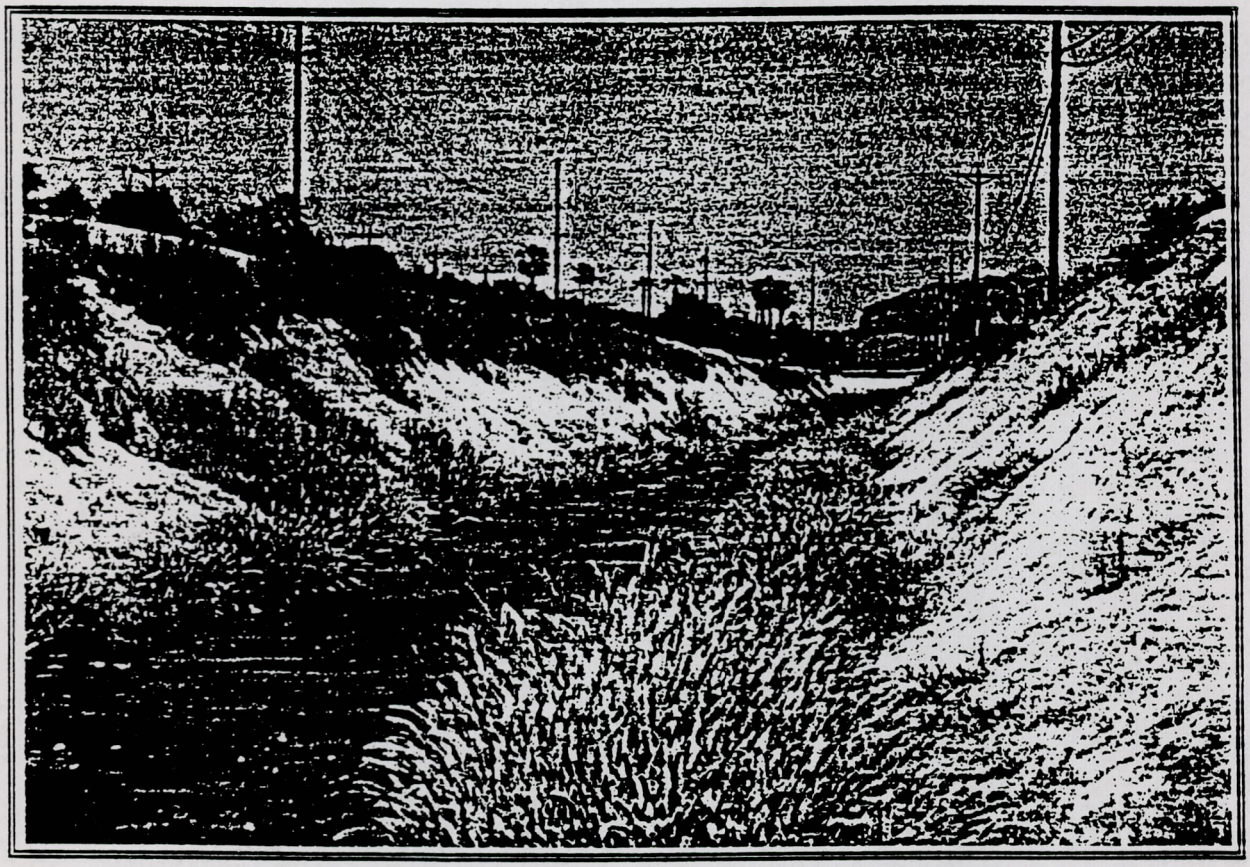
DRAFT ENVIRONMENTAL IMPACT STATEMENT

OLD CROSSCUT CANAL

MARICOPA COUNTY, ARIZONA



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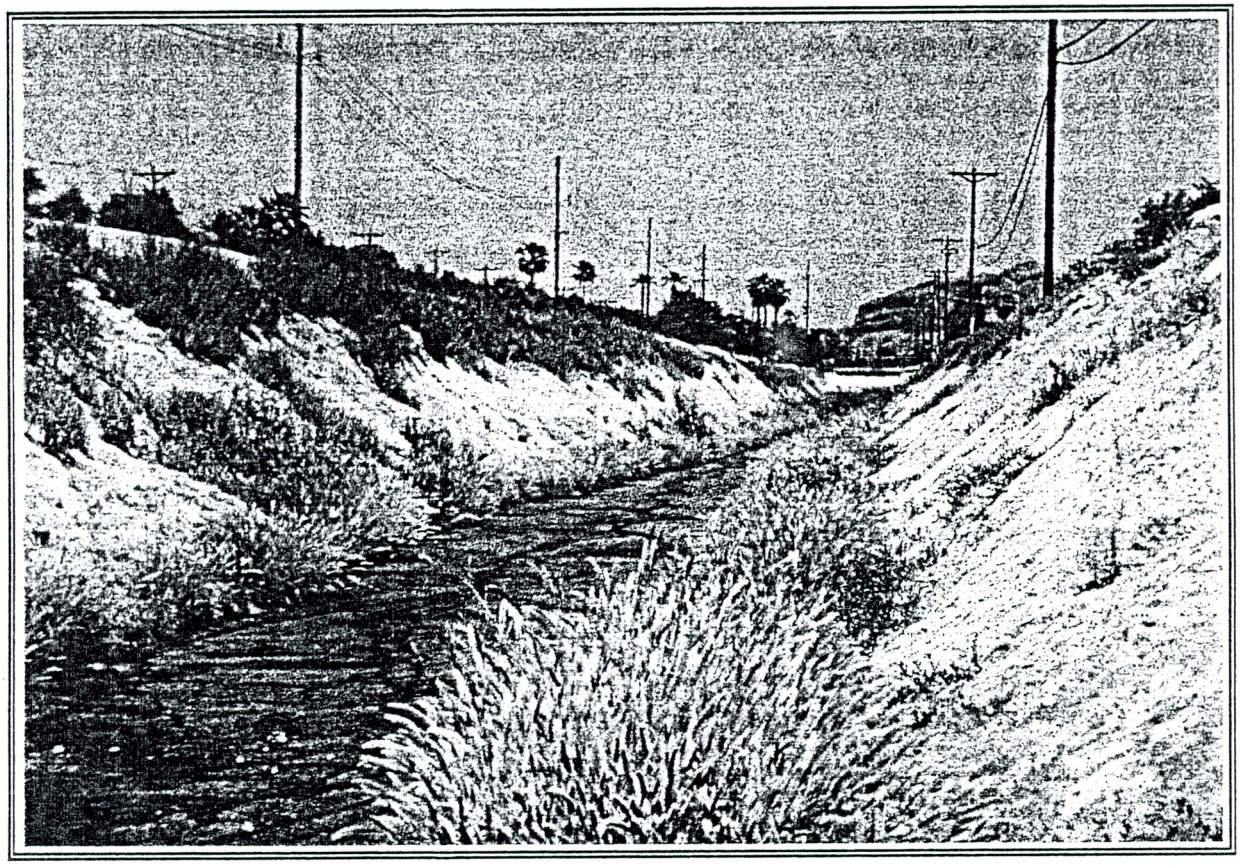

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DRAFT ENVIRONMENTAL IMPACT STATEMENT

OLD CROSSCUT CANAL

MARICOPA COUNTY, ARIZONA

ABSTRACT

This environmental impact statement was prepared by a team of six Arizona State University planning students for the spring semester of 1993. The focus is the Old Crosscut Canal. The study area encompasses approximately nine square miles and is located in east-central Phoenix, bounded to the north by Camelback Mountain, to the south by McDowell Road, by approximately 52nd Street to the east, and extending to 44th Street to the west.

This statement examines four options for the 2.12 miles of unimproved canal and their impacts upon the physical and social environment. The considered options include re-channelization as an underground canal with a surface park, re-channelization as an open concrete channel with an associated linear park, preservation of the historic earthen channel in accordance with the 1991 National Park Service - Historic American Engineering Record survey, and a "no-action" scenario.

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TABLE OF CONTENTS

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

APPENDICES

SUMMARY

This environmental impact statement focuses on the resolution of planning issues associated with current and future engineering and recreational development of the Old Crosscut Canal (OCC), located in east-central Phoenix, Arizona. There are 2.12 miles of unimproved canal, bounded to the north by Camelback Mountain, to the south by McDowell Road, by 52nd street to the east, and extending to 44th street to the west.

Four separate options were considered and evaluated based on their effects upon the surrounding areas. These options included re-channelization as an underground canal with a surface park, re-channelization as an open concrete channel with an associated linear park, preservation of the historic earthen channel and enhancement of its utility and aesthetic character, and a "no-action" alternative.

Several factors were considered in the analysis of each option, each factor considering the effects of the different options on the physical and social environment surrounding the canal. These factors include climate, water quality, flooding, soils, vegetation, wildlife, noise, culture, recreation, visual resources, and economics.

Our studies have shown that preservation of the OCC is the preferred option. Implementation of this option would result in retention of the canal's historical character, enhancement of the physical and social environment surrounding the canal, continued use of the canal as a flood-control mechanism, and the improvement of its recreational and visual character consistent with the long-term goals associated with the Metropolitan Canal Alliance (MCA).[1] Furthermore, the initial investment involved in the enhancement and preservation of the canal could promote its utility as a place of cultural interaction, bringing together residents in adjacent areas and creating a stronger sense of community.

The financial aspects of the preservation option are relatively low compared to the costs of the other options. The surface and underground re-channelization options involve significant expenses in both initial investment as well as maintenance and the no-action option would involve great long-term expenses as the canal deteriorates. The preservation option would require more initial financial investment than the no-action option, but would result in lower long-term costs.

In summary, the preservation of the canal stands out as the best option. It calls for a minor initial investment and minimal maintenance costs and allows the canal to become more effective in its capacity to serve as a flood-control device. Furthermore, it allows the canal to maintain its historically significant and rugged character, but makes the area surrounding the canal a more pleasant place.

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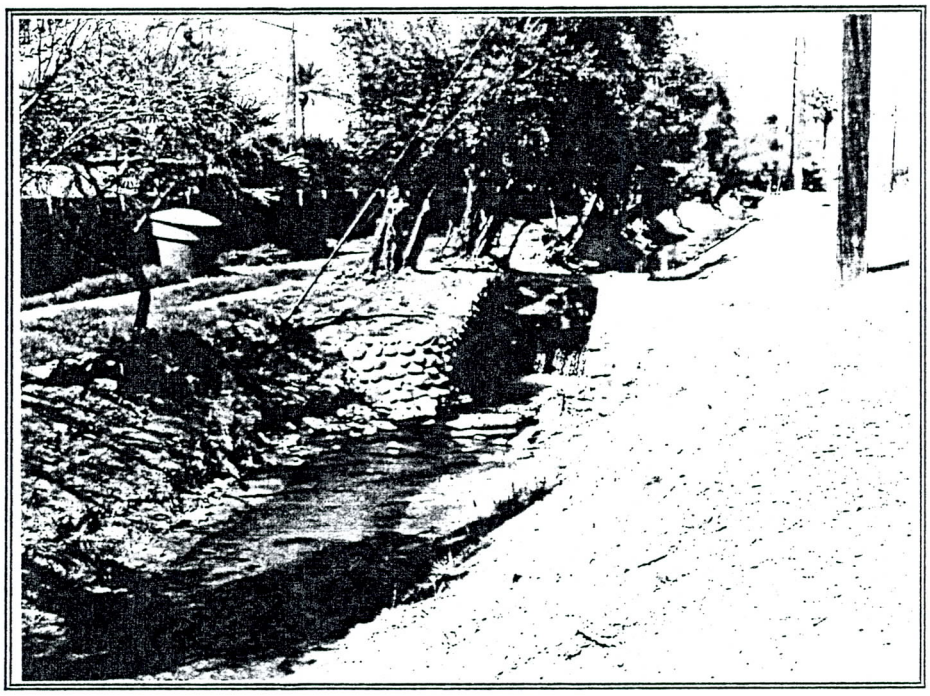
1 Southerland, Sharon, Personal Communication, 1992

Chapter 1

Purpose and Need



PURPOSE AND NEED FOR THE ENVIRONMENTAL IMPACT STATEMENT

The purpose of this study is to examine the area surrounding the Old Crosscut Canal (OCC) in Phoenix, Arizona. The area in which the canal is located has been heavily developed and the natural biotic community has been disturbed in the process.

The OCC has a history of flooding problems associated with its connection to the Arizona and Grand Canals. A variety of flood protection measures have been considered and some implemented throughout the years. In addition, due to the long history of human settlement and growth in the surrounding area on wildlife, no federal or state threatened or endangered species exist within the study area.

An important concern in the evaluation of the proposed options is the existing Motorola 52nd Street Superfund Site. The site has contaminated the area in the past and it is very likely that groundwater and soil contamination still exists throughout the region. This statement addresses the environmental consequences associated with the contamination.

As the National Environmental Policy Act of 1970 (NEPA) specifies, "proposals for legislation and other major Federal actions significantly affecting the quality of the human environment" require a statement to be prepared exploring the impact of the proposed action as well as alternate actions.[2]

In this case, the proposed action for the OCC was generated by the U. S. Bureau of Reclamation. It outlines a plan to convert the remaining portion of the OCC from an open, unlined ditch to an open concrete channel with an adjacent linear park.

Several issues that concern the canal are related to the goals of the 1992 City of Phoenix General Plan, including reduced street flooding, linked recreational areas, and a city-wide increase in open space allocated to recreational use.[3] The implementation of any of the proposed options for the OCC will have a direct and immediate impact on the surrounding environment. Furthermore, the selection of a preferred option will prove to be a vital step in determining the success or failure of the OCC as a flood-control device, as a recreational area, and as a historically-significant place.

As stated in the Council of Environmental Quality Regulations, "(t)he NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment."[4]

This statement explores these issues and the environmental consequences associated with the proposed action, but also presents other options for the future of the canal and explores their anticipated effects upon the environment.

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2 U. S. Congress, *National Environmental Policy Act*, Public Law 91-190, 1969
3 *Ibid.*
4 City of Phoenix Planning Department, *City of Phoenix General Plan*, 1992, p. 31-5

In summary, this statement will assist public officials and citizens in the decision-making process which will prove integral to the future use and function of the historic canal. The statement analyzes the potential impacts of the proposed option as well as alternative options and will focus upon the resolution of planning issues associated with current and future engineering and recreational development of the 2.12 miles of unimproved canal.

Description of the Planning Area

The OCC is located within Maricopa County in the City of Phoenix, Arizona. It encompasses an area of approximately nine square miles and is located in the east-central portion of the city near the Arcadia district. The canal is bounded on the north by the Arizona Canal near Camelback Road, on the south by McDowell Road, approximately 52nd Street to the east, and extending to 44th Street to the west (Figure 1).

The OCC is an open, earthen canal which acts as a unifying connection between the Arizona and Grand Canals. Its original use was as an irrigation canal, but since 1905, the canal has served as a flood control structure to take water from the Arizona Canal and transport it south to the Grand Canal and Salt River.

