman Bouwer
Mrs. Robert Corkhill
Jack DeBolske
Herbert Donald
John Ellingson
Mike Enriquez
Rushia Fellows
Jim Ferrin
Dr. Richard O. Flynn
Steve Freeman
John Girand
Edward M. Hall
Harry Higgins
Donald W. Hutton
John Katsenes
Dan Mardian
Gerry Maskulka
Dennis McCarthy
Marco Monacchio
Fred Nobbe
Carter Norris
Cliff Pugh
Hank Raymond
Paul Ruff
Roland H. Sharer
Robert Showers
Wesley Steiner
Reid W. Teeples
Jim Trant
Mason Walsh
Major Henry W. "Will" Worthington

consultants:

DANIEL, MANN, JOHNSON, & MENDENHALL • EARL V. MILLER ENGINEERS • GROUP CIVITAS • THE RESEARCH GROUP • WESTERN MANAGEMENT CONSULTANTS

Sponsors

PREFACE

The plans presented here are the product of Phase II of the Rio Salado Project planning study. Based primarily upon the Study Design, prepared in Phase I of the program, the consultant team has developed an overall concept plan for the Rio Salado Project area, and has outlined specific plans for two demonstration projects. Additionally, specific details of water use and implementation recommendations are presented.

As the Rio Salado Project proceeds over the years, continual detailed planning, design, and engineering studies will be required. Project leadership, exhibited to date by the Valley Forward Association and the Maricopa Association of Governments, must continue so that the Rio Salado potentials become realities.

Preface

PROLOGUE

The Salt River, a usually dry watercourse occasionally carrying flood runoff in an undefined channel, has been a divisive influence on urban growth patterns in the Phoenix metropolitan area and a blighting influence on the use of land in its immediate vicinity.

Its influence on urban growth has been to delay the development of both south Phoenix and north Tempe and to discourage the use of land with the greatest accessibility assets in the entire Salt River Valley; penetrated by the Maricopa Freeway; bordered on the north by the Southern Pacific/Sante Fe Railroad systems of freight lines, yards, and spurs; containing the metropolitan airport handling scheduled passenger and freight service.

The Rio Salado Project is an exciting concept for restoring life to one of the area's great natural resources, the Salt River. Within the framework of a comprehensive development plan based on environmental, economic, and other essential considerations, the Salt River can become a regional attraction appreciated for its beauty and recreational attributes. In addition, it can be an enhancement of great value to local interests in the development of new housing and commercial and recreational assets. Historic development patterns in other areas have proven repeatedly the magnetism of controlled flood plains and water-oriented lands.

Prologue

Preface	Page	
Prologue		
Summary		
Project Boundary Definition	1	
Concept Development Plan	1	
Land Use	1	
Transportation and Circulation	1	
Recreation/Open-Space System	1	
Water	2	
Phoenix Central Avenue Demonstration Project	2	
Tempe/ASU Demonstration Project	3	
Implementation Strategy	3	
SECTION 1:		
Background for Planning		
Planning Process	5	
Rio Salado Goals	5	
Conflicting Political Jurisdictions – The Need for Coordinated Development Policies	7	
Socio-Economic Factors	7	
Population Growth	7	
Economic Growth	8	
Future Land Requirements for the Urban Core of Maricopa County	8	
Existing Development Plans	9	
Regional Urban Design Considerations	9	
Natural Environment	9	
Hydrology	10	
Geology	10	
Structural Foundation Conditions	10	
Soil Classification	11	
Man-Made Environment	11	
Archaeology	11	
Sand and Gravel Operations	11	
Utilities	12	
SECTION 2:		
Water System		
The Water System	13	
Hydrography	13	
Controlled Releases	13	
Irrigation System	13	

Uncontrolled Storm Flows	Page	14
Storms	14	
Flood Peaks	14	
Improvements Affecting Runoff	15	
Municipal Drainage Systems	15	
Indian Bend Wash Project	16	
Central Arizona Project (CAP)	16	
Rio Salado Project	16	
Sedimentation	17	
Infiltration	17	
Evaporation	18	
Water Systems	18	
Water Sources for Future Development	19	
Surface Waters	19	
Groundwater	19	
Trends in Water Usage	19	
Water Control Systems	20	
City Water Supply Systems	20	
Municipal Sewerage Systems	20	
SECTION 3:		
Rio Salado Plan		
Rio Salado Edge Treatment	21	
Channel Design	24	
Land Use	24	
Mesa Area	24	
Tempe/ASU Area	25	
Phoenix Area	25	
Western Area	26	
Transportation and Circulation	27	
Rio Salado Water and Land Management	28	
SECTION 4:		
Tempe/ASU Demonstration Project		
Existing Conditions	30	
Land Ownership	30	
Geology	31	
Ponding Potential	31	
Hydrography	32	

Dam Design	Page	32
Sources of Water	32	
Other Design Considerations	33	
Foundations	33	
Erosion Protection	33	
Lake Operation	33	
Water Quality Control	33	
Utilities	33	
Open Space and Recreation Potentials	33	
Development Potentials	34	
Transportation and Circulation	34	
Implementation	34	
Phase 1	35	
Phase 2	36	
Phase 3	37	
Phase 4	38	
SECTION 5:		
Phoenix Demonstration Project		
Existing Conditions	40	
Land Use	40	
Land Ownership	41	
Topography and Slope	42	
Geology	42	
Hydrography	43	
Ponding Potentials	43	
Water Quality	43	
Development Potentials	43	
Public Recreation and Open Space	44	
Implementation	45	
Office Commercial	45	
Hotel/Motel	45	
Transportation and Circulation	46	
Residential Development	46	
Retail Commercial	46	
Institutional Land Uses	46	
Phase 1	47	
Phase 2	48	
Phase 3	49	
Phase 4	50	

(continued)

Table of Contents

Table of Contents (continued)

SECTION 6:

Implementation

Rio Salado Plan Implementation	51
Implementing Agency	51
Organizational Alternatives	51
Funding Rio Salado Project Alternatives	52
Federal	52
State	53
Local	53
The Implementing Agency	53
Other Considerations	53
Private Sources	53
Strategies for Obtaining Funds	54
Phasing	54
Public Education and Participation	55
Interim Strategy	55
Next Steps	56

Figure

1	Metropolitan Phoenix Plan
2	Phoenix Demonstration Project
3	Tempe/ASU Demonstration Project
4	Interactive Planning Process
5	Tempe Aerial View
6	Photo of Existing Salt River
7	Political Jurisdictions
8	Population Growth Maricopa County
9	Phoenix Metropolitan Area Growth Directions
10	Existing Natural Environment
11	Existing Man-Made Environment
12	Powerline
13	Salt River Project Boundaries
14	Potential Input Flows
15	Standard Project Flood Flows

Page

1	16	Post Orme Dam Flows	16
2	17	Seepage Loss (daily average)	17
3	18	Surface Area	18
5	19	Evaporation Loss (high month)	18
5	20	Evaporation Loss (average year)	18
6	21	Evaporation Loss (low month)	18
7	22	Existing Water Treatment Plants	20
7	23	Soft Edge Development	21
8	24	Hard Urban Edge Development	21
9	25	Rio Salado Plan	22-23
11	26	Flood Control Channel Alternatives	24
12	27	Rio Salado Plan: Mesa Element	25
13	28	Proposed Flood Control/Bird Refuge Area	26
14	29	Proposed Transportation and Circulation	27
15	30	Rio Salado Parkway: Typical Section	28
	31	Tempe/ASU Demonstration Project Area	29
	32	Aerial Photo: Tempe	30
	33	Existing Ownership Patterns: Tempe	31
	34	Typical Inflatable Dam	32
	35	Proposed ASU Development	34
	36	Tempe/ASU Project, Phase 1	35
	37	Tempe/ASU Project, Phase 2	36
	38	Tempe/ASU Project, Phase 3	37
	39	Tempe/ASU Project, Phase 4	38
	40	Phoenix Demonstration Project Area	39
	41	Existing Land Use Phoenix	40
	42	Existing Ownership Patterns: Phoenix	41
	43	Aerial Photo: Phoenix	42
	44	Proposed Phoenix Development	44
	45	Phoenix Project, Phase 1	47
	46	Phoenix Project, Phase 2	48
	47	Phoenix Project, Phase 3	49
	48	Phoenix Project, Phase 4	50
	49	Rio Salado Phasing	54

Table

Page

1	Land Requirements for the Urban Core of Maricopa County	9
2	Tempe Project Summary of Land Holdings	30

List of Figures

Summary

The potentials for the Salt River are exciting. In combination with flood control features, water could be maintained in the river on a year-round basis by a system of dams, lakes, and canals. New scenic parkways and local roads could provide access to viewpoints and major public recreation areas. Hiking, riding, and bicycling paths could traverse the entire length of the river through the metropolitan area. Sanctuaries for natural flora and fauna could be preserved for all time. A chain of parks and waterways could help knit the project area together throughout its full length. Private uses of property would be encouraged under special environmental quality standards.

In this time of great concern over exploding metropolitan development, large open spaces are a precious and nearly unattainable urban amenity. Here is a unique opportunity to realize an "in-town" open space of vast dimensions as measured by the breadth and range of opportunity for activity it provides. The current concern for energy supplies dramatizes the need for such a program.

The Phoenix Metropolitan Area urgently needs to advance the process of comprehensive planning in order to deal with the many problems of urban life that result from the region's phenomenal growth. The area continues to experience a high rate of urban development that is spreading into all contiguous, hitherto undeveloped areas.

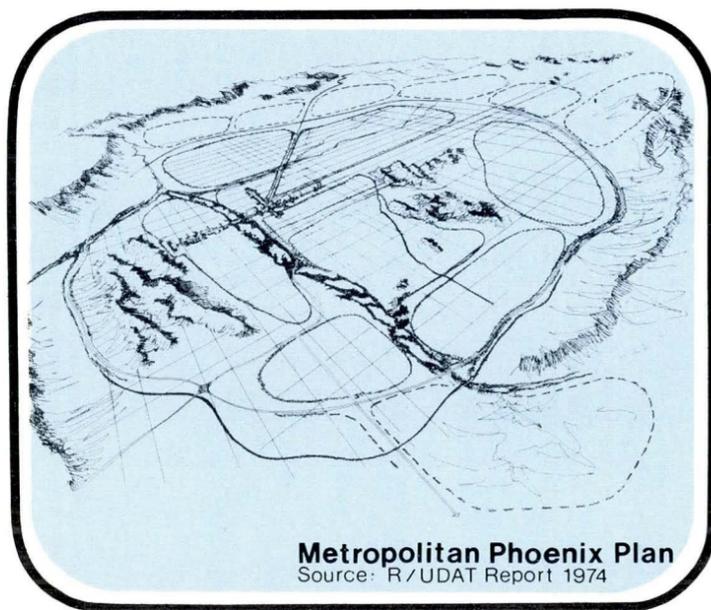


Figure No. 1

Because of its unique central metropolitan area location and potential for dramatic reuse and restoration, the Rio Salado is a prime area for accommodating some of the new growth. The need for comprehensive, long-range planning implementation and official development-policy coordination becomes more urgent with each passing day. Several municipal and county plans, as well as the recent study by the Regional Urban Design Team of AIA, have emphasized this need. The AIA study further illustrated the potentials of the Rio Salado Project to help control growth in a positive manner, and to provide a unifying influence in the Salt River Valley.

PROJECT BOUNDARY DEFINITION

The Rio Salado Project is essentially a flood plain reclamation proposal for the Salt River bed and adjacent lands. To date, the project has consisted of a planning-development study of the river's 40-mile course from the Granite Reef on the east to the confluence of the Salt and Agua Fria Rivers on the west. The study area encompasses approximately 20,000 acres as it passes through the Salt River Indian Community, Mesa, Tempe, Phoenix, the Gila River Indian Community, and unincorporated areas of Maricopa County.

Within the general study area, two demonstration projects have been designated: The Phoenix Central Avenue Demonstration Project and the Tempe/Arizona State University Demonstration Project. The Central Avenue Project is in a key regional location adjacent to the Phoenix Central Business District, at the intersection of the Central Avenue commercial spine and the Salt River. The Tempe/Arizona State University Demonstration Project is situated in a prime location to become an extension of the sports facility development of ASU and an extension of the Tempe Neighborhood Development Program (NDP).

The purpose of the demonstration projects is to provide a detailed test of the problems and potentials of reclaiming the Salt River flood basin in these two key regional locations.

CONCEPT DEVELOPMENT PLAN

The long-range concept plan for the Rio Salado envisions a gradual change in function of the Salt River bed from

vacant land and sand and gravel mining operations to water-oriented recreation. In conjunction with this change in function of the riverbed, adjacent land uses will change to maximize the potentials of this new major regional asset in the heart of the Phoenix Metropolitan Area.

LAND USE

The dominant new land use proposed is a public greenbelt park system along the entire length of the project area. Related to this system is the potential for high activity recreational development at several major activity nodes along the river.

New residential development in a variety of housing types related directly to new recreational amenities, is anticipated in several areas. In conjunction with this residential construction, development of commercial and community facilities will be generated. Various special land uses include the Pueblo Grande Historic Monument at 48th Street, a major sports complex between 7th and 16th Streets, and expansion of the Game Preserve/Wild Life Sanctuary of Estrella Regional Park. Additional general recommendations for land use include a future connection of the Rio Salado park system northward to the White Tank Open Space area and designation of the Agua Fria as an open-space/flood-wash preserve. These two areas could also be combined with an extensive agricultural greenbelt/preserve land-control system to limit the general spread of metropolitan Phoenix westward and southward.

TRANSPORTATION AND CIRCULATION

Another component of the Rio Salado Project is improved accessibility. The plan proposes a new east-west scenic parkway to provide maximum access to view sites and to new activity centers. Pedestrian access will be provided along the banks of all water development within the Rio Salado. A continuous hiking, bicycling, and equestrian trail system would reach the entire length of the project area.

RECREATION/OPEN-SPACE SYSTEM

One of the primary objectives of the Rio Salado is to provide a regional recreation system in the heart of the metropolitan area. This regional recreation system would

eventually include a full range of passive and active recreation facilities. The general concept is to maintain public recreation lands along the entire length and on both sides of the Salt River. Additionally, a number of connections are proposed to existing park systems: Granite Reef Dam recreation area, Indian Bend Wash, Papago Park, Tempe Beach, Estrella Regional Park, Agua Fria Wash, and the White Tank Mountains. Further planning should also be considered to provide a several-mile-wide agricultural/open-space "belt" preserve approximately between the Agua Fria River and White Tank Mountains. This belt would extend northward from the Salt River in order to preclude conversion of the valuable agricultural land to urbanized uses. It also would provide a natural, open space "breather" in the spread of urbanization westward from central Phoenix.

WATER

In the years ahead, the development of the Central Arizona Project aqueduct and Orme Dam will bring a change to the valley in terms of water allocations and the possibility of exchanges of water; this prospect will in turn allow for changes in the sources of water for various elements of the Rio Salado development over time.

A major water reclamation program is planned as part of the Rio Salado development, using wastewater from the urban area. The program basically consists of spreading urban wastewater effluent in special ponds in the riverbed area and allowing the water to seep into the underground water basin. Then water from underground would be pumped from wells located between the infiltration ponds, treated as needed, and pumped to the Rio Salado

developments. As the reclamation and reuse of municipal wastewater becomes more necessary, the Rio Salado Project will become a substantial user of such reclaimed water.

Throughout the 40-mile length of the project, access to sources of water will be determined by current economics and availability at the several locations. Other sources of water could be the Salt River Project for specific parcels of land now having water rights; possible exchanges of water with the Salt River Project or other irrigation districts; storm and flood waters; the Central Arizona Project, by purchase or exchange; municipal drainage systems; municipal water supply sources, and drilled wells.

Land in the riverbottom has been, and will continue to be, mined for sand and gravel. This condition dictates that individual projects will be developed on a phased basis in accordance with an overall plan. This in turn will create the need for water at the specific locations in different periods of time.

Phoenix Demonstration Project



Figure No. 2

PHOENIX CENTRAL AVENUE DEMONSTRATION PROJECT

An objective of the Rio Salado planning study has been the development of specific plans for Demonstration Projects. The Central Avenue Demonstration Project was selected for its prime location, the opportunities it presents for the fullest potential mix of land uses, an existing program for construction of a new bridge, and the potential for public/private agency partnership in revitalization of a basically underdeveloped area.

The project area is bounded on the north by the Maricopa Freeway (U. S. Route 10), on the east by 7th Street, on the south by Broadway Road, and on the west by 7th Avenue.

The long-range revitalization of this key area is predicated on a major change in the image of the area through a phased program to develop a new urban regional park with a large recreational lake in the heart of Phoenix. A marina and water-related recreational facilities would also be developed.

The entire perimeter of the new urban lake would have a minimum 100-foot-wide edge for public access, connecting newly developed urban park lands by pedestrian, bicycling, and equestrian paths and creating the initial

link in a Rio Salado greenbelt system. In addition to the public edge, the long-range concept plan for this project envisions major new regional park facilities.

A primary objective of the Central Avenue Project is to entice high-quality development of the scale that has taken place on North Central Avenue to cross the Salt River. Economic forecasts indicate a potential for new retail, commercial, office, and hotel development located between the Salt River and Elwood Avenue. The high-rise concept of the Central Phoenix Plan should be extended into South Phoenix to accommodate this demand.

Within the project area there will be substantial opportunities for new residential development oriented to the central park and lake facilities. The opportunity also exists for new industrial park and institutional development in the area to strengthen the economic viability of the project. Details of these projected land uses and their supporting economic forecasts are outlined in Chapter 4 of this report.

TEMPE/ASU DEMONSTRATION PROJECT

The initial project in Tempe offers some of the most exciting recreation and development potentials in the entire metropolitan area. The project area extends from the railroad tracks west of Mill Avenue to Hayden Road, adjacent to downtown Tempe and the ASU athletic facilities. Most of the remaining contiguous properties are undeveloped. The project area was selected because of extensive public land holdings in the area, ongoing capital improvements planned in the vicinity, and the opportunity to demonstrate coordination between diverse governmental agencies and private investment.

The emphasis of development plans is on active recreation. In this project the facilities serve both ASU and the general public. The focal point of the project will be an intercollegiate rowing course in the channel of the river, with compatible adjacent recreational and commercial facilities and expansion of ASU athletic facilities.

Another primary objective of this project is the expansion of Papago Park southward to the river. This would preserve a massive open-space area as well as provide a connection point to the valley's trail systems. Proposed plans provide for expansion of the City of Tempe's ongoing Neighborhood Development Program and the Tempe

Beach Park to the water's edge to bring the ASU campus and downtown activities closer together.

Improved access to and around ASU athletic facilities, together with trail connections to the Indian Bend Wash project, tie this first increment of the Rio Salado to other areas in the metropolitan region. This project could provide one of the most intensively used activity centers in the valley.

IMPLEMENTATION STRATEGY

The strategy for implementation of the Rio Salado Project is associated with three major considerations:

- The implementation agency
- Funding potentials
- Public education and participation.

The organizational tasks which must be accomplished in order to implement the project involve the following: management, utilization of funding potentials, land acquisition, overall planning responsibility, and intergovernmental coordination. The complexity of these five important activities may necessitate that primary responsibility for implementing the project's plans and programs be placed in a single agency. Existing agencies, especially MAG and the county, should be evaluated when determining the most appropriate body to assume this responsibility.

The potentials for funding the Rio Salado Project are numerous. Specific federal programs exist and alternatives are being proposed. The state stands as a possible funding source, which needs to be further explored. The local governments and Indian communities' capital improvement funds could be utilized. Finally, the project implementing agency could be given certain funding

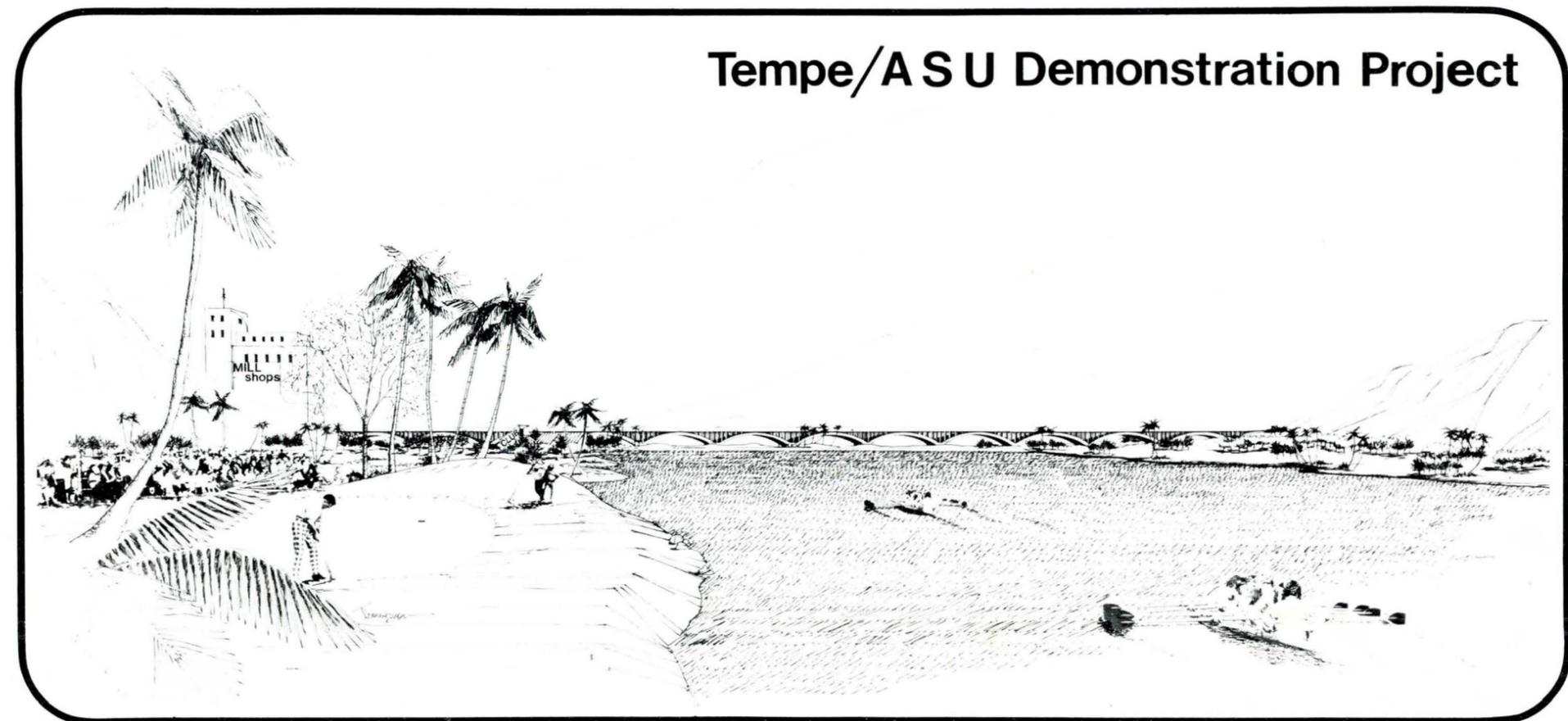


Figure No. 3

powers that would ensure a source of development and operating monies.

In order to maximize the use of these potential sources of funding, further study needs to be made of the status of existing and proposed federal programs. State agencies and programs need to be identified. Also, the legal and constitutional restrictions on giving the selected implementing agency the power of bonding and taxation, if required, must be identified and an assessment made for necessary legislation.

Other groups and individuals should be contacted and invited to participate in the Rio Salado Project in order to achieve the widest possible base of citizen involvement in determining the detailed implementation of the plan.

Responsibility for the citizen involvement program should rest with the agency holding primary responsibility for developing the project. Elements of the program should include:

- A permanent advisory committee
- An information system
- An evaluation system.

The implementing agency should hold a series of public workshops on project development and specific plans. The purpose of these workshops would be to identify affected citizens and potential users of project facilities.

A permanent citizens' advisory committee that closely parallels the economic, demographic, and social composition of the project study area should be formed and should be a formal body within the organizational structure of the implementing agency. Such a group should be charged with responsibility for assisting the implementing agency by:

- Informing the agency on the most desirable project uses
- Reviewing existing land use plans and regulations for the land adjacent to the project area
- Assisting in the designing of a program and a financing plan for implementation of the project plan.

1

Background for Planning

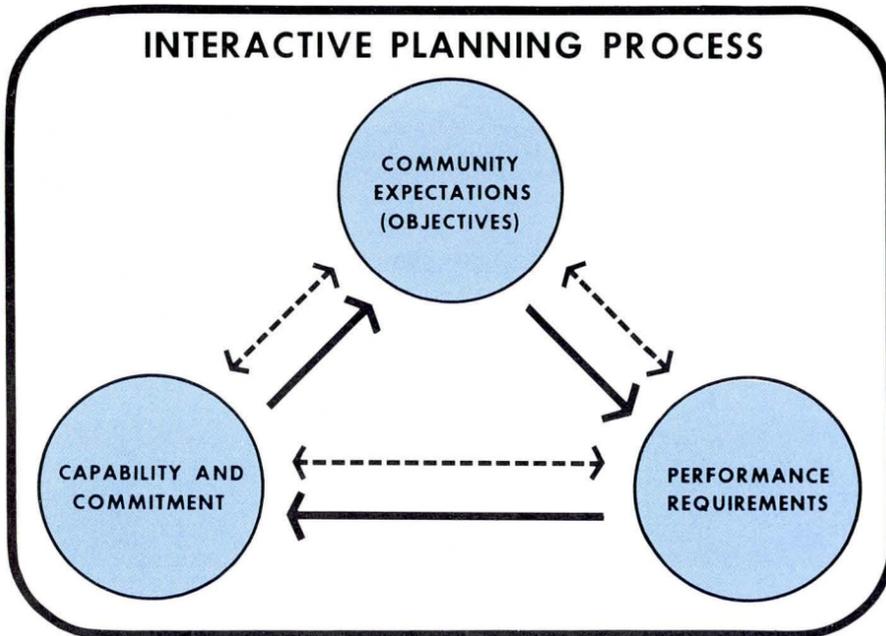


Figure No. 4

A project on the scale of the Rio Salado requires expertise in several professional disciplines. For the Phase II study, five firms combined their talents to produce a truly multidisciplinary planning team for planning the Rio Salado.

DMJM was the primary consultant with support from Earle V. Miller Engineers, Group Civitas, The Research Group, and Western Management Consultants. These five firms comprised a planning team that included the disciplines of regional planning, urban design, engineering, economics, architecture, governmental analysis, and environmental quality planning.

PLANNING PROCESS

The basic approach taken by the planning team was to use a design process including three key elements:

- Local objectives and expectations for the project area.
- Performance requirements to meet local objectives.
- The capability and commitment of the local community to implement the planning recommendations.

The role of the planning team in this iterative design process has been to assist the various local agencies and other affected groups in the planning area to define each of these three elements. In addition, the team's role has been to analyze how each of these elements can be balanced against each other to provide creative planning recommendations that meet a consensus of local objectives and expectations for the project area.

Using local interviews and the goals and policies established during Phase I of the study as a statement of objectives and expectations, the planning team hypothesized the full range of potentials that exist in the project area. Special attention was given to the objectives relating to recreation, open space, urban development and flood control measures. After reviewing the identified potentials with the Rio Salado Steering Committee, the planning team evaluated the constraints affecting the identified potentials. An extensive series of meetings with the regional, local and special interest agencies ensued to determine commitment and capabilities for further implementation of the Rio Salado Project.

Once an overall development concept for the Rio Salado had been identified through the above process, the planning

team directed its attention toward the two demonstration project areas for detailed evaluation of project potentials and implementation strategies. Specific plans for the project areas were developed, including basic phasing schedule and implementation programming. The information generated in these detailed studies was in turn applied back to the overall concept plan and refinements made.

The concept of the iterative design process is to be a continuing one with further refinement of the plans being done at local levels and in future Rio Salado studies based on feedback from the various agencies and individuals. This ongoing process would continue throughout the entire project area over the life of Rio Salado development.

RIO SALADO GOALS

In Phase I of the study the Rio Salado Steering Committee, a subgroup of the Valley Forward Association, developed a preliminary statement of project goals and objectives toward which a development might move. It is important to reiterate those goals because they provided the basis for this planning process. They are as follows:

General Considerations:

Flood control projects must be established as a precondition to any significant development in the Salt River flood plain. Given that, development should take the form that will unify the entire area and provide a special identity for it. The whole project must be accomplished within practical economic constraints and in consideration of the possibility of economies in certain functional areas accruing to the participants as a result of the project.

The Individual in the Metropolitan Area:

Recognizing that each person comes to the metropolitan area or decides to stay here for personal reasons, all goals and policies should be aimed toward enhancing individual freedom and respect for individual rights. Each individual's intellect, potential for creative growth, and contributions to the life of the community should be given the opportunity to develop.



Figure No. 5

The Separate Communities in the Project Area:

The interests of separately identified communities in the project area should be respected and advanced in accordance with the desires of the residents therein.

Environmental Quality:

It should be recognized that the Salt River (in Spanish, Rio Salado) is the "reason for being" of this great urban area. A principal effort should be directed at restoring life to the river and finding ways to dramatize and celebrate the role of water in the desert. This metropolis lives in a unique environment with a natural heritage, beyond its water, of clean air (albeit increasingly threatened), sunlight, desert, and mountains of great beauty. Every potential for enhancing the character of the metropolitan environment, both as a reality and as an image, should be explored and exploited beneficially.

It should be recognized that environmental quality has a direct bearing on levels of sickness, mental health, and crime.

Housing:

A wide variety of housing types should be provided for people of every age, income, and status group in the project area. A quality of housing should be maintained that will sustain human life in comfort and safety, at prices and rents that all affected people will be capable of paying. The growth and stability of family life should be encouraged through better housing.

Employment Opportunities:

For every person who desires to work, opportunity should be provided for meaningful employment, reasonably close to home, at decent wages, and with prospect for personal growth, development, and security. Such opportunities should be provided without regard to sex, creed, age, or color.

Commercial and Industrial Development:

Commercial and industrial development should be seen as essential to the economic viability of the

entire project. Development should be aimed, as well, at providing a wide variety of job options for all segments of the labor force. The interests of established enterprises must be respected, and the unique nature of the project environments should be exploited in attracting compatible new industries. It should be recognized that the realized Rio Salado Project will, itself, be a commercial enterprise of enormous magnitude and consequence, creating a very real image that will attract tourist spending and private investment.

Transportation and Communication:

The long-range project proposals should embrace all transportation concepts as future possibilities, while suggesting short-term solutions. They should similarly anticipate the improvement of communication between individuals and groups of all kinds, using all available media.

Leisure and Recreation:

For many years, the climate and other amenities of the Southwest, generally, and the Salt River Valley, particularly, have served as stimuli to the growth of both the resident and transient populations. To each, leisure and recreation are most important. It can be expected that free time will proliferate for members of our increasingly cybernetic, efficient, and affluent society.

Opportunities abound for the satisfaction of leisure and recreation needs in the project area. The evident potential of water for these purposes should be explored and exploited. Plans should carefully relate the proposed resources of those now existing or planned in the metropolitan area.

Neighborhood Quality:

The conservation, rehabilitation, and renewal of all residential areas throughout the project area should be made a part of an ongoing effort involving all of the area's residents. This respects the needs of both the permanent and the transient and mobile population. Zoning, building, housing, and subdivision controls should be regularly updated and, where appropriate, revised in order to ensure a high quality of future development

and the elimination of potential slum and blight conditions.

Urban Beautification:

To define beauty is difficult, but perhaps it can be perceived with consensus as the absence of ugliness. Beautification should not be seen as an addition, but as an inherent quality in every proposal and every achievement of the Rio Salado Project.



Figure No. 6

In addition to the above Goals statement, critical issues affecting the Rio Salado Project were defined in Phase I of the study. During this phase of the study these issues were analyzed in sufficient detail to develop the long-range concept plan and specific studies in the demonstration project areas. Summaries of the analysis of these issues are presented in this chapter.

CONFLICTING POLITICAL JURISDICTIONS – THE NEED FOR COORDINATED DEVELOPMENT POLICIES

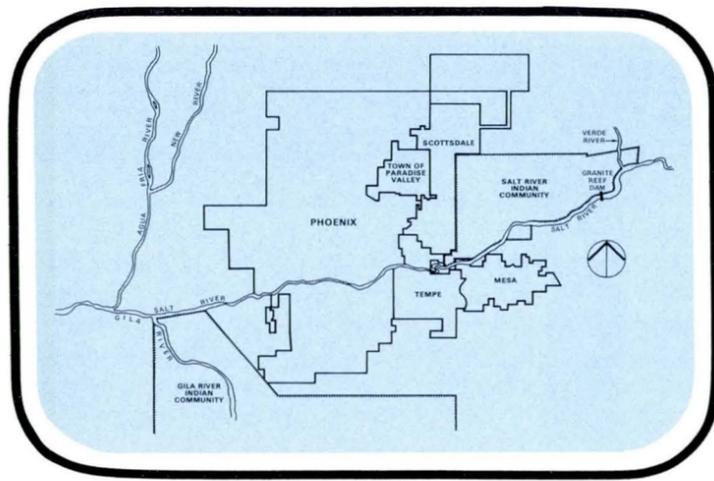


Figure No. 7

The Salt River passes through the political jurisdictions of the Salt River Indian Community, City of Mesa, City of Tempe, City of Phoenix, Maricopa County, and the Gila River Indian Community as illustrated in Figure 7.

In addition, there are sections of the riverbottom, that appear on the map as being within a municipality, which in fact are unincorporated areas of the county. As an example, a relatively small area of the riverbottom area east of Rural Road near Tempe is under county jurisdiction. Also there are several special rail and canal rights-of-way that cross or are near the Salt River.

The development goals of the political entities bordering the riverbottom may not always be consistent with one another with respect to the Rio Salado Project.

For example, one community may want to develop a park and golf course complex next to the riverbed, while a second adjoining government entity may simply treat the riverbottom as a source of sand and gravel to be later used as a landfill. The development goals of these two communities would obviously conflict.

Given the 40- to 50-year time table for total development of the Rio Salado, extraction of sand and gravel could be consistent with the project, if appropriately timed to allow for staged development. It is important for areas in the immediate vicinity of one another to have roughly consistent development timing.

Another potential source of political conflict along the Rio Salado is in the area of flood control. The problem of flooding transcends local political boundaries; thus flood control duties have been placed in governmental agencies that have areawide responsibility, such as the Maricopa County Flood Control District and the United States Army Corps of Engineers. It is important that right-of-way acquisition and flood control channel design be consistent with the overall design and concept of the Rio Salado Project. In addition, if the channel design were sufficiently flexible, it would be possible to add later stages of development to the project (such as water pooling areas) at a lower cost and with less impact on surrounding areas than if the channel design were inflexible. Regarding the channel, the planning team has met with favorable reaction from both the Flood Control District and the Corps of Engineers. Officials of these agencies, have expressed their interest in cooperating with the planning efforts for the Rio Salado.

Coordination among the concerned municipalities will also be desirable for any system of recreational trails that may follow the channel of the Rio Salado.

The management of water in the Rio Salado, initially in the demonstration project areas and subsequently in a series of linear lakes and lagoons up to the point of a flowing stream, may well require cooperation and coordination between each municipality traversed by the river and some overall agency, such as the County Flood Control District. Various organizational and administrative alternatives warrant further exploration before the most practicable arrangements have been determined.

SOCIO-ECONOMIC FACTORS

POPULATION GROWTH

Between 1960 and 1970 Maricopa County's population grew more than 43 percent to 967,500. Since 1970 it has increased almost 30 percent. And the Maricopa Association of Government's (MAG) projections of the county's population points toward continued growth – 1,726,700 by 1980, and 3,179,000 by the year 2000.

