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DRAFT ENVIRONMENTAL ASSESSMENT
AK-CHIN OPTION AND LEASE AGREEMENT

Prepared by

Jones & Stokes Associates, Inc.
Sacramento, CA

for

U.S. Bureau of Reclamation
Phoenix Area Office
Lower Colorado Region
Phoenix, AZ



June 1997



United States Department of the Interior

BUREAU OF RECLAMATION

Phoenix Area Office
P.O. Box 9980
Phoenix, Arizona 85068-0980

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To: All Interested Persons, Organizations, and Agencies

From: Dennis E. Schroeder
Area Manager

Subject: Draft Environmental Assessment (EA) on the Provision of Leased Ak-Chin Indian Community Water to Del Webb Corporation for Use at The Villages at Desert Hills, Maricopa County, Arizona (Due Date July 14, 1997)

Reclamation has prepared a draft EA for the Ak-Chin Option and Lease Agreement. A copy of the EA is attached for your information. The EA describes anticipated environmental consequences of providing leased Ak-Chin water to the Del Webb Corporation (Del Webb). Del Webb plans to pipe the leased water and treat it for use as a drinking water supply for a master planned community, The Villages at Desert Hills (Villages). The Villages is located approximately 3 miles north of Carefree Highway and 7 miles east of Lake Pleasant, in Maricopa County, Arizona.

The EA has been prepared consistent with the National Environmental Policy Act (NEPA). NEPA applies to Federal actions, or actions that involve Federal funds. Reclamation's first step in determining the appropriate scope of the NEPA document was to identify the factors of the existing environment that might influence or be affected by the Federal action. Based upon information provided by Del Webb, Reclamation has concluded it is reasonable to assume a non-Federal water supply source would be obtained for use at the Villages in the absence of the Ak-Chin water lease agreement. Therefore, Reclamation concluded the Villages would not be a consequence of Federal approval to provide leased water to Del Webb.

The EA, therefore, focuses on the impacts from the water delivery pipeline and treatment facilities needed to use the Ak-Chin water source. A "no action" alternative is also included in the EA. The no action alternative in a NEPA document represents the most reasonably foreseeable future responses or conditions that are likely to occur during the life of the project as a result of the EA's proposed action not being taken. It provides the basis upon which impacts from the proposed action can be compared. In the EA, impacts of the Villages are identified as part of the no action alternative and are generally described.

Reclamation will take into consideration any public comments received on the adequacy of this draft assessment prior to determining whether a Finding of No Significant Impact (FONSI) is appropriate, or an environmental impact statement (EIS) must be prepared. To be most helpful, comments on the adequacy of the EA should be as specific as possible regarding statements found in the EA that the reader believes are incorrect, including the reasons why the reader believes they are incorrect.

In association with the public comment and review period, we will be holding a public hearing on June 28, 1997. This hearing will be held at 10:00 a.m. at the New River Elementary School, 48827 North Black Canyon Highway, New River, Arizona. The format of the hearing will be similar to that followed at the November 2, 1996, scoping meeting. A court reporter will be present to record those wishing to provide oral comments at the June 28th hearing. If you need an interpreter or other assistance because of a disability, please contact Ms. Susan Pierce of Jones & Stokes Associates at 602-852-9772, or faxogram 602-852-9187, no later than June 18, 1997.

Please submit any written comments to Mr. Bruce Ellis, Chief, Environmental Resource Management Division, PO Box 9980, Phoenix, Arizona 85068-0980, Attention: PXAO-1500, prior to July 14, 1997. After the review and comment period has ended, we will consider all public comments received, both at the public hearing and in writing, prior to preparing a final EA. We will then determine whether an EIS needs to be prepared, or issuance of a FONSI is appropriate.

Thank you for your interest in this project. Should you have any questions regarding this matter, please contact Ms. Sandy Eto of my staff at 602-395-5688, or faxogram 602-395-5733.

Attachment



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DISCLAIMER

Pursuant to the requirements of 40 CFR Section 1506.5, Jones & Stokes Associates declares under oath that it has no interest, financial or otherwise, in the outcome of this project.

David A. Hane
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Phil Dunn
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6/5/97

Date

This document should be cited as:

Jones & Stokes Associates, Inc. 1997. Environmental assessment for the Ak-Chin option and lease agreement. Draft. June. (JSA 96-236.) Phoenix, AZ. Prepared for U.S. Bureau of Reclamation, Phoenix, AZ.

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List of Acronyms and Abbreviations

ACHP	Advisory Council on Historic Preservation
ADA	Arizona Department of Agriculture
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADT	average daily traffic
ADWR	Arizona Department of Water Resources
AGFD	Arizona Game and Fish Department
af	acre feet
af/yr	acre-feet per year
AMA	Active Management Area
APC	Maricopa County Environmental Services, Department of Air Pollution Control
APS	Arizona Public Service
BLM	U.S. Bureau of Land Management
CAGR	Central Arizona Groundwater Replenishment District
CAP	Central Arizona Project
CAWCD	Central Arizona Water Conservation District
CEQ	Council on Environmental Quality
cfs	cubic feet per second
CO	carbon monoxide
Corps	U.S. Army Corps of Engineers
dB	decibels
dBA	A-weighted decibel
Del Webb	Del Webb Corporation
DMP	Maricopa County Development Master Plan
EA	environmental assessment
EIS	environmental impact statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FCDMC	Flood Control District of Maricopa County
FEMA	Federal Emergency Management Agency
FONSI	finding of no significant impact

List of Acronyms and Abbreviations

I-17	Interstate 17
ITF	Integrated Turfgrass Maintenance
kV	kilovolt
L _{dn}	day-night average sound level
M&I	municipal and industrial
MCDOT	Maricopa County Department of Transportation
msl	mean sea level
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
NO _x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	U.S. Natural Resources Conservation Service
NRLP	New River Land Use Plan
NUPD	Neighborhood Unit Plan of Development
PM10	inhalable particulate matter less than 10 microns in diameter
ppm	parts per million
Reclamation	U.S. Bureau of Reclamation
ROG	reactive organic gases
ROW	right-of-way
Settlement Act	Ak-Chin Settlement Act
SHPO	State Historic Preservation Officer
SIP	state implementation plan
SLD	State Land Department of Arizona
tpy	tons per year
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
The Villages	Villages at Desert Hills master planned community
WSCA	wildlife of special concern
µg/m ³	micrograms per cubic meter

Section 1.0 Purpose and Need

1.1 INTRODUCTION

The Ak-Chin Indian Community (Community), United States of America, and Del Webb Corporation (Del Webb) have entered into an Option and Lease Agreement that would allow the Ak-Chin Indian Community to lease between 6,000 and 10,000 acre-feet per year (af/yr) of water to Del Webb for 100 years. Delivery of water under the Option and Lease Agreement requires completion of appropriate environmental review under the National Environmental Policy Act (NEPA).

Del Webb plans to transport the leased water by constructing a 9-mile-long pipeline from Waddell Canal south of Lake Pleasant to a future master planned community—The Villages at Desert Hills (The Villages)—that would be located approximately 3 miles north of the Carefree Highway (State Route [SR] 74) and 7 miles east of Lake Pleasant in Maricopa County, Arizona. The pipeline system would include a turnout structure at Waddell Canal, a small pumping plant, pretreatment facilities, the transmission pipeline, storage tanks, and a water treatment plant.

1.2 PURPOSE OF AND NEED FOR ENVIRONMENTAL ASSESSMENT

Background

In 1984, Congress enacted Public Law 98-530, the Ak-Chin Settlement Act (Settlement Act), which directed the Secretary of the Interior to deliver 75,000 acre-feet (af) of surface water annually to the Ak-Chin reservation at no cost to the Ak-Chin Indian Community. Colorado River water delivered through the Central Arizona Project (CAP) was specified as the source of the water. To implement the Settlement Act, the United States and the Community signed a contract in 1985 to provide permanent water and settle interim water rights. In 1992, Congress amended the Settlement Act to permit the Community to lease or exchange settlement water for beneficial use within the Pinal, Phoenix, and Tucson Active Management Areas, for periods not to exceed 100 years. In 1994, the Ak-Chin Indian Community, United States of America, and Del Webb agreed to an Option and Lease Agreement for provision of between 6,000 and 10,000 af/yr of leased settlement water. Del Webb had not yet finalized its plans for taking and using the leased settlement water; however, to provide for federal environmental review and clearances before water delivery and to proceed with federal approval of the Option and Lease Agreement, the following clause was added to the agreement to ensure that adequate environmental review requirements under NEPA would be met:

NEPA Compliance. Notwithstanding any other provision of this Agreement, Leased Settlement Water shall not be delivered to the Company unless and until the Company has obtained final environmental clearance from the United States. Final environmental clearance will be based upon an analysis of the environmental impacts of the Company's plans for taking and using Leased Settlement Water, in accordance with the National Environmental Policy Act of 1969 (83 Stat. 852) and other applicable environmental legislation. Any action(s) required on behalf of the Company in order to obtain final environmental clearance from the United States will be identified to the Company by the United States, and no Leased Settlement Water shall be delivered to the Company unless and until the Company has completed all such action(s) to the satisfaction of the United States. The cost of all such action(s), including the cost of review and oversight by the United States, shall be borne by the Company at no cost to the United States. The above requirements shall also apply to any new points of diversion of the Leased Settlement water proposed by the Company.

In December 1996, Del Webb chose to exercise its option to lease 10,000 af/yr. Del Webb also developed plans for taking and using the settlement water. The U.S. Bureau of Reclamation (Reclamation) has determined that an environmental assessment (EA) according to NEPA should be prepared to determine whether a finding of no significant impact is appropriate or if an environmental impact statement (EIS) should be prepared.

Purpose of this Environmental Assessment

This EA has been prepared to assess and disclose the environmental consequences of Reclamation's provision of leased settlement water under the Option and Lease Agreement. The EA addresses direct, indirect, and cumulative effects of the federal action. Because NEPA applies only to federal actions, the first step in determining the scope of the EA is to identify factors of the existing environment that might influence or be affected by the federal action. For Reclamation, this meant determining whether or not development of The Villages would be a consequence of the federal approval to provide leased water to Del Webb. Del Webb has identified alternative water supply options that could be used in the absence of receiving the leased Ak-Chin settlement water (Appendix A). Based on a review of these options, Reclamation believes it is reasonable to conclude that development of The Villages would occur in the absence of the proposed federal action. Please refer to the discussion of the No-Action Alternative in Section 2, "Proposed Action and Alternatives".

The No-Action Alternative, which describes the conditions that are assumed to exist in the absence of the federal action, provides the basis for comparing the environmental effects of the proposed action. Because The Villages could be developed in the absence of the federal action, Reclamation is focusing its evaluation of the proposed action in this EA on the impacts associated with construction of the water delivery and treatment facilities needed to take and use leased settlement water. Factors of the existing environment that are addressed in determining the impacts of construction of the water delivery and treatment facilities include:

- biological resource effects, including loss of desert habitat and impacts on plant and wildlife species, including special-status species;
- historic and Indian trust assets effects, and prehistoric cultural resource effects;
- water resources effects;
- air quality and noise effects;
- traffic and circulation effects; and
- land use, visual resource, and environmental justice effects.

The EA was prepared in compliance with NEPA, Council on Environmental Quality Regulations (40 CFR, Parts 1500-1508), Reclamation's NEPA Handbook (U.S. Bureau of Reclamation 1990), Floodplains and Wetlands Executive Orders 11988 and 11990, the federal Endangered Species Act (ESA) (PL 93-205, as amended), the National Historic Preservation Act (NHPA) (16 USC 470), and the Clean Water Act (33 USC 1251 et. seq.).

1.3 PURPOSE OF AND NEED FOR THE WATER LEASE

The purpose of the proposed water lease is to provide a surface water supply leased from the Ak-Chin Indian Community to Del Webb. Del Webb intends to use the leased water at a master planned community known as The Villages located approximately 3 miles north of Carefree Highway and 7 miles east of Lake Pleasant in Maricopa County, Arizona. Del Webb will deliver water to The Villages by constructing a 9-mile-long water delivery pipeline from Waddell Canal to the site.

The Ak-Chin Option and Lease Agreement is one option available to Del Webb for providing a reliable water supply for The Villages master planned community. An alternative to groundwater is needed to prove the existence of an assured water supply under regulations promulgated by the Arizona Department of Water Resources (ADWR), to avoid adverse effects on groundwater resources in the development area and to meet Maricopa County Development Master Plan (DMP) Stipulation "r" for The Villages development. Stipulation "r" allows groundwater in the development area to be used by Del Webb only on an interim basis during early construction and for County and public uses until a permanent water supply system is completed and hookup is available. Stipulation "r" was added to the conditions of the DMP by the Maricopa County Board of Supervisors because of the concern of New River and Desert Hills residents about limited groundwater supplies in the development area. The Arizona Groundwater Management Code, which is administered by the ADWR, also sets limits on who can use groundwater, how much can be withdrawn, and where it can be used. ADWR regulations governing the demonstration of assured water supplies are intended to preclude the use of groundwater in new developments such as The

Villages, unless the groundwater is replenished with surface water. The regulations are a part of ADWR's strategy for meeting the primary goal of groundwater management in the Phoenix Active Management Area (AMA) to achieve safe yield of groundwater resources by 2025. Safe yield will occur when the rate of annual groundwater withdrawn in the AMA is less than or equal to the rate of aquifer recharge.

Section 2.0 Proposed Action and Alternatives

2.1 OVERVIEW

Public Law 98-530, the Ak-Chin Indian Community Water Rights Settlement Act, as amended, provides for a Colorado River water supply for the Ak-Chin Indian Community to be delivered through the CAP. The amended act also provides that the Ak-Chin Indian Community may lease a portion of the supply available to it for uses in Pima, Pinal, or Maricopa Counties.

The Ak-Chin Community, United States of America, and Del Webb have agreed to implement an Option and Lease Agreement that would allow the Ak-Chin Community to lease 10,000 af/yr of settlement water to Del Webb for 100 years. Under the proposed action, leased settlement water would be conveyed through the CAP and would be delivered from Waddell Canal. Del Webb plans to construct and operate a 9-mile-long pipeline with ancillary facilities from Waddell Canal to a proposed water treatment plant east of Interstate 17 (I-17) in Maricopa County.

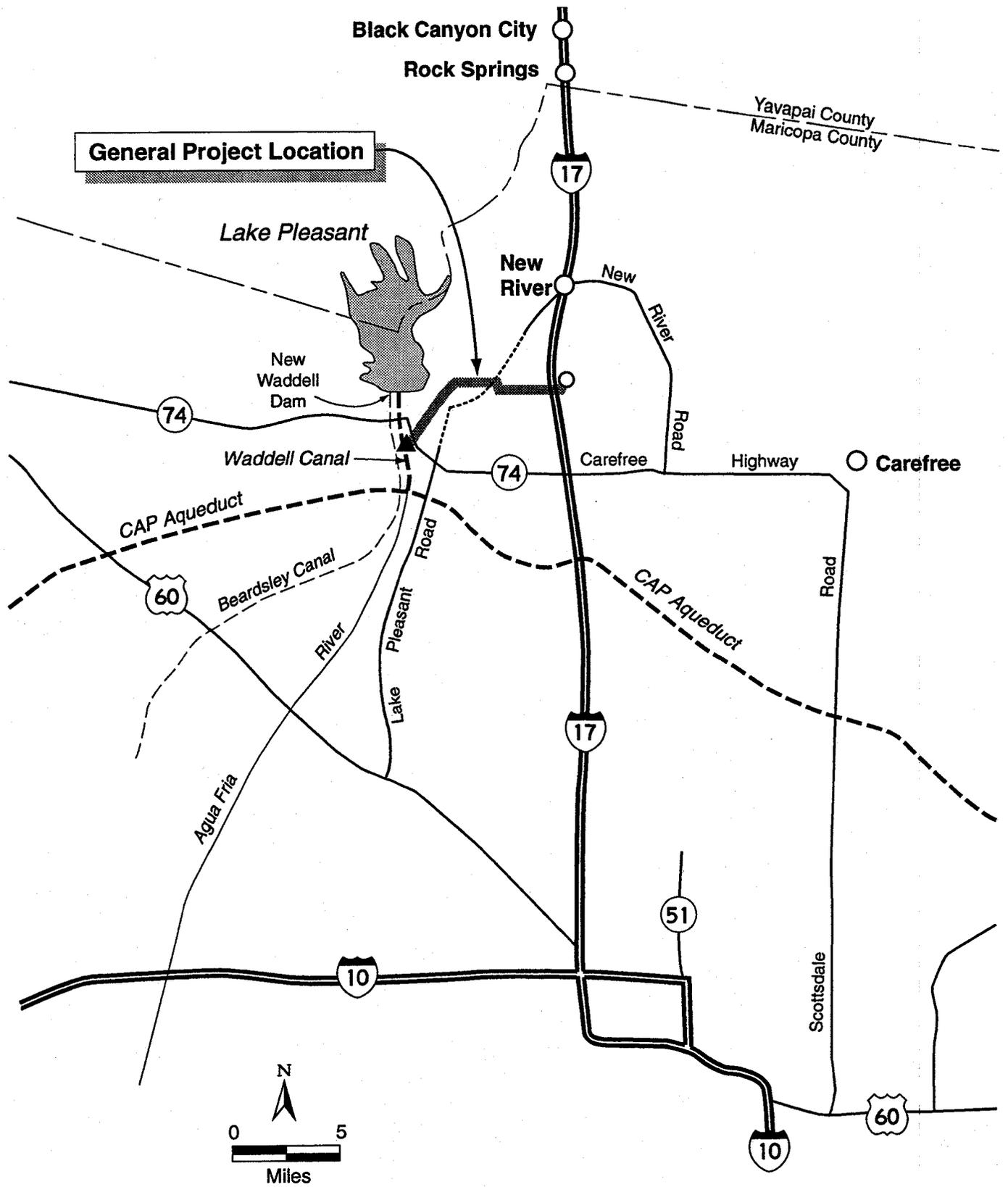
Under authority of the Colorado River Basin Act (PL 90-537), Reclamation is responsible for delivering water through the CAP. The federal action considered in this EA is Reclamation's provision of water under the Option and Lease Agreement.

2.2 PROPOSED ACTION

Reclamation proposes to provide leased settlement water under the Option and Lease Agreement to Del Webb for municipal and industrial use. Del Webb would construct water transmission facilities that would extend from Waddell Canal to a new water treatment plant (Figure 2-1). Pipeline facilities would consist of a buried pipeline with a turnout structure, pumping plant, and above-ground storage tanks at the terminus of the pipeline. The transmission pipeline and appurtenant facilities would be designed to deliver 10,000 af/yr of surface water supply.

The water delivery system would eventually be connected to a distribution system that would serve The Villages. Because alternative water supply options are available to Del Webb that do not involve a federal action, the EA assumes that development of the future master planned community would occur whether or not Reclamation provides water under the Option and Lease Agreement.

Deliveries of water from the CAP would be made pursuant to a schedule submitted annually by Del Webb to the United States and the Ak-Chin Indian Community and updated periodically to reflect the actual water demand of The Villages community. Del Webb would obtain a permit for a turnout facility from the Central Arizona Water Conservation District (CAWCD), and construct



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Figure 2-1
Regional Location of Proposed Action Facilities

the facility. An approved measurement device would be installed at the turnout. Measured flows would be continuously transmitted to the CAWCD operations center.

Water Supply Reliability

The water supply to be delivered from the CAP under the proposed action is highly reliable, both from the standpoint of legal and physical availability. The lease agreement among the Ak-Chin Indian Community, the United States of America, and Del Webb, is a legally binding document that assures that 10,000 af of Colorado River water available to the Ak-Chin Indian Community may be delivered to The Villages. The rate of delivery, if the full 10,000 af were used, may be as much as 40 cubic feet per second (cfs), which is far in excess of the maximum demand under the proposed action.

Colorado River water supplies made available to users in Arizona are delivered pursuant to contracts and laws with established priorities. Users with low priorities must reduce or stop using water if there is a shortage in Colorado River supply. Public Law 98-350 in conjunction with other federal laws and contracts, has established the priority of the Colorado River supply that must be delivered to the Ak-Chin Indian Community through the CAP facilities. The first 50,000 af of that supply is of a higher priority than any other CAP water, including that to be delivered to cities and other Indian communities and tribes. This water can be expected to be available even in times when no other water is available through the CAP. The next 25,000 af of the total 75,000 af that must be delivered to the Ak-Chin Community under normal water supply conditions is first priority CAP water. The 10,000 af of water available to The Villages will be from the 50,000 af of higher priority water. The net effect of the priority of the supply and the binding agreement that Del Webb has with the Ak-Chin Indian Community and the United States of America, is that there are no foreseeable circumstances when there will not be a full water supply to the planned community.

In addition to the dependability of a Colorado River supply, the CAP is a reliable delivery system. The canals and pumping plants are designed to allow for deliveries throughout the year without interruption for maintenance and repairs. However, unusual and unforeseen events may cause interruption of deliveries for short periods of time. The risk of interruption of deliveries under the proposed action is less than for most other CAP users because the point of delivery would be from the Waddell Canal. This location of take-out provides that water would be available from Lake Pleasant in the event that the flow of water in the CAP aqueduct from the Colorado River is interrupted. The effect is that the supply to The Villages would only be interrupted in the event of a CAP system failure west of Waddell Canal of sufficient duration to cause the CAP storage in Lake Pleasant to be entirely depleted by water demands below Waddell Canal during the period of failure.

Although the supply is highly reliable, the importance of a continuous water supply to a development the size of The Villages cannot be discounted. Options for adequate backup supplies are being evaluated and would be incorporated into the water delivery system. Included are onsite opportunities for aboveground reservoirs and aquifer storage. Any water use from wells would be from recharged water and would not adversely affect neighboring groundwater wells. The water

recharge and recovery activity would require approvals from the Arizona Department of Water Resources and Maricopa County.

The following section describes the components of the water delivery system.

2.3 WATER DELIVERY SYSTEM COMPONENTS

The water delivery system implementation would involve constructing and operating a turnout structure at Waddell Canal, a 9-mile-long transmission pipeline, storage tanks, and a water treatment plant. Total costs associated with constructing these system components would be approximately \$29 million.

Turnout Structure and Pumping Plant

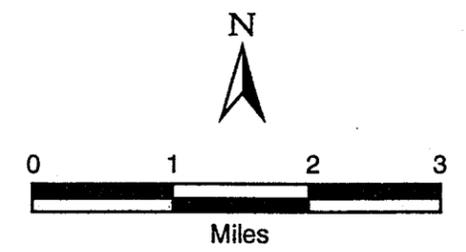
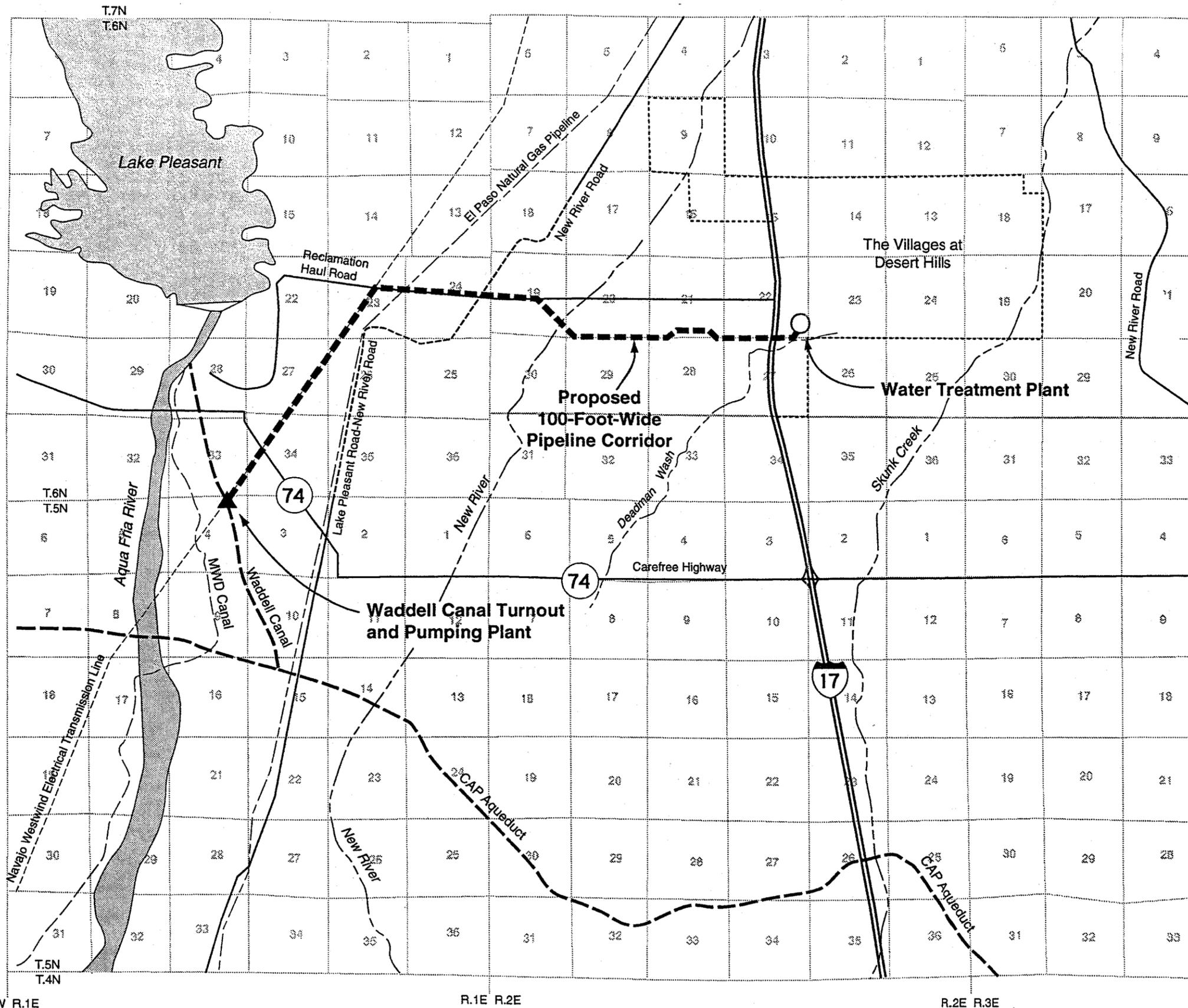
The turnout structure and pumping plant would be located on the eastern embankment of Waddell Canal at its intersection with the Arizona Public Service (APS) Navajo Westwind Project 500 kilovolt (kV) Southern Transmission Lines (electrical transmission lines) south of the SR 74 crossing (Figure 2-2) and would be used to deliver leased settlement water to the system. The turnout structure and pipeline would require a 100-foot-wide construction corridor and the pumping plant would require an approximately 150-square-foot area. To maintain existing flows within the canal during construction of the turnout, a temporary coffer dam would be constructed in the canal prior to the breaching of the canal and construction of the turnout structure. The proposed turnout structure would divert water by gravity to the pumping plant via an intake pipe. Figure 2-3 is an illustration of a typical turnout structure that could be used to divert water from Waddell Canal.

The pumping plant facilities would include a multiple bay concrete sump structure with pumping units on an operating platform. A standby diesel generation system and electrical instrumentation controls would also be included within a fenced security area. The sizes and capacities of the pumping units needed to pump water to the water treatment plant would depend on the rates of flows needed and the total dynamic head of the pumping conveyance system.

Transmission Pipeline

The 9-mile-long pipeline system would be located approximately 3 miles north of the Carefree Highway (SR 74), west of I-17, and southeast of Lake Pleasant (Figures 2-1 and 2-2). The 100-foot-wide pipeline corridor would begin at the turnout and pumping station on Waddell Canal at its intersection with the electrical transmission lines. The alignment would extend northeast from Waddell Canal on the east side of the transmission line corridor for approximately 3.3 miles to an intersection with a former haul road used by Reclamation to construct New Waddell Dam (Reclamation haul road) and then would extend east along the haul road alignment approximately

Figure 2-2
Proposed Water Delivery Facilities
under the Ak-Chin Option
and Lease Agreement

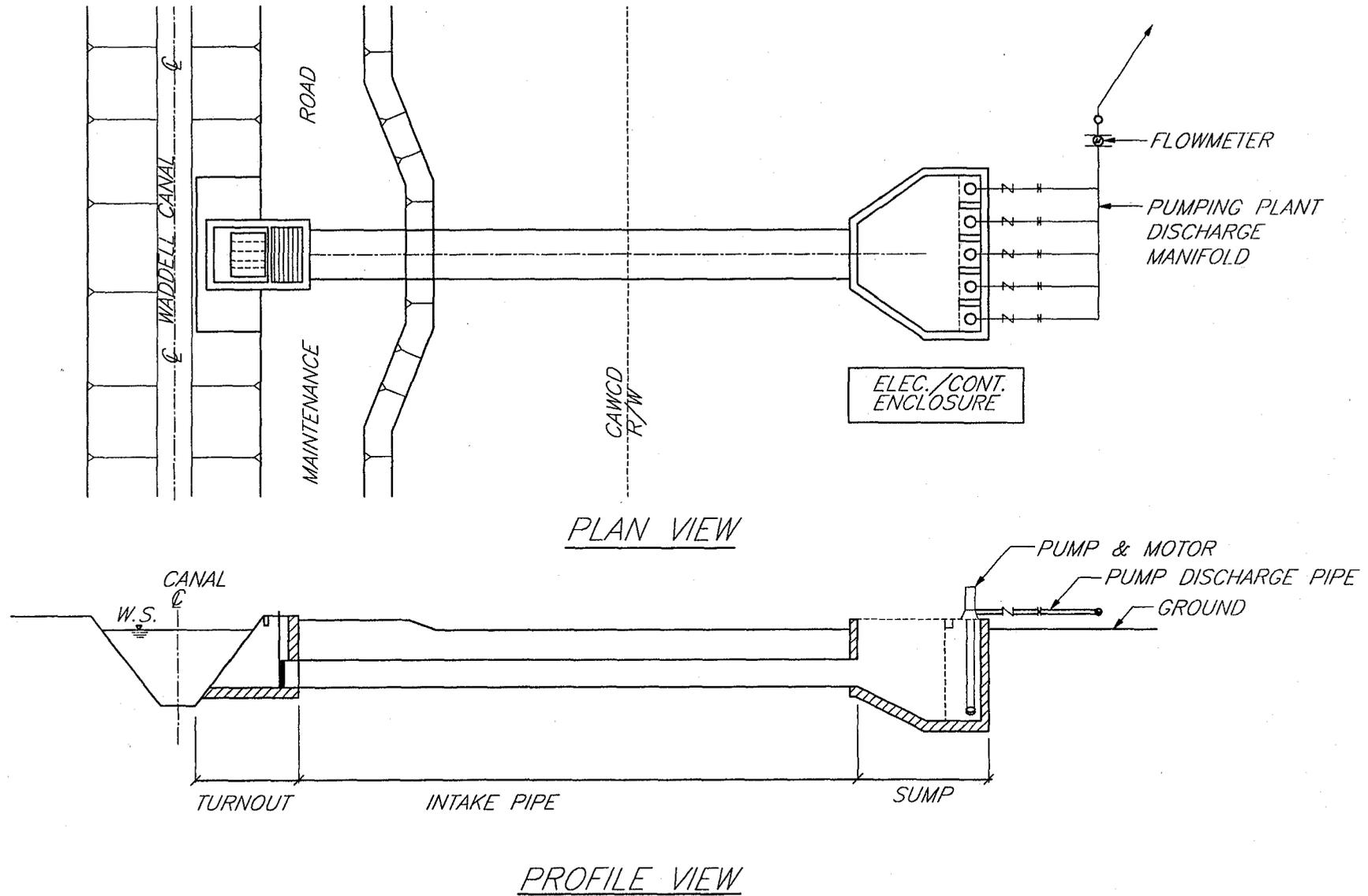


R.1W R.1E

R.1E R.2E

R.2E R.3E

2-5



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Figure 2-3
Typical Canal Turnout Structure

2.4 miles to a point approximately 0.5 mile west of New River. The alignment would then extend southeast across New River where the construction corridor would be approximately 200 feet wide. Additional corridor width is needed at New River to accommodate construction equipment in this area. East of New River, the alignment would be 100-foot wide and would extend approximately 3 miles to I-17 and beyond to its terminus at a proposed water treatment plant. The portion of the pipeline extending from the middle of Section 19 (Figure 2-2) east of New River was realigned following public scoping for the EA. (Please refer to "Alternatives Considered but Eliminated from Detail Analysis", below, for an explanation of this change.)

The pipeline would be 30-36 inches in diameter and would consist of concrete cylinder or ductile iron pipes. Nominal pipeline pressure would be approximately 150 pounds per square inch.

The pipeline would cross 6 roads (including SR 74 and New River Road), 17 minor washes, New River, an El Paso Natural Gas pipeline corridor, and I-17. The alignment topography ranges in elevation from 1,460 feet to 1,860 feet above mean sea level (msl) and stretches from near the Agua Fria River across the New River drainage to Deadman Wash. The pipeline would cross property owned or administered by Reclamation, Central Arizona Water Conservation District, Bureau of Land Management, State Land Department of Arizona, Arizona Department of Transportation, and Maricopa County Department of Transportation (Figure 2-2). Most of the 9-mile-long pipeline alignment crosses state land and would require right-of-way (ROW) easements.

Storage Tanks

The water treatment plant would require 2 million gallons of storage capacity. The storage tanks would be located upstream of the treatment plant and would be used to provide the minimum amount of storage capacity needed to maintain and regulate continuous 24-hour flows into the treatment plant.

Water Treatment Plant

The discharge point of the proposed transmission pipeline would be the 2-million-gallon storage tank located at the headworks to the proposed water treatment plant (Bookman-Edmonston Engineering 1996). A 44-acre area has been set aside in the southwest portion of the development site (Section 22) for the proposed water and wastewater treatment facilities (Figure 2-2). The potable water treatment plant would include presedimentation, coagulation, flocculation, sedimentation, filtration, chlorination, water storage, and solids-handling facilities.

The elevation of the ground surface at the proposed site of the water treatment plant is approximately 1,765 feet above msl. It would be necessary for the water supply to be delivered to the storage tank and treatment plant at about 10 feet above the ground surface elevation to provide sufficient hydraulic grade to move the water through the treatment train. The high water level of the

tank and the hydraulic elevation of the leased settlement water at the terminus of the transmission pipeline would need to be 1,775 feet above msl.

Construction and Operation

Construction of the pipeline would require space for trench excavation and backfill, pipe storage, and equipment operations. Pipe would be placed along the alignment before excavation and installation operations. A 100-foot-wide temporary construction easement is assumed for most of the pipeline alignment and appurtenant facilities. The crossing of New River and the pumping plant site would require larger construction sites (approximately 200 feet-wide). Before construction, all vegetation in the immediate vicinity of the pipeline alignment (20-30 feet) would be removed within the construction corridor and handled in accordance with state law; varying amounts of vegetation could be affected in other areas of the proposed corridor. Topsoil would be stripped from the trench area and stockpiled nearby for use during reclamation. Material would be excavated to a depth of approximately 9 feet and placed adjacent to the trench.

After the trench is excavated, a crane would pick up the pipes and position them in the trench. The construction corridor would be an adequate width to accommodate trenching pipe storage, pipe laying operations, and bedding and backfill operations. Bedding material would be placed and compacted in the trench, followed by placement of common backfill materials. Bedding material would be obtained from a local commercial source or generated by screening material that is excavated during construction. Excess materials would be spread over the disturbed area after pipeline construction and covered with stockpiled topsoil.

Pipeline construction would require crossing 17 minor drainages, and New River. These drainages do not have perennial streamflow; streamflow occurs only during brief periods of heavy thunderstorms. The pipeline would be buried below the scour depth calculated for a 100-year flood. After construction, the drainages would be restored to near-original conditions. The pipeline would be sited under I-17 and Lake Pleasant Road.

After construction is complete, a permanent 30-foot-wide maintenance easement would provide access to the pipeline.

Approximately 58% of the pipeline length would be located within or adjacent to the previously disturbed corridors of the electric transmission lines and the abandoned Reclamation haul road. The turnout structure and pumping plant would be sited on a 0.5-acre site and the pipeline construction corridor would encompass approximately 103 acres. The total area that could be affected by construction activities within the over 9-mile-long pipeline corridor is approximately 148 acres. The permanent 30-foot-wide pipeline corridor would encompass approximately 33 acres assuming that the pipeline would be 9 miles long.

Construction and operation of the water treatment plant would involve clearing up to 44 acres for the plant site and administrative and laboratory facilities. Construction of the processing area and other buildings would involve standard construction practices including construction of an

access road on the site to the treatment plant. The water treatment facilities would be automated to reduce operator dependence and ensure operation reliability. Backup power supply also would be provided to ensure operation reliability.

The delivery facilities would be owned and operated by a water company to be established to serve The Villages. The water company could be a subsidiary of Del Webb or another water supply entity. The pumping plant would be operated remotely.

2.4 NO-ACTION ALTERNATIVE

The No-Action Alternative represents the conditions that are assumed to exist in the absence of the proposed federal action and provides a basis for comparison with the proposed action. Under the No-Action Alternative, Reclamation would not provide water under the Option and Lease Agreement, and the specific water delivery and treatment facilities described in connection with the proposed action would not be constructed.

Del Webb has identified alternative water supply options that could be used in the absence of Leased Settlement Water and without the need for Reclamation approval. These water supply options are described in Appendix A. Based on this information, Reclamation believes it is reasonable to conclude that development of The Villages would occur in the absence of the proposed action. Similarly, Reclamation assumes that a water delivery system would be constructed to serve The Villages even if the proposed action is not pursued.

Because Reclamation has concluded that development of The Villages would occur regardless of whether the proposed action occurs, The Villages are included in the discussion of the No-Action Alternative, which represents the conditions that are assumed to exist in the absence of the proposed federal action. The discussion of The Villages in Section 3 includes a description of the affected environment of the proposed Villages development site and a summary of environmental issues related to development of The Villages. To ensure that no confusion is created about what constitutes the "affected environment" of the pipeline corridor, existing conditions, information, and environmental issues for The Villages are summarized together under the No-Action Alternative heading in the "Environmental Consequences and Mitigation Measures" sections of each topical resource area. The environmental consequences of The Villages also are summarized in Section 3.9 in the discussion of the cumulative impacts. The Villages will constitute part of the background of past, present, and reasonably foreseeable future actions against which the incremental effects of the proposed action will be assessed.

Because Reclamation has concluded that a water delivery system would be constructed to serve The Villages even if the proposed action is not pursued, the alternative water supply options identified by Del Webb are considered as part of the No-Action Alternative. For ease of analysis in examining the environmental effects of the No-Action Alternative, water supply Option 1 (provision of water service to The Villages by the City of Phoenix) has been selected to represent the various alternative water supply options, and is described in greater detail in order to identify the kinds of effects that may occur with any of the alternative water supply options.