For a time, the OCC was a proposed site for a hydroelectric facility. This function was later superseded by the necessity to use the canal as a drainage mechanism to accommodate a rising water table.

A superfund site exists at the Motorola Plant on 52nd Street just northeast of the canal. There have been approximately 200,000 gallons of chlorinated solvents disposed of at this site between 1950 and 1983. Due to previous waste disposal practices and leaks from an underground storage tank, contaminated soil and groundwater lie beneath the site and extend to the southwest. The total ethylene contamination in the groundwater near the study area averages 70 to 1,600 parts per billion. The presence of these contaminants has been the cause of human health disorders including leukemia, nervous disorders, and a variety of physical illnesses.

Following U. S. Environmental Protection Agency (EPA) intervention, Motorola, in agreement with the Arizona Department of Water Resources (ADWR), began a clean-up plan. Since 1988, the Arizona Department of Environmental Quality (ADEQ) has overseen Motorola's clean-up efforts. A groundwater extraction and treatment system has been implemented to protect against contamination.

The portion of the canal which lies below McDowell Road and continues to the Salt River has been realigned and rechanneled due to the construction of the Hohokam Expressway and Papago Freeway (Figure 2). At this point, the former pedestrian and bicycle connection to the Grand Canal has been removed, its termination occurring just north of the Hohokam Expressway connection at McDowell Road.

By closing the section of the canal south of McDowell road, the potential for recreational use in the area has been removed. Furthermore, the potential to implement a proposed Crosscut Recreation Loop connecting the OCC, the Arizona Canal, the New Crosscut Canal, and the Grand Canal has been eliminated since the southern portion of the OCC is no longer accessible to bicyclists or joggers.

History of the Canal

The OCC was constructed by Arizona pioneers in 1889 as a unifying mechanism connecting the Arizona and Grand Canals and serving as an irrigation device. However, following the disastrous floods at the turn of the century, the OCC has been used as a flood-control structure to take water from the Arizona Canal and transport it south to the Grand Canal and Salt River through the joint head drain, located approximately three-fourths of a mile east of the junction of the OCC and Grand Canal.

Due to the flood hazards associated with the Arizona Canal, control dams such as the Cave Creek and the Dreamy Draw Dams were constructed, effectively eliminating the functional nature of the OCC. However, Salt River Project has maintained an interest in the OCC specifically as a control device for the Arizona Canal.

Figure 3 is a general map showing locations of canals of the metropolitan Phoenix area.

In 1975, the City of Phoenix entered into agreement with Salt River Project (SRP) and the Maricopa County Flood Control District (MCFCD). Pending this agreement, SRP dedicated to the MCFCD and the City of Phoenix an easement along the one-hundred foot wide canal. Thus, SRP retained the right to the first one thousand cubic feet per second (cfs) of water in the canal and the city was given rights to connect storm drainage facilities with capacities of up to 1,000 cfs. This gave the City of Phoenix and the MCFCD the right to construct facilities or improve the area surrounding the canal as long as the flow of water was not interrupted.

In 1975, the Arizona Army Corps of Engineers included the OCC in its Phoenix Urban Study.[5] However, in 1978 the canal was removed from the study on the grounds that it was no longer a major waterway. It had been described as a "deeply incised, largely unimproved channel crossing major streets through culverts of varied shapes and sizes with limited capacity."[6] After many years without maintenance, the canal had deteriorated.

In 1987, a plan for an underground channel with a surface park was approved. This would provide adequate drainage for the Camelback - Arcadia district north of the Arizona Canal. The plan would increase the capacity of the Canal to 4,900 cfs at its outlet to the Salt River. In 1989, this plan was delayed by the Army Corps of Engineers due in large part to public protest.[7] Concerns raised by

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5 U.S. Army Corps of Engineers, Los Angeles District, South Pacific Division, *Feasibility Report: Phoenix Metropolitan Area Old Crosscut Canal, Phoenix, Arizona*, April 1989, p. 35

6 *Ibid.*, p. 36

7 *Ibid.*, p. 50

citizens focused on three topics, including the cost of the project, the fact that there are several parks nearby, and the limited capacity of the canal to support only a 25-year flood.

In 1990, the Arizona Department of Transportation (ADOT) signed an agreement to redesign and reconstruct the canal between McDowell Road and the Salt River. This was due to the construction of the Hohokam Expressway and Papago Freeway. Included in this program was the construction of a 300 cfs diversion facility for SRP since the canal no longer emptied into the Grand Canal, but siphoned under it. This reduced the likelihood of an overflow at the junction of the two canals.

Recent construction activities are addressing drainage concerns in the 48th Street neighborhood below Thomas road and improvements at the northern connection to the Arizona Canal. The construction will increase its capacity for future upstream flood control and improve storm drainage connections.

The area is historically significant and is eligible for listing on the National Register of Historic Places. Archaeological sites are also located within the study area. The U. S. National Park Service completed a Historic Architectural Engineering Record (HAER),[8] listing mitigation procedures and adverse affects that would be caused by proposed projects. The report verified the continued usefulness of the canal as a flood control structure and pointed to the possibility of expanding its use to include recreational facilities.

Planning Process Overview

The method followed both in the development of this statement as well as the options outlined herein were formulated and reviewed under what is commonly known as the planning process. Following is a description of the process and its nine steps.

Step 1: Identification of Issues

This step identifies major problems, concerns, and opportunities associated with the management of public land in the planning area. Issues are identified by the public, the lead agency, and other government entities. The planning process focuses on resolving these identified planning issues.

Step 2: Development of Planning Criteria

Planning criteria are the policies, laws, regulations, and guidelines that should be used for resolving issues, developing options, and choosing a proposed plan.

Step 3: Inventory Data and Information Collection

This step involves the collection and assembly of biological, physical, social or economic information needed to resolve the planning issues. The inventory information is used to determine how public land resources will respond to each of the options.

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8 U.S. Department of the Interior, National Park Service, Western Region, *Historic American Engineering Record: Photographs, written historical, and descriptive data*, 1991

Step 4: Analysis of the Management Situation

This step calls for an assessment of the current situation. It includes a description of current management guidance, discussion of existing problems and opportunities and consolidation of existing data needed to analyze and resolve the identified issues.

Step 5: Formulation of Options

During this step, several options are prepared, including a "no-action" scenario as well as others that strive to resolve the issues while emphasizing either environmental protection, resource efficiency maximization, or a balance between the two extremes.

Step 6: Estimation of the Effects of Options

The physical, biological, economic, and social effects of the implementing each alternative are estimated in order to allow for a comparative evaluation of impacts.

Step 7: Selection of the Preferred Alternative

From information previously generated in steps one through six, the lead agency selects a preferred alternative, prepares a draft environmental impact statement, and distributes the draft for public review.

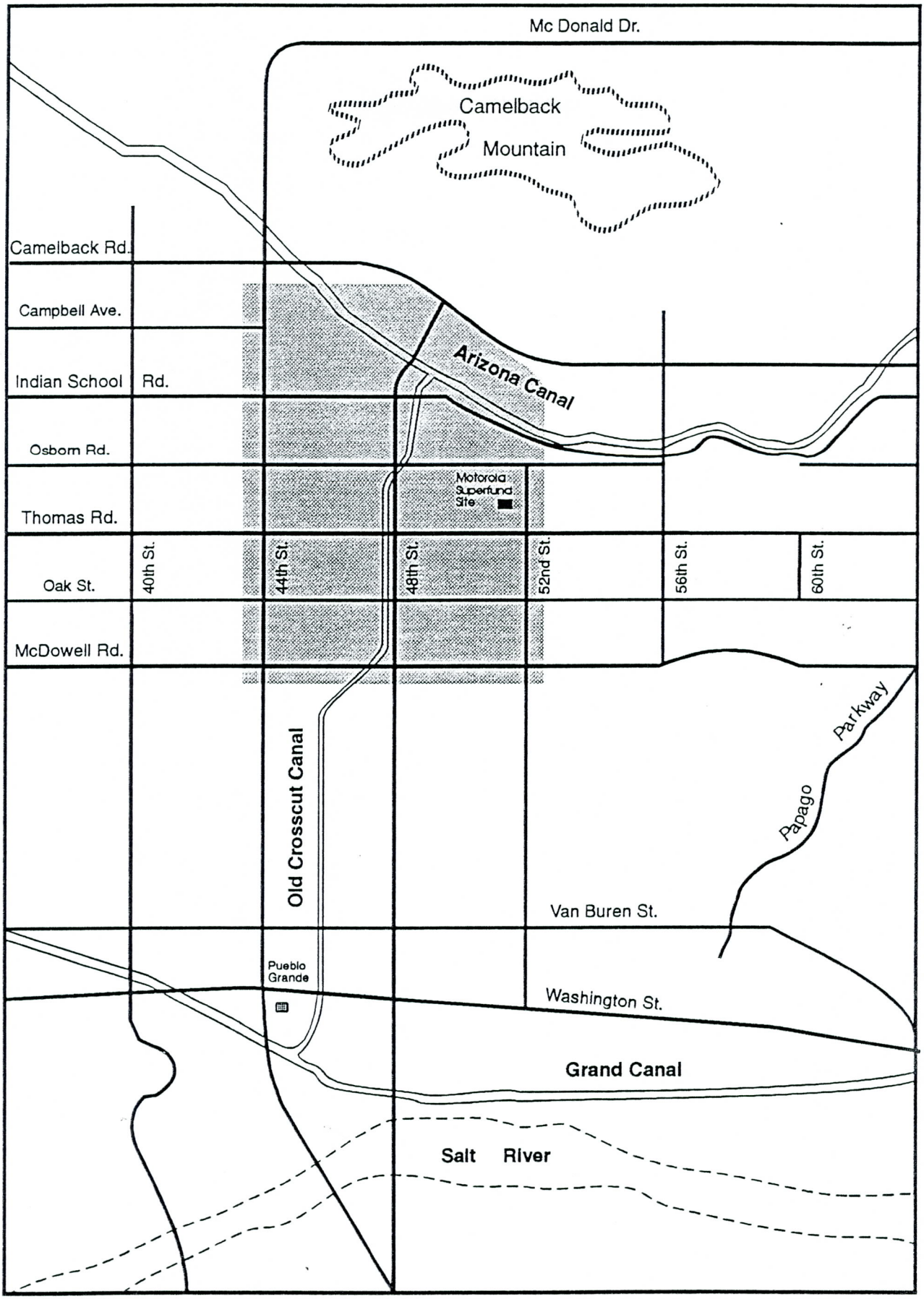
Step 8: Selection of the Resource Management Plan

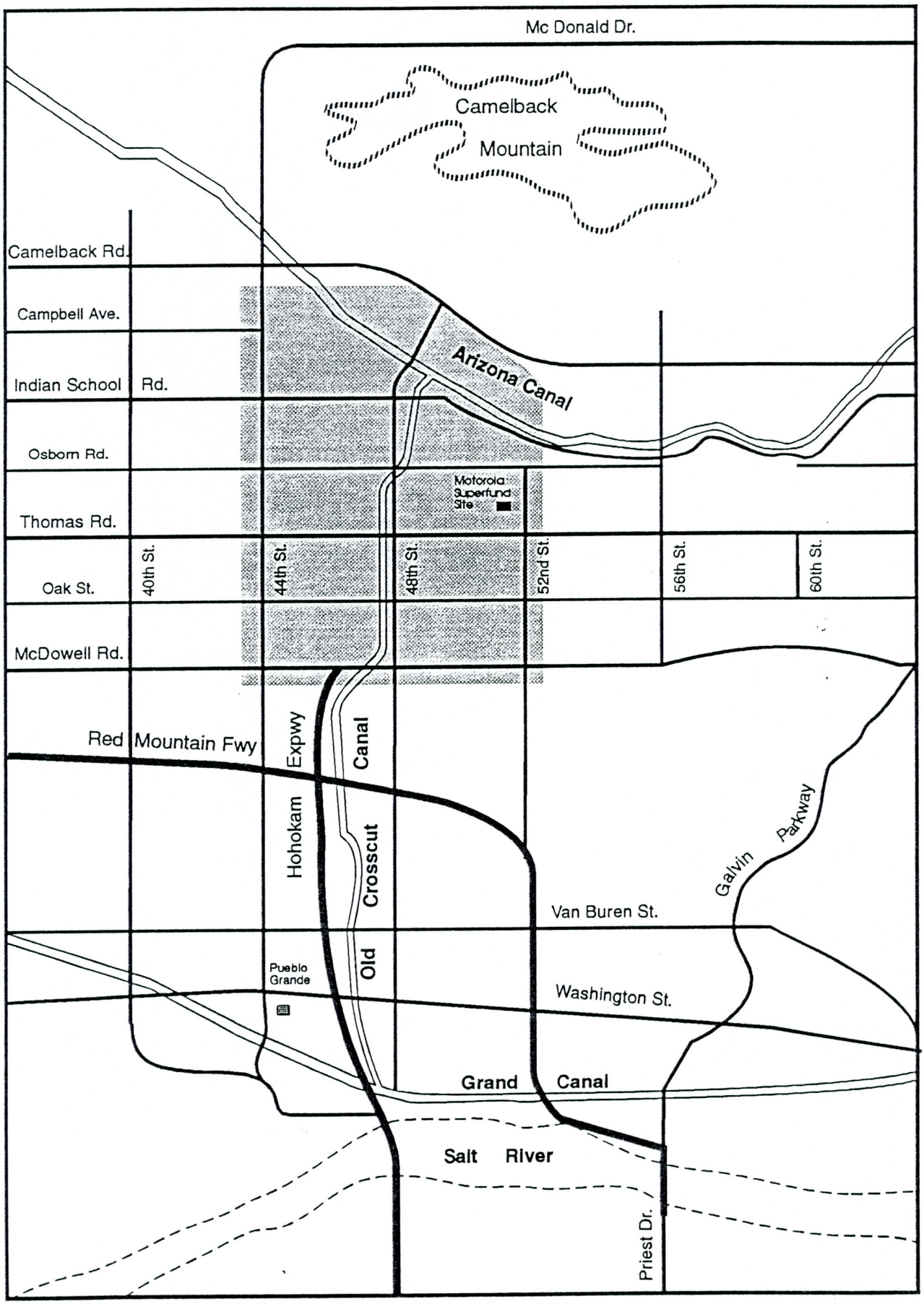
From the result of public review, the lead agency revises its plan of action in response to comments received from the circulation of the draft environmental impact statement.

Step 9: Monitoring and Evaluation

This step involves the collection and analysis of long-term resource condition and trend data to determine the effectiveness of the plan in resolving the identified issues. Monitoring will assure that implementation of the plan will achieve the desired results. Monitoring continues from the time the plan is adopted until changing conditions require its revision.

Figure 4 is a flowchart depicting the aforementioned planning process.

