0000048817

DEFENDANT ARIZONA AMERICAN WATER COMPANY'S EXHIBITS

102. Paradise Valley Water Company Comprehensive Planning Study ("CPS") 1999 (complete copy)

103. AAWC Table of Costs expended on the PVARF project (AZAW000395-402)

104. DRB's Stipulations for Case: Paradise Valley Arsenic Facility 109-DR-2004

105. Analysis Reports from well samples (AZAW000386-394)

106. Signatures in support of AAWC's arsenic removal facility

107. Letter to Kirsten Kueffner from AAWC dated January 25, 2005 re: property encroachment

108. Letter from the Kueffner Company, Inc. to Mayor Manross, dated January 17, 2005

109. AAWC's permit application (AZAW000162-357)

110. Arizona American Water Paradise Valley Arsenic Removal Facility design drawings (AZAW000442-452)

111. Photograph taken by Plaintiff(s) from east side of Arizona Canal (AZAW000403)

112. E-mail from Natalie Lewis to Eric Nesvig (and others), dated February 14, 2005 (COS0292-293)

113. E-mail from Christine Close to John Hink, dated August 25, 2004 (COS0493-494)

114. Letter from Sherry R. Scott to Jim Palecek, Esq., dated July 28, 2005

115. Table titled "Phase 1 Schedule of Payments," prepared by D.L. Norton General Contracting

116. Fax from Chip Norton to Bob Brown/Brown Tank, dated 1/28/05, re: Arizona-American ARF

117. DSWA Telephone Memorandum to/from Erick Skultstad, Chip Norton, and Rob McCandless, dated August 5, 2005, re: PVARF: Reservoir Foundation Recommendations (AZAW000408)

118. "A Cultural Resource Survey of 12.05 Acres and Viewshed Reconnaissance for an Arsenic Removal Facility in Scottsdale, Maricopa County, Arizona," August 2004 (Revised December 2004), by EcoPlan Associates, Inc.

119. Arizona-American Water Paradise Valley Water System Fire Flow Capacity Assessment, March 2004, prepared by Brown & Caldwell

120. Letter from Town of Paradise Valley to Brian K. Biesemeyer, P.E., Operations Manager, Arizona-American Water Company, dated August 10, 2005 (AZAW000154-155)

121. E-mail from Robert McCandless to Tim Friday, Peter Keenan, Joe Gross, and Chip Norton, dated 1/25/2005, re: impact of depressed reservoirs on electrical design

122. E-mail from Robert McCandless to Peter Keenan (copying Chip Norton, Dale Jensen, Joe Gross, and Tim Friday), dated 1/27/2005, re: impact of depressed reservoirs on electrical design

123. Partial site sections and partial site section site line studies prepared by H&S International

124. ADEQ document titled "On Cue with DEQ Drinking Water, Monitoring Requirements for the New Arsenic Standard," by Jeff Stuck, Manager, Drinking Water Section of Arizona Department of Environmental Quality, WQD

125. Document titled Arizona American Water Paradise Valley Arsenic Removal Facility Tank Location Rationale

126. Table titled "Cost of Buried Reservoir"

127. Document, untitled, re: delay imposed by a requirement to fully or partially bury the water tanks

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American Water Works Service Company, Inc.

1025 Laurel Oak Road • P.O. Box 1770 • Voorhees, New Jersey 08043 • (609) 346-8201 • Fax (609) 346-8360

July 27, 1999

IP 97-006

Mr. Ted Jones, President
Paradise Valley Water Company
8880 Kuhn Drive
Chula Vista, CA 91914

Re: Paradise Valley Water Company
Comprehensive Planning Study

Dear Mr. Jones:

System Engineering is pleased to submit the Comprehensive Planning Study report for the Paradise Valley Water Company. The study addresses all aspects of planning for PVWC, including the planning process, demand projections, source of supply, regionalization, production, and distribution system storage and hydraulic analyses. The report also includes prioritized recommendations for Paradise Valley Water Company improvements over a fifteen-year planning horizon.

We appreciate the cooperation and guidance provided by you and your staff during the course of this study.

Very truly yours,

Scott L. Phillips, P.E.
Planning Engineer

Gary A. Naumick, P.E.
Director, Planning

PARADISE VALLEY WATER COMPANY
COMPREHENSIVE PLANNING STUDY - 1999

American Water Works Service Company, Inc.

PARADISE VALLEY WATER COMPANY
COMPREHENSIVE PLANNING STUDY

AMERICAN WATER WORKS SERVICE COMPANY, INC.
SYSTEM ENGINEERING
1025 Laurel Oak Road
Voorhees, New Jersey 08043
July, 1999

PARADISE VALLEY WATER COMPANY
COMPREHENSIVE PLANNING STUDY

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EXECUTIVE SUMMARY

Overview

This 1999 Comprehensive Planning Study details a recommended capital improvement plan for Paradise Valley Water Company (PVWC) for 1999 through 2012. The purpose of this plan is to present a strategy for system improvements that is needed to enable PVWC to continue to provide safe, adequate, and reliable service to its existing and future customers. The plan considers customer and water demand projections, sources of supply, water quality and treatment effectiveness, and distribution storage facilities. PVWC's regionalization role is also addressed with respect to the regional setting of the PVWC system in the Phoenix metropolitan area.

Summary of Key Findings

The PVWC service area is primarily residential in character and is comprised of ten pressure zones. These pressure zones are located within the Town of Paradise Valley, parts of unincorporated Maricopa County, and a portion of the City of Scottsdale (COS). The Main Zone is the largest zone and is bordered to the north and south by Mummy Mountain and Camelback Mountain, respectively, and to the east and west by the Cities of Phoenix (COP) and COS. PVWC's largest customers, including the Paradise Valley Country Club (PVCC) and Marriott's Mountain Shadows Resort, are served from the Main Zone along with customers comprising the former Mummy Mountain Water Company, which until its acquisition by PVWC in late 1998, had been PVWC's only wholesale customer.

According to 1990 Census data, the Town of Paradise Valley's population is at about 90 percent of build out. Although relatively large population increases have been projected for surrounding parts of Maricopa County, the growth potential for the PVWC service area is limited to a small number of undeveloped areas, construction on individual vacant lots, and remodeling of existing homes. PVWC's service area is projected to be at about 98 percent of build out by the end of the current planning horizon.

Housing in the Town of Paradise Valley is among the most expensive in the area, and water usage patterns reflect significant usage for outdoor landscape irrigation. Accordingly, PVWC's overall per capita water consumption rate is amongst the highest in the State of Arizona. Water conservation efforts that have been implemented by PVWC include: customer education, an interior retrofit program, and water audits for large residential and resort/commercial customers. However, per capita consumption has exhibited an increasing trend despite the implementation of an inclining water rate structure for residential customers in

1992. This fact can be attributed to the unique characteristics of PVWC's customer base, which exhibits little sensitivity to higher water rates with improved service. The substantial improvements that PVWC has made to its system since 1994 have raised consumption due to increased pressures and water supply availability. Higher residential consumption has also been influenced by increased outdoor landscaping, which has resulted from the remodeling of existing homes.

At the end of 1998, PVWC provided public water supply service to approximately 4,600 customers in the Town of Paradise Valley, Maricopa County, and COS. The total number of customers is projected to exceed 5,100 by the end of the current planning horizon, corresponding to an average annual growth rate of about 0.7 percent. This compares to an annual average growth rate of about 1.1 percent over the past 12 years. Average day demands are projected to increase to 10 million gallons per day (mgd) by 2002 and 11.32 mgd by 2012, reflecting an average annual growth rate of 0.11 mgd. This rate is slightly lower than the upward trending rate of 0.13 mgd per year that was experienced over the past 5 years.

The reported historic maximum day demand for the PVWC service area of 15.41 mgd occurred on August 1, 1997. A maximum day ratio of 1.7 was used to project future maximum day demands. Use of this ratio results in future projected maximum day demands of 17.06 mgd and 19.25 mgd by 2002 and 2012, respectively.

The PVWC service area derives its source of supply from 7 deep groundwater wells located in the eastern part of its service area. Six of the wells are owned by PVWC. A seventh well is operated by PVWC in accordance with an agreement with the well's owner, the Salt River Project (SRP), to treat the well at PVWC's Miller Road Treatment Facility (MRTF). PVWC also has maintained an allocation for water from the Central Arizona Project (CAP). This water resource has been maintained since 1985 as a supplemental, renewable water resource.

The adequacy of PVWC's source of supply was evaluated based on the physical capacity of PVWC's groundwater supplies and pumping equipment compared to existing and projected demands, as well as the status of PVWC's supplies relative to groundwater regulations. The existing reliable capacity of the wells, 18.4 mgd, exceeds the historic maximum day demand, and is projected to be adequate for meeting future maximum day demands until about 2009. Additional supply is needed to meet long-term demands beyond 2009, and to provide a margin of safety in the near term.

Recommended Project A-2 provides for the construction of facilities to enable an existing SRP well (SRP Well 22.6) to be used by PVWC to meet system demands, thereby satisfying the needs described above. This well is located across the Arizona Canal from PVWC's MRTF and Well No. 14 and is currently used by SRP to divert groundwater to the Canal. Use of the SRP Well 22.6 provides other benefits, including increased flexibility for PVWC's use of its CAP allocation.

During 1985, PVWC executed a contract with the US Bureau of Reclamation and the Central Arizona Water Conservation District (CAWCD) providing for the annual delivery of up to 3,231 acre-feet per year (afy) of water from the CAP. The subcontract was obtained to assist PVWC in demonstrating a 100-year Assured Water Supply (AWS) and to obtain a reliable source of renewable water for long-term use. The CAP allocation has not been used because PVWC has not owned nor had access to the facilities needed to use the surface water supply. As a result of PVWC's inability to use CAP to provide utility service, the Arizona Corporation Commission (ACC) has not approved rate recovery for the municipal and industrial (M&I) capital charges that need to be made to retain PVWC's allocation for future use.

Throughout the 1990's PVWC explored several alternatives for making use of its CAP allocation. In July 1998, PVWC reached an agreement in principle with the SRP to modify an existing water exchange agreement that would enable PVWC to repay SRP for the use of water from SRP Well PCX-1 currently used by PVWC and SRP Well 22.6 with PVWC's CAP water instead of water pumped from PVWC's own wells. In addition to helping to eliminate an existing storage deficit, providing a use for PVWC's CAP allocation, and providing for adequate long-term reliable well capacity, Project A-2 will also enable PVWC to reduce its annual groundwater pumping, which is consistent with the provisions of the Groundwater Management Act.

The Groundwater Management Act was created in 1980 to provide a framework for managing the groundwater resources of the State of Arizona. The Arizona Department of Water Resources (ADWR) created a number of critical groundwater areas, called Active Management Areas (AMAs), to aide in the implementation and enforcement of the Groundwater Management Act. The PVWC is subject to the management plans developed by the ADWR for the Phoenix AMA. The First and Second Management Plans established target maximum gallons per capita per day (GPCD) rates for the PVWC system. As a private water company, PVWC does not have the authority to implement or enforce mandatory GPCD requirements. PVWC negotiated a Stipulation and Consent Order with the ADWR in which it agreed to implement certain voluntary conservation measures.

The Third Management Plan (TMP) is expected to take effect at the beginning of 2001 and will include a continued emphasis on the GPCD target rates as a compliance mechanism and the primary conservation tool. PVWC's unique customer and water usage characteristics limit the effectiveness of voluntary conservation measures and are likely to prevent PVWC from complying with the TMP under the Total GPCD program. Other compliance options for PVWC ultimately depend on its ability to reduce groundwater withdrawals by obtaining alternate, renewable sources of supply.

The AWS program is designed to support the goal of groundwater regulations to reduce groundwater withdrawals within the Phoenix AMA to safe yield levels by 2025. The PVWC system held an AWS designation until 1995 based upon a physical demonstration of water supply availability to the ADWR. However, new administrative criteria instituted for the AWS program in 1995 severely limited PVWC's ability to rely on groundwater for achieving AWS status. The new criteria for the AWS program appear to provide a mechanism for gaining credit for incidental recharge, recharge through membership in the Central Arizona Groundwater Replenishment District (CAGRD), and "exempt groundwater", in addition to PVWC's CAP allocation, as means for complying with the TMP.

The concept of "exempt groundwater", in particular, is of interest to PVWC. Exempt groundwater is groundwater pumped and treated from wells that have poor quality. Although its implications with respect to TMP compliance are not clearly defined in the groundwater regulations, exempt groundwater would conceivably be considered the equivalent of a renewable water resource. Recognition of exempt groundwater status for PVWC Well Nos. 14 and 15 would be consistent with the USEPA anticipated Final Consent Decree for the NIBW Superfund site, which requires operation of these wells as part of the remedy for the volatile organic chemical (VOC) contamination.

Other TMP compliance alternatives include membership in the CAGRD, purchased water from the City of Phoenix and/or COS, and the possible use directly, or as a groundwater credit, of the Town of Paradise Valley's wastewater flow, which is presently collected by the City of Phoenix and COS. An interconnection recommended for construction as Project B-3 would provide PVWC with a means for purchasing water from the City of Phoenix. The interconnection is recommended to be constructed along a boundary separating portions of the Town of Paradise Valley served by PVWC and the City of Phoenix.

Discussions between PVWC and City of Phoenix regarding PVWC's potential acquisition of COP-served areas of the Town of Paradise Valley (which comprise a total customer base of about 2,500 customers)

were discontinued during 1998. The potential acquisition appears unlikely due to the large number of capital improvements that would be needed for PVWC to provide adequate source of supply and distribution system facilities. A small part of the Town of Paradise Valley is served by the Berneil Water Company. PVWC has approached the Berneil Water Company on several occasions, but they have not been interested in selling their water system. PVWC would need to secure supplemental water resources to supply the entire Town of Paradise Valley, as its existing supplies are inadequate for this purpose. Purchased water from the City of Phoenix and/or COS would be the most likely short-term options for additional source of supply capacity, and the expected high cost of purchased water is another factor detracting from a potential acquisition at this time.