Water Supply Option 1

Under water supply Option 1, as described in Appendix A, the City of Phoenix would provide water service to The Villages from the City's existing water supply system through a series of pipeline extension agreements. The City's distribution system and service area would be extended to include The Villages. The distribution system under this option would involve connecting The Villages water supply pipeline to a 66-inch transmission line adjacent to Deer Valley Road that delivers treated City system water to areas west of 35th Street. The connection point would be just east of I-17 at Deer Valley Road, and from there, the pipeline would extend north on the eastern side of I-17 for approximately 12 miles to The Villages development area. The pipeline would be parallel and adjacent to the I-17 right-of-way and would consist of a 24-inch diameter pipeline from Deer Valley Road to Carefree Highway and a 36-inch diameter pipeline from Carefree Highway to The Villages development. A booster pumping plant located south of Happy Valley Road would be necessary to deliver the treated water. A water treatment plant on The Villages site would not be required under this option.

The Villages at Desert Hills

The Villages is a proposed 5,661-acre master planned community that would be located approximately 3 miles north of the Carefree Highway and 7 miles east of Lake Pleasant on I-17. The Villages is envisioned as a self-contained, multiple-use, mixed-density community of four interrelated "villages" with numerous amenities. The project would consist of 32 development areas on 4,969.5 acres planned for residential units; a maximum of 16,526 residential units would be phased in over the life of the project. Predominately single-family detached residential units would be developed at low to medium densities. The average density for the entire project, including high density units, is 2.9 dwelling units per acre.

Development of The Villages in Maricopa County is subject to a Development Master Plan (DMP) that includes a land use plan detailing the natural planning constraints and a Neighborhood Unit Plan of Development (NUPD), Planned Development overlays, and a special-use permit. The land use plan features a self-contained, mixed-use master planned community with interspersed open space areas and trails as well as golf courses. The DMP also includes an Ecological Resources Management Plan, Community Services and Facilities Plan, Circulation Plan, Drainage Plan, and Public Utilities and Services Plan.

Among the notable features identified in the DMP are the following:

- devotion of 38% of the site (2,150 acres) to open space, including undisturbed natural areas, restored areas, parks and playfields, equestrian trails, and golf courses;
- preservation of hillsides with slopes greater than 15% and major drainages;

- visual resource considerations and buffers near adjacent land use interfaces;
- access to I-17 at two interchanges;
- non-groundwater supply for municipal and industrial use and municipal-level wastewater treatment;
- Sheriff's substation and fire district site; and
- elementary and high school sites and facilities.

The project has also been found to be in compliance with Maricopa County Board of Supervisors' stipulations for the development master plan. Del Webb has also indicated that groundwater recharge facilities would be incorporated into the development. No details of these potential facilities are currently available.

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED ANALYSIS

Alternative Pipeline Alignments

Planning for the pipeline alignments under the proposed action involved a detailed feasibility study that evaluated five alternative CAP turnouts at Lake Pleasant, Waddell Canal, and the CAP aqueduct (Bookman-Edmonston Engineering 1996). Figure 2-4 shows all the turnout structures and pipeline alignment configurations that were considered for this analysis. Alternative A consists of a turnout structure at Lake Pleasant, and Alternative B consists of a turnout from the penstock at Lake Pleasant. Most of the pipeline alignments for both Alternatives A and B would be located within the abandoned Reclamation haul road in a similar manner as described for the proposed action. Alternative C consists of a turnout structure on Waddell Canal at the SR 74 crossing and a pipeline alignment extending north to the New River Road alignment and the abandoned Reclamation haul road. The proposed turnout structure would be located approximately 1 mile south of the Alternative C site on Waddell Canal at the APS transmission line crossing. Alternatives D and E consist of turnout structures on the CAP Aqueduct on the western and eastern sides of the I-17 crossing with pipeline alignments extending north to the development area.

Criteria for comparing the merits of each alternative included:

- constructability of the turnout structure and pipeline,
- permit requirements,
- construction schedule,
- ROW issues,

- water supply reliability and quality issues, and
- costs.

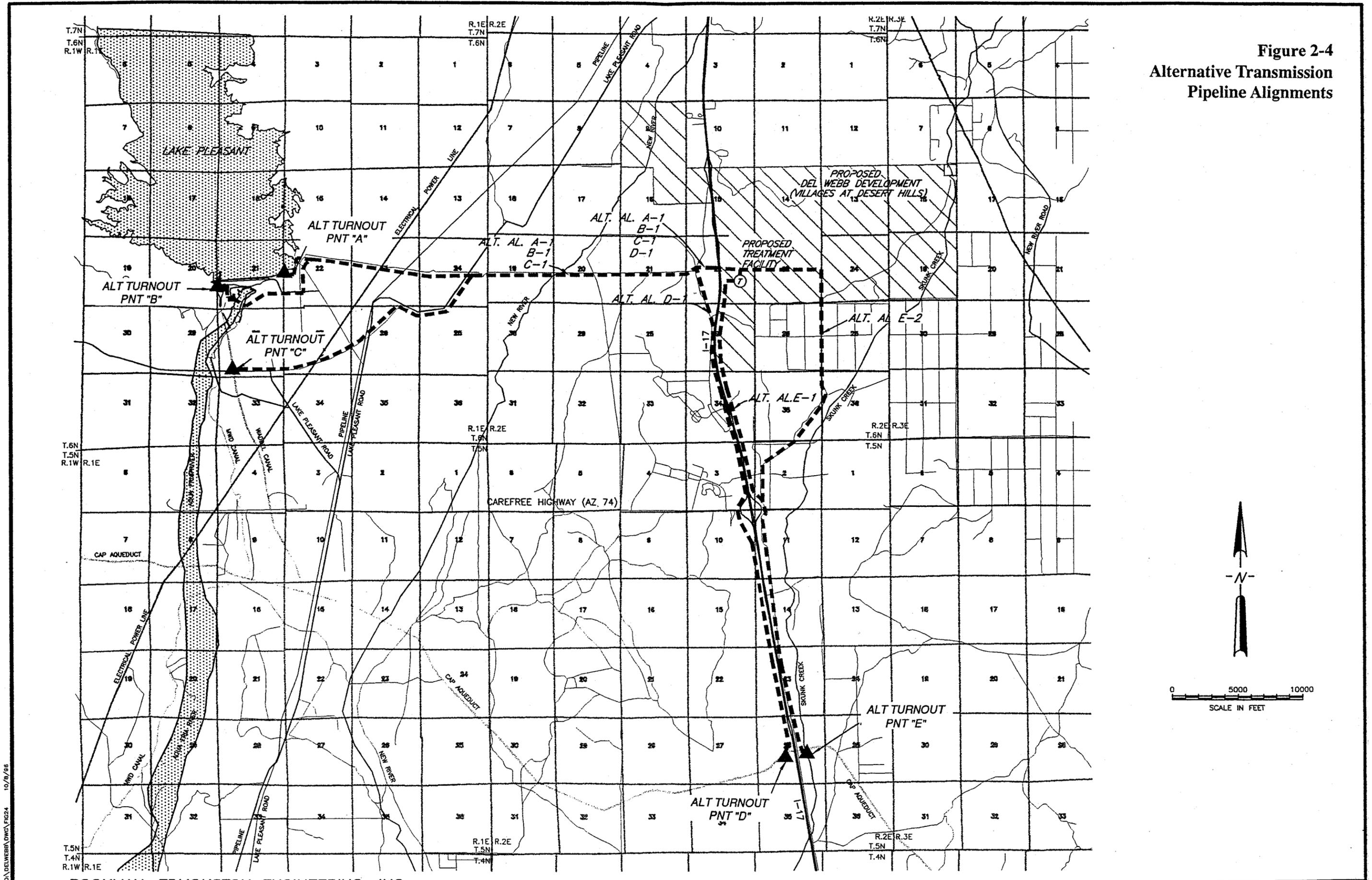
Each alternative offered different advantages and disadvantages. Table 2-1 is a summary of the feasibility evaluation conducted for each alternative. The first level of analysis in Table 2-1 identifies relative constructability issues, regulatory and ROW issues, water supply reliability and quality, and schedule considerations. The second level evaluates alternatives based on pumping requirements and number of pumps and pipeline length and diameter needs. Level three shows the relative costs associated with each alternative. Based on the data in levels one, two, and three, the alternatives were ranked. The first category provides ranking in terms of project implementation costs only. The second provides ranking on the basis of total project costs which include the pumping plant power costs over the assumed 45-year life cycle of the facilities. The third ranking considers constructability, ROW and permitting issues. The overall ranking for the alternatives considers all data collected for all of the evaluation criteria including costs.

The feasibility study concluded that Alternative Alignment C was the most feasible, although its costs were not the lowest. Other issues, such as optimal use of previously disturbed areas, constructability, and ROW opportunities, were the main criteria used to select Alternative C. Alternative C was later modified to adjust the turnout point at Waddell Canal to its present location; therefore, the proposed pipeline system is a modified version of Alternative C. The turnout location on Waddell Canal was moved to its current site because of constructability issues, its location near the APS electric transmission line corridor, and the possibility that environmental issues could be avoided by constructing in or near established corridors. A portion of the proposed pipeline corridor identified under Alternative C was also subsequently realigned after the EA public scoping period to avoid an area that was previously designated as proposed critical habitat for the cactus ferruginous pygmy owl. This proposed designation has since been eliminated, but the realigned portion, as shown in Figure 2-2, is still considered part of the proposed pipeline corridor. The original pipeline corridor that is not considered in detail in this EA would have extended along the abandoned Reclamation haul road from the middle of Section 19 east to I-17.

Alternative alignments A, B, D, and E were eliminated from detailed consideration because of excessive construction costs, difficult pipeline corridor terrain, and lack of established ROWs in which to conduct construction activities. Alternative water system delivery alignments considered during the detailed feasibility analysis are not evaluated in detail in this EA because these alternative alignments only partially meet Del Webb's technical and economic selection criteria, as shown in Table 2-1, and were found to be less environmentally preferable than the proposed pipeline corridor.

An additional Lake Pleasant turnout alternative was also investigated; however, it was dropped from further consideration because of noise and recreational effects on Lake Pleasant.

Figure 2-4
Alternative Transmission
Pipeline Alignments



D:\DELWEBB\DWG\FIG24 10/9/98

Table 2-1. Summary/Evaluation of Alternative Alignments, CAP Water Supply, Water Facilities and Alignments

	Alternative					
	A-1	B-1	C-1	D-1	E-1	E-2
Evaluation Criteria						
Constructability - intake/pumping plant	Very difficult; caisson and intake pipe construction in lake	Moderately difficult; tap into penstock pipe; hard rock area	Minor difficulty; need coffer dam for canal breach	Minor difficulty; need coffer dam for canal breach	Minor difficulty; need coffer dam for canal breach	Minor difficulty; need coffer dam for canal breach
Constructability - pipeline	First 2,000 feet difficult; hard rock; New River crossing and I-17 crossing with bore and jack	First 5,000 feet difficult; hard rock; requires crossing of Lower Lake/New River crossing/I-17 crossing with bore and jack	Crossing of Lake Pleasant Road, New River crossing and I-17 crossing with bore and jack	Carefree Highway crossing; crossing steep hill; hard rock area and Deadman Wash crossing	Carefree Highway crossing; crossing steep hill; hard rock area; Deadman Wash crossing; and I-17 crossing with bore and jack	Carefree Highway crossing; crossing steep hill; hard rock area; Deadman Wash crossing; and construction in improved rights-of-way (ROWs)
Clean Water Act compliance ^a	Individual Section 404 permit plus Nationwide Section 404 permit	Individual Section 404 permit plus Nationwide Section 404 permit	Nationwide Section 404 permit	Nationwide Section 404 permit	Nationwide Section 404 permit	Nationwide Section 404 permit
Special construction and/or salvage techniques	Required	Required	Required	Required	Required	Required
Land ownership within required ROW	Federal; state; ADOT; and private	Federal; state; ADOT; and private	Federal; state; ADOT; and private	State; ADOT; and private	State; ADOT; and private	State; ADOT; and private
ROW issues	Lake area; federal ownership (BLM); restricted access to County Regional park; aesthetic conditions and restrictions; state lands ROW acquisition process takes a minimum of 1 year	Encroachment of CAWCD facilities; approval difficult; state lands ROW acquisition process takes a minimum of 1 year	State lands ROW acquisition process takes a minimum of 1 year	State lands ROW acquisition process takes a minimum of 1 year	State lands ROW acquisition process takes a minimum of 1 year	State lands ROW acquisition process takes a minimum of 1 year
Water supply availability and reliability	Good; large fluctuation in lake water level	Good	Good	Good	Good	Good
Water supply quality	Least desirable	Some minor problems	Some minor problems	Some minor problems	Some minor problems	Some minor problems
Time implementation schedule	2 years	2 years	2 years	2 years	2 years	2 years
Water Facility Requirements						
Pumping cycle	24-hour	24-hour	24-hour	24-hour	24-hour	24-hour
Estimated pipeline length	40,570	48,890	42,240	45,700	39,300	49,200
Recommended pipeline diameter	30	30	30	30	30	30
Recommended number of pumps	4	4	4	4	4	4

Table 2-1. Continued

	Alternative					
	A-1	B-1	C-1	D-1	E-1	E-2
Project Implementation Costs						
Construction and ROW costs	\$5,952,998	6,442,718	5,453,866	5,761,208	5,133,811	6,162,519
Administrative, engineering, and construction management costs	2,018,015	2,142,893	1,890,736	1,969,106	1,809,122	2,071,442
Contingency - 25%	<u>1,488,250</u>	<u>1,610,679</u>	<u>1,363,466</u>	<u>1,440,302</u>	<u>1,283,453</u>	<u>1,540,630</u>
Project implementation costs	9,459,263	10,196,290	8,708,068	9,170,616	8,226,386	9,774,591
Power costs - present value (45-years)	<u>1,654,695</u>	<u>1,686,186</u>	<u>2,652,884</u>	<u>2,683,949</u>	<u>2,660,224</u>	<u>2,851,138</u>
Total project costs	\$11,113,958	\$11,883,476	\$11,360,952	\$11,854,565	\$10,886,610	\$12,625,729
Ranking						
Economic ranking - implementation costs	4	6	2	3	1	5
Economic ranking - total project costs	2	4	3	5	1	6
Constructability	6	5	1	3	4	2
Overall ranking	6	5	1	3	2	4

Notes:

- 1 = lowest implementation and total project costs and highest constructability.
6 = highest implementation and total projects costs and lowest constructability.

The evaluation of probable Clean Water Act compliance is based on analysis conducted as of March 1996 and does not reflect recent revisions to the nationwide permit program. A Section 404 individual permit would be required for the pipeline project.

Source: Bookman-Edmonston Engineering, Inc. 1996.

Section 3.0 Affected Environment and Environmental Consequences

3.1 INTRODUCTION

This section describes the affected environment and analyzes the environmental consequences of the proposed action and the No-Action Alternative. The analysis addresses the following resource topics: water resources; vegetation, wildlife, and special status species; cultural resources and Indian trust assets; air quality; noise; traffic and circulation; and land use, visual resource, and environmental justice issues. The analysis focuses on the environmental consequences of the Ak-Chin Option and Lease Agreement and associated water delivery facilities and addresses environmental issues associated with the No-Action Alternative in a qualitative manner. The No-Action Alternative assumes that the proposed action would not take place and that The Villages would be supplied by an alternative water supply (see Section 2, "Proposed Action and Alternatives"). Water supply Option 1 (Appendix A) is presented for illustrative purposes, to identify the kinds of effects that may occur under any of the water supply options.

3.2 WATER RESOURCES

Affected Environment

Hydrology and Drainage

The pipeline corridor is situated in the northeastern part of the Sonoran desert along upper-elevation terraces of the Basin and Range physiographic province. The pipeline corridor experiences climatic conditions typical of the arid southwestern United States; these conditions are characterized by hot, dry summers and mild winters. The average maximum daily temperature is approximately 105°F in July and 65°F in December (U.S. Geological Survey 1989). Rainfall averages 9.5 inches annually near Lake Pleasant and can be substantially more in the surrounding mountains. Two distinct seasonal periods of precipitation occur in the region. During the winter, Pacific storms produce prolonged rainfall of moderate intensity. Approximately 50% of the annual rainfall is associated with winter seasonal storms from November to April. During the late summer, subtropical moisture moving northward from the Gulf of Mexico and the Pacific Ocean brings intense thundershower activity of short duration.

The proposed pipeline corridor is located in the Agua Fria River and the New River watersheds. The constructed turnout on Waddell Canal and a small portion of the pipeline corridor would be located in the Agua Fria watershed. Most of the 9-mile-long pipeline corridor is within the New River watershed. From the turnout on Waddell Canal, the pipeline corridor parallels the existing electrical transmission line along a broad crest that generally increases in elevation from south to north where it crosses the former Reclamation haul road. Except for the Reclamation borrow pit area, the haul road topography is generally level across a broad basin that is bisected by the New River channel. East of the New River, surface elevations increase gradually near I-17, and relief in the terrain is greater near the terminus of the proposed pipeline. The eastern end of the pipeline corridor drains to Deadman Wash, which intersects the New River several miles downstream.

The locations and directions of flow for predominant surface water drainage features within the pipeline corridor are shown in Figure 3-1 in the "Vegetation, Wildlife and Special-Status Species" discussion. New River, which would be the largest drainage feature intersecting the pipeline corridor, forms a small valley that crosses the pipeline corridor in a northeast to southwest direction. Numerous small surface drainage swales cross the electrical transmission line corridor, the former Reclamation haul road, and the portion of the pipeline corridor east of New River. All of the small swales within the pipeline corridor are typical of intermittent desert washes that generally have flow only after storms that produce intense or prolonged rainfall; several years may pass between substantial streamflows (U.S. Geological Survey 1994). Streamflow after storm activity is generally of short duration, with much of the water percolating into the sandy streambed substrate. Although New River is also an intermittent stream, its flow can be substantial because of the relatively large drainage area (approximately 83 square miles). The U.S. Geological Survey (USGS) operated a stream gauge on New River from 1961 to 1982. Data from this period indicate that estimated peak flows are approximately 33,400 cfs for a 100-year recurrence interval and 3,150 cfs for a 2-year recurrence interval (U.S. Geological Survey 1991). Within the period of record, the highest actual peak flow, 19,500 cfs, occurred in September 1970.

Federal Emergency Management Agency (FEMA) floodplain information indicates that 100-year flood flows for the New River are approximately 5 to 10 feet deep in the area of the pipeline corridor (Federal Emergency Management Agency 1996). The slope of the New River channel within the area is approximately 1.0% and the designated floodplain ranges from 1,500 to 2,000 feet wide.

Groundwater in the area is generally at depths greater than 200 feet below ground surface, and seasonal high water tables do not occur in the soils of the area (Soil Conservation Service 1977). Construction, operation, and maintenance of the pipeline and water treatment plant would not intercept or change the nature of groundwater resources within the pipeline corridor.

Water Quality and Soils

Surface water quality is primarily dependent upon the mineral composition of the soils and associated parent materials and sources of contaminants within a watershed as well as the watershed's hydrologic characteristics. Terrain in the area of the pipeline corridor is composed primarily of basin deposits of recent alluvium that originate from erosion of the surrounding granitic, metamorphic, and volcanic mountainous areas. The alluvium generally increases in thickness with increasing distance from the base of the mountains. The soils that have formed consist predominantly of fine-grained and coarser-grained sandy clays on basin terraces, with clayey sands and clayey gravels occupying drainage channels and surrounding channel banks (Bowden Design Group 1995). The soils show very weak profile development and are largely covered with gravel; their use is primarily limited to desert range land. The lack of well defined channels for the small drainage swales indicate that the soils are relatively resistant to erosion.

Based on the undeveloped status of the pipeline corridor area, the surface water quality of natural streamflows would be expected to be acceptable for beneficial uses, such as intermittent aquatic habitat, groundwater recharge, and water supply for wildlife. Streamflow from storms would be expected to carry elevated loads of suspended sediment when runoff begins, followed by a dramatic decrease in sediment concentrations when the rainfall dissipates and flows recede (U.S. Geological Survey 1994).

Environmental Consequences and Mitigation Measures

Proposed Action

Impact: Temporary Alteration of Drainage Patterns and Floodplain Characteristics. Grading and trenching activities associated with construction in the pipeline corridor would temporarily alter the land surface and disturb existing drainage patterns. The potential effects include minor changes to the shape of small swales in the area of the pipeline crossing that could result in increased erosion and changes in the direction of drainage. Minor increases in soil erosion in 17 small washes could ultimately result in increases in sedimentation effects in downstream channels and offsite properties. Construction-related disturbance of the New River channel at the pipeline crossing would cause minor effects similar to those for the smaller drainage features, but the construction site could be exposed to much larger streamflows as well as floods that have higher potential for channel erosion.

Flooding of a river, stream, or wash may cause erosion that can be relatively deep in the streambed. Often this erosion is filled back in by sediment deposited as the flood subsides, but a pipeline crossing the river must be protected against being exposed by the erosion. The technical term for this erosion is scour. A scour analysis was performed for the pipeline crossings of the New River, a tributary of Deadman Wash, and other significant washes. The analysis used soils information obtained from geotechnical borings of the river and wash beds. In addition, floodflow

magnitudes and frequencies were used to determine a depth of scour (or erosion). Because the New River flows intermittently in a broad floodplain, it can change locations within the floodplain each time it flows. The pipeline would be buried below the depth of scour for the entire floodplain width.

The potential impacts from the proposed action are considered minor because pipeline construction would be of short duration, ground disturbance is likely to occur in only a small area of each drainage feature, and the pipeline would be installed underground and would be inspected and monitored on a regular basis. Given the nature of the desert climate and infrequent streamflow activity, the potential for permanently altering the existing drainage patterns is very small. Construction is also not expected to change the overall ground surface grade, and backfill soil would be compacted to minimize erosion associated with the site. The Flood Control District of Maricopa County (FCDMC) reviews construction practices within designated floodplain areas of the county. The proposed pipeline may require a General License for construction within the FCDMC ROW to assure that drainage features would not be adversely affected (Stroup pers. comm.). Construction of the pipeline would also comply with regulations pursuant to Section 404 of the Clean Water Act under jurisdiction of the U.S. Army Corps of Engineers (Corps) for construction activities within jurisdictional waters of the United States. A Section 404 permit will also require Section 401 Water Quality Certification from the Arizona Department of Environmental Quality.

Impact: Temporary Construction-Related Effects on Surface Water Quality.

Construction activities in pipeline corridor drainages could result in temporary surface water quality effects if construction were to occur during periods of storm activity. Any water quality effects would primarily be associated with minor increases in soil erosion and associated sedimentation of downstream aquatic habitat or desert vegetation and the potential for inadvertent release of construction-related materials, such as fuels and oil-based materials. If contaminants were to enter ephemeral stream channels they could affect aquatic organisms and wildlife and have downstream impacts. The magnitude of the impacts is normally dependent on the hydrologic environment, type of construction practice and contaminants used, extent of disturbed area, timing of precipitation, and proximity to drainage channels.

The potential impacts on surface water quality associated with the pipeline corridor are considered minor because surface flows are infrequent, construction activities would require a relatively small amount of soil disturbance, the activities would be temporary, and the potential release of contaminants could be minimized by following normal construction practices. Construction staging areas used for onsite storage of construction materials would be located well away from drainage channels (Wagoner pers. comm.). If storms and, consequently, streamflow were to occur while construction activities are taking place, any piles of excess soils and any disturbed areas in stream channels would be stabilized to minimize erosion hazards. The planned construction practices and the timing of operations within jurisdictional areas would be reviewed by the Corps in association with the certification process under Section 401 of the Clean Water Act to assure that potential water quality concerns are addressed.

No-Action Alternative

Under the No-Action Alternative, water supply Option 1 and The Villages development could also result in water resources issues.

Topographic features along the water supply Option 1 pipeline alignment would be the same as those along the I-17 corridor. Most of the terrain is flat, open desert land interspersed with occasional areas of rock outcrops and desert washes. The alignment would cross Deadman Wash, Skunk Creek, and several other intermittent streams. Construction of this option would involve grading and trench activities that could temporarily alter drainage patterns and floodplain characteristics in several intermittent streams and washes in a similar manner as described for the proposed pipeline corridor. Construction activities in washes and intermittent streams could also result in temporary effects on surface water quality if construction were to occur during periods of rainfall.

Topographic features of The Villages development area vary to a much greater degree than the area of the proposed pipeline corridor. Elevation ranges from 1,760 feet to 2,430 feet with slopes averaging 6%. Slopes of the New River Mountains are located in the northeast portion of the development area, low hills occur adjacent to I-17, and generally level terrain occurs in the southern portions of the property. The total annual rainfall is greater at the upper elevations of the property than in the New River valley. Many small drainages are located on the property, and Deadman Wash drains a relatively large area of the central and southern portion. Skunk Creek, a major channel that flows from north to south through the southeast corner of the property, has a FEMA-designated 100-year floodplain. Deadman Wash is also subject to periodic flooding.

The soils east of I-17 consist primarily of well-drained, gravelly-clay loams with low permeability. Issues concerning surface water quality in The Villages area would generally be similar to those described for the proposed pipeline corridor; however, suspended sediment loads during runoff events would probably be greater due to the increased streamflow velocities associated with steeper slopes in the stream channels east of I-17.

Substantial groundwater depletion has occurred in the western Salt River Valley area, which encompasses the New River area. In some areas, the groundwater level has decreased by 150 to 250 feet from historic levels (U.S. Geological Survey 1989). As a result, groundwater withdrawals are regulated pursuant to a Groundwater Management Plan for the AMA by the ADWR (Arizona Department of Water Resources 1991, as amended). The overall goal of the groundwater management plan is to establish "safe yield use" (i.e., nondepleting use) of groundwater resources by the year 2025. To reduce groundwater depletion in the region, the groundwater management plan requires all new developments to have an assured 100-year water supply from sources other than groundwater. An assured water supply can be demonstrated in several ways, including, but not limited to, the use of existing municipal supplies or CAP water, natural surface water supplies, water transferred from specific extinguished water rights, reclaimed wastewater effluent, and membership in the Central Arizona Groundwater Recharge District (CAGRDR). The CAGRDR was established to provide a mechanism by which water providers and developers can conveniently arrange to have groundwater they pump replenished with unused CAP water.

The Maricopa County Department of Planning and Infrastructure Development has required The Villages to provide a water supply in accordance with DMP Stipulation "r", which states, "The developer shall not use groundwater for golf course irrigation, residential, industrial, or commercial uses", with the exception of short-term uses during the construction phases and for certain public uses. Stipulation "r" was required because of local concern about the possible effect of new wells for The Villages on existing wells in the development area, and, in particular, the possibility that new groundwater demands at The Villages could result in drying up existing wells. Consequently, Del Webb is being required to import a water supply to the site, thereby eliminating the need to use any groundwater from the development area to meet long-term community demands.

Under the No-Action Alternative, development of The Villages could ultimately result in a decline in use of groundwater in the development area. The potential for developing ground water recharge facilities is being investigated. Because groundwater in the development area would not be the source of water for The Villages' residents, development in this area would ensure that small parcel residential development with individual wells and septic systems would not occur in this area. Interim use of a small amount of groundwater during early construction and for County and public uses would be allowed until a permanent water supply system is completed and hookup is available. Interim use of groundwater for these purposes would not adversely affect groundwater resources because the amount of water pumped would not exceed 150 af and would occur for less than 18 months. The interim supply of groundwater would also be recharged back to the aquifer should recharge facilities be developed. Overall, elimination of the use of groundwater for residential use would have a beneficial effect on groundwater resources.

The existing drainage configuration for The Villages property would be modified to accommodate development plans for the 5,661-acre residential development, including a traffic circulation system, golf courses, open space, and drainage channels. Construction of this residential area is not expected to substantially increase the volumes and peak rates of stormwater runoff to natural drainage channels because the requirements of the FCDMC have been incorporated into the Master Drainage Plan. These requirements limit peak runoff rates and require the use of retention/detention basins to provide for runoff control. In general, increased runoff rates can increase soil erosion and movement of debris in natural drainages if not checked by proper drainage channel design and construction, land grading practices, and soil stabilization measures. Increases in soil erosion can also lead to increases in associated sedimentation of downstream channels and offsite properties. If structures are constructed near the floodplains of major washes, flooding and possible structural damage could occur in these areas. The potential for drainage and flooding effects in The Villages development area would be reduced by implementing all phases of the project in accordance with the Master Drainage Plan (Bowden Design Group 1995). Golf courses planned for the community would be used to convey drainage and attenuate the effects of increased runoff.

Potential water quality issues under the No-Action Alternative associated with The Villages development include possible short-term effects from construction-related erosion and construction materials discharges and long-term urban runoff effects from residential areas and golf courses. Urban runoff typically carries increased loads of pollutants, such as heavy metals, petroleum products, and pesticides. Turfgrass management operations at golf courses have the potential to increase runoff and percolation of pesticides, fungicides, and fertilizers to shallow groundwater

(Balogh and Walker 1992). Possible long-term water quality effects from implementing The Villages would need to be addressed during implementation of the Master Drainage Plan, erosion control, and turfgrass maintenance programs.

Potential construction-related soil erosion and contaminant discharges could be eliminated through strict compliance with standard construction practices. Construction staging areas used for onsite storage of construction materials, such as fuels, should be placed well away from drainage channels. If storms and resultant streamflow occur during construction, areas of excess and disturbed soil and disturbed stream channels should be stabilized to minimize erosion hazards. Long-term impacts from urban runoff and golf course maintenance activities could be minimized by proper maintenance of drainage facilities to allow settling and deposition of pollutants that could reach stream channels. In addition, the potential release of chemicals used to maintain turfgrass could be eliminated by implementing the Integrated Turfgrass Maintenance (ITF) program outlined in the Master Drainage Plan (Bowden Design Group 1995). The ITF should be implemented by providing thorough training for all parties responsible for maintenance activities, monitoring of turfgrass conditions to avoid overapplication of water and chemicals, and effective use of natural biological pest controls to minimize the use of chemicals.

3.3 VEGETATION, WILDLIFE AND SPECIAL-STATUS SPECIES

Affected Environment

This section provides information on vegetation and wildlife resources in the pipeline corridor. Common and scientific names of plants and wildlife and a description of drainage features in the pipeline corridor are provided in Appendix B. Data were obtained by reviewing published and unpublished reports, searching records of the Arizona Game and Fish Department's (AGFD's) Heritage Data Management System (1996), obtaining a sensitive species list from U.S. Fish and Wildlife Service (USFWS), contacting agency and local biologists (Spiller, Gatz, Olson, and Mihlbachler pers. comms.), and conducting a field surveys.

A Jones & Stokes Associates botanist and wildlife biologist conducted a field survey on October 15 and 16, 1996. The survey consisted of walking an approximately 100-foot-wide corridor, covering the turnout and pumping plant site on Waddell Canal and the entire pipeline alignment (Figure 2-2). The biologists also surveyed a 44-acre site for the proposed water treatment plant east of I-17. The survey effort emphasized habitat assessments for special-status animals and rare plant surveys for special-status plants. Additional survey work for a portion of the pipeline corridor was conducted by SWCA, Inc. (1996a). Plant identification was based on Arizona Flora (Kearney and Peebles 1960) and was confirmed using the Catalog of the Flora of Arizona (Lehr 1978) and the Field Guide to the Plants of Arizona (Epple 1995).

Special-status plant and animal species that are known or have the potential to occur in the pipeline corridor are presented in Appendix C. Special-status species are defined as:

- federally proposed or listed threatened or endangered species (16 USC 1532),
- wildlife of special concern in Arizona (WSCA) identified by the AGFD (Olson pers. comm.) (species included in WSCA are currently the same as those in Threatened Native Wildlife in Arizona)(Arizona Game and Fish Department 1988),and
- protected native plants as defined in the Arizona Native Plant Law (1993) (McGinnis pers. comm.).

Four habitat types are found in the pipeline corridor: Sonoran desertscrub, xeroriparian scrub, seasonal drainages, and disturbed areas (Figure 3-1). Plants and animals associated with these habitat types are described below. To calculate habitat acreages, the pipeline corridor and the proposed treatment plant site were plotted on USGS 7.5-minute topographic maps, assuming a 100-foot-wide, approximately 9-mile-long pipeline corridor (including a 200-foot-wide corridor for the New River crossing) and a 44-acre site for the proposed treatment plant. The analysis assumes that some vegetation and wildlife in the entire pipeline corridor and at the treatment plant site could be disturbed even though portions of these areas could be left undisturbed.

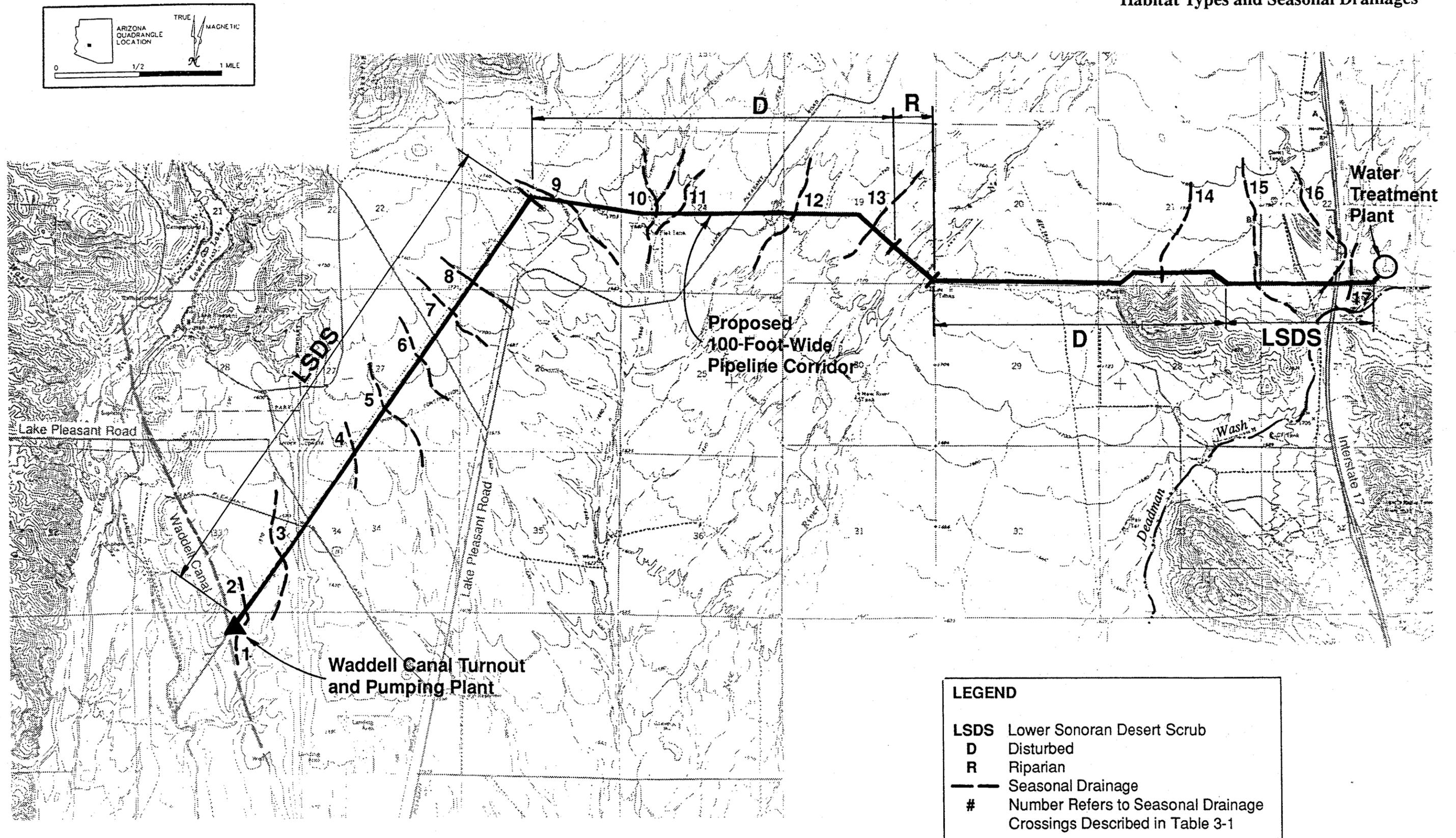
Sonoran Desertscrub Plant Community

The proposed pipeline corridor and treatment plant would encompass approximately 94.5 acres of Sonoran desertscrub habitat (Lower Colorado River Valley subdivision) (Figure 3-1), assuming a 100-foot-wide corridor. The desertscrub community occurs at the proposed pump station site on Waddell Canal and continues along the electric transmission line alignment to its intersection with the abandoned Reclamation haul road. This community also exists on both sides of the abandoned Reclamation haul road and is found east of New River in volcanic hills in the southern portion of Section 21. The proposed 44-acre water treatment plant site is also within this community.

Vegetation. Sonoran desertscrub is characterized by the presence of saguaro, creosote bush, mesquite, ironwood, saltbush, bursage, and cacti (Epple 1995) and is located in relatively undisturbed uplands within the pipeline corridor. Cacti are among the dominant shrubs; saguaro, teddy bear cholla, barrel cactus, beavertail, and strawberry hedgehog cacti were all observed. Cacti are interspersed with scattered foothill palo verde, creosote bush, triangle bursage, and velvet mesquite. The understory below the cacti and perennial shrubs was often grazed, with annual grasses remaining only in areas of cacti or other obstructions. Vegetation found east of New River includes species of cholla and prickly pear, brittle bush, creosote bush, triangle bursage, foothill palo verde, and tobosa grass (SWCA 1996a).

Wildlife. Indigenous mammals, birds, and reptiles (or signs of these wildlife, such as nests and tracks) observed during the field survey include kit fox (tracks), Harris' antelope ground squirrel, white-throated woodrat (stick nest), black-tailed hare, desert cottontail, Gambel's quail, Harris' hawk, loggerhead shrike, side-blotched lizard, and desert mule deer. The mixed cacti community provides habitat for a variety of common wildlife species, including woodpeckers, wood rats, owls,

Figure 3-1
Habitat Types and Seasonal Drainages



and lizards. Wildlife observed in the eastern portion of the pipeline corridor include desert cottontail, gila woodpecker, northern flicker, verdin, white-crowned sparrow, ruby-crowned kinglet, and black-throated sparrow. Signs of coyote, mule deer, and ringtail were also observed (SWCA 1996a). No major animal migration routes are known to occur in the area that could be affected by a buried pipeline; therefore, this issue is not discussed further.

Disturbed Habitats

The proposed pipeline corridor would cross approximately 47.5 acres of disturbed habitat along the former haul road, at the Reclamation borrow site, and east of New River (Figure 3-1).

Vegetation. The area along the haul road is dominated by brittle bush, which was seeded for restoration purposes (Wonderley pers. comm.). Other plant species observed along the haul road portion of the pipeline alignment are four-wing saltbush, desert holly, Russian thistle, and triangle bursage. The former borrow site was also seeded by Reclamation following construction of New Waddell Dam, but contains less cover than other disturbed areas. Vegetation at the borrow sites consists of Russian thistle, four-wing saltbush, triangle bursage, and brittle bush. Areas west of New River are heavily disturbed and generally devoid of vegetation.