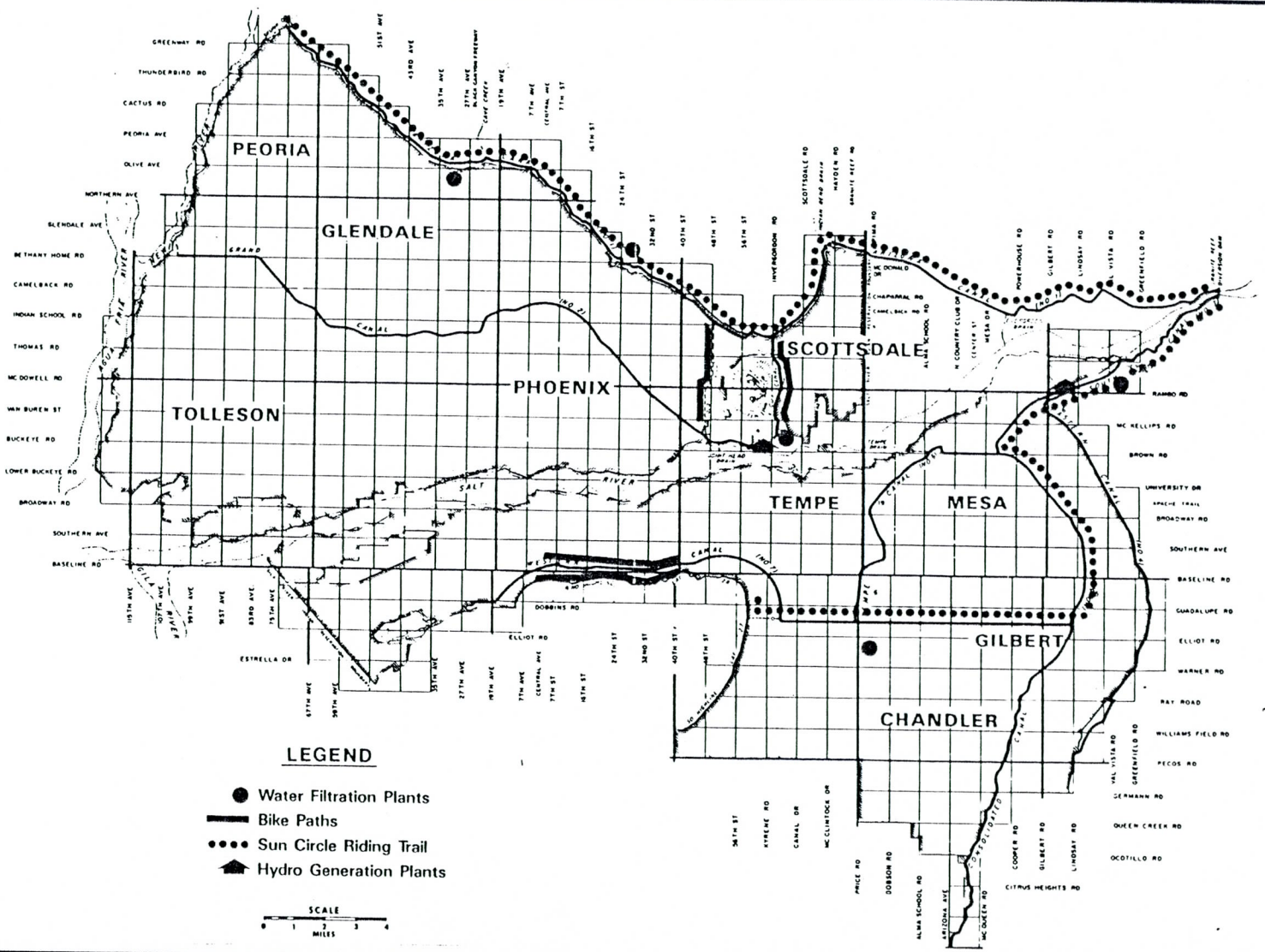

Mc Donald Dr.
Camelback
Mountain
Camelback Rd.
Campbell Ave.
Indian School Rd.
Osborn Rd.
Thomas Rd.
Oak St.
McDowell Rd.
Arizona Canal
Motorola Superfund Site
40th St.
44th St.
48th St.
52nd St.
56th St.
60th St.
Old Crosscut Canal
Papago Parkway
Van Buren St.
Pueblo Grande
Washington St.
Grand Canal
Salt River
N
Original Alignment
Study Area in Gray
Not to Scale
Impact Study Area
Old Crosscut Canal
Figure 1



Revised Alignment
Study Area in Gray
Not to Scale

Impact Study Area
Old Crosscut Canal

Figure 2

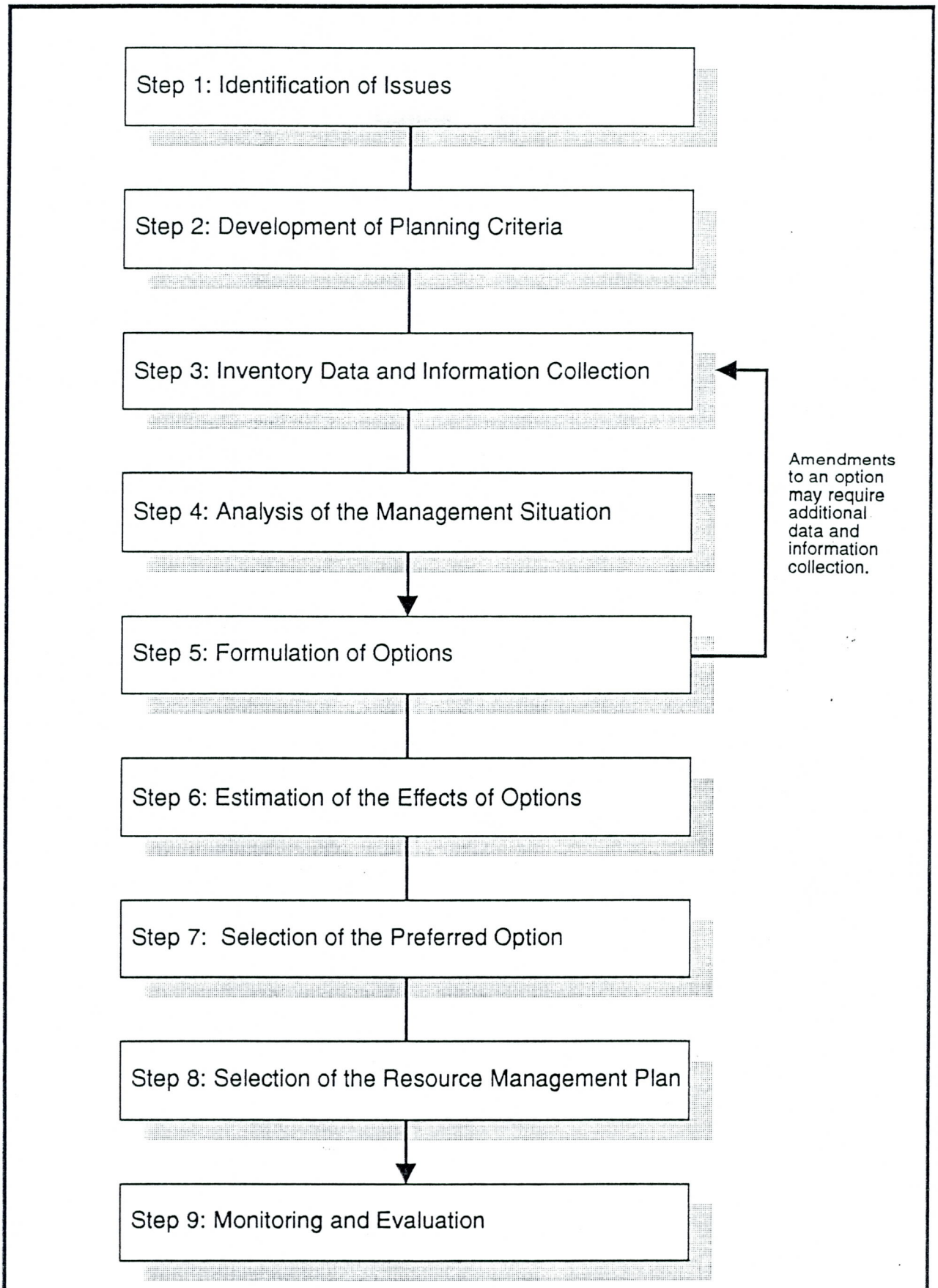


Not to Scale

Modern Phoenix Canal System
Old Crosscut Canal

(Source: Salt River Project, 1991)

Figure 3

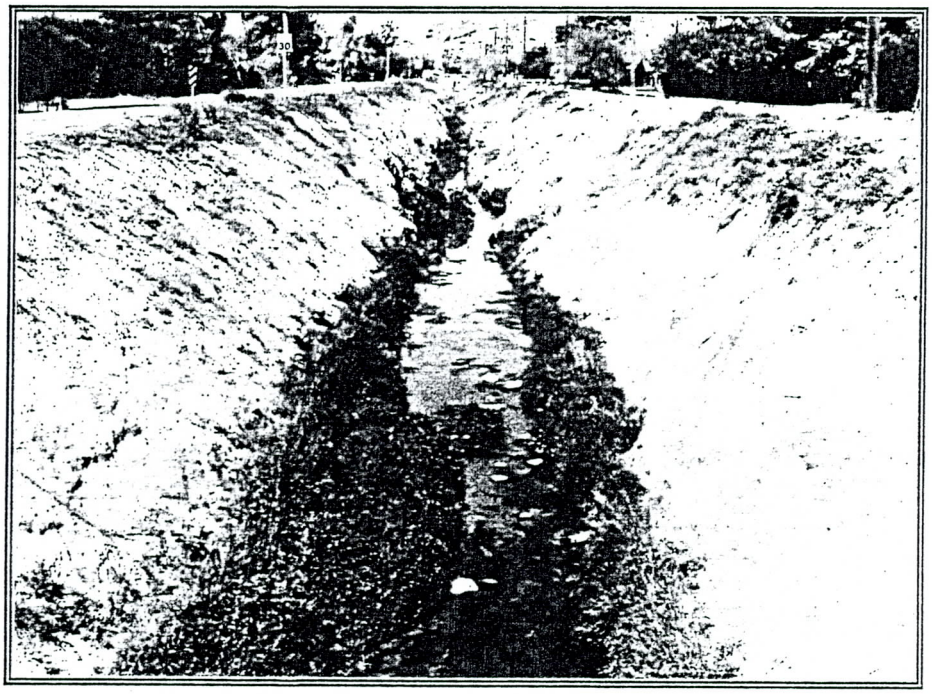


Planning Process Flowchart
Old Crosscut Canal

Figure 4

Chapter 2

Description of Options



DESCRIPTION OF OPTIONS

Introduction

This section provides the reader with a basic understanding of each of the four options being considered for the Old Crosscut Canal (OCC). Rather than including both the descriptions and the associated environmental consequences in one chapter, they are split into two separate chapters for better readability.

Option 1 Underground Channel

By implementing the underground channel option, the surface canal will be replaced by a surface park. The canal will be moved underground and lined on all sides with concrete. It will be virtually undetectable from the surface (Figure 5). By covering the canal and creating a park atmosphere, the OCC could continue to be used as a flood control device and would provide recreational and social opportunities for the surrounding neighborhoods.

The capital investment required for this option is greater than any other option, both in the initial construction of the canal as well as its maintenance. However, the resulting benefits may be great as well.

Option 2 Open Channel

The open channel option for the OCC dictates that the canal remain open but lined with concrete. In addition, a linear park will be created by adding pedestrian pathways and a landscape scheme along the canal's edges.[9] This would enhance both the visual character and the recreational environment for pedestrians, joggers, bicyclists, and residents. In addition, the significance of the canal will be maintained.

Option 3 Preservation

The preservation option for the OCC dictates that the canal remain unpaved and open within the study area (Figure 6). It would maintain its present use as an overflow drainage channel and would include improvements along the sides of the canal to enhance the utility and aesthetic character of the canal. A landscape scheme could help increase the canal's present use as a recreation corridor for bicycle and pedestrian activity.

This option would preserve the rough and rugged character of the canal as well as its historical significance. At the same time, both the canal's functionality and its aesthetic character would be improved, increasing the overall utility of the canal.

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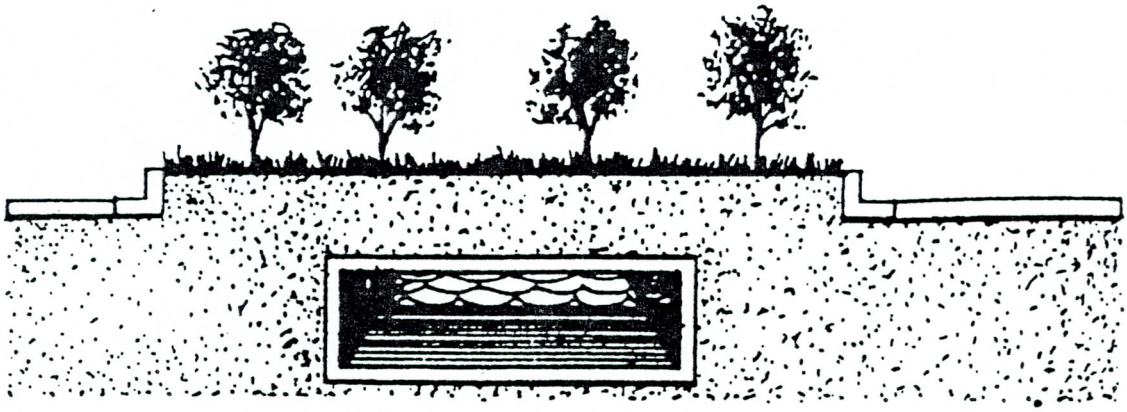
9 *Ibid.*

Option 4 No-Action

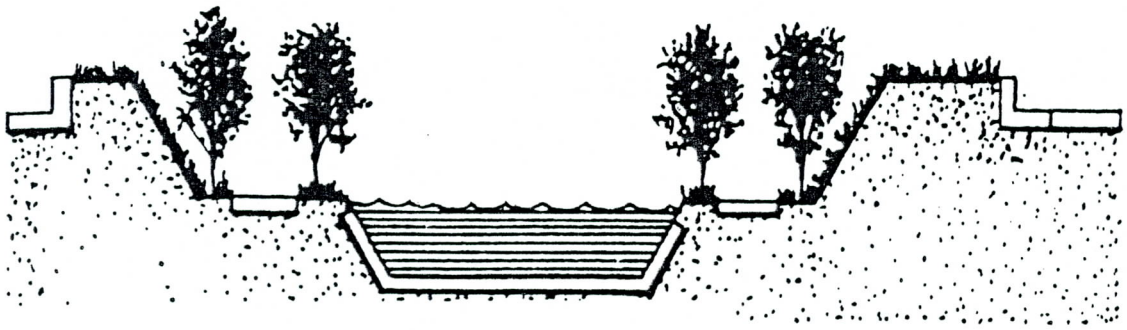
The no-action alternative for the OCC would dictate that the City of Phoenix and all cooperating agencies agree to leave the canal as it is. The canal would not be lined with concrete, preserved or modified in any way, or surrounded with parks. The canal would remain untouched.[10]

Although this option would require no action, it does not guarantee that the canal will be maintained in its present state. Due to environmental factors such as wind and surface runoff, the banks of the canal are consistently being eroded. The canal's condition is in decline and will continue to become worse if the no-action option is chosen.