PVWC owns and operates several production facilities for the purpose of treating its raw water supply and delivering finished water to the distribution system. These facilities include the MRTF, MRBS, and Well Nos. 16 and 17, which deliver water to the distribution system directly. The MRTF was placed in service in 1996 to provide for the removal of VOCs from a contaminant plume emanating from the NIBW Superfund site. The MRTF is owned and operated by PVWC; however, the construction cost and operating and maintenance costs are paid for by the NIBW Participating Companies. The MRTF currently treats water from Well Nos. 14 and 15 and SRP Well PCX-1.

The primary contaminant of concern is trichloroethylene (TCE), and levels of TCE in Well PCX-1 have approached 20 micrograms per liter (ug/L). TCE has recently been detected in Well No. 15 at levels ranging up to 1 ug/L. The plant was designed to accommodate expansion necessary to treat all of PVWC's wells (up to a maximum influent concentration of 200 ug/L per well), if necessary, due to migration of the contaminant plume. However, the plume management strategy, which includes continuous pumping and treatment of Well PCX-1 appears to be effective for limiting the spread of contaminated groundwater. No capital improvements are recommended with respect to the MRTF.

Water quality samples taken from Well No. 17 prior to its being placed in service in 1999 showed nitrate concentrations exceeding the maximum contaminant level (MCL) of 10 milligrams per liter (mg/L). Water from the well is currently being blended with water from Well Nos. 11 and 12 at the MRBS to provide a means for using the well while attempting to determine whether the elevated nitrate concentrations can be reliably reduced through continuous pumping. PVWC is also considering packering off the upper 200 feet of the well screen in an attempt to reduce the nitrate levels. In the event that the nitrate concentrations cannot be reduced, blending with water from Well No. 12 is recommended as the long-term solution.

Improvements needed to implement the blending approach are discussed as part of Project A-7, which involves the construction of a new MRBS and SRP outfall. The SRP outfall will enable PVWC to gain credit toward repaying its exchange agreement with the SRP, as well as providing a means for relieving startup water from Well Nos. 11, 12, 16, and 17.

The MRBS facilities consist of three pumps and three storage tanks. The distributive pumps deliver water from the tanks to the distribution system. Water for filling the tanks is obtained from Well Nos. 11 and 12. The reliable capacity of the pumps is less than the combined capacity of these wells and results in a production capacity deficit. The construction of a new booster station in conjunction with Project A-7 will eliminate the production capacity deficit for the wells and provide additional capacity for delivering water from storage. The construction of standby power facilities is also recommended for Well Nos. 11 and 12 and for the distributive pumps at the new MRBS.

Background concentrations of other water quality parameters, including: arsenic, chromium, fluoride, iron, and radon continue to meet existing water quality standards. PVWC should continue to closely monitor the levels of these parameters to detect any trend that might indicate the need for remedial measures in the future. A potential future MCL for radon of 100 picocuries per liter (pCi/L) may necessitate future capital improvements, which would likely involve expansion of the MRTF and/or blending to reduce the radon concentrations in untreated wells.

The PVWC distribution system has been improved significantly over the past several years, including the installation of new transmission mains, booster pumping facilities, and distribution system monitoring and control systems. Service to PVWC customers has improved greatly as a result of these projects.

The Main Zone comprises the majority of the distribution system and is served directly from PVWC's production facilities. Water is supplied to the other pressure zones via booster pumping from the Main Zone. Water is delivered through a distribution network consisting of more than 120 miles of mains. Distribution storage is provided by 9 tanks, which have a combined capacity of about 1.5 million gallons (MG). Storage provided in the three MRBS Tanks (comprising a total of about 0.7 MG) and MRTF clearwell are not included in this amount. A number of PVWC's customers are located along the steep slopes of Mummy and Camelback Mountain at elevations ranging above 1,700 feet above sea level; however, the majority of the service area is located below Elevation 1500.

A large distribution storage deficit exists in the PVWC system. This deficit is projected to increase from 1.6 MG to 2.2 MG by 2012. An evaluation of alternatives for eliminating this deficit was performed. An approach based on obtaining a modified water usage agreement with the PVCC was determined to be the most cost-effective approach. Alternative approaches based on the construction of a large distribution storage tank and an additional groundwater well (in addition to SRP Well 22.6) were also considered.

The PVCC Agreement approach is based on an optimized water usage pattern for PVCC's irrigation lake filling that minimizes the PVWC system's equalization storage need. Capital projects that are needed to implement this approach include Investment Project (IP) 99-04 (involving the conversion of the Country Club Tanks from the Country Club Zone to the Main Zone) and recommended Project A-7 (involving modifications to the MRBS).

PVWC has historically relied on well capacity for providing an increased rate of supply during peak hourly demands in the absence of adequate equalization storage. The evaluation of distribution storage alternatives also indicated that maintaining surplus well capacity is part of the recommended approach for deferring the significant cost of a new distribution storage reservoir. Accordingly, the construction of improvements associated with recommended Project A-2, which will enable PVWC's use of SRP Well 22.6, is also an important component of the PVCC Agreement approach. The installation of an interconnection with the City of Phoenix (Project B-3) and Project B-9, involving the construction of a pump station to maintain effective storage in the 60th Street Tank, are longer-term elements of this approach. The need for these projects could be offset with the potential future construction of a large storage tank in the PVWC system.

Although the cost savings associated with the PVCC Agreement approach are significant, the construction of a storage tank is a desirable long-term improvement for the PVWC system and is included as recommended Project B-10. A project for providing distribution storage had been recommended previously and was received favorably by officials from the Town of Paradise Valley, PVWC customers, and regulatory officials. A storage tank also provides an operating margin of safety in meeting peak hour demands in the event that a well supply must be removed from service due to a mechanical or water quality problem. Project B-10 should be moved up to a high priority project in the event that the PVCC Agreement approach and an agreement with the SRP for use of Well 22.6 cannot be implemented effectively.

A large majority of the project recommendations for the PVWC system are for the replacement of distribution mains. These projects reflect the fact that portions of the PVWC system contain a substantial amount of unlined, small-diameter mains. For example, almost 50 percent of the total length of distribution mains is cast iron, and over 60 percent of the mains are 6 inches or smaller in diameter. These mains limit flow and are a source of maintenance problems. Replacement of the mains is recommended to improve transmission capacity, fire flow, and to reduce maintenance problems.

Project Recommendations

The recommended projects have been classified according to their relative priority -- Priority A or Priority B. Priority A projects are generally recommended in response to state or federal water quality standards or facility design guidelines, near-term, growth-related needs, or the need to otherwise correct existing system deficiencies with respect to safe and adequate service. Priority B recommendations reflect projects that address predicted deficiencies of a lesser nature or at a later date of projected occurrence.

Although the listing order for Priority A and B projects is indicative of the relative priorities, they have generally not been assigned specific years of construction to allow flexibility in responding to local factors or changes in the regulatory or financial environment faced by PVWC. For example, it may be necessary to alter the order of project implementation to meet changes in system growth rates and scheduling constraints due to: variances and delays in zoning approval, land easement acquisition, and coordination of pipeline projects with municipal street and utilities construction projects. One significant ongoing project is referenced by its Investment Project number.

A summary of estimated project costs for the Priority A and Priority B projects in 1999 dollars is shown in Table E-1. Table E-2 provides a listing of the Priority A and Priority B projects in order of priority and with their associated costs. Estimated costs provided in 1999 dollars may be escalated to the future year of construction based on the Engineering News Record (ENR) Construction Cost index for the Phoenix metropolitan area.

Table E-1

Cost Summary of Recommended Capital Improvement Projects

Priority A	Priority B
$ 6,700,000	$ 10,900,000

Table E-2

Summary of Recommended Improvements
Priority A Projects

Project	Description	Page	Estimated Cost
IP 99-04	* Convert Country Club Tanks to Main Zone	6-24	$150,000
A-1	Install PVCC Lake Meter, Electrical Service, and SCADA	6-26	$150,000
A-2	Construct Improvements to Incorporate SRP Well 22.6	3-29	$250,000
A-3	Install 8,000 Ft. of 24-in Main along Invergordon and Jackrabbit Roads	6-27	$1,300,000
A-4	Install 200 Ft. of 8-in. Main in Vicinity of Clearwater Hills BS	6-28	$100,000
A-5	Install 4,000 Ft. of 16-in. Main along McDonald Dr.	6-29	$750,000
A-6	Install 6,600 Ft. of 24-in. Main along Miller Rd., Palo Verde Dr., and Others	6-30	$1,100,000
A-7	Construct New MRBS, SRP Outfall, & Related Facility Mods.	6-31	$1,600,000
A-8	Construct Small Main Replacements (reflects est. annual cost of $200,000)	6-33	$1,000,000
A-9	Install 800 Ft. of 12-in. Main along Superstition Ln.	6-34	$100,000
A-10	Install 1,700 Ft. of 12- & 8-in. Mains along Yucca Rd.	6-35	$200,000
	Total (1999 cost)		$6,700,000

* Denotes Project in Progress

Summary of Recommended Improvements
Priority B Projects

Project	Description	Page	Estimated Cost
B-1	Install 4,400 Ft. of 16-in. Main along 44th St. and McDonald Dr.	6-36	$800,000
B-2	Install 4,800 Ft. of 16-in. Main along Lincoln Drive	6-37	$700,000
B-3	Construct Interconnection w/COP; Install 2,700 Ft. of 16-in. Main	6-38	$500,000
B-4	Install 1,900 Ft. of 12-in. Main along Tatum Blvd.	6-40	$250,000
B-5	Install 2,700 Ft. of 12-in. Main along Chaparral Rd.	6-41	$300,000
B-6	Install 1,900 Ft. of 12-in. Main along Tatum Blvd. & Cholla Ln.	6-42	$200,000
B-7	Install 2,500 Ft. of 12-in. Main along Lakeside Ln. and Others	6-43	$800,000
B-8	Construct New Operations Center at MRTF	6-44	$1,300,000
B-9	Construct Booster Station at 60th Street Tank	6-45	$300,000
B-10	Construct 3.0-MG Storage Reservoir & Pump Station	6-46	$5,000,000
B-11	Retire Country Club BS & Install 4,600 Ft. of 16-in. Main along Tatum	6-47	$750,000
	Total (1999 cost)		$10,900,000

SECTION 1

COMPREHENSIVE PLANNING PROCESS

1.1 OVERVIEW

The purpose of this Comprehensive Planning Study report is to evaluate the Water Company's facilities, and to recommend the capital improvements necessary to enable Paradise Valley Water Company (PVWC) to continue to provide safe, adequate, and reliable service to its customers throughout the planning horizon of this report. In planning the needed water facilities, accepted engineering standards have been utilized to provide adequate capacity and an appropriate level of reliability to satisfy domestic, commercial, industrial and fire protection needs. This section provides a summary of the methodology and criteria used in reviewing the adequacy and reliability of existing facilities and in developing the recommended improvements.

While this section (and the study, in general) is organized such that specific criteria and corresponding water system characteristics are presented separately, the comprehensive, long-term focus of the planning process requires an integrated approach to the application of these criteria to water system evaluations. Therefore, project recommendations often address deficiencies with respect to more than one criterion.

A number of federal, state and local organizations maintain responsibility for the regulation and/or enforcement of regulations pertaining to the activities of public water supply utilities. The PVWC system was analyzed with respect to the applicable requirements and regulations of these organizations. The Arizona Corporation Commission (ACC) has jurisdiction over the quality of service and rates charged to their customers by public water utilities. The USEPA, Office of Water is responsible for the development of national programs, technical policies, and regulations relating to drinking water, water quality, groundwater, pollution source standards, and the protection of wetlands, marine, and estuarine areas. The Arizona Department of Water Resources (ADWR) administers state water laws, researches methods of augmenting water supplies to meet future needs, and develops policies to promote conservation and equitable distribution of water resources. The ADWR also oversees the use of Arizona's surface water and groundwater resources, including regulation relative to the Groundwater Management Code. The Arizona Department of Environmental Quality (ADEQ), Water Quality Division administers the Arizona Safe Drinking Water Program for public water systems. Through this program ADEQ enforces federal regulations in addition to state requirements. Its activities include: construction plan reviews, water system inspections, water system certifications, and water quality monitoring data review. The ADEQ is also responsible for administration of the State's point and non-point programs. The Maricopa County

Environmental Services Department (MCESD) approves construction plans and issues permits for projects in the county involving potable water, wastewater systems, water treatment facilities, and wastewater treatment. Engineering Bulletin No. 10 — "Guidelines for the Construction of Water Systems" published May 1978 by the ADEQ — is the source of many of the criteria referenced throughout this section.

1.2 DEMAND PROJECTION CRITERIA

Projections of customers, average day demand and maximum day demand have been made for the years 2002, 2007 and 2012 to provide a basis on which to evaluate the existing facilities and recommend improvements where necessary. Projections beyond 2012 are also presented to provide an extended basis for assessing the long-term adequacy of the existing sources of supply. The projections were developed based on a review of population trends, local/regional planning agency forecasts, historical customer and consumption data, and discussions with local Water Company representatives. Where applicable, statistical analyses were used to develop appropriate growth projections, consumption factors by customer category, and ratios between average and peak period water usage. Alternative demand projection scenarios are presented to illustrate the sensitivity to key assumptions regarding future growth and water consumption.

1.2.1 Methodology

The projections are primarily based on available data from 1987 through year-end 1997. Customer and water demand data for 1998 are presented and are generally consistent with historical trends. Customer and demand projections are based on a disaggregated approach whereby the number of customers and associated consumption are developed separately for each customer classification. The resultant projected average day demands for each system represent the summation of projections for each customer category, including non-revenue usage and UAF. Future maximum day demands were also projected based on the historical relationship between maximum day and average day demands.

Non-revenue usage and unaccounted-for water (UAF) were projected based on historical data and discussions with the Water Company regarding anticipated effects of water management activities. Non-revenue use includes water used for water main flushing, sewer flushing, fire-fighting, initial filling of newly installed water mains, and identified leakage. UAF represents the difference between metered system delivery and the sum of all metered sales and non-revenue usage. This category includes water lost due to meter inaccuracy, undetected leakage, illegally opened fire hydrants and unauthorized use. Water pumped

to waste upon startup of PVWC's deep well pumps is not included in the historical or projected UAF or non-revenue figures.