Wildlife. The disturbed habitat lacks the diversity of plant species and amount of cover required by many wildlife species. The biologists observed black-tailed hares, mourning doves, black-throated sparrows, horned larks, and foraging red-tailed hawks along the haul road. The open areas along the haul road and at the borrow site provide foraging opportunities for raptors, such as the red-tailed hawk and American kestrel. Many of the same wildlife species that occur in desertscrub habitats would be expected to occur occasionally in the disturbed habitats because these areas are surrounded by desertscrub habitat.

Seasonal Drainages

The proposed pipeline alignment crosses 17 seasonal drainages (2 of the crossings are at different locations in the same drainage [16 and 17]); the area of the crossings totals approximately 0.27 acre. Appendix B provides a description of the location, the dominant vegetation either in or surrounding the drainage, and the approximate width of each drainage. Figure 3-1 shows the location of these drainage features.

Vegetation. Common trees, shrubs, and plants observed in the seasonal drainages include catclaw acacia, foothill palo verde, velvet mesquite, creosote bush, and triangle bursage. Drainages ranged from 1 to 15 feet wide; most were 10 feet wide or less. None of the drainages contained standing water during the field survey. The five drainages crossing the former haul road and borrow area had been substantially altered by the construction activities associated with the New Waddell Dam. Downstream of the haul road, drainages were narrower, more eroded, and less defined than

upstream of the haul road, where the drainages are significantly larger, with well-defined bed and banks.

Wildlife. Seasonal drainages provide a temporary water source for wildlife species but probably do not provide standing water long enough to support amphibian breeding. Seasonal drainages provide more cover than the surrounding desertscrub or disturbed habitats and serve as movement corridors for wildlife species, such as the kit fox and numerous birds.

Xeroriparian Scrub Habitat

The proposed pipeline corridor crosses approximately 5.75 acres of xeroriparian scrub habitat in the New River channel (Figure 3-1).

Vegetation. The New River channel is the largest drainage that the pipeline would cross. A patchwork of sandy areas and areas with medium- to large-sized cobbles and small boulders is present in the channel. Vegetation in the channel is sparse and is subject to periodic scouring flows. Common plants include burro brush, canyon ragweed, sweetbush, and desert broom. Vegetation on small islands in the channel and on the western bank of the New River is more dense and diverse. Species occurring in these areas include catclaw acacia, brittle brush, creosote bush, triangle bursage, canyon ragweed, desert broom, and foothill palo verde. Saguaro occur in low numbers between the abandoned Reclamation haul road and the west bank of the New River. Many plants present between the abandoned Reclamation haul road and the west bank of the New River also occur in Sonoran desertscrub. The east bank of the New River is heavily disturbed within the pipeline corridor. Vegetation between the east bank and the southeastern corner of Section 19 (where the pipeline corridor turns to the east) is sparse and consists predominantly of dead, weedy annual species.

Wildlife. Wash habitats such as the New River are important to wildlife because they add diversity to the landscape. Riparian and wash areas provide water, thermal and hiding cover, movement corridors, and diverse nesting and feeding habitats for wildlife species. Common species that occur in washes include phainopepla, warblers, mourning doves, Gila woodpeckers, bats, and desert cottontails. Wildlife observed east of New River includes black-tailed jackrabbit and northern flicker (SWCA 1996a).

The proposed pipeline corridor is located south of an area previously proposed as critical habitat for the cactus ferruginous pygmy-owl, as listed in the December 12, 1994, Federal Register (59 FR 63975-63986). The final rule on cactus ferruginous pygmy-owl, published in the March 10, 1997, Federal Register (62 FR 10730-10746), determined, however, that designation of critical habitat in Arizona was not prudent. Please refer to the "Special-Status Wildlife" discussion below for survey results related to the cactus ferruginous pygmy-owl.

Special-Status Species

Appendix C provides a list of special-status plant and animal species that may potentially occur in the pipeline corridor. The USFWS (Spiller pers. comm.) identified 14 federally protected species that may potentially occur in suitable habitat in Maricopa County, including three endangered plants, eight endangered fish and wildlife species, two threatened wildlife species, and one wildlife species that is proposed for listing as endangered. The Heritage Data Management System used by AGFD (Olson pers. comm.) identified four additional special-status species that could occur in the pipeline corridor: one U.S. Forest Service sensitive plant, one U.S. Forest Service sensitive and "highly safeguarded" plant, and two wildlife species of special concern (Appendix C). Appendix D presents the Biological Assessment for the Ak-Chin Option and Lease Agreement Water Delivery Facilities.

Special-Status Plants. No special-status plants were observed during the field survey. There is a potential for one "highly safeguarded" plant, Hohokam agave, to occur in the pipeline corridor. The Hohokam agave has been previously observed in the region (SWCA 1994a), but was not identified during field surveys in the pipeline corridor. The four remaining special-status plants that could occur in Maricopa County—California snakewood, Arizona agave, Arizona hedgehog cactus, and Arizona cliffrose—are found at higher elevations than the proposed pipeline corridor and are not expected to occur in this area.

Several native plants were observed during the field survey that are in one of three *state* protected categories: salvage restricted, salvage assessed, and harvest restricted. These plants are listed in Appendix C and include eight salvage-restricted species (saguaro, strawberry hedgehog, ocotillo, barrel cactus, teddy bear and chain fruit cholla, desert Christmas cactus, and Englemann's prickly pear), three salvage-assessed species (blue and foothill palo verde and desert willow), and two harvest-restricted species (western honey and velvet mesquite). According to the Arizona Native Plant Law, a salvage permit and tags are required for removal of any of these native plants from the site.

Special-Status Wildlife. No state or federally listed wildlife species were observed during the field surveys (Jones & Stokes Associates 1996 and SWCA 1996a, 1996b, and 1997). Surveys were conducted for all the species identified in Appendix C with special emphasis on the American peregrine falcon, bald eagle, southwestern willow flycatcher, cactus ferruginous pygmy owl, and Sonoran desert tortoise. The project site supports potential habitat for only one special-status wildlife species, the Sonoran desert tortoise. Other species that are either known or expected to occur in the area include the California leaf-nosed bat and ferruginous hawk. Bald eagles and peregrine falcons could be transitory and may occasionally forage in the area.

Desert tortoises have the potential to occur along the proposed pipeline corridor and at the treatment plant site but were not observed during the field survey. The Sonoran population of desert tortoises prefer rocky, boulder-strewn hillsides, but could also occur in the deserts scrub and disturbed habitats throughout the pipeline corridor and in drainages and washes in the pipeline corridor. Investigation of the volcanic hills in the southern portion of Section 21 found no evidence of desert

tortoise. Known forage plants for this species do occur on the hills, but suitable tortoise shelter sites are rare.

Although the proposed pipeline corridor at the New River crossing is near an area previously designated as proposed critical habitat for the cactus ferruginous pygmy-owl, no owls are expected to occur near the pipeline corridor because suitable nest sites are limited and riparian habitat along the New River is confined to a narrow and disjunct area. Habitat types in the pipeline corridor differ significantly from those where cactus ferruginous pygmy-owl is known, and it appears unlikely that the species would occur in or near the proposed pipeline corridor. No tape-playback survey was completed along the corridor, but in two surveys for the species on the Desert Hills property (along the New River approximately 2.25 miles northeast of the proposed corridor and along several washes east of I-17; SWCA 1994a, 1996b) and north of the proposed alignment approximately 0.5 mile upstream, no cactus ferruginous pygmy-owls were observed. In addition, no cactus ferruginous pygmy-owls have been observed in the New River Valley since 1892, and the nearest known observations in recent records are from more than 100 miles away (SWCA 1996b).

Environmental Consequences and Mitigation Measures

Proposed Action

Impact: Potential Loss of Protected Native Plants. A number of protected native plants that could be affected by construction and maintenance operations including saguaro, blue and foothill palo verde, and velvet mesquite, were observed along the proposed pipeline corridor and at the water treatment plant site. Del Webb will conduct preconstruction surveys to determine whether the construction activities would result in the loss of native plants listed in the Arizona Native Plant Law (1993). If Del Webb cannot avoid native species and proposes to remove native plants over an area exceeding 0.25 acre, Del Webb will submit, in writing, a notice of intent to the Arizona Department of Agriculture (ADA) at least 60 days before the plants are scheduled to be removed. Del Webb will not begin removing native plants until it has received written confirmation from the ADA and will comply with applicable state law concerning salvage and relocation of native plants. In addition, Del Webb will coordinate with AGFD before reseeding disturbed upland areas with a native seed mix appropriate for desertscrub habitat. Seasonal drainages and riparian areas will also be reseeded with an appropriate seed mix to achieve an acceptable level of revegetation success.

Although Hohokam agave (*Agave murpheyi*) was not found in the pipeline corridor or treatment plant site during field surveys, field surveys conducted east of the pipeline corridor indicate that Hohokam agave does occur in the region. Its presence in the region indicates that it has the potential to occur in the pipeline corridor. Hohokam agave is listed as "highly safeguarded" under the 1993 Arizona Native Plant Law. The highly safeguarded designation is applied to plants "whose prospects for survival are in jeopardy or which are in danger of extinction throughout all or a significant portion of their ranges". If encountered along the pipeline corridor, Del Webb will comply with Arizona Native Plant Law regarding Hohokam agave as outlined above.

Impact: Temporary Effects on Seasonal Drainages. Constructing the pipeline could result in temporary disturbance of up to 0.27 acre in 17 seasonal drainages. Construction of the pipeline is expected to disturb up to a 100-foot-wide area at each minor drainage crossing and a 200-foot-wide area at New River. Habitat loss would be temporary and would involve a marginal number of velvet mesquite, catclaw, and foothill palo verde plant species and associated wildlife species. As part of the pipeline implementation, Del Webb will reestablish natural landscape contours and reseed with an appropriate native seed mix.

Impact: Effects on Possible Jurisdictional Wetlands and Other Waters of the United States. The pipeline corridor crosses some drainage features that are considered jurisdictional waters of the United States as defined by the Corps, including 17 seasonal drainages and New River. Del Webb is currently in the process of applying for an individual Section 404 permit from the Corps.

Impact: Loss of Xeroriparian Scrub. Construction of the pipeline across New River would temporarily affect 5.75 acres of xeroriparian scrub habitat in the New River channel. Del Webb will re-establish preconstruction conditions within the corridor to allow natural colonization of plant species in this area.

Impact: Loss of Sonoran Desertscrub. Construction of the pipeline would result in the temporary loss of nearly 51 acres of Sonoran desertscrub habitat; construction of the water treatment plant could result in the permanent loss of approximately 44 acres of this habitat. An abundance of this habitat type exists in the area. Del Webb will also reestablish preconstruction conditions within the pipeline corridor to allow natural colonization of native plant species and will reseed disturbed upland areas, as necessary, with an appropriate native seed mix. Therefore, the temporary and permanent loss of desertscrub habitat is considered a minor effect that is not anticipated to substantially affect plant and animal resources.

Impact: No Loss of Special-Status Species. Construction in the pipeline corridor would not adversely affect any special-status species because none are known to occur in this area.

Impact: Possible Effects on Desert Tortoise. Although not observed during the field survey, the desert tortoise could occur in the pipeline corridor and particularly near the volcanic hills east of New River and the treatment plant site. Del Webb will conduct preconstruction surveys for desert tortoise burrows. If tortoises are found on the site, Del Webb will contact the AGFD for recommendations and the appropriate permits to move the tortoise before construction begins. Construction of temporary shelters or burrows also could be required, depending on the number of burrows located in the area. Implementing the proposed action is expected to have little or no effect on desert tortoise mortality or long-term viability.

No-Action Alternative

Under the No-Action Alternative, water supply Option 1 and The Villages development could result in biological resources impacts.

During a preliminary survey conducted by SWCA on April 23, 1997, three plant communities were identified along the Option 1 pipeline alignment: disturbed habitat, Sonoran desertscrub, and xeroriparian habitat (SWCA 1997). Disturbed areas, such as those occurring between the Deer Valley and Pinnacle Peak interchanges, are either devoid of vegetation or are only sparsely vegetated with non-native species, such as Russian thistle and red brome, and provide minimal habitat for wildlife. Sonoran desertscrub habitat mainly occurs north of the Pinnacle Peak interchange and is dominated by creosotebush, triangle-leaf bursage, mesquite, and buckhorn cholla. Because of the proximity of desertscrub habitat to the I-17 corridor and evidence of disturbance, wildlife habitat value in this habitat type is generally considered low. Xeroriparian habitat is extremely limited and mainly occurs at Deadman Wash and a few other minor washes north of Carefree Highway. Common plant species observed in xeroriparian habitat include mesquite, creosotebush, desert ironwood, and blue palo verde. The water supply Option 1 alignment crossing at Skunk Creek has been altered, and no xeroriparian vegetation occurs at this location.

No federally listed threatened, endangered, or previously designated candidate species were observed along the alternative alignment. Habitat along the alternative alignment does not resemble breeding habitat that is currently known to be used by the southwestern willow flycatcher, bald eagle, or peregrine falcon. Because bald eagles and peregrine falcons are extremely mobile species, they may occasionally fly over and even forage within the area (especially in winter), but neither species is likely to regularly occur along the alignment. No cactus ferruginous pygmy-owl were detected at the Deadman Wash crossing or any other pipeline corridor areas during the current or previous surveys and the owl is considered unlikely to occur along this pipeline route.

Desert tortoise and Hohokam agave are known to occur in The Villages development area. California leaf-nosed bat and ferruginous hawk may occur along the alignment, but none were observed, and none are afforded legal protection under the federal Endangered Species Act.

Information on native vegetation, wetlands, and special-status plants and animals for The Villages development area was summarized from the "Biological Evaluation of the Proposed Villages at Desert Hills Project Site, Maricopa County, Arizona" (SWCA 1994a).

The Villages development area covers approximately 5,661 acres of currently undeveloped land. Vegetation on the site is typical of the Arizona Upland and Lower Colorado River Valley subdivisions of the Sonoran desertscrub community. Several washes and arroyos with riparian habitat typical of ephemeral watercourses in the Sonoran Desert cross the property. About 938 acres of the project site was burned during a 1993 wildfire. Upland habitats occur on approximately 5,094 acres, and riparian habitats cover approximately 567 acres.

The same 14 special-status species identified for the proposed pipeline corridor also potentially occur in The Villages development area. No federal threatened or endangered species were observed on the property, none are considered likely to occur, and the development is not expected to affect any threatened or endangered species (SWCA 1994a, 1996b, and Appendix D). Bald eagles and peregrine falcons could occasionally forage on the site because they are known to occur in the region, but none were observed during the surveys. Evidence of two state species of special concern was observed on or adjacent to the property: Hohokam agave (highly safeguarded

plant) and desert tortoise. The California leaf-nosed bat and ferruginous hawk are either known or expected to occur in the area. The Villages may have an effect on individuals of these state special-status species.

Under the No-Action Alternative, construction activities in The Villages development area would affect a variety of native plant communities and plant species. Impacts in xeroriparian areas will be minimized because development will generally be avoided in drainages. Effects on plant communities will also be reduced by implementing strategies in the Ecological Resources Management Plan that calls for a number of habitat protection measures, including preservation of hillsides over 15% and land use controls in sensitive or high-density plant communities. The Villages will be subject to native plant law to reduce effects on plants protected under the state's salvage restricted, salvage assessed, and harvest restricted categories.

Construction activities in The Villages development area could temporarily affect habitats in drainages, but is expected to largely avoid these areas. The development area contains xeroriparian vegetation, including Palo Verde mixed-scrub, mesquite/Palo Verde mixed-scrub, and desert broom mixed-scrub (SWCA 1994a). Palo Verde mixed-scrub occurs along Skunk Creek and Deadman Wash, mesquite/Palo Verde mixed-scrub occurs along a majority of the smaller washes and arroyos, and desert broom mixed-scrub occurs along the banks and within the braided channel of New River.

The washes and arroyos that support the xeroriparian vegetation are considered potential jurisdictional waters of the United States. Del Webb will obtain a Section 404 individual permit from the Corps for activities within jurisdictional waters of the United States.

3.4 CULTURAL RESOURCES

Affected Environment

Information provided on existing cultural resources in the pipeline corridor and treatment plant site is summarized from SWCA 1994b, 1996c, and 1996d.

Site Conditions

The pipeline corridor ranges in elevation from 1,460 to 1,860 feet above msl between the Agua Fria River to the west and a 44-acre water treatment plant site east of I-17. Most of the area consists primarily of desert scrub habitat dominated by creosote bush, bursage, and grasses. The geology is primarily gravel and cobble terraces covered by fine alluvium or areas with highly patinated desert pavement. Three basaltic rock outcrops are located near the pipeline corridor east of the New River crossing. The pipeline corridor runs along the eastern edge of the Navajo/Westwind electrical transmission line corridor for approximately 3.3 miles and then extends along the abandoned Reclamation haul road for approximately 2 miles of the 9-mile long pipeline

alignment. East of New River, the pipeline corridor crosses terrain that was disturbed during excavation of earthen rock material used to construct New Waddell Dam.

Prehistorical and Historical Setting

The potential for prehistoric archaeological sites in the pipeline corridor and treatment plant site is quite variable, ranging from sites that were used only for resource exploitation to intensively used agricultural and habitation areas on river terraces. Few indications of historic activities have been identified, other than ranching activities, isolated travel, or occasional recent or modern-age trash dumping episodes (SWCA 1996c, 1996d).

In prehistoric times, the Archaic people inhabited the region from 8000 B.C. to 300 A.D. Much of the land was used for seasonal hunting and gathering. Lithic tools used for gathering and building included various functional forms, such as scrapers, bifacial knives, unifacially altered flakes (various styles), drills, perforators, planes, bifacial and flake cores, and projectile points (Slaughter et al. 1992). Archaic populations followed a mobile lifestyle, with movements being constricted to specific geographic regions. As the Archaic Period continued, mobility decreased, reflecting a tendency toward sedentism (Slaughter et al. 1992).

Following the Archaic Period, the area was occupied by a sedentary group of people called the Hohokam. The Hohokam were desert farmers best known for engineering an extensive system of irrigation canals in central and southern Arizona (Haury 1976). As their population increased, they began to venture out and expand into other drainages. From A.D. 700 until A.D. 1450, the Hohokam established villages in the New River and Agua Fria river valleys (Green 1989). This area, known as the northern periphery, consists of sites suggesting an adaptation by small groups of Hohokam settlers who mixed agriculture, including irrigation, with hunting and gathering technologies.

The Hohokam occupation of the area appears to have been brief and to have been concentrated along the New River and Agua Fria drainages. Farming methods included reliance on direct precipitation and runoff that was diverted to fields (SWCA 1996c and d).

Previous Studies

Various segments of the pipeline corridor and areas near the corridor have been previously surveyed as part of the New Waddell Dam project. In 1972, the Museum of Northern Arizona conducted a survey of the Arizona Public Service Navajo Project 500 kV transmission line. Four cultural properties were identified along this corridor. Results of the interim and final reports indicate that none of the sites occur within or adjacent to the proposed pipeline corridor.

Various surveys were conducted between the Agua Fria drainage and I-17 as part of activities associated with construction of New Waddell Dam. Related archaeological surveys include those for the East Terrace Borrow Area (Green 1985), the New River Borrow Area (Fedick 1986), the

Eastern Addition of the New River Borrow Area (Green and Rankin 1988), the New Waddell Haul Road (Hackbarth and Green 1986), and the Agua Fria Borrow Area (Green and Effland 1985). Each of these surveys included a portion of the proposed pipeline corridor, and none identified any cultural resource properties in or near the pipeline corridor.

SWCA completed a cultural resources investigation of the 5,661-acre Villages development area in 1994 (SWCA 1994b). The investigation identified 13 sites and 205 isolated occurrences that were recorded. None of the sites and only one of the isolated occurrences occur in the vicinity of the proposed water treatment plant. No cultural resources were identified in the 44-acre site proposed for water treatment facilities.

Survey Methods

The archaeological surveys for the proposed pipeline corridor and associated facilities were completed by walking parallel transects along the linear corridor (two transects within the 100-foot wide corridor) and transects spaced at 20-meter intervals in the survey block of Section 22 (T6N, R2E). Segments of the pipeline corridor were marked with flagging to ensure that the surveys were conducted in the correct locations. All cultural materials identified during the survey were plotted on USGS maps, and descriptions of all artifacts were recorded for later reference. Much of the realigned portion of the pipeline corridor has been previously surveyed as part of borrow activities for New Waddell Dam. Additional surveys for an unsurveyed portion of the corridor were conducted on December 12, 1996, east of New River in the eastern half of Section 21. Surveys were conducted in a 200-foot-wide corridor for approximately a 0.5 mile section of the pipeline corridor.

Survey Results

One previously recorded site and 44 isolated occurrences were identified during the initial pipeline corridor survey. Site AZ T:4:171 (ASM), located on the east side of the New River drainage along the east/west quarter-section line of Section 20 was originally recorded in December 1964 as Site AZ T:4:13(ASU). It was recorded as a lithic and sherd area containing plainware pottery, mano fragments, a chert knife, cores, hammer stones, and chipped stone. The site was relocated by SWCA in 1996 and presumably had been disturbed by borrow activities conducted during construction of the New Waddell Dam. Much of the site is intact, although no ceramics were found on any portion of the undisturbed site area. Flaked stone on the site consisted of three chert flakes, one quartz flake, 77 basalt/rhyolite flakes, one basalt core tool, and 10 basalt/rhyolite cores (SWCA 1996c). Site AZ T:4:171(ASM) is probably a surface site, with a maximum depth of 10 centimeters. The undisturbed surface is desert pavement, and many artifacts are difficult to recognize. The proposed pipeline corridor is located approximately 0.5 mile south of the site.

No archaeological or historic sites, or substantial lithic scatters were located within the proposed pipeline corridor. One site, AZ T:4:53(ASM), a surface artifact scatter, is located immediately southwest of the December 12, 1996, survey area. The site was originally recorded by Don Simonis of the Bureau of Land Management (Green and Rankin 1988). At that time, it

contained limited lithic and ceramic artifacts. The site was reinvestigated as part of the New Waddell Dam New River Borrow Area expansion. Green and Rankin (1988) documented the site as containing only lithic artifacts. Both previous investigations recommended that AZ T:4:53 (ASM) was not eligible for listing on the National Register of Historic Places (NRHP). During the current work, the site was revisited and evaluated. It still contains no evidence to suggest that it should be considered eligible for the NRHP. The proposed pipeline corridor would be adjacent to the extreme northern portion of the site where only a few lithic artifacts are present (SWCA 1996d). No artifacts are located within the proposed pipeline corridor.

No archaeological or historic sites were identified in the 44-acre water treatment plant site east of I-17 (SWCA 1994b).

Isolated Occurrences. Of the 44 isolated occurrences identified during the initial survey, 39 are prehistoric and 5 are historic (Table 3-1). Many of the prehistoric isolates are made from the black porphyritic basalt that is common in the region. This material is commonly fine-grained with crystalline inclusions, which vary in frequency and size and often appear blue in color. Many of the cores and flakes may have been the result of cobble testing or expedient production of flakes. One of the isolates is a corner notched projectile point made of quartzite. The projectile point is somewhat crude and resembles an Archaic period form. Six Hohokam Red-on-buff sherds that appeared to be smaller pieces of a larger sherd, a Gila Plain, and Salt Variety pot break were also discovered. These were the only ceramic artifacts observed during the survey. The historic isolates, including a trash scatter, were all cans and tins (SWCA 1996c, 1996d).

Traditional Cultural Properties. Traditional Cultural Properties (TCPs) are properties that are eligible for listing on the NRHP because of their association with cultural practices or beliefs of a living community that (a) are rooted in that community's history and (b) are important in maintaining the continuing cultural identity of the community. Cultural resource surveys for the proposed water delivery pipeline and water treatment facility did not identify TCPs in the area. Reclamation will consult with Indian tribes who have a recorded presence, or who have claimed ancestry to the area to ensure that TCPs have been identified, recorded and that impacts to them have been considered. The tribes are: Ak-Chin Indian Community, Ft. McDowell Mojave-Apache Indian Community, Gila River Indian Community, Hopi Tribe, Salt River Pima-Maricopa Indian Community, Yavapai-Prescott Indian Tribe, and Zuni Pueblo.

Environmental Consequences and Mitigation Measures

Section 106 of the NHPA and NEPA require consideration of effects of projects on significant cultural resources and traditional cultural properties. Pursuant to the NHPA, Reclamation shall identify and take into account the effect of an undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places. For consultations required under Section 106 of the NHPA, Reclamation is operating under terms of a Programmatic Memorandum of Agreement (PMOA) signed by Reclamation, the Advisory Council on Historic Preservation, and the Arizona State Historic Preservation Officer (SHPO). The

Table 3-1. Isolated Occurrences Identified in the Project Area

IO No.	Description
1	Basalt primary flake (40% cortex)
2	Basalt primary flake (30% cortex)
3	Basalt secondary flake
4	Rhyolite primary flake (40% cortex)
5	Basalt secondary flake
6	Basalt core with 6 flake scars
7	Condensed milk can, hole in top
8	Basalt secondary flake
9	Basalt secondary flake
10	Possible flaking station with six basalt flakes (1 primary, 4 secondary, and 1 tertiary)
11	20 Gila Plain, Salt Variety sherds, probable pot break
12	Two (2) basalt secondary flakes
13	Basalt core with 5 flake scars
14	Basalt core with 6 flake scars
15	Basalt core tool with edge wear
16	Chert secondary flake
17	Basalt core tool with retouched edge
18	Basalt secondary flake with utilized edge
19	Tobacco tin
20	Chert tertiary flake
21	Chert tertiary flake
22	Tobacco tin
23	Chalcedony secondary flake
24	Basalt core with 8 flake scars
25	Six (6) Hohokam red-on-buff sherds
26	Quartzite corner-notched projectile point
27	Chalcedony primary flake with worked edge

Table 3-1. Continued

IO No.	Description
28	fwo (2) basalt flakes (1 primary, 1 secondary), core with 6 flake scars
29	Two (2) basalt flakes (1 secondary, 1 shatter)
30	Three (3) basalt flakes (1 secondary, 2 tertiary)
31	Basalt secondary flake
32	Milk can (hole in top)
33	Basalt core with 4 flake scars
34	Historic trash scatter (3 solder-drop sanitary cans, 1 lard bucket, 3 tobacco tins) in 5 m ² area
35	Basalt core with 1 flake scar
36	Basalt secondary flake
37	Basalt secondary flake
38	Chert tertiary flake
39	Chert primary flake (heavy patina)
40	Two (2) basalt flakes (1 secondary, 1 tertiary)
41	Basalt secondary flake
42	Basalt core and flake
43	Greenstone core tool with bifacial edge
44	Basalt core

Source: SWCA, Inc. 1996.

PMOA stipulates that Reclamation shall define the area of potential effect (APE) for all undertakings for which it is responsible, identify and evaluate all cultural resources, and afford the SHPO an opportunity to comment.

Proposed Action

Impact: No Effect on Cultural Sites. Construction in the proposed corridor would have no effect on Site AZ T:4:171 (ASM), and no new sites were found in the pipeline corridor (SWCA 1996c, 1996d). Site AZ T:4:53 (ASM) would also not be adversely affected because it is located south of the pipeline corridor and is not considered significant.

Impact: No Effect on Isolated Occurrences. Construction in the pipeline corridor and at the treatment plant site would not result in adverse impacts on prehistoric isolated occurrences because they have been recorded and the data potential has been exhausted.

Impact: Potential Disturbance of Unknown Cultural Resources. Constructing the pipeline and treatment plant could result in disturbance or alteration of unknown cultural sites that have not yet been uncovered or discovered. Ground-disturbing activities, such as grading and trenching, could uncover previously undiscovered resources. Access roads for pipeline maintenance and operation would also provide access to normally untraveled areas, including potentially sensitive archaeological or historic sites. If important cultural materials are encountered during construction or other activities, work would be stopped until a qualified archaeologist can evaluate the finds. Reclamation, in consultation with the SHPO, would require implementation of the following measures if significant cultural materials are present:

- complying with the NHPA, Arizona State Historic Preservation Act of 1982, the Arizona Burial Protection Law of 1990, and the Native American Grave Protection and Repatriation Act;
- securing an Archaeological Resources Protection Act (ARPA) permit from a federal land management agency (Reclamation or U.S. Bureau of Land Management);
- securing a State of Arizona Antiquities Permit from the Arizona State Museum; and
- preparing a mitigation plan in consultation with the SHPO and the Advisory Council on Historic Preservation (ACHP), other participating parties, and the interested public.

Impact: No Adverse Effect on Indian Trust Assets. Indian trust assets (ITAs) are legal interests in property and assets held in trust by the United States for federally recognized Indian tribes or individual Indians. Such trust status is derived from rights reserved by or granted to Indian tribes or individuals by treaties, statutes, and executive orders. ITAs may include land, minerals, water rights, and hunting and fishing rights. Reclamation has reviewed the proposed action for possible effects on ITAs. ITAs have not been identified within the pipeline corridor and would not be adversely affected by construction in the pipeline corridor. The Option and Lease Agreement

would provide a financial benefit to the Ak-Chin Indian Community. The following Indian tribes will be provided an opportunity to comment on the draft EA: Gila River Indian Community, Salt River Pima-Maricopa Indian Community, Ak-Chin Indian Community, and Prescott-Yavapai Indian Tribe (Eto pers. comm.). Effects on the ITAs would be considered negligible because no ITAs have been identified in the project area.

Impact: No Effect on Traditional Cultural Properties. Construction of the proposed water delivery pipeline and the water treatment facility will have no effect on known TCPs. Seven Indian tribes that have a recorded presence, or who have claimed ancestry to the area, will be consulted to ensure that TCPs have been identified, recorded, and that impacts on them have been considered.

No-Action Alternative

Under the No-Action Alternative, water supply Option 1 could have similar effects as those described for facilities under the proposed action. The water supply Option 1 pipeline alignment could encounter known and unknown cultural resources sites located along the I-17 ROW during the site selection and construction processes. Prehistoric sites encountered could include sites associated with habitation of the area by the Archaic people and later the Hohokam. Historic artifacts would be associated with agricultural use of the Black Canyon corridor. Should historic properties or prehistoric artifacts be encountered, implementation of this option would require compliance with applicable state law and coordination with the SHPO to ensure that sites are either avoided or protected.

Based on site surveys conducted by SWCA from August 3 to August 18, 1994, for The Villages development, 13 sites and 205 isolated occurrences were found on the 5,661-acre property (SWCA 1994b). Sites include one large agricultural complex, two field houses, four prehistoric artifact scatters, four historic trash dumps, one rock ring, and a road alignment that is possibly related to old Black Canyon highway. Isolated occurrences are scattered throughout the property, with concentrations apparent in the north and southeastern portions of the property and northwestern portions of the property.

Of the 13 sites identified, five are recommended for inclusion in the NRHP under Criterion (d) because of their potential to provide important information to Hohokam research in the northern periphery. These sites include: Site AZ T:4:119(ASM), a temporary habitation (field house); Site AZ T:4:121(ASM), a temporary habitation with agricultural features (field house); Site AZ T:4:122(ASM), an artifact scatter; Site AZ T:4:124(ASM), a large agricultural complex; and Site AZT:4:125(ASM), an artifact scatter. These sites are important resources in that they are indicative of the broad subsistence farming pattern and natural resource exploitation strategies that were implemented by Hohokam groups in the northern periphery of the Hohokam region. A final determination of eligibility would need to be made in consultation with the SHPO. These five sites appear to be worthy of further consideration because they have the potential to contribute to and broaden the current level of knowledge regarding Hohokam lifeways.

The remaining eight sites and all of the 205 isolated occurrences were determined by a professional archaeologist to not meet the criteria for listing in the NRHP because their data potential was exhausted during the recording process (SWCA 1994b). Reclamation concurs with this recommendation.

Del Webb will comply with federal historic preservation laws as required and applicable state law and will work with the SHPO to ensure that the eligible sites are either avoided or protected according to Secretary of the Interior standards.

3.5 AIR QUALITY

This section describes the existing air quality conditions and regulatory requirements for the region. The air pollutants of greatest concern in the pipeline corridor are ozone, inhalable particulate matter less than 10 microns in diameter (PM10), and carbon monoxide (CO). These pollutants are considered to be of concern because of the potential health risks they pose. These health risks are described below under "Federal Ambient Air Quality Standards".

Affected Environment

Federal Ambient Air Quality Standards

Ozone is a respiratory irritant that increases susceptibility to respiratory infections. Ozone causes substantial damage to leaf tissues of crops and natural vegetation and damages many materials by acting as a chemical oxidizing agent. Ozone is of concern primarily during summer because it is created by the interaction between high temperatures, the presence of sunlight, and atmospheric inversion layers, inducing photochemical reactions between reactive organic gases (ROG) and nitrogen oxides (NO_x). For this reason, significance thresholds are set for these ozone precursors rather than for ozone itself. The federal standards for ozone have been set for a 1-hour averaging time. The federal 1-hour ozone standard is 0.12 part per million (ppm), not to be exceeded more than three times in any 3-year period.

Federal PM10 standards have been set at 150 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) for a 24-hour average and at 50 $\mu\text{g}/\text{m}^3$ for an annual average. Federal 24-hour PM10 standards may not be exceeded more than 1 day per year, and annual standards may not be exceeded at all. Few particles larger than 10 microns in diameter reach the lungs, so PM10 is the focus of the federal standards. Health concerns associated with suspended particles focus on those particles small enough to reach the lungs when inhaled because they can lodge in the lungs and contribute to respiratory problems, including permanent lung damage. Fine particles interfere with the body's mechanism for clearing the respiratory tract or by acting as a carrier of an absorbed toxic substance.

CO is a mildly toxic pollutant that bonds to hemoglobin in the bloodstream when inhaled and interferes with oxygen transport to body tissues. The federal 8-hour average standard for CO is set at 9 ppm and may not be exceeded more than 1 day per year.

Existing Air Quality Conditions

In 1995, federal standards for ozone, PM10, and CO were violated in Maricopa County. The two active monitoring sites closest to the pipeline corridor have recorded exceedances of CO, ozone, or PM10 in 1996 (Brown pers. comm.). The nearest operating monitors are located in North Phoenix and Glendale, Arizona. The proposed pipeline corridor and treatment plant sites are located within the pollutant nonattainment area for CO, ozone, and PM10.

Emission Sources

Ozone precursor pollutants (ROG and NO_x) and CO emissions stem primarily from vehicle traffic associated with urban development. A variety of emission sources contribute to current particulate matter problems in the area. Major contributors to particulate matter problems include agricultural activities, dust resuspended by vehicle traffic on unpaved roads, construction and demolition, and aerosols formed by photochemical smog reactions.

Attainment Status and Air Quality Planning

Air quality management in Arizona is governed by the federal Clean Air Act, which is implemented by the U.S. Environmental Protection Agency (EPA). The Arizona Department of Environmental Quality (ADEQ) and the Maricopa County Environmental Services, Department of Air Pollution Control (APC), oversee air quality planning and control throughout Maricopa County. ADEQ is responsible for portable and refinery sources control, whereas APC is responsible for stationary and indirect source control, air monitoring, and preparation of air quality attainment plans. The federal Clean Air Act mandated the establishment of ambient air quality standards and requires areas that violate these standards to prepare and implement plans to achieve the standards. These plans are called state implementation plans (SIPs). A separate SIP must be prepared for each nonattainment pollutant. Maricopa County has complete SIPs for ozone, PM10, and CO; however, the SIPs for CO and ozone are currently being revised (Brown pers. comm.).

Conformity Screening

The proposed action is subject to EPA's general air quality conformity regulation because it is a project that requires federal approval. The conformity regulation states that any new project using federal funds or requiring federal approval must show that the project does not cause or contribute to a worsening of air quality in areas that violate the federal ambient air quality standards. These pollutant threshold levels, called *de minimis* emission levels, vary from pollutant to pollutant

and depend on the attainment status of individual air basins. The nonattainment status of the area is classified as "serious" for CO and PM10 and as "moderate" for ozone (Brown pers. comm.).

According to the EPA, the applicable *de minimis* levels for this project are 100 tons per year (tpy) for ROG and NO_x, 100 tpy for CO, and 70 tpy for PM10. Truck traffic associated with pipeline construction would be low and construction activities would be temporary. PM10 reducing measures will be incorporated into the project. The resulting emissions of CO, ROG, NO_x, or PM10 are, therefore, not expected to exceed the *de minimis* levels and no conformity analysis is necessary for construction of the pipeline under the proposed action.

Environmental Consequences and Mitigation Measures

Proposed Action

Impact: Short-Term Increase in ROG and NO_x (Ozone Precursors) and CO Emissions during Project Construction. Construction of the pipeline and water treatment plant could result in a minor short-term increase in the generation of CO, ROG, and NO_x emissions from the operation of construction equipment. Measures are available to minimize ROG and NO_x emissions during construction. Construction-related emissions will be short-term and are not expected to exceed *de minimis* levels because a relatively small number of construction vehicles would be needed to construct the pipeline and treatment plant.

Impact: Short-Term Increase in PM10 Emissions during Project Construction. Construction of the pipeline and treatment plant would result in a short-term increase in generation of PM10 emissions attributable primarily to earth-moving activities occurring over several months. As a condition of the construction contract, Del Webb would be required to submit an earth-moving permit application to the APC and implement a dust control plan to reduce PM10 fugitive dust emissions in accordance with Maricopa County Rule 310 for Fugitive Dust (Anthony pers. comm.). These PM10-reducing measures are included as part of the proposed pipeline and treatment plant construction requirements.

Impact: Potential Long-Term Increase in ROG and NO_x (Ozone Precursors) and CO Emissions during Project Operation. Operation of the water treatment plant could result in emissions to the air of ozone precursors and CO only if operation of the water treatment plant requires the use of internal combustion engines (thereby requiring the use of petroleum fuels). In such a case, Maricopa County may require that Del Webb obtain an Air Quality Permit, depending on the type of engines and the hours operated per year. The APC may also require that additional engineering modifications be made to water treatment equipment to reduce emission levels prior to granting an Air Quality Permit (Anthony and Chiu pers. comms.). Before receiving an Air Quality Permit from Maricopa County, Del Webb must demonstrate that air emissions would not exceed threshold levels. Operation of the pipeline is not anticipated to generate emissions of ozone precursors and CO. Because ROG-, NO_x-, and CO-reducing measures would be necessary prior to construction, this would be considered a minor adverse effect on air quality.

Impact: Potential Long-Term Increase of PM10 Emissions during Project Operation. Operation of the pipeline and treatment plant is not expected to result in earth-moving activities that would generate substantial PM10.

No-Action Alternative

Development of water supply Option 1 and The Villages would occur under this alternative. Existing air quality conditions are the same as identified in the "Affected Environment" section. The Villages and the water supply Option 1 pipeline alignment would not be subject to EPA's general air quality conformity regulation because these projects do not involve federal funding or Reclamation approval.

Air quality issues related to the water supply Option 1 pipeline would be similar to those described for the proposed pipeline corridor. Short-term, construction-related ROG, NO_x, and PM10 emissions would result from trenching and pipeline placing activities involving heavy equipment. Construction emissions under this option would likely be slightly greater than under the proposed pipeline because the Option 1 pipeline corridor would be approximately 3 miles longer than the proposed pipeline. No long-term pollutant emissions would result from this option because water would be treated at the existing City of Phoenix water treatment plant.