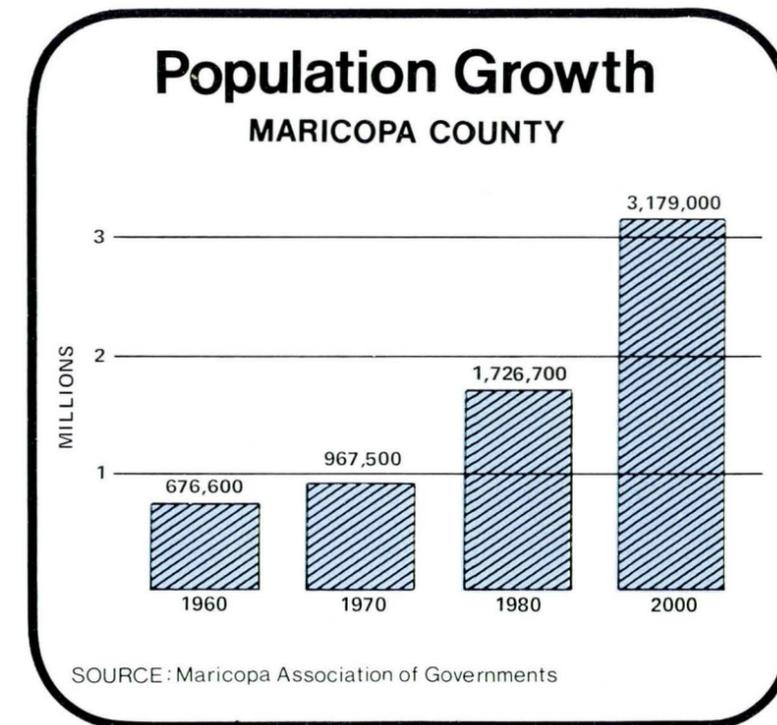


Figure No. 8

Growth Directions

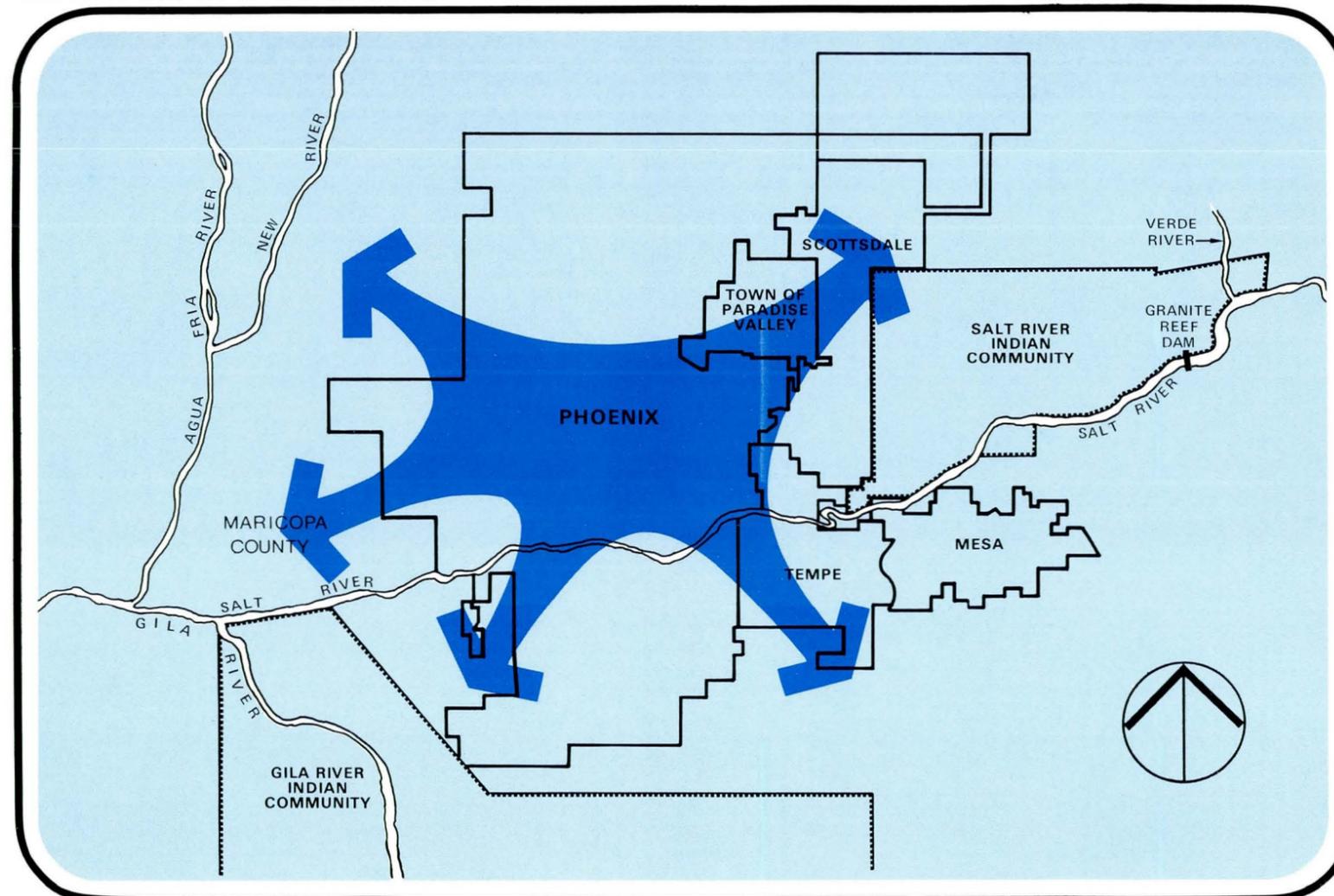


Figure No. 9

ECONOMIC GROWTH

As with population, Maricopa County has experienced rapid growth in employment, personal income, and other economic indicators. From 1969 to the end of 1971 total personal income increased \$862 million (25 percent). Non-agricultural employment likewise experienced strong growth, adding 73,400 jobs between 1969 and 1972, a 24 percent increase over that period.

All forecasts indicate a slower but continued economic growth. The apparent consensus of observers, however, is that Maricopa County will continue to experience strong economic growth relative to the past 10 years, and relative

to the nation as a whole. The Rio Salado Project, therefore, will be introduced into an economically active system.

FUTURE LAND REQUIREMENTS FOR THE URBAN CORE OF MARICOPA COUNTY

The magnitude of market potential in the urbanized core¹ of Maricopa County is illustrated in Table 1. These figures provide a conservative estimate of the potential market support for various land uses because they are based on higher ratios of land use to population than presently exist. Assuming even higher ratios, the land demands for urbanized

uses would be over 150,000 acres when the urban core's population reaches 1 million (approximately 1980 as projected by MAG).

The urban core planning area contains approximately 220,000 acres. Thus, when the population is 1 million there will be approximately 81,300 acres not used for urban purposes. When the population is 1.5 million there would be a deficit of 5,000 acres, a situation that would force intense development.

This last point is important. Future urban core land requirements can come from three basic sources:

- Vacant, developable land not otherwise utilized
- Agricultural land
- Land lying along the Rio Salado not having potential value for sand and gravel operations.

Given the present emphasis on preservation of agricultural land and the increasing problems of pollution caused by extended commuting trips, the relative closeness of the Rio Salado area as compared to land near the perimeter of the urban core makes this land a prime location and valuable asset to the entire urban area. With lakes, rowing courses, and other water-related amenities, the Rio Salado could potentially capture a significant portion of growing urban land demands.

¹ The urban core is defined here as the city of Phoenix planning area.

Table No. 1
LAND REQUIREMENTS FOR THE URBAN CORE^a
OF MARICOPA COUNTY

Land Use Classification	Approximate Acres of Land Requirements	
	Core Population = 1 Million	Core Population = 1.5 Million
Residential	60,300	90,450
Commercial	5,000	7,500
Industrial ^b	11,700	17,550
Public and Semipublic ^c	<u>73,890</u>	<u>110,250</u>
Total Urban Uses	150,890	225,750

^a MAG is in the process of developing land use to population measures for land planning areas but these were unavailable for Phase II planning work.

^b Excludes extractive industries.

^c Includes public parks and open space, streets and highways and canals and railways.

Sources: Projected by Western Management Consultants, Inc., based on land use to population ratios developed from City of Phoenix, *Comprehensive Plan 1990* adjusted for increased density.

EXISTING DEVELOPMENT PLANS

During the planning process, substantial effort was placed upon coordination of the Rio Salado concept with local and regional development plans. Additionally, specific policies, ordinances and actions of local agencies affecting the project area were investigated. In addition to official plans and policies, the planning team met with individual departments and bureaus to ascertain future informal plans and activities that might have some bearing on the Rio Salado.

Private sector development plans were also reviewed, especially those of the large landowners in the project area. Another primary factor was the expansion and development plan for Sky Harbor International Airport. Projected land requirements and noise contours had an effect on land use planning for the Rio Salado Project. Detailed analysis of the building height limits and acceptable noise levels indicates that development should be restricted in certain areas of the projected take-off and landing zones.

¹ Source: U.S. Department of Agriculture, Soil Conservation Service.

² Source: Arizona Fish and Game Department.

REGIONAL URBAN DESIGN CONSIDERATIONS

The Phoenix metropolitan area is today a rather typical example of the type of "spread-city" development that characterizes a majority of the urbanized areas of the western U.S. This growth, if it follows existing patterns, will be on relatively undeveloped lands in all directions from the core urbanized areas.

Probably the single greatest potential of the Rio Salado Project is for changing the existing development pattern along the existing Salt River. With careful planning, this new development pattern could provide opportunities for a new lifestyle, oriented toward recreation and an integrated mix of urban land uses. It would strengthen the existing urban form and change the image of the Salt River from "the back yard" of the region to a new, vital amenity.

In the fragile desert environment the "spread-city" form of development is not only wasteful of land and energy, but increases noise and air pollution, depletes the ground-water supply, increases the cost of living, and reduces the potential for environmental contrast between urbanized and natural areas. A more concentrated form of development to handle the anticipated population growth of the region seems not only desirable but critical to a balanced, economical life style. This concentrated development, in conjunction with a major recreation amenity, would alleviate many of the existing and anticipated problems of handling new population growth in a controlled manner, while providing a significant regional recreation amenity for existing residents.

The basic concept behind the Rio Salado Project is to reintroduce water into the present dry riverbed, to control the threat of flood, and to utilize this amenity to foster a comprehensive regional strategy for redevelopment of the riverbed. The character of this redevelopment would vary from natural to urban depending on the character of adjacent areas. In each instance it would provide an opportunity to carefully analyze what the most appropriate form of development might be.

NATURAL ENVIRONMENT

It is difficult to classify much of the project area except the far westerly end as having a natural environment. The construction of the dams on the Salt and Verde Rivers with resulting drying of the Salt River below Granite Reef Dam,

as well as the continued extraction of sand and gravel, has virtually eliminated any natural character in the area. As is much too often the case, the river has been used as the dumping ground, the "back door" of urban development. This factor is a primary incentive for reintroducing water into the Salt River in a controlled manner.

The project area is devoid of major wildlife habitats except for the area west of 91st Avenue. This area has developed into an attraction for indigenous streamside breeding birds, plus large numbers of migratory and wintering birds and other wildlife. They are attracted to the area because meandering channels of treated effluent from Phoenix treatment plants support a young forest of willow, cottonwood, and tamarisk trees. There are also many small lagoons lined with cattail. This unique area should be preserved.

In a more general framework, the Rio Salado Project area lies primarily within the "Phoenix Desert Shrub" vegetative unit. Characteristic species of this unit are creosotebush, mesquite, desert saltbush, and ironwood. Other common species include burroweed, fluffgrass, catclaw, threeawns, hedgeapples, and numerous annuals.¹ The mean annual precipitation range is 6 to 9 inches, with approximately 40 percent falling during the summer months. Mean monthly temperatures range from 50 to 90 degrees fahrenheit.

The only major wildlife range found within the project area is that of the mule deer.² Other wildlife include a variety of indigenous mammals, amphibians, and reptiles.



Figure No. 10

HYDROLOGY

Because of the sizable difference between flood channel capacity requirements before and after Orme Dam is constructed, the immediate and long-range planning of the Rio Salado will require sensitive phasing of the various development programs. Key hydrological factors are discussed in detail in Chapter 2. Major factors to be considered are:

Flooding

- To preserve the existing channel and overpour bank capacity within the project until completion of Orme Dam
- To provide for a flood carrying capacity of about 50,000 cubic feet per second after Orme Dam is completed
- To allow for flood flows from tributary streams or washes entering the project
- To allow for flood discharges from city storm drain systems
- To provide water ponding that will facilitate "fail-safe" features under flood stage conditions.

Water System Operation

- All lakes, ponds, channels and other water holding facilities must be incorporated into a single water management operation.
- Surface water ponds and flows must be related with groundwater movements beneath the project area.
- Recirculation of seepage losses will be of major importance in water management.
- Renovated sewage effluent may be the principal source of water for earlier projects.
- Salinity control will be a major factor in water management.
- A balanced biologic growth will be needed in lakes and ponds for its sealant qualities in the reduction of seepage losses, but must be controlled to prevent excessive growth.

GEOLOGY

The Rio Salado Project lies within a basin and range lowlands characterized by isolated mountains separated by broad valleys filled with several thousands of feet of unconsolidated sedimentary deposits. The project crosses two distinct plains separated by a series of small hills that extend southward from Camelback Mountain to Tempe and Bell Buttes.

The hills of the region are masses of eruptive rock extrusions composed predominately of Precambrian rhyolites, andesites, and basalts with some volcanic glass, pearlite, ash, and scoria. The projection into the valley is composed of metamorphized sedimentary arkose sandstone, breccia, and conglomerate rocks. These strata rest on an uneven surface of granite and are wholly fragmented.

Bedrock appears over the surface on a greater part of the hills and higher lands extending from Camelback Mountain to Tempe. Where bedrock was not exposed early, well drillers encountered it at shallow depths. The river crosses this range north of Tempe Butte, and its channel practically rests on bedrock. The andesites and red sandstones of Tempe Butte and the conglomerate on the hills on the north bank are exposed down to the riverbed.

Southwest of Tempe, Bell Butte rises from the level valley floor about midway between Tempe Butte and the Salt River Mountains. Well drilling has not exposed an underground connection between Tempe Butte, Bell Butte, and the Salt River Mountains, and there appears to be a free passage for underflow of groundwater between the Mesa and Phoenix Plains.

The Mesa Plain above Tempe Butte contains evidence of an older gravel deposit to an elevation of 25 feet or more above the present bed. Later these gravels were cut by the river to a depth of at least 75 feet, and this depression widened several miles. The later degradation was partially filled. It is widely believed from the evidence at hand that the Salt River formerly joined the Gila east of the Salt River Mountains.

The Phoenix Plain below Tempe Butte contains valley fill abutting more or less abruptly against the igneous formation of the Phoenix and Salt River Mountains. This valley was originally formed without influences from the Salt River. Its aggradation was due to erosion from the mountainsides themselves and to debris carried in by the small

streams entering the plain from the north. An older alluvium consists of medium- to well-cemented residual soils, and talus debris is generally found along side slopes of the valleys and underlying the recent alluvium. Away from the hills, the older alluvium is mostly sand and silty sands containing varying amounts of caliche. As compared to Salt River depositions the debris is fine; larger streams formed gravel beds but no boulders.

In the next stage, the Salt River cut through the bedrock at Tempe Butte along the present course of the river. A deep, wide channel of undetermined depth was degraded, then later filled with the coarser sands, gravels, cobbles, and boulders that presently underlie the riverbed. These rock materials are of especially high quality for concrete production.

In general, the valley deposits store large amounts of water and readily yield water to wells. Exposed rock resists erosion on hillsides, and sediment production is moderate. In the flatter valley sediment production is low. While there is evidence of ancient folding and faulting exposed in rock formations, no recent seismic activity has been recorded.

STRUCTURAL FOUNDATION CONDITIONS

In general, the undisturbed river deposits found throughout the Rio Salado Project are of a high bearing capacity, supportive of foundations, piers, and footings of the low structures existant in the area. There is evidence of the collapse of several concrete structures along the riverbed, but this damage appears to have resulted from undermining by flood waters. Bridge crossings show no damage due to settlement.

Water, on the other hand, poses considerable problems where structures are to be built below the water table level. The gravel material is highly pervious. Special provisions will probably have to be made to exclude water by use of various types of cofferdams or caissons.

Construction of levees, dams, or other water retention structures will probably require seepage control in the form of cutoff wall construction or blanketing of the upstream face of structures with an impervious material.

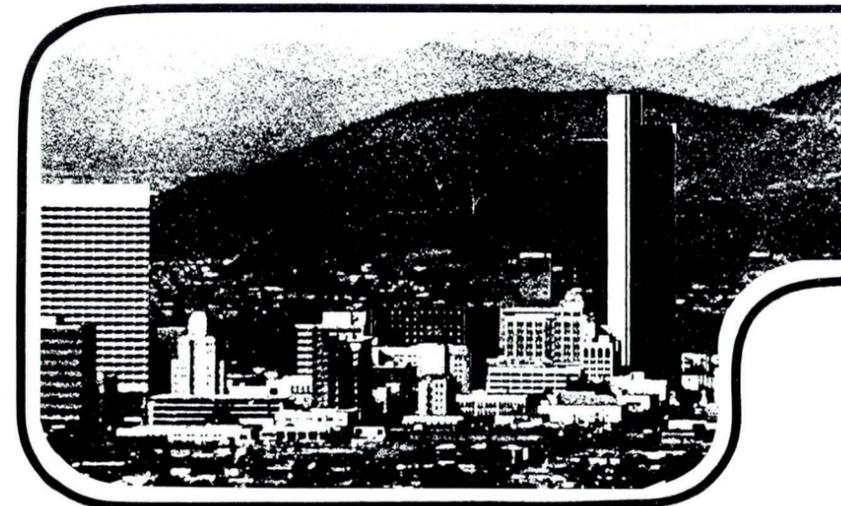
In areas of disturbed materials such as old landfill operations, material depositions from channel construction, etc., foundation conditions are unknown. Each site of a proposed structure must be investigated to determine the soil conditions at that site.

SOIL CLASSIFICATION

The Salt River bottomland constitutes a narrow strip of Class 6 lands, surrounded on each side by broad plains of arable and irrigable Class 1 lands. The Class 6 lands are mostly composed of soils very coarse in texture and of low water holding capacity, and are generally unsuited for agriculture. The Class 1 lands, on the other hand, are highly productive, particularly under irrigation in this area of mild climate.

Some areas of Class 1 lands may be included within the Rio Salado Project. These lands would be particularly amenable to the development of "greenbelt" parks composed of grasslands and trees.

The Class 6 soils will require amelioration before they can be put under cultivation or planted to irrigated vegetation. The principal problem will be to increase the water holding capacities of the soils to sustain plant growth. Modern irrigation facilities such as sprinkler or trickle irrigation systems must undoubtedly be incorporated in plan design.



MAN MADE ENVIRONMENT

The project area, as it stands today, is an anomaly in the region. A brief look from the air points out the general spread of urbanization, first to the surrounding low mountains, and now beyond them. The Salt River bed, however, is virtually devoid of urbanization because of its past history of flooding and its resource potential for sand and gravel operations.

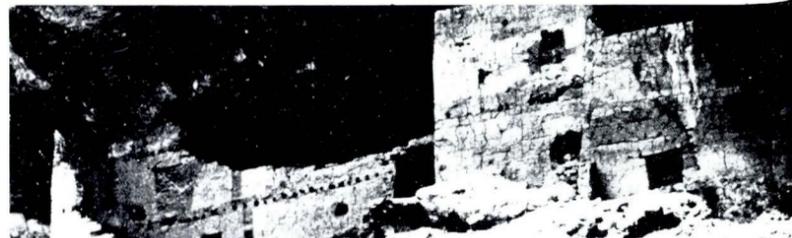
In certain areas, such as near the airport, new industrial development is occurring. Also, during the general development of the region, a number of structures have encroached on the flood plain, but they generally are not of particularly high quality today. The City of Phoenix, for instance, has found that the most severe areas of blighted housing are in this area.¹

Probably the most significant feature of the project area is its general lack of development despite a location adjoining the city centers of Phoenix, Tempe, and Mesa.

ARCHEOLOGY

Within and adjacent to the Rio Salado lie a wealth of pre-Columbian historical and archeological sites. Dr. Alfred Dittert, professor of anthropology at Arizona State University, estimates that there may be as many as 1,000 sites including many Hohokam Indian sites.

The prime concern expressed by all agencies contacted was the confidentiality of site locations due to the high incidence of vandalism, and the need for an environmental



impact analysis regarding the effects of the Rio Salado on these sites.

It was generally agreed that the Rio Salado could become a prime mover in getting proper agencies to dig, inventory, and preserve these sites.

SAND AND GRAVEL OPERATIONS

Perhaps the single most important influence on Rio Salado phasing will be sand and gravel operations. The Salt River has long been the primary source of extractive raw materials for the construction industry in the Phoenix area. In an economically dynamic area like Phoenix the importance of the sand and gravel cannot be overstated. The Rio Salado

¹ Phoenix, Comprehensive Plan: 1990, p. 50.

concept recognizes this importance. It is envisioned that the sand and gravel operations and Rio Salado development will become mutually beneficial elements with a very positive impact on the region.

In the past, areas where extractive operations have been completed were left as open pits that have been used as sanitary landfill sites. Under the Rio Salado concept these sites would be used as recreation sites, where water can be impounded and developed as lakes. Specific standards for

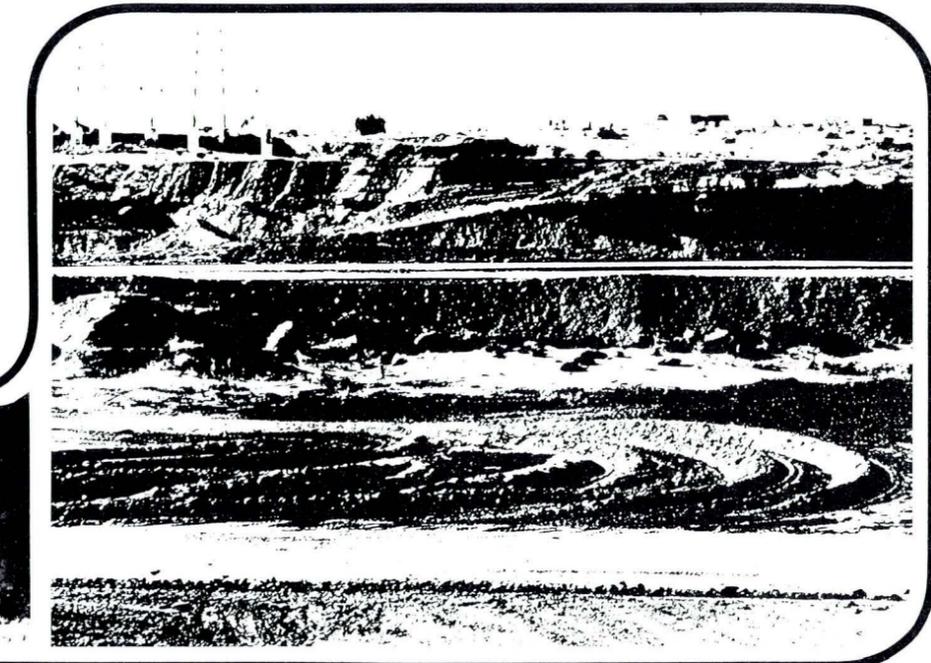


Figure No. 11

edge treatments would be set to ensure that recreational and related uses can be easily developed around extractive sites.

Generally, Rio Salado development will follow sand and gravel operations in each area of the riverbed. In some areas, however, extractive leases may be encouraged on publicly held land in order to accommodate an ongoing Rio Salado Project. An intricate system of development trade-offs and project scheduling will have to be worked out to accommodate both the extractive industries and Rio Salado development. Recent court decisions have permitted resource depletion allowances for tax purposes for extractive industries. These factors must be analyzed in detail in further study of the Rio Salado. This will be an important element of the next Planning Phase.

UTILITIES

The Salt River bottom lands serve as a convenient route for several major utility lines in the valley. Therefore, these lines become a significant influence on the planning of the Rio Salado Project, especially in the planning of future water courses. A discussion of each of the utilities to be considered in the Rio Salado planning program follows:

Power

The main power network enters the valley from the northeast. Two 230-kilowatt lines parallel the Salt River south of the Beeline Highway to a point near the intersection of Pima Road, where they turn westerly along the riverbottom. Several lines traverse the project area between Hayden Road and a location near 44th Avenue. These and any newly proposed lines will need to be incorporated in project development plans.

Arizona Public Service Company's Ocotillo Thermo-Electric Power Plant located at Hayden and University in Tempe is another potential source of water for the University projects. The average annual discharge of cooling waters from this plant is 486 gpm.

Sewers

As the low point in natural drainage from the Phoenix plain, the Salt River bottom serves as the logical alignment for major sewage outfalls. The principal trunkline to the 23rd Avenue and 91st Avenue treatment plants traverses the northern part of the project upstream to Hayden. The line now serves the northern part of Phoenix, Scottsdale, and Tempe. A second smaller trunk line traverses the project on the south, but only enters the project at its westerly end.

The City of Mesa is now served by the 8th Street Plant. Present plans are to abandon this plant in 1980 and to utilize the Phoenix system. Space has been reserved in the main trunk line and a 36-inch line connection is proposed to cross the river at Hayden.

Water

There are few city water lines in the project area. However,

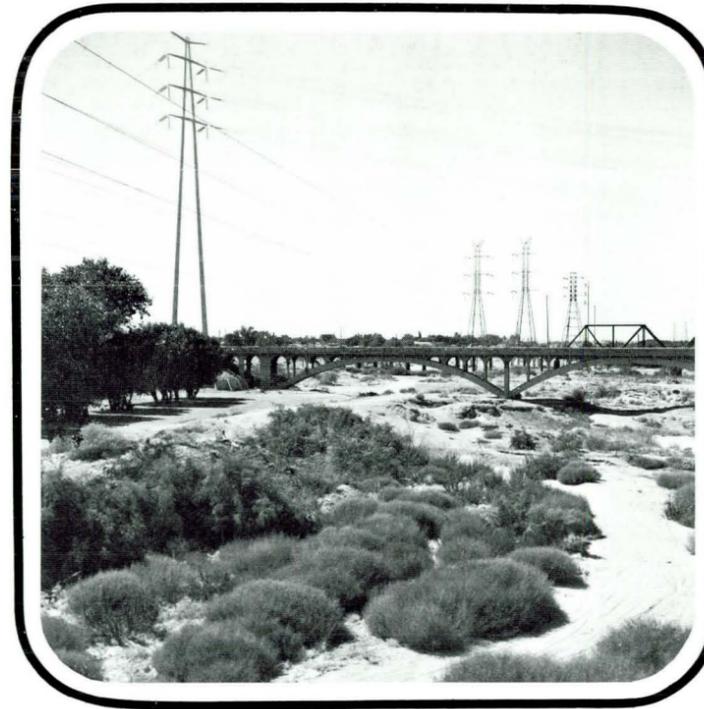


Figure No. 12

a principal 72-inch trunk line is now under construction, which will traverse the project area from Alma School Road to 3rd Avenue. A second 36-inch line crossing the river at Hayden is now being constructed. It will have a flow-line elevation at the bridge of 1,140 feet.

Existing water lines include:

- A 30-inch line crossing the river at Rural Road, which has a flow elevation of 1,144.5 feet at a point 2,300 feet north of University Drive
- A small 12-inch line crossing the river at Mill Avenue and an 8-inch line extending about one-fourth mile south of Gilbert on Rural Road are known to be laid at least 3 feet below ground surface.

Gas

Main trunk gas lines along the riverbottom that must be considered in the designs of the demonstration projects include:

- A 16-inch line along Central Avenue. This line is suspended on the existing bridge.
- A 10-inch line along Seventh Street. This line is suspended on the existing bridge.

- A 6- to 8-inch line along Mill Avenue. This line is suspended on the upstream highway bridge presently in use.
- A 10-inch line along Hayden Road. This line presently is laid underground. No plans exist at this time to suspend this line on the bridge now under construction.

Telephone

The Arizona Telephone and Telegraph Company has only one trunk line known to cross the areas of the proposed demonstration projects. This consists of a coaxial cable mounted in a steel pipe, crossing the Central Avenue Bridge at deck level.

Mountain Bell Telephone Company has a duct crossing on the Mill Avenue Bridge, a buried conduit along Rural Road, and aerial cable crossings at Hayden Road and just west of Mill Avenue. A principal ten-duct line is planned along Hayden Road, and will be attached to the bridge when it is constructed.

Arizona Nuclear Power Project (ANPP)

Proposed for construction by 1980 to 1983 is a nuclear power plant to be located west of Phoenix near the town of Wintersburg. The Arizona Public Service, Salt River Project, Tucson Gas and Electric, and other users have made an agreement with the City of Phoenix for the purchase of sewage effluent. However, adequate sewerage water supplies for the Rio Salado Project are forecast.

Possibilities exist for use by the NUPP of specific facilities in the Rio Salado Project. Supplemental water storage ponds for the nuclear plant could be located on the project in lakes near Buckeye on the Agua Fria River. This utility now maintains a separate planning office. Rio Salado Project planners will need to keep in continual contact with this office in regard to plans for both sewage effluent use and possible new power line construction.

2

Water System

THE WATER SYSTEM

The importance of water services and its use cannot be overstated in the Phoenix metropolitan area. More specifically, the concept of reintroducing water back into the Salt River is the cornerstone of the Rio Salado Project. This section describes in detail the hydrography and water systems parameters considered in the Rio Salado study.

HYDROGRAPHY

Water flow through the Rio Salado Project is composed of two types: 1) controlled releases from upstream storage facilities and 2) uncontrolled storm flows originating in that part of the watershed below storage facilities. Each type sustains individual flow characteristics influencing project development as greatly different parameters. Each must be considered separately in planning.

CONTROLLED RELEASES

The six reservoirs constructed on the Salt and Verde Rivers are the controlling devices for management of the runoff from the 12,500-square-mile watershed above the Rio Salado Project. The annual runoff varies from a low of less than 350,000 acre-feet to a high in excess of 3.5 million acre-feet, a factor of 10. Regardless of these extremes in runoff, the Salt River Project has an excellent record of water management, and wastes of excess flows have been minimal. In the 33 years between 1941 and 1973, controlled flows were released over Granite Reef Dam 16 times. Eleven of these were less than 10,000 acre-feet, and two were of 16,000 and 20,000 acre-feet respectively. The three major releases of 880,000, 551,800, and 1,180,000 acre-feet occurred in 1941, 1966, and 1973 respectively.

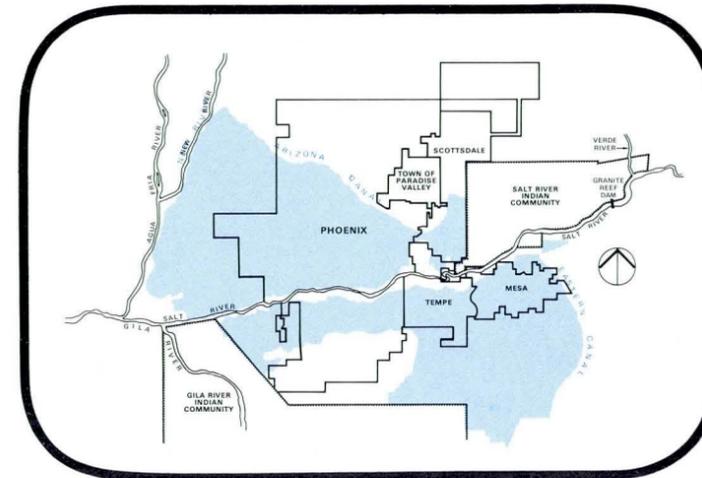
River flow peaking also has been greatly reduced by the construction of these reservoirs. Prior to construction of the first structure, Roosevelt Dam in 1907, a record flow of 300,000 cubic feet per second occurred in 1891. Since 1907 the peak recorded has been 67,000 cubic feet per second in 1966. This has resulted from the policy by the Salt River Project to try all possible means to maintain releases at less than 12,000 cubic feet per second, which is considered the maximum flow permissible without causing damage to project and downstream municipal facilities.

Small releases, such as in the case of 13 of the 16 releases since 1941, follow much the pattern of the 1965 release. At that time some 39,000 acre-feet were released from Bartlett Dam. Of this flow 19,000 acre-feet were diverted into the Salt River Project's canal system at Granite Reef Dam, and only 20,000 acre-feet were released into the Salt River. The peak discharge was held to 6,000 cfs.

IRRIGATION SYSTEM

The Rio Salado Project will always be vitally affected by the dams and canals of the Salt River Project. Flood releases from the project's reservoirs have been described above. The flows that may be released from the canal system are described below.

In 1962 the SRP initiated installation of a supervisory system through remote control of gate openings from a central office. The system was considered necessary



Salt River Project Boundaries

Figure No. 13

because of the unpredictable inflow of storm runoff into the main canals at numerous points below the diversion dam, and the need to protect against canal breakage with its resultant damage to urban development within the project area.

There are four wash inlets into the upper reaches of the South Canal on the south side of the Salt River within a short distance of the Granite Reef diversion structures. The Hennessy structure releases water into the river channel a short distance below the third wash inlet and is the principal outlet for the South Canal. Sizable releases were made in the 1930s and 1940s, but with the improved supervisory system releases have been greatly reduced. Discharges from the Hennessy Wasteway are not likely to reach the Rio Salado Project facilities. Discharges from the Tempe Wasteway however might be available to the Rio Salado Project due to its proximity to the ASU Campus

Most important to the Rio Salado Project are the releases from the Grand Wasteway which enters the river at Joint Head east of 48th Street. During the period from 1950 to 1969 the records show that in 17 of the 20 years, annual releases were of a quantity important to the Rio Salado system. The annual discharge averaged more than 1,000 acre-feet. The proposed siphoning of the Arizona Canal at Indian Bend Wash at about 46th Street will reduce these discharges considerably upon completion of the siphon. Construction may be completed in 1976 or 1977. Below Joint Head the Rio Salado Project will be most affected by flows from the City of Phoenix into the old crosscut canal, which is interconnected with the SRP Grand Canal.

Salt River Project waters are allocated entirely to water right lands. It may not be sold, nor may it be removed beyond project boundaries except by agreement for exchange. Should the Rio Salado Project obtain an allocation from the Central Arizona Project, it could be possible to work out arrangements for exchange of this allocation with the Salt River Project. Similarly, waters obtained from municipalities could possibly be exchanged. Such exchanges would need to be worked out through the municipalities.

While the Salt River Project does not have jurisdiction over the control of groundwater pumping within the project, it does have an interest in and jurisdiction over the removal of pumped groundwater from within the

Potential Input Flows

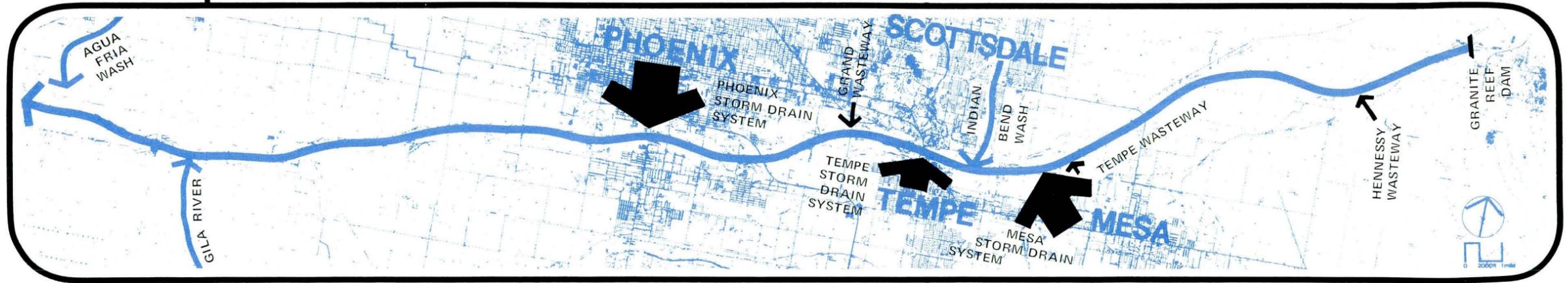


Figure No. 14

project boundaries. Thus water pumped from wells located within the Salt River Project and surface waters delivered to SRP lands within the Rio Salado Project must be used only within SRP boundaries.

UNCONTROLLED STORMFLOWS

Runoff characteristics of flood flows not subject to reservoir retention vary with the three basic types of storms that normally occur over the southwestern United States. These are: 1) general winter storms, 2) general summer storms, and 3) local storms.

STORMS

Though low in intensity, general winter storms produce large areal coverage and are of long duration, resulting in high peak flows and significant volumes in the larger basins. Ten of the 16 releases from the reservoir system probably resulted from runoff from this type of storm.

General summer storms occur primarily between July and September, with some storms as early as May or as late as October. Eighteen such storms have yielded significant runoff from tributaries below the reservoir system. Four such storms resulted in controlled releases from the reservoirs. These storms generally last a period of one to four days. Thunderstorms occurring late in the period on wet ground are conducive to high peak discharges of relatively short duration.

Local storms are normally scattered and isolated. These storms often produce severe flash floods over small drainage basins. Serious local damage sometimes results, particularly in urbanized areas.

FLOOD PEAKS

Flood routing studies carried out by the U.S. Army Corps of Engineers are incomplete at this time. However, preliminary evaluations, subject to change, estimate that under present conditions peak Standard Project Floods of about 290,000 cubic feet per second could occur at Granite Reef Dam. Streambed attenuation, overbank storage, and other factors would reduce these flows to peaks of about 253,000 cfs at the Mill Avenue Bridge, and 200,000 cfs at the confluence of the Salt and Gila Rivers. The frequency of occurrence of the Standard Project Flood, when plotted on a frequency curve, is about once in 200 years.

In the design of specific projects, consideration must be given to flood potential. First, as to whether the construction would be prior or subsequent to Orme Dam and, second, to preserve or increase the existing capacity through the area to be developed.

IMPROVEMENTS AFFECTING RUNOFF

Drainage of the broad range lowlands and isolated mountains that compose the lower Salt River watershed above its confluence with the Gila River has been in a constant state of change since modern development first was started in the late 1860s. In the early development stages, conversion of untilled desert lands to irrigated farms seriously affected local drainage patterns.