In establishing the appropriate ratio for use in projecting future maximum day demands, American Water System long-range planning utilizes the criteria that facilities should be planned to meet projected maximum day customer demands with a 95 percent confidence level (a 5 percent chance of being exceeded in a given year). The maximum day ratio that defines this level of reliability is called the 95th percent confidence ratio. Projected maximum day demands for the PVWC service area are based on the historical relationship between the maximum day and average day demand less non-revenue usage and UAF.

The general benefits of implementing demand management are discussed in the following subsection. Demand management measures are identified, and the appropriateness of their use in attempting to reduce water consumption is discussed. As a private water utility, PVWC does not have the authority to mandate or enforce certain types of conservation programs. The efficacy of demand management also depends on statewide and local issues, including regulatory acceptance and recognition of the cost of these programs (and the corresponding decrease in water sales) in customer rates.

1.2.2 Demand Management

The implementation of demand management measures is an important management consideration in areas of the country facing inadequate water supply resources. Demand management programs may be an effective means for balancing the uses of a scarce water resource in the event that this cannot be achieved through other means. In addition to preserving natural water resources, demand management may be applicable for deferring the construction of water supply facilities associated with system growth and water demand.

The value of demand management is widely recognized in the State of Arizona, where the quantity of water consumed greatly exceeds annual rainfall. For many years, irrigation, municipal, and industrial water users relied heavily on groundwater withdrawals to meet their water supply needs. During the 1980's, programs were implemented to manage the use and conservation of groundwater. While continuing to rely on conservation efforts, the State of Arizona has also promoted the use of renewable water resources, waste reduction/water reuse, and various water storage and recovery programs aimed at minimizing the overdraft of groundwater supplies. Since the Town of Paradise Valley is located in an area of the state where

reducing overdraft of groundwater resources is a priority and PVWC itself is 100 percent reliant on groundwater, demand management is an important consideration. In fact, as discussed in Section 3.4, conservation requirements are incorporated in groundwater regulations applicable to PVWC and other public and private municipal, industrial, and irrigation water systems.

Section 2.2 summarizes PVWC's existing conservation measures, including water audits, conservation education, plumbing retrofit kits, and control of UAF through leak detection, as well as meter, service line, and small main replacements. Each of these measures is an important component of water resource management aimed at preserving the Water Company's sources of supply and providing an efficient and economical water delivery system.

The water demand projections consider, among other factors, recognition of the effect of the mandated manufacture and installation of some interior plumbing fixtures in new homes on reduced customer consumption. Installation of low-flow fixtures in existing residences and commercial facilities can further assist in reducing water consumption. However, the effectiveness of retrofit programs depends on numerous site-specific factors, including: housing age, penetration and retention rates, and system water usage patterns. An aggressive retrofit program may be capable of achieving indoor water usage savings on the order of 5 to 10 percent. However, the savings represent a much smaller proportion of a customer's total consumption where outdoor and other discretionary water use is substantial, as is the case in the PVWC system. Therefore, measures such as water audits and conservation education may represent other effective means for conserving water.

On an annual basis, PVWC has never experienced a shortage of groundwater supply, and no such shortage is anticipated for the foreseeable future. Therefore, while the Company's conservation measures serve to minimize regulatory compliance costs and may achieve some incremental reduction in operating costs associated with pumping, water quality, and land subsidence, the primary benefit to the source of supply is long-term in nature. In contrast, source of supply deficits associated with meeting existing and projected maximum day demands are often the driving forces behind the need to provide additional source of supply capacity and/or production and distribution system improvements. In these cases the suppression of peak demands may result in near-term capital investment savings.

In general, different measures must be undertaken to achieve demand management during peak demand periods. In particular, such programs need to address ways to reduce outside water usage, assuming that

outside consumption is the primary factor influencing the level of demand above base period demands. Specific measures such as landscape irrigation restrictions may be needed to achieve significant savings. However, as a private water utility, PVWC does not have the authority to impose ongoing water use restrictions. The ACC is the governing agency to authorize water restrictions for PVWC. Furthermore, this type of program could have adverse public relations, economic development, and customer satisfaction effects. Public education efforts in which residential and commercial customers are informed about water-efficient landscape design and irrigation practices are alternatives to mandatory restrictions that may result in some savings with relatively minor adjustments to customers' lifestyles. In addition to reducing the magnitude of the peak day demand, information provided to consumers regarding efficient diurnal water usage practices may enable savings relative to water system needs driven by the peak hourly demand.

State or regional initiatives involving the use of alternative water resource technologies, such as water reuse/reclamation or artificial recharge represent other effective means for prolonging PVWC's shared groundwater resources. Therefore, the Water Company's participation in programs for educating and identifying potential alternate water resources or technologies should be another important aspect of its conservation efforts.

1.3 SOURCE OF SUPPLY ANALYSIS CRITERIA

1.3.1 Overview

The purpose of this section is to provide a summary of the criteria used to evaluate the adequacy of the existing raw water supplies with respect to both water quality and capacity. In general, the source of supply section focuses on the adequacy of the Water Company's existing sources of supply with respect to the water demands of its customers. This analysis considers the physical capacity of the supplies, as well as their adequacy with respect to groundwater regulations in the State of Arizona. A review of groundwater regulations is also beneficial for understanding the potential benefits that regional water supply activities may provide with respect to PVWC's long-term source of supply adequacy. The status of key regional activities and characteristics of regional water purveyors are presented in Section 4.

1.3.2 Source Quality and Protection

PVWC maintains a water quality surveillance program to monitor the potential for adverse water quality originating from both point and non-point sources. Monitoring of raw water quality for PVWC's sources of supply is accomplished by routine daily analysis for chlorine, pH, hardness, coliform bacteria, and/or other parameters, as appropriate, to ensure compliance with water quality regulations and to monitor the performance and efficiency of treatment processes. Samples are also submitted to the American Water Works Service Company's Quality Control and Research Laboratory in Belleville, Illinois for analysis in accordance with the American Water System's monitoring program for trace metals, volatile organic contaminants, pesticides, priority pollutants, and bacteriological parameters.

1.3.3 Source Adequacy Criteria

The capacity of the Water Company's well supplies was evaluated based on actual operating information. This information includes quantitative data regarding instantaneous maximum rates of supply and totalized flow vs. cumulative hours of operation, as well as qualitative information regarding operational difficulties and special operating or maintenance procedures that are necessary. Together, this information is used to assess estimated peak capacity and the dependable capacity that could be sustained during an extended period of dry weather.

In this report, source of supply adequacy is based on a comparison of the peak capacity of the well supplies with the largest well out of service to the projected maximum day demand. In addition, the ability of the well supplies to sustain their peak capacities over a period of prolonged pumping was also evaluated.

Both measures of source of supply adequacy draw a distinction between the physical limitations of the well and aquifer in supplying water vs. the physical facilities, i.e., pumps, raw and finished water pipelines, etc., needed to deliver water from the well(s) to the treatment facilities. The capacity and reliability of mechanical and electrical equipment should not limit the Water Company's ability to withdraw adequate supply from the wells.

According to Arizona groundwater law, groundwater belongs to the surface landowner, and while use of the groundwater must be reasonable, water diversion allocations for withdrawals from individual wells do not exist. However, the PVWC service area is located within a groundwater management area specifically established to control the overdraft of regional groundwater supplies. As a result, PVWC holds a service area right for the use of groundwater for supplying its customers, and this right is subject to groundwater

regulations administered by the ADWR. For example, provisions of the 1980 Groundwater Management Code require PVWC to report groundwater withdrawals, implement conservation measures, and pursue appropriate measures to increase the use of renewable water resources. These regulations represent a consideration when assessing the adequacy of PVWC's source of supply.

During 1998 ADWR issued a draft of a TMP, which includes compliance requirements and alternatives for the management period from the Year 2000 until 2010. The TMP is the third in a series of management plans designed to achieve a reduction in the amount of groundwater withdrawals to safe yield levels by 2025. Requirements of the TMP that are applicable to PVWC are reviewed in Section 3, along with a discussion of the use of PVWC's CAP allocation. Use of renewable supplies like CAP is consistent with the provisions of the TMP and is therefore beneficial to PVWC and its customers.

1.4 REGIONALIZATION

Regionalization opportunities are evaluated to determine if a consolidated solution to water supply problems in a particular area is feasible and/or if privatization opportunities exist. Regionalization can often provide economies of scale, avoid duplication of facilities, and provide more effective service to customers. It can improve reliability and enhance the fire protection system. Water systems within a specific geographic area can regionalize to benefit from shared treatment facilities or pumping facilities. In the case of privatization, the expertise and resources of PVWC and the American Water System may be utilized to the benefit of other area water suppliers and their customers.

1.5 PRODUCTION FACILITIES EVALUATION CRITERIA

1.5.1 Overview

The PVWC owns and operates several production facilities for the purpose of treating its raw water supply and delivering finished water to the distribution system. These facilities, in combination, are designed to meet projected maximum day demands with appropriate back-up provisions to allow for equipment maintenance or redundancy in the case of key components.

As all of PVWC's existing (and anticipated future) supplies are derived from groundwater sources, existing and proposed Federal and State regulations pertaining solely to drinking water derived from surface water sources do not apply and are not discussed in this report. The primary water quality parameters of concern to the PVWC are VOCs, primarily TCE, associated with a contaminant plume located in an area south of PVWC's well field. The contaminant plume originated from the NIBW Superfund site. In addition to

VOCs, several naturally occurring water quality parameters, including: radon, chromate, and nitrates are associated with PVWC's groundwater sources. The level of nitrates may also be influenced by surface activities, i.e., the use of fertilizers for agricultural and landscape purposes, particularly in the Upper and Middle Alluvium Units.

Primary Drinking Water Regulations establish legally enforceable concentration limits and/or levels of removal, as well as extensive monitoring requirements. The water quality parameters addressed by the Paradise Valley treatment facilities are also subject to Secondary federal regulations. These regulations set recommended, non-enforceable levels for drinking water contaminants that, if exceeded, affect the aesthetic quality of the finished water.

The PVWC production facilities have been evaluated to ensure that all existing water quality requirements will be satisfied. This analysis considers the adequacy of existing unit process design capacities for accommodating future plant flow needs. The USEPA is in the process of revising the MCLs for several contaminants, and is developing new limits for additional ones. A summary of representative finished water quality is presented in the Appendix to show the extent of water quality testing.

The production section for the PVWC service area provides an evaluation of the existing facilities, a review of the treatment processes, and an assessment of improvement needs. Section 1.5.2 includes a general discussion of the effects of current and proposed water quality regulations. The PVWC production facilities are discussed in Section 5.

The primary focus of the improvement needs analysis discussed in Section 5 is to address existing and proposed regulations, short-term growth capacity issues, significant reliability issues relating to water quality, the condition of treatment equipment, emergency power, and safety. Lower priority issues, including long-term growth, water quality/treatment goals associated with anticipated regulations, and the replacement of aging/inefficient equipment and facilities, are also considered with respect to the development of project recommendations.

1.5.2 Regulatory Setting

Many state regulations apply to the design and operation of water treatment facilities. Federal regulations address water quality, the most prominent being those promulgated under the Safe Drinking Water Act (SDWA). The Clean Water Act (CWA) covers any discharge into state waterways. Aspects of these regulations that have or could affect the Water Company's operations in the future are discussed in Sections 1.5.2.1 and 1.5.2.2.

1.5.2.1 Water Quality Regulations

Applicable water quality regulations are based on the SDWA, as promulgated by the USEPA and ADEQ. Federal primary water quality regulations promulgated by the USEPA must be adopted by the state, except that the ADEQ may opt to provide more stringent standards. PVWC is in compliance with all existing water quality regulations and is anticipated to be in compliance with future standards if regulated at the levels discussed in the following paragraphs. A description of the anticipated compliance status and alternatives, where applicable, is provided in Section 5.3.2.

Since 1986, the USEPA has promulgated six major water quality rules, including: the Surface Water Treatment Rule, the Total Coliform Rule, Phase I - Volatile Organic Contaminant (VOC) Rule, Phase II - Synthetic Organic Chemicals (SOC) and Inorganic Chemicals (IOC) Rule, Lead and Copper Rule, and the Phase V SOC and IOC Rule. Additional regulations were proposed and/or finalized in 1994-1998. These are the Information Collection Rule (ICR), Consumer Confidence Reports (CCRs), the Enhanced Surface Water Treatment Rule (ESWTR), and the Disinfectant/Disinfection By-Products Rule (D/DBP). Final versions of the CCR, ESWTR and D/DBP Rules were adopted during 1998. In August 1998, the USEPA published a final CCR Rule, which requires water suppliers to prepare and issue annual water quality data summaries.

The Phase I VOC and Phase II & V SOC and IOC rules establish maximum contaminant level goals (MCLGs), maximum contaminant levels (MCLs), and best available technology (BAT) for a broad spectrum of organic and inorganic chemicals. The MCLGs are health-based, non-enforceable concentration objectives. MCLGs for carcinogens are zero. MCLs are enforceable concentration limits. The MCLs are established based on health effects, costs, and the state of technology with respect to analytical detection and treatment. BATs are established in conjunction with MCLs for specific chemicals and are selected based on the feasibility and cost of achieving the required removal efficiency.

The Lead and Copper Rule (LCR) was promulgated in June 1991. It involves a treatment technique requirement consisting of corrosion control, possible source water treatment, public education, and, in some instances, lead service line removal. The bases for compliance are the results of tap water monitoring and optimization of corrosion control treatment.

The current MCL for total trihalomethanes (TTHMs) of 100 ug/L applies to systems serving more than 10,000 people. Regulated systems are required to monitor for THMs at quarterly intervals. Compliance is based upon a running average of four quarterly samplings. Quarterly monitoring for THMs and other disinfection by-products (DBPs) is performed via collection of samples at appropriate locations within PVWC's distribution system.