Air quality emissions generated from The Villages development would be consistent with air emission levels of other urban or suburban developed areas. Potential emission sources resulting from The Villages development include temporary construction-related sources and vehicular and truck traffic from the more than 16,500 projected residential units, associated commercial development, and proposed wastewater treatment plant facilities. As a result of the traffic expected to be generated at buildout in 20 years from The Villages development, the No-Action Alternative could be expected to generate long-term ROG, NO_x, CO, and PM10 emissions in a region currently identified as a nonattainment area for federal standards.

3.6 NOISE

Affected Environment

Relevant Guidelines and Regulations

Maricopa County has not established noise compatibility criteria for the pipeline corridor (James pers. comm.). The EPA, however, has established sound level guidelines for various types of uses (U.S. Environmental Protection Agency 1971). A sound level of 55 decibels (dB) day-night average sound level (L_{dn}) was established as the outdoor level in residential areas that protects the public health and welfare with an adequate margin of safety. The L_{dn} descriptor is a 24-hour average

weighted to penalize noise that occurs during nighttime hours (10 p.m.- 7 a.m.) when people are likely to be most sensitive to noise levels.

Existing Noise Conditions

No noise-monitoring data are available for the pipeline corridor. Existing noise conditions in the areas of the proposed turnout structure, storage tanks, water treatment plant, and pipeline corridor are typical of noise conditions in desert open space areas. The area around the pipeline, however, is generally uninhabited. Existing noise sources consist primarily of traffic from local roadways and I-17 as well as Waddell Canal, which is a minor noise source.

Environmental Consequences and Mitigation Measures

Proposed Action

Impact: Temporary Construction-Related Noise. Construction of the proposed water delivery facilities would result in a temporary increase in noise levels at the turnout structure, pumping plant, pipeline, storage tank, and water treatment plant construction sites. Figure 3-2 illustrates noise levels produced by various types of construction equipment. Properly maintained equipment would produce noise levels near the middle of the indicated ranges. The types of construction equipment that would likely be used for the pipeline construction would typically generate noise levels of 80-90 A-weighted decibels (dBA) at a distance of 50 feet while the equipment is operating (U.S. Environmental Protection Agency 1971, Toth 1979, Gharabegian et al. 1985). The operations of construction equipment can vary from intermittent to fairly continuous, and many pieces of equipment can operate at the same time. Assuming that a bulldozer (87 dBA), backhoe (90 dBA), and front-end loader (82 dBA) are operating simultaneously in the same area, peak construction-period noise could be approximately 94 dBA at 50 feet from the construction sites.

Although construction-related noise levels could be substantial at the proposed construction site, they would be temporary and no construction would occur at night. In addition, there are no sensitive noise receptors in the pipeline corridor. One homesite is located approximately 0.5 mile north of the pipeline corridor; it would not be affected by construction-related noise.

Impact: Operational Noise. Operation of the proposed turnout structure, pumping plant, and water treatment plant would create noise. In addition, operation of the water delivery system will require occasional maintenance, which also would generate noise; however, noise from maintenance activities would be temporary and would most likely be within the range of levels previously mentioned. In addition, there are no sensitive noise receptors in the pipeline corridor vicinity.

CONSTRUCTION EQUIPMENT	Noise Level (dBA) at 50 feet					
	60	70	80	90	100	110
Equipment Powered by Internal Combustion Engines						
Earthmoving						
Compactors (rollers)		■				
Front loaders		■	■			
Backhoes		■	■	■		
Tractors		■	■	■		
Scrapers, graders			■	■		
Pavers				■		
Trucks			■	■		
Materials Handling						
Concrete mixers		■	■			
Concrete pumps			■			
Cranes (movable)		■	■			
Cranes (derrick)				■		
Stationary						
Pumps		■				
Generators		■	■			
Compressors		■	■			
Impact Equipment						
Pneumatic wrenches			■			
Jackhammers and rock drills			■	■		
Pile drivers (peaks)					■	
Other						
Vibrators		■	■			
Saws		■	■			

Source: U.S. Environmental Protection Agency 1971.



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Figure 3-2
Construction Equipment Noise Ranges

No-Action Alternative

Under the No-Action Alternative, similar noise effects, as described for the proposed pipeline, could result from alternative water supply facilities. Construction of the water supply Option 1 pipeline and booster pump plants would involve a temporary increase in noise levels in the 80-90 dBA range adjacent to I-17 between Deer Valley Road and The Villages site. Construction noise associated with the pipeline at this location would probably not be noticeable because of the proximity of the I-17 background traffic noise source. Booster pumping plant operation would likely create a minor increase in noise levels at Happy Valley Road and north of the Carefree Highway; however, no inhabited structures are present in these areas.

Noise levels generated from The Villages development would be typical of those in other suburban areas around Phoenix. Noise levels would be greatest near roadways and in areas identified for public use. Background noise levels on I-17 could also increase by the time the development is completed, which is estimated to be approximately 20 years.

3.7 TRAFFIC AND CIRCULATION

Affected Environment

The proposed pipeline alignment would cross seven roadways: SR 74, New River Road, 87th Avenue, three unnamed gravel/dirt roads, and I-17. Most areas of the alignment would cross undeveloped rural land.

Highways and Roads

The primary roadway in the pipeline corridor is I-17, which connects Phoenix and Flagstaff, Arizona. In the project vicinity, I-17 is a four-lane facility. Average daily traffic (ADT) on I-17 in the vicinity of the pipeline corridor is 22,910 vehicles (Maricopa County Department of Transportation 1996).

Lake Pleasant Road (SR74) is a two-lane road extending north/northwest from Carefree Highway and crossing the Agua Fria River south of New Waddell Dam. The ADT on SR 74 in the vicinity of the proposed action is 678 vehicles (Hamlin pers. comm.). New River Road begins at an intersection with SR 74 approximately 0.5 mile north of Carefree Highway and extends northeast to I-17. New River Road is a two-lane road that is paved for a portion of its length north of the pipeline crossing; in the vicinity of the pipeline corridor as well as to the south, New River Road is improved gravel and dirt. The ADT on New River Road in the vicinity of the pipeline corridor is approximately 2,500 vehicles (Hamlin pers. comm.).

The Arizona Department of Transportation (ADOT) has jurisdiction over I-17 and SR 74, and the Maricopa County Department of Transportation (MCDOT) has jurisdiction over New River Road.

Environmental Consequences and Mitigation Measures

Proposed Action

Impact: Potential Alteration of Present Patterns of Vehicular Circulation and Increase in Traffic Hazards during Construction Activities. The proposed pipeline corridor would cross I-17, SR 74, New River Road, 87th Avenue, and a number of other unpaved roads. The crossing of I-17 and SR 74 would be accomplished by using conventional underground boring methods. These methods would not disrupt traffic patterns on I-17. Where it would cross New River Road and 87th Avenue, the proposed pipeline would be installed using trench-and-bury construction methods. Construction of the pipeline could result in lane or road closures, detours, open trenches, and the addition of construction trucks and equipment on the surrounding roadway system. This potential effect is considered minor because Del Webb has incorporated a traffic control plan for all road crossings into the project design. The traffic control plan will be coordinated with the MCDOT and ADOT, and construction will follow the standards of the local jurisdiction. Elements of the traffic control plan could include:

- coordinating with state and local jurisdictions regarding hours of construction and lane closures that would minimize construction impacts on the roadways;
- obtaining easements or encroachment permits from local agencies and ADOT, as necessary;
- providing for detours or ensuring that at least one traffic lane remains open along affected roadways and minimizing lane closures during the peak a.m. and p.m. commuting hours;
- specifying types and locations of warning signs, lights, and other traffic control devices;
- providing access for driveways and private roads; and
- notifying and consulting with emergency service providers to ensure that adequate emergency access is maintained.

Impact: Increased Vehicular and Truck Traffic on the Existing Roadway Facilities during Construction. Activities associated with construction of the intake structure, pipeline, storage tanks, and water treatment plant are expected to result in additional traffic on the pipeline corridor roadways. Because construction traffic would be temporary and truck volumes would be low, this impact would have a minimal effect on daily traffic levels.

Impact: Temporary Effect on Roadway Conditions. Pipeline installation and heavy equipment traffic could result in effects on roadway surface conditions at crossings. As part of the project, Del Webb will be required to follow normal construction practices, including restoring all road surfaces to original conditions and coordinating with local jurisdictions to ensure that appropriate truck routes are used.

Impact: Minimal Increase in Employee Traffic Volumes and Traffic Delays from Operation and Maintenance. Operating the water treatment plant would require additional employees that would generate additional new trips during both morning and evening peak hours. The possible generation of new trips during the peak hours would not result in a substantial increase in traffic. Operation and maintenance of the Waddell Canal turnout structure, pipeline, and storage tanks would require minimal traffic from maintenance vehicles and may occasionally require lane closures for maintenance activities. The maintenance activities would be relatively infrequent and would involve only temporary effects on traffic circulation.

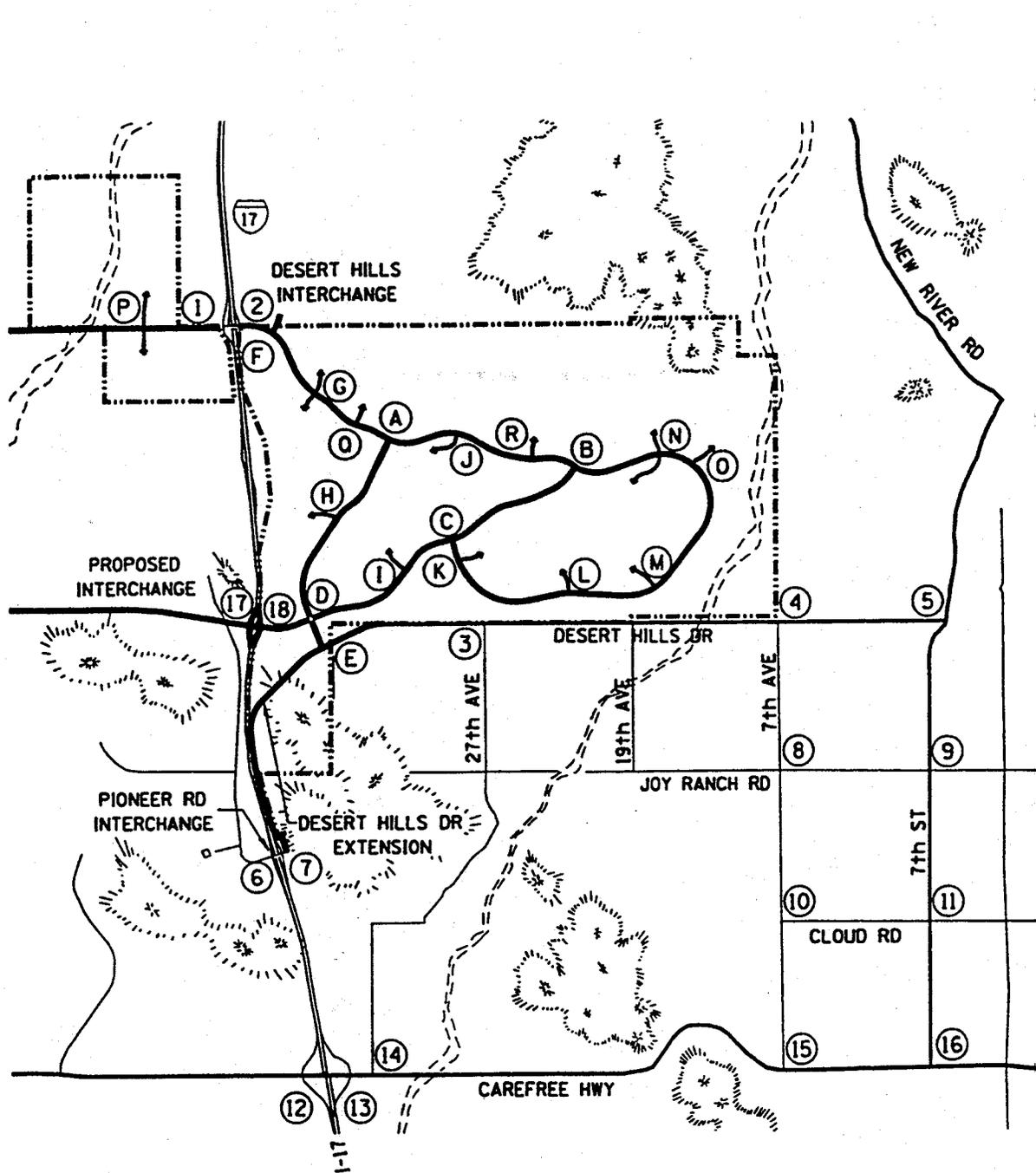
No-Action Alternative

Under water supply Option 1, construction activities associated with the pipeline alignment would result in temporary increases in vehicular and truck traffic on the local roadway network and could result in temporary effects on road conditions (e.g., asphalt damage, detours, or delays) related to construction equipment traffic. Operation and maintenance of the pipeline corridor would result in minor operational traffic effects, and no additional employee traffic related to water treatment plant operation would occur because the water supply would be treated by the City of Phoenix.

Traffic and circulation effects that could result from implementation of The Villages development were evaluated during the Maricopa County plan of development approval process. The following is a summary of the traffic study prepared for The Villages by Kirkham, Michael and Associates (1995).

The traffic study contains traffic projections for the planning horizon year 2015 for the New River Planning Area with and without The Villages development. Because of the size of The Villages development, it is anticipated that buildout would take approximately 20 years. Under this assumption, by the year 2015, 80% of the development would be completed. Figure 3-3 shows the existing and proposed roads in the development area.

The Maricopa Association of Governments' Base Case Model was used to project traffic volumes for the New River Planning Area for the year 2015 without The Villages development. A second model was run to project ADT volumes for the New River Planning Area for the year 2015 with The Villages development. Figures 3-4 and 3-5 show ADT volumes for the New River Planning Area with and without The Villages development for the year 2015. The traffic modeling also estimated a.m. and p.m. peak-hour traffic volumes at intersections external to The Villages area and on I-17.



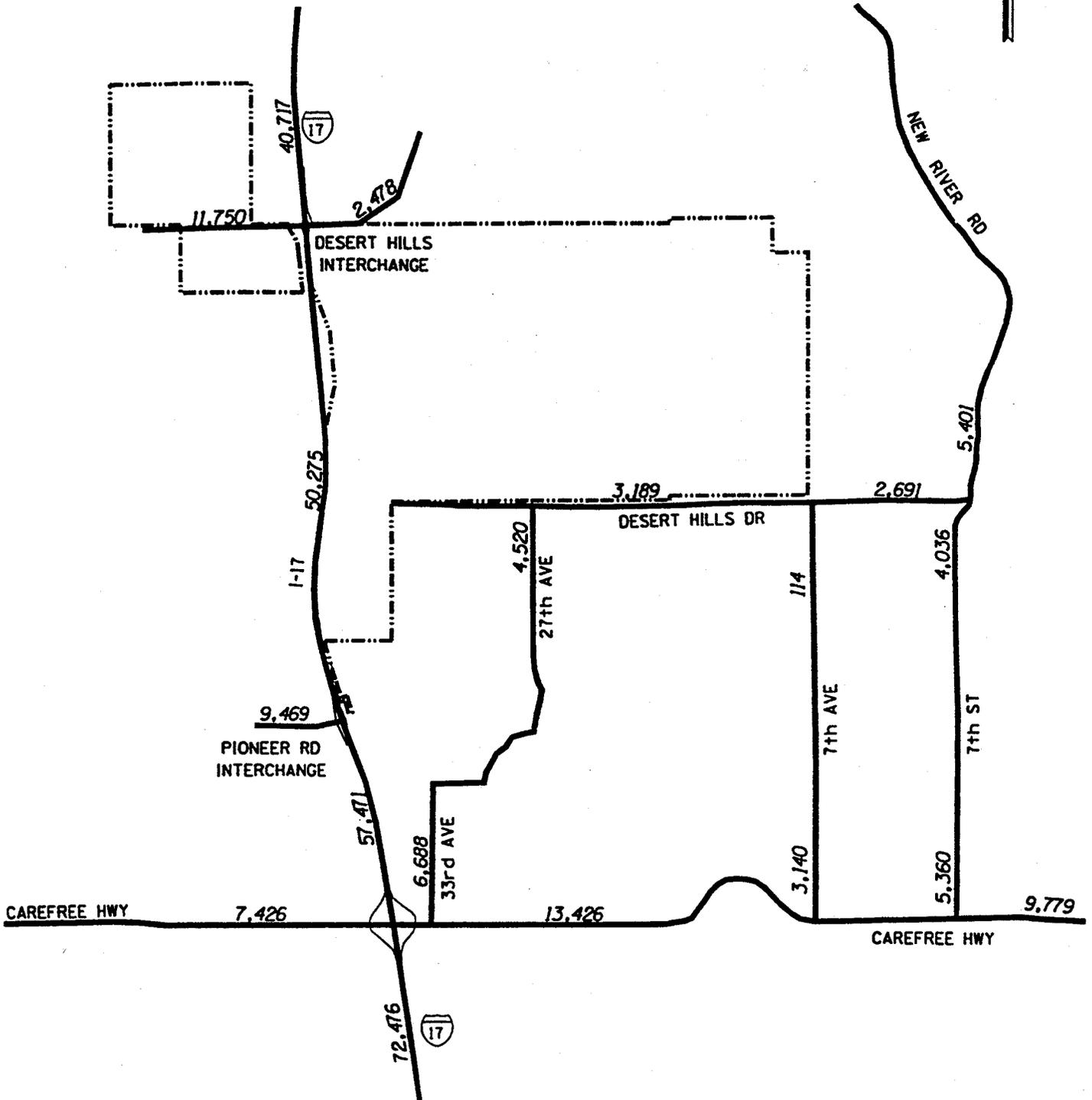
- (A) INTERNAL INTERSECTION LABEL
- (2) EXTERNAL INTERSECTION LABEL
- PROJECT BOUNDARY

Source: Kirkham Michael and Associates.



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Figure 3-3
Proposed Roadway System with the
Villages Development

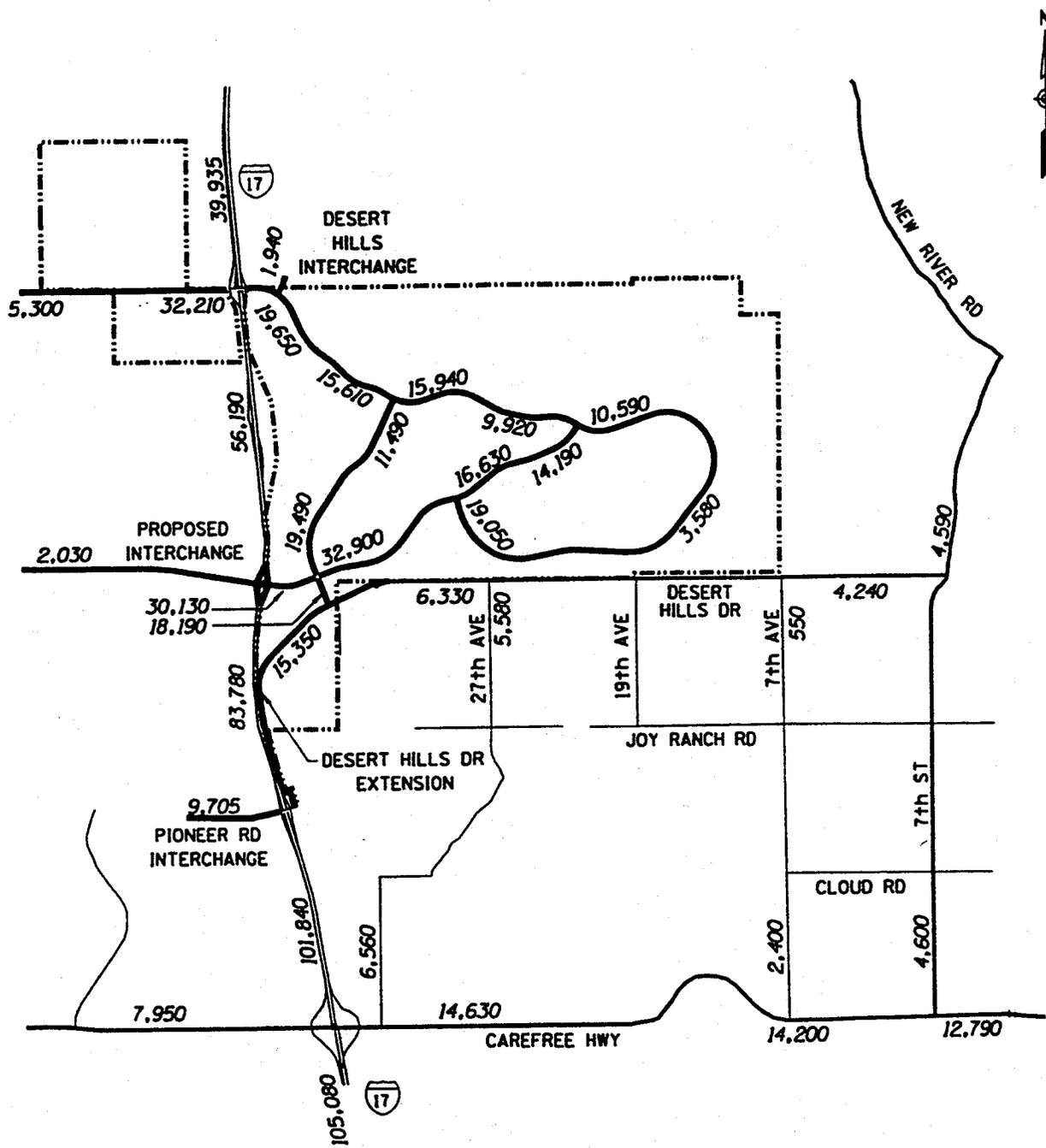


Source: Kirkham Michael and Associates.



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Figure 3-4
Average Daily Traffic without the
Villages Development



NOTE: VOLUMES SHOWN ARE ADJUSTED AS DISCRIBED IN TEXT

Source: Kirkham Michael and Associates.



Jones & Stokes Associates, Inc.

Figure 3-5
Average Daily Traffic with Villages Development

Generally, the traffic modeling shows that compared to existing conditions, ADT volumes on I-17 would increase from approximately 23,000 in 1996 to over 50,000 in 2015 without The Villages development. With The Villages development, the ADT on I-17 in 2015 would be between 56,000 and 84,000 vehicles as shown in Figure 3-5. ADT volumes on I-17 in 2015 would be greatest south of Carefree Highway both with and without The Villages.

Improvements to interchanges and interchange approaches are proposed to facilitate the projected increase in traffic volume (Figure 3-5). At the maximum zoning densities the existing Desert Hills and Pioneer Road interchanges will require improvements, and a new interchange is proposed near Deadman Wash, 1.5 miles north of the Pioneer Road interchange and 2 miles south of the Desert Hills interchange. Connections to the new interchange would be provided by six-lane major arterials that would parallel Deadman Wash and run northeast from the interchange. The existing Desert Hills Drive is proposed to be a four-lane minor arterial street extending west and south along I-17 to connect with the existing Pioneer Road interchange. Six-lane major arterial connectors running east and west to the existing Desert Hills interchange are also proposed. Existing access to residential areas south of Desert Hills Drive would not be affected by The Villages' circulation improvements.

Improvements to arterial roadways are also proposed to facilitate the projected increase in vehicles. The arterial roadways would be fed by 15 proposed major collector streets, two for the property west of I-17 and 13 for the property east of I-17. The major collector roadway proposed for the property on the west side of I-17 would be a north-south roadway that would eventually connect to the Desert Hills interchange. The major collector roadways proposed for the property east of I-17 would be a combination of east-west and north-south roadways that would connect to the arterial system. The major collector roadways would penetrate the individual subdivisions, collecting local traffic and distributing it to the arterial street system. They would also provide traffic circulation between neighborhoods and recreational facilities. All of the major collector roads are proposed to be three lanes, including a two-way left turn channelization that will widen to provide the appropriate intersection geometry required at arterial streets. Upon full buildout of The Villages development, intersections of major collector roads and arterial streets may require traffic signals.

3.8 LAND USE AND VISUAL RESOURCES

Affected Environment

Existing Land Use Conditions

The proposed pipeline would be located adjacent to Waddell Canal, adjacent to an existing electrical transmission line corridor and Reclamation's abandoned haul road for over half of its 9-mile length. The pipeline corridor consists primarily of desert open space, with few improved land-

use features in the vicinity. The corridor would cross 17 minor drainages, the New River channel, the El Paso Natural Gas pipeline corridor, six roads, and I-17.

The construction of the pipeline would require both temporary construction and permanent ROW easements because it would cross land owned by several different state and federal agencies. ROW access would be required from the U.S. Bureau of Land Management (BLM), State Land Department of Arizona (SLD), ADOT, and MCDOT. State and BLM land is primarily used for grazing and other open space uses. During pipeline construction, an approximately 100-foot-wide temporary construction easement would be required for all but the New River crossing where the construction site would be larger. Following construction, a 30-foot-wide, 50-year access easement would be required for the pipeline alignment.

The proposed project is located within the 216-square-mile New River Land Use Planning Area in Maricopa County. The land that the proposed pipeline corridor crosses is currently zoned R-43 (Rural Residential, 1 unit/acre). The New River Land Use Plan also provides for the development of higher densities associated with a development master plan.

East of I-17 several areas of scattered residential development exist on lots of 1 or more acres. The Arizona Factory Outlet Shops are located on the west side of I-17 at the Honda Bow Road (Desert Hills) interchange. The area between I-17 and Lake Pleasant Regional Park is mostly vacant and consists of undeveloped Sonoran desertscrub. In addition, one home site is located approximately 0.5 mile north of the pipeline corridor. No minority or low-income communities are located near the pipeline corridor. The Ben Avery Shooting Range, the Arizona Pioneer Museum, and an RV Park are located approximately 2 miles south of the pipeline corridor, a federal correctional center is located approximately 1 mile south of the pipeline corridor, and the New River Landfill, a residential waste site, is located over 1 mile to the north.

Visual Resources

Visual resources near the pipeline corridor consist generally of typical Sonoran Desert landscape features with scattered rural development. Background views in the area are typical of the landscape setting in much of central Arizona, consisting of distant views of foothills and mountainous terrain, which are generally considered to have high scenic value. Middleground views in the area are of flat desertscrub habitat in the lowland areas and of higher elevation hills, bluffs, and mountains. Prominent features in the area that add visual variety to the otherwise flat desert habitat are Daisy Mountain east of I-17, a relatively low volcanic outcrop 1 mile west of I-17 and south of the pipeline corridor, the New River channel, and the Agua Fria River. The surface of Lake Pleasant cannot be seen from the pipeline corridor.

Prominent views in the area are generally only from I-17, SR 74, and New River Road. Viewing opportunities in the area are also possible from a number of lightly traveled unimproved roads.

Environmental Consequences and Mitigation Measures

Proposed Action

Impact: Consistency with Land Use Goals and Planning Objectives of Maricopa County. Construction of the proposed water pipeline is consistent with the goals and planning objectives of Maricopa County. Maricopa County has identified the New River Planning Area as an area of desired future urban growth. However, uncertainty concerning water availability in the New River Planning Area is a severe constraint on future growth; 100% of the current water supply comes from groundwater sources that yield low volumes of water. Because the surface water supply under the proposed action would provide a reliable alternative to groundwater, it is considered consistent with applicable plans and policies.

Impact: Consistency with Adopted Land Use Designations and Zoning. The majority of the area that the proposed pipeline corridor would cross is vacant land. The property is currently zoned R-43 (one residential unit per acre). Because this zoning allows for provision of utility corridors and easements, the water delivery facilities are considered consistent with the intended land use for this area. The New River Land Use Plan makes development provisions for higher-density provided they are part of a DMP.

Impact: No Conflict with Adjacent Land Uses. Implementing the proposed action would not result in substantial conflicts with surrounding land uses because the pipeline corridor is vacant. The land immediately surrounding the proposed pipeline alignment is undeveloped, with the exception of Waddell Canal, roadway crossings, the El Paso Natural Gas pipeline, and the existing electrical transmission corridor (see the discussion of rights-of-way below). The land uses in the area identified above are not in the immediate vicinity of the proposed pipeline corridor and would not be affected because construction activities for the water delivery facilities would be temporary and the pipeline would be underground. No land use conflicts associated with the one homesite would occur because the site is approximately 0.5 mile north of the proposed pipeline corridor.

Impact: Possible Conflicts with Existing Local, State, and Federal Agency Rights-of-Way. Construction and operation of the proposed pipeline and treatment facilities would generally create minimal effects on existing local, state, and federal property and ROWs because construction of water delivery facilities is consistent with the general land use in the area and would not substantially affect use of property or ROWs.

Arizona State Lands Department. Most of the lands that the proposed pipeline corridor would cross are Arizona State Trust Lands. The state's primary goal for these lands is to maximize revenues from use of the lands for state schools. The proposed pipeline corridor has been reviewed by SLD staff, which determined that the pipeline would have only minor effects on State Trust Lands. Construction-related activities would create temporary physical effects on State Trust Lands; these effects would be minimized by measures incorporated into the pipeline design to restore the corridor. (See Section 4, "Environmental Commitments", for additional information on measures to restore the construction corridor.) Additional revenue would be generated related to use

of state land for a pipeline easement. Therefore, the ROW conflicts associated with Arizona State Trust Lands are not considered adverse, and the pipeline construction would have a beneficial economic effect on Arizona State Trust Lands.

Bureau of Land Management. BLM is in the process of acquiring acreage on the east side of Lake Pleasant for a dedicated conservation area, which may include portions of the pipeline corridor. The pipeline corridor also includes crossing a narrow BLM ROW east of New River that is known as the Black Canyon Corridor. Del Webb would be required to obtain a ROW easement from BLM to cross the corridor. BLM is working toward establishing a designated trail in the corridor to provide a public amenity for equestrian and pedestrian users. However, constructing an underground pipeline across the BLM ROW would result in only minor effects on BLM's plans to develop a trail in their designated corridor (Ragsdale pers. comm.).

Arizona Department of Transportation. The pipeline construction would involve crossing I-17 and SR 74. The ADOT has a policy of not allowing utilities in their ROW, with the exception of perpendicular crossings. The ROW along I-17 is 300 feet. A tunnel would be bored under the I-17 and SR 74 ROW to accommodate the proposed pipeline. Once completed, the pipeline would not affect the ROW. However, construction activities associated with the pipeline could create short-term impacts. Barricades and other traffic control measures would be required to reduce potential safety impacts.

Maricopa County Department of Transportation. MCDOT allows recognized public utilities to be placed in the ROW along county roads, but requires a permit. The proposed pipeline would cross New River Road and several other small roads within the County. Necessary permits have been obtained, and no impacts to the ROWs will occur. However, there will be short-term, construction-related impacts on roadways. Following construction, Del Webb would be required to restore the roadways.

APS Electric Utility Corridor. The proposed pipeline would be sited adjacent to the electric transmission line corridor for approximately 3.3 miles from just after the pumping station at Waddell Canal to the former Reclamation haul road. No adverse land use impacts on the existing transmission corridor are anticipated because the transmission line towers would not be affected by an underground pipeline. Additionally, locating the proposed facilities adjacent to an existing utility corridor would minimize any potential long-term land use conflicts because the facilities would be sited near an already disturbed corridor. APS has been contacted and pipeline placement will be coordinated with staff to ensure no conflicts with the existing ROW would occur. Approximately 35 feet of APS's existing right-of-way would be used as part of the 100-foot-wide construction easement, further reducing effects in the area.

El Paso Natural Gas Pipeline Corridor. The proposed pipeline would cross the alignment of the El Paso Natural Gas pipeline corridor. The proposed pipeline would not interfere with operation of the gas pipeline because the pipeline would be placed beneath the gas pipeline. Precautions will be taken during construction of the proposed pipeline to eliminate hazards associated with the gas pipeline. El Paso Natural Gas has been contacted to ensure no conflicts arise associated with the water pipeline.

Impact: No Effect on Prime Agricultural Lands. Implementation of the proposed pipeline and treatment plant would not require the conversion of prime agricultural land to nonagricultural uses because no prime agricultural land exists in the pipeline corridor. The proposed pipeline would cross existing grazing land. Provisions will be made to prevent livestock from falling into the trenches during construction.

Impact: Effect on Visual Resources. The proposed pipeline would not be visible during the operational phase and would, therefore, not create any long-term impacts on visual resources. Short-term effects on visual resources during construction are expected to be minor because construction would be temporary, the area of effect is relatively small, and no sensitive visual resource receptors would be adversely affected. Minor changes to views of the desert visual resources would be most apparent to motorists during construction at the SR 74 crossing and near I-17. Visual resource changes at the Waddell Canal turnout structure would be consistent with visual resources at the canal.

Impact: No Environmental Justice Effects. The proposed pipeline corridor construction site would not affect any minority or low-income communities because none exist in the corridor area. Environmental commitments identified for the proposed pipeline would also not directly or indirectly affect such communities.

No-Action Alternative

Under the No-Action Alternative, alternative water supply options would be used to serve The Villages development area. Water supply Option 1 would be consistent with the land uses goals, objectives, and designations of Maricopa County and would likely not result in substantial land use conflicts because the pipeline corridor would be sited adjacent to the I-17 corridor, and the pipeline would be buried. ADOT's policy of generally not allowing utilities in its 300-foot-wide ROW would require the pipeline to be sited over 150 feet east of I-17. The pipeline alignment would not affect any prime agricultural land, and no long-term visual resources impacts would result because the pipeline would be buried, the corridor would be revegetated, and the alignment would be sited adjacent to an existing transportation corridor.

The Villages development is within the 216-square-mile New River Planning Area. The Villages would be developed under a DMP that encompasses 5,661 acres of vacant desert scrub in the southern portion of the New River Planning Area. The site is currently vacant and is zoned to accommodate the proposed development. The DMP, NUPD, and planned development overlay are reflected in the New River Land Use Plan (NRLP) text and map, as amended.

Land uses surrounding the development area consist of I-17 to the west, vacant hills and the community of New River to the north, and scattered rural residences to the east and south. The rural residential area south of Desert Hills Drive is the most concentrated residential area in the development site vicinity.

The Villages development would convert 5,661 acres of vacant Sonoran Desert habitat to a master planned community environment. The development would include a mix of residential (16,526 units), commercial, employment, recreation, and open space uses. The average residential density for the entire project is 2.9 dwelling units per acre. Approximately 38% of the plan of development is devoted to open space and recreation areas, including undisturbed natural areas, hillsides with slopes over 15%, major drainage ways, golf courses, and 300 acres of neighborhood and community parks. No prime agricultural land will be converted in the development area.

The Villages development is consistent with the goals and objectives of Maricopa County and the NRLP. Additionally, numerous stipulations have been presented by the county with which The Villages development must comply. These stipulations are observed in the NUPD and have been incorporated into the plan of development or will be completed before construction.

The NRLP promotes using DMPs on large tracts in the area, provided that the project is responsive to the physical and natural constraints of the property. The reduction of rural residential sprawl and preservation of natural environmental features are goals of the NRLP that are taken into consideration in the proposed Villages development. The development will be integrated into the natural environment, allowing for the preservation of sensitive open space areas that contain visual resources and natural environmental features such as riparian washes, scenic areas, open desert, and steeply sloping desert hillsides.

A goal of the NRLP is to provide a land use environment which generates a diversified economic base that fosters varied employment opportunities, and encourages business formation and expansion. The Villages DMP meets this goal by providing commercial and job employment centers within the proposed Villages plan of development.

It is also anticipated that The Villages would be consistent with the socioeconomic and land use goals of the County and the NRLP, which encourage higher density urban residential developments that provide a mixture of housing types. Development of a treated surface water source and wastewater treatment plant for The Villages would eliminate the need for a groundwater source and would ensure that groundwater quality problems associated with individual septic systems do not occur in the development area.

Under the No-Action Alternative, The Villages development would not be expected to create substantial land use conflicts with adjacent rural residences. Rural residences to the north, east, and south of the property would be buffered from new development by the incorporation of low-density residential buffer areas into development plans. Daisy Mountain and the New River Range would eliminate views from and buffer land use conflicts with the existing New River community. Skunk Creek and over 300 acres of low-density residential buffer area would substantially reduce land use conflicts that could arise on the southern and eastern property boundaries. Based on the approved DMP, buffer areas along Desert Hills Drive would retain an R1-43 zoning density.

The northwest portion of the site west of I-17 near the Desert Hill interchange would include commercial and mixed land uses. This portion of the site is compatible with surrounding uses because it is adjacent to the existing Outlet Mall.

Under the No-Action Alternative, conversion of open desert habitat in The Villages development area to a master planned community environment setting would substantially change the current views of the site from I-17 and surrounding rural roads. To help minimize visual resource issues, Del Webb plans to preserve many of the natural drainage and hillside features and will provide 38% of the site for open space and recreation/park features. The development area will be landscaped and developed as a high-quality, master planned community. Background views of the mountains would not be affected.

Under the No-Action Alternative, public services and utilities for The Villages development area will be provided according to the DMP. Before adoption of the master plan, Maricopa County identified the lack of infrastructure in the New River Planning Area as a constraint to future development. The provision of public services by a developer is encouraged and many times required as a stipulation of development. All of the public services required in the area will be provided, as described below.

The Villages is in the Deer Valley School District. The Desert Mountain Middle School is approximately 2 miles to the south, and the Deer Valley Junior High and Barry Goldwater Senior High Schools are 10.5 miles south at Rose Garden Lane and 27th Avenue. The New River Elementary School is approximately 3 miles to the north on the east side of Black Canyon Highway. Land will be made available for elementary, junior, and senior high school facilities within The Villages development area. To the extent possible, schools will be located adjacent to parks to maximize shared use of recreational facilities. An agreement with the Deer Valley School District for specific types of facilities has been executed pursuant to a DMP Stipulation "u" to dedicate a 50-acre high school site and construct a \$7 million elementary school. Pursuant to DMP Stipulation "mm", The Villages has committed to reserve two additional school sites for a period of 10 years to serve future populations if necessary. Pursuant to DMP Stipulation "ee", the first Information Center will be converted to a library no later than 10 years from the opening of the first model home complex.

The Maricopa County Sheriff's Department currently provides police protection and security to the general area from a substation 18 miles from The Villages development. Police services in the development area will also be provided by the Maricopa County Sheriff's Department. Pursuant to DMP Stipulation "qq", Del Webb has dedicated a 12-acre site on the west side of I-17 adjacent to the Factory Outlet Mall for use by the Sheriff's Department, which may be operated in conjunction with a maintenance facility for the MCDOT.

The Daisy Mountain Fire District currently provides fire service in the area, with stations located at 7th Avenue and Desert Hills Drive and at 27th Avenue and New River Road. Pursuant to Stipulation "rr" of the DMP, a 2.5-acre site was donated in the development area to the Daisy Mountain Fire District for fire station facilities.