Ephemeral streams were cut and leveled into farm plots where rainfall as well as irrigation water was stored on the farm itself. Irrigation canals were designed to intercept and transport runoff from ephemeral streams to selected wasteway locations. In general this development resulted in a reduction of runoff to the Salt River.

Imposed upon the irrigation development has been the ever expanding municipal and residential growth of the principal city of Phoenix and the communities of Tempe, Mesa, Scottsdale, Glendale, Buckeye, Peoria, Paradise Valley, Sun City, Youngtown, Surprise, and Litchfield Park. This development has reached metropolitan proportions, with the residential areas of the outlying suburbs now abutting each other and that of the central Phoenix area. However, the transition from farmland to metropolis is not yet complete, and parts of the region still reflect agrarian characteristics.

In some of the early stages of residential development, the on-land storage of rainfall was maintained because home lawns continued to be irrigated. Irrigation borders were maintained, and thus rainfall was trapped and retained where it fell. Recent developers, however, have abandoned irrigation systems in favor of less costly on-

site drainage systems. Most of these systems have used the streets and gutters as main channels for disposal of runoff. The trend of storm runoff through development has been reversed, and resulting storm damages have recently increased.

MUNICIPAL DRAINAGE SYSTEMS

Because of the low annual precipitation (7.5 inches average annually) and the valley's development history, flood damage throughout most of the early development period was limited to areas of intensive commercial development. The good land slope found in most of these areas and their close proximity to the Salt River permitted rapid removal of flood waters in the street systems without major flood damage. Thus flood drainage systems have never been taken seriously by the citizenry, and, until recently, major bond issues were usually voted down.

Municipal drainage systems consist of individual pipelines leading directly to the Salt River. Nearly all are undersized and do not handle the runoff characteristics of the current development patterns. Recognition of the dangers of continuing this development trend has caused municipal leaders to consider a return to on-site storage facilities in large residential tract developments. In lieu of the earlier irrigation pattern of storage, developers now are beginning to incorporate "open space" grassed temporary storage basins oriented to recreation and beautification. While this trend is new and is far from being imposed on all new developments, it does point to greater civic and public consciousness of municipal drainage problems. Future development should result in an ever increasing interest in flood control, and will undoubtedly result in greater discharges into the Rio Salado Project area.

Standard Project Flood Flows

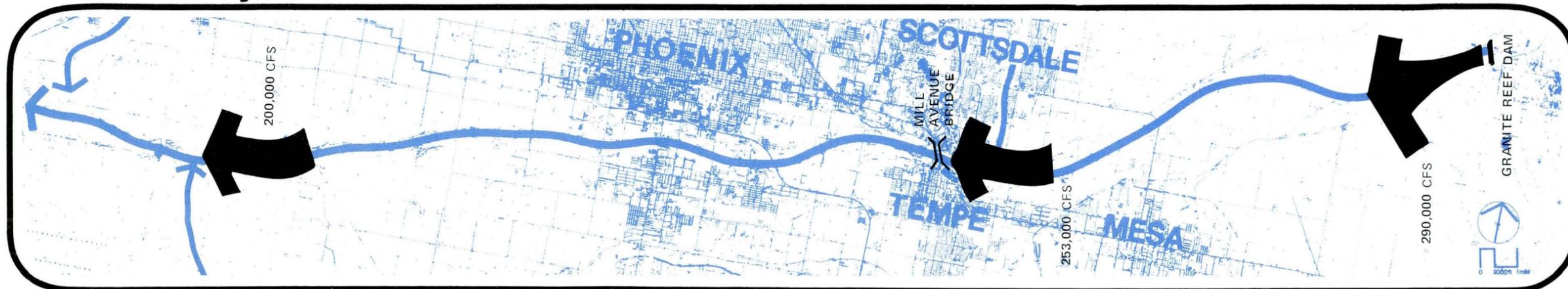


Figure No. 15

INDIAN BEND WASH PROJECT

This tributary to the Salt River discharges into the main stream between Scottsdale and Hayden Roads. The confluence lies along the upper reach of the University Demonstration Project. The Indian Bend Wash Flood Control Project was authorized in October 1965 by the U.S. Government and is presently under final stages of construction.

The project serves as an excellent example of increasing public interest in flood control work, while at the same time demonstrating the desire of the public for incorporation of the esthetic and recreational attributes of natural channels.

Development of the Indian Bend Wash area of Scottsdale has been very rapid during the past 15 years. Floods in 1970 and 1972 resulted in major flood damages estimated at \$1.4 million and \$2.9 million respectively. The public demand for protection became intense, and the voters of Scottsdale overwhelmingly approved a \$10 million flood control bond issue on 10 April 1973. However, voter interest in the esthetic value of Indian Bend Wash was not lessened by these costly floods, and a strong public sentiment enforced incorporation of a "greenbelt" floodway concept into the bond issue.

CENTRAL ARIZONA PROJECT (CAP)

The CAP is an authorized project for the diversion of Colorado River water to the central and southeast part of Arizona. Under the jurisdiction of the U.S. Bureau of Reclamation, the project comprises a series of pumping

plants and aqueducts for the transportation of water into the Salt River Valley and onward to the Santa Cruz Basin. Two principal structures of this project will have major impacts upon the drainage patterns affecting the Rio Salado Project.

The Granite Reef Aqueduct proposes to cross the northern part of the Salt River Valley drainage basin. To protect part of this canal, the project proposes construction of the Paradise Valley Detention Dike. This dike will extend from approximately Cave Creek Road (24th Street) to a point about 1,000 feet west of Taliesin West Lane (108th Street). The dike will intercept the drainage from about 43 percent of the Indian Bend Wash Basin. Award of contracts for construction of this dike has been made.

Orme Dam, to be located near the confluence of the Salt and Verde Rivers, is proposed by the CAP as a water retention reservoir for CAP diversions and for flood control capacities. The reservoir proposed will have a capacity of 1.6 million acre-feet, of which 400,000 acre-feet will be used for active storage and 950,000 acre-feet for flood control.

Upon completion of this structure, far greater control of flows originating in the upper basin can be imposed, therefore peak flood channel capacities through the Rio Salado Project can be greatly reduced, and annual flow patterns below Granite Reef Dam will be changed. While the CAP has been approved and work has commenced on some parts of the project, appropriations for construction of Orme Dam have not yet been approved.

RIO SALADO PROJECT

The project itself will impose a major change on the flow characteristics throughout the project limits. Control of small flows originating as storm runoff from municipal drains and irrigation project releases will be achieved through the extensive system of retention ponds and lakes developed within the project. Flows will be routed through these ponds to obtain optimum value in water usage.

Post Orme Dam Flows

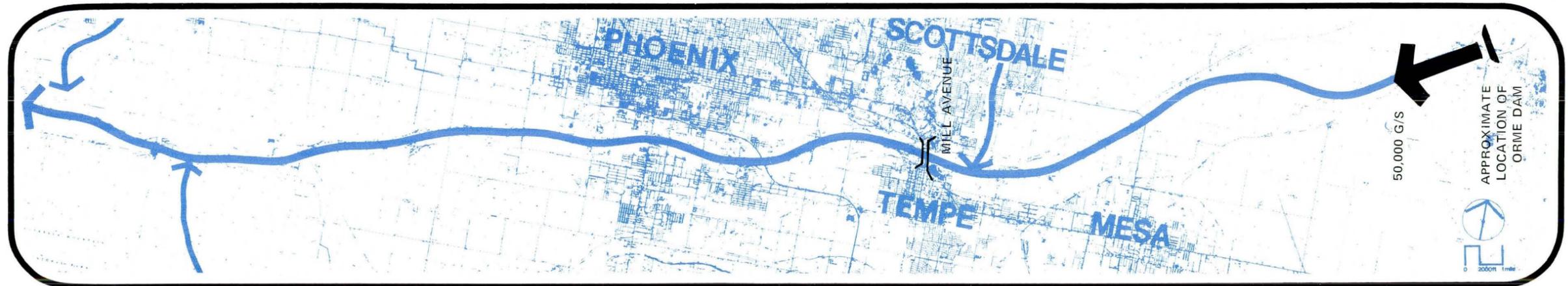


Figure No. 16

SEDIMENTATION

The potential problem of sedimentation has been considered. Most sedimentation comes from flood flows over undeveloped areas. Potential sedimentation will decrease as more land is developed, more flood retention facilities are constructed, and after Orme Dam is built. Lesser sedimentation would, of course, tend to seal the lake bottom. Heavy silting, to the extent where it must be removed, is not anticipated. There may be occasions when localized sedimentation may occur as a result of flood flows through the Rio Salado when minor sedimentation deposits should be removed for a specific part of the Rio Salado development.

Excessive sedimentation could decrease the permeability of the lake and channel bottom and alter the proposed water cycling rate which, in turn, could affect the amount of water treatment, if any, required.

Upon development of the upstream reservoir system, the entire character of the river changed. Flood flows were reduced. Heavy sediments were entrapped, and the river assumed its present character in the urban area. The river still retains its natural streambed characteristics above the Oak Street Crossing. Below this point numerous deep and sizable pits have been opened by gravel mining operations.

From 48th Street down to 16th Street the river has been rechanneled around the Sky Harbor Airport. More rechanneling is planned for the next expansion of Sky Harbor. Below 16th Street, gravel mining once again dominates the character of the river channel.

Flood releases from the reservoir system of clean water charge themselves with sediments as quickly as material becomes available. With the exception of the 1965 flood releases, flows have been well controlled and of low volumes. Velocities in the stream flow have been low, and resulting sediment movements have been limited to

the finer sands and small gravels. Much of the riverbed along natural channel sections is now paved with a coarse gravel bottom consisting of cobbles fist size or larger. These sections are quite stable under low flow conditions.

There is some movement of even the heavier materials above and between gravel pits. During the 1973 sustained flow, bed-load movements were so great in some sections that the bottom grade of the river is said to have degraded as much as five feet along short reaches. Bank erosion also was noted during this sustained flow of five months duration.

Much of the gravel west of 16th Street has already been mined, and this section has the appearance of a valley pitted by meteorites. Landfill operations are rapidly refilling abandoned gravel pits, and the trend is toward the rebuilding of a restricted channel section. The opening of new gravel pit operations is generally moving upstream from Hayden crossing and downstream from 35th Avenue.

Sediment contributions from the tributary Indian Bend Wash and from the city storm drains and irrigation wasteways are minimal. Water entering these channels is of low velocity not conducive to the movement of heavy sediments. Local depositions of fine sands, silts, and clays can be expected at their outfalls.

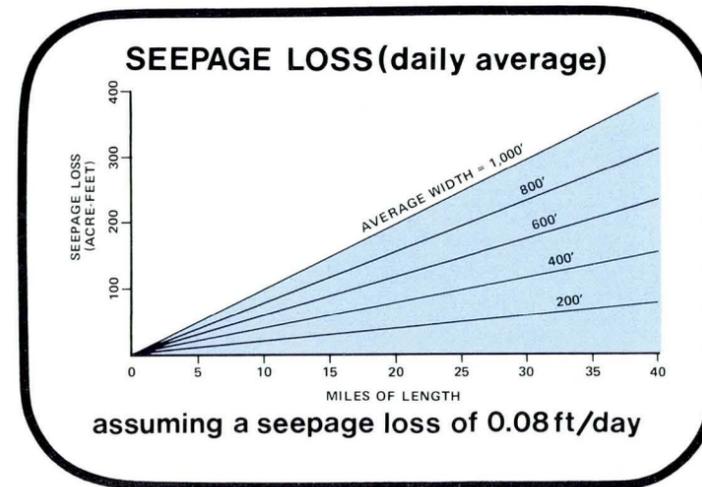


Figure No. 17

INFILTRATION

The coarse sands and gravels of the Salt River streambed are underlain by highly permeable materials conducive to a high rate of attenuation of stream flows. The ground-

water table has been lowered by massive pumping to a depth considerably below the riverbottom. Therefore, a large and ready storage volume for infiltrating water exists.

An example of the high attenuation that now occurs in the river channel is the measurements made on the 1965 controlled flood releases from Bartlett Dam. Of the 20,000 acre-feet of water that poured over Granite Reef spillways, only 5,500 acre-feet reached Joint Head Dam at 48th Street, 4,800 acre-feet reached the 16th Street crossing, and less than 100 acre-feet remained below 7th Avenue. The period of runoff was five days.

Infiltration of the 1965 releases was not completed within the actual flow period. Much of the water was entrapped in deep gravel pits. However, measurements within these pits showed generally an initial decline in the water surface of about 1.3 feet per day, with a 10-day average of slightly more than 1.0 foot per day.

Measurements of long period flows are not available. However, it has been estimated that about half of the 1.2 million acre-feet released in 1973 was recaptured and stored in the Salt River Valley groundwater reservoir. The remaining flows passed on downstream to be stored in Painted Rock Dam reservoir. Increased ponding by the Rio Salado Project will better the conditions of groundwater recharge leading to even higher percentages of recapture.

Water retention is of major importance to the design of project waterways. Available surface water flows are inadequate to offset deep percolation losses. Replacement of these losses will have to come from the groundwater pumped from beneath the waterways. In effect, circulation of seepage losses through pumping will be brought about.

Costs of pumping seepage losses could seriously affect project feasibility unless infiltration rates are reduced. Measurements above indicate that sedimentation can be utilized to lower rates considerably, but biologic growth may be more effective. Each project will need to be studied and water movements through the soil determined. Where infiltration rates are found to be excessive, artificial sealing may be required to form channel or lake bottom lining.

Daily average losses from seepage and evaporation of about 1 inch should prove acceptable in most of the recreational type waterways proposed. Figure 17 shows quantitatively the amount of daily pumping that would be required to replace water lost at this rate.

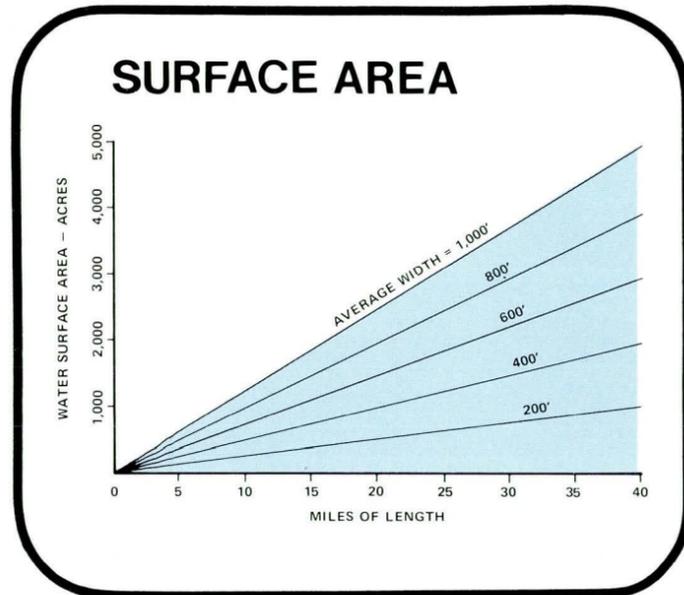


Figure No. 18

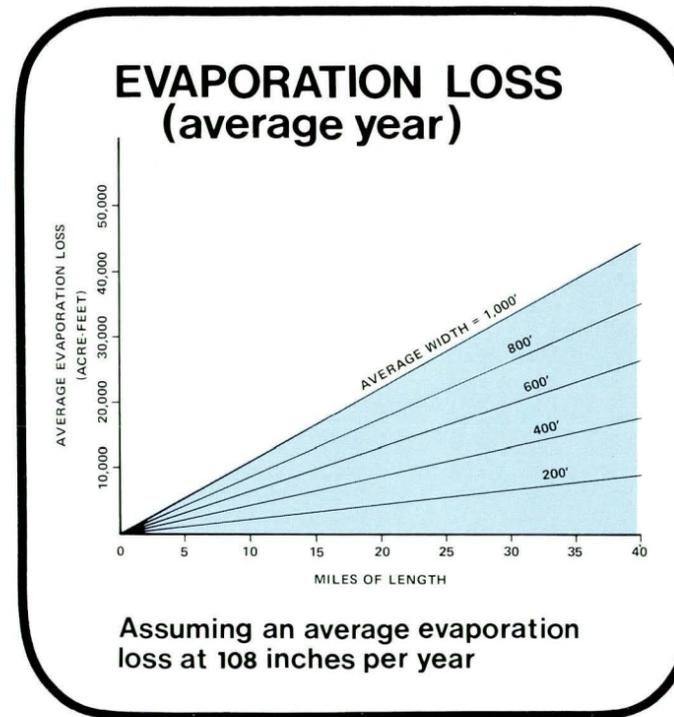


Figure No. 20

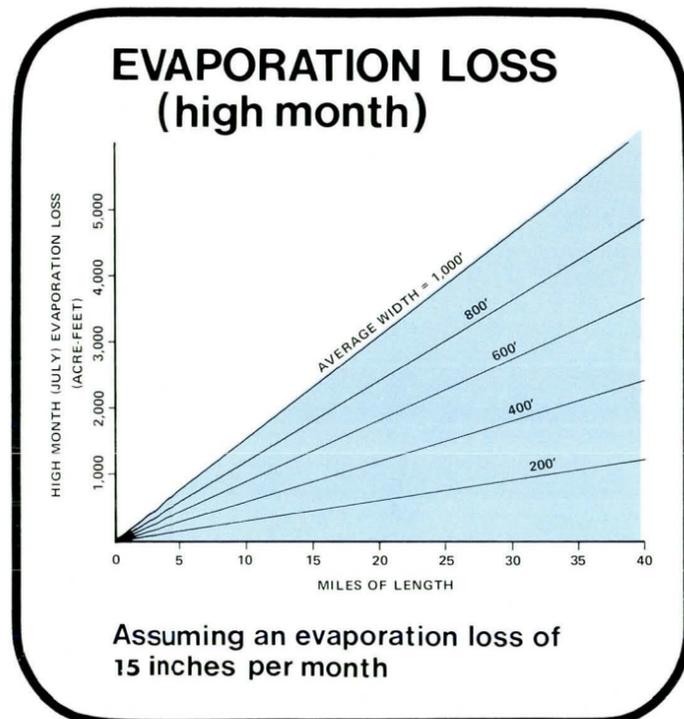


Figure No. 19

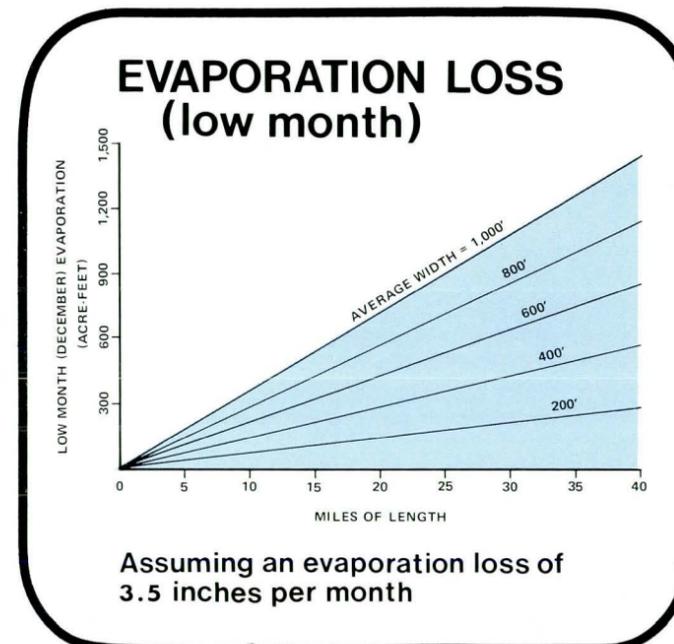


Figure No. 21

EVAPORATION

Evaporation from open water surfaces is very high in the dry hot air of Arizona. Average annual evaporation from small water bodies such as those in gravel pits and lakes and ponds as proposed for the Rio Salado Project is in excess of 6 feet, with peak years as high as 7 or 8 feet. Peak months are June and July, when an evaporation rate as high as 0.4 inch per day may be sustained over one full month's duration. Preliminary estimates for planning purposes are presented in Figures 18 through 21

Evaporation from small ponds represents a greater problem than just the loss of water. Left behind are all the salts contained within the original water volume. As an example, in a pond 6 to 8 feet in depth in which water is replaced as it evaporates, the salt content is doubled each year. If this continues, the pond will eventually become brackish. Operation of the Rio Salado Project water storage facilities must take this factor into consideration if project waters are to be maintained at swimming or fish-production quality. Periodic flushing of the lakes by releasing the water from the dams is one way that the salt buildup can be controlled.

WATER SYSTEMS

In terms of the development of water systems, the Salt River Valley can be said to be entering its second century of modern improvements. The first hundred years started in the late 1860s and was marked as an era of rapid agricultural growth. Expanding tillage of the land with an ever increasing demand for irrigation water forced the development of both surface and groundwater sources as rapidly as possible.

This, the second century, will from all indications be an era of metropolitan expansion — a period during which much of the available land and water resources of the Salt River Valley will be developed for human habitation and industrial and commercial development. The parameters for water handling and usage have changed considerably from those of an agriculturally oriented society. Existing modes of operation and legal constraints will undoubtedly need to be altered to meet the new demands.

WATER SOURCES FOR FUTURE DEVELOPMENT

The first century of the valley's development of water systems has left a legacy of major advantages and sizable disadvantages. The efficiency of past development kept pace with technical and economic growth. Today, with the exception of water to be made available through the Central Arizona Project, all sources have been fully developed.

SURFACE WATERS

In the early part of the modern development period, farmers in the Salt River Valley fought long and hard against capricious weather that gave them alternating floods or drought. By 1903 they had had enough and decided to band together to develop a water control system for surface water flows. Then followed a period of rapid growth development, and by 1946 the last dam of the Salt River Project that could be economically justified for agricultural water storage was completed.

Understandably, after so long a period of strenuous effort, the developers legally tied the irrigation water to the land it was meant to serve. Thus, claim has been laid to all controllable surface flows for use within the 250,000 acre area of the Salt River Project, Buckeye Irrigation District, Salt River and Gila Indian Reservations, Roosevelt Water Conservation District, and other irrigated areas. Under modern automated control and reservoir operation methods, this represents all of the surface flows during most years of runoff. Historically, since 1941 only 2.7 million acre-feet of water have been discharged below the control system, 97 percent of which was released in 1941, 1966, and 1973.

The average annual amount of 750,000 acre-feet gained from this source represents about 30 percent of the water presently utilized in the Salt River Valley.

GROUNDWATER

Agricultural and municipal development of wells within the Salt River Valley has kept pace with surface water development. It is estimated that in excess of 60 million acre-feet of water was pumped from the ground in the first century of modern development. Pumping reached a peak in excess of 2.0 million acre-feet early in the 1950s.

Annual pumpage does not represent annual consumption. Some of the water pumped returns to the ground as deep percolation from irrigation. Also, effluent from some sewage treatment plants infiltrates into the Salt River bed and recharges the groundwater. However, annual usage does exceed groundwater recharge, as exhibited by a falling water table. In some parts of the valley, this fall is about 10 feet per year.

Pumping conditions have reached economic limits in many wells drilled for agricultural use. Where 4,000 gpm wells were once considered common, today a 2,000 gpm well is considered a good producer.

Continued mining of groundwater is expected for future development. The deep alluvial strata underlying the valley continue to offer a source of water supply, particularly to users who can afford to pay the costs for pumping lifts.

TRENDS IN WATER USAGE

While the Salt River Valley is not a perfect closed water system, it is as near to one as man can make it under pres-

ent water usage. Little of the water in the system escapes downstream either as surface water flow or as groundwater seepage. The greatest loss comes through evaporation and transpiration.

However, in high density areas open space is needed for esthetic and recreational release. The greater the density of people in residential and commercial areas, the greater is the need for parks and recreational facilities. In parks and community development projects such as the Rio Salado Project, the normal evaporation and transpiration losses can be maintained at about the same levels as those of agricultural lands. The ratios of open water surface, grassed fields, bare soils, and parking areas can be designed so as to use specific quantities of water. Water used in ponds or lakes is not seriously polluted compared with that used for residences and is returned to the groundwater as seepage, but with an increased salt content from evaporation.

Agricultural use is actually the highest consumer of water in the valley. About two-thirds of water delivered to a farm escapes the system either by evaporation or by transpiration. There is little surface loss of water from farms because of the general flatness of the terrain and the method of irrigation practiced. Nearly all water not consumed is returned to the system through deep percolation to the groundwater. Present trends are toward even greater conservation of water for increased crop production. Sprinkler, trickle, or drip irrigation systems are being installed so that water can be applied at rates nearer to evapo-transpirational losses.

As farmlands are redeveloped into residential areas, the actual consumption of water is greatly reduced if sewage is reclaimed. Because much of the land is covered by buildings, streets, and sidewalks, a smaller area is exposed to evaporation. Water used within the structures themselves is returned to the system as sewage.

In high density residential areas, the quantity of water used is greater than that of croplands per unit of area covered. However, the size of irrigated lawns is even further reduced, and an even greater percentage of water is returned as sewage. Lands redeveloped as commercial areas have both a low water demand and a low rate of water consumption. The same generally holds true for the type of light industrial developments now prevalent in the valley.

WATER CONTROL SYSTEMS

In the past, the vast majority of the water has been distributed through irrigation systems. With the development of municipalities, the trend is toward more control through the municipal systems. Also increasing at a rapid rate is the quantity of sewage to be processed.

CITY WATER SUPPLY SYSTEMS

Some of the water used in the Phoenix, Tempe, and Mesa city systems is obtained by pumping of groundwater. Also, surface and groundwater is delivered to three jurisdictions from the Salt River Project. This water is made available to these cities provided it is not removed from the project area. Municipal water may be made available to the Rio Salado Project, but costs will probably limit usage in recreational facilities to swimming pools and beach complexes.

MUNICIPAL SEWERAGE SYSTEMS

A major potential for the Rio Salado Project is the reuse of waste water from urban areas. Basically it consists of the spreading of secondary sewerage effluents in special high-rate infiltration basins. An experimental project location in the Salt River bed west of Phoenix known as Flushing Meadows has shown that the removal of BOD, suspended solids, and fecal coliforms can thus be obtained in waters pumped from shallow levels immediately underneath the pond. These infiltration basins could help sup-

port wildlife preserve areas along certain structures of the Salt River.

Greater percentages of nitrogen and phosphorous removal will be necessary if the effluent is to be used in recreational lakes. However, at present, the reclaimed water obtained is essentially colorless and odorless. Testing will be required in Phase III of the Rio Salado Planning Project to determine whether well location and/or depth of pumping will have sufficient effect upon the filtration to reduce chemicals to bathing water quality acceptable to the State Health Department. Also to be considered in the Rio Salado Project is the use of isolated basins open to public view, but with restricted access as groundwater recharge basins or refiltering ponds.

Three water treatment plants from which effluent may be made available are: 1) the Mesa Plant located east of Hayden Road, 2) the 23rd Avenue Phoenix Plant, and 3) the 91st Avenue Phoenix Plant. A 40-acre high-rate infiltration pond system is to be constructed at 35th Avenue in 1974. This system is similar to the Flushing Meadows Project, and it will renovate effluent from the 23rd Avenue Plant. Much of the treated effluent from this new facility will be used at a proposed nuclear power plant near Wintersburg; however, more than adequate supplies of water are forecast to service that facility. Some treated waste water, therefore, would become available for Rio Salado use.

Existing Water Treatment Plants

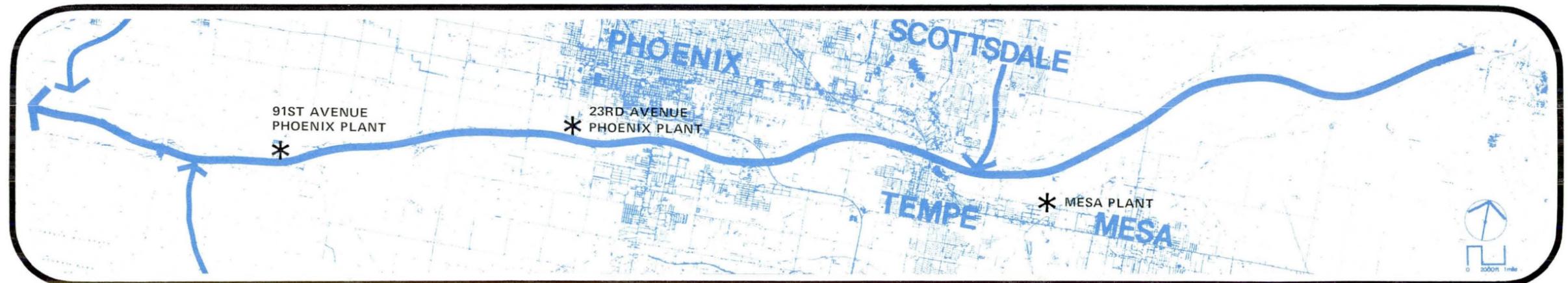
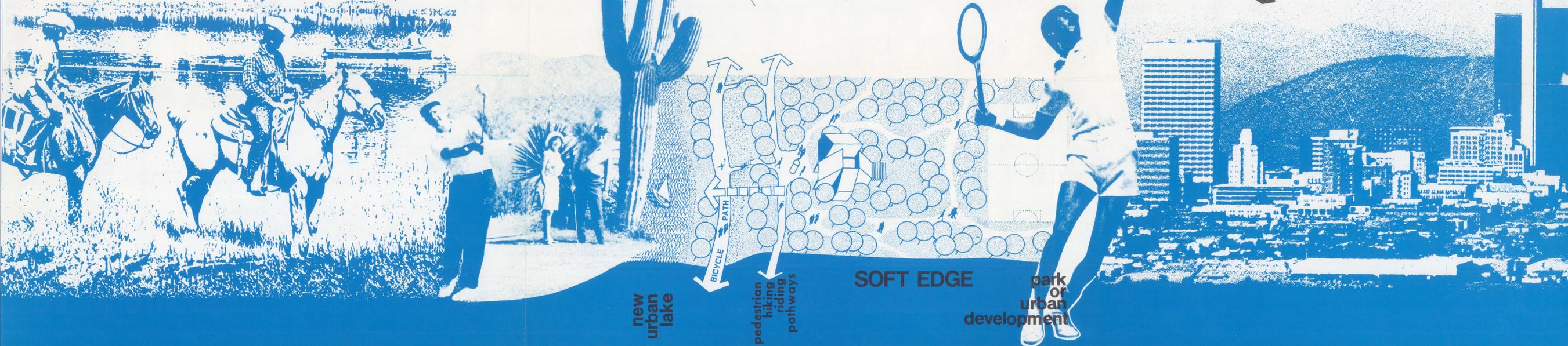
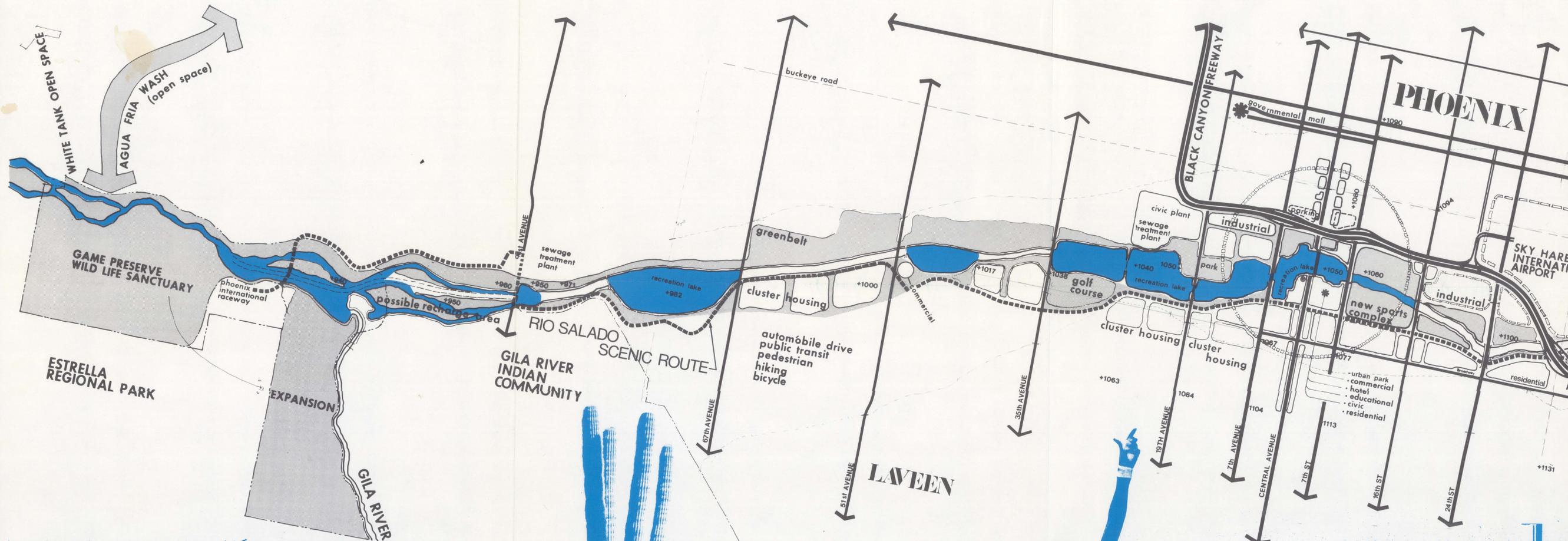


Figure No. 22

3

**RIO SALADO
PLAN**



THE RIO SALADO PROJECT

The Rio Salado Project is an exciting concept for restoring life to one of the area's great natural resources, the Salt River. Within the framework of a comprehensive development plan based on environmental, economic, and other essential considerations, the Rio Salado can become a regional attraction sought for its beauty and recreational attributes. In addition, it can be an enhancement of great value to local interests in the development of new housing and commercial and recreational assets. Historic development patterns in other areas have proven repeatedly the magnetism of controlled flood plains and water-oriented lands.

The potentials for the Rio Salado are also exciting. In combination with future flood-control features, water could be maintained in the river on a year-round basis by a system of dams, lakes, and canals. New scenic parkways and local roads could provide access to view points and major public recreation areas. Hiking, riding, and bicycling paths could traverse the entire length of the river through the metropolitan area, and sanctuaries for natural flora and fauna could be preserved for all time. A chain of

parcs and waterways could help knit the project area together throughout its full length.

In this time of great concern over exploding metropolitan development, large open spaces are a precious and nearly unobtainable urban amenity. Here is a unique opportunity to realize an "in-town" open space of vast dimensions as measured by the breadth and range of opportunities for activity it provides. The current concern for energy supplies dramatizes the need for such a program.

The Phoenix Metropolitan Area urgently needs to advance the process of comprehensive planning in order to deal with the many problems of urban life that result from the region's phenomenal growth. The area continues to experience a high rate of urban development that is spreading into contiguous, hitherto undeveloped areas. Because of its unique location in the central metropolitan area and its potential for dramatic reuse and restoration, the Rio Salado is a prime area for accommodating some of the new growth.

CONCEPT PLAN

The Rio Salado Project is essentially a flood plain reclamation proposal for the Salt River bed and adjacent lands. To date, the project has comprised a planning study of the river's forty-mile course from the Granite Reef on the east to the confluence of the Salt and Agua Fria Rivers on the west. The study area encompasses approximately 20,000 acres as it passes through the Salt River Indian Community, Mesa, Tempe, Phoenix, the Gila River Indian Community, and unincorporated areas of Maricopa County.

Long range concept plans for the Rio Salado envision a gradual change in function of the Salt River bed from vacant land and sand and gravel mining operations to water-oriented recreation. In conjunction with this change in function of the riverbed, adjacent land uses will change to maximize the potentials of this new major regional asset in the heart of the metropolitan area.

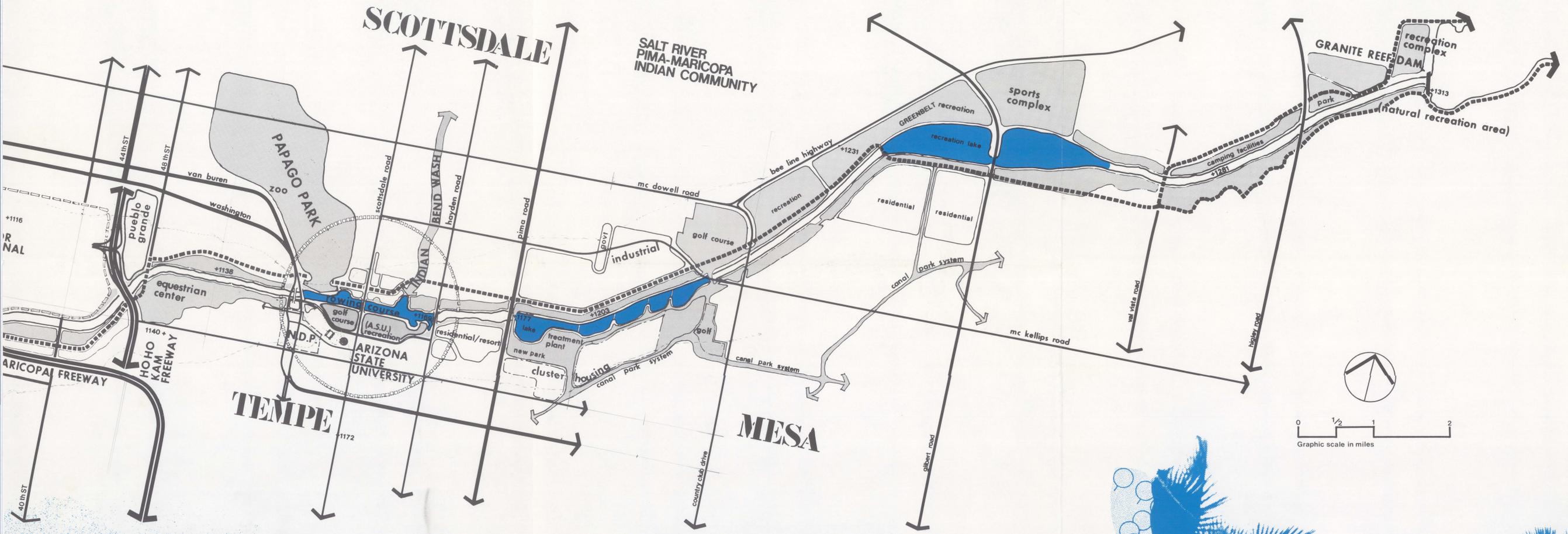
A period of 40 to 50 years may be required to bring the Concept Plan to reality. As each segment of the Rio Salado is developed, the momentum to continue the project

will become stronger. Each development will further demonstrate the benefits inherent in the project. As specific plans for each segment are analyzed, even greater opportunities and potential will become apparent.