In late 1998, the USEPA published the Final Stage 1 D/DBP Rule. As a groundwater system, the compliance date for PVWC is December 2003. The final rule sets maximum residual disinfectant level goals (MRDLGs) and maximum residual disinfectant levels (MRDLs) for disinfectants. Monitoring for disinfectant residuals should be scheduled at the same time and location within the distribution system as monitoring for total coliforms. The applicable disinfectant for PVWC is sodium hypochlorite, and its corresponding MRDLG and MRDL is 4.0 mg/L.

The Stage 1 D/DBP Rule will phase out the 100 ug/L standard for TTHMs effective December 2003 for PVWC. Under the first stage of the D/DBP Rule, the MCL for TTHMs will be lowered to 80 ug/L. The Stage 1 D/DBP Rule also includes MCLs for haloacetic acids (60 ug/L), bromate (10 ug/L), and chlorite (1,000 ug/L). The Stage 1 D/DBP Rule also specifies Best Available Technologies (BATs) for disinfectants and DBPs, including control of treatment processes to reduce disinfectant demand, control of disinfection processes to reduce disinfectant concentrations, and granular activated carbon (GAC). However, the quantity of precursor material in groundwater supplies is generally low, and any D/DBP issues can generally be resolved by modifying disinfectant contact time, concentration, or choosing an alternative disinfectant. A proposed Stage 2 of the D/DBP Rule is expected by late 2000, with promulgation expected by Spring 2002.

Current information regarding the groundwater disinfection rule (GWDR) indicates that this regulation will consist of operational requirements, i.e., a treatment technique (disinfection as a minimum), rather than MCLs. Compliance with the rule is also likely to be based on the completion of a sanitary survey of the well supply. Increased monitoring for viruses or viral indicators may be required depending on the supply's

vulnerability to microbial contamination, and the existing level of treatment. The USEPA is currently collecting data that will permit a better assessment of the site-specific factors influencing this vulnerability. This information will be used to develop feasible treatment requirements, as well as appropriate provisions for avoiding these requirements. A proposed GWDR is due in September 1999, with a final rule expected by Fall 2000.

The current MCL for arsenic of 50 ug/L is expected to be lowered. A revised standard must be proposed by January 1, 2000, with a final rule due within one year. As a known human carcinogen, the USEPA could set a relatively low standard for arsenic in the range of 2 to 4 ug/L. However, concerns for the high cost of compliance, i.e., treatment, and uncertainties regarding health benefits may result in regulation at a level between 10 ug/L and 50 ug/L.

1.5.2.2 Treatment Residuals Disposal

Water treatment facility wastes are considered pollutants and are restricted from being discharged to rivers, lakes, and other water course. The CWA has provided for the issuance of National Pollutant Discharge Elimination System (NPDES) permits for point source discharges into surface waters. These permits are administered by the State of Arizona. PVWC's production facilities do not generate constant or recurring waste streams. However, the Water Company has been issued a permit to deliver stripped groundwater from the MRTF to the Arizona Canal. The Water Company does not currently have a NPDES permit to discharge overflow from the MRBS tanks to the Arizona Canal.

1.5.3 Electrical Service and Standby Power

The reliability of electrical service and the availability of standby power have been analyzed. In order to provide an acceptable degree of reliability, the ability to produce at least half of the projected average day demand is desirable. The availability of a sufficient volume of distribution storage and/or interconnections may be considered with respect to meeting this standard. Recommendations are made to meet the above criteria where necessary.

1.5.4 AWWSC Standard for Chemical Containment

Compressed gas and liquid treatment chemicals used in the water industry are generally stored and fed in a concentrated form. Proper management of the chemicals is necessary to protect the consumer, environment, and Water Company personnel and facilities. PVWC production facilities have been evaluated to determine compliance with recent American Water Works Service Company (AWWSC)

Standards relative to chemical feed and storage facilities. These standards provide an appropriate level of protection.

Feed equipment is considered adequate if sufficient capacity is available to treat the water while considering maximum flow and feed rates with the largest chemical feeder or pump out of service. Chemical storage is considered adequate if 31 days of storage is available while considering maximum flow and feed rates, and provisions for containment. Primary containment is defined as the container holding the chemical. Secondary containment is the structure designated to hold spillage or leakage. Minimum secondary containment volume is considered to be 110 percent of the largest storage tank capacity within the containment area. Facilities to house compressed gas feed systems are needed to provide operator and local population safety, and to ensure adequate containment in the event of a gas leak. Individual feed and storage rooms are recommended for all installations. The storage room should contain all elements of the feed system that are under pressure, and be sized for a minimum 30-day supply.

PVWC uses just one treatment chemical, sodium hypochlorite, in its water production activities. Sodium hypochlorite solution or on-site generation of chlorine is used at all of PVWC's other production facilities. PVWC is currently in compliance with Article 80 and regulations for transporting and handling hazardous materials.

1.6 DISTRIBUTION AND STORAGE EVALUATION CRITERIA

1.6.1 Overview

This section describes the criteria applied in evaluating Paradise Valley Water Company's distribution and storage facilities. General guidelines for assessing the overall adequacy of distribution system facilities are presented in Section 1.6.2. These guidelines serve as a basis for developing improvement recommendations. Applicable criteria are provided for pumping and storage facilities, tank property sizing, and distribution mains. Considerations for the use of computerized hydraulic models in the evaluation of distribution facilities are also presented. Computerized hydraulic models were used to supplement engineering analysis and judgment in developing improvement recommendations. Published reports from the Insurance Services Office (ISO) and local fire protection standards also serve as guidelines for evaluating the adequacy of the various system components to deliver fire flows. The results of the analysis of the distribution system facilities and improvement recommendations are presented in Section 6.

1.6.2 Distribution System Guidelines

1.6.2.1 General

In the process of analyzing existing facilities and planning for future pipelines, distributive pumps and storage tanks, a number of minimum standards are considered. Distribution mains are considered adequate if they can meet two conditions of service. First, peak customer demand should be met at a minimum system pressure of 20 pounds per square inch (psi) or higher, although maintaining at least 40 psi at all locations under normal flow conditions represents a desirable goal. Fire flow goals should also be met while maintaining 20 psi minimum pressures in the system.

1.6.2.2 Pumping

Distributive pumping facilities are considered adequate if the capacity of the pump stations, with the largest pumping unit assumed out of service, is sufficient to meet the maximum daily demand projected to occur within the pressure zone. In the absence of adequate equalization storage (see below), pumping facilities should be capable of meeting the peak hourly demand with the largest pump out of service. This criterion also applies to pressure zones that derive their supply through hydro-pneumatic systems. In the absence of adequate fire reserve storage, the total pumping capacity should also equal or exceed the sum of the maximum day demand, needed flow to other zones, and needed fire flow rate.

1.6.2.3 Storage Volume

Storage facilities are considered adequate if the effective volume of the facility, or groups of facilities acting together, provide sufficient volume to meet equalization needs on the maximum day and provide the necessary fire protection reserve. The effective volume of storage is that quantity which can be used from the tank while maintaining adequate system pressures under the domestic and fire flow conditions outlined above for distribution mains. Therefore, the maximum effective volume for gravity storage is the quantity located at a water level above the elevation corresponding to the highest ground elevation served within the storage tank's area of influence plus about 50 feet (20 psi).

The entire volume of pumped storage is normally considered to be effective storage, provided that the distributive pumps are designed to maintain a minimum discharge pressure of 20 psi. The effective volume may be reduced by the volume of water need to prevent vortexing of the pumps. Also, the volume that is considered effective should be capable of being supplied to the system by available pumping capacity, excluding pumps needed to meet maximum day demands, if any.

A water system's total storage volume is allocated for demand equalization, fire protection and emergency reserve. The portion of this volume allocated for demand equalization and fire protection must be effective storage, as defined above. Any storage capacity beyond what is needed for these purposes represents available emergency reserve.

The ideal equalization volume is that quantity of water provided to allow the distributive or booster pump station output rates to be constant and equal to the average system demand on the maximum day of the year. Constant pumping promotes overall system efficiency and reduces operating costs. Estimates of needed equalization volume are based on the results of peak hour analyses, which quantify hourly pumping variations and storage contribution.

Fire protection reserves were calculated on the basis of the highest ISO recommended flow and duration published for each gradient in the service area. ISO's municipal fire protection ratings normally consider flows up to 3,500 gallons per minute (gpm) for a duration of three hours. Where individual structures are assigned higher ISO fire flow ratings, it is assumed that fire protection needs in excess of 3,500 gpm at individual sites will be satisfied through the development of individual customer-owned fire suppression systems.

Historically, PVWC has used excess well capacity to offset the lack of adequate distribution storage in meeting diurnal demand variations (equalization storage). However, two conditions should be met in order for well capacity to be considered a feasible long-term alternative to distribution storage. First, well capacity must be available in excess of what is needed to provide adequate maximum day reliable production capacity. In addition, transmission and distribution mains must be adequate to deliver peak demands from the wells to the customers. The distribution storage analysis for the PVWC system considers excess well capacity among other alternatives for providing adequate equalization storage.

The equalization storage need exhibited by the PVWC system reflects the hot and dry climate in Arizona and corresponding water usage patterns of its customer base. In general, PVWC's customers have little flexibility in their diurnal water usage patterns. However, several of PVWC's large customers take water delivery for the purpose of filling golf course irrigation lakes, which does provide some flexibility in their water usage. Because of their large usage, changes in the timing of the refill of the golf course lakes can have significant effects on the system's equalization need, and the possibility of achieving savings through

management of the diurnal usage pattern of these customers was also considered in the storage analysis for the PVWC system.

1.6.2.4 Distribution Mains

The design of pipeline improvement projects is normally based upon the ability to meet projected system demands and the maximum needed fire flow at adequate pressure, but the following general criteria should also be followed:

- Mains should not be less than 8-inches in diameter, except where the main does not serve a fire hydrant and there is no possible further extension of the facilities beyond 500 feet, or where proper engineering justification for a smaller main can be made, such as cases where the average flow delivered by the main is very low.

- Major transmission mains or mains which potentially can serve as major transmission mains should not be less than 12-inches in diameter.

Improvement projects for distribution system mains include main extensions, reinforcement and replacement. In instances where existing pipelines no longer provide sufficient carrying capacity along a selected route, a recommendation may be made for paralleling or replacing the existing main. The choice between reinforcing or replacing an existing main is dependent upon a number of site-specific factors, including: condition/repair history of the main, cost/feasibility of relocating existing fire hydrants and customer service lines, space limitations for the new main, and relative contribution of the existing main to the needed hydraulic capacity. Recommendations in this study are primarily based on the last of these factors.

A number of distribution system improvement projects are recommended in this report for assuring safe, adequate and reliable general service while others are primarily for fire protection improvement. Each type of project has multiple benefits which may result in general enhancement of the system in terms of improved pressures, flows, reliability and more stable water quality.

1.6.2.5 Emergency Power/Storage

The ability to provide continuous service during a power outage is critical to a system's reliability and depends on several factors including the nature of the electrical service, i.e., service from one vs. two substations, the existence of any floating storage within the gradient, and the existence of pumps that can be driven by diesel fuel or natural gas.

During a power outage, the demand is assumed to be 50 percent of the average day demand. Analysis of outages in other systems has shown this to be a reasonable estimate of the usage pattern. During a power outage, many demands by their nature are curtailed. These would include certain residential demands such as washing machine or dishwasher use. In addition, many commercial and industrial demands are curtailed during an outage. The facilities within a gradient have been considered adequate if 50 percent of the projected average day demand can be met from emergency powered pumping facilities, or if floating storage facilities are available to meet 50 percent of the average day demand for 24 hours.

1.6.2.6 Computerized Hydraulic Models

A computerized hydraulic model is a tool for evaluating system operation and assessing system deficiencies and alternative improvement approaches. The reason for using a model for these purposes is its ability to predict existing and future potential operating conditions with an acceptable degree of accuracy. The accuracy of the model is evaluated by comparing predicted results to known pressures, flows and water levels from actual operating records of the existing system.

The development of an accurate computer model requires complete information regarding the distribution network, location and characteristics of distribution pumping and storage facilities, and the distribution of customer demands. Meter route data provide information needed to assign customer demands to corresponding pipeline junctions in the hydraulic model. Production facilities and storage tanks are also represented in the model according to their known characteristics, e.g., pumping capacity, storage level range and total volume.

The distribution network of pipelines to be modeled is a representation of the actual distribution system. The "skeletonized" model includes large-diameter mains (generally, 8-inches and above) that are significant with respect to their distribution capacity and overall model connectivity. The model may also contain smaller-diameter mains, where inclusion of these mains is necessary to create an adequate representation of the distribution network. C-factor tests may be conducted or theoretical C-factor considerations may be used to assign pipe friction coefficients to the pipelines.

Model calibration is performed by simulating actual operating conditions. Adjustments to model parameters are made in an attempt to improve the degree to which the model-predicted results match the actual conditions. The assumed demand distribution and pipeline friction coefficients are two of the model

parameters that may be modified to achieve the best agreement between the actual conditions and model predictions. As a minimum, the operating scenarios used for calibration include the peak hour and the minimum hour demands on the maximum day.

Future-year models are developed by assigning demands according to the projected growth pattern. A constant demand distribution pattern representing customer in-fill is generally used unless anticipated growth can be assigned to a particular location. Analysis of future-year models provides a basis for ensuring that recommended improvements adequately address long-term needs. The hydraulic model analyses are used to evaluate improvement needs based on experienced and projected maximum day conditions, including peak and minimum hour demands and fire flows. Predicted system pressures serve as the primary basis for determining whether the system is in need of improvement.

A new computerized hydraulic model was created for the Paradise Valley water system in conjunction with the Comprehensive Planning Process. The model was used to evaluate system adequacy and to evaluate alternative improvement projects to address distribution system needs. The model was developed using the commercially available software package, CYBERNET.

SECTION 2
DEMAND PROJECTIONS

2.1 OVERVIEW

PVWC supplies potable water to approximately 4,600 customers in Maricopa County, located in central Arizona. The municipalities served include portions of the Town of Paradise Valley and the City of Scottsdale (COS), as well as portions of unincorporated Maricopa County.