No sanitation district currently exists in the area. The Villages development will provide a sewer system and a wastewater treatment facility for both potable water and reclamation of non-potable wastewater. The 44-acre site for the water treatment plant identified under the proposed action would also serve as a site for a tertiary wastewater treatment plant that will accommodate the

entire development. Treated effluent is planned as a future source of water for golf course and landscape irrigation. The golf course lakes will serve as storage basins for the irrigation systems. The wastewater treatment facility is anticipated to serve only The Villages development.

The Villages site is currently not served by solid waste disposal services. Trash collection and disposal services in the development area will be provided by a private collection company and will be disposed of at either the Skunk Creek landfill or the Maricopa County Northwest Regional Landfill. Both have sufficient capacity to serve The Villages and would not need to be expanded.

The Villages site is not within an established water district. The Desert Hills Water Company service area abuts the southeast corner of the property and the boundary of the Sabrosa Water Company service area is approximately 1 mile to the northeast. Under the No-Action Alternative, The Villages development will secure one of the alternative water supply options. Groundwater will not be extracted from local wells to serve the community. (Groundwater can only be used on an interim basis early in construction until a permanent water system is completed). No effects on existing water companies in the area are expected because no established water district exists in the development.

A number of developed and undeveloped recreational resources currently exist in the pipeline corridor near the I-17 corridor. Lake Pleasant Regional Park, which is managed by the Maricopa County Parks Department, is located approximately 10 miles to the west of The Villages development area. The 141,400-acre park includes an extensive system of recreational facilities. The Cave Creek Recreational Area to the east of The Villages development area includes 2,752 acres of trails for hiking and equestrian uses.

The Ben Avery Shooting Range and Recreation Area encompasses 1,443 acres and has facilities that include public shooting ranges and a 100-space campground. An excellent archery range with 5 miles of trails and a practice area is also present, and a trap and skeet range is lighted for night use.

Under the No-Action Alternative, The Villages development would ultimately increase the local population and demand for existing recreational resources in the area. The Villages, however, will provide substantial new recreational amenities, such as 300 acres of public and private parks and open space areas with walking, biking, and equestrian trails. The community will also include a number of private 18-hole golf courses and will feature public access to multi-use/equestrian trails and pathways that will traverse the community and provide access to offsite destinations. Del Webb is also required under its DMP to initiate discussions with the Arizona State Land Department to help secure an interconnecting trail system across state and federal land to Lake Pleasant.

3.9 CUMULATIVE IMPACTS

Cumulative impacts result from the incremental impact of the proposed actions when they are added to other past, present, and reasonably foreseeable future actions (40 CFR 1508.7).

The water delivery pipeline development that would result from implementing the proposed action would have only minor environmental impacts on seasonal drainages, state special-status plant and wildlife species, cultural resources, air quality, noise, land use, and traffic conditions as described above for the proposed action topical analyses. Construction impacts of the water delivery system would be temporary, operational impacts would be minimal, and facility construction and operation would be subject to the environmental commitments identified in Section 4. The proposed pipeline corridor also has been selected because much of the alignment has been previously disturbed (along the APS electric transmission line corridor and abandoned Reclamation haul road) and biological and cultural resource conditions are generally considered moderate to low quality in the area.

Other past, present, or reasonably foreseeable actions proposed in the area that would contribute to cumulative background conditions (conditions that would occur with or without the proposed action) include preliminary proposals for other water supply infrastructure projects and scattered commercial, recreational, and residential development. The City of Phoenix has indicated that it intends to construct a future water treatment plant and distribution facilities in the vicinity of Lake Pleasant to serve future development in northern Phoenix. It is possible that pipeline facilities described under the proposed action could be considered for use or could be expanded in the future for City of Phoenix municipal and industrial (M&I) use. No detailed plans for City of Phoenix water treatment or delivery facilities are available.

The most notable development in the recent past that is located near the pipeline corridor is the Factory Outlet shopping mall located to the north. Maricopa County has approved plans for The Villages master planned community located east of the pipeline corridor and I-17. The Villages consists of 5,661 acres and was approved for 16,500 residential units as described in Section 2 under the No-Action Alternative. Other planned projects include the BLM Black Canyon trail corridor, City of Peoria annexation and development plans near Lake Pleasant, and MWD's development at Lake Pleasant.

Maricopa County's New River Land Use Plan indicates that most of the property in the vicinity of the pipeline corridor is currently designated as rural residential (1 unit per acre). Higher densities can occur under this plan if it is part of a development master plan. Much of the area surrounding the pipeline corridor is state trust land, which can be sold or leased for residential and commercial development. The State Land Department typically creates master plans for large expanses of land prior to sale or lease.

The existing or planned developments that contribute to cumulative background environmental conditions and that have had or could have similar effects as described for the proposed pipeline corridor include all of the projects that could result in direct physical effects from

construction in the desert environment or that could contribute to indirect growth-related effects. Cumulative hydrologic and water quality impacts in desert washes are expected to be relatively minor because streamflows in the area are infrequent and because the Corps of Engineers regulates effects on jurisdictional waters of the United States, FCDMC regulates the rates of runoff that are allowed from new developments, and construction in or near drainages would generally be temporary or minimized. Inadvertent release of construction materials, such as fuels or oil-based products, could be minimized using standard construction practices and measures required by FCDMC. Groundwater withdrawals would not increase in the area because surface water from the CAP, rather than groundwater, would be used for domestic consumption.

Effects from other reasonably foreseeable actions would result in conversion of Sonoran desertscrub habitat, including over 5,000 acres in The Villages development area, and reduction in its value as habitat for common and state special-status wildlife species. Portions of desert washes and xeroriparian vegetation could be temporarily affected in areas where cumulative development would involve crossing the washes. Numerous minor washes and Deadman Wash and Skunk Creek could be temporarily affected. The potential exists for federally listed threatened or endangered plant or wildlife species to be affected by the cumulative background development that could occur in the New River Planning Area, but no federally listed species were identified as occurring in The Villages development area. Other special-status species that are either known to occur or have the potential to occur in the area could be affected by cumulative background development.

The potential for cultural resource effects on identified or unknown sites exists in the area, particularly near drainages, washes, and New River because of the prehistoric and historic Hohokam occupation. The Villages development area, for example, contains five cultural resource sites that are considered by a professional archaeologist to meet the criteria for listing in the NRHP. Construction effects on these resources would be avoided or minimized based upon recommendations of the SHPO or as required by applicable state law.

Cumulative air quality impacts would involve minor, short-term, construction-related NO_x and PM₁₀ emissions from construction equipment and earthmoving activities, long-term pollutant emissions related to increased population growth, and automobile emissions associated with urban development. Cumulative noise effects would also involve short-term, construction-related impacts in the range of 80-90 dBA at a range of 50 feet and longer term noise impacts primarily near major transportation corridors, such as I-17, that are typical of suburban or urban environments.

Please refer to the discussion of the No-Action Alternative under the "Traffic and Circulation" section for a description of projected future average daily traffic volumes and transportation improvements that could be required by 2015.

The proposed action is not expected to result in substantial incremental increases in cumulative impacts beyond that which would result from other past, present, or reasonably foreseeable actions in the New River Planning Area. Impacts from constructing and operating the proposed water delivery system would affect a relatively small corridor of the Sonoran Desert, most of the effects would occur only during project construction, and Del Webb will incorporate environmental commitments into the pipeline design to minimize environmental effects.

CAP water is a major renewable water source available to provide M&I supplies to accommodate future urban growth in the Phoenix metropolitan area. The cumulative growth impacts that were anticipated to result from use of CAP water were considered and disclosed in Reclamation's final EIS entitled "Water Allocations and Water Service Contracting - Central Arizona Project," which addressed CAP M&I, agricultural water, and Indian Community allocations. That EIS identified similar types of regional/cumulative land use changes, growth and biological resource effects that may be associated with use of water delivered through the CAP system, that may be relevant to the types of effects that may be associated with delivery of the Leased Settlement Water through the CAP.

3.10 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

Construction of the pipeline would result in the temporary loss of nearly 51 acres of Sonoran desertscrub habitat; construction of the water treatment plant would result in the permanent loss of a maximum of approximately 44 acres of this habitat. An abundance of this habitat type exists in the area. Del Webb will also reestablish preconstruction conditions within the pipeline corridor to allow natural colonization of native plant species and will reseed disturbed upland areas, as necessary, with an appropriate native seed mix. Therefore, the temporary and permanent loss of desertscrub habitat is considered a minor effect that is not anticipated to substantially affect plant and animal resources.

Section 4.0 Environmental Commitments

The following environmental commitments have been incorporated into the design of the proposed water delivery and treatment facilities to ensure that potential effects on the environment are avoided or minimized. Environmental commitments apply only to facilities described under the proposed action.

4.1 WATER RESOURCES

Del Webb will limit adverse effects on drainage and floodplain characteristics by complying with FCDMC permit and license requirements as they apply to uses in the floodplain and minimizing any diversions to natural surface drainages. Del Webb shall design and locate the pipeline facilities to avoid areas of high erosion potential. Del Webb will also comply with the National Pollutant Discharge Elimination System (NPDES) stormwater general permit and will implement a stormwater pollution prevention plan.

Del Webb shall conduct pipeline siting activities in accordance with normal construction practices to minimize the potential for release of contaminants associated with construction equipment. Staging areas used for onsite storage of hazardous materials will be located at least 100 feet from the edge of a wash or other drainage feature. If construction takes place during storms, soil piles and disturbed areas near drainages will be stabilized using standard erosion control measures.

4.2 BIOLOGICAL RESOURCES

Del Webb will conduct preconstruction surveys for native plants, including saguaro and Hohokam agave, to determine whether the precise location of the water delivery facilities would result in the loss of native cacti and trees. If Del Webb cannot avoid native plants and proposes to remove them from an area exceeding 0.25 acre, the proponent shall submit, in writing, a notice of intent to the ADA at least 60 days before the plants are scheduled to be removed. Del Webb will not begin removing native plants until it has received written confirmation from the ADA and will comply with applicable state law concerning salvage and relocation of native plants.

Del Webb will reseed disturbed upland areas with a native seed mix appropriate for desert scrub habitat. Seasonal drainages and riparian areas within the 100-foot-wide corridor will also be reseeded with an appropriate native plant seed mix.

Del Webb will obtain and comply with any special conditions included in a Corps permit under Section 404 of the Clean Water Act for effects on jurisdictional waters of the United States.

Del Webb will conduct preconstruction surveys for desert tortoise burrows. If desert tortoises are found on the project site, Del Webb will follow AGFD guidelines for handling desert tortoises and will contact AGFD for recommendations and the appropriate permits to move the tortoise before construction begins. Construction of temporary shelters or burrows also could be required, depending on the number of burrows in the area.

4.3 CULTURAL RESOURCES

If cultural materials are encountered during construction or other activities associated with the proposed action, Reclamation shall be immediately notified and work shall be stopped until a qualified archaeologist can evaluate the find. Reclamation, in consultation with the SHPO, will require, as appropriate, the following measures if significant cultural material is present:

- complying with the NHPA, the Arizona State Historic Preservation Act of 1982, the Arizona Burial Protection Law of 1990, and the Native American Protection and Repatriation Act;
- securing an Archaeological Resources Protection Act permit from a federal land management agency (Reclamation or U.S. Bureau of Land Management);
- securing a State of Arizona Antiquities Permit from the Arizona State Museum; and
- preparing a mitigation plan in consultation with the SHPO and the ACHP, other participating parties, and the interested public.

4.4 AIR QUALITY

Del Webb will obtain all necessary permits in compliance with all applicable regulations of Maricopa County Environmental Services, Department of Air Pollution Control. Del Webb will also apply dust suppression measures in accordance with Rule 310 for Fugitive Dust to control excessive particulate matter emissions generated from construction and operational activities in the pipeline corridor.

4.5 TRAFFIC AND CIRCULATION

Del Webb will incorporate into the proposed water delivery facilities design and construction plans a traffic control plan for all road crossings. The traffic control plan will be coordinated with MCDOT and ADOT, and standards of the local jurisdiction could be followed during construction. Elements of the traffic control plan could include:

- coordinating with state and local jurisdictions regarding hours of construction and lane closures that would minimize construction impacts on roadways;
- obtaining easements or encroachment permits from local agencies and ADOT, as necessary;
- providing for detours or ensuring that at least one traffic lane remains open along affected roadways, and minimizing lane closures during the peak a.m. and p.m. commute hours;
- specifying types and locations of warning signs, lights, and other traffic control devices;
- providing access for driveways and private roads; and
- notifying and consulting with emergency service providers to ensure that adequate emergency access is maintained.

Del Webb will restore all road surfaces affected by pipeline construction to original conditions and shall coordinate with Maricopa County to ensure that appropriate truck routes are used.

4.6 LAND USE AND VISUAL RESOURCES

Del Webb will ensure that the appropriate easements and ROW clearances are obtained from the Arizona State Land Department, U.S. Bureau of Land Management, Arizona Department of Transportation, Maricopa County Department of Transportation, and APS before beginning construction to ensure that no ROW or easement conflicts would result from construction of the pipeline.

Section 5.0 Consultation and Coordination

5.1 RELATED LAWS, RULES, REGULATIONS, AND EXECUTIVE ORDERS

Clean Water Act

The Clean Water Act strives to “restore and maintain chemical, physical, and biological integrity of the Nation’s water”. The goals of the act are achieved through a system of water quality standards, discharge limitations, and permits. If the water quality of a water body is potentially affected by a proposed action, an NPDES permit may be required. If a project may result in the placement of material into waters of the United States, a Corps dredge-and-fill permit (Section 404) may be required. The individual Section 404 permit may also apply to activities in wetlands and riparian areas. The proposed pipeline construction corridor would require an individual permit from the Corps.

Before either an NPDES or a Section 404 permit is issued, a water quality certification must be obtained.

Endangered Species Act

The ESA provides protection for animal and plant species in danger of extinction (endangered) and those that may become so in the foreseeable future (threatened). Section 7 of the ESA requires federal agencies to ensure that all federally associated activities in the United States would not have adverse impacts on the continued existence of threatened or endangered species or on designated areas that are important in conserving those species. Action agencies must consult with the USFWS to determine the potential impacts that a project may have on protected species. Reclamation has included a biological assessment as Appendix D, covering direct effects of the pipeline project and cumulative impacts that could result from The Villages development plan. The BA is provided for informational purposes and does not imply a finding of significance for NEPA purposes. The BA concludes approval of the Option and Lease Agreement will not affect federally listed species. It further concludes no cumulative impacts from the development of The Villages are anticipated. A copy of the BA will be provided to the USFWS.

National Historic Preservation Act

The NHPA establishes Federal law and policy for the protection of significant historic properties, including prehistoric archaeological sites, buildings, and traditional cultural places. Specifically, each Federal agency shall identify and take into account the effect of an undertaking on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places. For consultations required under Section 106 of the NHPA, Reclamation is operating under terms of a PMOA signed by Reclamation, the Advisory Council on Historic Preservation, and the SHPO. The PMOA stipulates that Reclamation shall define the APE for all undertakings for which it is responsible, identify and evaluate all cultural resources, and afford the SHPO an opportunity to comment.

The APE for this EA includes both the proposed pipeline corridor and water treatment plant and The Villages development, and is consistent with 36 CFR Part 800 (Protection of Historic Properties). No historic properties were identified within the pipeline or treatment plant impact areas. Thirteen archaeological sites were identified within the property boundary of The Villages. All were evaluated for their eligibility for listing on the NRHP; five are recommended for inclusion on the NRHP (SWCA 1994b).

Reclamation will consult with the SHPO regarding impacts to historic properties and TCPs. Appropriate mitigation measures will be negotiated with the SHPO and Del Webb. At the present time, Del Webb has stated its desire to preserve the historic properties rather than mitigate. Section 106 will be concluded before initiation of construction of the Villages.

Executive Order 11988, Floodplain Management

Executive Order 11988 requires a construction agency to "avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative" within the 100-year floodplain.

The purpose of this directive is to avoid, where practicable alternatives exist, the short- and long-term adverse impacts associated with floodplain development. In carrying out their responsibilities, federal agencies are required to reduce the risk of loss due to floods; minimize the impact of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. Del Webb would comply with any FCDMC permit or license requirements issued regarding activities in the floodplain. Pipeline construction would require extending the pipeline corridor across a number of seasonal drainages and the New River channel. No adverse effects of the proposed action on floodplain conditions are anticipated to occur.

Executive Order 11990, Wetlands

Executive Order 11990 requires a construction project/company to “avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. . . .”

Federal agencies, in carrying out their land management responsibilities, are to take action that will minimize the destruction, loss, or degradation of wetlands, and take action to preserve and enhance the natural and beneficial values of wetlands. Each agency shall avoid undertaking or assisting in wetland construction projects unless the head of the agency determines that there is no practicable alternative to such construction and that the proposed action includes measures to minimize harm. Del Webb intends to avoid one possible wetland area near the proposed pipeline corridor and to obtain and comply with the requirements of a Corps 404 permit for activities occurring in jurisdictional waters of the United States.

Farmland Protection Policy Act

The U.S. Natural Resources Conservation Service (NRCS) is responsible for administering the Farmland Protection Policy Act. NRCS has not identified any prime or unique farmland in the project area, and construction of the pipeline or other water delivery facilities would not affect any prime or unique farmlands.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act requires federal agencies to consult with USFWS, National Marine Fisheries Service (NMFS), and the state fish and wildlife resource agency before undertaking or approving water projects that impound or divert surface water. This consultation is intended to promote conservation of fish and wildlife resources by preventing their loss or damage and to provide for development and improvement of fish and wildlife resources in connection with water projects. Federal agencies undertaking water projects are required to fully consider recommendations made by USFWS, NMFS, and the state fish and wildlife resource agency in project reports, such as NEPA documents, and include measures to reduce impacts on wildlife in project plans. The Fish and Wildlife Coordination Act does not apply to the Ak-Chin water lease because the project does not impound or divert, or modify surface streams as described in the act.

5.2 SUMMARY OF AGENCY AND PUBLIC INVOLVEMENT ACTIVITIES

On October 17, 1996, notices were mailed to 265 interested agencies, organizations, and persons informing them of the 30-day public scoping comment period and of a public meeting for preparation of an EA for this project. Reclamation also published a notice of the scoping process and public meeting in the Federal Register on October 15, 1996 (Volume 51, No. 200). Reclamation conducted an agency coordination meeting on October 31, 1996, to present the proposed action and elicit comments from interested and affected federal, state, and local agencies. The meeting was attended by staff members from the USFWS, BLM, AGFD, Bureau of Indian Affairs, and City of Phoenix, and was also attended by several members of the general public.

Reclamation also conducted a public scoping meeting at New River Elementary School on November 2, 1996. The meeting was attended by more than 60 people, of whom approximately 15 provided comments on the scope and content of the draft EA. Reclamation provided an overview of the purpose of the meeting, the proposed pipeline route, and the NEPA process before accepting comments from the public. During the meeting, Reclamation announced it would extend the deadline for written comments to December 13, 1996. A second notice regarding the public scoping comment period extension was sent to over 300 recipients on November 12, 1996.

Reclamation received approximately 68 comment letters from agencies and members of the public regarding the scope and content of the draft EA.

Comments received include numerous comments on the merits of the Option and Lease Agreement and The Villages development and a number of comments on the scope and content of the draft EA, including:

- requests for a full EIS to be prepared on the water delivery facilities and The Villages development;
- concerns and questions about use of groundwater in the area;
- concerns about leapfrog development;
- questions about the reliability of the surface water supply;
- requests for early notice of the public meeting;
- requests for the EA to address air quality, traffic, and development density issues;
- concerns about vegetation and wildlife resources effects and cultural resource issues; and
- concerns about effects on the Agua Fria River and New River.

Reclamation has reviewed and considered all of the comments received during the public meeting and in writing and has incorporated relevant comments on the content and scope of the draft EA into the document, where appropriate. Copies of the transcript of the public meeting and all comment letters are available at Reclamation's Phoenix Area Office. A public hearing will also be conducted during the NEPA public review period to receive comments on the content of the draft EA.

The EA analyses were conducted based on information from the following federal, state, and local agencies:

- U.S. Bureau of Reclamation, Phoenix Area Office;
- U.S. Fish and Wildlife Service;
- U.S. Bureau of Land Management
- Arizona State Land Department
- Arizona Game and Fish Department;
- Arizona Department of Water Resources;
- Arizona Department of Environmental Quality;
- State Historic Preservation Officer;
- Maricopa Association of Governments;
- Maricopa County Air Pollution Control District;
- Maricopa County Department of Transportation;
- Maricopa County Flood Control District; and
- Maricopa County Planning Department.

Section 6.0 Citations

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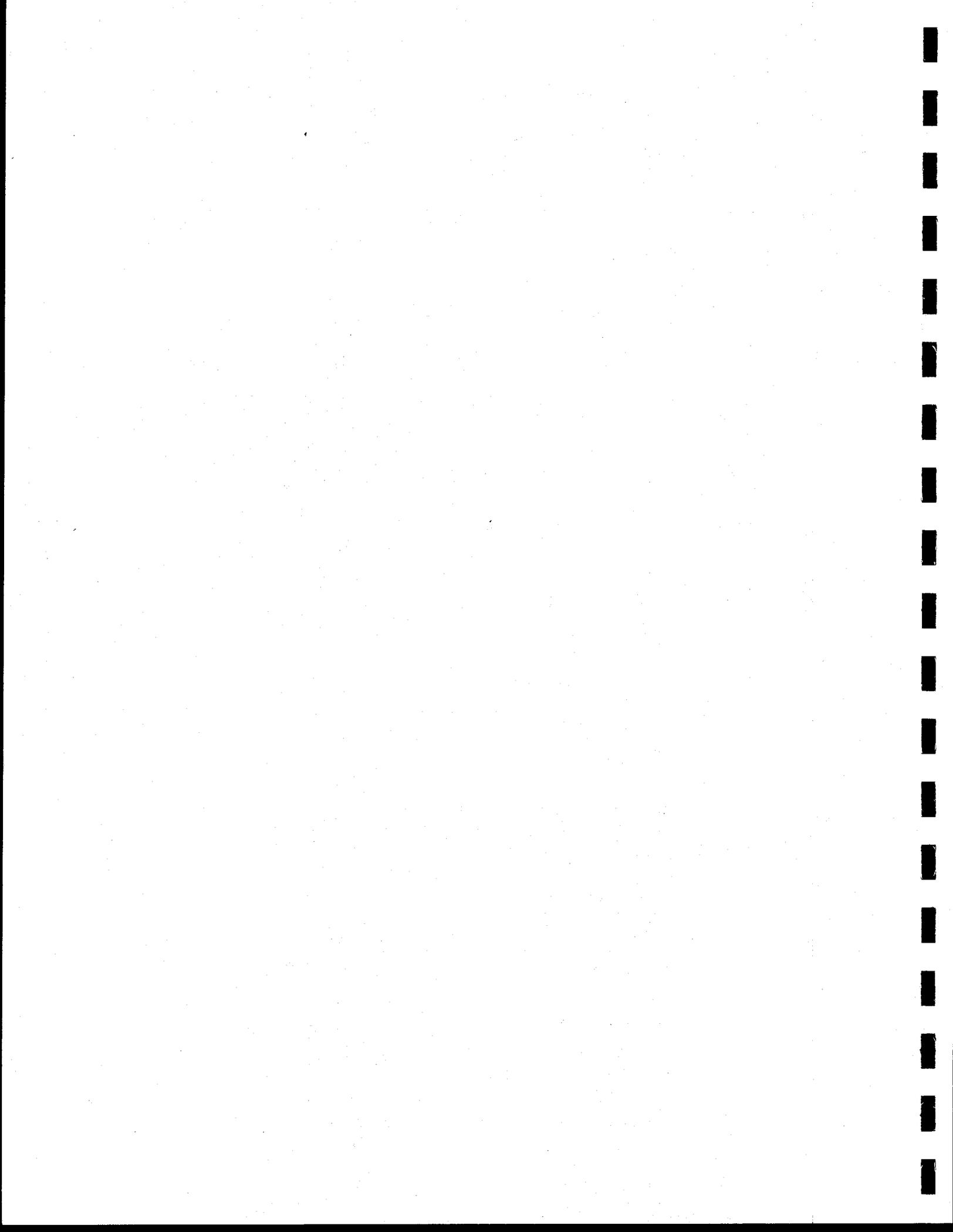
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Appendix A. Water Supply Options



INTRODUCTION**WATER SUPPLY OPTIONS**

This appendix describes the non-federal water supply sources that Del Webb Corporation (Del Webb) could secure to provide water to The Villages at Desert Hills (The Villages) in order to illustrate what would happen in the development area in the absence of the proposed action. None of the water supply options described below requires the approval of the Bureau of Reclamation (Reclamation) or any other federal entity.

Four alternative sources were examined:

- ▶ City of Phoenix service provided by extending the City's existing water distribution system north from Deer Valley Road to The Villages;
- ▶ City of Phoenix service using CAP water conveyed through a separate system taking water from the CAP system;
- ▶ Extension of existing City of Peoria system north to The Villages; and
- ▶ Enrollment of The Villages in Central Arizona Groundwater Replenishment District (CAGRD) and provision of replenished groundwater from wells located offsite. Service would be provided by a newly-formed water company.

Each of the options was evaluated to determine whether:

- (1) There was an adequate supply to meet the projected demand;
- (2) The water was legally available;
- (3) The supply would be considered an assured water supply (AWS) pursuant to the Groundwater Management Act (GMA);
- (4) It was economically feasible to develop and deliver to The Villages; and
- (5) It was technically feasible to construct facilities to deliver the water to The Villages.

Each of the above options is described in more detail in this appendix.

REGULATORY AND LAND USE CONSIDERATIONS

Discussed below are the most pertinent regulatory and land use considerations that apply to water supply sources for The Villages.

GROUNDWATER MANAGEMENT

The Villages is located in the Phoenix Active Management Area (AMA) which was established in 1980 with the enactment of the Groundwater Management Act (GMA). All groundwater and its uses are, therefore, subject to the various laws and administrative rules which control groundwater use in the AMA. The Arizona Department of Water Resources (ADWR) is the regulatory agency charged with enforcing the GMA. Following are the provisions of the GMA that affect the development and use of water supplies that might be secured for The Villages.

Assured Water Supply

ARS Section 45-576 requires that before a subdivision in an AMA is approved by the local jurisdictional authority and by the State Real Estate Commissioner, the subdivider must obtain a certificate of AWS or the subdivision must receive service from a water provider designated as having an AWS. ADWR has adopted rules to guide the administration of the AWS program.

In general, water supplies for an AWS must be renewable. Development cannot occur based on mined groundwater. A CAP supply delivered pursuant to a municipal and industrial subcontract is considered to be a renewable supply. Except for a small allotment for existing providers, groundwater may not be used as a source for an AWS unless it is supported by natural recharge, a permitted groundwater recharge project, or membership in CAGR.

Service Area Rules

Groundwater use regulations apply to providers' water service areas and not to other boundaries of jurisdiction, such as city limits. In general, the service area is that area actually being served water by the providers' system, i.e., the area inside the pipeline system which distributes water. Service areas may be expanded to serve additional areas as they develop. However, they may not be expanded for the purpose of incorporating a well field for a water supply.

Water Management Plans

ADWR is required to prepare and adopt groundwater management plans for each AMA for identified periods. The Second Management Plan is now in effect. It will be replaced by the Third Management Plan in the year 2000. Each plan establishes water conservation requirements for all groundwater users for the management period. Each plan also includes criteria for ADWR to follow for permitting uses and the general plan to achieve the established goals of the groundwater management program.

CITY LIMITS AND PLANNING AREAS

Figure A-1 depicts City of Phoenix limit boundaries in the vicinity of The Villages as of December 1, 1996. Most of the area to be developed as The Villages is currently not within an incorporated city; however, the City of Phoenix has annexed the Factory Outlet Stores immediately adjacent to The Villages and the portion

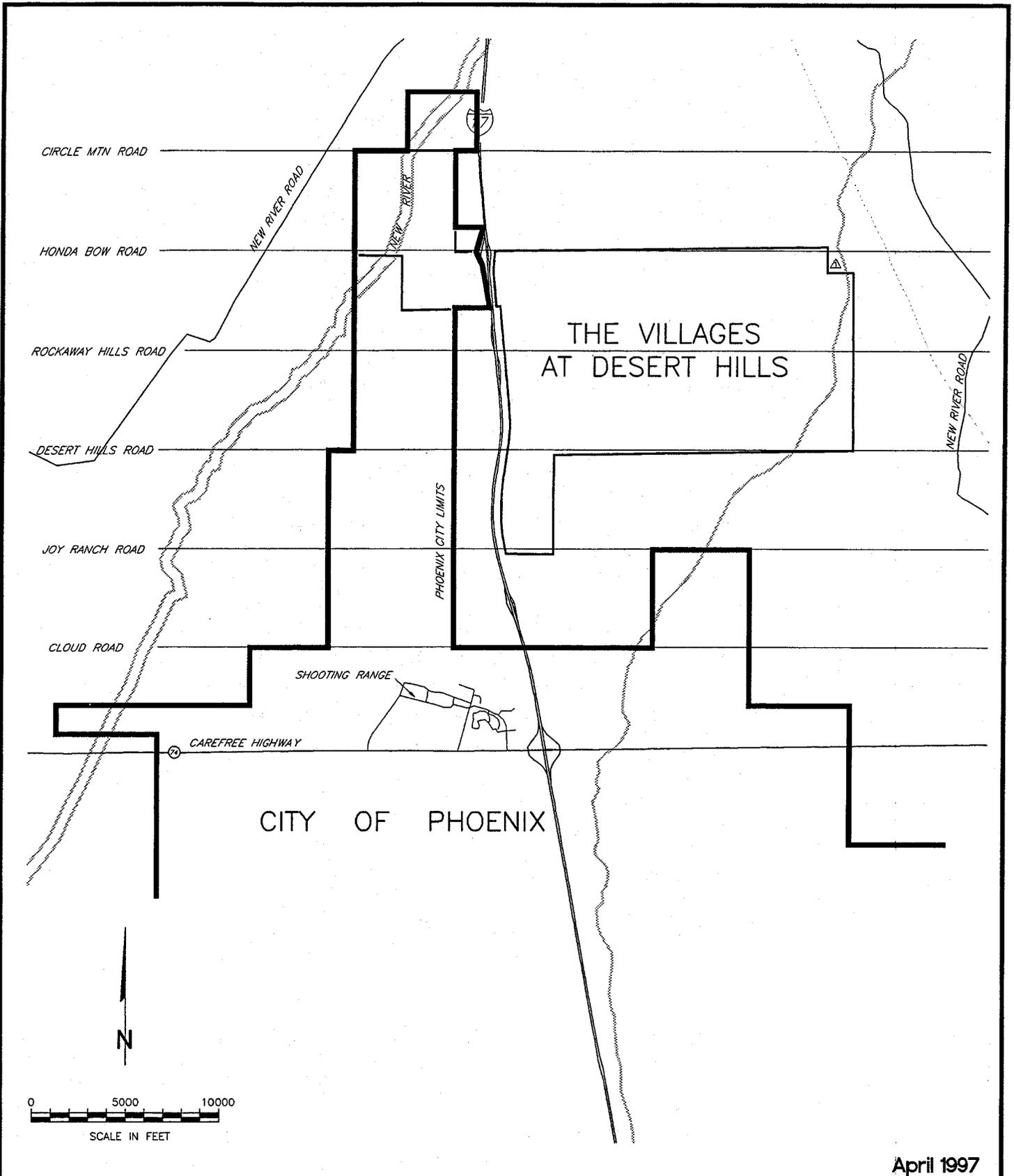
of The Villages that is west of Interstate 17. There are no immediate plans for incorporation of the rest of the area to be occupied by The Villages into any municipality.

The City of Phoenix plans to serve water to the area, including The Villages, in the future. The Phoenix Water Resources Plan, approved by the City Council in November 1995, indicates a Water Service Planning Area extending north to the Tonto National Forest boundary. Figure A-2 shows the Water Service Planning Area.

DEVELOPMENT MASTER PLAN STIPULATION

A Development Master Plan Stipulation with Maricopa County restricts the amount of groundwater that may be used at The Villages. The stipulation provides:

"The developer shall not use groundwater for golf course irrigation, residential, industrial or commercial uses. The only time the developer may use groundwater is on an interim basis early in construction and on an interim basis for County and public uses (such as the fire station, Sheriff's substation and utility yard, trailheads and potential school sites), until the permanent water system is completed and hook-up is available to these facilities. Except for water needed for construction of the main water delivery pipeline and of the water and wastewater treatment facilities, the interim pumping of construction groundwater referenced above shall in all events not exceed a maximum construction period of 18 months nor a maximum amount of 150 acre-feet. All interim pumping of groundwater shall comply with ADWR's regulations providing for protection of existing groundwater users in the area. At a minimum this interim supply of groundwater shall be recharged into the aquifer as soon as the recharge facility described in the DMP has been fully permitted and constructed."



April 1997

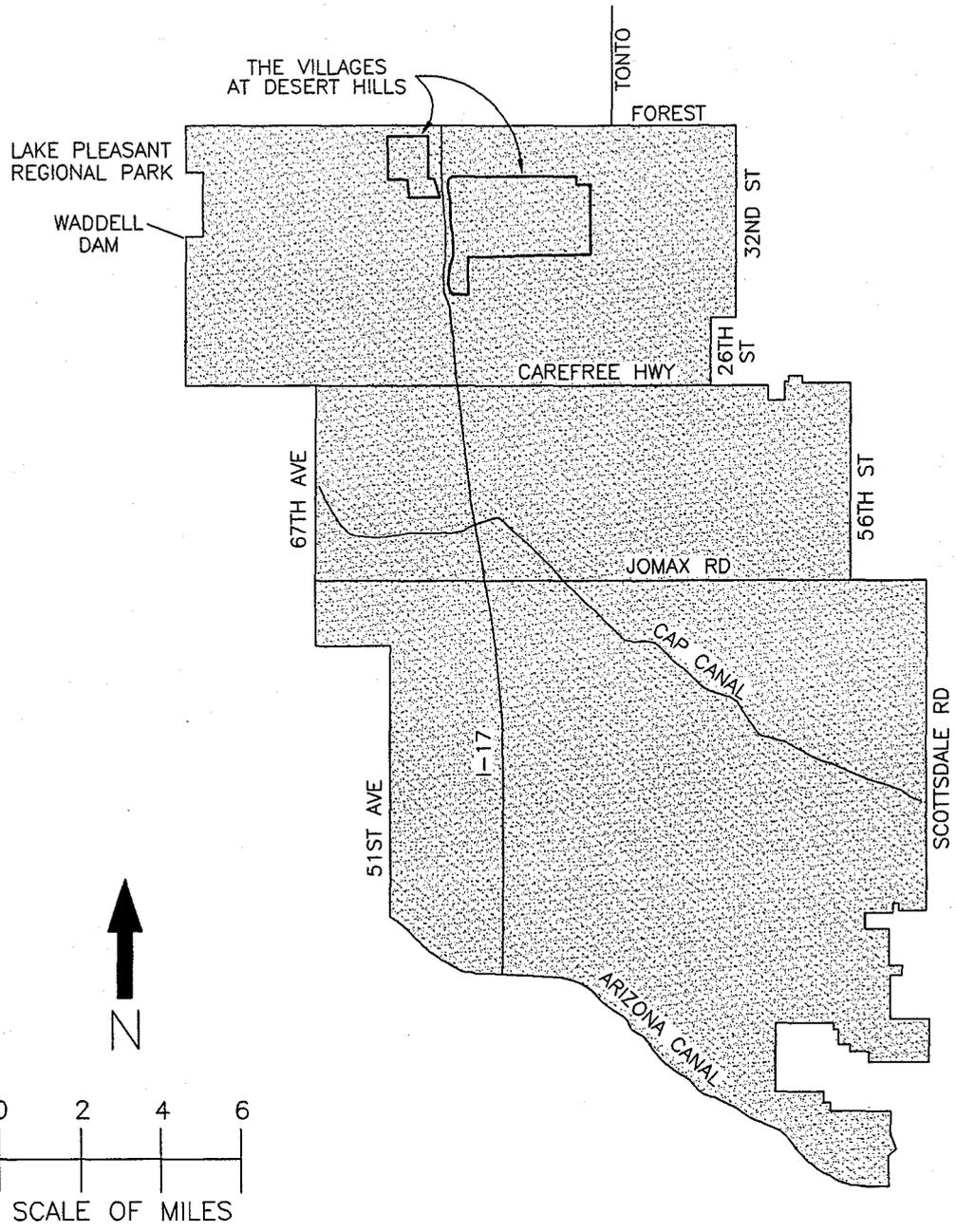
Bookman-Edmonston
Engineering, Inc.

Phoenix City Limits
In Vicinity of The Villages
at Desert Hills

FIGURE A-1

4/18/97

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From: *Phoenix Water Resources Plan*
 City of Phoenix Water Services
 Department, November 1995

May 1997

BOOKMAN-EDMONSTON
 ENGINEERING

CITY OF PHOENIX
 NORTHERN AREA
 OFF-PROJECT WATER SERVICE PLANNING AREA

FIGURE A-2

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CURRENT AND PLANNED WATER FACILITIES

Groundwater is currently the only source of water for the area surrounding The Villages. Individual wells make up most of the water service. The Desert Hills Water Company, located to the south, and Sabrosa Water Company, located to the north of the proposed new development, are the only providers in the immediate vicinity. The Desert Hills Water Company operates two wells and serves 540 customers (1995 Annual Report) and the Sabrosa Water Company operates three wells and serves 72 customers (1994 Annual Report).

City of Phoenix water delivery facilities extend north near the Dynamite Boulevard alignment close to where the CAP Aqueduct crosses Interstate 17. Water delivery facilities extend north to Happy Valley Road with main trunk lines along Deer Valley Road.

The City of Phoenix has proposed to construct a 320 mgd treatment plant near Lake Pleasant that will use CAP water from Waddell Canal. The plant will be constructed in stages with full capacity several years away. Operation of the new plant is scheduled to begin about year 2005. The treatment plant will supply water to the areas south and north of the Carefree Highway. A 78-inch trunk line will be constructed from the treatment plant along Carefree Highway.

The City of Peoria distribution system currently extends only as far north as Beardsley Road. Peoria water service is from groundwater at this time.

The City of Peoria currently has plans for construction of a City-owned treatment plant near Greenway Road and the Arizona Canal to treat both CAP and SRP water supplies. The City also has agreed to purchase a share of the City of Glendale's new Pyramid Water Treatment Plant which will treat CAP water supplies.

ARIZONA STATE LAND DEPARTMENT PLANS

The Arizona State Land Department (ASLD) owns most of the public land surrounding and to the west of The Villages. The land will be managed pursuant to the Urban Land Act which provides that ASLD develop plans for its development and disposal. At this time, there are no plans adopted for the land's development.

NON-FEDERAL WATER SUPPLY OPTIONS

OPTION 1 - SERVICE FROM EXISTING CITY OF PHOENIX SYSTEM

Under this option, the City of Phoenix would provide water service to The Villages from the City's existing water supply system through a series of line extension agreements. The City's distribution system and service area would be extended to include The Villages. The extension of Phoenix' water supply system to include The Villages' property is reflected in the Phoenix Water Resources Plan approved by the Phoenix City Council in November 1995.