10 *Ibid.*



Option 1 - Rechannelization with recreation area on surface



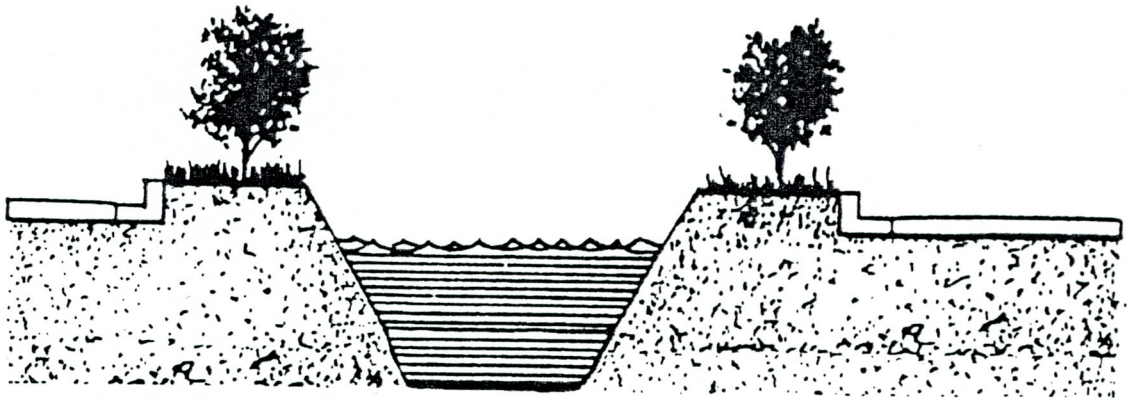
Option 2 - Concrete channel with linear park

Not to Scale

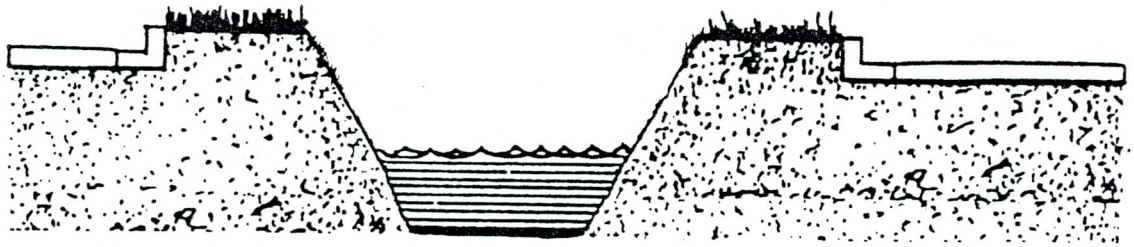
Proposed Options
Old Crosscut Canal

(Source: Adapted from U.S. Army Engineer District, Los Angeles Corps of Engineers, 1981)

Figure 5



Option 3 - Earthen channel preserved with landscape improvements



Option 4 - No change - preserve existing earthen structure

Not to Scale

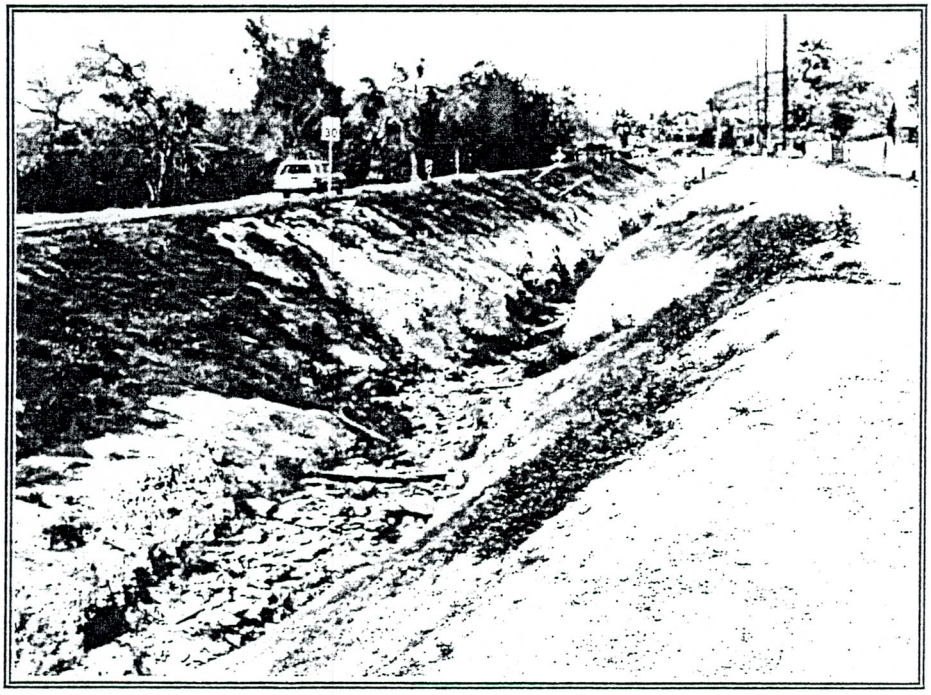
Proposed Options
Old Crosscut Canal

(Source: Adapted from U.S. Army Engineer District, Los Angeles Corps of Engineers, 1981)

Figure 6

Chapter 3

Affected Environment



AFFECTED ENVIRONMENT

Introduction

The contents of this chapter describe resources that may be affected by the implementation of any of the proposed options for the Old Crosscut Canal. The descriptions are only detailed as needed to allow for an understanding of the effects of implementing an option. Where impacts will be slight or insignificant, descriptions are brief or not included. More detailed descriptions of resources in the planning area may be obtained from the preparers of this document. Additional information and references concerning some resources are located in the appendix section.

Physical Environment

Geology and Topography

Arizona is characterized as a basin and range physiographic province, which is subdivided into mountain and desert regions. The OCC is located within the Salt River Valley, a Sonoran Desert section of the province.[11] Three geologic units are found within this basin and include recent (quaternary) alluvium, tertiary red unit, and precambrian igneous complex. The tertiary and quaternary alluvium sediments have eroded from the adjacent mountains and have ultimately filled the basin area.[12]

Recent alluvium underlies most of the area and reaches a maximum thickness of 250 feet near the Salt River. This geological formation is characterized by loose rock and mineral material moved from its origin and deposited by streams, flood plains and alluvial fans,[13] These materials are classified as silty clayey sands to sandy clays which, over time, form caliche. The calcareous cementation that ultimately forms caliche ranges from light to heavy and generally increases with depth.[14] The uncemented layer above the caliche is susceptible to erosion and is present on various portions of the OCC channel's slopes.

According to the American Geological Institute, the tertiary red unit is composed of sandstone, siltstone, and shale that are red due to the presence of ferric oxide. Unlike the red unit, the precambrian igneous complex is an mixture of igneous rocks that differ in form and consist of plutonic or volcanic rocks, or a composite of the two.

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11 Cordy, Gail Ellen, Arizona State University Thesis, *Environmental Geology of the Paradise Valley Quadrangle,* 1978, p. iii

12 U.S. Department of the Interior, National Park Service, Western Region, *Historic American Engineering Record: Photographs, written historical, and descriptive data,* 1991, p. iii

13 American Geological Institute, 1984

14 Thomas-Hartig & Associates, *Old Crosscut Canal: Indian School Road to McDowell Road, Phoenix, Arizona,* 1991, p. 3

The study area is located in the seismic zone 1 of the Verde Fault System, indicating that only minor seismic activity is expected.[15] Most seismic activity is located on Arizona's western border near Yuma.

Camelback Mountain, 2,700 feet at its peak, has a slope of about sixty percent and is located north of the OCC. Papago Park Mountain is less rugged and more gently sloped and is located east of the canal. The canal is in the flat valley region and has an approximate slope of two percent. This slope was calculated from the Arizona Canal to the Grand Canal, north to south along cross section AA (Figure 7).

Climate

The study area characterized by a typical desert climate of low rainfall and low humidity and the area receives an average of seven inches of rainfall annually. The precipitation season mostly occurs in summer and autumn. In summer, annual storms often begin in July and continue until the end of August. Summer rain storms are characterized as short in duration and of large quantity. During this "Monsoon" season, humidity remains relatively high.[16]
A second seasonal rainfall starts in November and continues until March. Most of the storm systems associated with this period come from the Pacific Ocean.[17]

Temperature range during the summer season are is extreme. From the beginning of June until the end of September, the temperature often exceeds 100 degrees Fahrenheit. From late Spring to early summer, the temperature usually varies by 40 degrees Fahrenheit or more between daybreak and early afternoon with moderately cool evenings. Yet in July and August, relatively high humidity keeps minimum temperatures above 80 degrees Fahrenheit. Winters are short and mild with average temperatures in the mid-sixties.[18]

Water Resources

Groundwater -

Soils affected by groundwater surrounding the OCC are described as having a damp to moist soil moisture content. Groundwater ranges in depth from 12 to 25 feet below the existing ground surface. The boring logs are used to measure groundwater levels at the time of boring and may vary with time, seasonal conditions, and water flow through the OCC.[19]

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15 U.S. Army Corps of Engineers, Los Angeles District, South Pacific Division, *Feasibility Report: Phoenix Metropolitan Area Old Crosscut Canal, Phoenix, Arizona*, April 1989, p. 22
16 U.S. Department of Agriculture, Soil Conservation Service, *Soil Survey of Maricopa County, Arizona, Central Part*, 1977, p. 113
17 *Ibid.*
18 Balling, Robert C. and Sandra W. Brazil, *Time and Space Characteristics of the Phoenix Urban Heat Island*, Journal of the Arizona-Nevada Academy of Science, 1987, vol.21, p. 75-81
19 American Geological Institute, 1984, p. 62

Land subsidence and earth fissure development have occurred in some parts of the Phoenix area due to major groundwater declines. A National Geodetic Survey along the Arizona Canal detected no significant subsidence near the study area.[20]

Surface Water

The study area is subject to flooding caused by excess runoff from steep hills, including Camelback Mountain, or from gently sloping areas near the OCC. Runoff from Camelback Mountain concentrates in numerous gullies and forms sheet flows. These flows are controlled by the slope of the land and man-made obstructions. When the paths are interrupted by embankments such as those used for highways and canals, ponding and diversion occur. A number of these structures within the area affect surface runoff including the Arizona, Old Crosscut, and Grand Canals.

Arizona Canal

The Arizona Canal acts as a water supply canal which carries water between Granite Reef Dam and Skunk Creek. Flow in the canal ranges from 700 to 1,100 cfs. During storms, the flow may exceed the canal capacity and the southern bank can be overtopped or broken, causing flooding in the surrounding neighborhoods. For the Arizona Canal's protection, the OCC functions as a flood control ditch.

The Arizona Canal has diversion structures to provide irrigation water to customers, one of which is the New Crosscut Canal, located a few miles to the east of the OCC. This canal is responsible for delivering water to the Penstock water treatment plant for further recycling into the canal system.

Grand Canal

The Grand Canal runs parallel to and has the same function as the Arizona Canal. It receives water from the New Crosscut Canal and conveys it to the New River. Previously, it received water from the OCC during floods and brought it west towards the New River or to the Salt River through waste gates. Now, the OCC siphons under the Grand Canal and continues to the joint head drain, at which point water is discharged into the Salt River.

Water Quality

Although the OCC's original purpose was as an irrigation feeder ditch, its uses have changed to include conveying waste, flood, and drain water to the Grand Canal.

Due to the Arizona Canal's susceptibility to flooding, any floodwaters which overtop the canals banks could introduce contaminants into the Old Crosscut and the surrounding neighborhoods. The OCC's primary use is as a flood control structure. Therefore, water quality is effected only when the canal is used as an outlet to discharge water into the Grand Canal or the Salt River.

The EPA Superfund Cleanup Site is located at the Motorola Manufacturing plant on 52nd Street and McDowell Road. High levels of volatile organic compounds have been detected in the area and

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20 U.S. Army Corps of Engineers, Los Angeles District, South Pacific Division, *Feasibility Report: Phoenix Metropolitan Area Old Crosscut Canal, Phoenix, Arizona*, April 1989, p. 12

have produced samples of heavy metal concentrations in excess of drinking water standards. These heavy metals include barium, chromium, lead, and copper.[21] The identification of the hazardous materials at the site is important when considering the OCC's link to surrounding neighborhoods and other waterways.

Flooding

Technical Issues

The OCC was not originally constructed as a flood control device, but rather as an irrigation canal. That use was short lived for two reasons. First, it became unacceptable to irrigate with groundwater and second, the area faced potential water-logging.[22] In 1918, the surrounding had a groundwater depth of ten feet or less. The U.S. Army Corps of Engineers determined that the OCC could better serve as a conductor of groundwater collected from waterlogged areas. A drain was completed in 1921 to transfer water to the OCC. One year later, this improvement was found unsatisfactory and a second drain was built one quarter mile from the original. By the 1940s, it became more acceptable to use groundwater for irrigation and was seen as a way of eliminating the waterlogging problems. At this same time the Arizona Canal was lined, which further lowered the water table.

It was then that the OCC took on its present responsibility as "an auxiliary flood control ditch".[23] In 1967, Salt River Project and the City of Phoenix constructed waste gates at the junction of the Grand Canal and the Old Crosscut in order to make it a more efficient and dependable backup flood channel.

The MCFCD, the current owners of the canal, entered an agreement in 1975 with SRP and the City of Phoenix to reconstruct the OCC as a flood control and drainage channel. In 1987, a drainage plan was approved to collect and channel drainage from the Camelback-Arcadia area into the OCC. However, it was determined that without an increase in capacity to 800 cfs, the canal might not successfully handle a 25-year flow. The Army Corps of Engineers declined participation in the project and it was delayed. In 1991, the MCFCD, City of Phoenix, and SRP entered into another agreement to reconstruct the canal north of McDowell Road to allow the necessary capacity increase to handle storm drainage.

Social Issues

The primary land use along the canal is residential. Street flooding and minor property damage in the area usually occur in periods of heavy rain. Some residents report annual flood damage.

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21 Arizona Department of Transportation & U.S. Army Corp of Engineers, *Final Environmental Assessment for State Route 143*, 1987, p. 73

22 U.S. Army Corps of Engineers, Los Angeles District, South Pacific Division, *Feasibility Report: Phoenix Metropolitan Area Old Crosscut Canal, Phoenix, Arizona*, April 1989, p. 21

23 *Ibid.*, p. 23

During a storm in 1972, homes were flooded south of the Arizona Canal due to two breaks in the canal just west of the OCC and water crossing the canal at a depressed intersection (56th Street and Mitchell). This storm caused several million dollars in flood-related damage.[24]

Without major reconstruction of the canal, damages could occur as frequently as every 25 years. These damages are projected in Table 1.