This plan is indeed what its name implies, a *concept*. Many changes will occur over its period of implementation. The plan will become the impetus for overall change that is so desirable in the Salt River area.

LAND USE

The dominant new land use proposal is a public greenbelt park system along the entire length of the project area. Related to this system is the potential for high-activity recreational development at several major activity nodes along the river. New residential development in a variety of housing types and related directly to new recreational amenities is anticipated in several areas. In conjunction with this residential construction, new development of commercial and community facilities will be generated. Various special land uses include the Pueblo Grande



Historic Monument at 48th Street, a major sports complex between 7th and 16th Streets, and expansion of the Game Preserve/Wild Life Sanctuary of Estrella Regional Park. Additional general recommendations for land use include a future connection of the Rio Salado park system northward to the White Tank Open Space area and designation of the Agua Fria as an open-space/flood-wash preserve. These two areas could also be combined with a provision for an extensive agricultural greenbelt preserve land control system to limit the general spread of the Phoenix metropolitan area westward and southward.

White Tank Mountains. Further planning should also be considered to provide a several-mile-wide agricultural/open-space "belt" preserve between the Agua Fria River and White Tank Mountains. This belt would extend northward from the Salt River in order to preclude conversion of the valuable agricultural land to urbanized uses. It also would provide a natural, open-space "breather" in the spread of urbanization westward from central Phoenix.

TRANSPORTATION AND CIRCULATION

Another component of the Rio Salado Project is improved accessibility. The plan proposes a new east-west scenic parkway to provide maximum access to view sites and to new activity centers. Pedestrian access will be provided along the banks of all water development within the Rio Salado. A continuous bicycle and equestrian trail system would reach the entire length of the project area. Detailed locations of the circulation components should be set when detailed planning for each specific project area is done. In the interim, rights of way should be established and set aside for future development in order to assure continuity of these regional circulation elements.

WATER

In the years ahead, the development of the Central Arizona Project aqueduct and Orme Dam will bring a change to the valley in terms of additional water and the possibility of exchanges of water; this prospect will in turn allow for changes in the source of water for various elements of the Rio Salado development.

As the reclamation and reuse of municipal waste water becomes more necessary, the Rio Salado Project will become a substantial user of such reclaimed water. Indeed, a large part of the make-up water for the two pilot projects will provide a demonstration of the capabilities and practicality of using and reusing waste waters. To as great an extent as practical, in terms of availability, compatibility, and economics, reclaimed water will be considered and used throughout the total project.

A major water reclamation program is planned as part of the Rio Salado development, using waste water from the urban area. The program consists basically of spreading urban waste water effluent in special ponds in the riverbed area and allowing the water to seep into the under-

ground water basin. Then water from the underground would be pumped from wells located between the infiltration ponds, be treated as needed, if required, and pumped to the Rio Salado developments.

Throughout the 40-mile length of the project access to sources of water for various periods of time will be determined by the economics and by availability at the several locations. Other sources of water could be the Salt River Project for specific parcels of land now having water rights, possible exchanges of water with the Salt River Project or other irrigation districts, storm and flood waters, purchase or exchange with the Central Arizona Project, municipal drainage systems, municipal water supply sources, and drilled wells.

IMPLEMENTATION STRATEGY

The strategy for implementation of the Rio Salado Project is associated with three major considerations:

- The Implementation Agency
- Funding Potentials
- Public Education and Participation.

The organizational activities which must be accomplished in order to implement the project involve the following: management, utilization of funding potentials, land acquisition, overall planning responsibility, and intergovernmental coordination. The complexity of these five important tasks may necessitate that primary responsibility for implementing the project's plans and programs be placed in a single agency.

The potentials for funding the Rio Salado Project are numerous. Specific federal programs exist and alternatives are being proposed. The state stands as a possible funding source, which needs to be further explored. The local governments and Indian communities' capital improvement funds could be utilized. Finally, the project implementing agency could be given certain funding powers that would ensure a source of development and operating monies.

In order to maximize the use of these potential sources of funding, further study needs to be made of the status of existing and proposed federal programs. State agencies

and programs need to be identified. Also, the legal and constitutional restrictions on giving the implementing agency the power of bonding and taxation must be identified and an assessment made for necessary legislation.

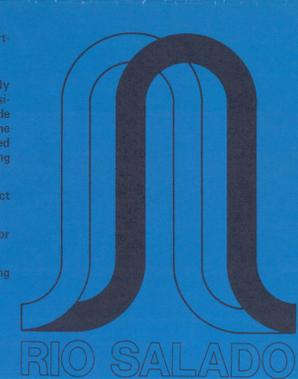
Other groups and individuals should be contacted and extended an invitation to participate in the Rio Salado Project in order to achieve the widest possible base of citizen involvement in determining the detailed implementation of the project plan. Responsibility for the citizen involvement program should rest with the agency holding primary responsibility for developing the project. Elements of the program should include:

- A permanent advisory committee
- An information system
- An evaluation system

The implementing agency should hold a series of public workshops on project development and specific plans. The purpose of these workshops would be to identify affected citizens and potential users of project facilities. The workshops would be held on a schedule and basis similar to those used by the Arizona Highway Department in highway location and design.

A permanent citizens' advisory committee that closely parallels the economic, demographic, and social composition of the project study area should be formed and made a formal body within the organizational structure of the implementing agency. Such a group should be charged with the responsibility for assisting the implementing agency by:

- Informing the agency on the most desirable project uses
- Reviewing existing land use plans and regulations for the land adjacent to the project area
- Assisting in the designing of a program and a financing plan for implementation of the project plan.



RIO SALADO PLAN

sponsors: MARICOPA ASSOCIATION OF GOVERNMENTS • VALLEY FORWARD ASSOCIATION
 consultants: DANIEL, MANN, JOHNSON, & MENDENHALL • EARLE V. MILLER ENGINEERS • GROUP CIVITAS • THE RESEARCH GROUP • WESTERN MANAGEMENT CONSULTANTS

Along the 40-mile stretch of the Rio Salado Project area there exists the potential for almost every conceivable land use. More important, however, is the fantastic range of opportunities that the proper combination of land uses, transportation, and water systems offers the Phoenix metropolitan region.

The Concept Development Plan described in this section reflects the results of the iterative planning process outlined earlier, analyzing all of the opportunities, constraints, and realistic implementation potential. The plan incorporates features that help to achieve all of the established goals of the Rio Salado Project. The reintroduction of water to the Salt River becomes the impetus for the character change that is so necessary for the Rio Salado to accomplish its objectives.

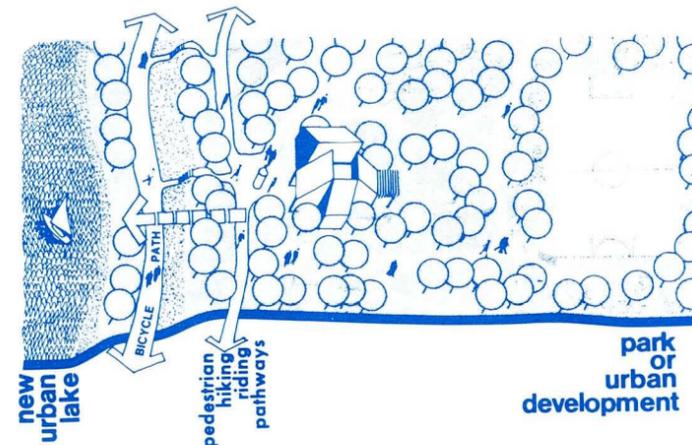
A period of 40 to 50 years may be required to bring the Concept Plan to reality. As each segment of the Rio Salado is developed, the momentum to continue the project will become stronger. Each development will further demonstrate the benefits inherent in the project. As specific plans for each segment are analyzed, even greater opportunities and potential will become apparent. This phenomenon is demonstrated in the planning and design of Indian Bend Wash.

The Rio Salado Plan is indeed what its name implies, a concept. Many changes will occur over its period of implementation, reflecting the need for overall change that is so desirable in the Salt River area.

RIO SALADO EDGE TREATMENT

The basic design concept for the Rio Salado is to provide a variety of new edges ranging from "soft" to "hard" depending on the adjacent land uses, and the intensity of use along the reintroduced water elements.

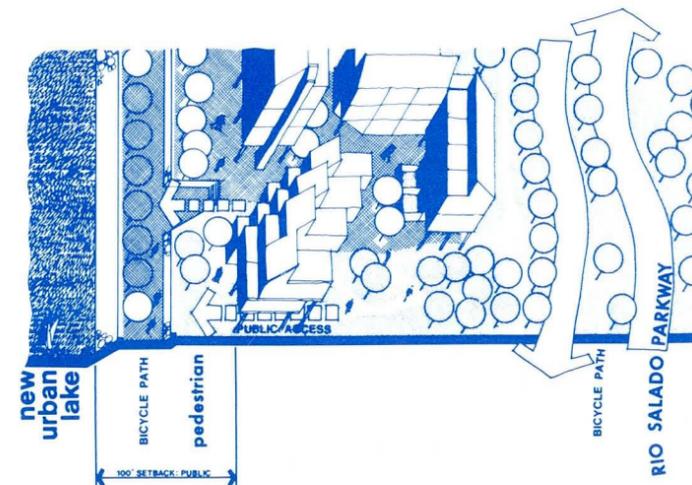
SOFT EDGE DEVELOPMENT



A soft edge is conceived as a low-intensity, park-like or natural development incorporating primarily improved areas and recreation facilities. Such an edge would be designed to provide erosion control, but would have a gradual slope toward the water, perhaps permitting the user to wade directly in. It would be landscaped primarily with plant materials, or no vegetation at all, and would incorporate bicycling, hiking, and equestrian pathways along the water's edge. The majority of the proposed Rio Salado edges would be in this "soft" edge form. Existing examples of this edge type can be found along Indian Bend Wash in Scottsdale.

Figure No. 23

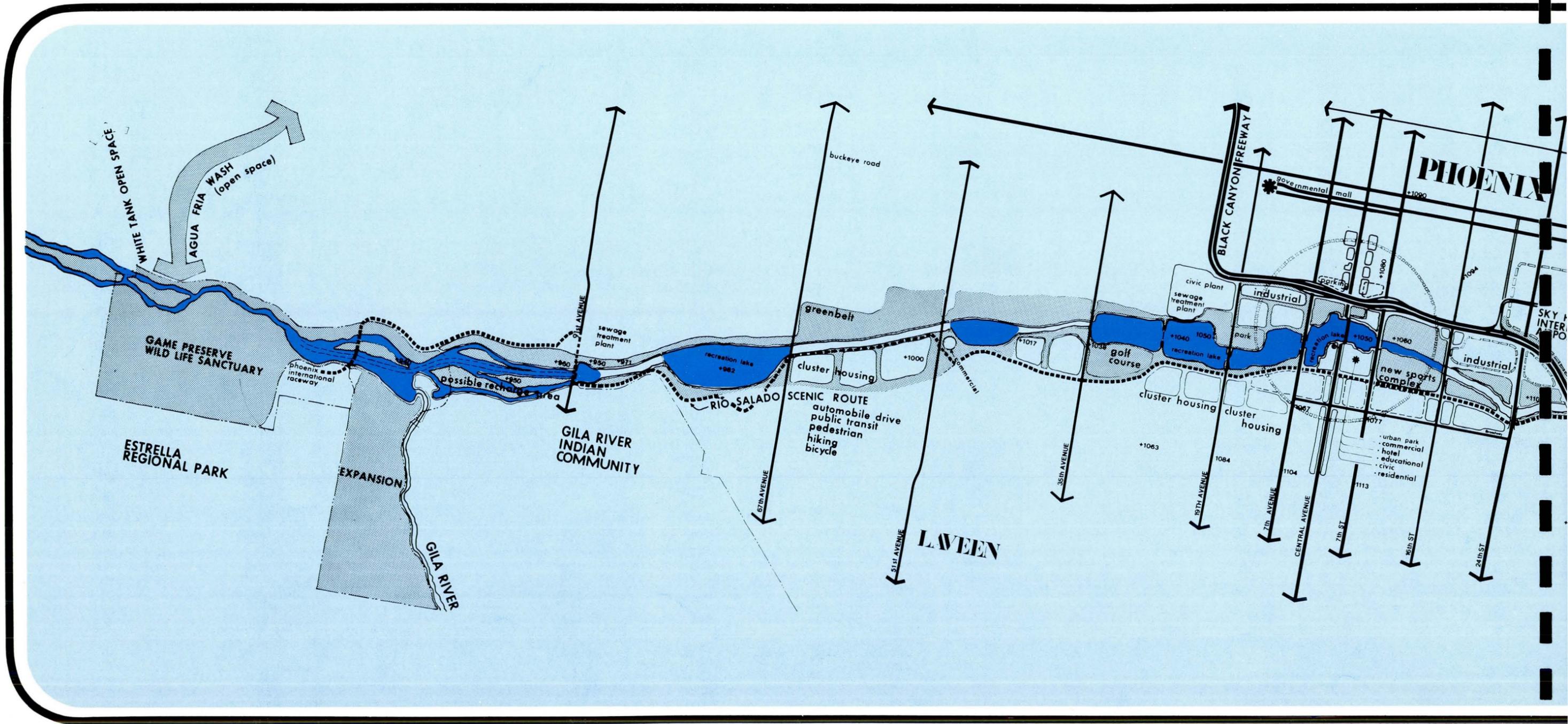
HARD URBAN EDGE DEVELOPMENT



As the Salt River passes through the more urbanized areas, the intensity of land uses adjacent to it will increase, as well as the number of people. In these areas, the appropriate treatment for the water's edge would be paving, in materials such as brick, cobble, and other media. Vegetation would be controlled by the use of planters or delimited planting areas. Lighting would be increased, and the separation of pedestrians, bicycles, and possibly horses would be necessary because of the more intensive use of areas with this type of edge. Additionally, semi-public and private courtyards and pedestrian access might provide a transition between the public edge and private development. Existing examples of this edge type are most prevalent in older European cities, such as the banks of canals of Venice and Amsterdam, and the Seine in Paris.

Figure No. 24

THE RIO SALADO PLAN



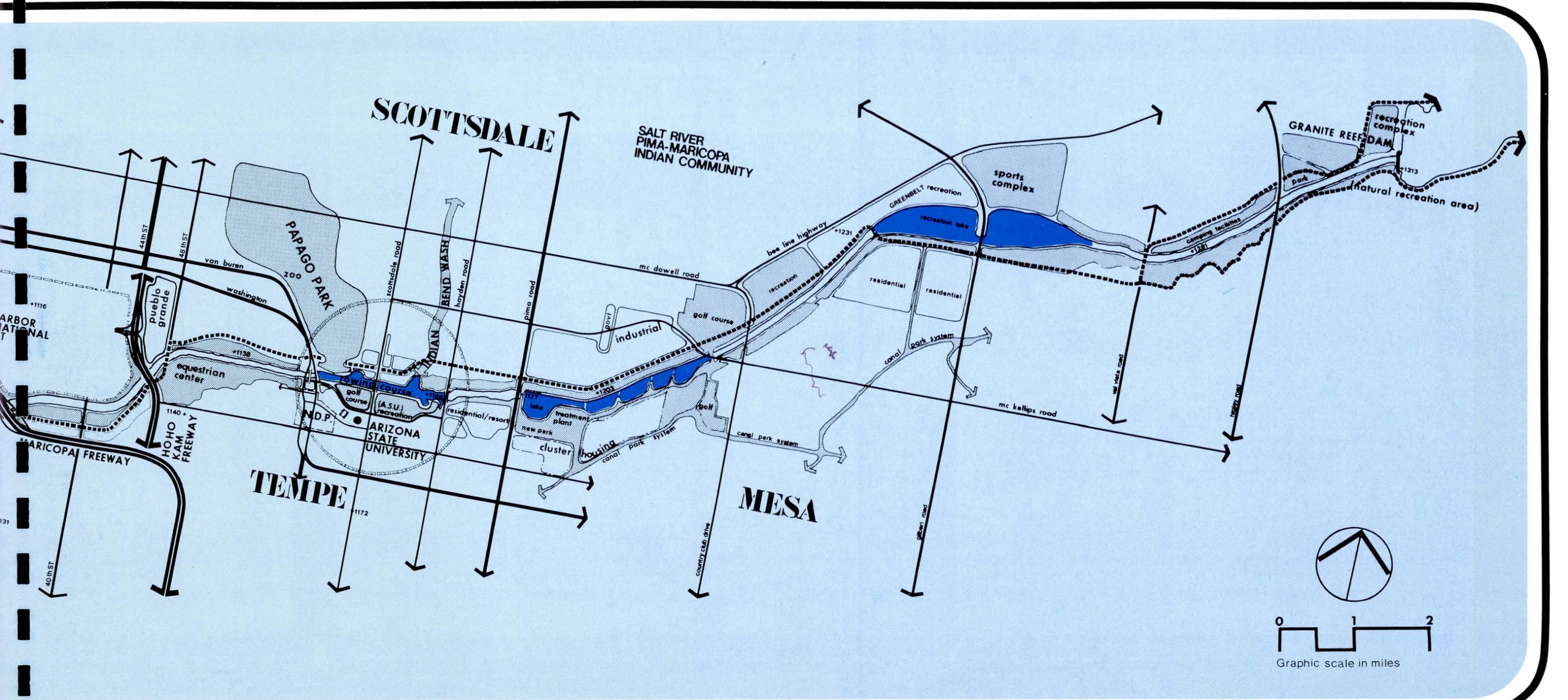


Figure No. 25

CHANNEL DESIGN

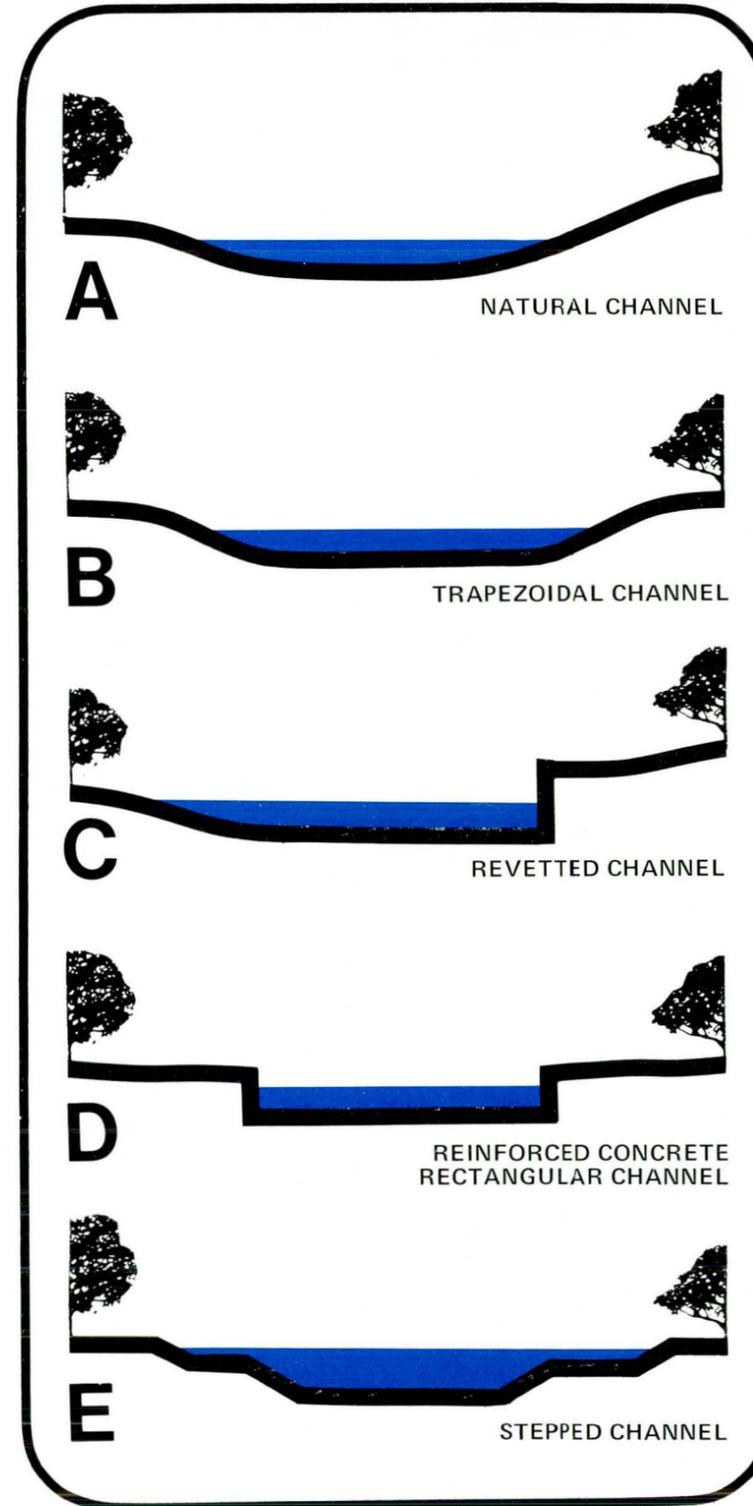
Another determinant of the edge treatment in specific areas will be flood control channel design. There are several alternative designs that can be incorporated into the Rio Salado development concept, depending upon flood control needs in each area. The following diagrams represent typical sections of alternative channel configurations that could be used along the Rio Salado.

LAND USE

The project area begins at the site of the Granite Reef Dam in the Salt River Indian Community. Upon completion of the dam facilities, new recreation potentials will open up in the area. In fact, all of the Indian community lands adjacent to the Salt River hold a very high potential for future recreational and urban development uses. The Rio Salado concept plan envisions an extensive park and recreation system along the north side of the river from McKellips Road east to Granite Reef Dam. This system would include a major recreational lake in the riverbed when sand and gravel operations are completed in the area. On the north side of the lake would be located a large new campground facility, with connections to all the trail systems along the Rio Salado. Other major projected recreational facilities within the Indian community would be a professional golf course and a large open area that could be developed into a major sports complex if and when the demand should arise. At the south end of the lake, new residential development could relate well with the recreation and open space areas on the Indian community and the canal-park system in Mesa. At the westerly end of the Indian community a new industrial park is planned, which should be heavily landscaped and oriented toward the Rio Salado. In that same area the Bureau of Indian Affairs is constructing a new governmental center, which should also be tied to the Rio Salado by a greenbelt system.

Indian Bend Wash, recently developed for recreational purposes, provides the primary connection between the city of Scottsdale and the Rio Salado. The trail system of the wash will connect directly into the Rio Salado's system and to ASU. The Rio Salado should also serve as an inducement to upgraded development along Scottsdale Road.

Flood Control Channel Alternatives



MESA AREA

The City of Mesa has perhaps the best opportunity of any community along the Salt River for incorporating the Rio Salado Project into its community-wide parks program. The city's comprehensive General Plan outlines a park system that includes a major community park in each quadrant of the city, interconnected by a system of trails and paths along the irrigation canals that run through the city. This canal-park system forms a natural connection to the extensive trail and linear greenbelt system of the Rio Salado Project.

More important, however, is the opportunity for the city to develop one of its major community parks as part of the Rio Salado Project. The City of Mesa plans to terminate operation of their sewage-treatment plant in 1980. This city-owned property, along with additional acreage acquired around the treatment plant, would make an excellent high-activity community park for the City of Mesa and a major activity node along the Rio Salado. The new park could be intensively developed with a variety of activity centers and play fields. As part of the Rio Salado Project, the park could be built around a series of lakes and ponds along the riverbed. In the main park area, a recreational lake of up to 100 acres could be developed. A linear extension of the park easterly, up the river to McKellips Road, could be developed around a series of small lakes or ponds that could be designed for a variety of recreational uses. These lakes and ponds and the surrounding parklands can be engineered and designed to accommodate anticipated flood water releases without severe damage to the facilities and surrounding areas.

With the introduction of the new park into the area, undeveloped lands around the park will become more desirable for new development. In keeping with the park-like atmosphere of the area, the city should encourage innovative designs in planned unit developments that retain an open-space, park-like character of the area.

Further development of a canal-park system would connect the entire community via a series of trails to the new park complex, as well as to other new major parks. With such a park and trail system, all of the people of Mesa could have pleasant and convenient access to the features and facilities of the Rio Salado Project.

Figure No. 26

Rio Salado Plan: Mesa Element

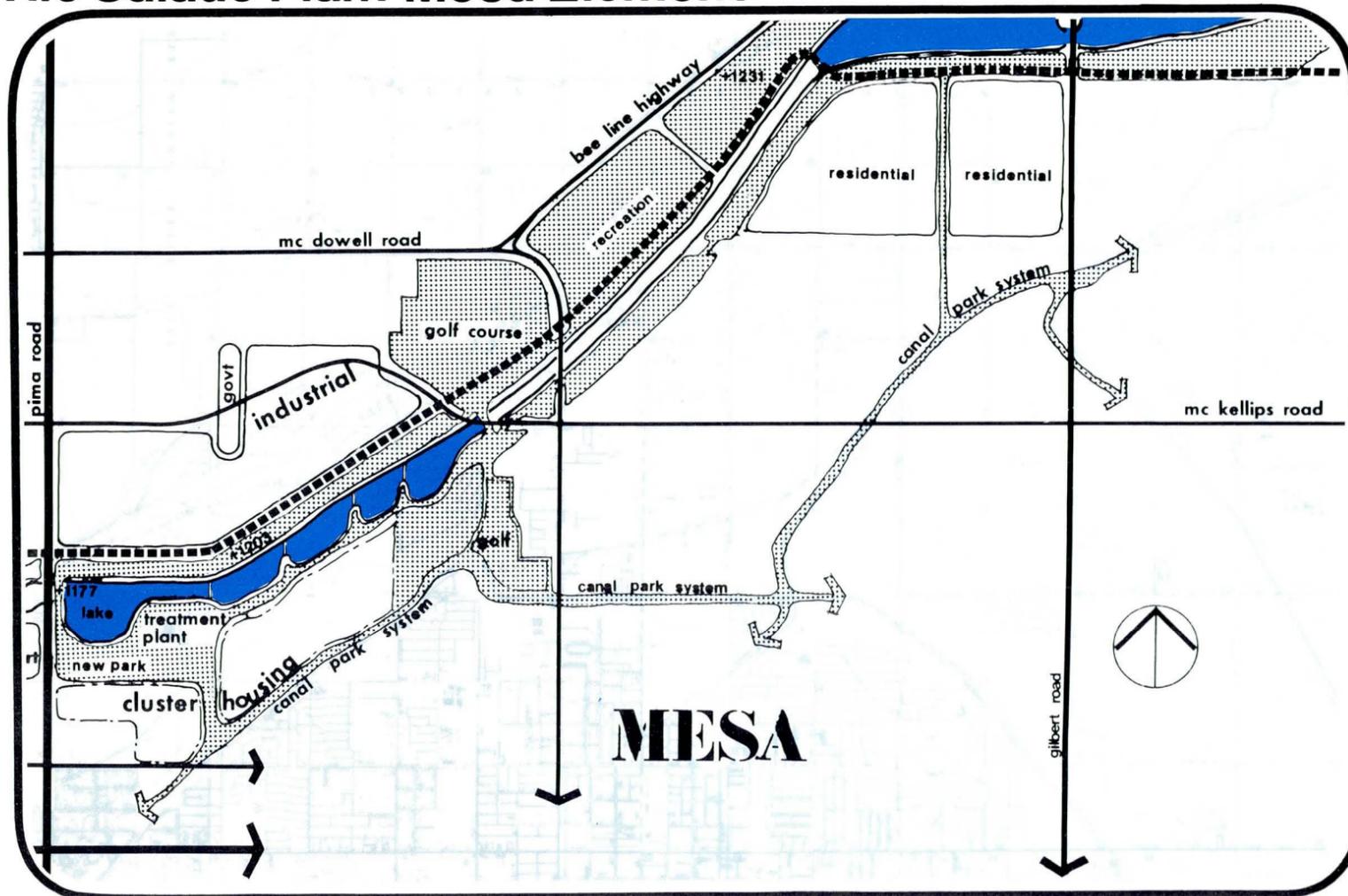


Figure No. 27

TEMPE/ASU AREA

The Tempe/ASU area offers unique recreational opportunities along the Rio Salado. The combination of intercollegiate athletic facilities with public park and open space areas should result in one of the most exciting recreation areas in the valley. Augmented by commercial development expanding from downtown Tempe, the area will be enhanced as a major activity center in the metropolitan area. Details of the land use potentials of the Tempe area are discussed in Chapter 5 of this report because the opportunities are so great in this area that it was selected to be a Rio Salado demonstration project.

PHOENIX AREA

To the west of Tempe the opportunity exists to develop a major equestrian center on the basically undeveloped land north of the riverbed. The noise contours from Sky-Harbor International airport preclude many types of development, and demand is growing in the area for a superior equestrian facility. The site can easily be connected with existing equestrian trail systems in the valley, and it is large enough for a variety of activities to take place concurrently.

On the north side of the river the Pueblo Grande Histori-

cal Park is being restored and expanded. This important historical monument should also be sensitively related to the Rio Salado.

Around the airport area the Rio Salado will serve primarily as a greenbelt. The airport expansion plans make flood walls and channeling mandatory for public safety. Noise contours present further problems and preclude any active recreation or urbanized development. To the west of the airport, a quality industrial park development begins. This type of development is indicative of the development sought all along the project.

In South Phoenix, beginning at 32nd Street and extending westward, there is a strong desire to upgrade residential development near the river. The introduction of the Rio Salado greenbelt and water elements could provide the impetus for such development. Along the south edge of the Rio Salado greenbelt system a series of sensitively designed and executed planned area developments (PADs) could set a new standard for development in the South Phoenix area, leading to continued improvements in that area of the city. Of special note is the fact that the American Institute of Architects Regional Urban Design Assistance Team identified the South Phoenix area as one of the most suitable for future urban development in the region, and the Rio Salado as one of the most positive elements in the urban design of the city and control of urban growth problems. New residential units will generate additional commercial development to help increase the tax base of the area.

On the north side of the river, expansion of the high quality industrial parks is envisioned. Unique existing residential neighborhoods, however, should be retained. Between 7th Street and 16th Street is the site of the proposed new stadium complex, which would be a major element in promoting the Rio Salado if it indeed comes to fruition in the near future. The architects and planners for the stadium have worked with the Rio Salado planning team to incorporate the concepts into their plans. The specific plans for the stadium complex reflect the Rio Salado as an important design element.

Similar to the Tempe/ASU area, the Salt River between 7th Street and 7th Avenue offers outstanding opportunities for a major activity center in the valley. Utilizing eventually excavated gravel mining pits to develop a new

inner-city large recreation lake as a focal element, urban parklands and extensive new commercial, institutional, and residential developments could be generated in this area. Specific details of the potentials, constraints and plans for this second Rio Salado demonstration project are outlined in Chapter 4 of this report.

The section from 7th Avenue west to 67th Avenue also holds exciting potentials for future park and recreational lands interspersed with upgraded residential development on the south side. This area has been identified as one of the major growth areas in the future. As sand and gravel operations are completed along the river and new flood control measures are introduced, the Rio Salado greenbelts and water systems will be developed. This should provide the impetus for quality residential construction within this area. There will also be a new golf course and regional park development to augment the recreational lakes. Along the north side of the river will be a relatively large band of open space greenbelt to serve as a buffer between future industrial development to the north and the Rio Salado and potential residential growth on the south.

WESTERN AREA

From 67th Avenue westward the Rio Salado will retain more of a natural character for open space and recreational enjoyment. Between 67th and 91st Avenues the potential for a large multi-activity lake exists after sand and gravel operations are completed. In the meantime the Rio Salado greenbelt and trail systems would link the urban areas to the east with the natural amenities of Estrella Regional Park and the wildlife sanctuary to the west.

The final major activity center along the Rio Salado is the Phoenix International Raceway. It is projected that this facility serve as the primary parking and entry point to the regional park and wildlife preserve areas. With reference to these preserve areas, it is recognized that an area of the Rio Salado should be planned and designed for emphasis on preservation of and improvements to bird nesting grounds and the compatible small wildlife refuge. The area from 91st Avenue to Gillespe Dam lends itself to this concept, as it has for many years been a major nesting area for the valley's white wing and mourning

Proposed Flood Control / Bird Refuge Area

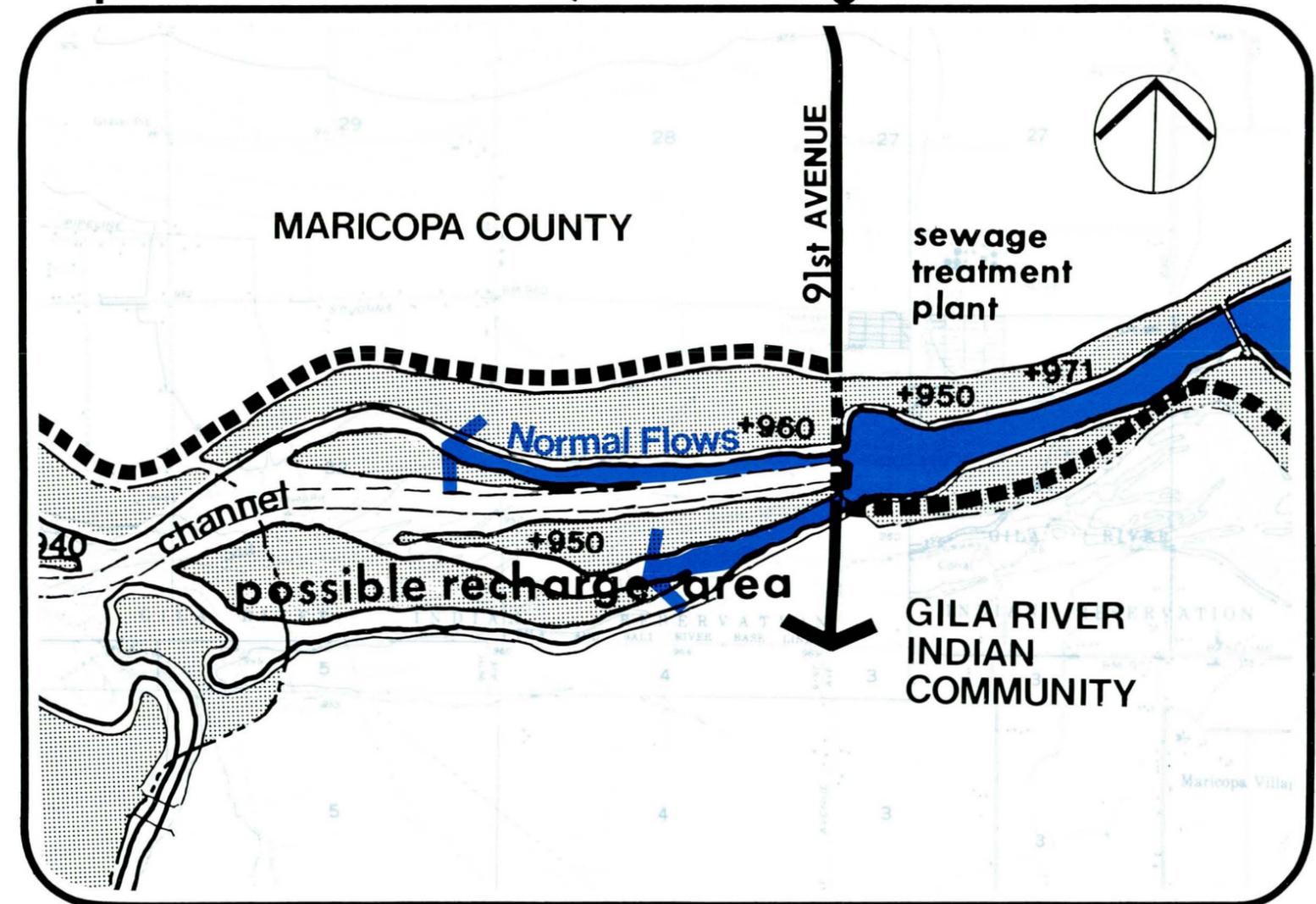


Figure No. 28

dove population. The area covers sizable acreage in the riverbottom. However, as the river is dry almost all the time, much of the desert growth has been dying.