Phoenix has already annexed the 900 acres of The Villages lying west of Interstate 17. In a June 11, 1996, letter to Bruce Ellis of the Bureau of Reclamation, Frank Fairbanks, Phoenix City Manager, confirmed that the City could be a water supplier to The Villages based on the City's plans to serve the area with CAP water from its proposed Lake Pleasant Water Treatment Plant. (This letter is attached to the back of this document.) No part of this water service agreement would require the approval of Reclamation or any other federal entity, and no part of it would impact groundwater levels in The Villages area or use unreplenished groundwater.

Water Supply

The City of Phoenix currently has adequate existing and planned water supplies to serve The Villages. In November 1995, the Phoenix City Council approved a revised Phoenix Water Resources Plan that identifies an available water supply of 227,704 acre-feet per year for "off-Project" areas, including The Villages.¹ The water demand for off-Project lands in 1995 was 175,300 acre-feet per year, leaving 52,404 acre-feet per year available to serve new development. The projected demand for The Villages is 7,900 acre-feet per year at full build-out.

The City of Phoenix projects that water demand in the off-Project area may slightly exceed available supplies by the year 2045. Additional supply opportunities have been identified by the City, but definite plans for their development have not been completed. If The Villages is served by the City of Phoenix, it may result in the use of portions of existing water supplies with other later development being served from other planned supplies. Nevertheless, it is clear that the City of Phoenix currently has adequate water supplies available to serve The Villages.

¹Certain lands within the City of Phoenix are within Salt River Project (SRP) and have surface water supplies that are not available to lands outside of SRP. The Phoenix Water Resources Plan analyzes the "off-Project" areas separately, because the supply of water for SRP land is considered adequate only to meet future needs in the SRP area.

<p style="text-align: center;">City of Phoenix Off-Project and Non-Member Projected Water Supplies and Demands (1,000 Acre-feet)</p>								
	1995	2000	2005	2010	2015	2025	2035	2045
CAP Allocation	113.9	113.9	113.9	113.9	113.9	113.9	113.9	113.9
Gateway	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Reclaimed Wastewater for Turf	1.6	3.3	3.3	3.3	3.3	3.3	3.3	3.3
Groundwater	15.0	15.0	15.0	15.0	15.0	15.0	15.0	15.0
Roosevelt Cons. Space		32.3	32.3	32.3	32.3	32.3	32.3	32.3
RID EXCH. SRPMIC	14.2	8.5	28.5	28.1	28.1	24.7	4.7	8,137
Fort McDowell Settlement	0	4.3	4.3	4.3	4.3	4.3	4.3	4.3
Hohokam ID Buyout	62.0	2.4	43.7	34.6	25.6	16.0	6.0	6.0
Total Average Year Off-Project Supplies	228	271	262	253	244	231	221	214
Hot Weather Demand	149	162	177	193	210	233	257	281
Surplus (Deficit)	79	109	85	60	34	(2)	(36)	(67)

Source: Phoenix Water Resources Plan, City of Phoenix Water Service Department, November 1995.

As can be seen from the above projection, the City has an adequate supply to meet all demands until about the year 2025. Development of additional supply opportunities will assure a full supply well beyond this time. Additional supply opportunities include reallocated CAP, State Land allocated CAP, recharge and recovery of reclaimed water, and water from McMullen Valley. As discussed above, the projected City demand includes estimates for The Villages area. Service to The Villages by the City would not increase the demand significantly, if any, over that already projected.

Pursuant to ARS 45-576.E, the City of Phoenix is deemed to have an AWS until January 1, 1998. Because Phoenix is a deemed provider, The Villages could obtain service from Phoenix and, by doing so, satisfy the assured water supply requirements. The City of Phoenix has applied to ADWR to be designated as having an AWS for the period following January 1, 1998, and is expected to receive such a designation. Receipt of water service from Phoenix as a designated AWS provider will satisfy the AWS requirements for The Villages.

Delivery Facilities

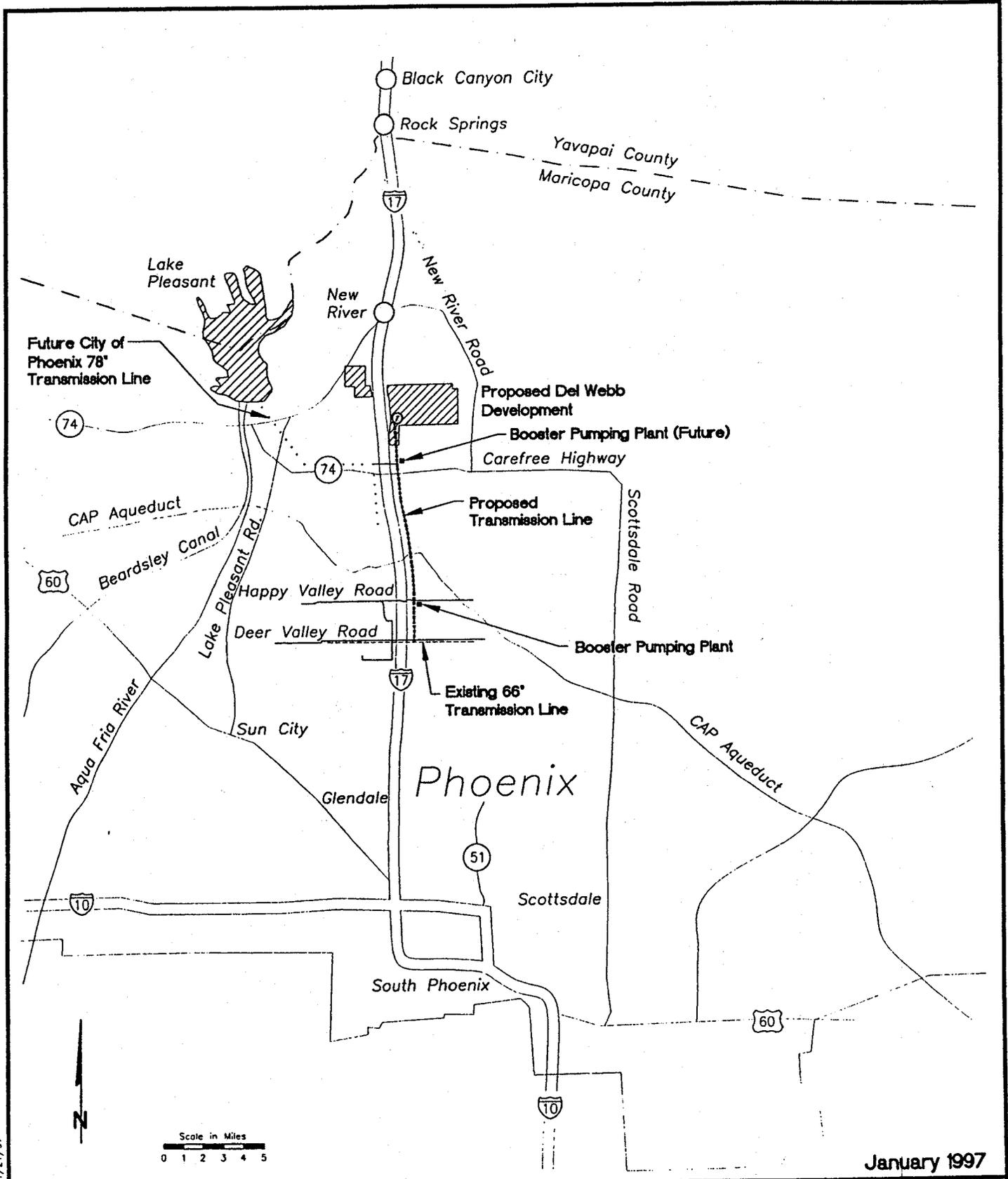
The most likely candidate for connecting the proposed Villages transmission line would be the 66-inch transmission line adjacent to Deer Valley Road that delivers treated Phoenix system water from to areas west of 35th Avenue. The connection point would be just east of Interstate 17 at Deer Valley Road, approximately five miles west of the Union Hills Water Treatment plant. The Union Hills Water Treatment Plant is used to treat CAP water.

The total length of the proposed pipeline would be approximately 63,000 feet (12 miles). The alignment would be parallel and adjacent to the east right-of-way (ROW) of Interstate 17, as shown in Figure A-3. The alignment would cross Skunk Creek, Deadman Wash, several minor intermittent streams, the CAP Canal, Carefree Highway, and other minor roadways.

The Villages' transmission line configuration would consist of a 24-inch diameter pipeline from the Deer Valley Road connection point to the Carefree Highway (43,000 linear feet), and a 36-inch diameter pipeline from Carefree Highway to The Villages development (20,000 linear feet). Because the City of Phoenix plans to build the 320-mgd Lake Pleasant Water Treatment Plant and a 78-inch line along Carefree Highway before the full demand is realized at The Villages, the pipeline south of Carefree Highway could be sized smaller (24-inch) to meet this intermediate level demand and tap into the Phoenix 78-inch line when it is available (currently planned for the year 2005). Design and timing of The Villages' transmission line would be coordinated with the City of Phoenix in accordance with its Master Plans and the needs of development in the North Phoenix area.

A booster pumping plant located south of Happy Valley Road would be necessary to deliver the treated water from the Deer Valley Road connection point to The Villages. The pumping plant would be sized to meet the intermediate demand noted above. Once the planned City of Phoenix 78-inch transmission line is operational, the connection could be made at Carefree Highway, and this booster pumping plant would no longer be necessary. The transmission line segment from Deer Valley Road to Carefree Highway would continue to be integrated with the City of Phoenix distribution system. A booster pumping plant would, however, be necessary north of Carefree Highway (on The Villages 36-inch transmission line) to deliver treated water from the new connection point to The Villages. Figure A-3 shows the conceptual layout for this alternative. Additional facilities and connections to the City of Phoenix water distribution system may be required.

An alternative configuration that does not include a connection to the future 78-inch line would consist of a 36-inch diameter transmission line the entire 12-mile distance from Deer Valley Road to The Villages and one booster pumping plant sized for the maximum day Villages' demand.



January 1997

Bookman-Edmonston
Engineering

Option 1
Service from Existing
City of Phoenix System

FIGURE A-3

1/21/97

S:\DWG\DELWEBB\EA\FIG3

Because this system would be delivering treated water, a water treatment plant at The Villages would not be necessary, and the terminal configuration at The Villages development would be different. The pipeline would most likely terminate at a storage facility with the storage facility sized and located with respect to distribution system requirements (rather than treatment plant requirements).

System Operation and Maintenance

Because this would be an extension of service by the City of Phoenix, the system would be operated and maintained by the City. Users would be customers of the City of Phoenix Water Department. Water rates for customers would be established by the City based on policy for service to similar areas on the outskirts of the distribution system.

Estimated Costs

A pre-feasibility-level cost estimate is presented in the table below. Costs include construction costs for the pumping plants and transmission line, and rights-of-way, legal, engineering, construction management, administration, and contingency costs. The total estimated cost for Option 1 is \$12.7 million.

Estimate of Cost to Provide Treated Water from the Existing City of Phoenix Water Supply System (Option 1)	
Item Description	Cost
Pumping Plants	
Happy Valley Road	\$ 1,000,000
Carefree Highway (future)	800,000
Subtotal, Pumping Plants	\$ 1,800,000
Transmission Pipeline (20,000 linear feet, 36-inch diameter and 43,000 linear feet, 24-inch diameter)	\$ 6,428,000
Rights-of-Way	\$ 610,000
Subtotal	\$ 8,838,000
Legal, Engineering, Construction Management and Administration (15%)	\$ 1,326,000
Contingencies (25%)	\$ 2,541,000
TOTAL ESTIMATED COST	\$12,705,000

The source of funding for construction could be negotiated between Del Webb and the City. A number of variations of up-front funding and development fee structures is possible.

OPTION 2 - CITY OF PHOENIX SERVICE THROUGH CONSTRUCTED FACILITIES

In this option, the City of Phoenix could provide water service to The Villages using constructed facilities. The constructed facilities would likely consist of a turnout and pumping plant at the Hayden-Rhodes Aqueduct just east of Interstate 17 and a pipeline parallel to Interstate 17 from the Hayden-Rhodes Aqueduct to The Villages. Del Webb would construct the system for the City, or the City itself could construct the system. Service would be by the City as an extension of its existing service area. As with Phoenix service under Option 1, no part of this service arrangement would require the approval of Reclamation or any other federal entity. No part of the arrangement would impact groundwater levels in The Villages area or use unreplenished groundwater.

Water Supply

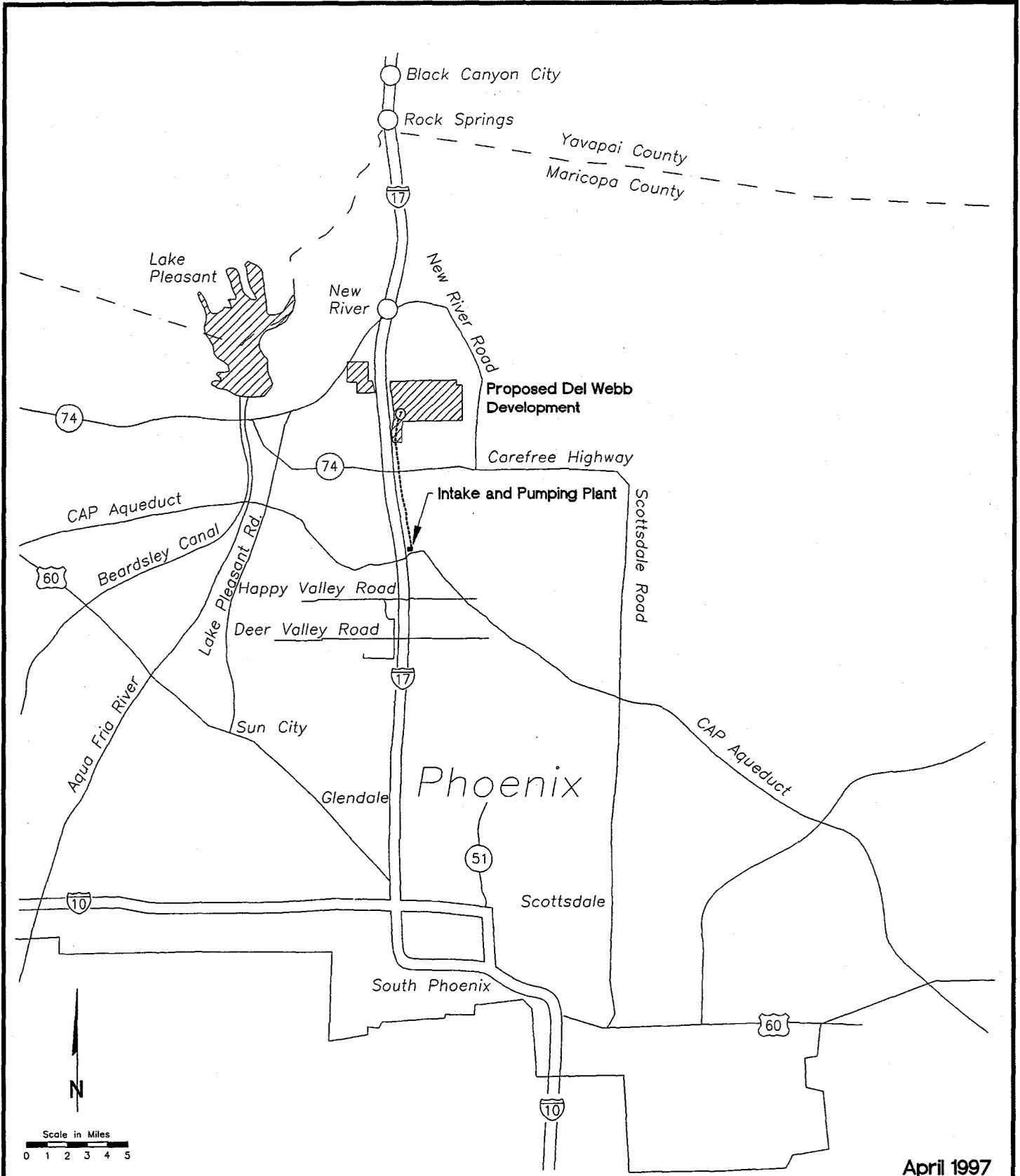
The City of Phoenix water supply is discussed in Option 1. This option would integrate the diversion and delivery facilities into the City of Phoenix system. Water delivered to The Villages through the system would be from the City's 113,882 acre-foot CAP allocation.

As previously discussed, the City is deemed to have an AWS until January 1, 1998, and is expected to become designated as having an AWS for the period after January 1, 1998. Receiving water service from a deemed or designated provider satisfies the AWS requirement for The Villages.

Delivery Facilities

Delivery facilities would be as shown in Figure A-4. This alignment would allow for the facilities to be integrated into the overall City system in the future. The system would consist of a turnout from the CAP canal, a pumping plant, and a pipeline from the pumping plant to The Villages.

The intake structure and pumping plant for this alternative would be constructed on the north embankment of the main aqueduct of the CAP immediately east of Interstate 17. The transmission pipeline alignment would begin at the discharge of the pumping plant and proceed in a northerly course, lying east of and immediately parallel to the Interstate 17 ROW. The alignment would continue to head north parallel and adjacent to the Interstate 17 ROW to the on-site treatment plant location. The alignment would require crossing Carefree Highway, other minor roads, several minor intermittent streams and Deadman Wash. The total length of the transmission pipeline required under this alternative alignment is about 45,700 feet (8.7 miles). Design and timing of The Villages' transmission line would be coordinated with the City of Phoenix in accordance with their Master Plan and the needs of development in the north Phoenix area.



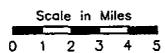
April 1997

Bookman-Edmonston
Engineering, Inc.

Option 2
City of Phoenix Service
Through Constructed Facilities

FIGURE A-4

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Estimated Costs

The total project cost for this option is estimated to be \$10.2 million, as shown in the following table. The source of funding for construction could be negotiated between Del Webb and the City. A number of variations of up-front funding and development fee reimbursements could be structured.

Estimate of Cost to Provide City of Phoenix Service Through Constructed Facilities (Option 2)	
Item Description	Cost
Turnout Structure	\$ 254,000
Pumping Plant	\$ 1,600,000
Transmission Pipeline (38,000 linear feet, 36-inch diameter)	\$ 4,873,000
Rights-of-Way	\$ 370,000
Subtotal	\$ 7,097,000
Legal, Engineering, Construction Management and Administration (15%)	\$ 1,065,000
Contingencies (25%)	\$ 2,041,000
TOTAL ESTIMATED COST	\$10,203,000

Water rates for customers would be established by the City, based on policy for services to similar areas on the outskirts of the distribution system.

OPTION 3 - SERVICE FROM EXISTING CITY OF PEORIA SYSTEM

Under this option, Del Webb would obtain water service from the City of Peoria by extending the City's existing supply system. The City of Peoria water service agreement is not limited to a particular water source, thus providing the flexibility to use either Peoria's CAP entitlement or groundwater sources, with replenishment, within Peoria's existing service area. Peoria would pump groundwater from its well fields and the pumped groundwater would be replenished with surface water by the CAGR, as provided under State law.

In September 1990, the City of Peoria and Lakeview City, Inc. entered into an agreement for water service by Peoria to the property now referred to as The Villages at Desert Hills. The agreement provided that it would apply to Lakeview City and its successors. Peoria has acknowledged that Del Webb, as the successor to Lakeview City, Inc., is entitled to water service under the agreement. The principal provision of the agreement is that the City of Peoria will serve water to The Villages' property sufficient to satisfy all present and future demands for potable and non-potable water. The agreement does not restrict the source of the water supply to be provided.

Water Supply

The City of Peoria has adequate existing and planned supplies to serve The Villages. A March 1997 report, Peoria Water Master Plan, describes the City's current and year 2020 projected water supplies and demands. The table below is a summary of information from the report and shows water demands and projected supplies to meet those demands in the City's planning area outside of the Salt River Project. Peoria, similar to Phoenix, serves water to land both on and off the Salt River Project. Surface water supplies available from SRP are not available to be used "off-Project", but are adequate to meet all of the future uses on Project lands.

<p style="text-align: center;">City of Peoria Off-Project Project Water Supplies and Demands (Acre-feet per year)</p>						
	1995	2000	2005	2010	2015	2020
Demand	8,843	17,477	25,113	30,947	38,664	46,221
Water Resources						
Groundwater	8,843	699	1,005	1,238	1,547	1,849
CAP	--	16,777	19,709	19,709	19,709	19,709
Reclaimed Water	--	--	4,399	7,224	9,277	11,376
Stormwater	--	--	--	2,776	8,131	13,287

The projected uses in the City of Peoria do not include The Villages. However, additional groundwater supplies are available to the City pursuant to provisions of the state's Assured Water Supply Rules and its membership in CAGR. Peoria has identified the future availability of 18,508 acre-feet per year of groundwater. Since the City is anticipating a use of only 1,849 acre-feet per year in 2020, there will be a substantial amount of unused supply available.

Pursuant to State statute, ARS 45-576.E, the City of Peoria is deemed to have an assured water supply until January 1, 1998. Under this status, The Villages could obtain water service from the City of Peoria and meet the state's AWS requirements. In order to continue its AWS status after January 1, 1998, the City filed an application to be recognized as having an AWS designation. In its AWS application, Peoria anticipates pledging approximately 60,000 acre-feet of water per year from three supply sources: 18,709 acre-feet of CAP water; 18,508 acre-feet of excess groundwater; and 23,103 acre-feet of SRP water.

Supplies which Peoria can pledge for assured water supply purposes are currently limited by treatment capacity. Peoria anticipates pledging nearly 50,000 acre-feet per year of capacity in treatment facilities including 24,600 af/yr of well capacity that would be used to pump excess groundwater pursuant to the City's membership in CAGR. Such groundwater would be replenished by CAGR with surface water supplies. Given infrastructure constraints and certain supply constraints, however, Peoria anticipates pledging approximately 43,000 acre-feet per year.

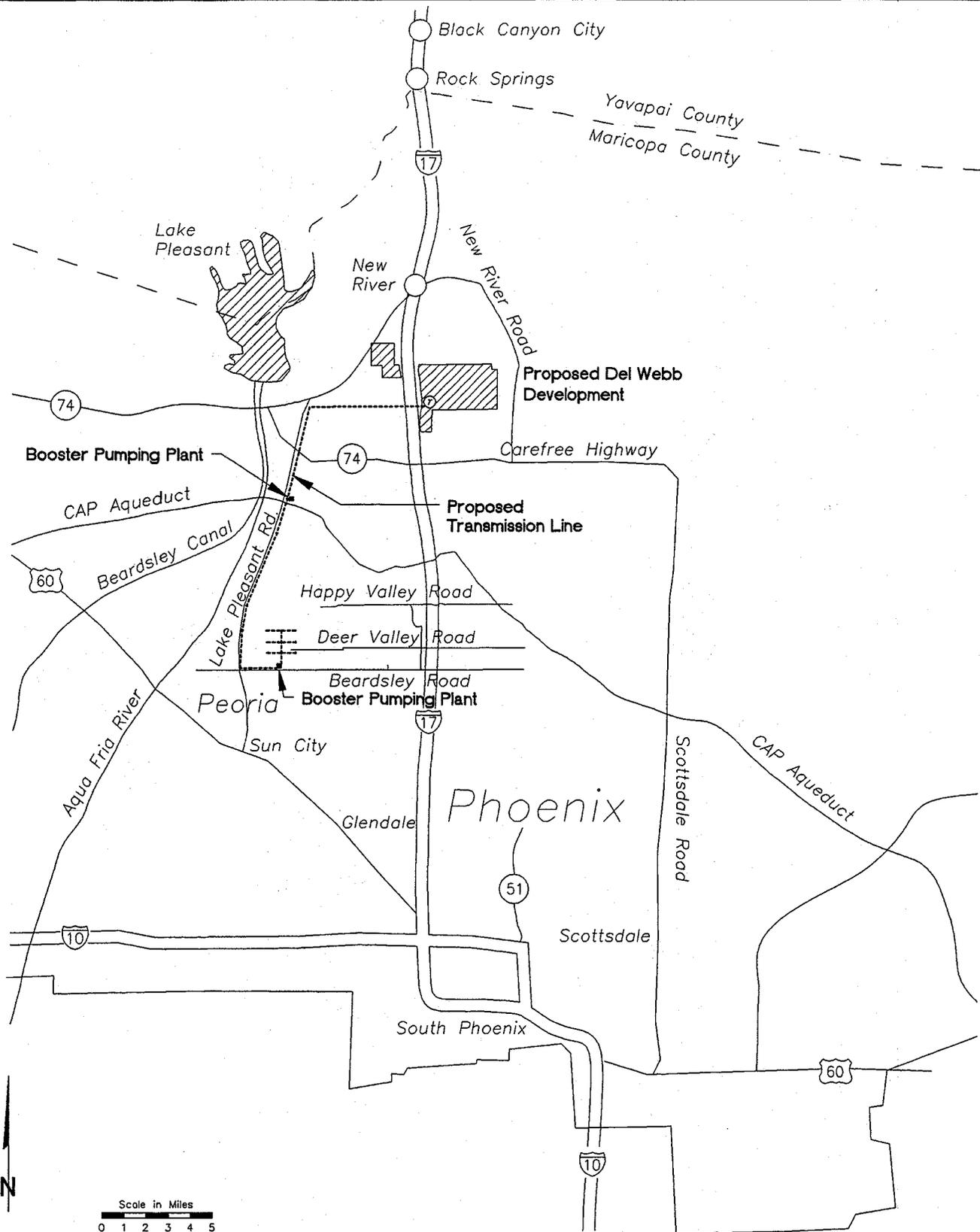
If Peoria does not become a designated AWS provider, or later loses such designation, The Villages could continue to receive water service from Peoria. In order to satisfy AWS requirements for any

remaining development, Del Webb could enroll the remainder of The Villages' property as member lands of the CAGR D and obtain a certificate of Assured Water Supply for those lands. Any groundwater pumped from existing Peoria well fields by Peoria to serve those lands would be replenished with surface water by the CAGR D. This service arrangement would not require the approval of Reclamation, nor would it impact groundwater levels in The Villages area or use unreplenished groundwater.

The estimated impacts of groundwater production to supply The Villages from the Peoria system were evaluated with respect to the requirements for a 100-year AWS. In order to demonstrate a 100-year water supply, the depth to water at the end of 100 years needs to be less than 1,000 feet.

In performing this analysis, it was assumed that 8,000 acre-feet per year would be obtained from nine wells located in Sections 16 and 21 in Township 4 North, Range 1 East, as shown in Figure A-5.

The analysis shows that the maximum drawdown at the end of 100 years would be about 185 feet indicating that the supply would meet the criterion for a 100-year AWS. The drawdown over time at the well field is shown graphically in Figure A-6. The drawdown at the closest City of Peoria well (located in section 21) due to the development of the well field is estimated to be 115 feet after 100 years.

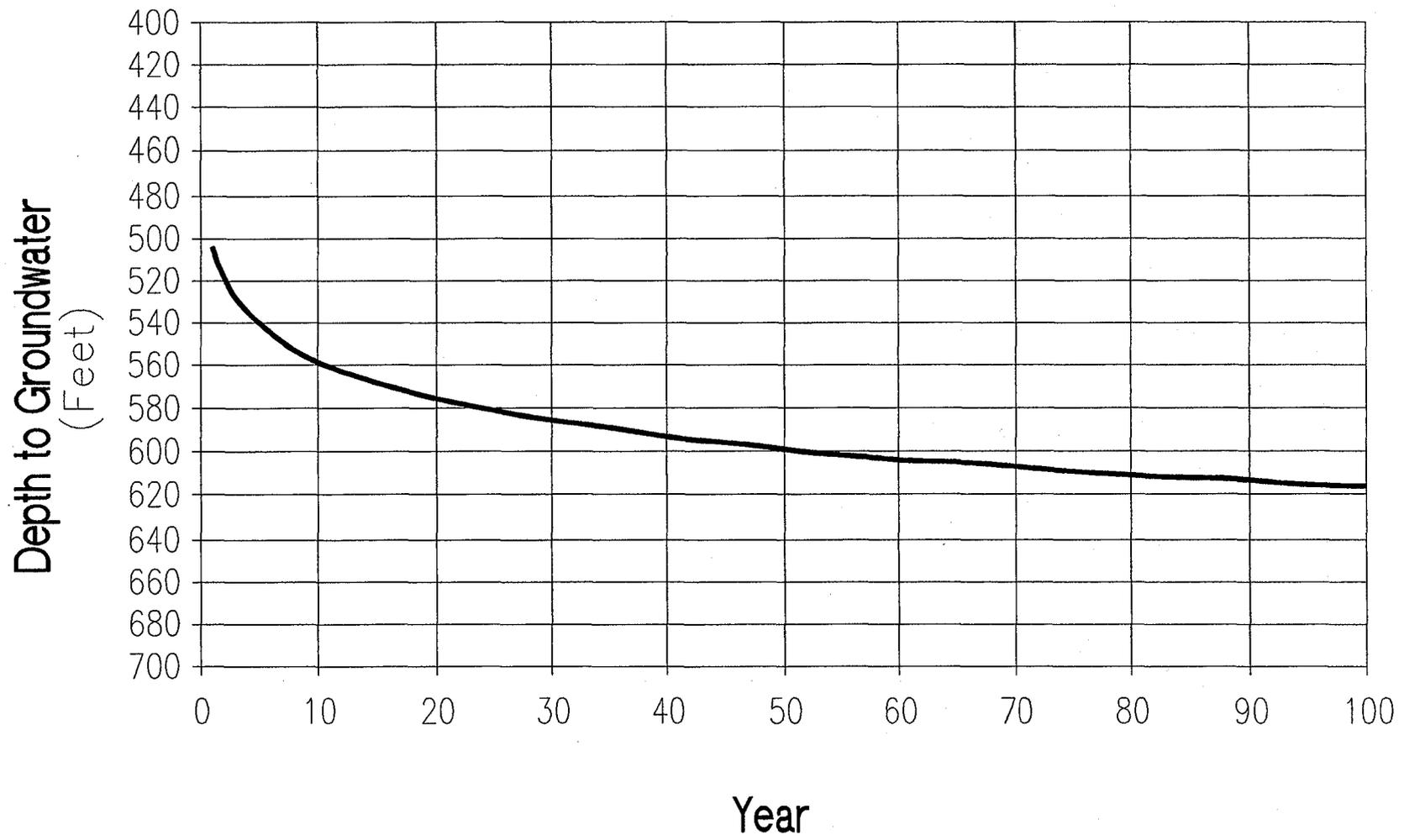


May 1997

BOOKMAN-EDMONSTON
ENGINEERING

Option 3
Service from Existing
City of Peoria System

FIGURE A-5



Offsite Wellfield for The Villages

April 1997

4/22/97
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Bookman-Edmonston
Engineering

Drawdown Effects of New Wells
In City of Peoria System for Option 3

FIGURE A-6

Delivery Facilities

The required facilities would include a connection to the existing City of Peoria water distribution system, a well field, a booster pumping plant, and a transmission pipeline. An estimated nine wells would need to be drilled to a depth of approximately 1,600 feet. Each well would require a 400-horsepower pump. The wells would be connected to the existing City of Peoria water distribution system in the vicinity of Beardsley Road and 91st Avenue. The City of Peoria operates a 16-inch diameter water distribution pipeline at this location.

A booster pumping plant and a transmission line would need to be constructed to deliver water to The Villages. A 36-inch diameter transmission line would head west from the booster pumping plant parallel and adjacent to the northern Beardsley Road ROW, as shown in Figure A-5. At the Lake Pleasant Road, the transmission line would parallel and be adjacent to the southern ROW of the Lake Pleasant Road heading north. The transmission line would head due east along the section line starting at the southern boundary of Section 23, Township 6 North, Range 1 East to The Villages. It is estimated that approximately 19 miles of 36-inch diameter pipeline would be required.

System Operation and Maintenance

Because this would be an extension of service by the City of Peoria, the system would be operated and maintained by the City. Users would be customers of the City of Peoria Water Department. Water rates for customers would be established by the City, based on policy for service to similar areas on the outskirts of the distribution system.

Costs

A pre-feasibility-level cost estimate is presented in the table below which shows construction costs for the well field, pumping plant, and transmission line, and costs for rights-of-way, legal, engineering, construction management, administration, and contingencies. The total estimated cost for Option 3 is \$27.9 million.

Estimate of Cost to Provide Service from Existing City of Peoria System (Option 3)	
Item Description	Cost
Well field (9 wells, 1,300 feet deep)	\$ 2,860,000
Pumping Plant	\$ 3,200,000
Transmission Pipeline (102,000 linear feet, 36-inch diameter)	\$12,342,000
Rights-of-Way	\$ 981,000
Subtotal	\$19,383,000
Legal, Engineering, Construction Management and Administration (15%)	\$ 2,907,000
Contingencies (25%)	\$ 5,573,000
TOTAL ESTIMATED COST	\$27,863,000

OPTION 4 - CAGR D MEMBERSHIP; SERVICE BY PRIVATE WATER COMPANY

Under this option, the physical water supply for The Villages would be provided from well sites leased or purchased by the water company in the Phoenix AMA where it is determined that pumping over the next 100 years will not cause the water level in the aquifer to decline to more than 1,000 feet below ground surface. The water company's service area would be established through the use of Type 2 non-irrigation grandfathered rights with water for the development being withdrawn from the off-development well sites and piped to The Villages.

As with Option 3, groundwater pumped at these off-development well sites would be replenished by surface water supplies provided by the CAGR D as a result of the enrollment of The Villages' lands in the CAGR D.

This option allows Del Webb to obtain water service for The Villages and an AWS under Arizona law using an arrangement that does not require the approval of Reclamation or any other federal entity and would not impact groundwater levels in The Villages area and would not use unreplenished groundwater.

Water Supply

The estimated impacts of groundwater production to supply The Villages under Option 4 were evaluated with respect to the requirements for a 100-year AWS. In order to demonstrate a 100-year water supply, the depth to water at the end of 100 years needs to be less than 1,000 feet.

In performing this analysis, it was assumed that 8,000 acre-feet per year would be obtained from nine wells, located in Township 5 North, Range 4 East, as shown in Figure A-7.

The analysis shows that the drawdown at the end of 100 years would be about 155 feet. As shown in Figure A-8, the depth to groundwater at the well field would be about 730 feet at the end of 100 years of pumping, which indicates that the supply would meet the criterion for a 100-year AWS.

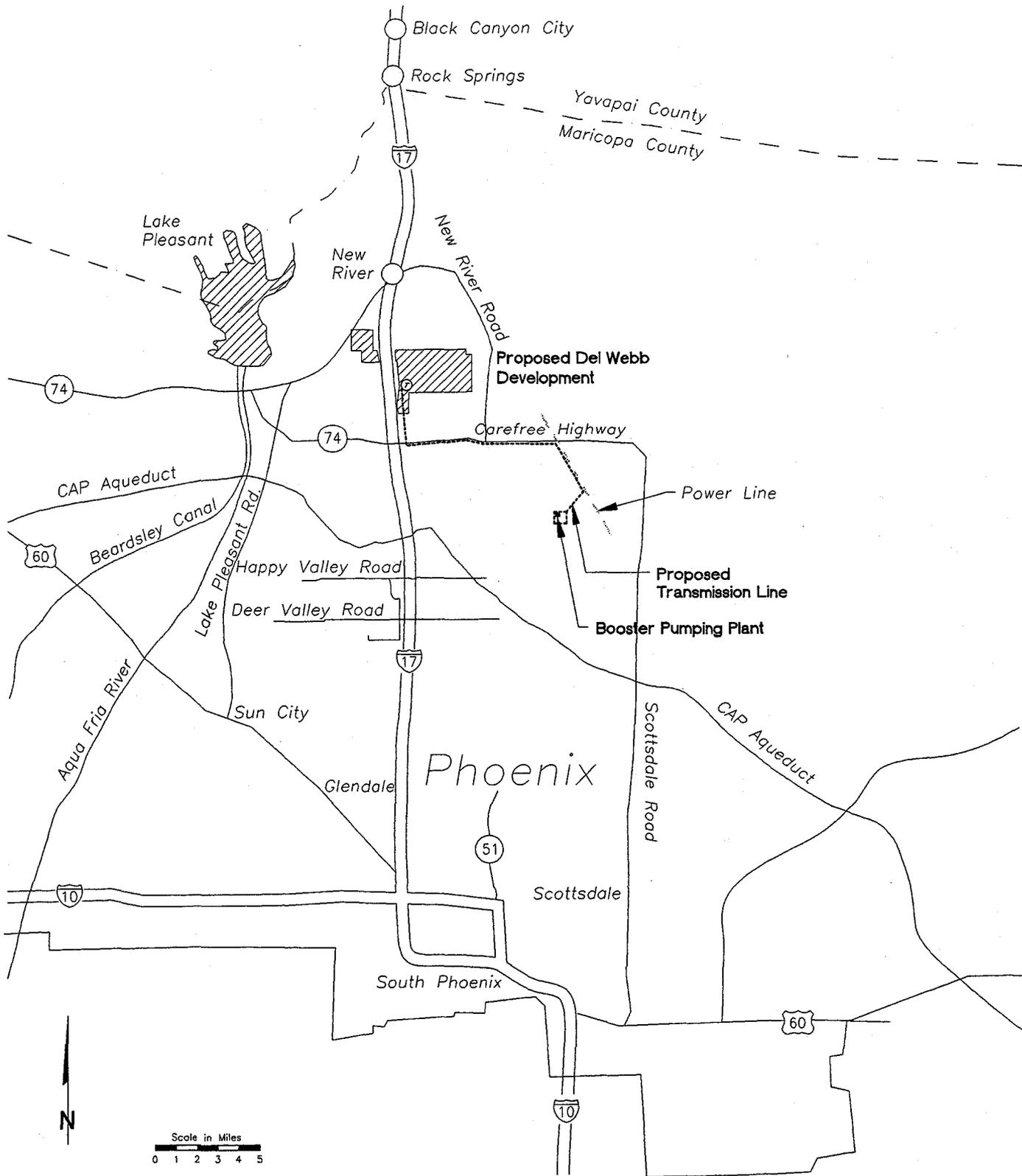
The analysis used to assess the long-term impacts on groundwater assumes that the 8,000 acre-foot per year demand can be met by wells pumping at a constant rate of about 11 cfs or about 5,000 gpm over the year. However, in fact, the demands will vary during the year, with the demand for the peak day being about 28 cfs, or about 12,700 gpm. The estimated costs are based on the number of wells needed to provide the peak capacity.

Delivery Facilities

The required facilities would include a well field, a booster pumping plant, and a transmission pipeline. An estimated nine wells would need to be drilled to a depth of approximately 1,600 feet. Each well would require a 400-horsepower pump. The wells would be connected to a common booster pumping plant, which would pressurize the water for transmission to The Villages. A 36-inch diameter transmission line would head northeast from the booster pumping plant to the existing power lines, as shown in Figure A-7. The transmission line would then parallel and be adjacent to the southern ROW for the power lines. At the Carefree Highway, the transmission line would parallel and be adjacent to the southern ROW of the Carefree Highway heading west. At Interstate 17, the transmission line would parallel and be adjacent to the eastern ROW of Interstate 17 and would head north to The Villages. It is estimated that approximately 14 miles of 36-inch diameter pipeline would be required.