TABLE 1
Damages by Event (Oct. 1988 Prices x 1000, at 8 5/8%)

Study Area	25 year	50 year	100 year	Annual Average
North of AZ Canal	$3,067	$4,387	$6,820	$405
South of AZ Canal	$14,680	$18,080	$20,077	$1,228
Total	$17,747	$22,467	$26,887	$1,633

(U.S. Army Corps of Engineers Feasibility Report , 1989)

The OCC drainage area is sensitive to heavy rains. The steep slopes of Camelback Mountain in combination with the heavily developed area at the base of the mountain impair water infiltration rates and cause rapid runoff. Flood hazards associated with the Arizona Canal have decreased since the construction of the Cave Creek Dam, Dreamy Draw Dam, and the Indian Bend Wash Floodway. The need remains for the Old Crosscut to be maintained for the protection for the residents living near the canal.

Soil

There are four series of soils in the study area: Estrella, Laveen, Mohall, and Valencia (Figure 8). The largest soil series in the study area is the Laveen type. This is a well drained, moderately alkaline, alluvial soil, of 0 to 1 percent slope, water runoff is slow, and erosion hazards are slight. The next largest series is Valencia, located at the northern juncture with the Arizona Canal. This series is also a well drained, moderately alkaline, alluvial soil of a similar slope. Runoff is slow and the soil is prone to blowing and therefore represents a dust precipitate hazard especially during dry periods. The Estrella and Mohall series, found elsewhere in the study area, are of similar composition. Erosion and blowing are not considered a problem for either of these soil types. The permeability of each of the soil groups is described as moderate with high water capacity. These soil series can be used for irrigated plant materials and have little or no limitations for use as paths, trails or recreation areas. Plant roots can penetrate each of the soil types to a depth of 60 inches or more.[25]

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24 *Ibid.*, p. 43
25 U.S. Department of Agriculture, Soil Conservation Service, *Soil Survey: Eastern Maricopa and Northern Pinal Counties Area, Arizona,* November 1974, p. 12-26

The soil samples obtained in the test borings of the engineering study are those of a medium dense to dense clayey/sandy clay deposit. Soil moisture studies done at the time of the test borings were described as moist. Groundwater was detected at depths from 12 to 25 feet below the surface of the canal. The level of groundwater found by the study was shallow. There were recommendations that allowances be made for potential uplift under the existing channel, occurring during periods of increased groundwater levels. The soil along the canal is characterized as fairly strong with low settlement potential.[26]

The soil survey indicates a low susceptibility of native soils to water and wind erosion near the canal. Steep, unvegetated slopes of the canal exhibit a tendency to erode due to the flow of water over the canal's banks. Gully erosion caused by water flow is evident at many points along the canal. This erosion can be characterized as a natural but destructive process because the displaced soil is not replaced. Wind erosion is evident in those areas that lack natural ground cover, especially those areas of little or no slope. Points of erosion have been successfully stabilized in some areas with the use of increased vegetation.

Vegetation

The majority of the natural biotic communities along the OCC have been disturbed as a result of extensive urbanization within the Phoenix area. The native vegetation that grows has been relegated to small, undeveloped patches consisting of a variety of species: mesquite, catclaw, acacia, palo verde, broom baccharis, creosote bush, eucalyptus, tree tobacco and russian thistle.

A variety of non-native vegetation has been introduced in the surrounding neighborhoods, including Mexican fan palms, California fan palms, barabados aloe, asparagus fern, shoestring acacia, chinese juniper, bougainvillea, coolibah, ghust gum, Lantana, oleander, differents pine, and a variety of flowers. Due to the age of the community, much of the vegetation is mature and established. Table 2 lists both the native and non-native vegetation in the area.

Some protected species exist within the study area and require special consideration. Table 3 provides a listing of these protected species.

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26 American Geological Institute, 1984, p. 3

Table 2: Plant Inventory

COMMON NAME	*SCIENTIFIC NAME*
Mexican fan palm	*Washingtonia robusta*
California fan palm	*Washingtonia filifera*
Barbados aloe	*Aloe barabadensis*
Asparagus fern	*Asparagus densiflorus*
Shoestring acacia	*Acacia stenophylla*
Desert broom	*Baccharis sarathiodes*
Bougainvillea	*Bougainvillea* spp.
Coolibah	*Eucalyptus microtheca*
Ghust gum	*Eucalyptus papuana*
Lantana	*Lantana camara*
Oleander	*Nerium oleander*
Pine	*Pinus* spp.

Table 3: Protected Plant Inventory

COMMON NAME	*SCIENTIFIC NAME*
Barrel Cactus	*Ferocactus wislizenii*
Night Blooming Cereus	*Peniocereus greggii*
Cholla	*Opuntia bigelovii*
Hedgehog	*Echinocereus engelmani*
Pin Cushion	*Mammillaria microcarpa*
Saguaro	*Carnegiea gigantea*
Prickly Pear	*Opuntia engelmannii*
Needle Cactus	*Opuntia acanthocarpa*
Flannel Bush	*Fremontodendron*
Ocotillo	*Fouquieria splendenus*
Yucca	*Yucca* spp.
Desert Spoon	*Dasylirion wheeleri*
Desert Holly	*Atriplex hymenlytra*

Wildlife

Due to the extensive urbanization within the Phoenix metropolitan area, no federal or state threatened or endangered species exist in the immediate area. The dominant wildlife likely to be found includes small reptiles (lizards and snakes), small mammals such as gophers, mice, bats and stray cats and dogs from the surrounding neighborhood. Insects and other small animals include ants, aphids, bees, wasps, hornets, beetles, moths, butterflies, crickets, grasshoppers, locusts, true

bugs, mites, snails, slugs and earthworms. Birds are mostly migrant from the cooler pinyon-juniper or ponderosa forested highlands north and east of Phoenix.

Social Environment

Culture

Past

During the Archaic period between the years 8,000 B.C.-100 A.D., several prehistoric societies inhabited Arizona's central region. Among these societies were the Mogollon, Hohokam, Anasazi, and Salado Complex. By 1450 A.D., development of these native groups ceased, followed by a widespread population decline. Each society was identified by separated diagnostic traits in architecture and ceramics. The most populated region was occupied by the Mogollon, located in mountainous areas and valleys along major drainages and terraces. Much of the Mogollon sites exhibited Hohokam characteristics, especially towards the latter end of the period. During the following period, 1534-1912, many of the societies were located north and southeast of the central region.

The Pueblo Grand Ruin (a major Hohokam village site) and Hohokam-Pima irrigation sites are located south of the project area. Both are listed on the National Register of Historical Places and are also National Historic Landmarks.[27] Although the archaeological sites are located outside the study area, their northern extents are not known and may continue into the study area.

Present

Contemporary society uses the OCC as a linkage to surrounding neighborhoods and for recreation. It is surrounded by a mixture of residential and commercial uses (Figure 9). In addition, the residents in the surrounding area have many different ethnic backgrounds and ages.

The urbanization of the area surrounding the OCC has made the canal a neighborhood amenity. Previously, the MCA's Crosscut Canal Loop proposal included the OCC as a part of a larger regional scheme. The channelization and construction of the canal south of McDowell Road has severed this loop, relegating the northern section of the OCC as a reacreational open space area serving the surrounding communities.

Socioeconomics

The location of the canal in the Phoenix metropolitan area has played an integral role in the development of adjacent areas as established residential communities. The residents of these communities are more educated, are more likely to be from another state, are more likely to be employed, have a higher income, and are less likely to be living below the poverty level than the residents of Maricopa County as a whole.[28]

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27 U.S. Army Corps of Engineers, Los Angeles District, South Pacific Division, *Feasibility Report: Phoenix Metropolitan Area Old Crosscut Canal, Phoenix, Arizona*, April 1989

28 City of Phoenix, Planning Department, *City of Phoenix General Plan*, 1992, p. 31-5

However, there is a common pattern throughout all statistics leading to the conclusion that the communities on the north end of the canal near Camelback Road are more affluent than those nearer to McDowell Road on the south end of the study area. The communities near and adjacent to Camelback Road contain bigger lots and larger, more expensive homes, are far more educated (52% possess a bachelor's degree or more), and earn almost double the income of the average for the study area as a whole. The communities near McDowell road exhibit more crowded neighborhoods, are less educated (only 21% possess a bachelor's degree or higher), and earn substantially less than the averages for Maricopa County.[29]

Figure 10 shows the locations of census tracts immediately adjacent to the canal

Table 4 provides detailed census tract, study area, and county statistics.

29 *Ibid.*

Table 4: Census Data Source: U. S. Census of Population & Housing, 1990	Maricopa County	Study Area
Total Population	2,122,101	33,809
Persons enrolled in school	557,988	7,746
%	26%	23%
Grades 1-12	351,130	4,340
%	17%	13%
College	171,202	3,062
%	8%	9%
Educational Attainment	1,344,654	23,949
No diploma	248,814	2,712
%	19%	11%
High School Graduate	798,267	13,041
%	59%	53%
Bachelor's Degree	201,449	5,333
%	15%	23%
Graduate/Professional Degree	96,124	2,913
%	7%	13%
Percent born in Arizona	33%	30%
Percent in labor force	67%	69%
Median household income	$30,797	$39,426
Percent living below poverty level	12%	8%

Table 4: Census Data

Source: U. S. Census of Population & Housing, 1990

	Census Tracts Adjacent to The Old Crosscut Canal									
	1079	1080	1081	1082	1110	1111	1112.01	1112.02	1113	1137
Total Population	3,594	3,270	1,874	3,057	4,418	4,198	5,110	3,531	4,757	4,760
Persons enrolled in school	773	921	487	714	900	995	1,118	837	1,001	1,199
%	22%	28%	26%	23%	20%	24%	22%	24%	21%	25%
Grades 1-12	364	568	241	483	524	558	539	367	696	733
%	10%	17%	13%	16%	12%	13%	11%	10%	15%	15%
College	338	266	246	231	376	349	502	449	305	466
%	9%	8%	13%	8%	9%	8%	10%	13%	6%	10%
Educational Attainment	2,825	2,268	1,408	2,276	3,318	3,027	3,517	2,034	3,276	2,793
No diploma	121	113	123	255	350	341	443	446	520	826
%	4%	5%	9%	11%	11%	11%	13%	22%	16%	30%
High School Graduate	1,315	771	525	1,439	1,788	1,721	2,245	1,149	2,088	1,741
%	47%	34%	37%	63%	54%	57%	64%	56%	64%	62%
Bachelor's Degree	827	853	450	457	801	602	533	372	438	189
%	29%	38%	32%	20%	24%	20%	15%	18%	13%	7%
Graduate/Professional Degree	662	531	310	125	329	363	296	67	230	37
%	23%	23%	22%	5%	10%	12%	8%	3%	7%	1%
Percent born in Arizona	21%	27%	26%	31%	32%	31%	32%	36%	39%	42%
Percent in labor force	62%	59%	64%	71%	70%	67%	76%	84%	71%	67%
Median household income	$60,439	$72,202	$48,984	$30,598	$34,430	$34,342	$25,719	$21,190	$26,932	$18,132
Percent living below poverty level	4%	2%	4%	7%	4%	6%	13%	22%	13%	31%

Economic Development

The areas adjacent to the OCC support commercial activity which a middle-class population sustains. Although the area has not been heavily developed, there is a potential to further develop the area if more people are to be drawn into the area.

Adjacent Land Uses

The study area is located nearly parallel to 48th Street from McDowell Road to the Arizona Canal just north of Indian School Road. The length of the area under study is approximately 2.12 miles running in a direct north-south line.

The land immediately adjacent to the canal consists of four types; medium density residential, small scale multifamily rental units, commercial, and open space. The southern mile is bordered primarily by medium density residential homes in good physical condition. Several small scale rental properties are mixed in with the single-family homes to achieve a visually interesting mixture of activities.

The canal runs through one main commercial area at 48th Street and Thomas Road. This commercial district is directly connected to one of the secondary cores of mixed-use land designated in the 1991 Phoenix General Plan.[30] The commercial district north the canal is of primarily residential use. The north end has open space bordering the west side of the canal. As previously mentioned, the Motorola superfund site at 52nd Street and McDowell is a land use which requires much attention in planning for the future of the area.

Several of the residents whose properties border on the canal have expressed concern in the past over building a park so near to their homes when there are two large parks nearby. Papago Park is located approximately one mile southeast of the site and Squaw Peak Park is several miles northwest. Since the majority of the land use immediately adjacent to the project is residential, it will be crucial to foresee measures necessary to avoid conflict with the property owners. These measures should include early and extensive coordination with the surrounding landowners to assure the satisfaction of all parties involved.

Recreation

The OCC is an essential section of the MCA's proposed Crosscut Canal Loop. This entails an 11-mile circuit, connecting the Old and the New Crosscut Canals with portions of the Grand and Arizona Canals. Cities such as Phoenix, Scottsdale, and Tempe have joined in recognizing the recreation potentials for this 11-mile circuit. Such recreational activities involve jogging, hiking and bicycling, as well as public art exhibits, equestrian trails, and community education centers.

Currently, the bicycle path is part of the Papago Loop Trail, which connects cyclists and hikers to other recreational sites in nearby Papago Park, Pueblo Grande, and many other networks of trails

30 *Ibid.*

throughout the city of Phoenix. However, due to the present reconstruction and re-channelization of the canal south of McDowell Road, public access has been limited.

Safety

The OCC is considerably dangerous to those who participate in recreation near the canal. There are currently no barriers preventing those engaging in recreational activities from falling into the twenty-foot-deep canal, which has rough outcroppings and may be the cause of serious injury. There is a need to provide a barrier of some type, be it a fence or a vegetative buffer, to improve the quality of the area and make it a safer place. Pedestrian access is limited and street crossings dangerous.

Figure 11 is a map depicting pedestrian access in the area.

Visual Resources

As it is currently, the canal is an eyesore along most of its length. There are areas with severely overgrown vegetation. This vegetation tends to collect paper, plastic, and other lightweight trash in a concentrated area. The nature of the depression itself without the vegetation ends up as home for much urban street trash, especially after a rain which will wash oil and dirt from the streets into the canal. Additionally, some areas of the canal have standing stagnant water which is not only aesthetically displeasing, but smells as well.