To provide for major flood flows it is recommended that an excavated flood control channel be built through this area. Such a channel is currently being studied by the Maricopa County Flood Control District. This would generally serve to dry up the adjacent areas.

As a means of accomplishing both objectives, i.e., improving the natural habitat and providing for flood control, a multipurpose development is proposed. The

development would consist of a small impoundment, contained by an inflatable dam, at the upper end of the existing bird-nesting area and level overflow sections, which would discharge into the several existing high-flow channels. A major flood-flow channel would be excavated through the reach of the sanctuary to about 115th Avenue. See Figure No. 28

In operation, low flows in the river would be impounded and then overflow into the several natural channels through the refuge area. At periods of high flow the inflatable dam would deflate, to the extent needed, to allow floodwaters to flow through the excavated channel

and the natural waterways at the same time. After the flood had passed, the inflatable dam would be raised to normal position.

With this concept and operation, water for sustaining vegetation would be spread throughout the refuge area via the numerous existing channels, and in this way the habitat and wildlife can be maintained.

TRANSPORTATION AND CIRCULATION

In order to serve the new activity centers and some of the new development along the Rio Salado, the plan provides for a low-speed, low-volume, parkway-type road along at least one side of the Rio Salado for its full length of approximately 45 miles. For the most part, the parkway is proposed as a divided roadway with a wide median but without curbs and gutters, except in certain areas, to provide a restful and serene atmosphere for pleasure driving. The median and side areas would be planted with grass, trees, shrubs, flowers, etc., to enhance the view and assist in controlling dust, erosion, and noise. In some areas the trail system will be located in the landscaped median.

The road would start at Phoenix Raceway on the south side of the river, and cross the river on 115th Avenue. It would then meander east along the north edge of the Rio Salado greenbelt to 91st Avenue, cross the Salt River again, and continue east along the south edge of the greenbelt to 87th Avenue. From here it would follow the south side of the greenbelt, serving as a collector street for the proposed high density cluster housing and

commercial development within the greenbelt to 35th Avenue. After crossing 35th Avenue, it would continue east on the south side of the proposed golf course, then thread its way along the south side of the greenbelt and north of proposed cluster housing all the way to 7th Avenue at Elwood Street.

Elwood Street, from 7th Avenue east to 16th Street, is being planned as a major street by the City of Phoenix to provide traffic facilities for the proposed football stadium. In this section, Elwood Street will provide service to the Rio Salado recreation areas as well as to the cluster housing and commercial developments related to the Rio Salado.

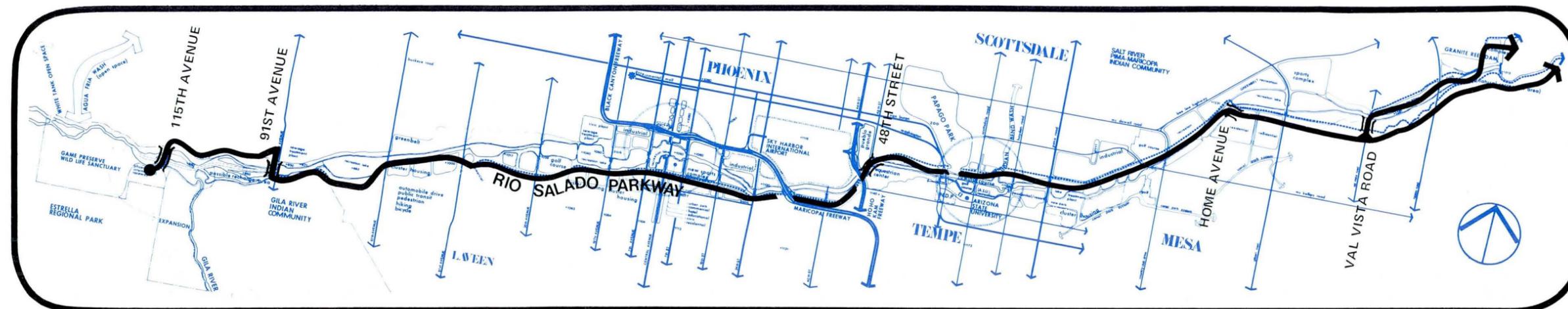
From 16th Street east to the Maricopa Freeway (I-10), the road will again become a divided parkway along the south side of the Rio Salado greenbelt. After crossing under the freeway, the road will meander through the greenbelt and under the Hohokam Parkway, then cross the Rio Salado on 48th Street. From here it will go east along the north side of the greenbelt to Mill Avenue (U. S. 80-60-70) and extend across it into the expanded Papago Park.

After entering Papago Park, it will swing to the south to follow along a greenbelt near the proposed Rio Salado-University Rowing Course, then swing north to Princess Road at about 70th Street and continue east to Pima Road. From Pima Road, it would travel east and north-east between a greenbelt on the south side and a proposed Indian Industrial Park on the north side of McKellips Road. From here it would follow close to the river chan-

nel through a greenbelt to about Horne Avenue, where it would turn south and cross the river at or near a new dam for a Rio Salado lake.

From this point, it will go east along Thomas Road extended for 3½ miles to a point just east of Val Vista Road. The road for most of this section would be on the south side of and adjacent to a Rio Salado greenbelt. At this point, the road would split with one branch going north across the river, then up river along the north side of a greenbelt to Granite Reef Dam. The other road would continue north and east along the easterly side of the Southern Canal, and then on the westerly side adjacent to the greenbelt to Granite Reef Dam.

At the Granite Reef Dam area, roads could be provided, where practical, along the general shoreline of the present lake formed by the dam. When Orme Dam is constructed, the road could extend up the mountainsides to scenic viewpoints and rest areas.



Proposed Transportation and Circulation

Figure No. 29

Rio Salado Parkway: Typical Section

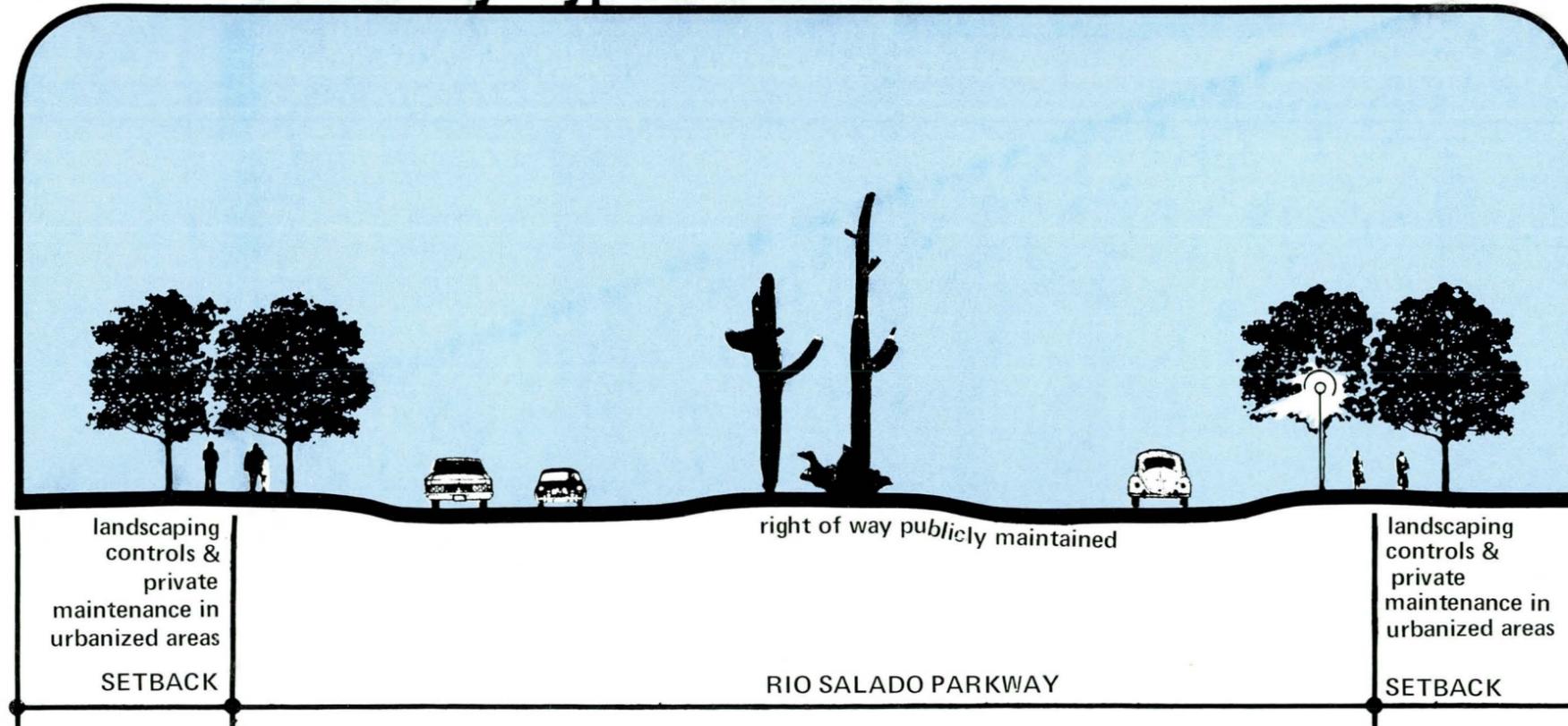


Figure No. 30

Another major transportation improvement associated with the Rio Salado Project will be a new road on the south side of the river between Mill Avenue and Scottsdale Road, which will provide a much needed access to the ASU athletic complex and the expanded commercial units near Tempe Butte. This link is described in more detail in Chapter 5 of this report.

RIO SALADO WATER AND LAND MANAGEMENT

Under present conditions the Salt River bottom lands can be said to be ecologically extremely fragile. River flows have been diverted. Groundwater has been lowered, and only the hardiest plants now survive in this area of soils of low water-holding capacity. None of these plants can sustain life when exposed to disturbances by man.

Development of the Rio Salado Project will require a change in the river's present ecology. Channel sections

can be returned to former conditions representative of desert riverbottoms. Bank sections can be made into desert parks or grassed areas. Opportunities are many, but each will require the use of water to upgrade the vegetal types to those amenable to human use and occupancy.

Probably 10 to 15 percent of the project will be composed of temporary or permanent open-water surfaces — lakes, ponds, catchment basins, and canals. Another 40 percent may make up areas of grasses or other types of vegetation that require regular and sizable applications of irrigation. Ten percent may be devoted to streets, parking lots, and buildings, none of which require water. The remaining 30 to 35 percent could be developed to desert vegetal growth requiring limited irrigation. The water required to support this type of development would range from 35,000 to 50,000 acre-feet per year to offset evaporation and transpiration losses.

As water is a precious resource to the Salt River Valley, its use and reuse must be optimized. A primary objective of the Rio Salado Project will be water conservation and water reclamation. To carry out these objectives in a project in which water is to be used for many purposes will require careful management in all facets of water use.

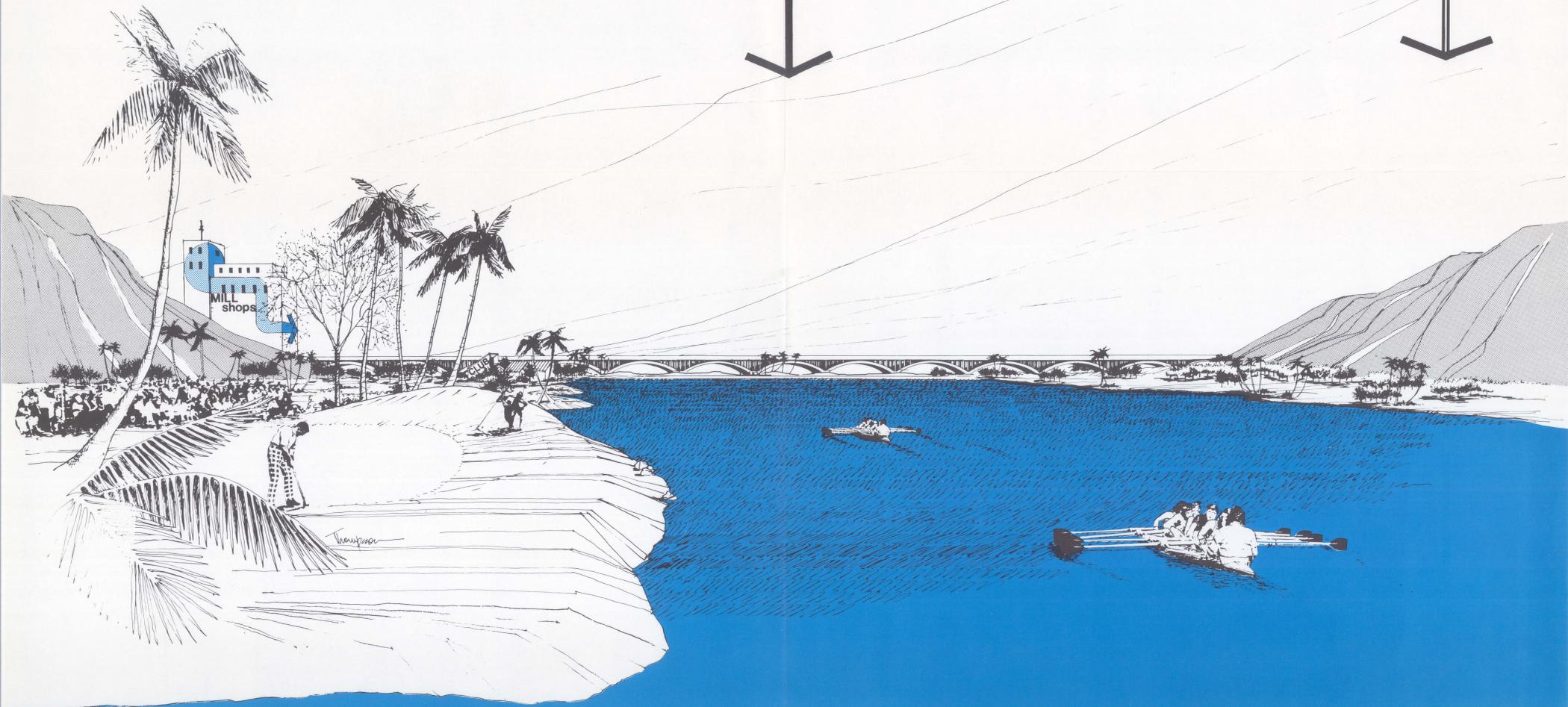
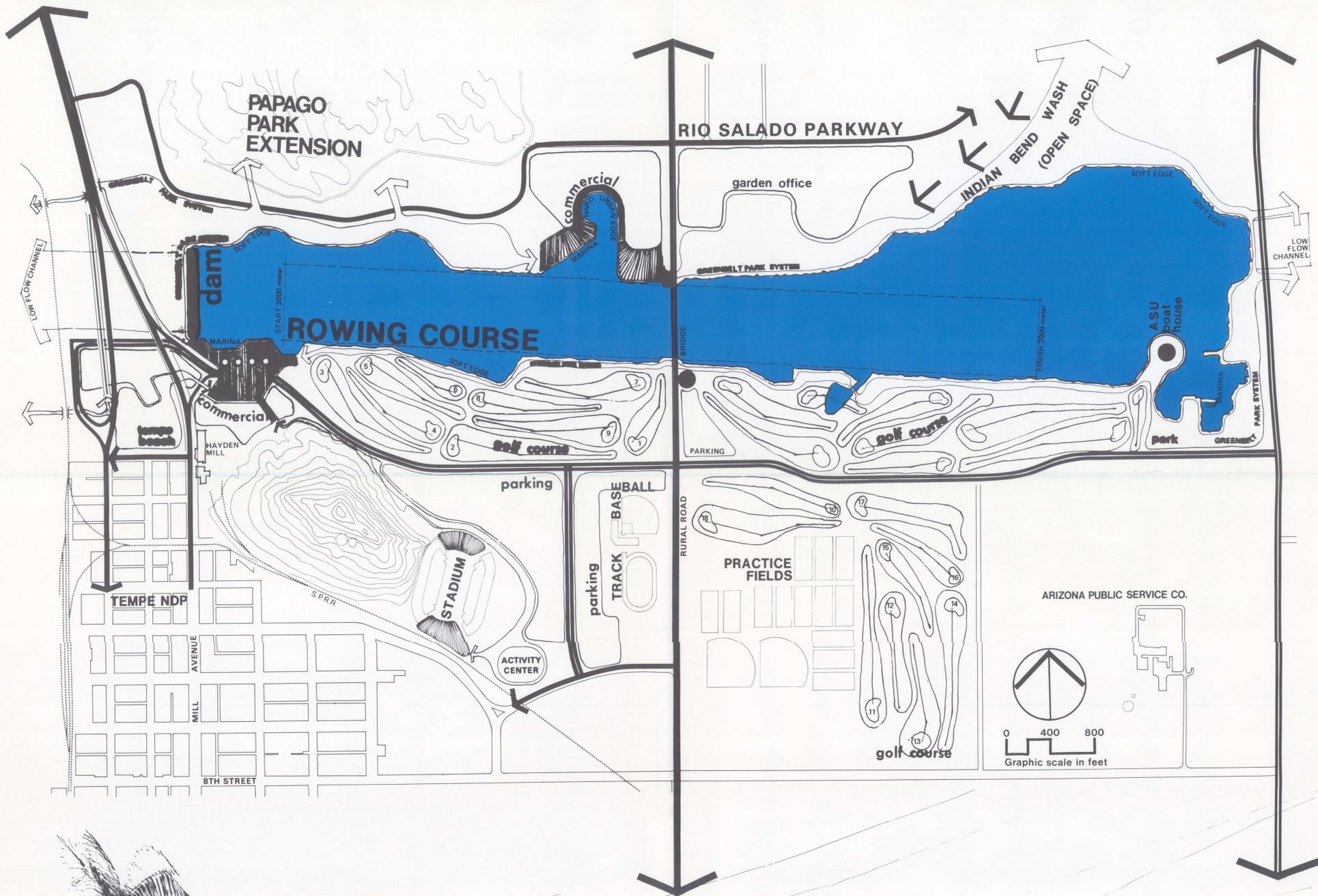
Much of the water lost through evapotranspiration can be replaced by capture of flood runoff. These waters can be ponded and held until they have infiltrated into the streambed and added to the groundwater reservoir.

In permanent lakes and ponds, water will be circulated and filtered through the soil by infiltration and pumping from the groundwater table. Infiltration rates, which normally are high in sandy soils, can be reduced by depositions of fine sediment and biologic growth. Where these do not reduce seepage sufficiently, lining of lake bottoms may be required. Linings to be considered include thin coverings of clay materials, chemical sealants such as SS13, soil cements, and asphalt membranes.

Water impoundments for groundwater recharge will need to maintain high infiltration rates. Alternate wetting and drying of the riverbed materials normally will permit rapid infiltration for up to a month, or until biologic growth develops. In lieu of impoundments, spreading basins may be used in which water is diverted over large areas for rapid infiltration. Lands such as wildlife preserves in which dense vegetal growth is maintained can best serve this purpose. These lands should be located along the western end of the project to receive the brinier discharges of waters formerly stored, retained, and routed through the project's water system.

4

**TEMPE / A.S.U.
DEMONSTRATION
PROJECT**



TEMPE/ASU DEMONSTRATION PROJECT

Probably nowhere within the entire project area is there as much potential for demonstrating the Rio Salado ideals as in the City of Tempe, adjacent to Arizona State University. Specific study of this area revealed almost unlimited recreational opportunities combining intercollegiate athletic with public park, open space, and aquatic recreation facilities.

Proposed new bridge construction, a trail system, and new access roads can make this project available to a large segment of the metropolitan population as a major activity center. New commercial development that complements the recreational activities could be generated in key locations. Perhaps the most important potential of this project, however, is the demonstration of intergovernmental and private sector cooperation.

The Tempe/ASU Rio Salado Demonstration Project is located on the Salt River approximately 8 miles east of downtown Phoenix. It is bordered on the west by Mill Avenue Bridge; on the north by Papago Park and the confluence of Indian Bend Wash; on the east by the Hayden

Road river crossing, and on the south by Tempe Butte and Arizona State University. This dramatic site is enhanced by Tempe Butte and the Hayden Flour Mill, two of the valley's best-known landmarks.

The plan and conceptual sketch above show the project at full development in approximately 15 to 20 years. A phased program of development is planned so that some activities can begin within the next 3 years.

The emphasis of development plans is on active recreation. In this project the facilities serve both ASU and the general public. The focal point of the project will be an intercollegiate rowing course in the channel of the river, with compatible adjacent recreational and commercial facilities and expansion of ASU athletic facilities.

Another primary objective of this project is the expansion of Papago Park southward to the river. This would preserve a massive open space area as well as provide a connection point to the valley's trail systems. Also, a present proposal would expand the City of Tempe's ongoing Neighborhood Development Program and Tempe Beach

Park to the waters' edge, providing further integration between the ASU campus and downtown activities.

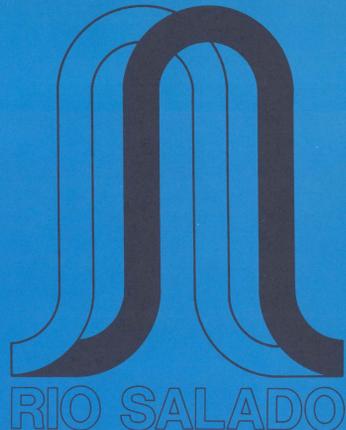
Improved access to and around ASU athletic facilities and trail connections to the Indian Bend Wash project tie this first increment of the Rio Salado to other areas in the metropolitan region. This project could provide one of the most intensively used activity centers in the Salt River Valley.

The benefits that would be realized from the Tempe/ASU Demonstration Project are both immediate and long range. The consolidation and coordination of all the plans and concepts that are proposed by the various agencies involved would produce such representative immediate benefits as:

- The channeling of the riverbottom to aid in control of flood waters of the Salt River and Indian Bend Wash
- The construction of the Scottsdale Road bridge, which will provide a much needed dry crossing over the flood control channel
- The availability of a body of water for recreational use.

The long-range benefits, far more comprehensive in scope and magnitude, would include:

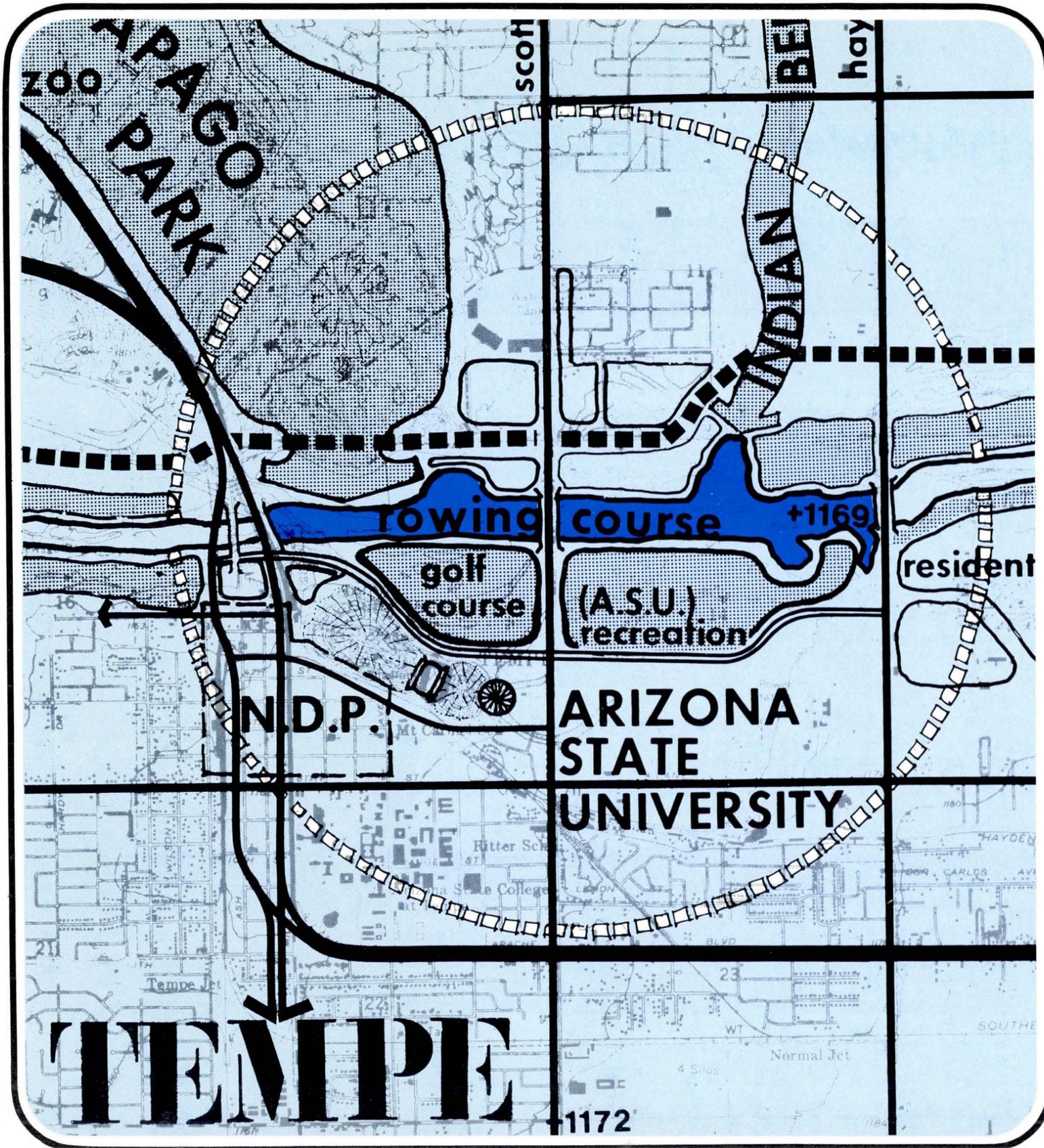
- The construction of a bridge paralleling the Mill Avenue Bridge which will provide another dry crossing and coordinate the Tempe Neighborhood Development Program with the Rio Salado
- The extension of Papago Park to the waters' edge, providing open space and passive recreation areas
- The extension of Tempe Beach to provide additional active recreational spaces
- The development of an east-west access road from Mill to Rural to Hayden, which will provide ingress-egress to the Rio Salado as well as ease traffic loads during athletic functions at ASU
- The creation, by river channeling, of a considerable amount of land for recreational purposes, such as the University Golf Course and park lands.



1974 TEMPE/A.S.U. DEMONSTRATION PROJECT

sponsors
MARICOPA ASSOCIATION OF GOVERNMENTS • VALLEY FORWARD ASSOCIATION

consultants
DANIEL, MANN, JOHNSON, & MENDENHALL • EARLE V. MILLER ENGINEERS • GROUP CIVITAS • THE RESEARCH GROUP • WESTERN MANAGEMENT CONSULTANTS



Tempe/ASU Demonstration Project Area

Figure No. 31

Probably nowhere within the entire project area is there as much potential for demonstrating Rio Salado ideals as in the City of Tempe, adjacent to Arizona State University. Specific study of this area revealed almost unlimited recreational opportunities combining intercollegiate athletics with public park, open space, and aquatic recreation facilities.

Proposed new bridge construction, a trail system, and new access roads can make this project available to a large segment of the metropolitan population as a major activity center. New commercial development that complements the recreational activities could be generated in key locations. Perhaps the most important potential of this project, however, is the demonstration of intergovernmental cooperation at all levels with private sector development to achieve the Rio Salado ideals and concepts.

The Tempe/ASU Rio Salado Demonstration Project is located on the Salt River approximately 8 miles east of downtown Phoenix. It is bordered on the west by Mill Avenue Bridge; on the north by Papago Park and the confluence of Indian Bend Wash; on the east by the Hayden Road river crossing and on the south by Tempe Butte and Arizona State University. This dramatic site is augmented by the Tempe Butte and the Hayden Flour Mill, two of the valley's best-known landmarks.

The selection of the Tempe/ASU site for the first demonstration project was based primarily on the following factors:

- The City of Tempe and ASU have large land holdings in the project area.
- These agencies are enthusiastic and anxious to participate with their own concepts and plans.
- The County Flood Control Agency and the Corps of Engineers have immediate plans for flood control measures that include construction of a Scottsdale Road bridge and a flood channel in the project area in the near future.
- Usable water is available at the eastern extreme of the project by reclaiming the effluent from the Mesa Sewage Treatment Plant.
- The site is strategically located in the Tri-City area.

All of these current plans and future proposals by these various agencies offer a tremendous potential for a demonstration project.

EXISTING CONDITIONS

The existing land uses within and adjacent to the Tempe/ASU Demonstration Project area can be generally categorized as those uses within the flood plain and those adjacent to the flood plain. The land uses that lie within the flood plain primarily consist of:

- Commercial: stables, boat sales, and general commercial

- Industrial: gravel mining operations, presently inactive, but not depleted, scrap metal storage and processing, automotive junkyard, small concrete precast yard

- Recreational: batting range, go-cart track.

The land uses that are presently adjacent to the flood plain consist of:

- Commercial: shopping center, motel, and Tempe's Central Business District
- Parking: ASU football, basketball, baseball, and track stadium parking

- Recreational: ASU football and basketball practice fields, Tempe Beach (City Park) and the Tempe portion of Papago Park.

An additional element is the right-of-way for the Arizona Public Service transmission lines that extend along the entire east-west axis of the project area.

LAND OWNERSHIP

The major land holders within the project area are ASU, City of Tempe, Bureau of Reclamation, Union Sand and Rock, United Metro Sand and Gravel, and the Southern Pacific Transportation Company Railroad. The acquisition and development plan will be phased to coincide with the depletion of sand and gravel resources that exist within the project area. The large land holdings of the public and quasi-public agencies provide an opportunity that greatly diminishes the problems generally associated with land acquisition.

Table No. 2

TEMPE PROJECT SUMMARY OF LAND HOLDINGS¹

- Large private parcels near the riverbottom – 138 acres
- Private parcels in the riverbottom – 54 acres
- Small private parcels near the riverbottom – 130 acres

- Public holdings near the river:

City of Tempe	18 acres
Arizona State University	25 acres
United States	67 acres
Total	110 acres

- Public holdings in the riverbottom:

City of Tempe	16 acres
Arizona State University	49 acres
United States	91 acres

Total 156 acres

(Includes confluence of Salt River and Indian Bend Wash)

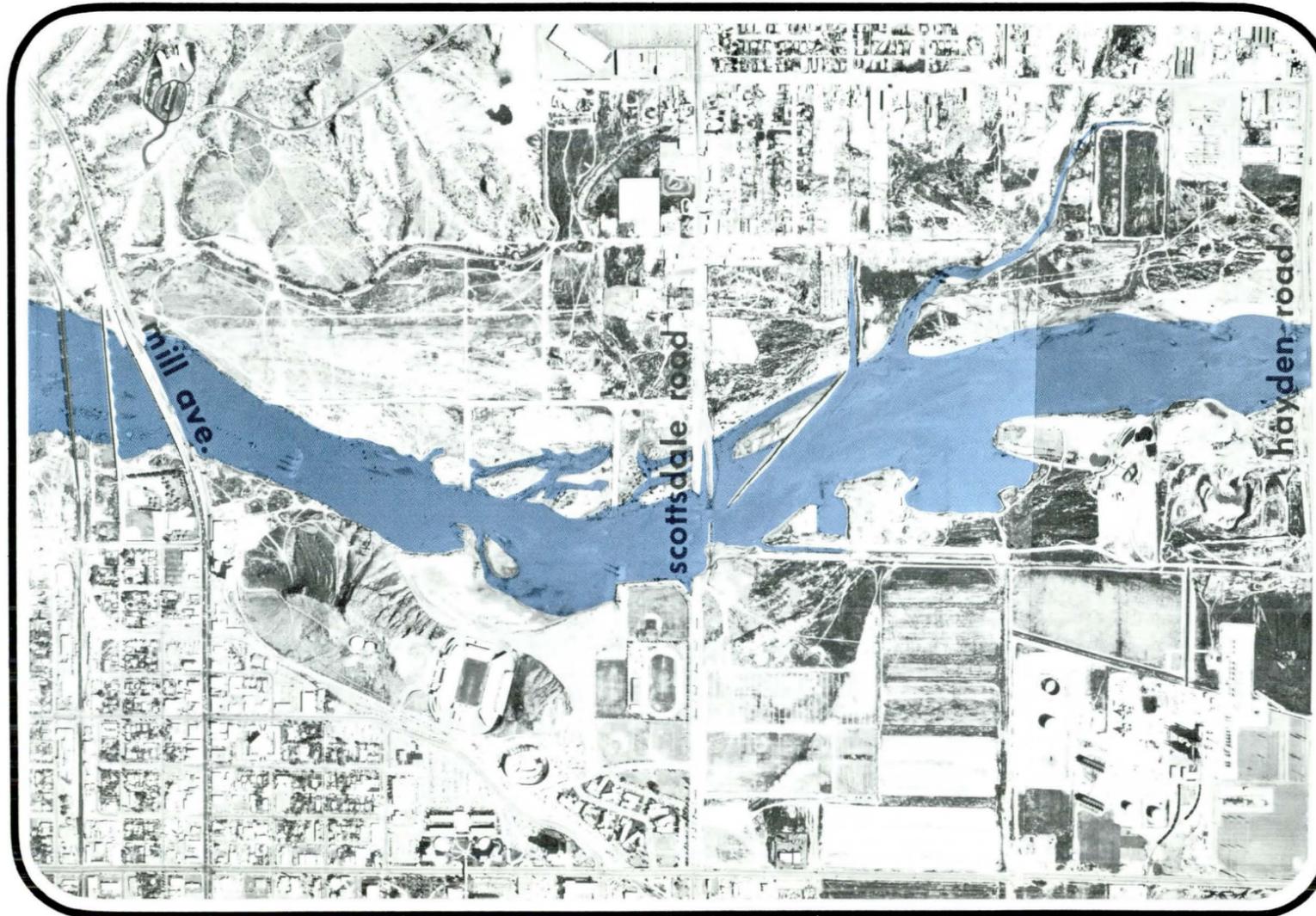


Figure No. 32

¹Tempe project boundaries: west – Southern Pacific railroad bridge; east – Hayden Road; north – Gilbert Drive; south – aligned with 1st Street through Tempe Butte.

Existing Ownership Patterns: Tempe

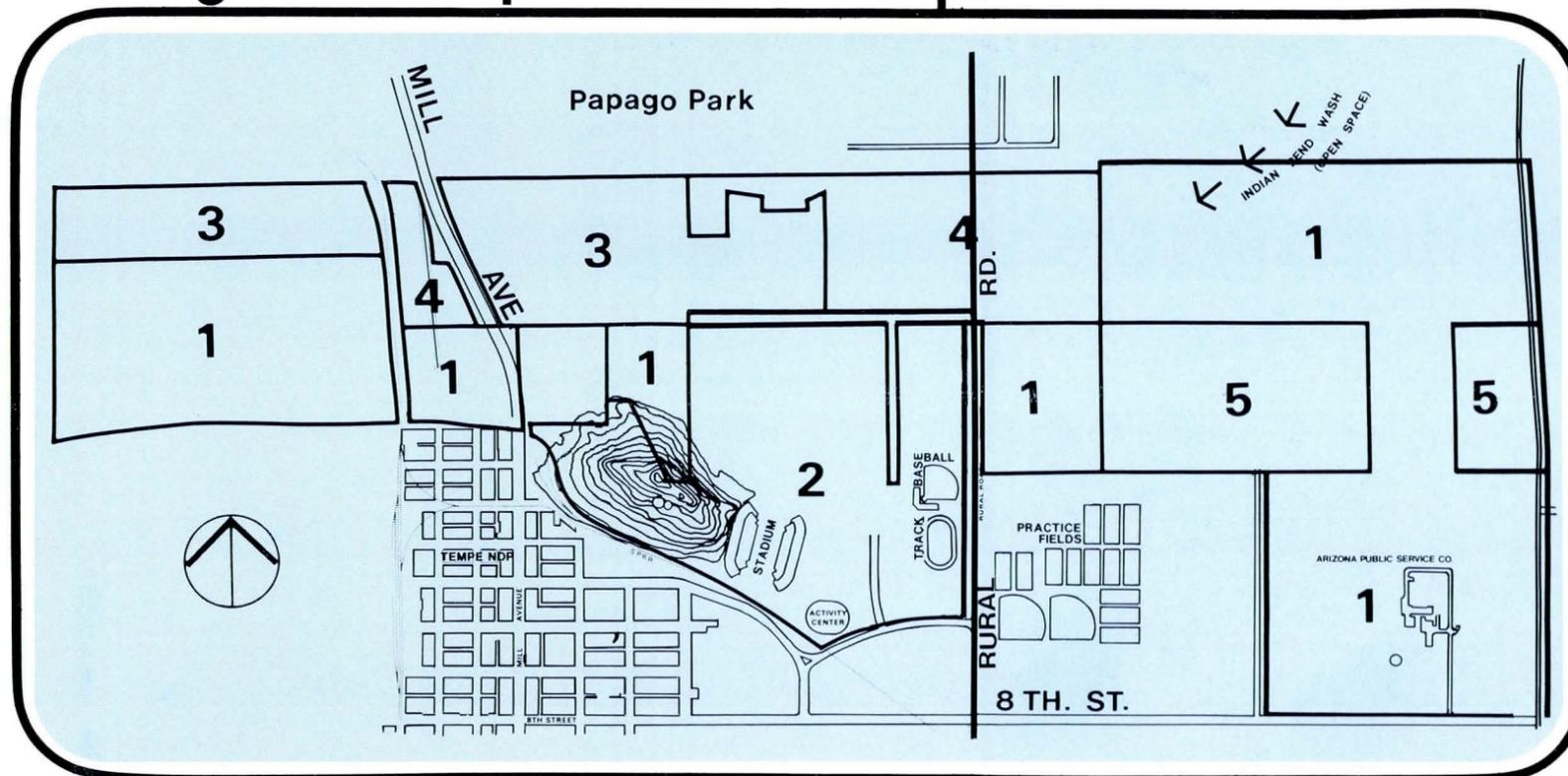


Figure No. 33

LEGEND

- 1 PUBLIC
- 2 ASU
- 3 DEVELOPMENT CO.
- 4 PRIVATE
- 5 SAND AND GRAVEL

GEOLOGY

The project encompasses that part of the Rio Salado that crosses through the rocky channel north of Tempe. The bedrock sill over which the river poured at one time has been covered by recent gravel deposits. It is believed to be shallow, but its depth is unknown.