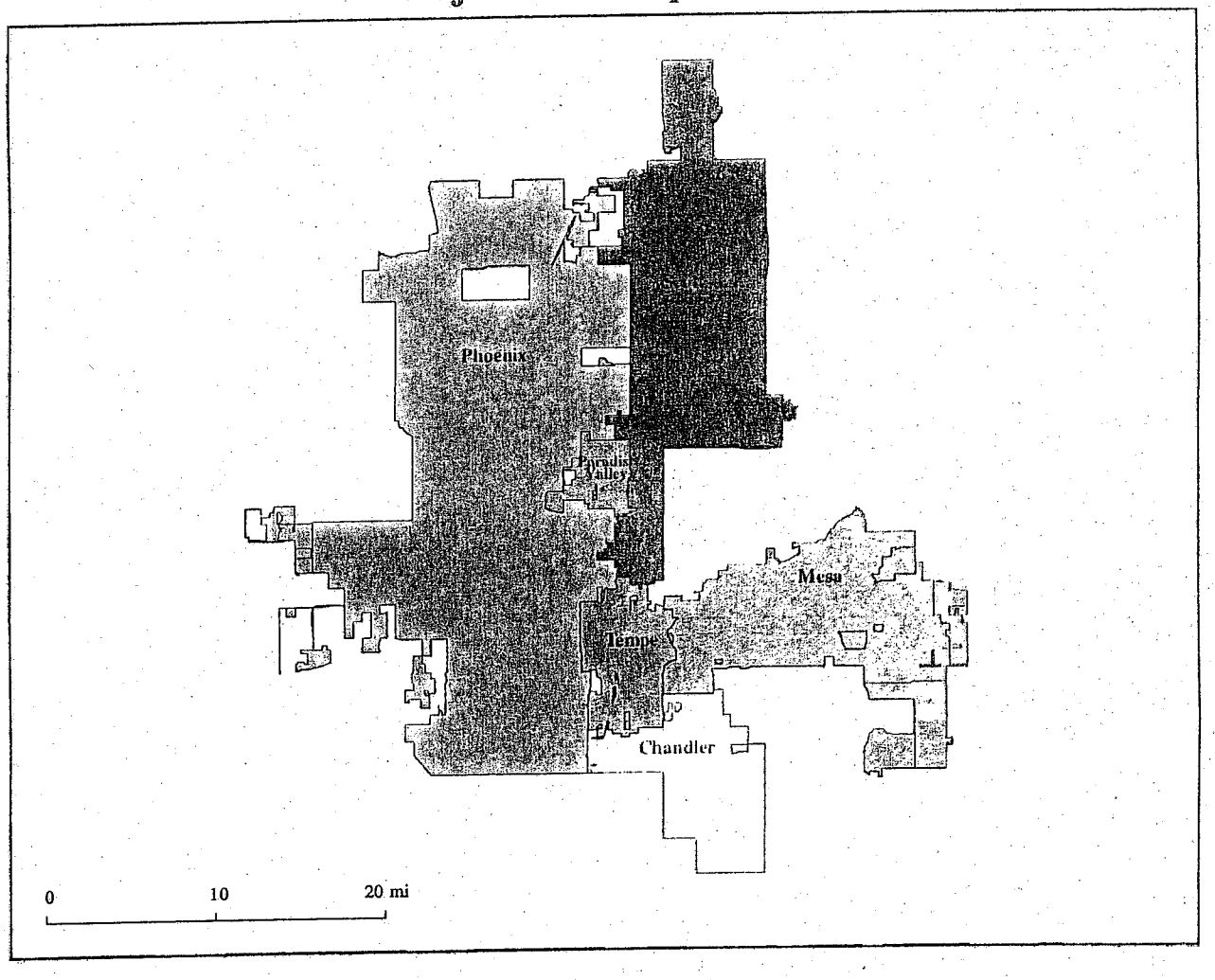
PVWC serves approximately one-half of the Town of Paradise Valley, which is located adjacent to the northeast portion of the City of Phoenix. The Town is bordered on the north, west and south by the City of Phoenix (City of Phoenix) and on the east by the COS. The remaining portion of the Town is served by the City of Phoenix and by the Berneil Water Company. The location of the Town of Paradise Valley in relation to surrounding communities is illustrated on Exhibit 2-1.

The Town of Paradise Valley is primarily a residential community, which was incorporated in 1961 in an effort to maintain control of zoning in the area. The minimum area for a residential lot in the Town is one acre. There are also a number of large commercial customers located in the Town including the PVCC, Marriott's Mountain Shadows Resort, and numerous other resort hotels. A number of resort hotels served by PVWC are located in the COS.

Housing in the Town of Paradise Valley is among the most expensive in the area. Many of the existing houses are very large single-family homes with significant amounts of landscaping. Some of the homes have been built on the sides of mountains located within the Town boundaries. A number of the homes are maintained as seasonal dwellings, with out-of-state residents spending only a portion of the year in the area. Although the houses may be occupied for a portion of the year, upkeep of the property and landscaping continues year round.

This section provides an overview of historical customer growth and water consumption, as well as projections for future customer growth and demand. Historical customer and demand data for PVWC over a minimum period of 10 years were reviewed. Three customer and demand projection scenarios were developed to account for the uncertain nature of future customer growth and water usage characteristics. Baseline projections reflecting the "base" growth scenario are discussed in detail in the

Exhibit 2-1
Town of Paradise Valley and Adjacent Municipalities



following sections. This scenario represents the expected long-term trend in customer and demand growth. The bases for the "low" and "high" projection scenarios are summarized in Section 2.5.9.

Customer and demand projections are presented for 2002, 2007, and 2012, which are the target years for evaluating water supply facility adequacy. The Town of Paradise Valley is approaching build out, and a key assumption for the demand projections is that remaining development will be substantially complete by 2012. Accordingly, demand projections that are presented for planning horizons of 20 (2017) and 30 years (2027) show minimal additional customer and demand growth. However, some residual customer and demand growth is expected due to remodeling of existing housing stock and reoccupation of vacant residences. The conversion of existing housing stock is a recent trend to which higher residential water usage has been attributed. The number of PVWC customers and their associated demands are projected to remain constant after 2027.

2.2 CONSERVATION

PVWC meters 100 percent of its customer's usage and has instituted a meter change out program to ensure the accuracy of metered consumption. PVWC does not have a leak detection van or formal program for addressing leakage since costs associated with these programs have not been authorized by the ACC. These services are available from local contractors on an as needed basis. Prior to 1994, UAF in the PVWC system accounted for less than about 5 percent of the annual system delivery. Higher UAF since 1994 is attributed to increased leakage along older, small-diameter mains as a result of increased system pressures, as well as improved production and residential metering.

In November 1992, PVWC signed a conservation stipulation with the ADWR in which PVWC agreed to perform certain conservation-related activities. Water audits are an important element of these conservation activities. PVWC has implemented a program to conduct water audits of at least 100 of its 250 largest residential customers and 12 of its resort/commercial customers. In each case the customer was offered a residential retrofit kit. PVWC is monitoring the water consumption of all audited customers.

In addition to offering retrofit kits through the water audit program, PVWC also makes the kits available to single-family residential customers for pickup at the Water Company office building. Through this program, PVWC notifies customers via mail regarding the availability of the kits, attempts to target customers with above average interior use, and tracks monthly water usage for pre- and post-installation conditions. PVWC has also established an interior retrofit program for multifamily residential customers.

PVWC customers have actively participated in both voluntary programs, although the data are insufficient to draw definitive conclusions regarding their effectiveness.

Another important aspect of PVWC's Water Conservation Program is its customer education program. This program involves the distribution of conservation literature, including tips on efficient water usage, residential leak detection, desert lawn care, and xeriscape alternatives.

Water usage patterns in the PVWC service area reflect significant usage for outdoor landscape irrigation. Accordingly, the conservation measures likely to have the most significant effect are outdoor watering restrictions. However, during the peak demand period in 1995, the ACC did not approve the use of mandatory restrictions to combat water service problems. Indoor retrofit programs are anticipated to have a minimal effect -- especially for reducing peak period usage.

In 1992, PVWC implemented an inclining water rate structure for residential customers to discourage excessive water usage; however, PVWC also presented several innovative conservation rate tariffs that were rejected by the ACC in the 1992 and later General Rate Cases. A uniform rate was also implemented for PVWC's other customer classes, eliminating the declining rate blocks that had been in place prior to June 1, 1992.

2.3 REGIONAL SETTING

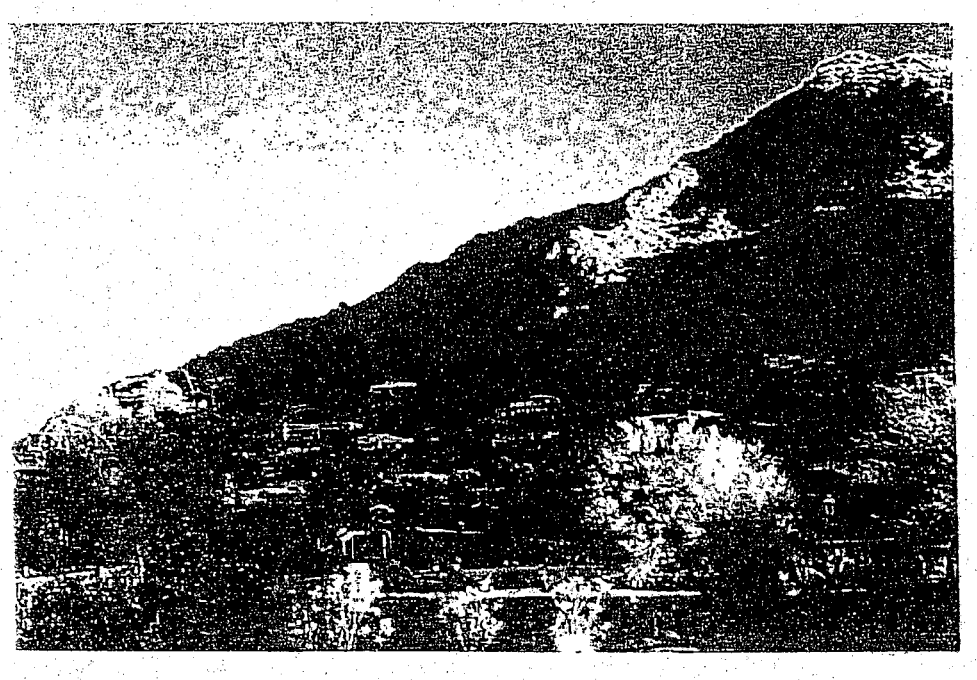
The economy in the Phoenix metropolitan area is varied, with job markets in manufacturing, services and tourism. In addition to the City of Phoenix and COS, Paradise Valley is also located within about 10 miles from the Cities of Tempe and Mesa. Tempe is the home of Arizona State University, and has an economic base made up of high technology, manufacturing, services and retail trade. Mesa has an economy based upon manufacturing, wholesale and retail trade, transportation and services. Agriculture has played an important role in the past, but diversification has moved the economy into other markets.

The City of Phoenix is home to Luke and Williams Air Force Bases. Among the major government employers are the State of Arizona, the City of Phoenix and Maricopa County. Large private employers, including: Motorola, U. S. West, and Arizona Public Service benefit the local economy by contributing to employment opportunities and to the tax rate base of the municipalities in which they are located.

The Town of Paradise Valley itself encompasses a total land area of approximately 16.5 square miles. It totally encompasses Mummy Mountain and is bounded by the Phoenix Mountain range to the west and Camelback Mountain to the south. Due to the mountainous terrain, the majority of development is located in the valley areas north and south of Mummy Mountain. However, as pictured on Exhibit 2-2, residences have also been constructed within the foothills of both Mummy Mountain and Camelback Mountain, and, to a lesser extent, along the steeper slopes of these mountains.

Exhibit 2-2

Northeast Slope of Camelback Mountain



2.4 POPULATION AND GROWTH POTENTIAL

Historical and projected census data and demographic information were obtained from the US Census Bureau, State of Arizona Department of Economic Security (DES), the Town of Paradise Valley Planning Department, and Maricopa Association of Governments (MAG). Information provided by the ADWR was also obtained. Table 2-1 indicates the historic populations of the State, County, Town, other nearby communities, and the PVWC service area.

Table 2-1

Historical Population

Location	Population (1)					Annual Percent Change	
	1970	1980	1985 (2)	1990	1995 (2)	1980-1995	1990-1995
State of Arizona	1,776,000	2,716,500	3,187,000	3,665,200	4,071,600 (3)	2.7	2.7
Maricopa County	971,000	1,509,200	1,991,000 (4)	2,122,100	2,528,700	3.5	3.6
Town of Paradise Valley	6,637	11,085	11,510	11,671	12,638	0.9	1.6
PVWC Service Area (5)	N/A	7,146	8,267	N/A	8,346	1.0	—
Phoenix	584,000	789,700	898,000	983,400	1,154,100	2.6	3.3
Mesa	N/A	152,400	220,000	288,100	372,400	6.1	5.3
Scottsdale	67,800	88,600	117,200	130,100	168,600	4.4	5.3
Tempe	64,000	106,900	153,800	141,900	152,700	2.4	1.5

Notes:

(1) US Census data unless otherwise noted.
(2) Special Census population estimates prepared by Maricopa Association of Governments
(3) 1994 figure
(4) 1987 figure
(5) As estimated by Arizona Department of Water Resources

Available 1990 Census data were reviewed to determine basic demographic characteristics of PVWC's service area. In general, marked differences exist between areas within the COS and the Town of Paradise Valley. For example, the average population per household and average number of housing units per acre were 2.47 and 0.56, respectively, for parts of the Town of Paradise Valley compared to 1.99 persons per household and 2.08 units per acre for areas served within the COS. In particular, the relatively small average ratio of housing units to total land area reflects the Town's minimum 1-acre lot zoning requirement. An older housing stock, higher median income level, lower vacancy rate, and higher owner-occupancy rate are other characteristics of areas served within the Town of Paradise Valley compared with areas that PVWC serves within the COS.