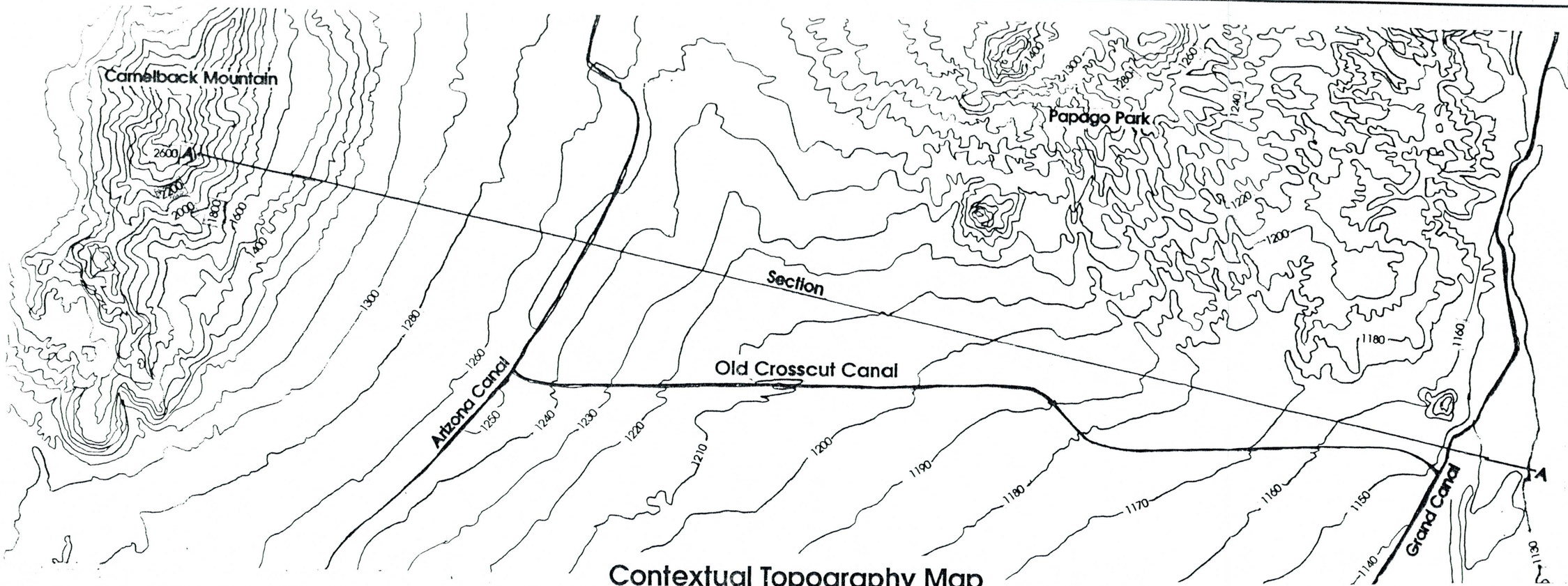
The neighborhoods and businesses that line the canal range from very good to medium quality as far as a subjective visual assessment of maintenance and improvements. In addition, there are views of Camelback Mountain from various points on the canal which is striking especially at sunset or dusk. These views should be mapped and preserved regardless of the chosen option. This view represents one of the few non-urban elements of the OCC.

Noise

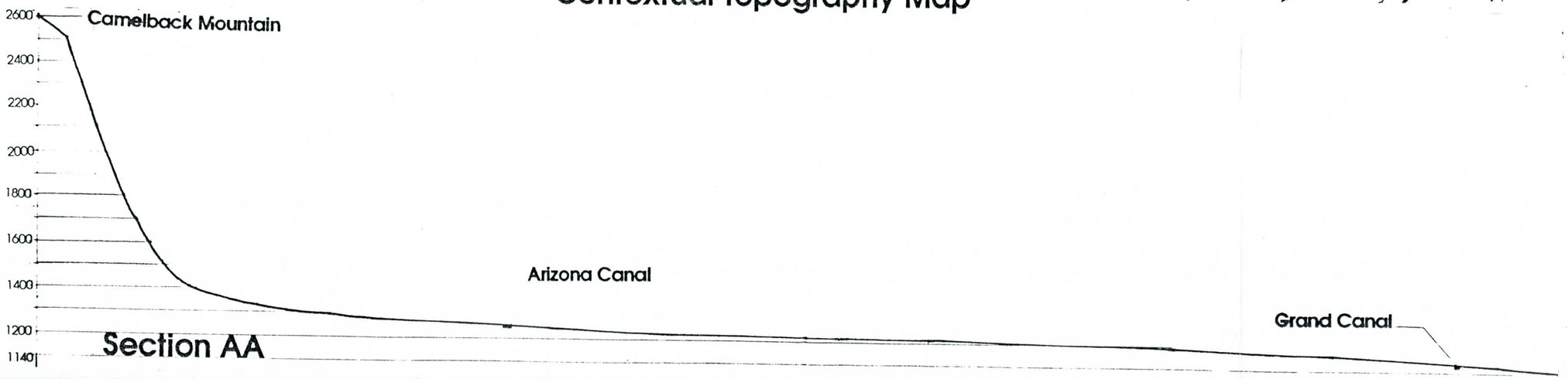
The area surrounding the OCC is primarily residential. Thus, noise standards vary by individual community but are relatively low. The highest level of noise that persists in the area occurs at approximately fifty to sixty decibels, resulting primarily from vehicular traffic on roads adjacent to the canal.

According to the EPA's standards for common effects of sounds, most of the activities that occur near the canal, including walking, bicycling, and normal conversation, fall well below the level of community response, which occurs at seventy decibels. However, increased utility of the canal will result in increased vehicular and pedestrian traffic throughout the area and an accompanying increase in noise levels. This may prove to be a critical concern for residents in adjacent areas as the community response level is surpassed.

The EPA has developed noise measurement scales to determine the levels at which interference from noise leads to more harmful effects such as hearing loss, insomnia, irritability, and high blood pressure. These occur in the range above one hundred decibels and are not feasible for consideration.



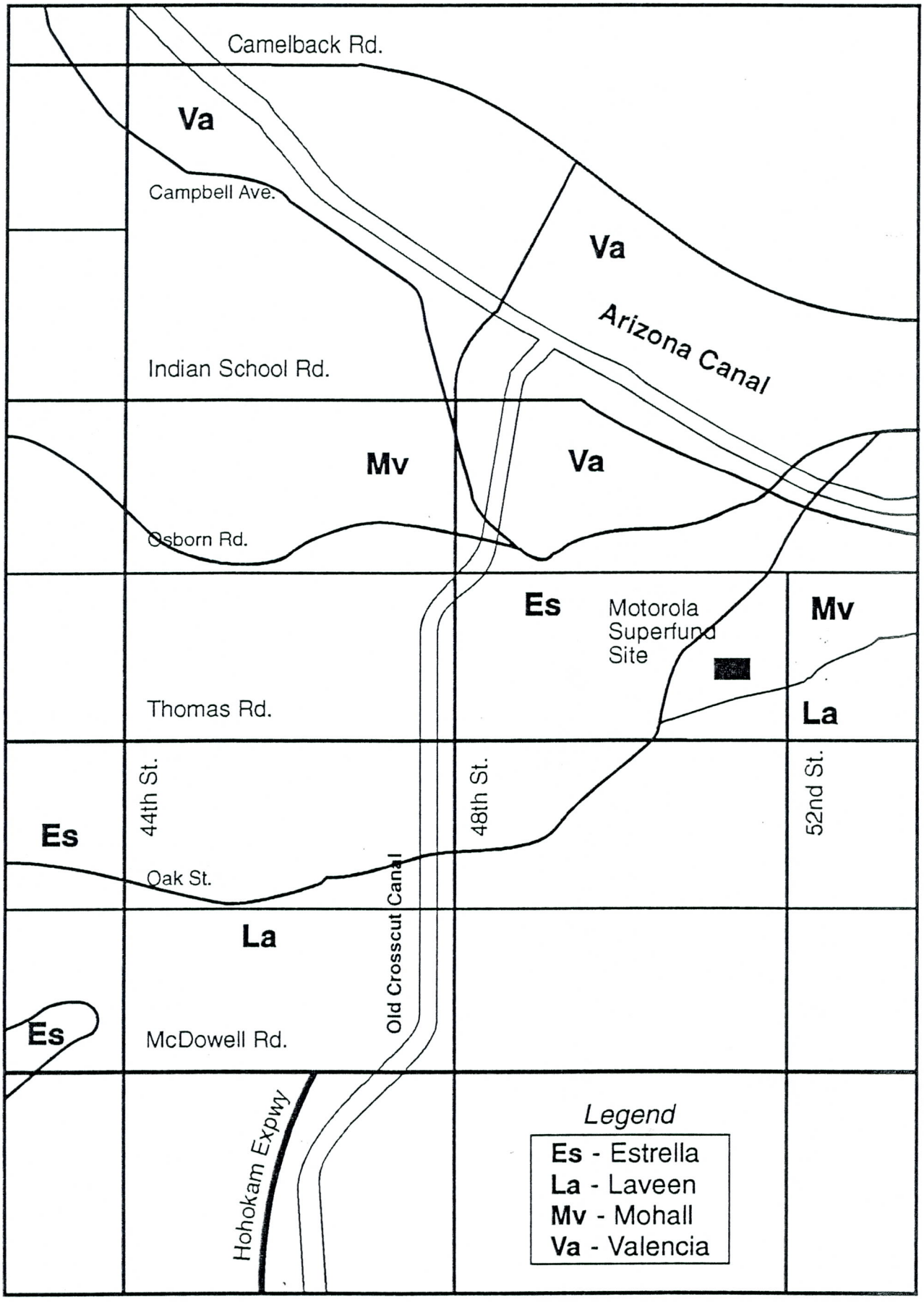
Contextual Topography Map



Not to Scale

Study Area Topography
Old Crosscut Canal

Figure 7

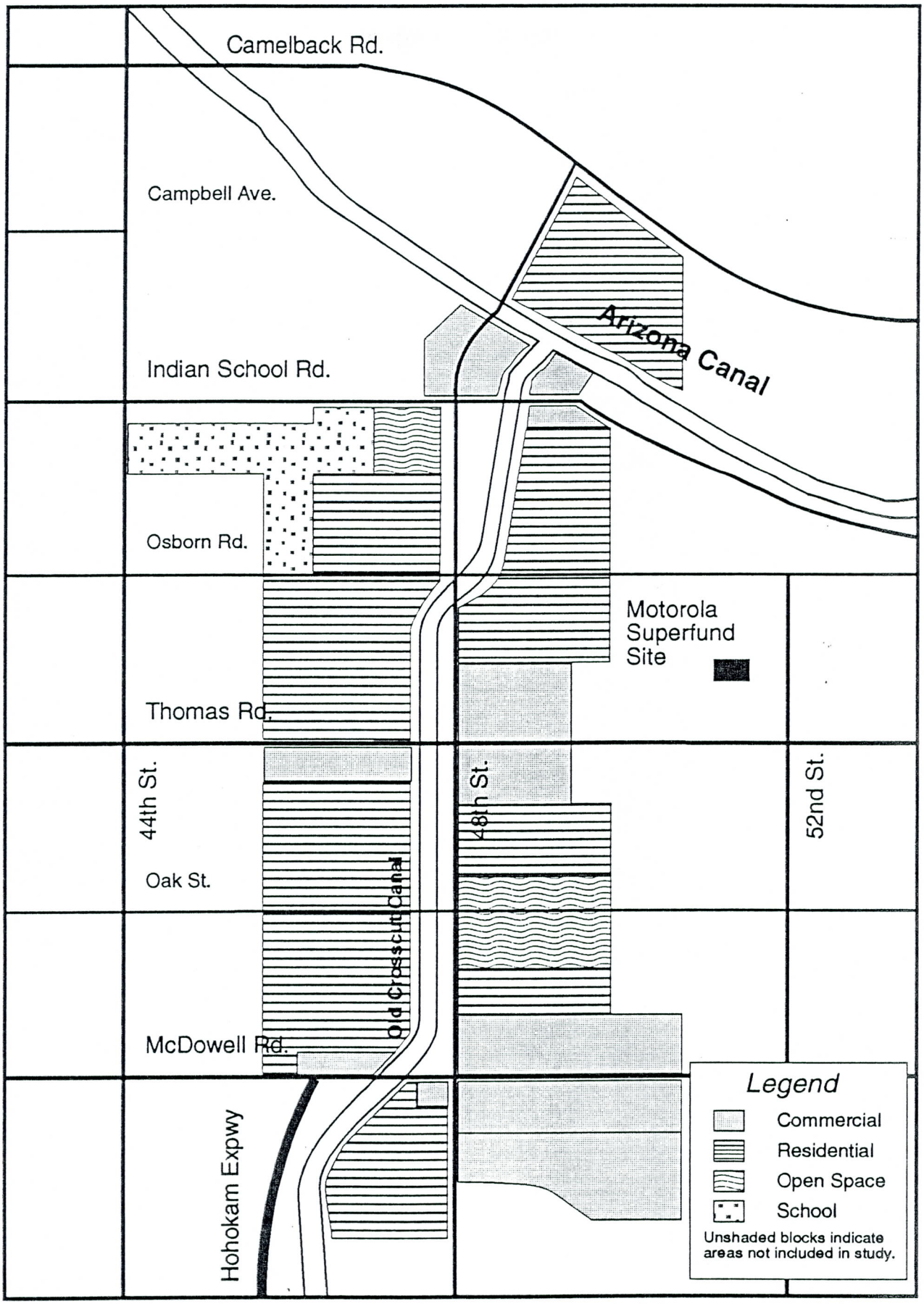


Not to Scale

Soil Resources
Old Crosscut Canal

(Source: U.S. Department of Agriculture, Soil Conservation Service, 1974)