System Operation and Maintenance

The delivery facilities would be owned and operated by the water company established to serve The Villages.

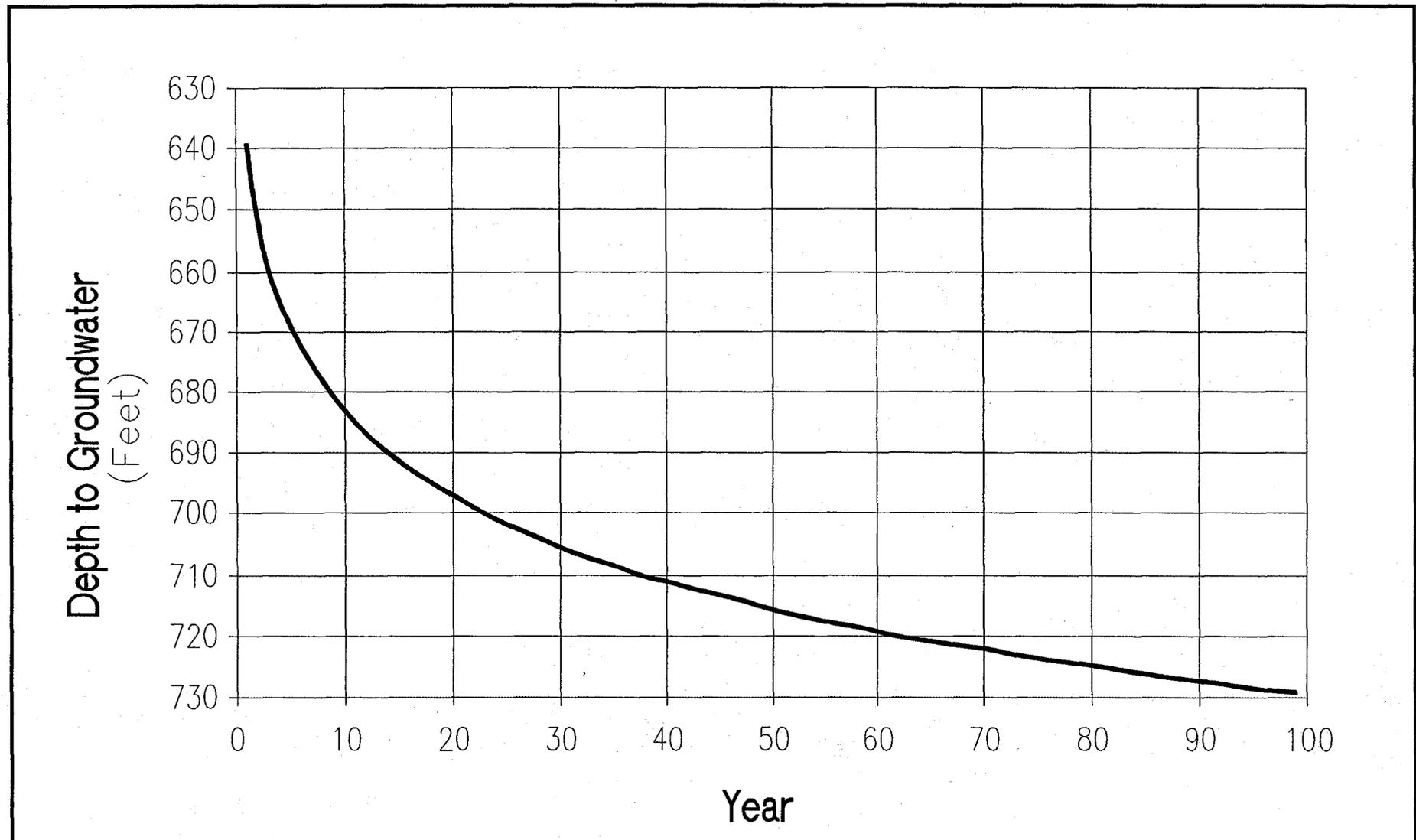


May 1997

BOOKMAN-EDMONSTON
ENGINEERING

Option 4
CAGR Membership
Service by Private Water Company

FIGURE A-7



Offsite Wellfield for The Villages

April 1997

Bookman-Edmonston
Engineering

Drawdown Effects of New Well
Field for Option 4

FIGURE A-8

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Estimated Costs

A pre-feasibility-level cost estimate is presented in the table below which shows construction costs for the well field, pumping plants, and transmission line, and costs for rights-of-way, legal, engineering, construction management, administration, and contingencies. The total estimated cost for Option 4 is \$19.2 million.

Estimate of Cost to Provide Phoenix AMA Groundwater Through CAGR Membership (Option 4)	
Item Description	Cost
Well field (9 wells, 1,600 feet deep)	\$ 2,794,000
Pumping Plant	\$ 1,000,000
Transmission Pipeline (74,000 linear feet, 36-inch diameter)	\$ 8,847,000
Rights-of-Way	\$ 713,000
Subtotal	\$13,354,000
Legal, Engineering, Construction Management and Administration (15%)	\$ 2,003,000
Contingencies (25%)	\$ 3,839,000
TOTAL ESTIMATED COST	\$19,196,000



City of Phoenix

OFFICE OF THE CITY MANAGER

June 11, 1996

Mr. Bruce Ellis
Bureau of Reclamation
23636 North Seventh Street
Phoenix, Arizona 85024

Dear Mr. Ellis:

Re: Del Webb Corporation - The Villages at Desert Hills

SEARCHED	INDEXED
SERIALIZED	FILED
JUN 12 '96	
6/14	11:12 AM
6-19	1:50 PM
W. R. H. H.	
A. C. H. H.	
G. P. H. H.	

Winner of the
Carl Bertelsmann
Prize



Del Webb Corporation has asked the City to write to you concerning whether the City of Phoenix would feasibly provide water service to The Villages at Desert Hills. We understand that the Bureau of Reclamation has requested this information as part of the NEPA Compliance Process. The Phoenix Water Services Department prepared this letter to provide you the necessary information.

Our understanding at this time is that The Villages will be self-sufficient as to water and wastewater treatment services. The Villages, except for a small portion on the west side of I-10, is not in the City of Phoenix and has not requested services from Phoenix. Given this, no details of service by Phoenix have been explored, at this time.

North Phoenix will ultimately be served water by the City's proposed Lake Pleasant Water Treatment Plant, which is currently included in its water services master plans. The planned long-term service area for this water treatment plant, which will treat and distribute Central Arizona Project (CAP) water from Lake Pleasant, includes the area encompassed by The Villages. Although the master plans to date do not assume water service to The Villages, the plans could be updated through the appropriate City procedures to reflect such service and to include an allocation of water resources for that development from existing and future water resources identified in the Phoenix Water Resources Plan that become available to the City of Phoenix.

There are two alternative ways in which Phoenix could serve The Villages area, if a decision was made in the future to do so. First, it could be served as part of the Phoenix water system, assuming that at some future point The Villages became part of the City of Phoenix. Or second, if the area does not become part of the City of Phoenix, a contractual agreement for treatment and delivery of The Villages water supply could be developed. We currently have such an agreement with the City of Tolleson and we are exploring additional such agreement with westside cities. The City of Phoenix has not formally explored these alternatives with Del Webb Corporation, but we would be willing to do so.

Mr. Bruce Ellis
Page 2
June 11, 1996

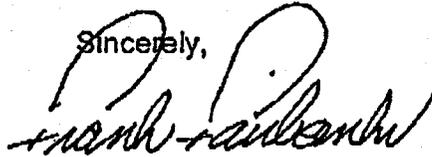
The Villages' current infrastructure plans should be examined jointly with Phoenix to assure that the water system being installed by The Villages is compatible with future service by Phoenix, and the economies of scale are maximized and duplication is minimized. The Villages has pledged to engage in a joint planning exercise with Phoenix to establish possible guidelines to achieve these objectives.

In summary, based upon the above, Phoenix could be a water supplier to The Villages. Appropriate planning and institutional procedures, including Council approval, would have to be implemented before actual service could be provided.

This letter is not intended to be a commitment by the City of Phoenix to provide water service to The Villages at Desert Hills nor a binding commitment of any kind by the City of Phoenix.

I hope this letter answers questions you might have concerning the possibility of Phoenix providing water service to The Villages. Should you have other questions or need more information, please contact Mr. Michael Gritzuk, Phoenix Water Services Director.

Sincerely,



Frank Fairbanks
City Manager

c: David R. Garcia
Michael Gritzuk
Jesse Sears

**Appendix B. Plant and Wildlife Nomenclature and
Description of Seasonal Drainages**

Table B-1. Plant Species Encountered along the Proposed
Water Delivery Pipeline Corridor

Common Name	Scientific Name
Barrel cactus	<i>Ferocactus wislizenii</i> ^a
Bermuda grass	<i>Cynodon dactylon</i>
Blazing star	<i>Mentzelia pumila</i>
Blue palo verde	<i>Cercidium floridum</i> ^b
Bristle-lobed sandmat	<i>Euphorbia setiloba</i>
Brittle bush	<i>Encelia farinosa</i>
Broom snakeweed	<i>Gutierrezia sarothrae</i>
Burro brush	<i>Hymenoclea salsola</i>
Canyon ragweed	<i>Ambrosia ambrosioides</i>
Catclaw acacia	<i>Acacia greggii</i> var. <i>arizonica</i>
Chain fruit cholla	<i>Opuntia fulgida</i> ^a
Creosote bush	<i>Larrea tridentata</i>
Desert broom	<i>Baccharis sarathroides</i>
Desert Christmas cactus	<i>Opuntia leptocaulis</i> ^a
Desert hackberry	<i>Celtis pallida</i>
Desert holly	<i>Atriplex hymenelytra</i>
Desert mistletoe	<i>Phoradendron californicum</i>
Desert senna	<i>Cassia covesii</i>
Desert tobacco	<i>Nicotiana trigonophylla</i>
Desert trumpet	<i>Eriogonum inflatum</i>
Desert willow	<i>Chilopsis linearis</i> ^b
Englemann's prickly pear	<i>Opuntia phaeacantha</i> ^a
Fluff grass	<i>Erioneuron pulchellum</i> (<i>Tridens pulchellus</i>)
Foothill palo verde	<i>Cercidium microphyllum</i> ^b
Fountain grass	<i>Pennisetum setaceum</i>
Four-wing saltbush	<i>Atriplex canescens</i>
Globe mallow	<i>Sphaeralcea ambigua</i>
Gray thorn	<i>Zizyphus obtusifolia</i>
Hairy tridens	<i>Erioneuron pilosum</i> (<i>Tridens pilosus</i>)
Janusia	<i>Janusia gracilis</i>
Mormon tea	<i>Ephedra</i> sp.
Ocotillo	<i>Fouquieria splendens</i> ^b
Rabbit brush	<i>Chrysothamnus nauseosus</i>
Rambling milkweed	<i>Sarcostemma hirtellum</i>
Roughseed clammyweed	<i>Polanisia dodecandra</i> ssp. <i>trachysperma</i>
Russian thistle	<i>Salsola iberica</i>
Sacred datura	<i>Datura</i> sp.
Saguaro	<i>Cereus giganteus</i> ^a

Common Name	Scientific Name
Seep willow	<i>Baccharis salicifolia</i>
Six-weeks three awn	<i>Aristida adsensionis</i>
Skeleton weed	<i>Eriogonum deflexum</i>
Strawberry hedgehog	<i>Echinocereus engelmannii^a</i>
Teddy bear cholla	<i>Opuntia bigelovii^a</i>
Tobosa grass	<i>Hilaria mutica</i>
Triangle bursage	<i>Ambrosia deltoidea</i>
Velvet mesquite	<i>Prosopis velutina^c</i>
Western honey mesquite	<i>Prosopis glandulosa^c</i>
White-thorn acacia	<i>Acacia constricta</i>
White virgin's bower	<i>Clematis ligusticifolia</i>
Woolly tidestromia	<i>Tidestromia lanuginosa</i>

Notes:

- ^a Salvage restricted protected native plants
- ^b Salvage assessed native plants
- ^c Harvest restricted protected native plants

Table B-2. Wildlife Species Encountered along the Proposed
Water Delivery Pipeline Corridor

Common Name	Scientific Name
Birds	
American kestrel	<i>Falco sparverius</i>
Black-tailed gnatcatcher	<i>Polioptila melanura</i>
Black-throated sparrow	<i>Amphispiza bilineata</i>
Cactus wren	<i>Campylorhynchus brunneicapillus</i>
Common raven	<i>Corvus corax</i>
Curve-billed thrasher	<i>Toxostoma curvirostre</i>
Gambel's quail	<i>Lophortyx gambelii</i>
Gila woodpecker	<i>Melanerpes uropygialis</i>
Harris' hawk	<i>Parabuteo unicinctus</i>
Horned lark	<i>Eremophila alpestris</i>
House finch	<i>Carpodacus mexicanus</i>
Killdeer	<i>Charadrius vociferos</i>
Loggerhead shrike	<i>Lanius ludovicianus</i>
Mourning dove	<i>Zenaida macroura</i>
Northern cardinal	<i>Cardinalis cardinalis</i>
Northern flicker	<i>Colaptes auratus</i>
Northern mockingbird	<i>Mimus polyglottus</i>
Phainopepla	<i>Phainopepla nitens</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Ruby-crowned kinglet	<i>Regulus calendula</i>
Verdin	<i>Auriparus flaviceps</i>
Western kingbird	<i>Tyrannus verticalis</i>
White-crowned sparrow	<i>Zonotrichia leucophrys</i>
Mammals	
Black-tailed jackrabbit	<i>Lepus californicus</i>
Coyote	<i>Canis latrans</i>
Desert mule deer	<i>Odocoileus hemionus crooki</i>
Desert cottontail	<i>Sylvilagus auduboni</i>
Harris' antelope ground squirrel	<i>Ammospermophilus harrisi</i>
Kit fox (tracks)	<i>Vulpes macrotis</i>
Ringtail	<i>Bassariscus astutus</i>
White-throated woodrat (nest)	<i>Neotoma albigula</i>

Table B-2. Continued

Common Name	Scientific Name
Reptiles	
Side-blotched lizard	<i>Uta stansburiana</i>
Western whiptail	<i>Cnemidophorus tigris</i>

Table B- 3. Locations and Characteristics of Seasonal Drainages
Along the Proposed Water Delivery Pipeline Corridor

Drainage Location	Vegetation	Approximate Width (feet) Bed and Bank Condition
1. Between Waddell Canal and the proposed pump station, parallel to the canal	Foothill palo verde, triangle bursage, creosote bush, velvet mesquite	3 feet, cobble bottom with bed and bank
2. First drainage crossing between proposed pump station and Carefree Highway	None	5 feet, flat gravel bottom with bed and bank
3. Second drainage crossing between proposed pump station and Carefree Highway	None	10 feet, sandy bottom with bed and bank
4. First drainage crossing from Carefree Highway to intersection with haul road	Desert senna, brittle bush, creosote bush	1 foot, shallow overland drainage with no bed and bank
5. Second drainage crossing from Carefree Highway to intersection with haul road	Brittle bush, tobosa grass, foothill palo verde, velvet mesquite, gray thorn, triangle bursage	1 foot, shallow overland drainage with no bed and bank
6. Third drainage crossing from Carefree Highway to intersection with haul road	Bristle-lobed sandmat, globe mallow	1 foot, shallow overland drainage with no bed and bank
7. Fourth drainage crossing from Carefree Highway to intersection with haul road	Velvet mesquite, creosote bush	1 foot, slightly incised, sand/cobble bottom with no bed and bank
8. Fifth drainage crossing from Carefree Highway to intersection with haul road	Brittle bush, tobosa grass, creosote bush, foothill palo verde, triangle bursage	1 foot, slightly incised with no bed and bank
9. Haul road; first drainage from transmission line to New River	Foothill palo verde, triangle bursage, velvet mesquite	2 foot, 2 to 3 feet incised with bed and bank
10. Haul road; second drainage from transmission line to New River	Globe mallow, triangle bursage, bristle-lobed sandmat, catclaw acacia, foothill palo verde	15 feet wide with bed and bank, 5 foot channel north of haul road, channel modified by haul road and only slightly incised to the south
11. Haul road; third drainage from transmission line to New River	Bristle-lobed sandmat, globe mallow	.5 feet, no bed and bank

B-5

Table B-3. Continued

Drainage Location	Vegetation	Approximate Width (feet) Bed and Bank Condition
12. Haul road; fourth drainage from transmission line to New River	Bermuda grass, bristle-lobed sandmat, six-weeks three awn, desert broom triangle bursage	20 feet wide, bed and bank with vegetated channel
13. Haul road; fifth drainage from transmission line to New River	Bristle-lobed sandmat, brittle bush, six-weeks three awn, triangle bursage	20 foot wide scoured channel north of haul road, five foot wide vegetated channel below haul road, with defined bed and bank
14. Reclamation borrow site to I-17; first drainage	None	5 feet wide with bed and bank
15. Reclamation borrow site to I-17; second drainage	Velvet mesquite	15 feet wide with bed and bank
B-6 16. Del Webb property from I-17 to proposed treatment plant; first drainage adjacent to I-17, is a continuation of #16	Triangle bursage, desert senna	10 feet wide with bed and bank
17. Del Webb property from I-17 to proposed treatment plant; second drainage	Canyon ragweed	5 feet wide with bed and bank, deeply incised with cobble bottom

**Appendix C. Special-Status Plant and Wildlife Species
Known or with Potential to Occur at the
Project Site**



GAME & FISH DEPARTMENT

2221 West Greenway Road, Phoenix, Arizona 85023-4399 (602) 942-3000

Governor
Fife Symington

Commissioners:
Chairman, Nonie Johnson, Snowflake
Michael M. Golightly, Flagstaff
Herb Guenther, Tacna
Fred Belman, Tucson
M. Jean Hassell, Scottsdale

Director
Duane L. Shroufe

Deputy Director
Thomas W. Spalding

October 31, 1996

Ms. Stephanie Myers
Jones & Stokes Associates, Inc.
2600 V Street
Sacramento, California 95818-1914

Re: Special Status Species; Proposed Pipeline Project (Township 5 North, Range 1 East, Section 4; Township 6 North, Range 1 East, Sections 23, 24, 27, 33, 34; Township 6 North, Range 2 East, Sections 19-22) Arizona

Dear Ms. Myers:

The Arizona Game and Fish Department (Department) has reviewed your letter, faxed October 18, 1996, regarding special status species in the vicinity of the above-referenced area, and the following information is provided.

The Department's Heritage Data Management System has been accessed and current records show that the special status species listed below has been documented as occurring in the project vicinity.

<u>COMMON NAME</u>	<u>SCIENTIFIC NAME</u>	<u>STATUS</u>
bald eagle	<u>Haliaeetus leucocephalus</u>	LT, WC, S
California snakewood	<u>Colubrina californica</u>	S
Hohokam agave	<u>Agave murpheyi</u>	S, HS
lowland leopard frog	<u>Rana yavapaiensis</u>	WC, S
Sonoran desert tortoise	<u>Gopherus agassizii</u>	WC, S

STATUS DEFINITIONS

LT - Listed Threatened. Species identified by the U.S. Fish and Wildlife Service (USFWS) under the Endangered Species Act (ESA) as being in imminent jeopardy of becoming Endangered.

WC - Wildlife of Special Concern in Arizona. Species whose occurrence in Arizona is or may be in jeopardy, or with known or perceived threats or population declines, as described by the Department's listing of **Wildlife of Special Concern in Arizona** (WSCA, in prep.). Species included in WSCA are currently the same as those in **Threatened Native Wildlife in Arizona** (1988).

Ms. Stephanie Myers

October 31, 1996

2

- S - Sensitive.** Species classified as "**sensitive**" by the Regional Forester when occurring on lands managed by the U.S.D.A. Forest Service.
- HS - Highly Safeguarded.** Those Arizona native plants whose prospects for survival in this state are in jeopardy or are in danger of extinction, or are likely to become so in the foreseeable future, as described by the Arizona Native Plant Law (1993).

In addition, the project occurs in the vicinity of proposed Critical Habitat for the cactus ferruginous pygmy-owl (Glaucidium brasilianum cactorum) (59 Federal Register 63975, December 12, 1994). We recommend contacting USFWS, at the address listed below, for additional information regarding ESA and how it applies to the pygmy-owl.

Mr. Sam Spiller
Field Supervisor
Arizona Ecological Services State Office
U.S. Fish and Wildlife Service
2321 West Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
Phone: (602) 640-2720

At this time, the Department's comments are limited to the special status species information provided above. This correspondence does not represent the Department's evaluation of impacts to wildlife or wildlife habitat associated with activities occurring in the subject area. The Department would appreciate the opportunity to provide such an evaluation when specific actions become available.

Thank you for the opportunity to provide this information. If you have any questions, please contact me at (602) 789-3606.

Sincerely,



Nancy Olson
Project Evaluation Specialist
Habitat Branch

NLO:no

cc: Sam Spiller, Field Supervisor, Az E.S. State Office, USFWS
Kelly Neal, Regional Supervisor, Region VI, Mesa

AGFD# 10-18-96(06)

GUIDELINES FOR HANDLING SONORAN DESERT TORTOISES
ENCOUNTERED ON DEVELOPMENT PROJECTS
Arizona Game and Fish Department
Revised November 29, 1993

Desert tortoises of the Sonoran population are those occurring south and east of the Colorado River. Tortoises encountered on short-term projects (less than one week), and not in a burrow should be moved out of harm's way to adjacent appropriate habitat. A tortoise should be moved no further than necessary, not to exceed 0.1 mile from its original location. If it is necessary to move a tortoise more than 0.1 mile to safeguard that tortoise, the Arizona Game and Fish Department (Department) should be contacted to place the tortoise into a Department-regulated desert tortoise adoption program. Moving a tortoise should be done quickly, handling the tortoise as little as possible, while keeping the tortoise in an upright position at all times. If more than one tortoise is to be handled, separate disposable gloves should be worn for each one to avoid potential transfer of disease between tortoises.

If a burrow of a specific tortoise is determined to be in jeopardy of destruction, the tortoise should be relocated to the nearest appropriate alternate burrow, as determined by a qualified biologist. Failure to locate a suitable burrow nearby could mean death for a tortoise, especially during May, June or July, before the onset of the summer rains, or during the winter brumation (hibernation) in December, January and February. If a suitable burrow cannot be found nearby, the tortoise should be placed in an adoption program.

Tortoises salvaged from projects which result in substantial permanent habitat loss (e.g. housing and farm developments), or those requiring removal during long-term (longer than one week) construction projects, will also be placed in desert tortoise adoption programs. Managers of projects likely to affect desert tortoises should apply for a Department handling permit to facilitate temporary possession of tortoises. Likewise, if large numbers of tortoises (>5) are expected to be displaced by a project, the project manager should contact the Department for guidance and/or assistance.

Please keep in mind the following points:

- These guidelines do not apply to the Mohave population of desert tortoises which are found to the north and west of the Colorado River. Mohave desert tortoises are specifically protected under the Endangered Species Act, as administered by the U.S. Fish and Wildlife Service.
- These guidelines are subject to revision at the discretion of the Department. We recommend that the Department be contacted during the planning stages of any project that may affect the desert tortoise.
- Take, possession or harassment of a desert tortoise is prohibited by state law. Unless specifically authorized by the Department, or as noted above, project personnel should avoid disturbing any tortoise.



United States Department of the Interior
Fish and Wildlife Service

Arizona Ecological Services Field Office
2321 W. Royal Palm Road, Suite 103
Phoenix, Arizona 85021-4951
(602) 640-2720 Fax (602) 640-2730



In Reply Refer To:

AESO/SE
2-21-95-I-468

October 23, 1996

REC-7
OCT 25 1996

Ms. Stephanie Meyers
Jones & Stokes Associates
2600 V Street
Sacramento, California 95818

RE: Feasibility Study for Pipeline Project North of Phoenix, Arizona

Dear Ms. Meyers:

This letter responds to your telephone request of October 18, 1996, for a list of species which are listed as threatened, endangered, or are proposed to be listed as such under the Endangered Species Act of 1973, as amended (Act), which may potentially occur in this project area (Maricopa County). The enclosed list may include candidate species as well. In the past, the U.S. Fish and Wildlife Service has provided project-specific species lists and information. However, staff reductions no longer permit us to provide this detailed level of assistance. We regret any inconvenience this may cause you and hope the enclosed county list of species will be helpful. In future communications regarding this project, please refer to consultation number 2-21-96-I-291.

The enclosed list of the endangered, threatened, proposed, and candidate species includes all those potentially occurring anywhere in the county, or counties, where this project occurs. Please note that this project area may not necessarily include all or any of these species. The information provided includes general descriptions, habitat requirements, and other information for each species on the list. Also on the enclosed list is the Code of Federal Regulations (CFR) citation for each listed or proposed species. Additional information can be found in the CFR and is available at most public libraries. This information should assist you in determining which species may or may not occur within this project area. Site-specific surveys could also be helpful and may be needed to verify the presence or absence of a species or its habitat as required for the evaluation of proposed project-related impacts.

Endangered and threatened species are protected by Federal law and must be considered prior to project development. If the action agency determines that listed species or critical habitat may be adversely affected by a federally funded, permitted, or authorized activity, the action agency must request formal consultation with the Service. If the action agency determines that the planned action may jeopardize a proposed species or destroy or adversely modify proposed critical habitat, the action agency must enter into a section 7 conference with the Service.

Candidate species are those which are being considered for addition to the list of threatened or endangered species. Candidate species are those for which there is sufficient information to support a proposal for listing. Although candidate species have no legal protection under the Act, we recommend that they be considered in the planning process in the event that they become listed or proposed for listing prior to project completion.

If any proposed action occurs in or near areas with trees and shrubs growing along watercourses, known as riparian habitat, the Service recommends the protection of these areas. Riparian areas are critical to biological community diversity and provide linear corridors important to migratory species. In addition, if the project will result in the deposition of dredged or fill materials into waterways or dredging in waterways, we recommend you contact the Army Corps of Engineers which regulates these activities under Section 404 of the Clean Water Act.

The State of Arizona protects some plant and animal species not protected by Federal law. We recommend you contact the Arizona Game and Fish Department and the Arizona Department of Agriculture for State-listed or sensitive species in this project area.

If we may be of further assistance, please contact Tom Gatz.

Sincerely,



Sam F. Spiller
Field Supervisor

Enclosure

cc: Director, Arizona Game and Fish Department, Phoenix, AZ

3/21/96

LISTED TOTAL= 13

NAME: ARIZONA AGAVE

AGAVE ARIZONICA

STATUS: ENDANGERED CRITICAL HABITAT: No RECOVERY PLAN: No CFR: 49 FR 21055, 05-18-1984

DESCRIPTION: HAS ATTRACTIVE ROSETTES OF BRIGHT GREEN LEAVES WITH DARK MAHOGANY MARGINS. FLOWER: BORNE ON SUB-UMBELLATE INFLORESCENCES.

ELEVATION RANGE: 3000-6000 FT.

COUNTIES: GILA, YAVAPAI, MARICOPA

HABITAT: TRANSITION ZONE BETWEEN OAK-JUNIPER WOODLAND & MOUNTAIN MAHOGANY-OAK SCRUB

SCATTERED CLONES IN NEW RIVER MOUNTAINS AND SIERRA ANCHA. USUALLY FOUND ON STEEP, ROCKY SLOPES. POSSIBLY MAZATAL MOUNTAINS. SHOULD BE LOOKED FOR WHEREVER THE RANGES OF Agave toumeyana var. bella AND Agave chrystantha OVERLAP.

NAME: ARIZONA CLIFFROSE

PURSHIA SUBINTEGRA

STATUS: ENDANGERED CRITICAL HABITAT: No RECOVERY PLAN: Yes CFR: 49 FR 22326 5-29-84

DESCRIPTION: EVERGREEN SHRUB OF THE ROSE FAMILY (ROSEACEAE). BARK PALE SHREDDY. YOUNG TWIGS WITH DENSE HAIRS. LEAVES 1-5 LOBES AND EDGES CURL DOWNWARD (REVOLUTE). FLOWERS: 5 WHITE OR YELLOW PETALS <0.5 INCH LONG.

ELEVATION RANGE: <4000 FT.

COUNTIES: GRAHAM YAVAPAI MARICOPA MOHAVE

HABITAT: CHARACTERISTIC WHITE SOILS OF TERTIARY LIMESTONE LAKEBED DEPOSITS.

WHITE SOILS OF TERTIARY LIMESTONE LAKEBED DEPOSITS CAN BE SEEN FROM A DISTANCE.

NAME: ARIZONA HEDGEHOG CACTUS

ECHINOCEREUS TRIGLOCHIDIATUS ARIZONICUS

STATUS: ENDANGERED CRITICAL HABITAT: No RECOVERY PLAN: No CFR: 44 FR 61556,10-15-1979

DESCRIPTION: DARK GREEN CYLINDROID 2.5-12 INCHES TALL, 2-10 INCHES IN DIAMETER, SINGLE OR IN CLUSTERS. 1-3 GRAY OR PINKISH CENTRAL SPINES LARGEST DEFLEXED AND 5-11 SHORTER RADIAL SPINES. FLOWER: BRILLIANT RED, SIDE OF STEM IN APRIL- MAY

ELEVATION RANGE: 3700-5200 FT.

COUNTIES: MARICOPA, GILA, PINAL

HABITAT: ECOTONE BETWEEN INTERIOR CHAPPARAL AND MADREAN EVERGREEN WOODLAND

OPEN SLOPES, IN NARROW CRACKS BETWEEN BOULDERS, AND IN UNDERSTORY OF SHRUBS. THIS VARIETY IS BELIEVED TO INTERGRADE AT THE EDGES OF ITS DISTRIBUTION WITH VARIETIES MELANCANTHUS AND NEOMEXICANUS CAUSING SOME CONFUSION IN IDENTIFICATION.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY:

Maricopa

3/21/96

NAME: LESSER LONG-NOSED BAT

LEPTONYCTERIS CURASOAE YERBABUENAE

STATUS: ENDANGERED

CRITICAL HABITAT: No RECOVERY PLAN: No CFR: 53 FR 38456, 09-30-88

DESCRIPTION: ELONGATED MUZZLE, SMALL LEAF NOSE, AND LONG TONGUE.
YELLOWISH BROWN OR GRAY ABOVE AND CINNAMON BROWN BELOW.
TAIL MINUTE AND APPEARS TO BE LACKING. EASILY DISTURBED.

ELEVATION
RANGE: <6000 FT.

COUNTIES: COCHISE, PIMA, SANTA CRUZ, GRAHAM, PINAL, MARICOPA

HABITAT: DESERT SCRUB HABITAT WITH AGAVE AND COLUMNAR CACTI PRESENT AS FOOD PLANTS

DAY ROOSTS IN CAVES AND ABANDONED TUNNELS. FORAGES AT NIGHT ON NECTAR, POLLEN, AND FRUIT OF PANICULATE AGAVES AND COLUMNAR CACTI. THIS SPECIES IS MIGRATORY AND IS PRESENT IN ARIZONA, USUALLY FROM APRIL TO SEPTMBER AND SOUTH OF THE BORDER THE REMAINDER OF THE YEAR.

NAME: SONORAN PRONGHORN

ANTILOCAPRA AMERICANA SONORIENSIS

STATUS: ENDANGERED

CRITICAL HABITAT: No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67

DESCRIPTION: BUFF ON BACK AND WHITE BELOW, HOOFED WITH SLIGHTLY CURVED
BLACK HORNS HAVING A SINGLE PRONG. SMALLEST AND PALEST OF
THE PRONGHORN SUBSPECIES.

ELEVATION
RANGE: 2000-4000 FT.

COUNTIES: PIMA, YUMA, MARICOPA

HABITAT: BROAD, INTERMOUNTAIN ALLUVIAL VALLEYS WITH CREOSOTE-BURSAGE & PALO VERDE-MIXED CACTI ASSOCIATIONS

TYPICALLY, BAJADAS ARE USED AS FAWNING AREAS AND SANDY DUNE AREAS PROVIDE FOOD SEASONALLY. HISTORIC RANGE WAS PROBABLY LARGER THAN EXISTS TODAY. THIS SUBSPECIES ALSO OCCURS IN MEXICO.

NAME: DESERT PUFFISH

CYPRINODON MACULARIUS

STATUS: ENDANGERED

CRITICAL HABITAT: Yes RECOVERY PLAN: Yes CFR: 51 FR 10842, 03-31-1986

DESCRIPTION: SMALL (2 INCHES) SMOOTHLY ROUNDED BODY SHAPE WITH NARROW
VERTICAL BARS ON THE SIDES. BREEDING MALES BLUE ON HEAD AND
SIDES WITH YELLOW ON TAIL. FEMALES & JUVENILES TAN TO OLIVE
COLORED BACK AND SILVERY SIDES.

ELEVATION
RANGE: <5000 FT.

COUNTIES: LA PAZ, PIMA, GRAHAM, MARICOPA, PINAL, YAVAPAI, SANTA CRUZ

HABITAT: SHALLOW SPRINGS, SMALL STREAMS, AND MARSHES. TOLERATES SALINE & WARM WATER

CRITICAL HABITAT INCLUDES QUITOBAQUITO SPRING, PIMA COUNTY, PORTIONS OF SAN FELIPE CREEK, CARRIZO WASH, AND FISH CREEK WASH, IMPERIAL COUNTY, CALIFORNIA. TWO SUBSPECIES ARE RECOGNIZED: DESERT PUFFISH (*C. m. macularis*) AND QUITOBAQUITO PUFFISH (*C. m. eremus*).

3/21/96

NAME: GILA TOPMINNOW

POECILIOPSIS OCCIDENTALIS OCCIDENTALIS

STATUS: ENDANGERED CRITICAL HABITAT: No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-1967
DESCRIPTION: SMALL (2 INCHES), GUPPY-LIKE, LIVE BEARING, LACKS DARK SPOTS ON ITS FINS. BREEDING MALES ARE JET BLACK WITH YELLOW FINS.

ELEVATION
RANGE: <4500 FT.

COUNTIES: GILA, PINAL, GRAHAM, YAVAPAI, SANTA CRUZ, PIMA, MARICOPA, LA PAZ

HABITAT: SMALL STREAMS, SPRINGS, AND CIENEGAS VEGETATED SHALLOWS

NAME: RAZORBACK SUCKER

XYRAUCHEN TEXANUS

STATUS: ENDANGERED CRITICAL HABITAT: Yes RECOVERY PLAN: No CFR: 55 FR 21154, 05-22-1990;
DESCRIPTION: LARGE (UP TO 3 FEET AND UP TO 16 POUNDS) LONG, HIGH SHARP- 59 FR 13374, 03-21-1994
EDGED KEEL-LIKE HUMP BEHIND THE HEAD. HEAD FLATTENED ON TOP.
OLIVE-BROWN ABOVE TO YELLOWISH BELOW.

ELEVATION
RANGE: <6000 FT.

COUNTIES: GREENLEE, MOHAVE, PINAL, YAVAPAI, YUMA, LA PAZ, MARICOPA (REFUGIA), GILA, COCONINO, GRAHAM

HABITAT: RIVERINE & LACUSTRINE AREAS, GENERALLY NOT IN FAST MOVING WATER AND MAY USE BACKWATERS

SPECIES IS ALSO FOUND IN HORSESHOE RESERVOIR (MARICOPA COUNTY).

NAME: AMERICAN PEREGRINE FALCON

FALCO PEREGRINUS ANATUM

STATUS: ENDANGERED CRITICAL HABITAT: No RECOVERY PLAN: Yes CFR: 35 FR 16047, 10-13-70; 35
DESCRIPTION: A RECLUSIVE, CROW-SIZED FALCON SLATY BLUE ABOVE WHITISH FR 8495, 06-02-70
BELOW WITH FINE DARK BARRING. THE HEAD IS BLACK AND APPEARS
TO BE MASKED OR HELMETED. WINGS LONG AND POINTED. LOUD
WAILING CALLS ARE GIVEN DURING BREEDING PERIOD.

ELEVATION
RANGE: 3500-9000 FT.

COUNTIES: MOHAVE COCONINO NAVAJO APACHE SANTA CRUZ MARICOPA COCHISE YAVAPAI GILA PINAL PIMA
GREENLEE GRAHAM

HABITAT: CLIFFS AND STEEP TERRAIN USUALLY NEAR WATER OR WOODLANDS WITH ABUNDANT PREY

THIS IS A WIDE-RANGING MIGRATORY BIRD THAT USES A VARIETY OF HABITATS. BREEDING BIRDS ARE YEAR-ROUND RESIDENTS. OTHER BIRDS WINTER AND MIGRATE THROUGH ARIZONA. SPECIES IS ENDANGERED FROM REPRODUCTIVE FAILURE FROM PESTICIDES.

LISTED, PROPOSED, AND CANDIDATE SPECIES FOR THE FOLLOWING COUNTY:

Maricopa

3/21/96

NAME: BALD EAGLE

HALIAEETUS LEUCOCEPHALUS

STATUS: THREATENED

CRITICAL HABITAT: No RECOVERY PLAN: Yes CFR: 60 FR 35999, 07-12-95

DESCRIPTION: LARGE, ADULTS HAVE WHITE HEAD AND TAIL. HEIGHT 28 - 38";
WINGSPAN 66 - 96". 1-4 YRS DARK WITH VARYING DEGREES OF
MOTTLED BROWN PLUMAGE. FEET BARE OF FEATHERS.

ELEVATION

RANGE: VARIES FT.

COUNTIES: YUMA, LA PAZ, MOHAVE, YAVAPAI, MARICOPA, PINAL, COCONINO, NAVAJO, APACHE, SANTA CRUZ, PIMA,
GILA, GRAHAM

HABITAT: LARGE TREES OR CLIFFS NEAR WATER (RESERVOIRS, RIVERS AND STREAMS) WITH ABUNDANT PREY

SOME BIRDS ARE NESTING RESIDENTS WHILE A LARGER NUMBER WINTERS ALONG RIVERS AND RESERVOIRS.
AN ESTIMATED 200 TO 300 BIRDS WINTER IN ARIZONA. ONCE ENDANGERED (32 FR 4001, 03-11-1967; 43 FR 6233, 02-
14-78) BECAUSE OF REPRODUCTIVE FAILURES FROM PESTICIDE POISONING AND LOSS OF HABITAT, THIS
SPECIES WAS DOWN LISTED TO THREATENED ON AUGUST 11, 1995. ILLEGAL SHOOTING, DISTURBANCE, LOSS OF
HABITAT CONTINUES TO BE A PROBLEM.

NAME: MEXICAN SPOTTED OWL

STRIX OCCIDENTALIS LUCIDA

STATUS: THREATENED

CRITICAL HABITAT: Yes RECOVERY PLAN: Yes CFR: 56 FR 14678, 04-11-91

DESCRIPTION: MEDIUM SIZED WITH DARK EYES AND NO EAR TUFTS. BROWNISH AND
HEAVILY SPOTTED WITH WHITE OR BEIGE.