According to 1990 Census statistics, the total population of Maricopa County of over 2.1 million people accounted for 58 percent of the total population of the State of Arizona. The results of the 1995 Special Census indicate that the population of Maricopa County increased to over 60 percent of Arizona's total population. The population of the City of Phoenix represented 45 percent of Maricopa County's population, with the populations of several other large cities, including Mesa, Scottsdale, and Tempe comprising an additional 26 percent. In comparison, the Town of Paradise Valley accounted for about one-half of one percent of the County population.

Although population increased at a substantial rate in most areas of Maricopa County in the past, this type of growth did not occur in the Town of Paradise Valley. Between 1980 and 1995, Maricopa County's overall population grew at an average annual rate of 3.5 percent compared to only 0.9 percent for Paradise Valley. However, Table 2-1 indicates that the growth rate of the Town of Paradise Valley, City of Phoenix, and COS accelerated relative to the State and County between 1990 and 1995.

Table 2-1 also indicates the population of the PVWC service area, as estimated by the ADWR. The population estimated by ADWR for the PVWC is intended to recognize the geographic boundaries of the service area, as opposed to political boundaries. In addition, the ADWR projections attempt to capture the "resident" population, or only that portion of the total population whose principal residence is within Maricopa County. Their estimates of resident population and total housing units reflect an average population per occupied housing unit ratio of 2.21.

Table 2-2 indicates population projections for Maricopa County and the Town of Paradise Valley. These projections were obtained from the MAG publication entitled "Socioeconomic Projections Interim Report -

Table 2-2

Projected Population

Location	Population (1)				Average Annual Growth Rate 1995-2020
	1995	2000	2010	2020	
Maricopa County	2,528,700	2,954,200	3,709,600	4,516,100	2.3%
Town of Paradise Valley	12,638	13,309	13,375	13,418	0.2%
City of Phoenix	1,154,100	1,298,100	1,544,100	1,795,500	1.8%
City of Scottsdale	168,600	204,900	270,800	306,700	2.4%

Note:

(1) Source: Socioeconomic Projections Interim Report – June, 1997 (Maricopa Association of Governments)

June, 1997". These projections indicate that Maricopa County's total population is anticipated to grow by almost 80 percent between 1995 and 2020, corresponding to an average annual growth rate of 2.4 percent. This growth rate and the projected growth rate from 1995 to the Year 2000, 3.2 percent per year, are less than the growth rate experienced from 1990 to 1995. In contrast, the projections in Table 2-2 reflect the fact that the Town of Paradise Valley has limited growth potential. Projected growth at the rate of 1 percent per year through the Year 2000 is anticipated to slow considerably such that the average growth rate for the projection period is only 0.2 percent per year. According to these projections, an estimate for the total population of the town of Paradise Valley at build out would be between 13,400 and 13,500 people.

The MAG projections were developed with input provided by representatives from the various municipalities, including the Town of Paradise Valley, and are generally consistent with the Town's own perception of its growth prospects. Since it is bounded by other communities, any growth in the Town would have to come from within. In addition, the Town of Paradise Valley has only a small number of undeveloped areas remaining. These areas constitute the major sites for projected growth. Any remaining growth would be due to construction on individual vacant lots and remodeling of existing homes. The portions of Maricopa County and Scottsdale that are served by PVWC have also been developed, and offer limited growth opportunities. Accordingly, PVWC's service area is anticipated to be substantially built out within the current planning horizon.

However, MAG's projected populations by Transportation Area Zone (TAZ) appear to underestimate the growth potential in some areas. The best example is the 80-acre to 100-acre property owned by Sinclair Oil. The Sinclair Oil tract is located adjacent to the Judson School at the corner of Indian Bend Road and Mockingbird Lane in eastern Paradise Valley. A resort developer is attempting to obtain approval for the construction of a resort community, including clustered housing units. If the special use permit for this type of development is revoked, the tract would be developed as single-family homes with a minimum lot size of one acre. However, the MAG projections for this TAZ do not reflect this magnitude of development potential.

The redevelopment of vacant homes and renovation of existing, occupied homes are other factors that could influence increased water consumption, and, to some extent, higher population growth within the Town of Paradise Valley. The driving forces for these activities are increased property values and favorable federal tax provisions, which enable homeowners to reap significant gains in selling their homes. Alternatively,

homeowners are able to use the increased equity in their land to finance the renovation or replacement of smaller homes with newer and/or larger ones.

These factors were considered along with the MAG projections in developing the customer projections presented in the following section. In particular, possible development of the Sinclair Oil property as single-family homes should be consistent with the projected total number of residential customers by 2012. If this property were to become fully developed within the next 5 years, then the projected residential growth rate during this period of time would likely be exceeded. Since this type of development is not anticipated, however, a stable growth rate was projected throughout the 15-year planning horizon.

2.5 CUSTOMERS AND DEMAND

Historical customer and demand data over the past 11 years were obtained from Company records. Information on customers and demand for each category of customer is summarized in Table 2-3. In 1987, the total number of customers served by the PVWC was 4,126. This figure increased to 4,639 at the end of 1998. As shown on Figure 2-1 residential customers represented approximately 95 percent and 93 percent of the total in 1988 and 1998, respectively. The percentage of commercial customers increased from 3.5 percent to 4.8 percent. As discussed in Section 2.5.2, the decline of residential percentage and increase in commercial percentage is partially attributed to an accounting reclassification. The total number of "other" and fire/special customers accounts for the remaining percentage of about 2 percent for both 1987 and 1998.

As shown on Figure 2-2, when demands by category are calculated as a portion of the total demand, the results are much different than the ratio of the number of customers in each class to the total number of customers. In 1998, residential customers accounted for approximately 61 percent of the total demand, commercial customers accounted for 26 percent of the total demand, and "other" customers accounted for about 3 percent of the total demand. Combined non-revenue and UAF represented 9.6 percent of the total demand. Fire/special customers accounted for an insignificant portion of the total usage.

The overall metered consumption rate for the system during 1988 and 1998 were 1,675 and 1,875 gallons per customer per day (gpcd), respectively.

Table 2-3

Customer and Demand Summary (1)
"Base" Scenario

Year	Number of Customers					Demand (mgd)									Max/Avg Day Ratio
	Resid.	Comm.	Fire/ Special	"Other"	Total	Resid.	Comm.	Fire/ Special	"Other"	Total Metered	Non-Revenue	UAF	Total Avg. Day	Max. Day	
1987	3,915	137	56	18	4,126	4.39	2.42	0.000	0.10	6.92	0.019	0.39	7.32	11.43	1.56
1988	3,930	145	62	18	4,155	4.49	2.33	0.000	0.14	6.96	0.033	0.40	7.39	11.70	1.58
1989	3,929	146	65	16	4,156	4.96	2.54	0.001	0.15	7.66	0.038	0.20	7.89	11.70	1.48
1990	3,940	147	68	21	4,176	4.67	2.36	0.001	0.15	7.18	0.048	0.42	7.64	12.19	1.59
1991	3,995	147	69	15	4,226	4.60	2.31	0.001	0.15	7.06	0.045	0.28	7.38	11.07	1.50
1992	3,916	191	61	18	4,186	4.24	2.14	0.000	0.13	6.51	0.035	0.09	6.64	10.41	1.57
1993	3,993	209	71	23	4,296	4.48	2.42	0.000	0.18	7.09	0.046	0.18	7.31	11.30	1.55
1994	4,070	211	71	27	4,379	4.99	2.48	0.000	0.19	7.66	0.042	0.75	8.45	13.22	1.56
1995	4,095	211	71	30	4,407	5.01	2.27	0.001	0.21	7.49	0.041	0.81	8.34	14.52	1.74
1996	4,130	215	71	32	4,448	5.51	2.52	0.001	0.25	8.28	0.034	0.71	9.02	13.49	1.50
1997	4,218	232	70	32	4,552	5.62	2.68	0.000	0.22	8.53	0.012	0.90	9.45	15.41	1.63
1998	4,302	233	73	31	4,639	5.23	2.23	0.000	0.23	7.69	0.010	0.82	8.52	13.42	1.58
2002	*4,422*	*257*	*77*	*41*	*4,797*	*6.11*	*2.99*	*0.001*	*0.08*	*9.18*	*0.050*	*0.80*	*10.03*	*17.06*	*1.70*
2007	*4,560*	*287*	*82*	*51*	*4,980*	*6.34*	*3.33*	*0.001*	*0.10*	*9.77*	*0.053*	*0.85*	*10.68*	*18.15*	*1.70*
2012	*4,685*	*317*	*87*	*61*	*5,150*	*6.57*	*3.67*	*0.001*	*0.12*	*10.36*	*0.057*	*0.91*	*11.32*	*19.25*	*1.70*
2017	*4,731*	*320*	*87*	*62*	*5,200*	*6.64*	*3.71*	*0.001*	*0.12*	*10.47*	*0.057*	*0.92*	*11.44*	*19.45*	*1.70*
2027	*4,779*	*323*	*88*	*63*	*5,253*	*6.71*	*3.74*	*0.001*	*0.13*	*10.58*	*0.058*	*0.93*	*11.56*	*19.66*	*1.70*

(1) Note: Projected future customer and demand in italics

Figure 2-1
PVWC Customer Profile

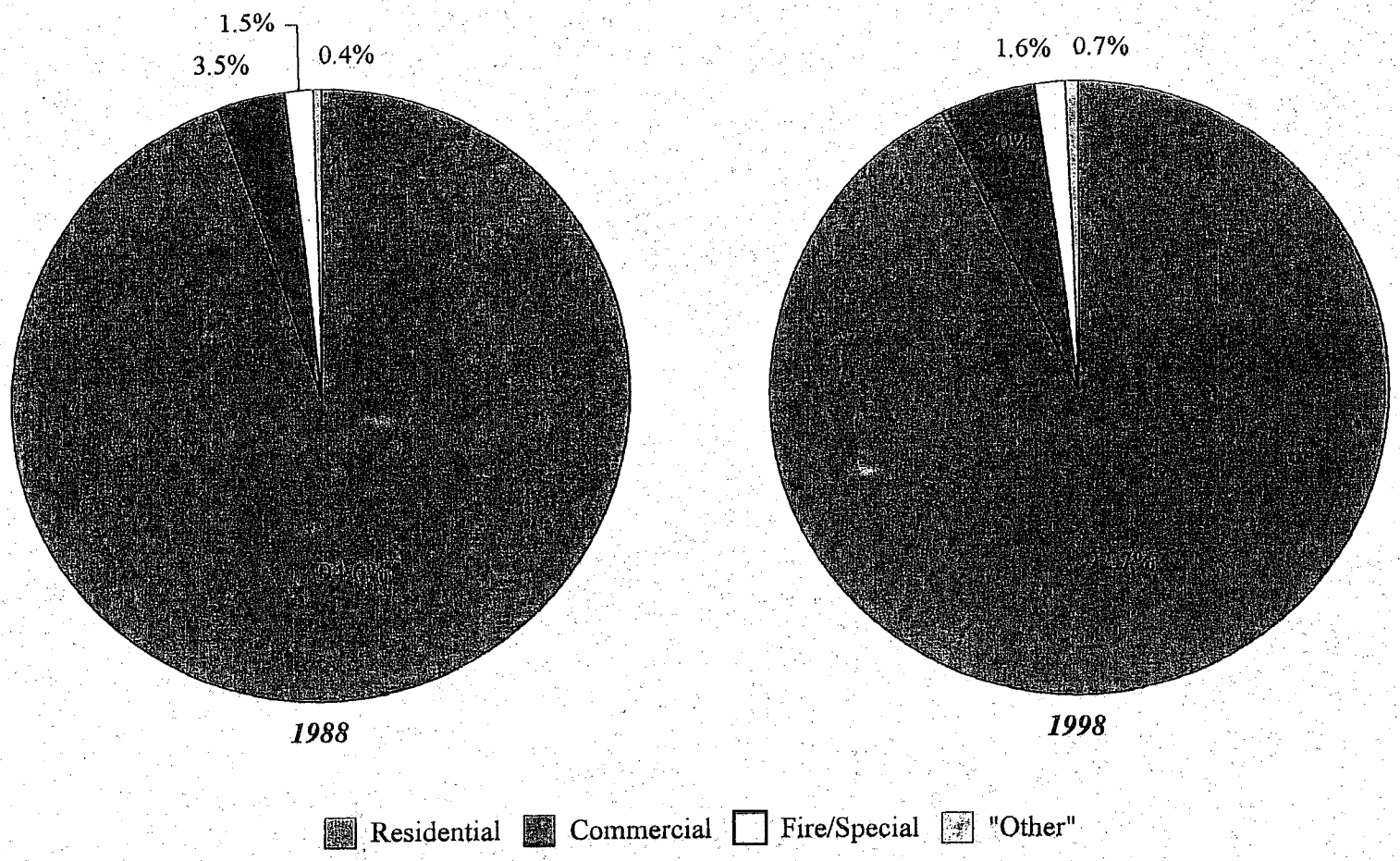
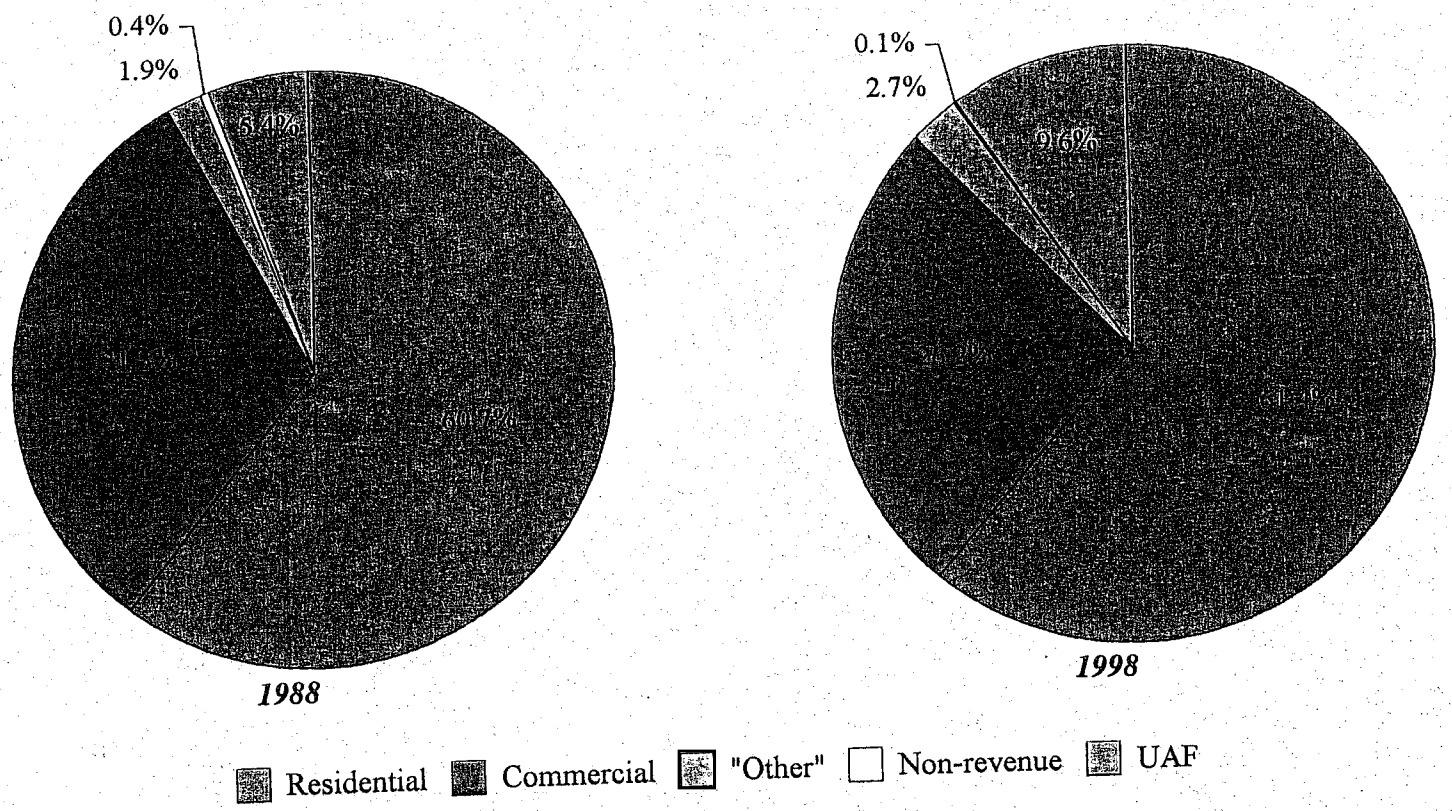