Figure 8

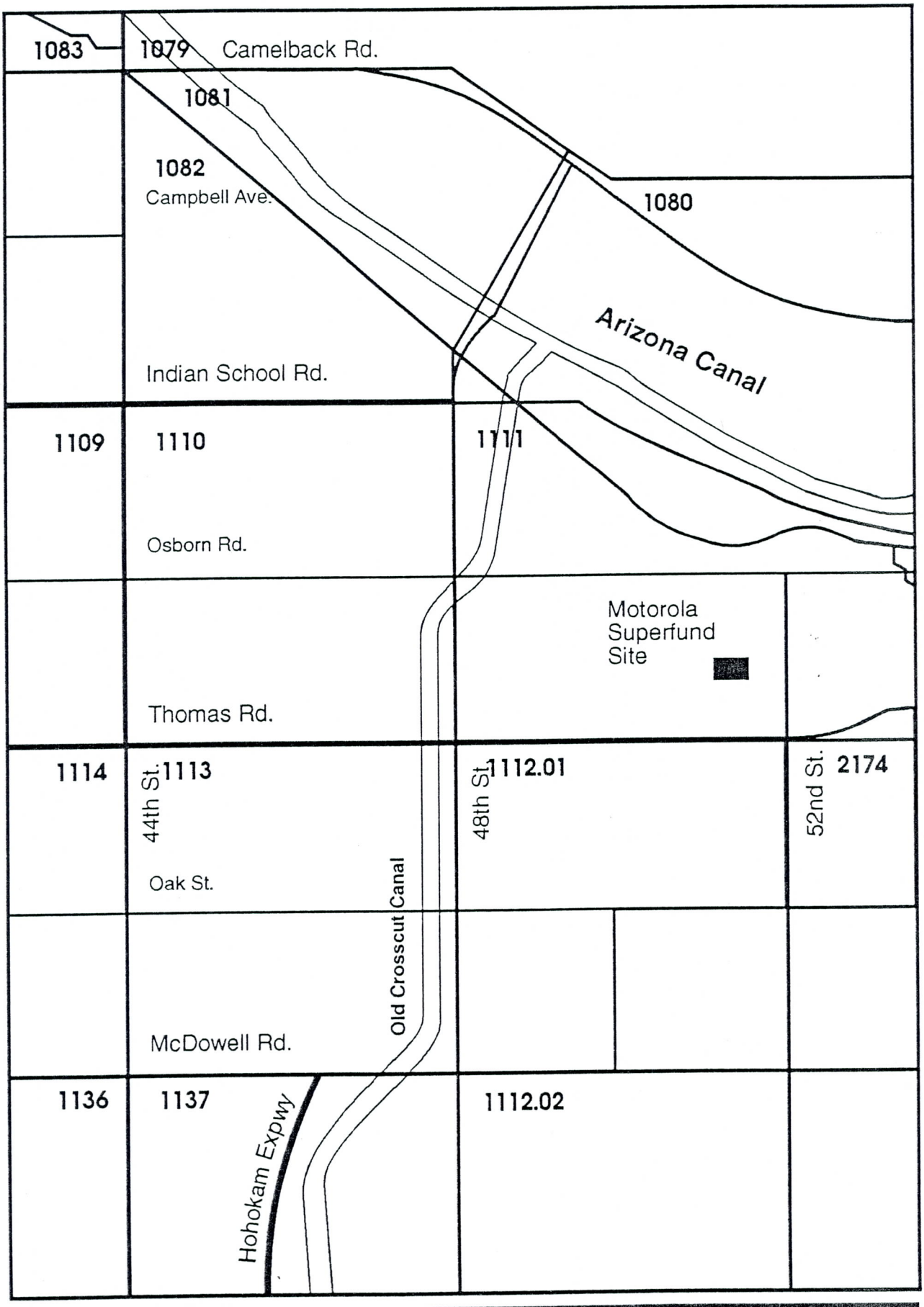


Not to Scale

Adjacent Land Use
Old Crosscut Canal

(Source: Adapted from Phoenix Parks, Recreation, and Library Department, 1990)

Figure 9

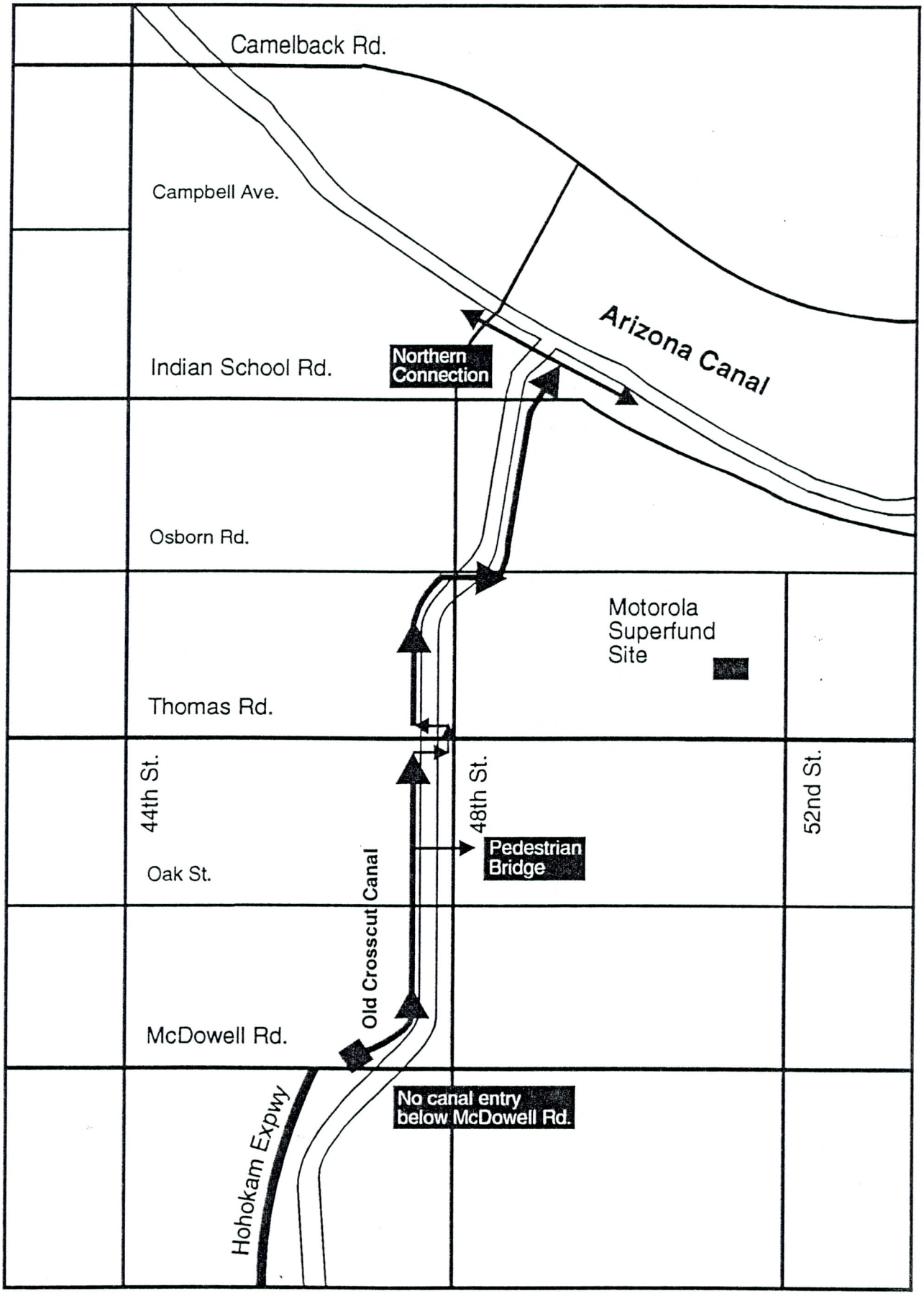


Not to Scale

Study Area Census Tracts
Old Crosscut Canal

(Source: Maricopa County Department of Planning and Development, 1990)

Figure 10



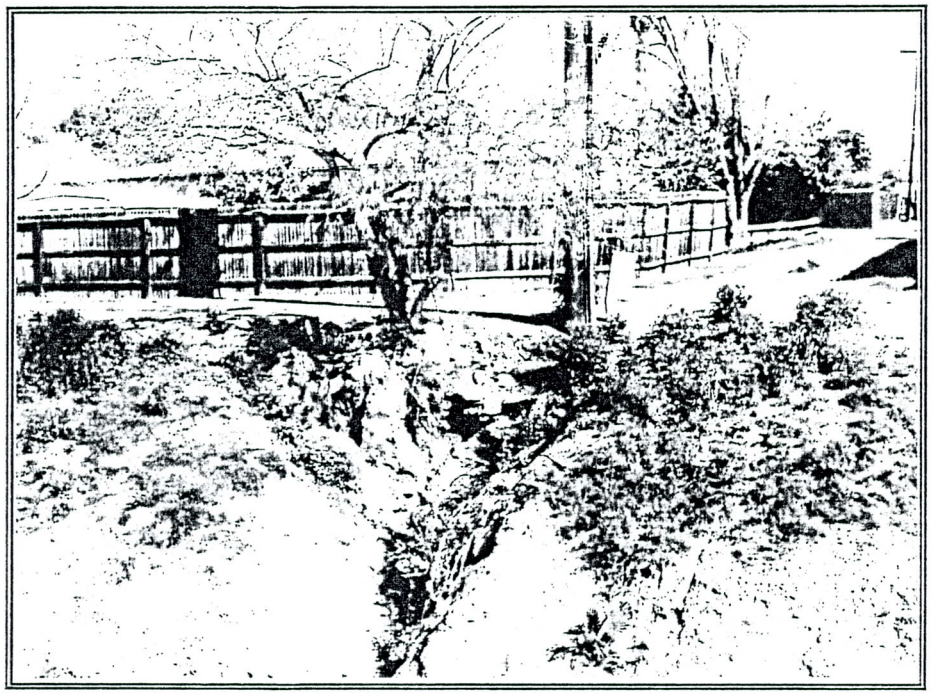
Not to Scale

Pedestrian/Bicycle Circulation
Old Crosscut Canal

Figure 11

Chapter 4

Environmental Consequences



ENVIRONMENTAL CONSEQUENCES

Introduction

This section will help the reader gain a better understanding of the environmental consequences associated with each of the four options considered for the Old Crosscut Canal. By listing each environmental consideration and the related consequences associated with the implementation of each option, the options may be easily compared with each other.

Option 1: Closed Box

This option will prevent urban street trash from collecting within the channel. It will also prevent overgrowth of vegetation in the channel, but unless maintained, vegetation overgrowth could occur as a problem along the edges of the closed box structure. The uniformity of a closed paved surface will eliminate the jagged, eroded edges of the unlined canal. Whether or not that is a positive element will depend on individual preferences. Some people have expressed dismay at the unnatural site of a concrete strip bisecting their neighborhood, while others believe anything would be an improvement.

Option 2: Open Channel

This would still leave the canal vulnerable to collecting trash within its bed. This option would also have a similar subjectivity of approval as experienced in the closed box option in the perception of visual quality. It would eliminate vegetation within the banks of the canal, but also must be maintained to prevent overgrowth along the sides.

Option 3: Preservation

Part of the criteria for this application would require periodic removal of vegetation from the bed of the canal. This option would be likely to be the cleanest of the options simply due to the periodic maintenance requirement involved. The open canal will still tend to be a garbage collection point. In addition, the controlled planting along the sides of the canal will be the most undisputed source of good visual quality. This vegetation will enhance the aesthetic quality of the corridor with potential to provide linkage with adjacent neighborhoods. Some strategically placed site furnishings could allow more enjoyment of the visual resources, especially views of Camelback Mountain.

Option 4: No Action

This option will provide the poorest visual quality. It will continue to collect urban street garbage in concentrated areas. The overgrowth of vegetation will continue, while rugged erosion of the banks worsens. Overall visual quality will continually decline.

Physical Environment

Climate

Option 1: By creating a surface park, the microclimate may be altered significantly. If the arid desert landscape is replaced by a landscape with more vegetation, the temperature may drop slightly and additional shade will be available. However, if a xeriscape is implemented, the climate will most likely remain unchanged.

Option 2: The addition of vegetation will affect the micro-climate of this area by creating shade to cool the area and reduce evaporation. In addition, as the channel is lined with concrete, a "heat island" could be formed due to the accumulation and reflection of solar radiation. These two impacts will most likely balance each other, creating a safer and more enjoyable environment for recreational use.

Option 3: Any type of re-vegetation plan for the sides of the canal will minimally effect the immediate microclimate. If the vegetation includes trees that are large enough to cast shadows on the canal at various times of the day, the water temperature may be affected, allowing slightly less evaporation to occur.

Option 4: The climate will remain unchanged as a hot, arid desert region. The need to provide adequate shade in order to attract people to the area will remain unaddressed.

Water

Option 1: The amount of water managed by the canal will not be altered in any significant manner. However, the ability of the canal to support overflow will be eliminated since the channel will be underground and enclosed.

The quality of the water in the canal will be improved since the waterway will be enclosed, reducing the possibility for waste of any kind to enter the canal.

Option 2: The brush and vegetation which currently exists in the canal will be removed and the channel lined with concrete. Thus, the capacity of the canal to handle increased flow will improve since the water will be able to flow unobstructed through the concrete-lined channel.

The presence of water near the canal would create a pleasant atmosphere, attracting more recreational users to the area. This may make the canal more susceptible deliberate dumping and may lead to declining water quality.

Option 3: The amount of surface water managed by the OCC will not be altered from its current level. Groundwater will not be affected except for the negligible amount of water utilized by the new landscape.

The OCC will remain susceptible to urban contaminants introduced by surface flooding. In addition, attempts to improve the banks for pedestrian and bikers is likely to draw more people into the area. Thus, a greater potential will be present for litter to be thrown directly into the canal or along the banks.

Option 4: There will be no changes in flow of surface and groundwater in the area. The quality of the water will continue to decline. Furthermore, the trash at the base of canal will continue to accumulate, lending to further contamination of the water.

Flooding

Option 1: Since the OCC functions as a flood control device maintaining a small amount of water, covering the canal would not significantly affect normal water flow. However, large amounts of precipitation may result in unforeseen problems in the Arizona Canal's susceptibility to flooding as well as the natural runoff that occurs in neighborhoods surrounding the entire canal system.

Because the OCC functions as a natural drainage route, runoff that usually finds its way into the canal may be subject to ponding or dispersion in adjacent areas that are not designed to handle large amounts of water. The re-routing of this runoff could ultimately cause severe flooding and endanger public safety.

However, due to the arid climate and the low average precipitation in the valley, the OCC is likely to remain dry for the greater percentage of the year. In summary, there is a great potential for widespread damage if specific situations arise, but a small likelihood that those situations will occur.

Option 2: The capacity of the OCC to carry water will be increased by lining it with concrete. Therefore, the canal's efficiency as a flood control device for the Arizona and Grand Canals will increase, diminishing the likelihood of flooding problems.

Option 3: By clearing the trash, debris, brush, and vegetation which currently lies in the OCC, the capacity of the canal to function as a flood-control mechanism will be improved due to the fact that water will be able to flow unobstructed. In this aspect, the canal will not function as efficiently as it would be if lined with a concrete channel (Option 2), but its capacity will be significantly improved.

Option 4: The problems associated with flooding will remain unsolved. Due to the OCC's relatively low capacity to handle runoff during times of heavy precipitation, problems have occurred in the adjacent neighborhoods including overtopping and ponding, causing property damage and interruption in the flow of traffic throughout the area. These problems will continue to persist.

Soil

Option 1: As the new landscape is implemented on the surface, the chances for erosion will decrease dramatically. The canal will no longer be so susceptible to soil degradation caused by wind and water as the new vegetation provides a base around which soil may become more permanent.

In addition, the quality of the soil will increase. Instead of supporting a barren desert landscape, the soil will have to support a planned park environment. The demands upon the soil will vary depending on the type of landscape used (xeriscape, lush grass playing fields, etc.), but the overall quality of the soil will increase regardless of the scheme.

Option 2: Lining the channel with concrete will eliminate the occurrence of erosion on the canal banks. Soil in adjacent areas and in the surrounding linear park would be improved to some degree, depending upon the type of park scheme implemented. Soils may also be affected adversely by the consistent recreational use of the area, leading to surface erosion.