ELEVATION

RANGE: 4100-9000 FT.

COUNTIES: MOHAVE, COCONINO, NAVAJO, APACHE, YAVAPAI, GRAHAM, GREENLEE, COCHISE, SANTA CRUZ, PIMA,
PINAL, GILA, MARICOPA

HABITAT: NESTS IN CANYONS AND DENSE FORESTS WITH MULTI-LAYERED FOLIAGE STRUCTURE

GENERALLY NESTS IN OLDER FORESTS OF MIXED CONIFER OR PONDERSA PINE/GAMBEL OAK TYPE, IN
CANYONS, AND USE VARIETY OF HABITATS FOR FORAGING. SITES WITH COOL MICROCLIMATES APPEAR TO BE
OF IMPORTANCE OR ARE PREFERRED.

NAME: SOUTHWESTERN WILLOW FLYCATCHER

EMPIDONAX TRAILLII EXTIMUS

STATUS: ENDANGERED

CRITICAL HABITAT: Yes RECOVERY PLAN: No CFR: 60 FR 10694, 02-27-95

DESCRIPTION: SMALL PASSERINE (ABOUT 6") GRAYISH-GREEN BACK AND WINGS,
WHITISH THROAT, LIGHT OLIVE-GRAY BREAST AND PALE YELLOWISH
BELLY. TWO WINGBARS VISIBLE. EYE-RING FAINT OR ABSENT.

ELEVATION

RANGE: <8500 FT.

COUNTIES: YAVAPAI, GILA, MARICOPA, MOHAVE, COCONINO, NAVAJO, APACHE, PINAL, LA PAZ, GREENLEE, GRAHAM,
YUMA, PIMA, COCHISE, SANTA CRUZ

HABITAT: COTTONWOOD/WILLOW & TAMARISK VEGETATION COMMUNITIES ALONG RIVERS & STREAMS

MIGRATORY RIPARIAN OBLIGATE SPECIES THAT OCCUPIES BREEDING HABITAT FROM LATE APRIL TO
SEPTEMBER. DISTRIBUTION WITHIN ITS RANGE IS RESTRICTED TO RIPARIAN CORRIDORS. DIFFICULT TO
DISTINGUISH FROM OTHER MEMBERS OF THE EMPIDONAX COMPLEX BY SIGHT ALONE. TRAINING SEMINAR
REQUIRED FOR THOSE CONDUCTING FLYCATCHER SURVEYS.

3/21/96

NAME: YUMA CLAPPER RAIL

RALLUS LONGIROSTRIS YUMANENSIS

STATUS: ENDANGERED

CRITICAL HABITAT: No RECOVERY PLAN: Yes CFR: 32 FR 4001, 03-11-67; 48

DESCRIPTION: WATER BIRD WITH LONG LEGS AND SHORT TAIL. LONG SLENDER
DECURVED BILL. MOTTLED BROWN ON GRAY ON ITS RUMP. FLANKS
AND UNDERSIDES ARE DARK GRAY WITH NARROW VERTICAL STRIPES
PRODUCING A BARRING EFFECT.

ELEVATION
RANGE: <4500 FT.

COUNTIES: YUMA, LA PAZ, MARICOPA, PINAL, MOHAVE

HABITAT: FRESH WATER AND BRACKISH MARSHES

SPECIES IS ASSOCIATED WITH DENSE EMERGENT RIPARIAN VEGETATION. REQUIRES WET SUBSTRATE
(MUDFLAT, SANDBAR) WITH DENSE HERBACEOUS OR WOODY VEGETATION FOR NESTING AND FORAGING.
CHANNELIZATION AND MARSH DEVELOPMENT ARE PRIMARY SOURCES OF HABITAT LOSS.

3/21/96

PROPOSED TOTAL= 1

NAME: CACTUS FERRUGINOUS PYGMY-OWL

GLAUCIDIUM BRASILIANUM CACTORUM

STATUS: PROPOSED ENDANGERED CRITICAL HABITAT: No RECOVERY PLAN: No CFR: 59 FR 63975, 12-12-94

DESCRIPTION: SMALL (APPROX. 7"), DIURNAL OWL REDDISH BROWN OVERALL WITH
CREAM-COLORED BELLY STREAKED WITH REDDISH BROWN. SOME
INDIVIDUALS ARE GRAYISH BROWN

ELEVATION

RANGE: <4000 FT.

COUNTIES: MARICOPA, YUMA, SANTA CRUZ, GRAHAM, GREENLEE, PIMA, PINAL, GILA, YAVAPAI

HABITAT: MATURE COTTONWOOD/WILLOW, MESQUITE BOSQUES, AND DESERT SCRUB

RANGE LIMIT IN ARIZONA IS FROM NEW RIVER (NORTH) TO GILA BOX (EAST) TO CABEZA PRIETA MOUNTAINS
(WEST). ONLY A FEW DOCUMENTED SITES WHERE THIS SPECIES PERSISTS ARE KNOWN, ADDITIONAL SURVEYS
ARE NEEDED. CRITICAL HABITAT HAS BEEN PROPOSED FOR THIS SPECIES.

Appendix D. Biological Assessment

**Biological Assessment for the
Ak-Chin Option and Lease Agreement
Water Delivery Facilities**

Prepared for:

U.S. Bureau of Reclamation
Phoenix Area Office
Phoenix, AZ 85068-0908
Contact: Dr. Brian Muhlbachler
602/395-5695

Prepared by:

Jones & Stokes Associates, Inc.
2600 V Street, Suite 100
Sacramento, CA 95818-1914
Contact: Stephanie Meyers
916/737-3000

June 1997

INTRODUCTION

The Ak-Chin Indian Community, United States of America, and Del Webb Corporation (Del Webb) have entered into an Option and Lease Agreement that would allow the Ak-Chin Indian Community to lease between 6,000 and 10,000 acre-feet per year (af/yr) of water to Del Webb for 100 years. In December 1996, Del Webb chose to exercise its option for 10,000 af/yr. Delivery of water under the Option and Lease Agreement requires final environmental clearance from the Bureau of Reclamation (Reclamation), including compliance with the Endangered Species Act.

Del Webb plans to transport the leased water by constructing a 9-mile-long pipeline from Waddell Canal south of Lake Pleasant to a future 5,661-acre master planned community—The Villages at Desert Hills (The Villages)—that would be located approximately 3 miles north of the Carefree Highway (State Route 74) and 7 miles east of Lake Pleasant in Maricopa County (Figure 1). The Villages would have a maximum of 16,526 residential units: predominantly single-family detached homes built in low to medium densities. The planned average density for the entire project, including some high density units, is 2.9 dwelling units per acre. Approximately 38% (2,150 acres) of the development would be retained as open space (e.g., natural areas, parks and playfields, golf courses, and equestrian trails). The Development Master Plan also calls for the preservation of major ephemeral drainages and hillsides with slopes greater than 15%.

In compliance with Section 7 of the Endangered Species Act of 1973, as amended, this Biological Assessment has been prepared to analyze the anticipated impacts on threatened and endangered species that may result from Reclamation's approval of the Option and Lease Agreement. Direct and indirect effects are reviewed for the pipeline construction, as well as possible cumulative impacts from The Villages development.

PROJECT DESCRIPTION

Reclamation proposes to provide leased settlement water under the Option and Lease Agreement to Del Webb for municipal and industrial use. Del Webb would construct water transmission facilities that would extend from Waddell Canal below Lake Pleasant to a new water treatment plant at The Villages. Pipeline facilities would consist of a buried pipeline with a turnout structure, pumping plant, and above-ground storage tanks at the terminus of the pipeline. The transmission pipeline and appurtenant facilities would be designed to deliver 10,000 af/yr of surface water. The water delivery system would eventually be connected to a distribution system that would serve The Villages development.

EXISTING RESOURCES

Pipeline Corridor: Waddell Canal to The Villages

Four habitat types are found in the pipeline corridor: Sonoran Desertscrub (Brown 1982), xeroriparian scrub, seasonal drainages, and disturbed areas (Figure 2). See Appendix B of the Environmental Assessment for a list of common and scientific names of plant and wildlife species mentioned in the text.

Sonoran Desertscrub Plant Community

The proposed pipeline corridor and treatment plant would encompass approximately 94.5 acres of Sonoran Desertscrub habitat (Lower Colorado River Valley Subdivision) (Figure 2), assuming the corridor would be 100 feet wide. The desertscrub community occurs on the proposed pumping station site on Waddell Canal and continues along the transmission tower alignment to its intersection with the former Reclamation haul road. This community also exists on both sides of the former Reclamation haul road and is found east of New River and the volcanic hills in the southern portion of Section 21. The proposed 44-acre water treatment plant site is also within this habitat type.

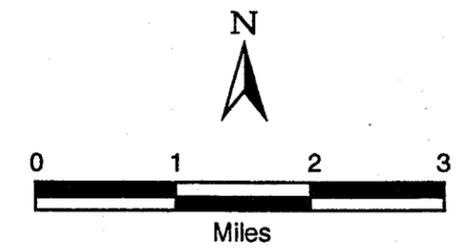
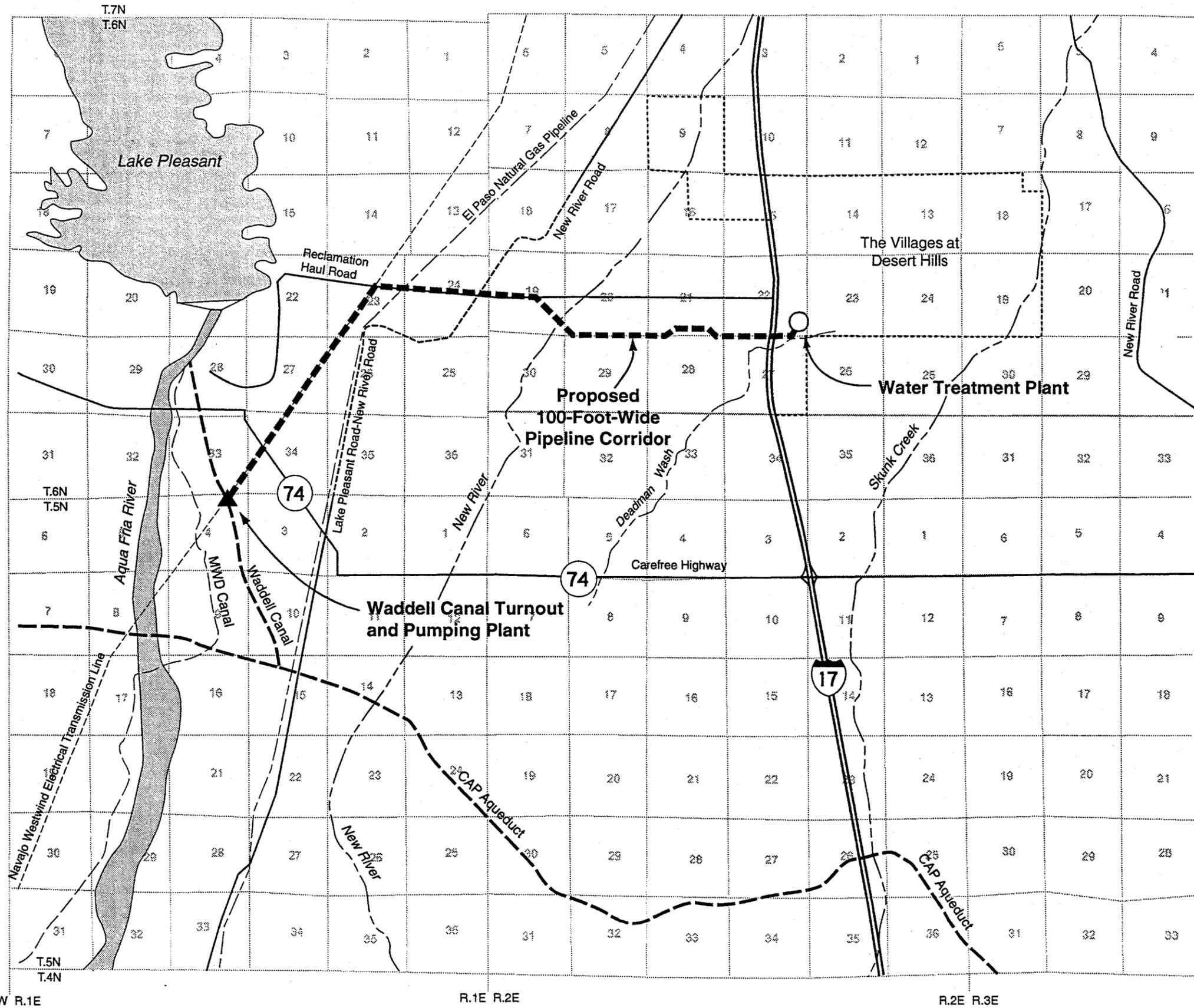
Vegetation

Sonoran Desertscrub occurs on the relatively undisturbed uplands within the pipeline corridor. Dominant plant species include cholla cacti, creosote bush, velvet mesquite, ironwood, saltbush, foothill palo verde, triangle-leaf bursage, and brittle bush. Annual grasses account for most of the understory ground cover because of heavy grazing in the area.

Wildlife

The desertscrub community provides habitat for a variety of common wildlife species, including desert cottontail, gila woodpecker, northern flicker, verdin, white-crowned sparrow, ruby-crowned kinglet, and black-throated sparrow. Signs of coyote, mule deer, and ringtail have also been observed (Jones & Stokes Associates 1996, SWCA 1997).

Figure 1
Proposed Water Delivery Facilities
under the Ak-Chin Option
and Lease Agreement

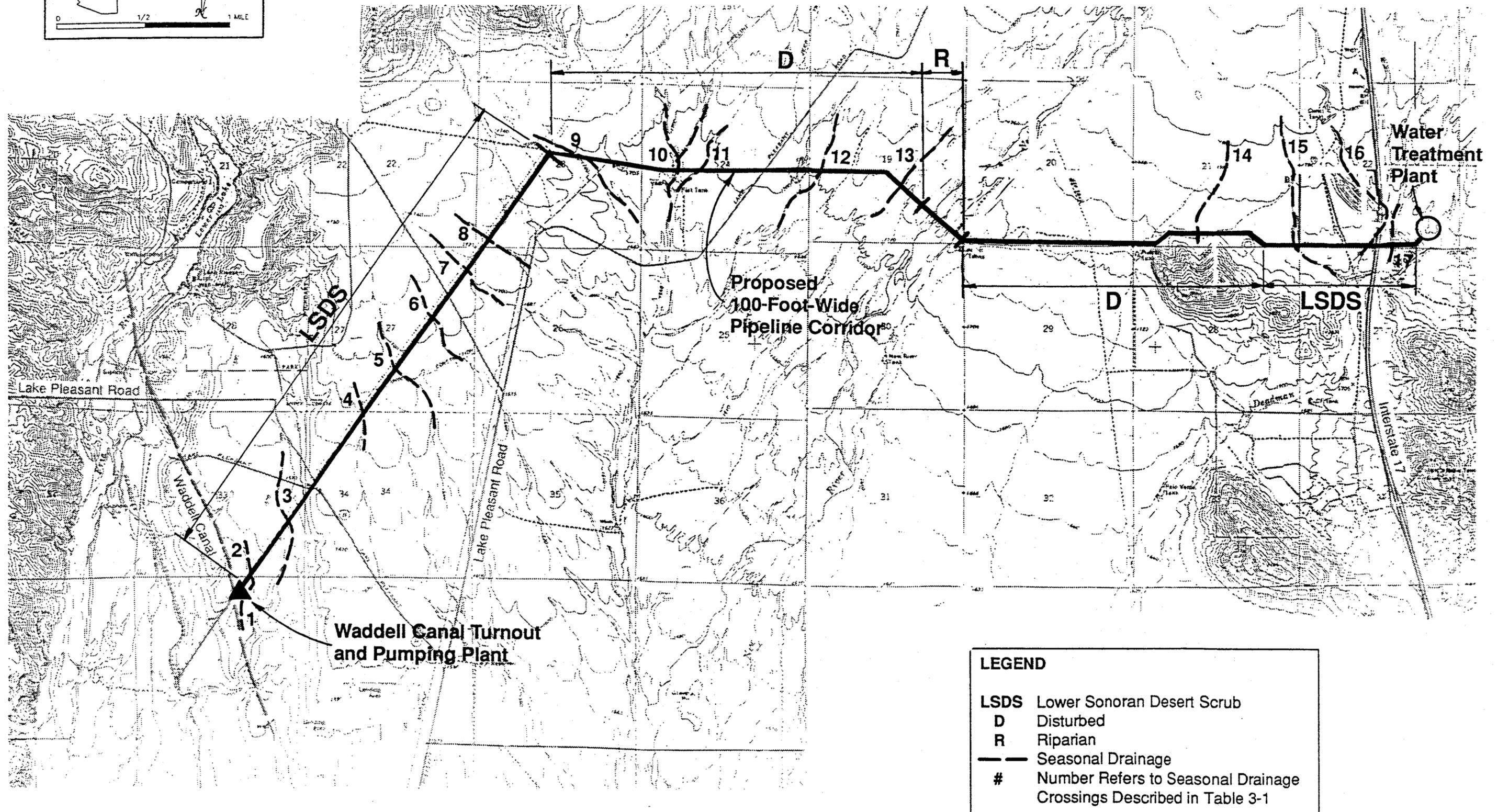
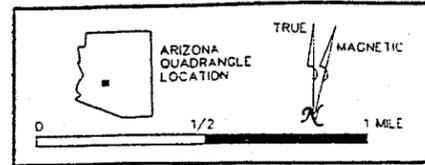


R.1W R.1E

R.1E R.2E

R.2E R.3E

Figure 2
Habitat Types and Seasonal Drainages



Disturbed Habitats

The proposed pipeline corridor would cross approximately 47.5 acres of disturbed habitat along the haul road, at the Reclamation borrow site, and east of New River (Figure 2).

Vegetation

The haul road and borrow area are dominated by brittle bush, four-wing saltbush, desert holly, Russian thistle, and triangle-leaf bursage. Areas west of New River are heavily disturbed and generally devoid of native vegetation.

Wildlife

The disturbed habitat lacks the diversity of plant species and amount of cover required by many wildlife species, but black-tailed hares, mourning doves, black-throated sparrows, horned larks, and foraging red-tailed hawks have been observed along the haul road. Many of the same wildlife species that occur in desertscrub habitats would be expected to occur occasionally in the disturbed areas because these habitats are adjacent to one another.

Seasonal Drainages

The proposed pipeline alignment would cross 17 seasonal drainages (2 of the crossings are at different locations in the same drainage [16 and 17]); therefore, a total of .27 acre would be affected (Figure 2).

Vegetation

Common trees and shrubs observed in the seasonal drainages include catclaw acacia, foothill palo verde, velvet mesquite, creosote bush, and triangle-leaf bursage. Drainages range from 1 to 15 feet wide; most are 10 feet wide or less. The five drainages crossing the haul road and borrow area were substantially altered during Reclamation's earlier construction activities and, therefore, support only sparse native vegetation.

Wildlife

The seasonal drainages provide a temporary water source for wildlife species, but probably do not contain standing water for sufficient durations to support amphibian breeding. Seasonal drainages provide more cover than the surrounding desertscrub or disturbed habitats and can be important movement corridors for wildlife species.

Xeroriparian Scrub Habitat

The proposed pipeline corridor would cross approximately 5.75 acres of xeroriparian scrub habitat in the New River channel (Figure 2).

Vegetation

The New River channel is a mosaic of sandy and rocky substrates that are sparsely vegetated and subject to periodic scouring flows. Common plants include burro brush, canyon ragweed, sweetbush, and desert broom. Vegetation on small islands in the channel and on the western bank of New River is more dense and diverse. Species occurring in these areas include catclaw acacia, brittle brush, creosote bush, triangle-leaf bursage, canyon ragweed, desert broom, and foothill palo verde. Saguaros occur in low densities between the former Reclamation haul road and the west bank of New River. The east bank of New River is heavily disturbed and the sparse vegetation is predominantly comprised of weedy annual species.

Wildlife

Wash habitats, such as New River, are important to wildlife because they add diversity to the landscape. Riparian and wash areas provide water, thermal and hiding cover, movement corridors, and a greater diversity of nesting and feeding habitats for wildlife species. Common species found in washes include phainopepla, warblers, mourning dove, northern flicker, Gila woodpecker, bats, black-tailed jackrabbit, and desert cottontail.

The proposed pipeline corridor is located south of previously proposed critical habitat for the cactus ferruginous pygmy-owl, as listed in the December 12, 1994, Federal Register (59 FR 63975-63986). A Final Rule, published March 10, 1997, in the Federal Register (62 FR 10730-10746) stated, however, that designation of critical habitat in Arizona for the cactus ferruginous pygmy-owl was not prudent.

The Villages at Desert Hills

Vegetation

The 5,661-acre area proposed for development of The Villages master planned community is covered by relatively undisturbed Sonoran Desertscrub habitat, including large expanses of both the Arizona Upland and Lower Colorado River Valley Subdivision (Brown 1982) (Figure 3). Dominant upland plants include velvet mesquite, foothill palo verde, triangle-leaf bursage, creosote bush, brittle bush, and cholla cacti. Several ephemeral washes with velvet mesquite, ironwood, desert broom, catclaw acacia, wolfberry, burro bush, blue palo verde, and bristlebush also occur on the property (SWCA 1994). Upland habitats cover approximately 90% (5,094 acres) of the area, and xeroriparian habitats cover approximately 10% (567 acres) (SWCA 1994). In 1993, a wildfire burned 13% of the site, affecting mostly upland habitat. Hohokam agave, a state-protected species, has been located in low densities on portions of the area.

Wildlife

A wide variety of common wildlife species frequently observed in Sonoran Desertscrub habitat have been documented on The Villages property (SWCA 1994). In addition, special-status wildlife species, such as the desert tortoise, ferruginous hawk, and California leaf-nosed bat, are known or expected to utilize habitats of the area (SWCA 1994).

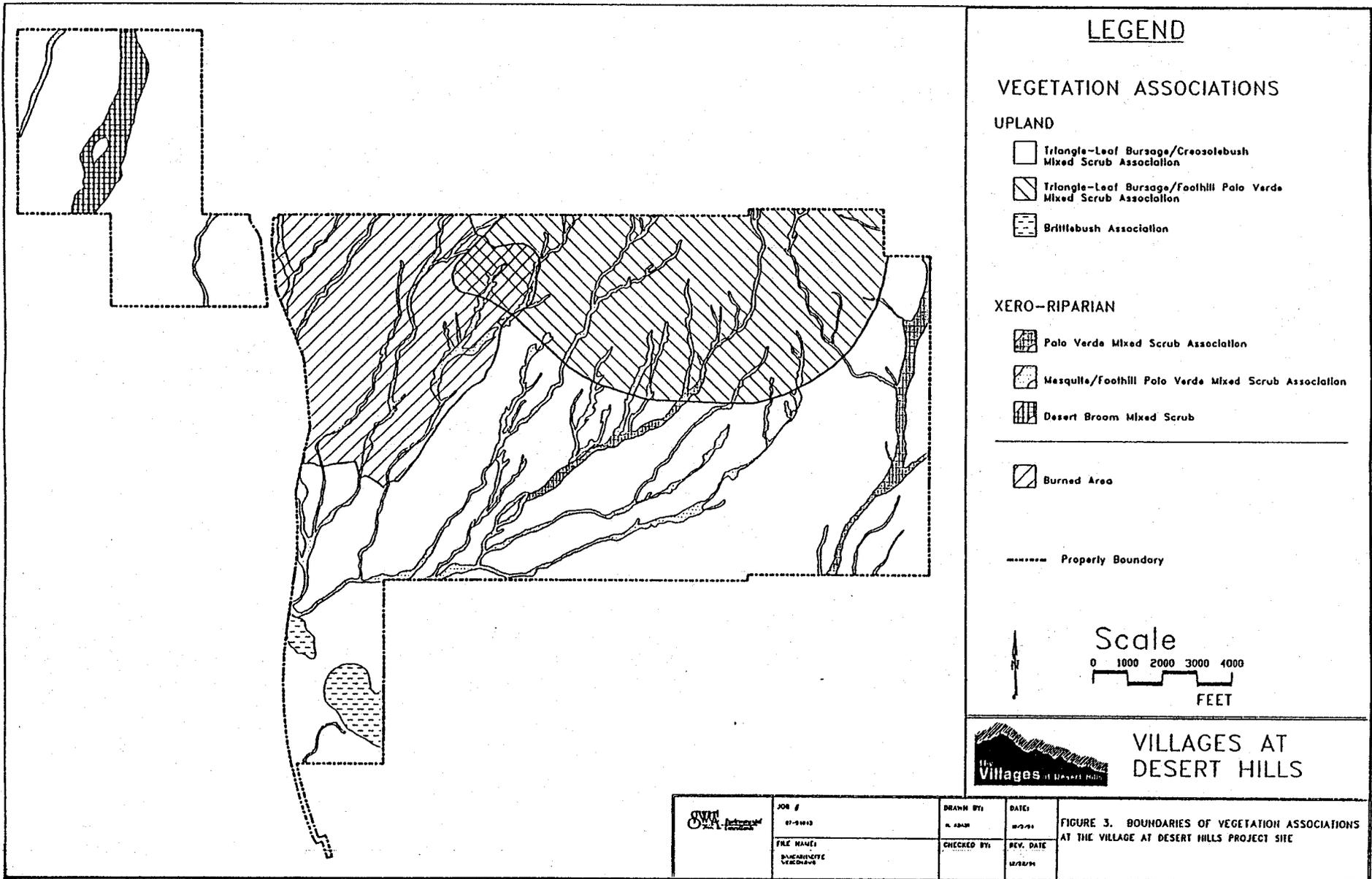
SPECIES OF CONCERN

In accordance with Section 7(c) of the Endangered Species Act of 1973, as amended, Reclamation requested from the Fish and Wildlife Service a list of all endangered, threatened, and proposed species that may occur in the project area (Maricopa County)(see Appendix C of the Environmental Assessment). Four species were subsequently determined to have the potential to occur along the pipeline alignment or on The Villages property: American peregrine falcon, bald eagle, cactus ferruginous pygmy-owl, and southwestern willow flycatcher.

Analysis

A comparison of the habitats observed along the pipeline alignment with the habitat needs of the federally listed species indicates that no suitable habitat or resources for these species occur in the area. The American peregrine falcon, a wide-ranging migratory bird, is a possible transient in the area, but a lack of water and nesting habitat (cliffs and steep slopes) would limit its use of the affected habitat. Bald eagles nesting at the upper end of Lake Pleasant could occasionally forage in the vicinity of the proposed pumping plant, but they are not expected to be affected by the proposed pipeline because no bald eagle nesting or foraging habitat would be directly affected. No suitably

Figure 3



dense upland or riparian habitat for the southwestern willow flycatcher or cactus ferruginous pygmy-owl exists along the proposed pipeline corridor. Field surveys in 1996 and 1997, which used the established survey protocol, also failed to locate pygmy-owls along the pipeline alignment at New River (SWCA 1996, 1997).

Suitable nesting and breeding habitat for the American peregrine falcon and bald eagle does not occur on The Villages development site; however, these species could be transitory through the area. Although several large desert washes occur across the site, dense riparian habitat capable of supporting southwestern willow flycatchers is absent. Potential habitat for the cactus ferruginous pygmy-owl does occur within some xeroriparian habitats on The Villages development site, but field surveys have not documented the presence of this species (SWCA 1994, 1996). Some uplands adjacent to the xeroriparian habitat do support a higher density of ironwood and saguaro; a common characteristic of known pygmy-owl habitats around Tucson, Arizona. However, overall plant density and vertical canopy structure is significantly lower than documented in the pygmy-owl habitats near Tucson.

CONCLUSIONS

Based on field surveys, literature reviews, and on-site habitat assessments, Reclamation has determined that approval of the water lease agreement among the Ak-Chin Indian Community, United States of America, and Del Webb, and construction of a water delivery pipeline from the Waddell Canal to The Villages would not affect federally listed species. No direct or indirect impacts on listed species would occur from construction of the pipeline because no suitable habitat for these species is present in the area. Furthermore, cumulative impacts from the development of The Villages are not anticipated because no suitable habitat is present for the American peregrine falcon, bald eagle, and southwestern willow flycatcher, and field surveys have located no cactus ferruginous pygmy-owls in the area.

CITATIONS

- Brown, D. E.(ed.). 1982. Biotic communities of the American Southwest-United States and Mexico. Desert Plants, Vol. 4, Nos. 1-4.
- Jones & Stokes Associates, Inc. 1996. Biological resources survey for the Del Webb pipeline corridor. Unpublished survey data. Sacramento, CA.
- SWCA. 1994. Biological evaluation of the proposed Villages at Desert Hills project site, Maricopa County, Arizona. December 29. Report submitted to Del Webb Corporation, Phoenix, AZ.

SWCA . 1996. Results of Cactus Ferruginous Pygmy-Owl Survey Along the Proposed Pipeline Alignment for the Desert Hills Off-Site Water Supply System. Technical Memorandum submitted to Del Webb Corporation (December 12, 1996).

SWCA. 1997. Biological Survey of New Pipeline Alignment. Technical Memorandum submitted to Del Webb Corporation (January 29, 1997).

**Attachment A. Common and Scientific Names of Plant and Animal Species Mentioned in
the Biological Assessment**

Plants

Common Name	Scientific Name
Barrel cactus	<i>Ferocactus wislizenii</i> ^a
Beavertail	<i>Opuntia basilaris</i>
Brittle bush	<i>Encelia farinosa</i>
Burro brush	<i>Hymenoclea salsola</i>
Canyon ragweed	<i>Ambrosia ambrosioides</i>
Catclaw acacia	<i>Acacia greggii</i> var. <i>arizonica</i>
Creosote bush	<i>Larrea tridentata</i>
Desert broom	<i>Baccharis sarathroides</i>
Desert holly	<i>Atriplex hymenelytra</i>
Englemann's prickly pear	<i>Opuntia phaeacantha</i> ^a
Foothill palo verde	<i>Cercidium microphyllum</i> ^b
Four-wing saltbush	<i>Atriplex canescens</i>
Ironwood	<i>Olneya tesota</i>
Russian thistle	<i>Salsola iberica</i>
Saguaro	<i>Cereus giganteus</i> ^a
Saltbush	<i>Atriplex</i> sp.
Strawberry hedgehog	<i>Echinocereus engelmannii</i> ^a
Sweet bush	<i>Bebbia juncea</i>
Teddy bear cholla	<i>Opuntia bigelovii</i> ^a
Tobosa grass	<i>Hilaria mutica</i>
Triangle bursage	<i>Ambrosia deltoidea</i>
Velvet mesquite	<i>Prosopis velutina</i> ^c
Western honey mesquite	<i>Prosopis glandulosa</i> ^c

Notes:

^a Salvage restricted protected native plants

^b Salvage assessed native plants

^c Harvest restricted protected native plants

Attachment A. Continued.

Animals

Common Name	Scientific Name
Birds	
American kestrel	<i>Falco sparverius</i>
American peregrine falcon	<i>Falco peregrinus anatum</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Black-throated sparrow	<i>Amphispiza bilineata</i>
Cactus ferruginous pygmy-owl	<i>Glaucidium brasilianum cactorum</i>
Desert mule deer	<i>Odocoileus hemionus crooki</i>
Gila woodpecker	<i>Melanerpes uropygialis</i>
Horned lark	<i>Eremophila alpestris</i>
Mourning dove	<i>Zenaida macroura</i>
Northern flicker	<i>Colaptes auratus</i>
Phainopepla	<i>Phainopepla nitens</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Ruby-crowned kinglet	<i>Regulus calendula</i>
Verdin	<i>Auriparus flaviceps</i>
White-crowned sparrow	<i>Zonotrichia leucophrys</i>
Southwestern willow flycatcher	<i>Empidonax traillii extrimus</i>
Mammals	
Black-tailed hare	<i>Lepus californicus</i>
Coyote	<i>Canis latrans</i>
Desert cottontail	<i>Sylvilagus auduboni</i>
Kit fox (tracks)	<i>Vulpes macotis</i>
Ringtail	<i>Bassariscus astutus</i>

**Appendix E. Application for Earth Moving Permit,
Demolition, and Dust Control Plan**



Application for Earth Moving Permit, Demolition & Dust Control Plan

Applicant: Owner/Operator/ Leasee General/Prime Contractor Developer

Legal Business Name: _____

Address: _____

City/State/Zip: _____

Phone: _____ Fax: _____

Primary Contact Person: _____

Title _____ Pager/Mobile Phone _____ Onsite Phone _____ Offsite Phone _____

Property Owner/General Contractor _____

Phone _____ Contact Person _____ Title _____

Project Location/Street Address _____

Nearest Major Intersection: _____ City _____

Legal Description (from Phoenix Metropolitan Map Book): Township _____ Range _____ Section _____

Size of Project in Acres (include staging and stockpile areas: _____ Project Start Date: _____

Fee Schedule:

Total Surface Area Disturbed:	Fee
0.1 to less than one acre	\$ 65.00
One to less than five acres	\$110.00
Five acres or greater	\$ 8.00 per acre plus \$80.00

Brief description of the project: _____

Type of Project (mark all applicable codes):

- Residential (RD) Commercial/Industrial (CD) Road Work (RC) Temporary Storage/Yard (TS)
 Trenching (TR) Site Preparation/Land Dev (SP) Weed Control (WC) Demolition (DE)

For renovation or demolition activities the following information is required:

Is asbestos present? _____	ASHERA Determination made by _____	Date _____
Has 10 Day NESHAP Notification been submitted? _____	If Yes, date: _____	Copy of 10 Day Notification attached? <input type="checkbox"/> Yes <input type="checkbox"/> No Start Date: _____

In accordance with Rule 310, Section 401.2, a plot plan is required. Provide a plot plan sketch on 8 1/2 in. by 11 in. paper which includes the total area to be disturbed. Indicate sources of fugitive dust emissions on the plot plan, including delivery, transport, and storage areas. Be sure to include linear dimensions in feet on plot plan. Pursuant to Rule 310, Section 303, a dust control plan is required with any earthmoving application.

Additional measures and comments may be attached to this form. Pursuant to Rule 310, Section 503, records of actual implementation or application of these measures must be maintained daily and kept on site and made available upon request by the Control Officer or designee. The records must be retained for at least 3 years by the permittee.

DUST CONTROL PLAN

Choose at least one measure as a primary RACM (Reasonably Available Control Measure) per category. Unless designated, any other control measure in the category will be considered a contingency or back-up control measure. You may prepare your own plan to submit by following the guidelines in Rule 310, Section 401.

Earthmoving / Demolition (ie., trenching, rough grading, final grading, landscaping, material handling)

- Conduct watering as necessary to prevent visible emissions
- Prewet site
- Cease operations (contingency only, cannot be used as a primary RACM)

Disturbed surface areas

On the last day of active operations and when active operations will not occur for not more than fifteen days;

- Apply chemical stabilizers. Reapply as necessary to maintain stabilization.
- Apply water to all unstabilized disturbed areas 3 times per day
- Install wind fences/screens
- Construct berms

Within 8 months of the last day of active operations:

- Pave the affected area
- Physical stabilization with gravel/recycled asphalt
- Physical stabilization with vegetation

Unpaved roads

- Stabilize with gravel/recycled asphalt
- Apply chemical stabilizers to all unpaved road surfaces in sufficient quantity and frequency to maintain a stabilized surface
- Water all roads used for any vehicular traffic as needed to control emissions
- Water all roads used for any vehicular traffic at least once daily and restrict vehicle speeds to 15 miles per hour

Open storage piles

- Apply chemical stabilizers
- Apply water to the surface area of all open storage piles on a daily basis when there is evidence of wind driven fugitive dust
- Install temporary coverings/enclosures

Access points

- Install a stabilized construction entrance/gravel pad (Required for all access points on sites of 5 acres or more)
- Install a wheel washer
- Limit, restrict, reroute motor vehicle access
- Vacuum/ Wet broom daily

Hauling

- Haul trucks carrying bulk materials must be tarped

Describe available water supply, distance from worksite, method of application, & water storage:

I certify that I am familiar with the operations presented in this application and agree to conduct all operations related to the worksite in compliance with the above dust control plan, Rule 310, any permit conditions and all applicable environmental regulations.

Signature of Responsible Official _____

Print Name & Title _____

(The responsible official is an officer or designated signer from the company named as applicant. If a designated signer is used, a written designation signed by an officer shall be on file with this office.)

Construction Checklist
Daily Recordkeeping for Compliance with Rule 310: Fugitive Dust

Project (as listed on earthmoving equipment permit) : _____

Yes	No	Does Not Apply	
[]	[]		Is the dust control plan and earthmoving equipment permit on site?
[]	[]		Are the control measures listed in the dust control plan installed on the site and being implemented?
[]	[]	[]	If the site is greater than 5 acres, are gravel pads installed at all access points?
[]	[]		Are construction on-site traffic routes and parking restricted to areas specifically designated for those uses?
[]	[]		Is there any evidence of sediment, debris or mud on public roads at site access points?
[]	[]		Was any sediment, debris or mud cleaned by a sweeper truck or manually cleaned from the public road in the last 24 hrs?
[]	[]		Are records of cleaning/sweeping activities available?
[]	[]		Is there sufficient water available for dust control on site?
[]	[]		Are records available confirming amount of water purchased and amount applied?

List any corrective action taken: _____

Name & Signature of Employee/ Contractor

Date

Name of Company

Appendix F. Common Conversion Factors to Metric Units

Common Conversion Factors to Metric Units

Class	Multiply:	By:	To Get:
Area	acre	4047.0	m ²
	acre	0.4047	ha (10 000 m ²)
	ft ²	0.0929	m ²
	yd ²	0.8361	m ²
	mi ²	2.590	km ²
Length	ft	0.3048 *	m
	in	25.4 *	mm
	mi	1.6093	km
	yd	0.9144 *	m
Volume	ft ³	0.0283	m ³
	gal	3.785	L **
	fl oz	29.574	mL **
	yd ³	0.7646	m ³
	acre ft	1233.49	m ³
Mass	oz	28.35	g
	lb	0.4536	kg
	kip (1,000 lb)	0.4536	tonne (1000 kg)
	short ton (2,000 lb)	907.2	kg
	short ton	0.9072	tonne (1000 kg)
Density	lb/yd ³	0.5933	kg/m ³
	lb/ft ³	16.0185	kg/m ³
Pressure	psi	6894.7	Pa
	ksi	6.8947	MPa (N/mm ²)
	lb/ft ²	47.88	Pa
Velocity	ft/s	0.3048 *	m/s
	mi/h	0.4470	m/s
	mi/h	1.6093	km/h
Light	footcandle (lumen/ft ²)	10.764	lux (lx) (lumen/m ²)
Temperature	°F	$t_{°C} = (t_{°F} - 32) / 1.8$	°C

* Exact

** Both "L" and "l" may be used for liter. However, "L" is preferred so as not to be confused with the numeral "1".