Figure 2-2
PVWC Demand Profile



Fire/Special Demand < 0.01%

2.5.1 Residential

PVWC provided water service to 4,302 residential customers at the end of 1998. The total number of residential customers is comprised of single-family customers and a relatively small number of irrigation accounts associated with homeowner associations' common meters. The number of single-family customers includes approximately 100 residences that have two or more meters.

During 1998, the PVWC system experienced a net increase of 84 residential customers, of which 60 resulted from PVWC's purchase of its sole wholesale customer, the former Mummy Mountain Water Company. The average growth rate of residential customers over the past 5 years was about 60 customers per year, or approximately twice the average rate for the entire period from 1988 to 1997. A linear regression of the historical data since 1989 indicates that the long-term trend is growth at a rate of 30 customers per year. This rate was used as the basis for projecting the future number of residential customers through 2002, decreasing to a rate of about 25 per year by 2012. Accordingly, the number of residential customers is projected to increase to 4,422 by 2002 and 4,685 by 2012, as shown in Table 2-3.

A review of undeveloped land was conducted by ADWR and the Water Company in 1986. The review concluded that an additional 901 residential customers could be added to the system after 1986 for a total of 4,808 residential customers at build-out. Residential customer growth of 1 percent is projected from 2012 to 2017 and from 2017 to 2027, resulting in a total of 4,779 residential customers by 2027 (assumed build-out). This figure is in general agreement with the results of the 1986 study.

The annual residential consumption rate for the service area varied between 1,083 gpcd and 1,333 gpcd over the past 10 years. The average residential consumption factor during this period was 1,215 gpcd. However, residential consumption has exhibited an increasing trend. A linear regression of historical consumption factors from 1988 to 1998 indicates an increase of 13 gpcd per year. From 1992 to 1997, the trend is even stronger, increasing at the rate of about 54 gpcd per year.

Residential customer consumption patterns closely follow weather conditions, particularly in areas such as Paradise Valley, where outdoor irrigation usage represents a large proportion of domestic water use. Over the past 20 years the average annual rainfall in Paradise Valley was 8.6 inches, ranging from a total of about 3 inches in 1977 to almost 15 inches in 1984. Summer average temperatures during 1994, 1995, and 1996 ranged from 86 degrees Fahrenheit (F) to 97 degrees F. A maximum daily temperature of 121

degrees F was recorded during July, 1995. The 1995 heat wave included 5 straight days with temperatures over 120 degrees F and 18 straight days with temperatures over 115 degrees F.

Evapotranspiration is the weather variable that reflects the watering needs of vegetation. High evapotranspiration increases the watering requirements. A review of annual evapotranspiration rates for the Phoenix area over the past 10 years indicates a strong correlation to residential consumption. For example, 1989 and 1994 were years with high evapotranspiration rates and relatively high average residential consumption factors.

However, the changing characteristics of the PVWC system also influence residential water consumption. As discussed previously, significant remodeling of existing homes and landscaping and the construction of several new subdivisions on large, landscaped lots tend to result in a proportionately greater increase in water usage relative to the increase in the number of residential customers. In addition, more customers are residing in Paradise Valley year-round. The significant improvements that PVWC has made in its system since 1994 have raised pressures and increased water supply availability, thereby influencing higher residential consumption.

As renovation of existing housing stock continues, there is a potential for a continued rise in residential consumption. Accordingly, future residential demand was projected based on a consumption factor of 1,380 gpcd, which approximates the upper 95th percent confidence interval for historical data since 1992. Residential demand projections for 2012 reflect the use of a consumption factor of about 1,400 gpcd, which recognizes the anticipated effect on higher usage of ongoing and planned pumping and transmission improvements within the PVWC system. Use of these factors and the projected customer growth discussed above results in projected residential water demand of 6.11 mgd by 2002 and 6.57 mgd by 2012.

2.5.2 Commercial

A total of 233 commercial customers were served by PVWC at year-end 1998. Commercial business is limited within the Town of Paradise Valley. The majority of the commercial customers are exclusive resorts. Some commercial establishments are also located in parts of the COS that are served by the Water Company. Other examples of commercial customers include master-metered apartments and condominium complexes, private schools, golf course buildings and irrigation meters, and hotels and motels.

PVWC tracks the consumption of its 10 largest customers on a monthly basis. These customers are all commercial customers, and a summary of their average annual demands for 1997 is presented in Table 2-4. As shown in Table 2-4, the total consumption by the 10 largest commercial customers accounted for over 70 percent of the average annual commercial demand in 1997. The two largest customers, PVCC and Marriott's Mountain Shadows, accounted for over one-third of the commercial demand, and a large proportion of this, 0.77 mgd, is attributed to golf course irrigation. The ADWR has authorized an annual turf allocation of 575 afy (0.5 mgd) for the PVCC. PVCC exceeded this allocation in 1997 during reconstruction of its golf course fairways.

Between 1991 and 1992 the number of commercial customers increased from 147 to 191. This increase corresponded to the conversion of residential timeshare units at the Hilton Villas to commercial-classified hotel rooms. Between 1996 and 1997 the number of commercial customers increased by 17. However, due to the lack of available land, future commercial development is unlikely to be sustained at this pace. A linear regression of commercial customers between 1992 and 1998 indicates a growth rate of 6 customers per year. This was used as the basis for projecting the future number of commercial customers. Possible sources of future growth of commercial customers include expansion of existing resorts and golf courses and additional commercial establishments. Based on these assumptions, the number of commercial customers is projected to increase to 257 by 2002 and 317 by 2012.

Commercial consumption ranged from 9,600 gpcd in 1998 to 17,420 gpcd in 1989. The average rate was 12,700 gpcd between 1989 and 1998. Commercial consumption has remained fairly constant following the conversion of residential timeshare units in 1992. Over this period of time, the median commercial consumption factor was 11,570 gpcd, and a factor of 11,600 gpcd was used to project future commercial demand. As shown in Table 2-3, commercial water demand is projected to increase from 2.23 mgd in 1998 to 2.99 mgd by 2002 and 3.67 mgd by 2012. These projections are anticipated to be consistent with an increased demand of up to about 0.5 mgd associated with a possible expansion of the PVCC golf course.

Table 2-4

Summary of Large Commercial Customer Demand

Customer Name	1997 Annual Avg. Usage (mgd)		Percentage of Commercial Demand
	Golf Course Only	Total	
Paradise Valley Country Club	0.60	0.62	23.2
Marriott's Mountain Shadows	0.17	0.30	11.1
Red Lion's La Posada	—	0.23	8.4
Marriott's Camelback Inn	—	0.17	6.2
Scottsdale House	—	0.12	4.6
Paradise Valley Resort	—	0.11	4.0
Stouffer's Cottonwood Resort	—	0.10	3.7
Scottsdale Embassy Suites	—	0.10	3.8
Tennis Ranch, Inc.	—	0.09	3.3
Holiday Inn Sunspree	—	0.08	2.8
Total Large Customers:	0.77	1.92	71.4
Total Commercial Demand:	—	2.68	—

2.5.3 Industrial

There are no industrial customers in the PVWC service area. The nature and zoning of the area precludes construction of this type of facility in the future. Therefore, no industrial customers and associated water demand are anticipated during the planning period.

2.5.4 "Other"

PVWC provided water supply service to a total of 31 "other" customers at the end of 1998. The "other" category consists of municipal/government accounts, public schools, playgrounds and resale.

Prior to the end of 1998, PVWC provided water service to a single sale for resale customer in the Town of Paradise Valley. This customer, the former Mummy Mountain Water Company, was served through 2 meters located along Invergordon Drive north of Cactus Wren Road and was among the Water Company's five largest customers in recent years. During 1997, Mummy Mountain Water Company purchased 61.7 MG (an average of 0.17 mgd) from PVWC. The former Mummy Mountain Water Company water system was comprised of about 60 residential customers. As discussed in Section 2.5.1, these customers are now counted among PVWC's residential customer base, and their consumption will be similarly recorded beginning in 1999.

The total number of "other" customers has increased gradually over the past 10 years. A linear regression indicates that the long-term growth trend is about 2 customers per year, and this was used as the basis for future "other" customer projections. Accordingly, the number of "other" customers is projected to increase to 41 by 2002 and 61 by 2012.

Consumption in this category decreased from 10,295 gpcd in 1991 to 6,870 gpcd in 1995. The "other" customer consumption factor ranged from 6,900 (1995) to 7,850 (1996). Adjusting for the former Mummy Mountain Water Company account conversion, the estimated consumption factor applicable to remaining (and future) "other" customers is about 2,000 gpcd. Use of a consumption factor of 2,000 gpcd results in projected "other" demands of 0.08 mgd and 0.12 mgd by 2002 and 2012, respectively.

2.5.5 Fire/Special

In 1998, PVWC provided private fire service to a total of 73 accounts, with service sizes ranging from 2- to 8-inches in diameter. A linear regression of historical fire/special customer growth indicates that the

long-term trend is about 1 customer per year. Use of this growth rate results in projected total of 77 fire/special customers by 2002 and 87 customers by 2012.

Historical fire/special customer consumption has ranged from 1.3 gpcd in 1988 to 17.8 gpcd in 1991, with an average of 7.3 gpcd. A shown in Table 2-3 use of a factor of 10 gpcd results in projected fire/special customer demand of 0.001 mgd throughout the planning horizon.

2.5.6 Non-Revenue Usage and Unaccounted-for Water

Non-revenue usage, representing main flushing, operation of bleeders and blow-offs, street cleaning, fire fighting, Water Company use and identified leakage varied between 0.12 percent and 0.64 percent of annual system delivery since 1988. The average percentage was 0.45 percent, and future non-revenue is projected at 0.5 percent of the total average day demand. Accordingly, non-revenue usage is projected to increase to 0.05 mgd and 0.057 mgd by 2002 and 2012, respectively.

Unaccounted-for water (UAF), representing meter inaccuracies, undetected leakage and unauthorized use, ranged from 0.094 mgd in 1992 to 0.90 mgd in 1997, reflecting a tenfold variation over this time period. When expressed as a fraction of system delivery, UAF represented between 1.4 percent (1992) and 9.7 percent (1995) of the total average system demand. The historical average percent of total system delivery is 6.1 percent; however, over the past five years, UAF has increased to an average of 9.1 percent of the total average day demand.

Increased UAF over the past several years may be attributed to a number of factors, including: improved metering, new construction, and increased leakage associated with the effect of higher system pressures on older, smaller-diameter mains in some parts of the distribution system. While UAF in the range of 9 percent is not excessive (ADWR's maximum UAF requirement relative to the Groundwater Management Act is 10 percent), replacement of the older mains, elimination of polybutalene service, and improved metering should enable the UAF to be reduced. Accordingly, future UAF for the PVWC system is projected based on 8 percent of the total average day demand. As shown in Table 2-3, UAF is projected to be 0.8 mgd in 2002 and 0.91 mgd in 2012.

2.5.7 Total Customers and Annual Average Day Demand

Table 2-3 contains the historical and projected customers and demands for individual customer classifications, non-revenue usage, and UAF. Between 1987 and 1998, the total number of customers

increased from 4,126 to 4,639, corresponding to an annual average growth rate of about 1.1 percent. The total number of customers in PVWC's service area is projected to exceed 5,100 by the end of the current planning period. The average annual growth rate associated with reaching this milestone is about 0.68 percent.