Groundwater contours differ greatly from those of surface topography. At a high groundwater table when the river flowed continuously, the rock sill undoubtedly acted as a subsurface dam with a resultant drop in watertable elevation below the sill. However, after a long history of groundwater pumping in the Scottsdale area, the ground-

water contours have been reversed, and the water levels show a depression north of the river with a generalized flow pattern northward from the river. The groundwater elevation two to three miles north of the river is about 75 feet below that found under the river.

A highly pervious underground streambed is believed to extend southward from the river under the Mesa Plain, but this lies east of the University Project area. A similar generalized flow pattern showing a southerly movement of water under the Mesa Plain also tends to draw water from the project area. A reversal of the direction of flow of groundwater upstream and across the rock sill is indicated.

The project area is less disturbed by gravel operations than the Central Avenue Project area, and less is known of the composition of the riverbed material. However, because the coarse materials deposited along the riverbottom in the Phoenix Plain must have passed through this notch, it is reasonable to assume that the river's bottom down to bedrock is also composed of coarse gravels and cobbles. Above the rock barrier older, finer sediments probably underlie the newer coarse gravels, at least along the mountain slopes of the original valley fill.

PONDING POTENTIAL

Basically the project concept consists of a 2,000-meter rowing course along the Salt River flood channel. Water is to be ponded behind a special inflatable dam (similar to that described for the Central Avenue Demonstration Project) to be installed in the channel a short distance above the Mill Avenue Bridge. The channel will pass beneath the proposed Rural Road bridge now under design and Hayden Road bridge now being constructed. The proposed dam will be approximately 15 feet high and will pond water to elevation 1,152 feet. The lake formed will have a surface area of about 250 acres. Its storage volume will be about 1,840 acre feet. The lake will extend beyond Hayden Road and under the bridge will have a depth of approximately 4 feet.

It is proposed to move the channel generally northward, and to provide a more direct east to west flow direction under the new bridges and across Mill Avenue. Part of the 600-foot wide channel will have to be man-made, and part will be in the natural channel. Most of the channel relocation will be done in conjunction with the construction of the bridge on Rural (Scottsdale) Road.

HYDROGRAPHY

Nearly the full reach of the river between Mill Avenue and Hayden Road follows its own natural course. Gravel operations are and have been minimal. One firm is presently operating on the north bank west of Hayden Road, and some very minor pitting from small operations is observable in the channel bottom.

The riverbottom throughout the entire reach is quite stable. A coarse gravel to cobble pavement has been developed on most of the bottom surface. Some shallow sand depositions exist above Mill Avenue, indicating a possible backwater effect from the two highway and single railway bridge piers.

A greater amount of storm water will be received from Indian Bend Wash, but here again the flows are not dependable.

Treated water can be purchased from each of the three city water systems, but probably in small quantities only.

DAM DESIGN

Insofar as is practical, the first stage dam should be designed for incorporation into the final structure to be built after Orme Dam is complete. As Orme Dam will actually effect a reduction in peak flood flows, the anticipated flows will be greatest in the first stage. However, frequency of occurrence of flows in excess to the final design capacity should be quite low, while the period between construction of the first dam and completion of Orme Dam is comparatively short. The element of risk involved may well justify temporary structures such as "break-away" levees, provided downstream safety can be assured.

In the first stage the overall dam structure, including both "break-away" sections and inflatable dam sections, should span the entire 600-foot width of the flood channel. In the second stage the overpour section of the dam may be reduced, depending upon allowable rises in flood levels. In this instance, construction of the inflatable dam to the width of the final design would permit incorporation of this section into the final structure.

The inflatable dam itself may be built in several sections of 100 to 200 feet in length with intermediate piers. The

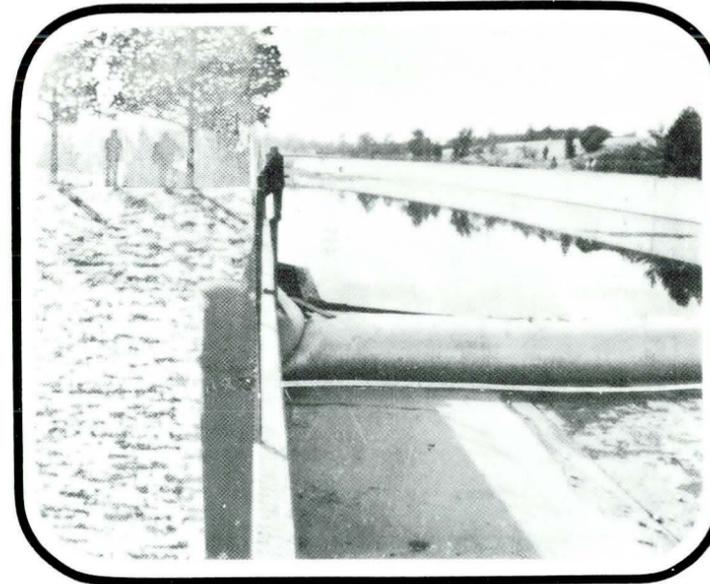


Figure No. 34

piers could serve as bridge deck supports for the future design, or could incorporate blockouts for future radial gate installations.

Foundation requirements for the first stage development will be equal to or more stringent than those for the second stage. Base slabs, aprons, and cutoff walls for the original stage should serve design requirements of the second stage. Energy dissipaters needed in the afterbay would serve in both stages. Because of this potential for cost reduction in the stage development, designs prepared in Phase III of the Rio Salado Project should be prepared for both stages of development.

As in the Central Avenue Project, it is proposed that the inflatable dam be installed in a notch inset into the base slab of the dam so that when it is fully collapsed, flow through the section will be uniform. The dam itself may be attached to either vertical piers or sloped abutments. It will be water-filled, or a combination of air- and water-filled. Inflation will be controllable to permit partial releases from the lake of small discharges. Complete deflation could be automatic upon the rise of the upstream water surface to a specified level. City water under pressure can serve as the source of water for the dam's operation.

Channel designs will need to meet two design flood conditions. The first, as recommended by the U. S. Corps of

Engineers, will need to accommodate a peak flow of 253,000 cubic feet per second, representative of present upstream development of the river. The second, a smaller peak flow of 50,000 cubic feet per second, is recommended following completion of Orme Dam.

Flood contributions from the tributary Indian Bend Wash are expected to increase slightly with further municipal development and stream improvement programs. A soon-to-be-constructed retention dam above the Arizona Canal and future Granite Reef Aqueduct will reduce the peak discharge, which would contribute towards better utilization from the Indian Bend Wash.

SOURCES OF WATER

The Mesa City sewage disposal plant located on the south bank of the river about 2 miles east of the project could be a possible source of water for the University Project. The 5-million-gallon-per-day capacity plant is scheduled to phase out of operation in about 5 years. At that time the city proposes to construct a 36-inch line from the plant west and south to join the 56-inch sewage main trunk line to the 23rd Avenue Phoenix plant. Space for this discharge has been reserved by Mesa, and a contract agreed upon.

Several possibilities exist in the use of this water. Odor proofing of the plant (the principal cause for abandonment) would probably be too costly. However, a process of sewage separation, discharging heavier materials into the Phoenix system while retaining the secondary effluents for processing at the plant site, might be acceptable. Adequate land, about 140 acres, is owned by the city at this location for use in high-rate infiltration plants such as the Flushing Meadows plant in Phoenix.

The storm drain systems from the Cities of Mesa, Tempe, and Scottsdale now consist of: 1) a 36-inch line entering the project from the south at Rural Road; 2) a 78-inch line from the east on the south side of the river entering east of Rural Road; 3) a 66-inch line from the north entering east of Rural Road about Mary Street; 4) a 24-inch line entering immediately above the project from the south on Hayden. The total discharge from these drains will provide only a small part of the flow required. Because they are not dependable, they should not be considered as a source of water, but rather as factors in maintaining a low salinity buildup in the lake's operation.

OTHER DESIGN CONSIDERATIONS

Because of its location farther upstream from the Central Avenue Project, less streambed attenuation occurs and greater amounts of controlled flows will need to be passed through the project's channels. The dual conditions to be met in peak flood flows make a development scheme of two phases more practical — one before and a second after Orme Dam is constructed.

FOUNDATIONS

No serious stability problems should be encountered at the site for the inflatable dam. A concrete diversion type structure did exist at one time near this site, but nearly all of the overpour section of this dam has been destroyed. This points out the need for a substantial concrete foundation, abutments, and intermediate piers to protect against undercutting by flood flows. The structure must include a cutoff wall under it to a depth sufficient to prevent piping and development of sand boils downstream under ponding conditions.

Location of the rock sill below the structure could be important to both the structural design and to lake operation with reclaimed seepage water.

EROSION PROTECTION

As the dam and its spillway will consist of a concrete and rubber structure, no erosion problem is expected from flood flows.

Wave action of earth fills and shorelines may require bank armoring along some locations.

LAKE OPERATION

The process of filling and maintaining water in the lake is the primary consideration of the Tempe/ASU Project. The lake's surface is 60 percent greater than that of the Central Avenue Project, and the bottom materials are even more porous. Lining the lake bottom may prove too expensive, and the project may need to rely entirely upon the self-sealing qualities of lake operation and recycling of bottom seepage.

Biologic growth offers the least costly sealant for the early stages of the project. Food supplies vary with the different algae genre. However, it is known that the production of algae in high-rate secondary sewage ponds develops seals in these ponds in 15 to 30 days. The nutrients of the high-rate filter effluents should be tested for algae production to determine the practicality of using these high-nutrient waters at these concentrations during the filling process. Settling of natural sediments after a flood may also be an effective sealant. Later, after a seal is established, the water could be brought to fishing quality and to boating quality for operation of the rowing course.

Because of its size, filling and pumping capacities would probably be twice that of the Central Avenue Project. However, location of the bedrock sill at the downstream end of the project could show possibilities for raising the groundwater levels by cutoff wall construction or by other means. Depths to bedrock, groundwater depths, and general groundwater flow patterns will need to be determined in the Phase III Study to establish pump locations and capacity requirements.

WATER QUALITY CONTROL

High-rate infiltration plants of the Flushing Meadows type should, under the same designs, provide similar results in nitrogen and phosphate reductions. The filtering characteristics of the substrata should be at some variance because of the differences in materials encountered. Some modifications may be needed in the designs.

Inflow from Indian Bend Wash will have considerable influence on water quality. Flows of even the 2-year frequency will serve to reduce salinity buildup within the lake. The confluence of Indian Bend Wash with the main channel of the rowing course will need to be modified to meet new flow evaluations under ponded conditions.

UTILITIES

City water pressure will be required for the inflation of the water-filled (and possibly combined air- and water-filled) dam. Water and other utilities will be needed in the rowing course boathouse, marinas, parking lots, and shore facilities.

No conflict with major utility trunk lines should occur, but existing lines will need to be incorporated in the design of the project.

OPEN SPACE AND RECREATION POTENTIALS

The Tempe/ASU demonstration project plan is predominantly a recreation-oriented proposal that takes advantage of relatively large public land holdings and the nature of the existing activities near the project area. The ASU athletic complex located to the south of the riverbed was a strong influence on the planning of this project. To augment that complex, as well as to provide for general public recreational needs, the focal point of the project will be a 2,000-meter intercollegiate rowing course. In conjunction with the planned construction of a new bridge at Scottsdale Road, the County Flood Control District plans to excavate a channel approximately a mile in each direction from the bridge. This new channel can be easily designed to conform to the rowing course standards. Water for the course would be impounded by constructing a dam just upstream of Mill Avenue.

Along both sides of the rowing course will be public access edges, with a comprehensive pedestrian and bicycle trail system traversing the project. A new City of Tempe park is proposed at the southeasterly end of the rowing course at Hayden Road. This park would be the site of the boathouse for the ASU crew and would provide spectator areas and parking for the crew events.

On university property south of the river, ASU plans to build an 18-hole golf course between Rural Road and Hayden Road. This course will be built incrementally over a period of years as budget and land availability permit. There is an urgent need to improve access to and expand the parking facilities around the ASU stadia complex. To satisfy these needs in a manner that would be most advantageous to both the Rio Salado and the university, a multifunctional greenbelt area is proposed between the stadia complex and the river. The major feature of this area will be a lighted nine-hole "executive" golf course. This course can be designed with the tee and green areas elevated out of the potential flood plain. The lower fairway areas could then be inundated during excessive water flows and could be used for overflow parking for stadium events. The golf course would also carry the open space/recreational character of the Rio Salado to the activity centers of the university. To provide better access to the athletic complex and Rio Salado features, a new road is proposed from Mill Avenue to Hayden Road. Details of proposed circulation plans are found later in this section.

Proposed ASU Development



Figure No. 35

One of the most dramatic proposals of the Tempe/ASU Project is the expansion of Papago Park southward to the river. This would tie the Rio Salado project directly to the largest regional park in the urbanized Phoenix area. The Papago Park expansion would be primarily used as an open space park with connecting trail systems and scenic parkways. A major constraint on active recreational use of the expanded area is the project noise contour from Sky Harbor International Airport. The open space function of the expanded park therefore takes on a functional character in addition to purely esthetic value.

DEVELOPMENT POTENTIALS

The addition of a significant water amenity (the rowing course) to the riverbottom near the university and the extension of Papago Park would make the land immediately adjacent to the river prime developable land. The combination of a natural desert backdrop, a significant body of water, close proximity to the cultural and sporting attractions of Arizona State University, and relative nearness to major employment centers such as downtown Phoenix is unparalleled in Maricopa County.

The sites indicated for commercial land uses are quite attractive. Each of the sites has major east-west and north-south arterial access. Also the sites (especially the northern site on the corner of Gilbert and Scottsdale Roads) are

so situated as to be able to serve the Cities of Scottsdale and Tempe and attract business from Mesa. All three cities are among the fastest growing in Maricopa County.

The institutional land uses in the Tempe Project are consistent with the plans of the City of Tempe and Arizona State University. The development of additional parks and the golf course development in the area should add even more attractiveness to the land reserved for private development.

Tempe's ongoing Neighborhood Development Program (NDP) offers exciting potential for linking the Rio Salado to the revitalized core of the city. NDP plans have been incorporated and expanded to capture this opportunity. Commercial/recreational uses that complement the Rio Salado features are especially desirable.

TRANSPORTATION AND CIRCULATION

The Tempe/ASU Demonstration Project has a variety of opportunities for the improvement of existing circulation patterns. The City of Tempe has plans now for the improvement and realignment of Curry Road to the north. The ultimate plan calls for access from Curry Road near the intersection of U. S. Routes 60, 80, and 89 through the expanded Papago Park to Gilbert Road, servicing the waterfront commercial sites. Gilbert Road, then extending

easterly across Scottsdale Road, will service the garden industrial area and the Indian Bend Wash open space and will intersect Princess Road and provide access to Hayden Road. This portion of roadway is intended eventually to be part of the total Rio Salado Parkway System.

On the south, a new road from Mill Avenue to Scottsdale Road north of Tempe Butte will provide the much-needed access to ASU stadia parking and a new commercial center east of the Tempe Bridge. This road will also connect Scottsdale and Hayden Roads and service the new ASU golf course, boathouse, and city park.

The City of Tempe's Neighborhood Development Plan calls for a new bridge west of the existing Tempe Bridge to provide a one-way couplet into the downtown Tempe area. These plans have been incorporated into the University Project plan.

In the Tempe/ASU Demonstration Project, pedestrian, bike, and equestrian trails will connect to existing trails in Papago Park and Indian Bend Wash. They will traverse the boundary of the new lake and provide public access to the water's edge.

IMPLEMENTATION

As with the Central Avenue Demonstration Project in Phoenix, the entire planning area should be immediately established as a "special planning district," or Rio Salado Planning District, with the same criteria as the demonstration project. The process may be somewhat more difficult because part of the Rio Salado is located in Maricopa County territory, necessitating the adoption by two local agencies, as well as by Arizona State University, of the "special planning district" concept.

A phased program is also proposed for the Tempe/ASU Demonstration Project. The City of Tempe appears to be the most appropriate agency to assume the leadership role for implementing this demonstration project.

The development sequence is, of course, very general. Detailed planning, design, and engineering will have to precede each of the steps prior to effectuation. As with the Central Avenue project, the above phases are not exclusive of each other. As opportunities arise, some steps can precede others. Again, impact is the critical issue.

Phase 1

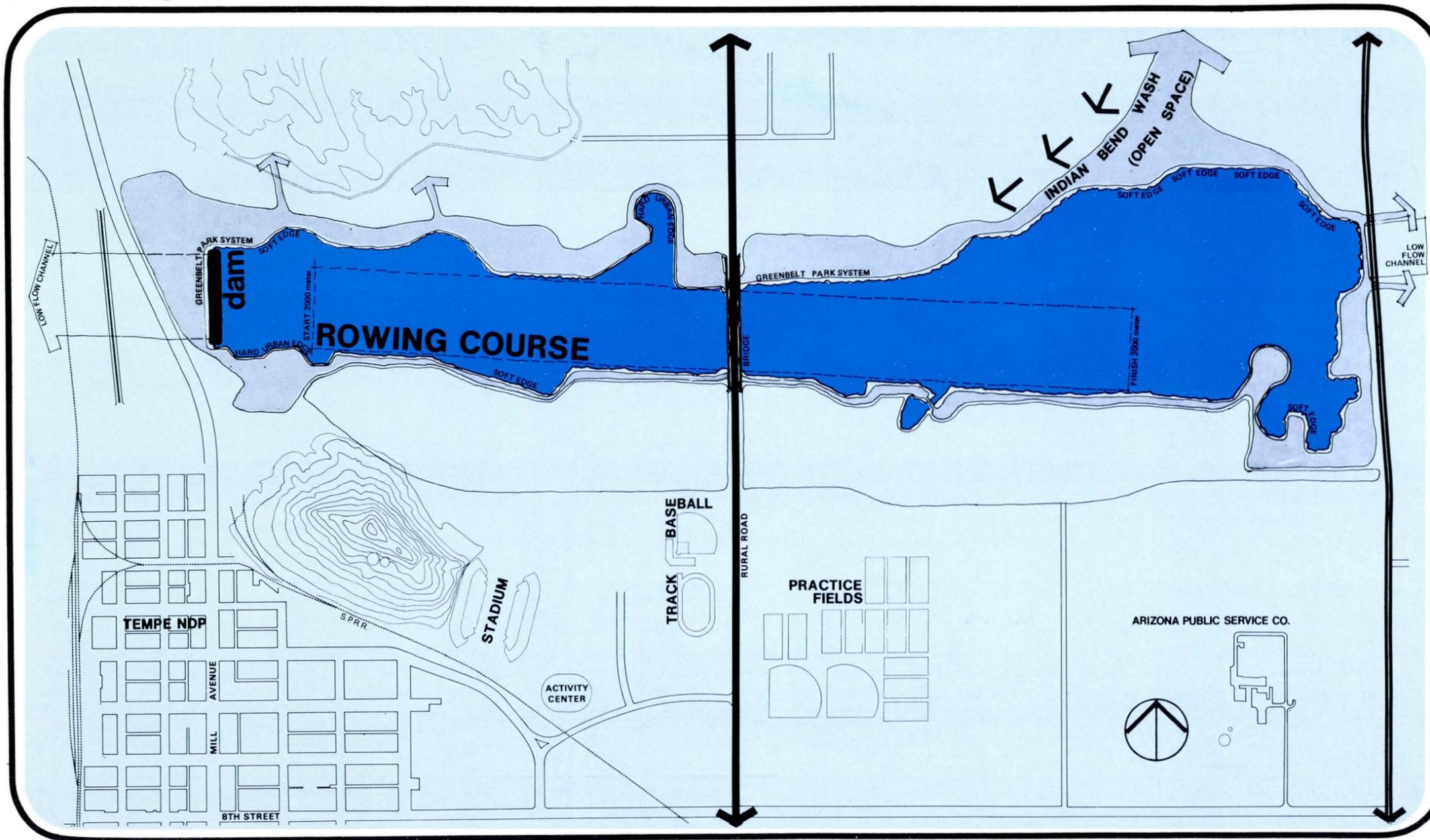


Figure No. 36

- A. Secure Rio Salado development rights on public and/or quasi-public land
- B. Construct new Scottsdale Road Bridge (programmed by Maricopa County)
- C. Dredge channel for flood control from Mill Avenue to Hayden Road, incorporating the rowing course
- D. Construct inflatable dam for water impoundment
- E. Construct confluent structure at mouth of Indian Bend Wash
- F. Construct pumping equipment and lines for water source
- G. Secure total public access edge around rowing course and begin immediate landscape program
- H. Impound water to create new lake.

alignment and standards. (Programmed by Maricopa County Flood Control District)

Phase 2

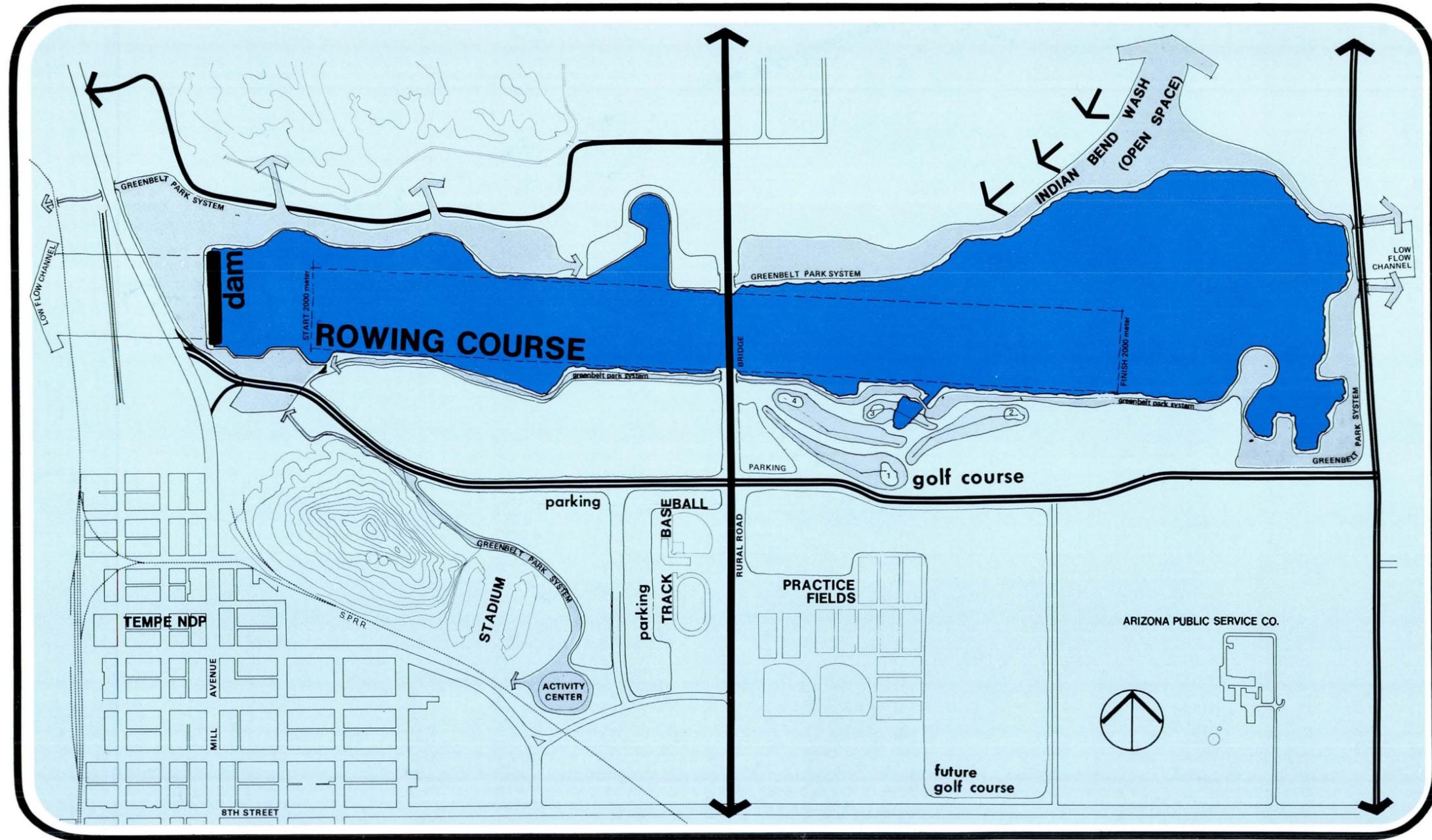


Figure No. 37

- A. Begin development of ASU Golf Course
- B. Acquire additional public park land
- C. Begin new road development into ASU stadia complex and Rio Salado Parkway on the north side of the river
- D. Establish pedestrian and bicycle trail system around project, into ASU and downtown Tempe, and up the Indian Bend Wash to Scottsdale Trail System
- E. Expand and upgrade ASU parking facilities toward the river
- F. Prepare area for nine-hole golf course between the stadia complex and the river.

Phase 3

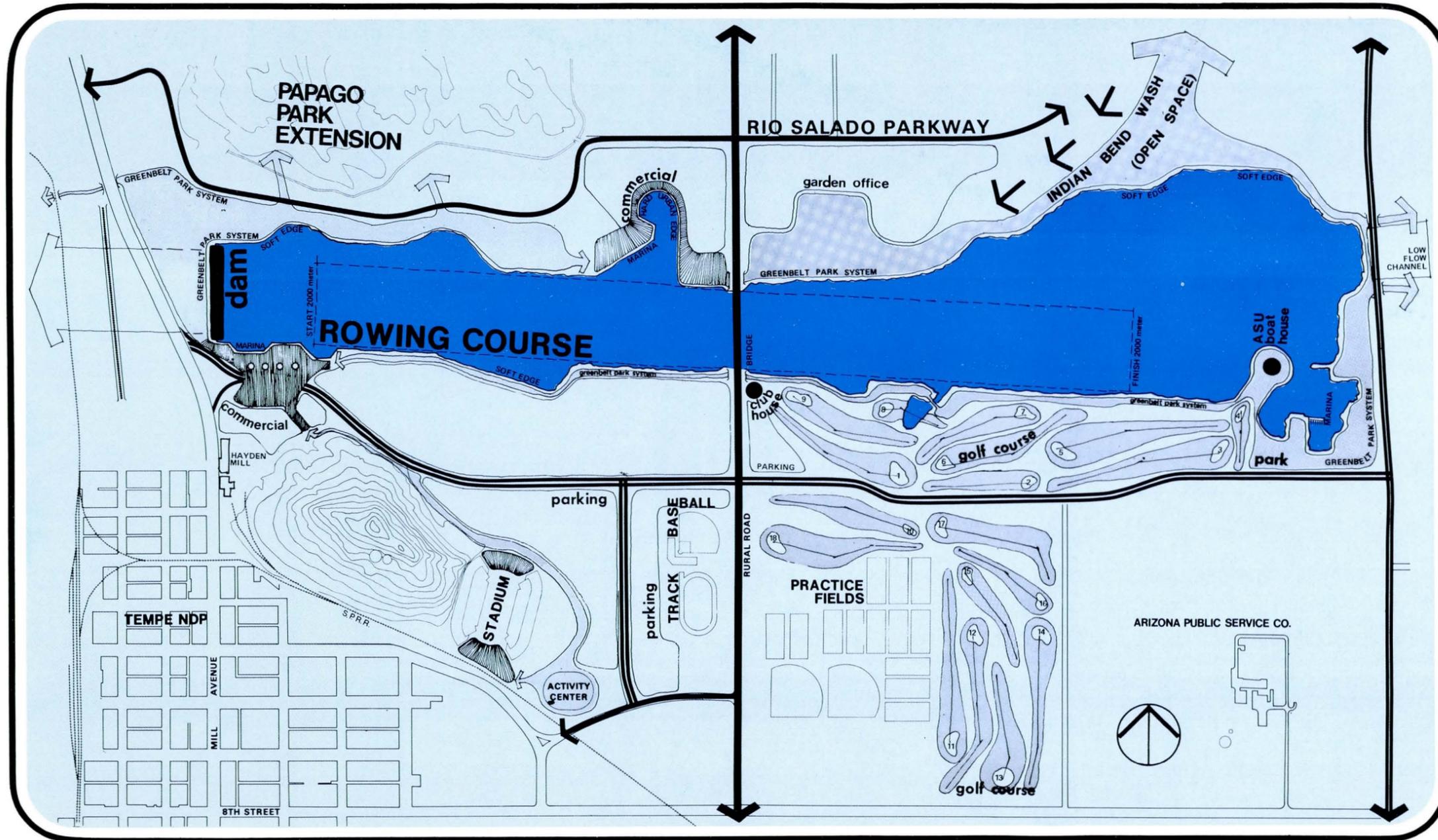


Figure No. 38

- A. Continue golf course construction (both sites)
- B. Develop small city park on Hayden Road at the ASU boathouse
- C. Complete road improvements on both sides of the river
- D. Introduce private development at Scottsdale Road and Mill Avenue (commercial, recreational, and garden office/industrial development)
- E. Acquire land for expansion of Papago Park south to the Rio Salado.

Phase 4

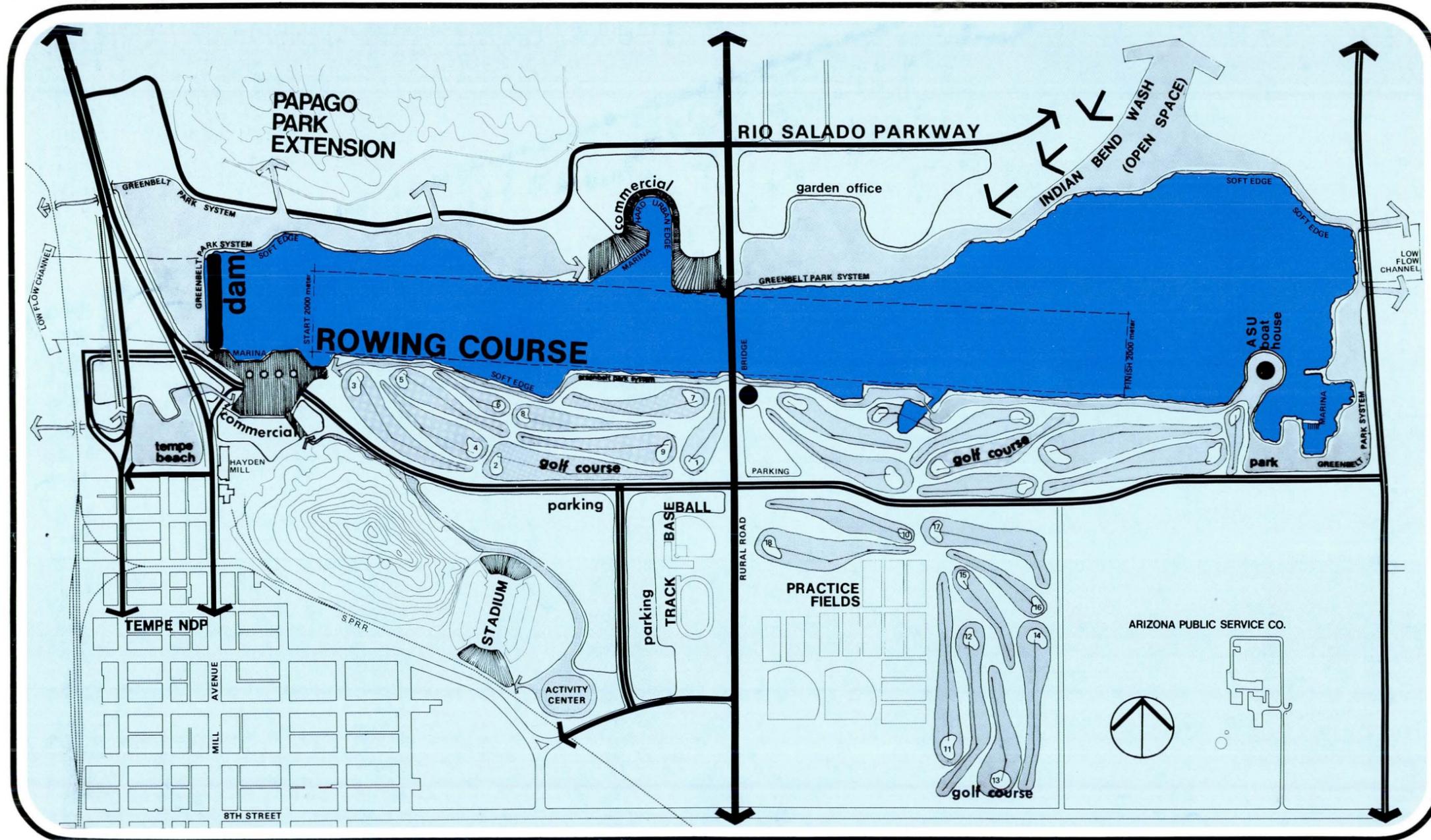
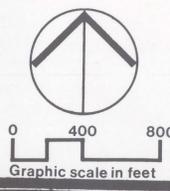
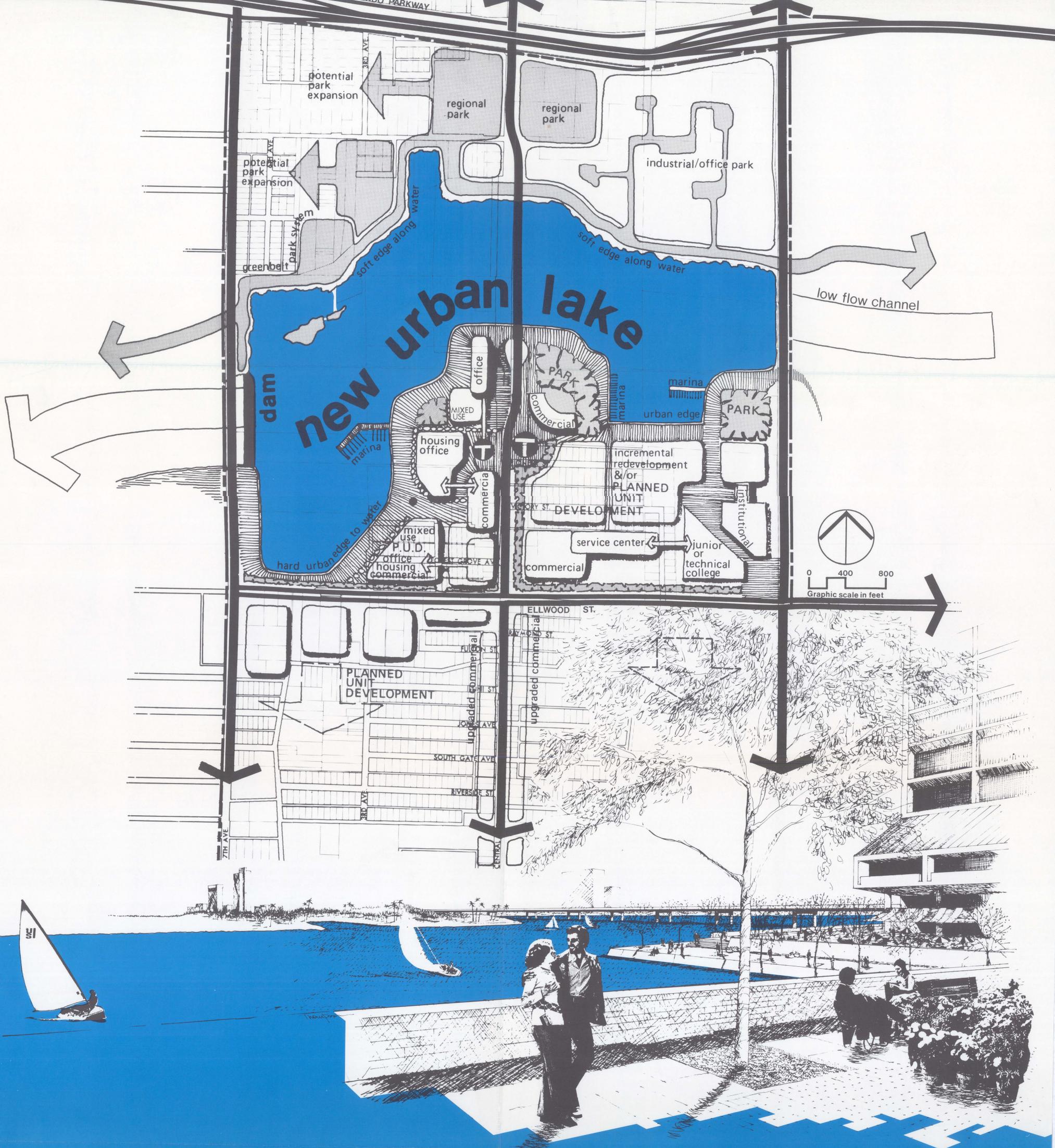


Figure No. 39

- A. Construct new bridge for ASU street alignment in downtown Tempe; incorporate permanent dam into the bridge design
- B. Expand Tempe Beach Park with small lake and additional facilities
- C. Complete circulation system with connections to new bridge
- D. Complete golf course construction
- E. Continue private development in specified areas
- F. Complete development of Papago Park expansion program.