Option 3: Leaving the canal unpaved will expose the soil during times of low water flow. This will increase chances for erosion due to wind. However, soils studies of the canal indicate a low susceptibility to wind or water erosion. The vegetation of the banks will also help stabilize the soil and reduce the amount of wind and water which cause erosion.

Option 4: If the canal is left unpaved, soil will continue to be exposed to the elements, especially during times of drought, and may become more susceptible to damage caused by wind and water flow. Furthermore, erosion of the canal banks caused by wind and water flow will continue due to the lack of any kind of protection such as vegetation. In the hot and dry climate, dust and dirt will continue to circulate in the surrounding areas.

Vegetation

Option 1: All native material that has grown within the canal before its covering will be destroyed by the concrete channelization of the canal bed. The native growth of a barren desert landscape within and adjacent to the canal will be replaced by a planned environment. The new vegetation will be designed for recreational use and will reflect an appropriate aesthetic character for a linear park.

The planting along the park will provide relief from the urban monotony associated with a heavily developed area. It would not only act as a visual boundary, but would provide an identifiable area of social interaction.

Option 2: The amount of vegetation in the area will increase as a new landscape scheme is implemented along the edges of the canal to provide shade and increased comfort for pedestrians using this area.

Option 3: The preservation option will increase the amount of vegetation within the area. There are a number of options available, ranging from lush green fields to a more environmentally conscious xeriscape.

Option 4: The amount of vegetation in the area will remain the same. The need to provide vegetation to mitigate soil problems will remain unaddressed.

Wildlife

Option 1: The species which currently reside and migrate in and near the canal will be disturbed. Although new habitats will be created as the park is implemented, the habitats and niches of many native species will be destroyed.

Option 2: The number of small animal habitats within this area will increase. By implementing a new landscape scheme, the necessary food and shelter for many new habitats will be become available throughout the area.

Option 3: Planting additional vegetation in an area will often lead to population growth in wildlife by providing food and shelter necessary for animal habitats and survival in an urban area.

Option 4: The habitats currently supported by the canal will remain undisturbed.

Social Environment

Culture

Option 1: By covering the OCC and providing a linear park above its path, its significance, both historically and technically, are hidden from sight. One of the major cultural considerations that would be ignored with the implementation of this alternative would be the historical significance of the canal in terms of the archaeological sites located within the area. The OCC is important not only in understanding the agricultural development within the valley throughout history, but also in comprehending the Native American influences on land and development.

Development of this alternative could also provide a center for cultural activities such as the formation of interpretive centers, public art exhibits, and community education centers.

Option 2: The creation of a linear park will stimulate increased recreational and cultural uses. These uses may include cultural activities such as arts and crafts festivals as well as passive recreational uses such as biking, running, or walking. However, with these relatively intense uses comes the possibility of conflicts with the surrounding residential communities. These conflicts include noise, traffic, and a lack of privacy for people living near the canal.

Option 3: This option will preserve the historical significance of the canal in the early development of the Phoenix metropolitan area. The improvements to the canal will be minimal and will not significantly alter the character of the canal.

In addition, successful improvement of the canal banks will draw people with different cultural backgrounds into an area where they will have a common ground with one another. It will create an area for social interaction between residents of the area and visitors.

Option 4: The no-action scenario fails to address the need to create a common space in which interactions between neighbors, visitors, and friends could occur. However, those activities which the canal currently supports will continue to be supported. The cultural environment will remain unchanged.

Economic Development

Option 1: Re-channelization of the canal with a surface park could encourage development by creating an open space system capable of linking key commercial and residential centers. The park could act as a unifying mechanism rather than separating the adjacent communities as a dividing barrier.

Option 2: The canal's potential for recreational activity will increase business in the surrounding area. This option has the tendency to attract people to the area, which could be utilized to the advantage of commerce.

Option 3: The attraction of the canal as an area of recreation will draw more people into the area. These people can be expected to visit nearby businesses and restaurants more than they do now. This would bring a small increase in revenue to the area.

Option 4: The opportunity to create something which draws people and their financial resources will continue to be ignored. Although the canal could provide great opportunities for increased revenues, this option would not take advantage of them.

Adjacent Land Uses

Option 1: The creation of the park has both positive and negative opportunities. While its implementation offers great opportunity for commercial activity due to increased traffic throughout the area, this traffic may prove to be a source of conflict for those in residential areas. Additional noise and the possibility of increased crime are both critical concerns which must be addressed.

In addition, there are already two parks nearby. Papago Park is located approximately one mile southeast of the site and Squaw Peak Park is several miles northwest.

Option 2: The addition of a linear park along the edges of the canal may lead to conflict with the residential districts. Residents may face increased traffic, noise, and lack of privacy. However, some residents may appreciate the convenience of a park in their backyard. The addition of the park will stimulate activity and profits in nearby commercial districts as more people come into the area. Furthermore, by building a park, the property values of the residences in the surrounding neighborhoods will most likely appreciate.

Option 3: Some of the residents in adjacent neighborhoods have expressed concern over an increase in people using what is essentially their back or front yards. This option could heighten their concerns and opposition. Parking along the front of the residences can cause further aggravation. Noise levels will also be expected to increase in the immediate area.

Option 4: The property values and land uses in adjacent neighborhoods would not be changed in the immediate future. However, due to continuing deterioration of the OCC, there may be a negative impact on the properties in the surrounding neighborhoods on a long-term basis.

Recreation

Option 1: This alternative provides a place of social interaction that links currently isolated neighborhoods. The physical barrier created by the canal is transformed into an activity center for all ages. The creation of a park atmosphere would not only provide a corridor through Phoenix, Tempe, and Scottsdale, but would effectively complete the MCA proposed Crosscut Canal Loop. This alternative would not only provide for recreational activities such as bicycling, walking, and jogging, but would be expanded to include passive recreation. The park could also accommodate public art exhibits, equestrian trails, and public art centers linked to the surrounding communities.

Option 2: The canal provides a convenient path for pedestrians wishing to bicycle, walk, or run along the canal from Scottsdale to Phoenix. Pedestrians would not only enjoy recreational uses, but also the tranquillity of flowing water. The added landscape and shade would enhance the area.

Option 3: The designation of the OCC as an integral part of the MCA's recreation plan makes this option viable, although the character of the proposed plan may be more suited to the linear park option. However, by preserving the canal and providing a landscape scheme, the character will be improved for recreational use.

Option 4: As the condition of the OCC continues to deteriorate, the number of people using the area for recreation may decrease if joggers, walkers, and bicyclists find the area less and less attractive.

Safety

Option 1: The problems associated with the safety of those participating in recreation near the canal will be totally eliminated. The only safety-related problems which may exist would concern the connection with the adjacent canals and their accessibility.

Option 2: By providing a linear park and a vegetative buffer separating the recreation areas from the canal, the safety of the canal will be significantly improved. The degree of safety would depend upon the type of buffer implemented.

Option 3: By enhancing the immediate area and providing amenities to stimulate recreational use, more people will be present in the area. This dictates the need to provide a buffer separating the canal and the adjacent recreational areas. Once again, the degree of safety depends on the type of buffer, whether it is a fence or simply a line of vegetation.

Option 4: The need to provide a buffer to restrict access and prevent people from falling into the canal will remain unaddressed. The area will continue to be a dangerous place for children and adults to walk, jog, and bicycle.

Visual Resources

Option 1: Although the water flowing in the OCC is not of any great quantity, the psychological effect of water on people and their attitudes about an area remains a critical concern. Covering the canal will ultimately strip the environment of the revitalizing effects of water in the desert. The sound, smell, and sight of water plays a vital role in how one views the environment. Due to the extent to which the Phoenix metropolitan area is urbanized, it is important to preserve the canal as a psychological amenity that will ultimately nurture both the human and natural environments.

Option 2: The maintenance of the canal as an open channel would enhance the character of the canal. The preservation of such corridors will lend to the revitalization of both the human and natural environments.

Option 3: As the canal is preserved and minor modifications made, its visual character as a historically significant waterway will be preserved. The significance of the OCC as a natural, unlined channel will be respected and the visual character improved by the preservation option.

Option 4: The visual character of the OCC as a historic feature, rugged and untouched by modern industrial society will remain. In this aspect, the no-action option provides a positive contribution to visual resources. However, the same canal is seen by some to be a barren, dry, and ugly eyesore. In this sense, this option fails to address the opportunity to create visual beauty.

Noise

Option 1: The noise currently generated from the water running in the canal will most likely diminish since the channel will exist underground. However, as more people use the area as a recreation space, additional noise will be generated. This may prove to be a source of conflict with residents in adjacent neighborhoods. Citizen participation should be encouraged to assure the satisfaction of everyone involved.

Option 2: As the use of the canal is increased with the park implementation, an increase in noise levels may occur. Many recreational users will be attracted to the canal, which may cause conflicts with property owners in the adjacent areas.

Option 3: The impact of this option would not change the noise level. Although there is an opportunity for the traffic to increase as the visual character of the area is enhanced, the noise generated will most likely be minimal.

Option 4: The noise levels in adjacent areas will remain unchanged. The only significant noise comes from the flow of water and those using the area for recreation.

Financial Aspects

Option 1: This alternative is the most expensive due to the investment required for its completion and maintenance. The covering of the canal along with the creation of a linear park are time, labor, and material intensive. In addition, consideration must be given to the cost of maintaining not only the linear park, but the channel beneath the park, for the lifetime of the project. Projected over a long period of time, this option's cost may outweigh its possible benefits.

Option 2: Consideration of the extensive costs involved in the creation of a linear park must be taken into account. This option would demand less investment than the underground channel option, but would still involve substantial funding both in the initial construction and the maintenance of the park facility.

Option 3: This option requires minimal investment in landscape materials and minimal labor to install and maintain them.

Option 4: The no-action scenario requires no investment. However, the negative financial impacts associated with the delay of improvements to the area will persist, possibly resulting in higher costs in the long-term.

Environmental Consequences Matrix

Following is a matrix summarizing the key aspects of the environmental consequences associated with each of the four options. Each summary is given a rating based on the nature (positive or negative) and the magnitude (1=least, 10=most) of its effect.

	Option 1 Underground Channel	Option 2 Surface Channel	Option 3 Preservation	Option 4 No Action
Physical Environment				
Climate	Depends upon the type of landscape implemented. Xeriscape would not change the climate, but others would cause slight reduction in temperature and create additional shade.	Addition of concrete would cause temperature increases from solar reflection; vegetation could create additional shade and reduce temperatures	Addition of vegetation could alter the microclimate slightly. If implemented vegetation includes trees large enough to cast substantial shadows, cooler temperatures may result.	The climate will remain unchanged. The need to provide shade to attract people and create a pleasant environment will remain unaddressed.
Water	The ability of the canal to handle overflow will be eliminated; the quality of the water will be improved since the possibility of waste entering the stream at surface points is eliminated.	The capacity of the canal to handle high levels of flow will increase since the water will be conveyed through a concrete channel without obstructions such as dirt, vegetation, etc.; the canal will still be susceptible to surface dumping	By removing many of the obstructions currently existing in the canal, its capacity to handle increased flow will be improved; however, by attracting more people to the area, the likelihood of deliberate dumping will increase	Ability of the canal to handle flow will continue to decrease; water quality in the canal will continue to decline; accumulation of trash will continue to occur
Flooding	May be the cause of severe problems if overflow does occur; however, the likelihood of this occurring is very obscure	Capacity of the canal to handle increased flow will be improved, reducing the chances of flooding in adjacent areas.	By removing the obstructions, water will be conveyed more effectively and the chances of flooding will decrease.	Flooding will continue to be a problem in the area
Soil	Erosion will not occur as frequently; soil quality will be improved	Surface erosion may continue to occur adjacent to the canal, but the park scheme would lead to improved conditions	Soil will continue to be exposed during times of low flow, leading to increased chances of erosion; enhancement of the surrounding area will result greater soil quality.	Erosion of the canal banks from wind and water flow will continue due to the lack of any kind of protection from vegetation, etc.
Vegetation	Much of the native vegetation will be destroyed by the construction of the underground channel and replaced by a planned environment.; the new scheme will provide a place of social interaction.	As the new scheme is implemented, additional landscaping will be added and the quality of the area improved.	The amount and quality of vegetation will increase, whether from a xeriscape or traditional scheme.	The need to provide vegetation and address related social issues will remain unaddressed.
Wildlife	Species currently inhabiting the canal and adjacent areas may be displaced; new habitats will be created by the park-environment.	(Same as Option 1)	Additional vegetation of the area could provide additional habitats, and food for wildlife.	Habitats currently supported by the canal will remain undisturbed.

	Option 1 Underground Channel	Option 2 Surface Channel	Option 3 Preservation	Option 4 No Action
Social Environment				
Culture	The historical and cultural significance of the canal will be hidden from sight; could function as a cultural hub for social interaction.	Linear park will stimulate additional social and recreational use	Will preserve the historical significance of the canal; improvements will be minimal and will not significantly alter the character of the canal, creating an area conducive to social interaction.	Fails to address the need to create a common space for social interactions.
Economic Development	Would encourage development in the surrounding areas by creating an open space system linking commercial and residential centers.	Potential for recreational activity will increase the potential for successful commerce.	The attraction of people to the area for recreation may lead to increased revenues for surrounding businesses	Opportunity to stimulate economic development in the area will be ignored.
Related Land Uses	May lead to opportunities for commercial activity, but increased traffic may prove to be a source of conflict for residents in adjacent areas; there are two parks within just a few miles.; property values in adjacent areas may appreciate.	(Same as Option 1)	Residents in adjacent neighborhoods may express concern over increased traffic in the area.	There may be a negative impact due to the canal's deteriorating condition.
Recreation	Provides a place for recreation, but there are already two parks nearby; will help complete the MCA's crosscut loop.	(Same as Option 1)	Would create an area suitable for recreational activity; would maintain historical integrity.	Declining condition of the canal will eventually result in less recreational activity in the area.
Visual Resources	Creation of the park will improve the visual character of the area; effects created by water's presence would be eliminated.	Would enhance the visual character of the canal as the park scheme is implemented.	Rugged visual character and integrity will be maintained	Rugged character and integrity would be maintained, but the site's need for some improvements will remain unaddressed.
Noise	Additional pedestrian & vehicular traffic in the area would lead to increased noise levels.	(Same as Option 1)	(Same as Option 1)	No change would occur in terms of noise levels.
Financial Aspects	Very expensive to implement due to both initial construction and maintenance costs	Expensive to construct, but may mitigate future problems.	Minimal expenses involved in clearing of obstructions and improvements in adjacent area.	No initial costs, but long-term costs due to flooding and declining conditions may be tremendous

Appendices

ACRONYMS

ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
cfs	cubic feet per second
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
HAER	Historic American Engineering Record
MCA	Metropolitan Canal Alliance
MCFCD	Maricopa County Flood Control District
NEPA	National Environmental Policy Act
OCC	Old Crosscut Canal
SRP	Salt River Project

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