5

**PHOENIX
DEMONSTRATION
PROJECT**



PHOENIX DEMONSTRATION PROJECT

The Phoenix Demonstration Project is conceived as an extension of the Phoenix Central Avenue corridor southward across the Salt River. It is one of the most critical elements of the Rio Salado Plan. The area has remained underdeveloped because of the flood threat of the Salt River and is today primarily a peripheral industrial zone of the central city, with extraction of sand and gravel from the river bottom having been the primary use. The long-range potentials of the project area are great because of its central location, adjacency to existing urban services, and relatively undeveloped status today.

The above diagram illustrates these long-range potentials, which may take as long as 20 years to realize. However, initial increments of this project can begin immediately. The new Central Avenue Bridge can provide the impetus for continuing development of the Rio Salado Project. Parklands and small lakes can be developed early to advance the concept to its full potential in years to come.

The basic concept that has been proposed for the Phoenix Demonstration Project is the development of a new "activity center" in the Phoenix metropolitan area. In order to achieve this new function and image for the Central Avenue Bridge area, the widest possible range and

mix of land uses and functions have been tested as potentials. Preliminary findings of the economic consultant for the project indicate that there is a potential demand for private development within the project area for new medium- or high-density residential development, neighborhood and specialty commercial activities, new office development, hotel/motel facilities, office/industrial parks, and new institutional uses.

The long range plan for the project area calls for mixing land uses and building uses in a complementary manner through use of planned area development. One of the key concepts of the Rio Salado Project is the development of a continuous band of recreation and open space along the entire 40-mile length of the Salt River. As the recreation and open space band passes through urbanized areas such as the Central Avenue Demonstration Project, the intensity of functions will increase.

However, the most important step toward this potential multi-land-use development would be the construction of the Central Avenue Lake. A lake in the river bottom of the Central Avenue Bridge area could significantly increase land values in the area. Because of the anticipated eventual completion of sand and gravel excavations in

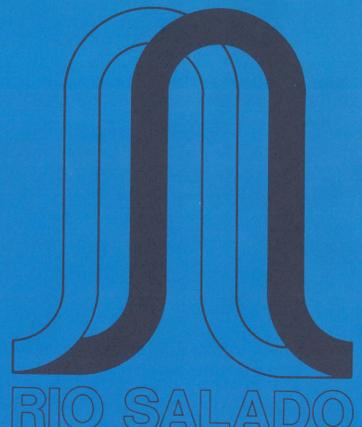
the project area, the close proximity to the Phoenix central business district, and the existing configurations of the Salt River, a unique opportunity exists. The reintroduction of water into the river basin and development of a new 120-acre urban lake could be achieved by construction of an inflatable dam approximately 13 feet high upstream from the present 7th Avenue box culvert. The water level would be raised to about Elevation 1,050 feet, creating an average depth in the lake of 17 feet. Water for the lake could be obtained from processed effluents of the 35th Avenue High-Rate Infiltration Plant and pumped through a pipeline located generally along lower Buckeye Road.

The new lake would have a public edge a minimum of 100 feet wide around its entire perimeter. Additional provision is made for pedestrian and open space connections from and through the adjacent private development to this public edge and urban lake, connecting interior semipublic plazas, courtyards, and pathways directly to the edge and lake. Two basic edge types are suggested for the project. On the southern edge, a hard urban edge is suggested as most appropriate in conjunction with new urban development. This would be a paved area, with planters, trees, steps, streets, lighting, information kiosks,

and varying platform levels. This edge would become a promenade for the larger number of people living, working, and visiting in the adjacent urban development. It would also provide an opportunity for outdoor cafes, street vendors, and casual, impromptu performances. Ideally, it would be alive with activity both day and night. Along the northern edge of the urban lake, a soft edge is envisioned, with extensive landscaping and a park-like atmosphere extending directly to the water's edge. Adjacent to the soft edge, extending northward between Central and 7th Avenues, a regional park is proposed as a prime potential and asset to the entire project.

As an impetus to new urban development south of the Salt River, one of the primary requisites would be development of improved circulation and access. The initial increment of the proposed Rio Salado Parkway, roughly along the present Ellwood Street alignment, would be a primary element in this improved circulation.

The new Central Avenue Bridge to be constructed by the City of Phoenix to replace the existing structure will include pedestrian crossings. Pedestrian interchange points at both the north and south public edges along the lake should be designed into the bridge.

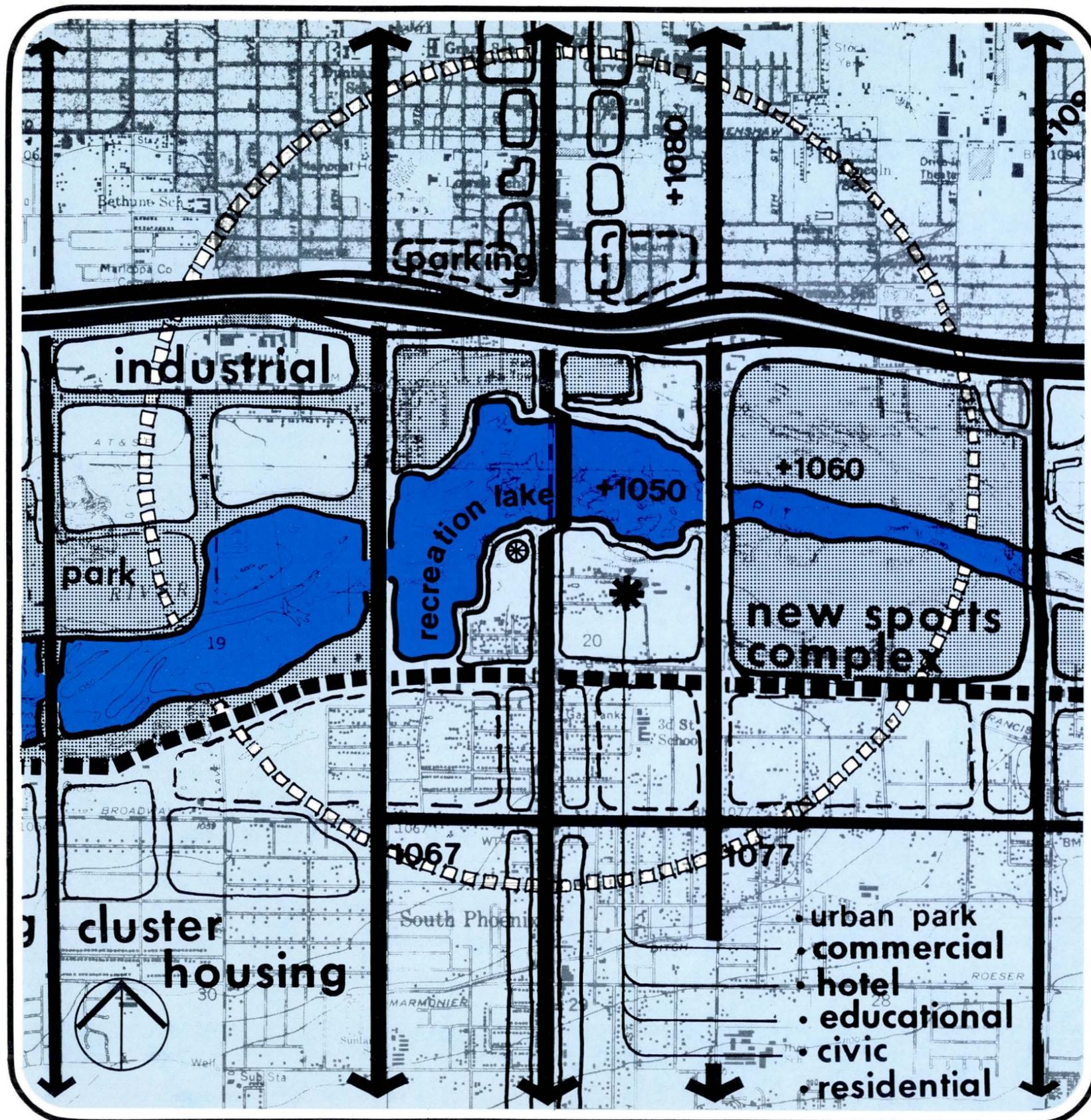


RIO SALADO

1974 PHOENIX DEMONSTRATION PROJECT

sponsors
MARICOPA ASSOCIATION OF GOVERNMENTS • VALLEY FORWARD ASSOCIATION

consultants
DANIEL, MANN, JOHNSON, & MENDENHALL • EARLE V. MILLER ENGINEERS • GROUP CIVITAS • THE RESEARCH GROUP • WESTERN MANAGEMENT CONSULTANTS



Phoenix Demonstration Project Area

Figure No. 40

A demonstration project for a project on the scale of Rio Salado must have a significant impact if the demonstration is to be effective. The City of Phoenix wisely selected the new Central Avenue Bridge as the impetus for a pilot project on the Rio Salado.

The project area is bounded on the north by the Maricopa Freeway, on the south by Broadway, on the west by 7th Avenue, and on the east by 7th Street. It is conceived as the extension of the Phoenix Central Avenue Corridor southward across the Salt River. It is one of the most critical elements of the Rio Salado Plan.

Historically, the area has remained underdeveloped because of the flood threat of the Salt River and is today primarily a peripheral industrial zone of the central city, with extraction of sand and gravel from the riverbottom having been the primary use.

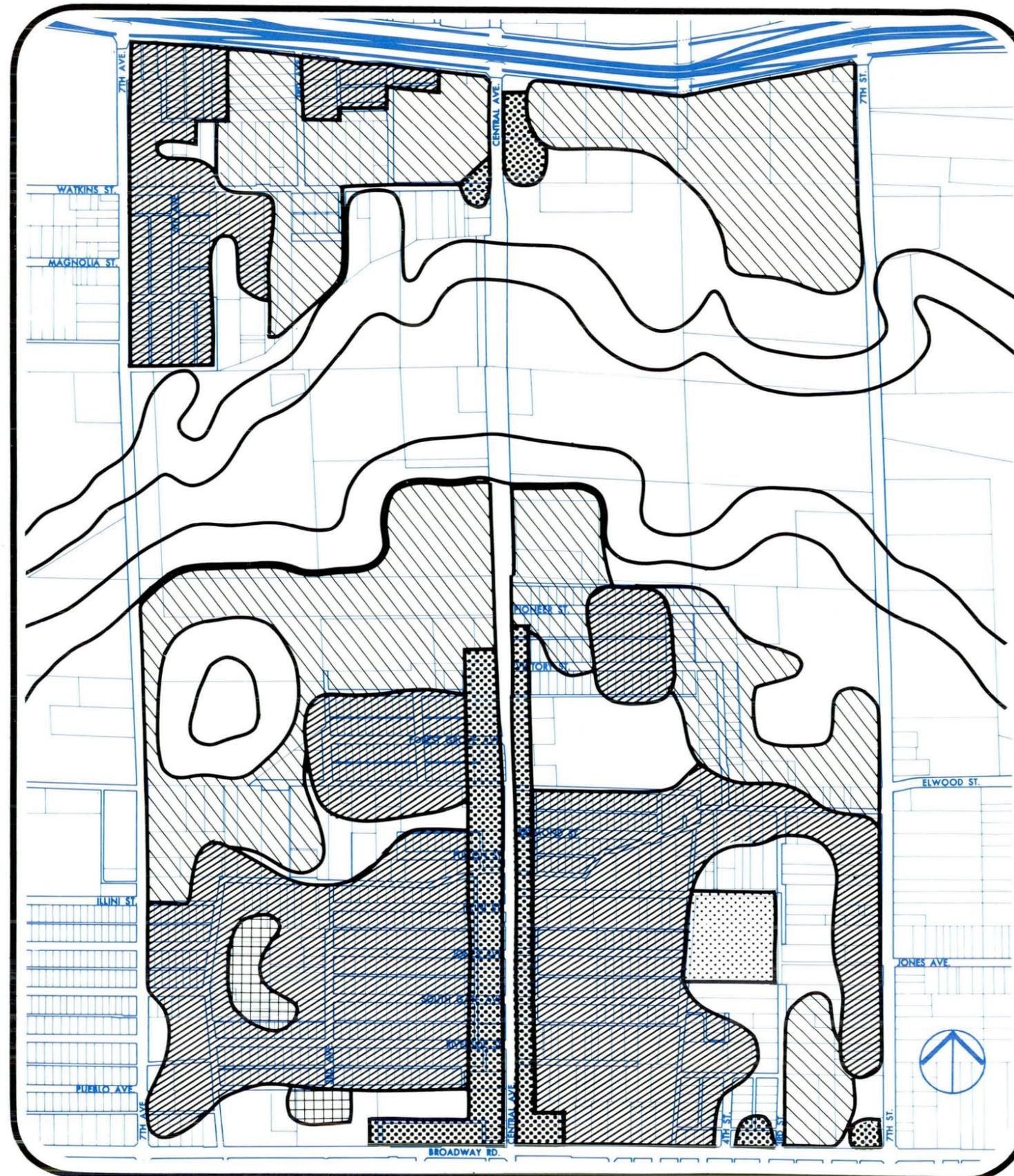
The potentials of the project area are great because of its central location, adjacency to existing urban services, and relatively undeveloped status today. The concept plan for the Central Avenue Demonstration Project addresses the following significant issues:

EXISTING CONDITIONS:

- Land use
- Land ownership
- Topography, slope geology, and hydrography

POTENTIALS

- Water ponding
- Economic land use development
- Public recreation/open space
- Transportation/circulation
- Implementation



Existing Land Use

Figure No. 41

EXISTING CONDITIONS

LAND USE

The project area contains the full mix of urban development, with the predominant uses being low-intensity industrial and low-density residential. In addition, there is a large amount of vacant land. Existing commercial development is limited to the frontage parcels along Central Avenue and Broadway.

The Salt River has been excavated for sand and gravel, but these operations have been completed in the area between Central Avenue and 7th Street. For most of the year, the riverbed is dry, with the exception of some large ponds just east of 7th Avenue. During the rainy season, the riverbottom and adjacent areas are subject to flood, with the 100-year flood line ranging from the Maricopa Freeway on the north to Broadway on the south.

The largest single land use is the sand and gravel operation of Union Rock between 7th Avenue and Central Avenue. Material for this plant was initially excavated from the area between 7th Avenue and Central Avenue. It is now imported by conveyor from excavations west of 7th Avenue. This plant operation contains the tallest structures and establishes the primary existing industrial image for the project area.

In addition to having a relatively low intensity of development, buildings in the area are generally old and not in good condition. There are, however, a few new small industrial structures in the northwest and southeast quadrants of the area, and some of the homes are well maintained.

- RESIDENTIAL
- COMMERCIAL
- INDUSTRIAL
- SCHOOL
- AGRICULTURAL
- 1973 RIVER HIGH WATER LEVEL

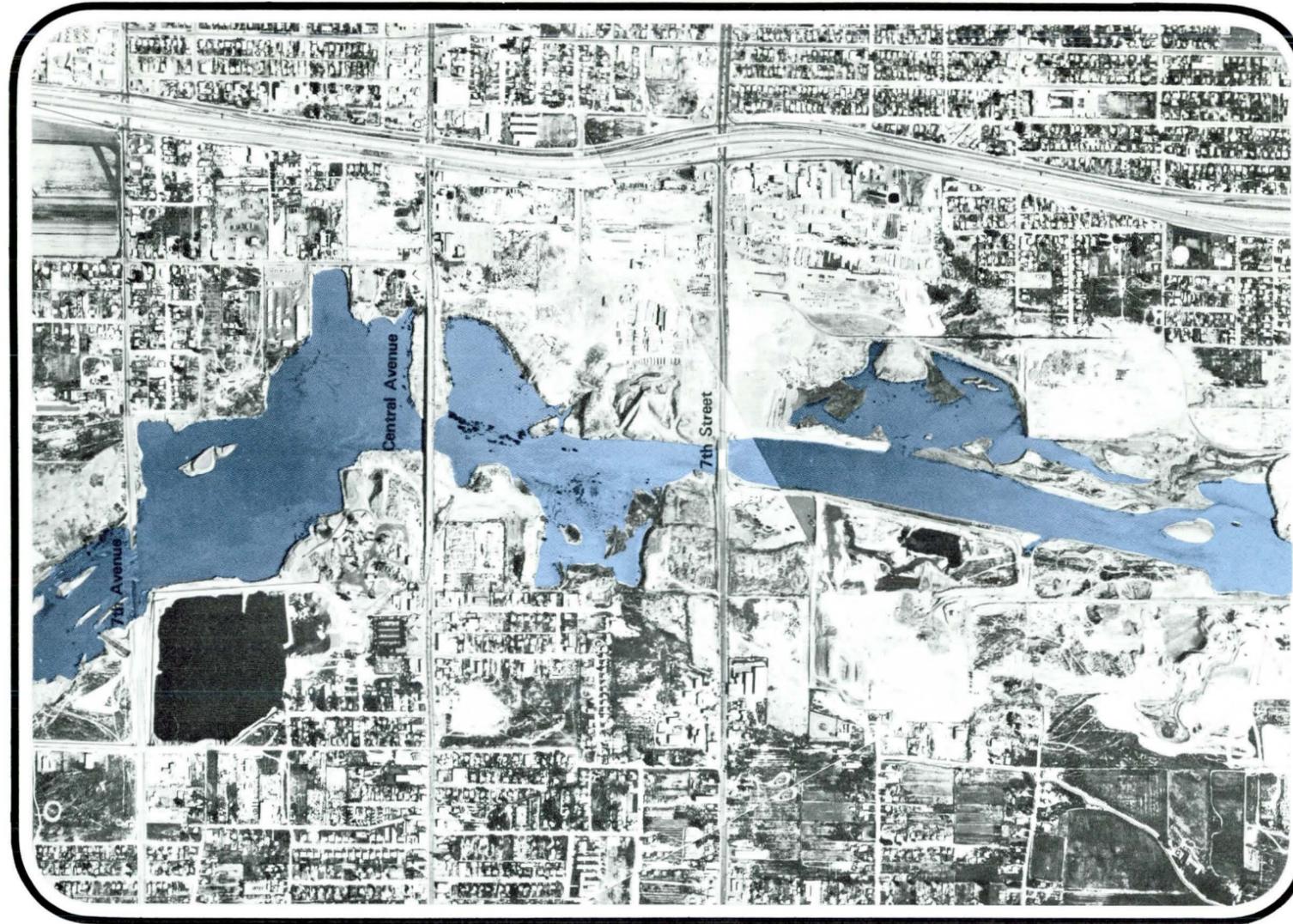


Figure No. 43

TOPOGRAPHY AND SLOPE

The project area is relatively flat, with the exception of the riverbottom. There is a general slope from east to west, with a maximum change in elevation from 7th Street to 7th Avenue of approximately 20 feet over a distance of 4,800 feet. The sand and gravel operations have significantly altered the topography of the riverbottom, particularly between Central Avenue and 7th Avenue. Also, on the south bank of the river just east of Central Avenue, there is an old fill area in what was at one time a sand and gravel excavation.

GEOLOGY

In the river channel between 7th Avenue and 7th Street the depth of the alluvial deposits of coarse sands and gravel is unknown. The Union Rock and Materials Company excavated to Elevation 1,020 before seepage from a rising water table caused by surface flows forced abandonment of the main river channel. The company struck a layer of hardpan (caliche) at Elevation 1,020, which they did not penetrate. In an adjacent pit on the south bank just east of 7th Avenue, the bottom grade was excavated to 30 feet below groundwater table. A 9,000-gpm pump was used to remove water infiltration, with a second 9,000-gpm standby pump. Abandonment of this pit came when the water inflow exceeded the capacity of the two pumps.

The present standing water surface in the open pits along the river channel is considerably above the groundwater elevation. It is believed that the small flows from storm drains and concrete plant waste are offsetting evaporation and deep percolation losses. Indications are that the bottom of the pit has been nearly sealed by fine sediment deposits, or that the hardpan encountered at Elevation 1,020 is serving as an impermeable barrier perching the water above the groundwater table.

Immediately upstream from the 7th Avenue box culvert structure, the City of Phoenix is using the bottom of the channel for a nonbiodegradable landfill operation. Clean, heavy material such as broken concrete slabs, curbs, and gutters is being dumped. The backfill is being maintained at or below the invert elevation of the two 16-foot-by-15-foot box culvert openings.

Downstream of 7th Avenue the undisturbed riverbed is lined with cobbles 12 inches to 18 inches in diameter. The undisturbed material is apparently stable, and there is no evidence of subsidence at any of the three river crossings.

HYDROGRAPHY

Plans and designs will need to consider three conditions of flood flows through the Central Avenue Project, as follows:

- Present condition in which the 7th Avenue road embankment is over-topped at flows in excess of 50,000 cfs
- Temporary conditions (before Orme Dame is completed) in which low flow protection is increased to 20,000 cfs before overtopping
- Final and permanent post-Orme Dam condition, in which flood protection is brought to full Standard Project Flood Capacities.

Existing channel conditions, both upstream and downstream from this demonstration project, are quite stable. Streambeds consist of coarse gravel to cobble surfacing, resistant to scouring by even relatively sediment-free flood waters. The 7th Avenue roadway embankment itself is subject to erosion. The street paving serves as an erosion-resistant surface, but the embankment is subject to undercutting along the downstream face.

PONDING POTENTIALS

Because of the anticipated eventual completion of sand and gravel excavations in the project area, the close proximity to the Phoenix central business district, and the existing configuration of the Salt River, a unique opportunity exists. The reintroduction of waters into the river basin and development of a new 120-acre urban lake could be achieved by construction of an approximately 13-foot-high inflatable dam upstream from the present 7th Avenue Box Culvert.

The water level would be raised to about Elevation 1,050 feet, creating an average depth in the lake of 17 feet. Water for the lake could be obtained from processed effluents of the 35th Avenue High-Rate Infiltration Plant and pumped through a pipeline located generally along lower Buckeye Road.

Seepage losses would be recovered by pumping from groundwater at the lake site. Water for the initial filling of the lake would need to come from the 35th Avenue Wastewater Renovation Project. After the lake is filled, the use of effluents may be reduced to replacement of evaporation losses only, unless downstream releases for salinity control are required.

Structural requirements, lake operation, and design considerations are discussed in Chapter 2, Water Systems.

WATER QUALITY

This Report does not and cannot determine to what extent chemical treatment may be required for the water sources, recycling, and useful life in regard to salts, nutrients, and algae, as there is no experience record in this regard and the project was not funded for such studies.

It is proposed, however, that testing should be accomplished during the project design phase and provisions be made for control monitoring and implementation of changes during the life of the project. The cost of monitoring and treatment as required should be considered during the planning and implementation of the project.

DEVELOPMENT POTENTIALS

The Central Avenue Bridge area is presently heavily industrialized, and surrounded by residential and strip commercial development of marginal quality. Near the eastern edge of the project there are attractive industrial parks which seem to be progressing toward the immediate project area.

The basic concept which has been proposed for the Phoenix Demonstration Project is the development of a new "activity" node in the Phoenix metropolitan area. A node is a section of the city which becomes a focal point of activity with a strong identity within the overall urban fabric of a metropolitan area. In order to achieve this new function and image for the Central Avenue Bridge area, the widest possible range and mix of land uses and functions have been tested as potentials for the area. Preliminary findings of the economic consultant for the project indicate that there is a significant potential demand for private development within the project area for new medium- or high-density residential development, neighborhood and specialty com-

mercial activities, new office development, hotel/motel facilities, industrial/office parks, and new institutional uses.

The long-range plan for the project area calls for mixing land uses and building uses in a complementary manner through use of Planned Area Development zoning. This would allow, for instance, residential development on upper floors and commercial uses on the ground floors along the proposed new urban lake. Also, residential-cum-office condominium units would be feasible and meet an existing need in the Phoenix metropolitan area.

However, the most important step toward this potential multi-land-use development would be the construction of the Central Avenue Lake. A lake in the riverbottom of the Central Bridge area could significantly increase land values in the area. Perhaps the lake could make land that presently lies next to the riverbottom nearly as desirable as freeway-oriented property.

Proposed Phoenix Development



Figure No. 44

Adjacent to the soft edge, extending northward between Central and 7th Avenues, a regional park is proposed as a prime potential and asset to the entire project. Initial increments of the park would take advantage of the existing extensive areas of large, vacant parcels. Over time, provision would be made to limit urban development in this area. An active acquisition program should be implemented to extend the regional park to the maximum extent possible, consistent with the capability to finance and commitment to develop the regional park in this area.

Between Central Avenue and 7th Street a high quality industrial/office park is proposed, consistent with pri-

vate ownership plans and the general pattern of this type of development between the Maricopa Freeway and the river. Structures in this development that are closest to the river should be developed with an orientation to the amenities of the river and park. In addition, provision might be made for continuation of the soft-edge public park along the river into the proposed development to create a park-like atmosphere which could be utilized both by the public at large and by workers within the proposed development. Instead of limiting the use of the landscaped grounds of the development to a visual setting for the structures, provision of executive recreational amenities and picnic facilities might provide both an added public amenity and a private investment sales advantage.

PUBLIC RECREATION AND OPEN SPACE

One of the key concepts of the Rio Salado Project is the development of a continuous band of recreation and open space along the entire 40-mile length of the Salt River. As the recreation and open space band passes through urbanized areas, such as the Central Avenue Demonstration Project, the intensity of functions will increase.

One of the major features of the Central Avenue Project is the development of a new 120-acre urban lake, with a minimum 100-foot-wide public edge around its entire perimeter. Additional provision is made for pedestrian and open space connections from and through the adjacent private development to this public edge and lake, connecting interior semipublic plazas, courtyards, and pathways directly to the public edge and urban lake.

Within the lake, there is a potential for small sailboat marinas in those protected areas outside the main flow of the flood channel, primarily on the southern edge of the lake. Power boats are not deemed appropriate for a lake of this scale. The lake could be stocked with fish to permit sport fishing from the public edge.

Two basic edge types are suggested for the project. On the southern edge, a hard urban edge is suggested as most appropriate in conjunction with new urban development. This would be a paved area, with planters, trees, steps, streets, lighting, information kiosks, and varying platform levels. This edge would become a promenade for the larger number of people living, working, and visiting the adjacent urban development. It would also provide an opportunity for outdoor cafes, street vendors, and casual, impromptu performances. Ideally, it would be alive with activity both day and night.

Along the northern edge of the urban lake, a soft edge is envisioned, with extensive landscaping and a park-like atmosphere extending directly to the water's edge. Bicycle, pedestrian, and equestrian paths would be included. This would be an area where one would go to sit on the grass and have a picnic overlooking the lake, or to take a hike, fly a kite, or throw a frisbee. The intensity of population utilizing this edge would generally be less than that found on the hard urban edge, owing to the lower intensity of urban development adjacent to it.

IMPLEMENTATION

As a first step in implementing the Central Avenue Bridge Project the entire project area would be established as a special planning district, or Rio Salado Planning District. This concept includes classification of the Rio Salado Plan as a "specific plan" for the project area. Special design controls and a review program should be established under the detailed planning program for the area. The development concepts of the Central Phoenix Plan should be extended to the project area to encourage extension of the vital development of the Central Avenue Corridor into the South Phoenix area. Incentives for the private redevelopment of nonpark areas should be established, including incentive zoning and introduction of public amenities and infrastructure. Strict zoning standards, based on separation of urban land uses and building density, would be waived in favor of quality development standards based on a program of development criteria and design controls established for a mixed-use functional district.

Given the scale of the proposed revitalization and the present capability of commitment of the citizens and officials of Phoenix to bring the project to fruition, the project will probably be implemented under a four-phase development program. The following development sequence seems appropriate and within the administrative capability of the City of Phoenix at this time.

As population increases, new retail centers will be required to satisfy the additional demand for goods and services. Projected market support for retail activities in the Central Avenue Bridge area was determined by evaluating current market support by the present trade area population for retail centers, and applying this estimate to the projected 1980 population increase for the trade area.

To this was added the potential support of new residents of the apartments and townhouses in the Central Bridge area.

The sum of these two sources of additional support for retail centers in the trade area was projected to be approximately 110,000 square feet of gross leasable space. Total area, including parking, landscaping, malls, and walkways, would be 440,000 square feet, or approximately 10 acres.

OFFICE COMMERCIAL

In a 1969 study, the absorption of high-rise office space in the Central Corridor area was estimated to average approximately 250,000 square feet per year to 1980. This estimate, however, was based on lower rates of growth in employment and population than those prevailing in the Phoenix metropolitan area in the past 4 years.

Based on MAG's 1980 population projection of 1.7 million in Maricopa County, the absorption of high-rise space could average 300,000 to 320,000 square feet per year to 1980.

If the Central Avenue high-rise corridor were extended to just south of the Central Avenue Bridge, some of this demand for high-rise space could be accommodated on the south shore of the Central Avenue lake. High-rise towers could provide a critical mass of development in South Phoenix which would tend to tie Phoenix together and break down the psychological barriers previously created by the riverbed.

The development plan should be flexible, with choice parcels reserved to allow for staged development of office towers in increments of 150,000 to 200,000 square feet.

HOTEL/MOTEL

The close proximity of the project to Sky Harbor International Airport, the Maricopa Freeway, the central business district, the Civic Plaza, and the proposed football stadium makes the project area a potential site for hotel/motel facilities. A motor hotel in the area could feature boating and lake-front views. An appropriate size facility would offer 150 to 200 units.

TRANSPORTATION AND CIRCULATION

As an impetus to new urban development south of the Salt River, one of the prime requisites would be development of improved circulation and access. The initial increment of the proposed Rio Salado Parkway, roughly along the present Elwood Street alignment, would be a primary element in this improved circulation.

The new Central Avenue Bridge to be constructed by the City of Phoenix to replace the existing structure will include pedestrian crossings. Pedestrian interchange points at both the north and south public edges along the lake should be designed into the bridge.

Previous studies of the Central Avenue corridor through central Phoenix have recommended the inclusion of a public transportation line to service the corridor. Provision is made on the south bank of the lake for a major public transportation node integrated with the new urban development. The introduction of public transportation with a node at this point would foster the new development and make the proposed recreational amenities available to a wider range of people, such as children and the elderly, who would be unable to drive to the site.

RESIDENTIAL DEVELOPMENT

The most appropriate varieties of residential development for the Central Avenue portion of the Rio Salado Project are high-density uses such as townhouses and apartments. This was felt to be the case because the infrastructure costs of such things as the Central Avenue Bridge and the ultimate lake would be prohibitive if low-density, single-family dwelling units were constructed.

Over the past 2 years (1972 and 1973) the absorption of townhouses in the Phoenix metropolitan area has averaged approximately 4,500 units per year. If the present rate continues, and a significant water amenity is introduced into the Central Bridge area, it would be reasonable to estimate that the Central Bridge area could capture at least 1 percent (45 units per year) of the entire metropolitan market. A realistic range of densities for the Phoenix market would be from 8 to 12 dwelling units per gross acre, resulting in an acreage requirement of from 3.75 to 5.62 acres per year.

In the case of rental apartments, it is estimated that the Central Avenue Bridge area could absorb on the order of 225 units per year once the lake is completed. This esti-

mate is based on a projected citywide demand for 9,000 new apartment units and a capture rate of 2.5 percent for the bridge area. A density range for apartment units consistent with the project is 29 to 43.5 units per gross acre, amounting to approximately 5.17 to 7.76 acres per year in land requirements.

RETAIL COMMERCIAL

General retail and service commercial uses are not anticipated for development along the lake's edge. Commercial uses near the lake should be limited to specialized commercial shops complementing the recreational character of the project, as well as restaurants and minimal service facilities to serve local office personnel and visitors to the area.

The most appropriate site for retail commercial development near the lake would be at the intersection of Central Avenue and the improved Elwood Street alignment on Rio Salado Parkway. This site would be accessible by auto user and by pedestrians from the developed complexes. Commercial facilities at this site would primarily serve local residents in the area.

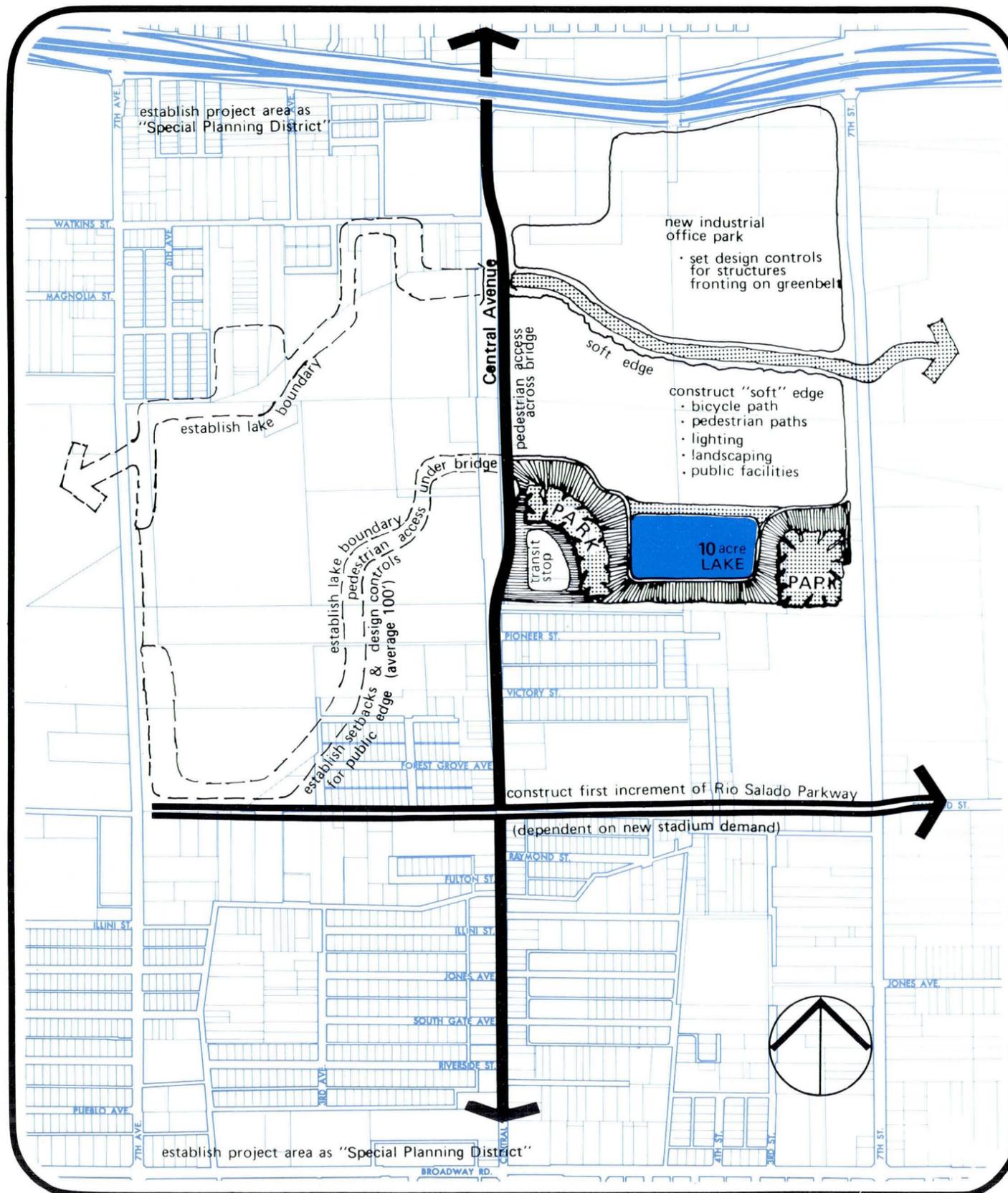
Commercial development intended to serve the overall South Phoenix populace would be best located at the intersection of Central Avenue and Broadway Road. This site is supported by the South Phoenix Planning Committee as the primary location for a regional shopping center in South Phoenix.

INSTITUTIONAL LAND USES

A proposed new municipal stadium between 7th and 16th Streets will have virtually a sea of parking. The planning team attempted to identify compatible land uses that could use these parking facilities when not used by the stadium. One such land use is a technical college, which would use the stadium parking lot Monday through Saturday. The Maricopa County Community College District has expressed interest in the concept.

Another institutional use which would be highly compatible with the project would be the development of a multigovernment service center. This center could be housed in low-profile, mall-like offices and contain branch offices of federal, state, county, and city governmental agencies.

Phase 1



- Development of a new urban park in South Phoenix between Central Avenue and 7th Street along the southern edge of the proposed new urban lake
- Construction of a temporary dike and a recreational lake of approximately 10 acres adjacent to the new park
- Designation of the entire future urban lake boundary
- Designation of an approximately 100-foot-wide public access edge around the future urban lake
- Introduction of new private development to the project area in the form of a high quality industrial/office park between Central Avenue and 7th Street, north of the future urban lake
- Development of the first segment of the Rio Salado Parkway approximately along the present Elwood Street between 7th Avenue and 7th Street (dependent on construction of the proposed stadium between 7th Street and 16th Street)
- Construction of the new Central Avenue Bridge, plus pedestrian and bicycle access across the bridge interchanging with the public edges at the north and south ends of the bridge
- Development of a public transit (bus, at this time) stop at the south end of the new bridge.

Figure No. 45

Phase 2

- Construction of the first increment of a new regional park on the north side of the future urban lake. This would be on existing City of Phoenix property, with joint use of the A.P.S. property between 7th and Central Avenues.
- Construction of a roughly 20-acre recreational lake on the riverbottom portions of City of Phoenix property
- Construction of the soft public edge around the new lake and between 7th Avenue and Central Avenue.

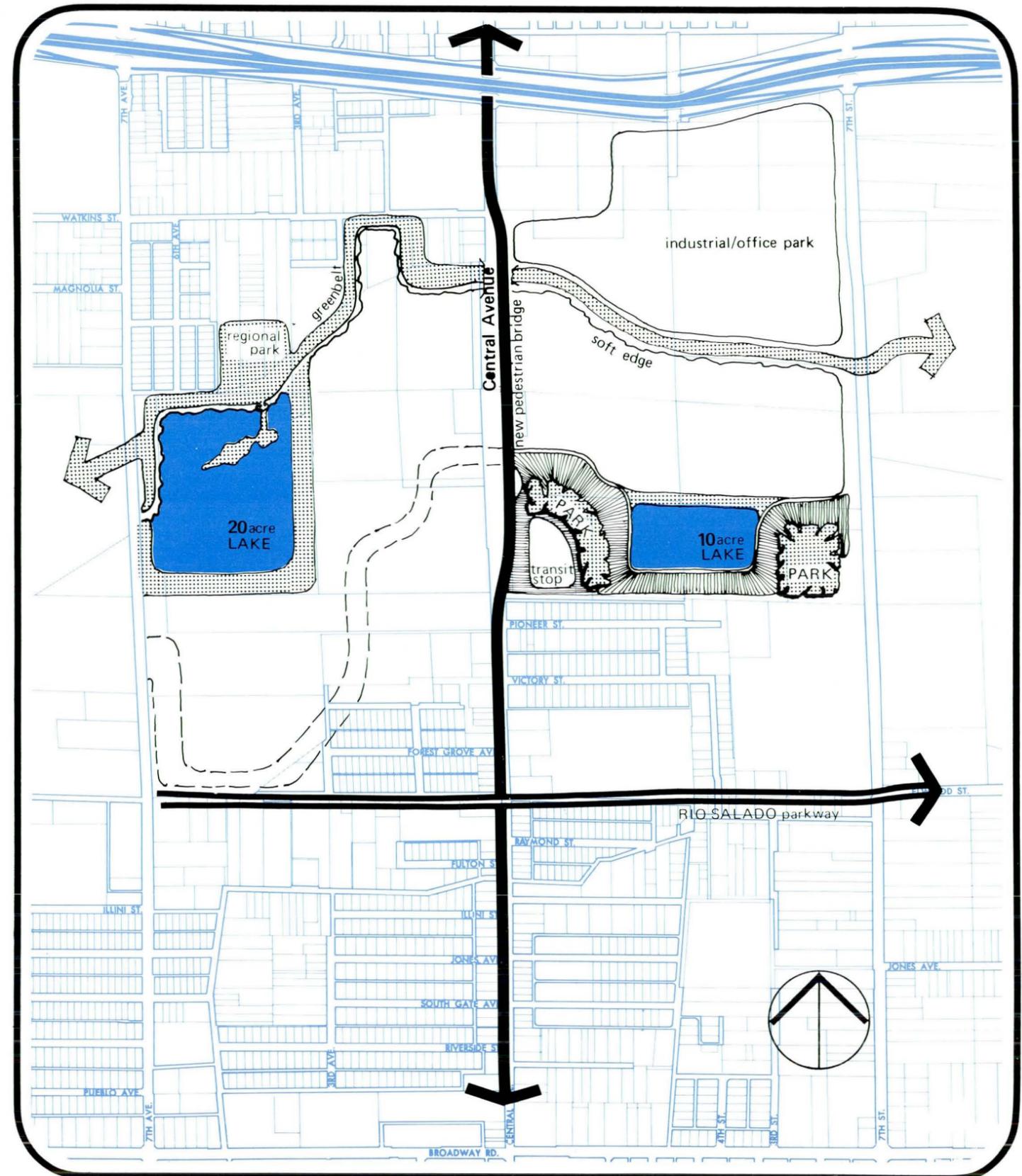
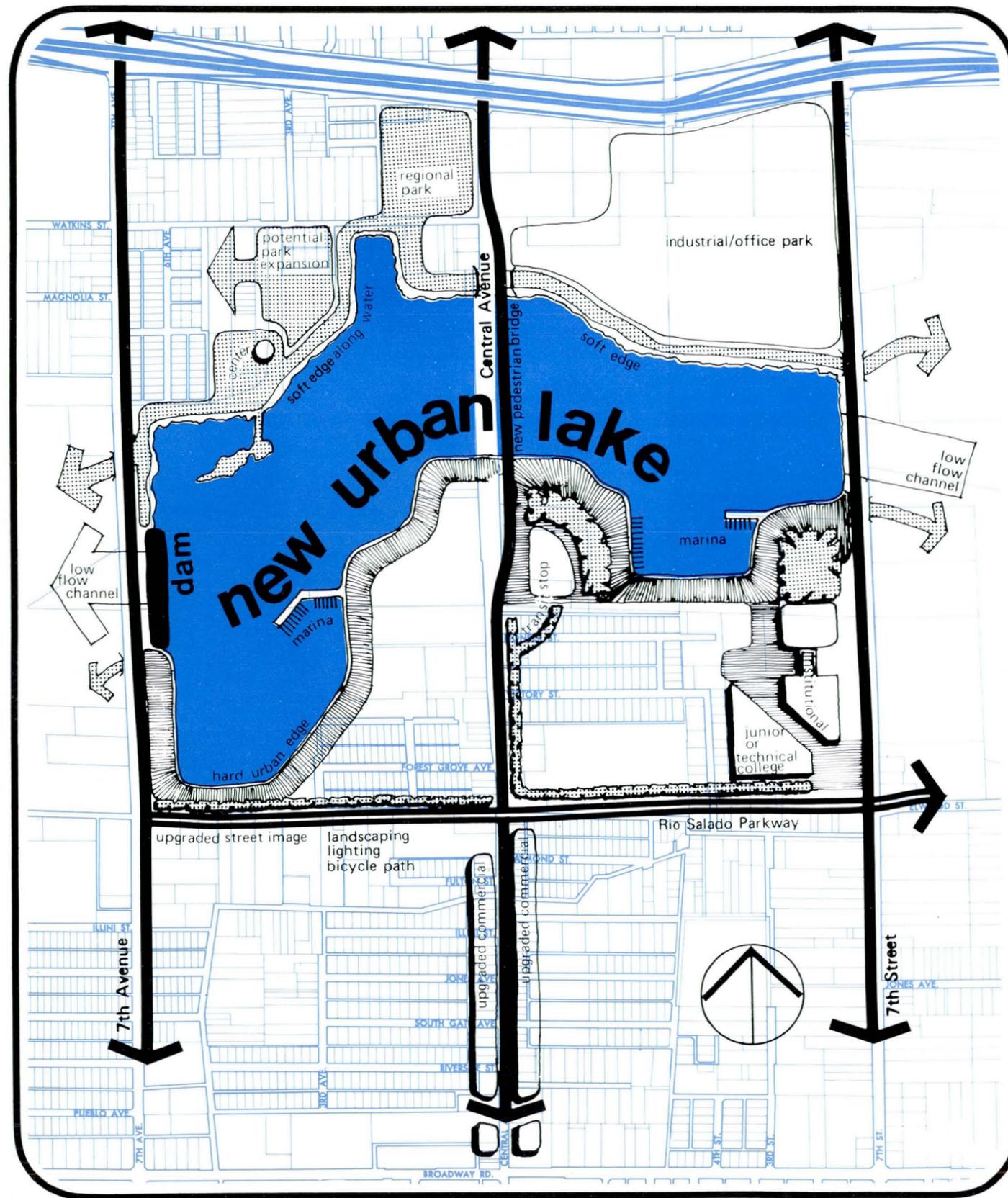


Figure No. 46



Phase 3

- Complete construction of the new urban lake and the inflatable, fail-safe fabric dam near 7th Avenue
- Complete construction of the public edge and trail system around the new urban lake
- Development of an expanded north regional park, including a community center
- Development of marinas on the southern edge of the new urban lake
- Continuing private sector development and revitalization
- Reconstruction of 7th Avenue and 7th Street.

Figure No. 47

Phase 4

- Private redevelopment of the designated land and building uses around the lake and park
- Completion of the north regional park.

The above phases are not necessarily exclusive of each other; elements of any particular phase could be constructed earlier or later in the overall program. An important inducement to joint public and private revitalization, however, would be the creation of significant impact early in the overall plan. Also important is the concentration of resources to do a particular element of the project completely and well, rather than spreading resources too thinly throughout the project.

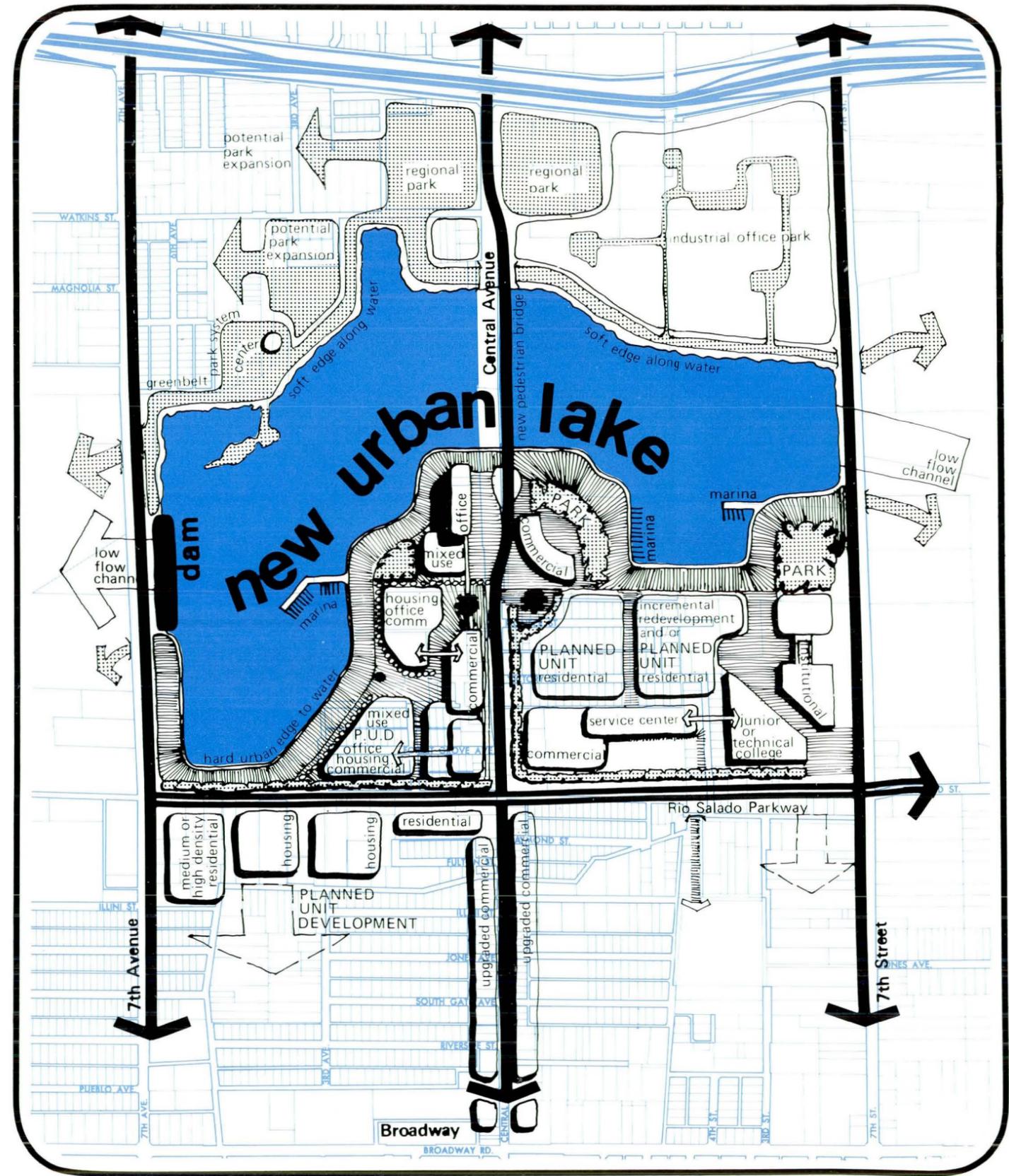


Figure No. 48

6

Implementation

The Rio Salado Project to date is the result of a concerted effort by students and faculty of the ASU College of Architecture, Valley Forward Association, the Maricopa Association of Governments, the consultants, and the local agencies and officials. After almost 8 years, what began as a student project has developed into a definitive development plan with specific plans for two initial projects for development. If this effort is to have any meaning, the time has come for direct action. This study phase seeks to take this important step from plan to action, by recommending the initial moves to effectuation. Effectuation of any general plan is not an easy process. A carefully conceived program requires constant vigilance on the part of the implementing agencies and the citizens. The various processes for implementing the Rio Salado plan are as closely interrelated as the elements of the plan itself.

RIO SALADO PLAN IMPLEMENTATION

The following discussion relates to implementation of the overall concept plan.

IMPLEMENTING AGENCY

Through the planning study phases the Valley Forward Association and the Maricopa Association of Governments have provided excellent leadership in bringing the Rio Salado Project to its current level of progress. However, when the two demonstration projects start to become realities, it will be mandatory that some kind of simplified administrative arrangement for management and control be created and be popularly supported. Unless this is accomplished early in the program, the entire Rio Salado concept will become fragmented and practically impossible to fulfill.

Completely advisory, ad hoc arrangements that locate decision-making powers within a great number of existing local governments and official agencies in the area will make coordination clumsy at best, and impossible at worst. On the other hand, the creation of a massive, single-purpose special project-wide district — another form of municipal government — could remove so much authority from local legislative bodies that it could practically defy controls and accountability to the public it is supposed to serve.

During the Phase II of the Rio Salado Planning Study, the planning team made preliminary investigations of

the alternative administrative structures that could be utilized for effective implementation of the Rio Salado Project.

The task of project management will require that the implementing agency be capable of making and effectuating the day-to-day decisions of organizing, staffing, and managing the project.

The various funding potentials for the Rio Salado Project are discussed later in this section; however, the capacity to utilize these resources is an important task. The implementation agency should be able to participate in existing and proposed federal programs, receive state and local appropriations, incur bonding indebtedness, request loans, and receive donations and grants.

The power to acquire necessary land for the project is another vital subject that must be addressed in selecting or establishing a single agency for implementing the project. Primarily, the power to purchase directly or condemn the necessary land is most important. Secondly, leasing and acquisition of scenic easements, development rights, and restrictive covenants are additional land use powers necessary for project development.

The 40-mile project study area crosses numerous political jurisdictions, government projects, and Indian communities. This complex intergovernmental aspect creates the urgency of the two remaining tasks: overall planning responsibility and intergovernmental coordination.

Most of the local governments and all of the three Indian communities included within the project area have established extensive planning programs. Additionally, three other major government projects, the Central Arizona Project, the Salt River Project, and the Indian Development District of Arizona have planning capabilities. The planning programs of these several groups must complement and relate to the Rio Salado Project. Thus, the implementing agency should have, at a minimum, an overall coordination responsibility for planning efforts of these groups and the project.

Besides planning activities, the other programs of these legal entities must be compatible with the project's future development. Hence, the coordination of intergovernmental relations will be a major task for the implementing agency. Besides local service provision and capital improvement programs, a very important issue of intergovernmental coordination with the local governments

will be land use controls on lands adjacent to the project area.

Also, the 1973 Arizona Legislature passed two significant laws that will affect the nature and extent of local land use control programs and procedures related to the project in the future. Designated as the Urban Environment Management Act and the Floodplain Management Act, these new laws mandate revised procedures for cities exercising zoning power and mandate control of development within certain floodplains. The implementing agency for the project will be responsible for ensuring compatible land uses adjacent to the project area by cooperation with and coordination of local government land use control programs. Minimally, a review and reconciliation procedure that allows the project's implementing agency to advise on local land use control decisions is necessary.

ORGANIZATIONAL ALTERNATIVES

The organizational alternatives for the successful completion of these tasks are two: the use of an existing agency or establishment of a new entity. The first alternative, use of an existing agency, offers some possibilities.

The Maricopa Association of Governments (MAG) is composed of all 18 cities and towns in and including Maricopa County. Thus, MAG's jurisdiction covers the affected local governments — Mesa, Tempe, Scottsdale, Phoenix, and Maricopa County. However, MAG's current powers and responsibilities are limited to planning for and advising the member local governments.

Also, the three Indian communities are not members of MAG. Of the activities described above, MAG does not possess the authority for utilizing certain necessary funding sources (i.e., bonding, taxation) and land acquisition powers (i.e., eminent domain). MAG also has no land use control powers or functions under present state legislation. MAG could manage the project, assume overall planning responsibility, and coordinate intergovernmental relations. These functions would be contingent upon an agreement by the local government members to allow MAG to assume such responsibilities.

Maricopa County (which covers the same geographical area as MAG, excluding the incorporated areas) is a possibility for designation as the single implementing agency for the Rio Salado Project. The county is able to assume the responsibilities associated with addressing the various tasks of developing the project. However, the county's jurisdiction is limited to the unincorporated areas. Thus, any exercise of powers within the four cities of the project area would require interlocal arrangements. This fragmentation of jurisdiction would be a critical issue in defining the area of land use controls. The problem is immediate because the two proposed demonstration projects are located in Phoenix and Tempe (the Arizona State University site).

Below the county level, performance of the various tasks necessary to develop the project would be fragmented and incremental. No one city has jurisdiction over the entire project area and, hence, lacks the ability to assume overall planning management and funding responsibilities. If a single city attempted to implement the entire project, intergovernmental coordination would require a series of separate agreements and arrangements.

Another possible solution seems to be formation of an organizational entity with sole responsibility for project implementation and subsequent powers to perform the necessary tasks. The specific powers, duties, and responsibilities with which this agency would be invested must be carefully analyzed, together with the successful establishment and utilization of similar agencies in other sections of the country. Legislative requirements and interlocal agreements must be proposed, which will provide a new implementing agency with the capability to manage, utilize funding potentials, acquire land, conduct overall planning responsibility, and coordinate the activities of the various federal, state, and local government interests.

FUNDING RIO SALADO PROJECT IMPROVEMENTS

While the planning phases of the project have been under way, investigations have been made of funding sources that can provide money for building each part of the project in its proper developmental stage. The capital improvement programs of all public agencies and the building programs of all private developers operating within or on the periphery of the project must be coordinated with the Rio Salado building program in order to maximize the value of every dollar being spent in the area.

As identified in the Phase I Report, funds will be needed for the following features of Rio Salado development:

- Precise planning and engineering studies for areawide and subarea improvements
- Aggregation and acquisition of some land that will be required to satisfy the public purposes of the plan, especially public open space
- Flood control features, side channel inlets, lakes, ponds, marinas, etc. (public and private funds)
- Landscape restoration (public and private funds)
- Revitalization and modernization of some structures having historic value or good reuse possibilities
- New public utility systems and services
- Additional local streets and parkways
- Public recreation facilities

Funding potential from the several levels of governments (federal, state, and local) and the implementing agency is discussed below.

FEDERAL

Preliminary investigation indicates that there are four primary federal agencies with a potential for supplying funds for the Rio Salado Project. They are the U. S. Department of Housing and Urban Development (HUD), the Bureau of Outdoor Recreation (BOR), the Economic Development Administration (EDA), and, rather surprisingly, the U. S. Bicentennial Commission.

HUD programs include monies for urban renewal, public works, model cities, community development, new com-

munities, and comprehensive planning assistance. However, the majority of these programs are scheduled for termination on June 30, 1974, and Community Development Special Revenue Sharing (set forth in the proposed Better Communities Act) is being proposed as an alternative.

The Better Communities Act (BCA) eliminates the categorical grant program for several HUD programs¹ and replaces them with a block grant to the states and local communities. These grants do not require local matching effort, and the act allows the governments to spend the funds in accordance with an adopted community development plan. The possibility exists that the project's implementing agency must request specific implementing funds from area local governments and the state government. Negotiation to assure that these requests obtain high local and state priority is imperative.

The Federal Bureau of Outdoor Recreation (BOR) administers the Land and Water Conservation Fund. Annual state apportionments from the fund may be employed as a 50/50 matching basis for capital costs associated with park development. Programming of BOR funds is to be in accordance with a statewide outdoor recreation plan. The Arizona Outdoor Recreation Coordinating Commission (AORCC) is the state agency that decides on allocation of these funds within the state.

The Economic Development Administration (EDA) within the U. S. Department of Commerce administers a series of grant programs for public works and development facilities, loans for businesses and development companies (including Indian tribes), planning and technical assistance, and public works impact projects. The Indian Development District of Arizona (IDDA) has a division in the project area that includes the three Indian reservations within the project. The IDDA is an EDA-funded agency. However, the EDA is presently being phased out, and, unless the agency is revitalized, the potential for funds from this program is negligible.

With 1976 only 2 years away the U. S. Bicentennial Commission wants to ensure that local communities and organizations in all states are prepared for our nation's bicentennial celebration. Funding is, of course, a major

¹These include urban renewal, neighborhood facilities, open space land, basic water and sewer, public works, model cities, and public facilities.

concern to any group planning a Bicentennial Project. There are a number of federal agencies and private organizations that have earmarked funds specifically for Bicentennial Projects.

Under the "HORIZONS 76" category, the Rio Salado Project has been recognized as a Bicentennial Project. Therefore, the Rio Salado is eligible for specially earmarked funds in all federal agencies, as well as from such groups as the National Science Foundation.

Additional funds from sources within the federal government may be available for special demonstration projects such as renovation of sewage effluent. These funds would be available from the Environmental Protection Agency (EPA). The Corps of Engineers and the Department of Transportation are other potential sources.

STATE

The state government has taken the lead in trying to get the Rio Salado Project started. Senator James Mack of Tempe introduced Senate Bill 1285 in the latest session of the legislature, which appropriates funds to be matched by the municipalities concerned for acquisition of property for the Rio Salado Project. The funds would be administered through AORCC and would be sufficient to begin acquisition of the privately owned lands in both demonstration project areas.

Presently, there are no specific state funds for the physical development of the Rio Salado Project beyond land acquisition. However, AORCC does have a special fund for recreational lake development to which application could be made for monies to construct the dams for the demonstration projects.

LOCAL

Potential sources of funding from the four cities and the country are in the form of direct appropriation and allocation of federal general and special revenue-sharing monies. As with the state, the project implementing agency must request that the existing general revenue-sharing funds or the special revenue-sharing funds, if adopted, be used in project development. Initial phases of Rio Salado development should be coordinated into their Capital Improvement Programs as early as possible.

Another potential source of local funds is the three Indian communities. The Gila River, Salt River, and the Fort McDowell Reservations receive funding from HUD, EDA, and the Office of Economic Opportunity, which could be utilized in developing the project.

THE IMPLEMENTING AGENCY

The single agency to which is delegated the responsibility for implementing the Rio Salado Project might be authorized to independently exercise certain funding powers. Basically, these powers would include the authority to apply for federal, state, or local funds, as well as to receive grants and donations. However, the potential of the two additional powers of bonding and taxation should be explored. Such additional funding powers would ensure a source of funds if others were not available. These powers would also require serious study as to legal and constitutional restrictions that could prohibit the use of such powers.

OTHER CONSIDERATIONS

The funding sources for the Rio Salado are affected by the channelization of the river. Projects undertaken prior to channelization will certainly be funded differently from the channelization itself, and post-channelization projects may well attract financing not available until that time.

In advance of channelization, the development of the Rio Salado area is being concentrated on demonstration projects. These projects, though undertaken in advance of channelization to demonstrate the potential of the Rio Salado area will, nevertheless, be designed to fit into the channel design prepared by the Corps of Engineers.

The funding in question here is the minimum necessary to acquire the right-of-way for the lakes proposed, construct the lakes, landscape the shoreline, and provide public access to these amenities.

Additional funding must be considered to provide a public park adjacent to the lakes, and for the public purchase of all land surrounding the lakes. Such purchase could be for the threefold purpose of (1) controlling land use, (2) deriving income for paying back basic construction costs, and (3) overcoming the drag of fragmentary ownership on redevelopment.

The right-of-way required for the channel will presumably be acquired by the Maricopa County Flood Control District and financed through funds available to it. Construction will presumably be funded by federal appropriations to the Corps of Engineers, which will design and oversee the construction of the channel.

It is important in this connection to maximize the width of the right-of-way acquired so that appropriate recreational trails along the channel and appropriate access points for the public can be provided.

It would also be desirable to acquire Corps funding for special treatment of the banks to enhance the appearance of the river area and to provide for such lakes and lagoons as may be recommended in the overall Rio Salado design.

At the time that right-of-way is acquired for the channelization of the river, the state, county, and municipal highway departments should cooperate in obtaining additional right-of-way for such parkway systems as may be recommended in the Rio Salado design.

PRIVATE SOURCES

As outlined in the Phase I report, two types of private sources should be sought: business enterprises and non-profit foundations. Several major firms in the Phoenix Metropolitan Area have or will have vested interests in the Rio Salado area. Contributions could justifiably come from the banking institutions, utility companies, large industrial firms, and other groups interested in water resources and land development.

More realistic, however, will be the inducement for private development generated by public investment in the Rio Salado. The plan encourages such development along most of the project area.

Nonprofit foundations could be approached for specific projects that might fit into their respective programs or that might have more general application. The Bicentennial Project designation could open many of these doors.

Rio Salado Phasing

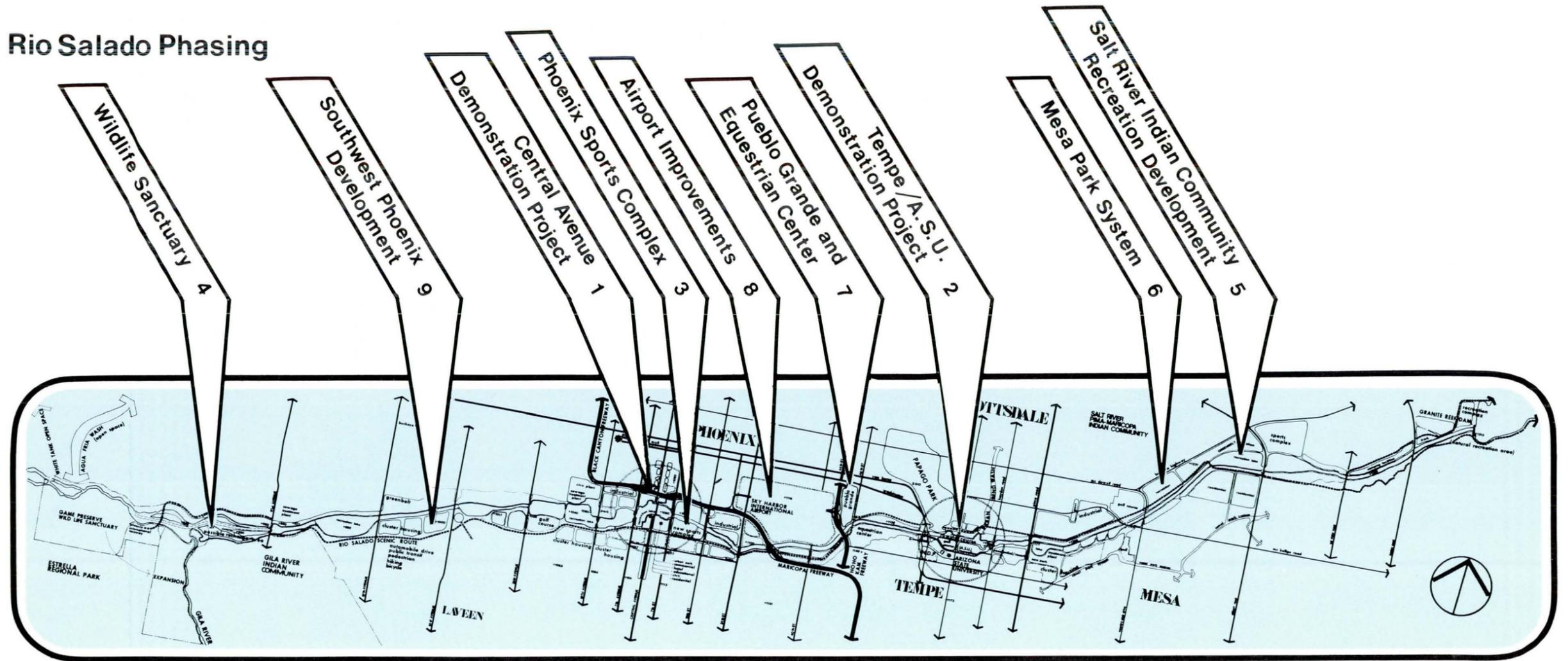


Figure No. 49

STRATEGIES FOR OBTAINING FUNDS

Perhaps the most significant feature of the Rio Salado Project is its unique concept. Throughout the explorations in Phase I, virtually no other projects of this type were found in the United States. In all funding efforts, the "demonstration" aspects of the program should be stressed, e.g., intergovernmental relations, flood control in direct combination with urban development, the dry riverbed course through the heart of a metropolitan area, water reclamation, minority enterprise, and in-town recreation.

The generally aggressive approach to fund raising, utilized thus far, should be continued. Direct contact should be made at the highest possible levels in both the state and federal governments; this would include senators, congressmen, state legislators, and the governor.

A coordinated approach should be taken in filing applications for existing assistance programs. The Steering Committee should actively participate in this aspect of the

project. A continuing public relations program should be maintained. Regular press releases and newsworthy events should be scheduled. Speakers should be available to various community groups that are interested and able to lend political support to the funding effort.

PHASING

For any project of the scope and magnitude of the Rio Salado, program phasing of development is a critical element. The multijurisdictional character of the Rio Salado area makes phasing an even more critical issue.

A most important consideration in establishing the project priorities for the Rio Salado Project are the plans and proposals for conservation and development being fostered by many agencies and groups in this area. Sky Harbor International Airport expansion, sand and gravel operations, flood control proposals, city and county planning and zoning actions, large-scale private develop-

ment proposals, and community renewal programs will all have a substantial bearing on the project area.

The basic criteria for selecting priority areas and projects include:

- Suitability for widespread accessibility and community use
- Adaptability to major physical, political, social, and legal constraints
- Compatibility with long-term goals for Rio Salado as a whole.

As mentioned earlier in the report, the sand and gravel operations will be the key element to project phasing. Local Capital Improvement Programs will be almost as significant. The detailed coordination of these key elements and other phasing considerations should be the subject of one of the studies completed during Phase III of the Planning Program.

With the information currently available, a generalized sequence of Rio Salado development can be projected. This projection, of course, is subject to the many considerations outlined above, as well as the future structure and authority of an implementing agency. Figure identifies sequential project areas for development along the Salt River with basic time parameters. Ideally, as the benefits and potentials of the Rio Salado become obvious from the initial projects, future area development can be accelerated.

PUBLIC EDUCATION AND PARTICIPATION

The key to success is public support, coordinated effort, and a dynamic approach. The agency charged with the responsibility of developing and implementing the Rio Salado Project should also assume responsibility for the citizen involvement program. Elements of the program should include:

- A permanent advisory committee
- An information system
- An evaluation system.

The implementing agency should hold a series of public workshops on alternative project development and site plans. The purpose of these public workshops would be to identify affected citizens and potential users of project facilities.

A permanent citizens' advisory committee that closely parallels the economic, demographic, and social composition of the project study area should be formed and made a formal body within the organizational structure of the implementing agency. The Rio Salado Steering Committee of Valley Forward Association could be designated as this committee. Such a group should be charged with responsibility for assisting the implementing agency by:

- Informing the agency on the most desirable project uses
- Reviewing existing land use plans and regulations for the land adjacent to the project area
- Assisting in the designing of a program and financing plan for implementation of the project plan.

The implementing agency (in conjunction with the citizens' advisory committee) should develop and utilize an

information system. This system would issue periodic newsletters on the status of the project, conduct a public speaking service for meetings of groups and organizations, use the various media to disseminate information, and investigate other various methods that will ensure maximum feasible public understanding.

The fourth element of the citizen involvement program should be a rating system for the various project proposals. As a primary responsibility of the implementing agency through the citizens' advisory committee, the rating system could be developed from similar systems used to evaluate airport site selection.

The citizen involvement program should maximize public participation in and understanding of the Rio Salado Project's development and operations. Public workshops offer the opportunity for participation; the advisory committee ensures the involvement of citizens; the information system provides necessary communication, and the rating system establishes a rational evaluation of options.

INTERIM STRATEGY

Until a regional implementing agency is designated or established, the initial demonstration projects, and perhaps others that become feasible, will have to be implemented by the local agencies. Specific strategies for the Central Avenue and Tempe/ASU projects were outlined in the respective sections describing those projects. However, there is still a need for areawide coordination of Rio Salado developments.

The greatest need for coordination may well arise in the case of land-use controls beyond those presently established for flood protection by the State of Arizona. Each zoning jurisdiction that the river traverses is responsible for directing and controlling the use of land along its section of the river. Though each would have the recommendations of the Rio Salado Plan as a guide, their interpretation could vary sufficiently to reduce chances of coordinated development in keeping with the objectives of the Rio Salado Plan. A special advisory commission with responsibility for monitoring the development of the Rio Salado area should be able to review any request for a new land use, whether by public or private agency, and comment on its conformance to the Rio Salado Plan and to the appropriate zoning jurisdiction before that jurisdiction takes final action.

As additional Rio Salado projects become feasible for early implementation, local agencies may still be the primary vehicles for continuing progress. Preliminary implementation options for the local projects are seen as follows:

- Establishment of the demonstration projects as "redevelopment areas" utilizing available federal and state funding programs and the power of eminent domain
- Establishment of a "special improvement district" to make use of taxation powers to pay for public improvements (51 percent of the property values must approve such an option). This technique has been used in Phoenix to fund construction of new parking structures.
- Establishment of a "development corporation" that would include property owner participation, such as that for the new Phoenix Civic/Convention Center, which was achieved through establishment of a "special tax" on hotels, construction, and construction contractors. The tax was used to retire bonds used for acquisition and construction. This corporation presently has excess revenue, some of which is being considered for use in development of the new sports stadium.

As outlined earlier, each local Rio Salado project area should be designated as a "Special Planning District" to assure complete review and development control of new uses.

NEXT STEPS

The Rio Salado Planning Process has proceeded to a point where definitive action is required for the project to progress toward reality. Of course, further planning is necessary in specific areas of concern, notably detailed project design and phasing and designation of an implementing agency. However, direct progress can be made by beginning implementation measures for the two demonstration projects, as outlined in this report.

On a regional scale, several steps can be taken immediately to help ensure that the Rio Salado continues as an ongoing program. These include:

- Adoption of the Rio Salado Concept Plan by MAG, the county, municipalities, and Indian community legislative bodies
- Detailed establishment of project boundaries and

designation of the Rio Salado as a "Special Planning District" in each jurisdiction

- Undertake specific study to determine the most effective implementation agency for the project.
- Establishment of the Rio Salado Steering Committee of Valley Forward as the official citizens' advisory committee for the project; within that committee, selection of a subcommittee to review all development proposals within the project area
- Proceeding with an extensive public information program to generate more excitement and commitment to the Rio Salado concept
- Drafting and support of legislation for local and state governments that encourages development of and commitment to the Rio Salado
- Securing of funding for further planning, design, and engineering of the project to ensure that the program progresses smoothly.

The key to success is action. At no time can the project be put aside to be resurrected at some convenient time in the future. The Rio Salado is only beginning to capture the imagination of the public. The momentum of the program must be maintained from this point forward.