The average day demand represents the summation of projected water sales for all customer classifications plus non-revenue usage and UAF. The total average day demand fell to 8.52 mgd in 1998 after reaching a peak of 9.45 mgd in 1997. Over the past 5 years, total system delivery has trended upward at the rate of 0.13 mgd per year. Projected average day demands from 2002 through 2012 reflect a similar growth rate. Total average day demands are projected to reach 10 mgd by 2002 and 11.32 mgd by 2012.

Based on the historical data and projections shown in Table 2-3, the PVWC system will be at 98 percent build-out by 2012. Projections beyond 2012 indicate a decline in the rate of growth of the annual average day demand to less than 0.02 mgd per year. The projected total number of customers and average day demand at build-out (2027) is approximately 5,250 and 11.6 mgd, respectively.

2.5.8 Maximum Day Demand

In order to properly assess the facilities needed to meet future demands, the maximum daily demand must be correlated to projected average daily demands. The maximum day demand is the largest system demand occurring on a single day for each year. The historical maximum day demand for the PVWC service area of 15.41 mgd occurred on August 1, 1997. This maximum day demand was 0.9 mgd higher than the next highest demand of 14.52 mgd, which occurred in 1995. Maximum day demands have exhibited an increasing trend throughout the 10-year historical period.

Projected maximum day demands are based on the historic relationship between maximum day and average day water demand. Since 1988, the ratio of maximum day to average day demand ranged from 1.48 to 1.74, with an average of 1.57. The ratios also exhibit a slight increasing trend over this time period. Projected future maximum day demands are based on a ratio of 1.70, which is the upper 95th percent confidence interval. The statistical probability that the actual maximum day to average day ratio would exceed this ratio in a given year is 5 percent, which is consistent with the American Water System's reliability criteria discussed in Section 1.2.1. As shown in Table 2-3, future maximum day demands for the PVWC service area are projected to reach 17.1 mgd by 2002 and 19.3 mgd by 2012.

2.5.9 Comparison to 1990 CPS Projections

The 1990 CPS utilized the ADWR demand targets for the Phoenix AMA Second Management Plan. The demand targets were based on the per capita consumption figures and population projections that were officially recognized by ADWR. The resulting projections included average day demands for 1995, 2000, and 2005 of 7.29 mgd, 7.52 mgd, and 6.96 mgd. Corresponding maximum day demands projections were 12.97 mgd, 13.38 mgd, and 12.40 mgd. The actual 1998 and historical (1997) average day demands exceed the then projected Year 2000 average day demand by 1 mgd (13 percent) and 1.93 mgd (26 percent), respectively. The reported 1998 maximum day demand of 13.42 mgd closely approximates the then projected Year 2000 maximum day demand. However, both the historical 15.41 mgd (1997) and projected (19.25 mgd) maximum day demands exceed the previous projections by significant amounts.

2.5.10 Alternate Projections

Alternate "low" and "high" customer and water demand projections are shown in Table 2-5 along with those presented in Table 2-3 for the "base" scenario. The alternate demand projection scenarios are intended to illustrate a potential range of conditions that may occur in the future in response to customer growth that is higher or lower than what was assumed for the "base" scenario. Residential and commercial consumption factors were also varied to illustrate their impact on demand projections.

One factor that may affect the residential customer growth potential is the number of vacant housing units. In addition to resident population, MAG projected the number of occupied and vacant residential housing units in Paradise Valley. Higher and lower vacancy rates were assumed for the purpose of obtaining "low" and "high" residential customer growth projections. For example, lower vacancy may be influenced by strong economic conditions, or other incentives that make living in Paradise Valley on a year-round basis more desirable.

Commercial customer growth projections under the "base" and "high" scenarios may be considered conservative in light of the limited commercial development potential in the service area. Uncertain development plans for a large tract of land near Indian Bend Road is one factor that supports the conservative projections; however, PVWC should track future commercial customer growth and make appropriate adjustments to the timing of growth-related improvement projects in the event that the projected growth does not occur.

Table 2-5

Alternative Demand Scenarios

Year		Total Customers	Average Day Demand	Maximum Day Demand
2002	"Low"	4,737	9.41	15.98
	"Base"	4,797	10.04	17.06
	"High"	4,827	10.41	17.70
2007	"Low"	4,860	9.69	16.47
	"Base"	4,980	10.68	18.16
	"High"	5,062	11.23	19.09
2012	"Low"	4,982	9.98	16.97
	"Base"	5,150	11.32	19.25
	"High"	5,297	12.05	20.49

With respect to water demand, uncertain weather conditions, changing customer characteristics, and, to a lesser extent the presence or absence of conservation effects, were the assumed driving forces for the use of alternate water consumption factors. For instance, average consumption factors over a more recent time period were used in lieu of historical averages to reflect current consumption trends may have been influenced by one of these forces.

According to Table 2-5, the projected number of customers, average day demand, and maximum day demand by 2012 for the "low" scenario are 4,982, 10.0 mgd, and 17.0 mgd, respectively. This scenario is based on the assumption that future annual growth rates for residential, commercial, "other", and fire/special customers through the 2002 are 20, 2, 2, and 0.5, respectively. Customer growth beyond 2012 is projected to increase by 1 percent from 2012 through 2017 and from 2017 to 2027. Further assumptions for this scenario are that residential consumption will stabilize at 1,330 gpcd, "other" consumption will correspond to an average of 1,850 gpcd, and that UAF can be reduced to 7 percent of the annual average day demand, as a result of PVWC's continued efforts to replace aging and undersized distribution mains. (Section 6.3.5 includes a profile illustrating the extent to which old and undersized mains are installed throughout the PVWC distribution system.)

Under the "high" scenario, the total number of customers, average day demand, and maximum day demand are projected to increase to 5,257, 12.3 mgd, and 21 mgd, respectively, by 2012. The "high" scenario is based on residential, commercial, "other", and fire/special customer growth rates of 35, 8, 3, and 1 customers per year through 2012. In addition, a higher residential consumption factor of 1,410 gpcd was used along with a higher UAF percentage of 9 percent of the projected total system delivery.

Historic and projected customers, total average day demands, and maximum day demands for the PVWC service area are illustrated on Figures 2-3, 2-4, and 2-5, respectively. Figures 2-4 and 2-5, illustrate the very significant increases in average and maximum day demands that have been experienced due to increased production capacity and improved hydraulics within the distribution piping grid. While the annual total customer growth rate averaged about 1.1 percent since 1987, the average and maximum day demand growth trends reflect annual average growth rates of 2.1 percent and 2.5 percent, respectively for the same time period. On each of these figures, the line representing the "base" scenario customer and demand projections is bordered by shaded regions, which represent the range of expected variation associated with the "low" and "high" scenario projections. In each figure, a break in the projected growth

Figure 2-3
PVWC Customer Projections

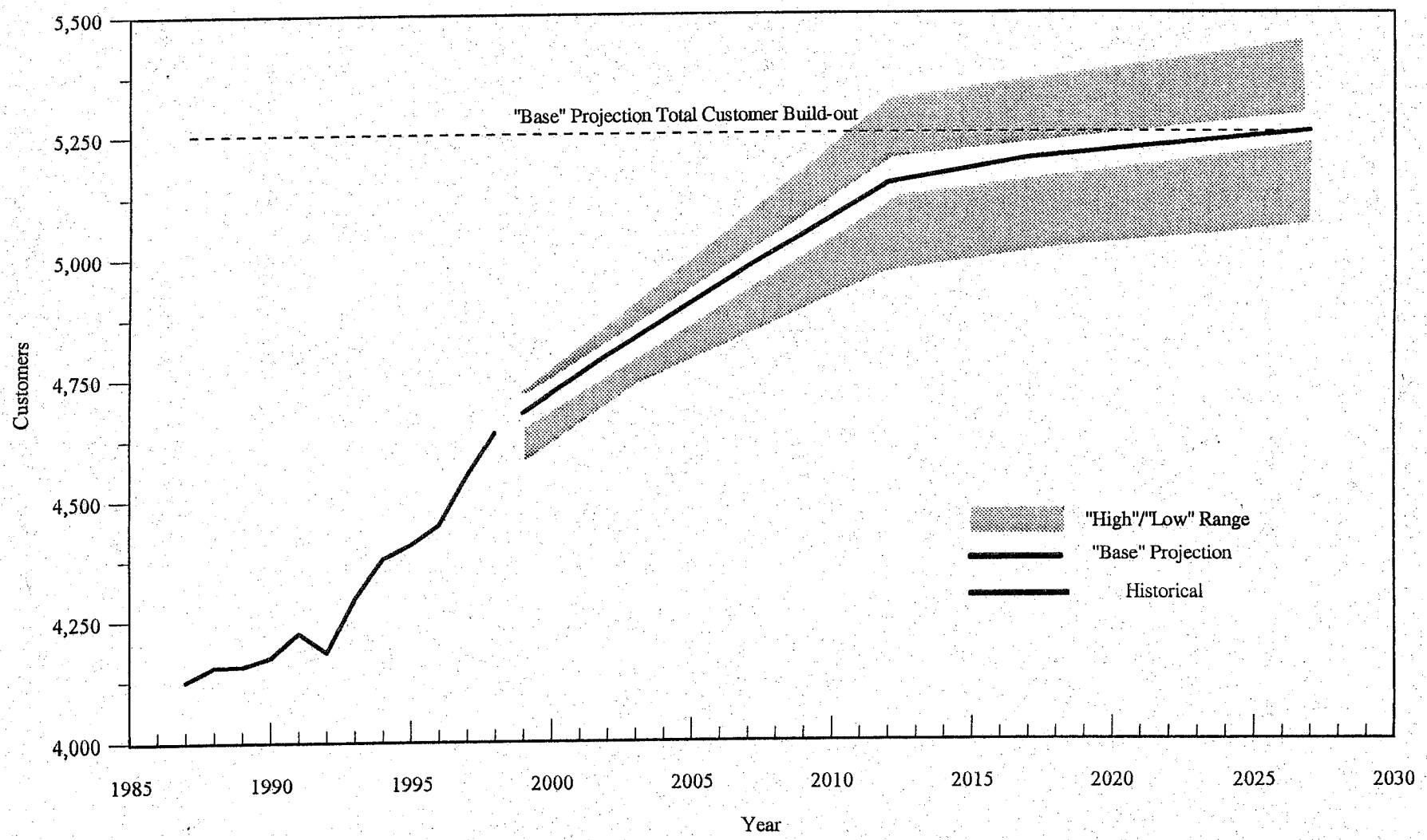


Figure 2-4
PVWC Average Day Demand Projections

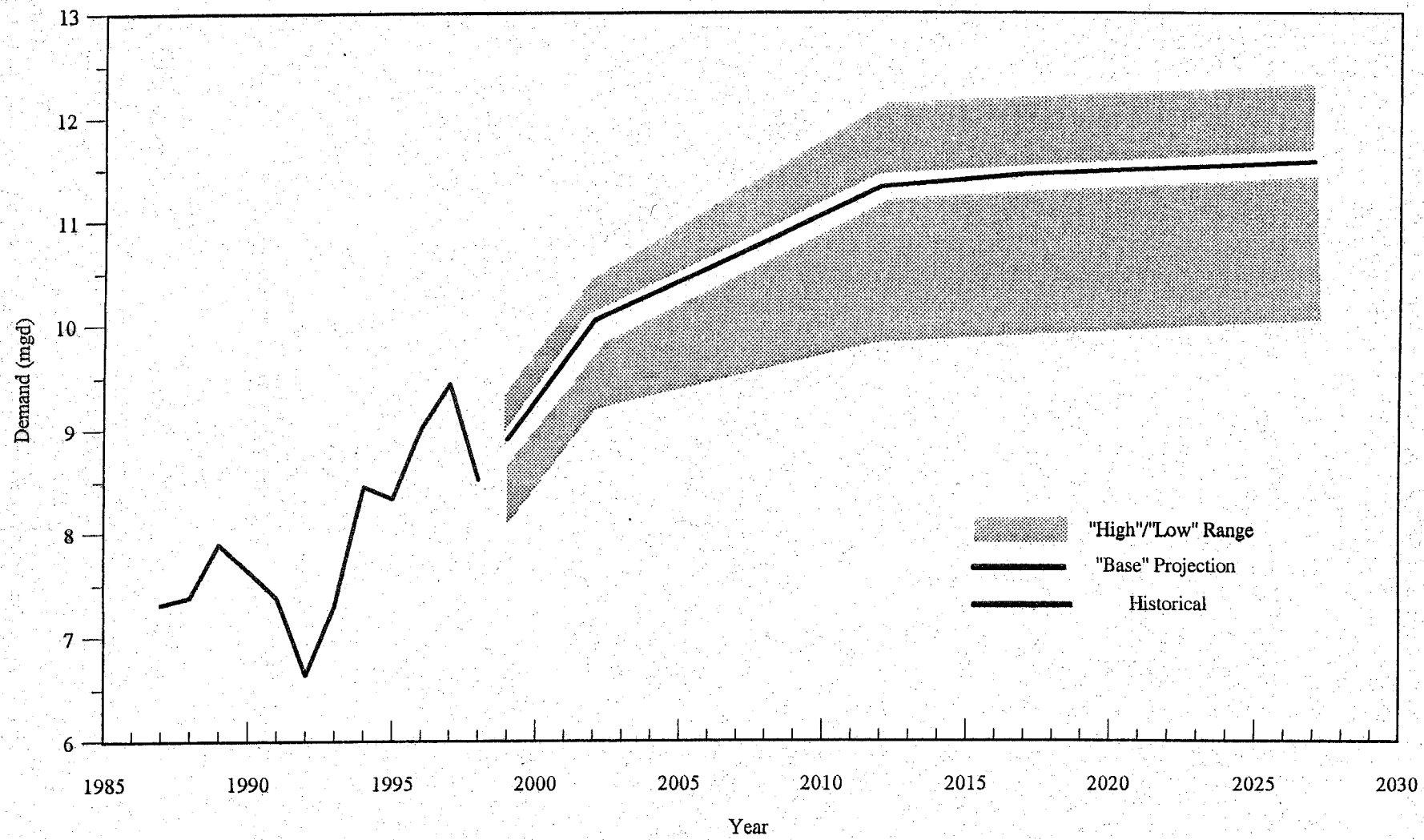
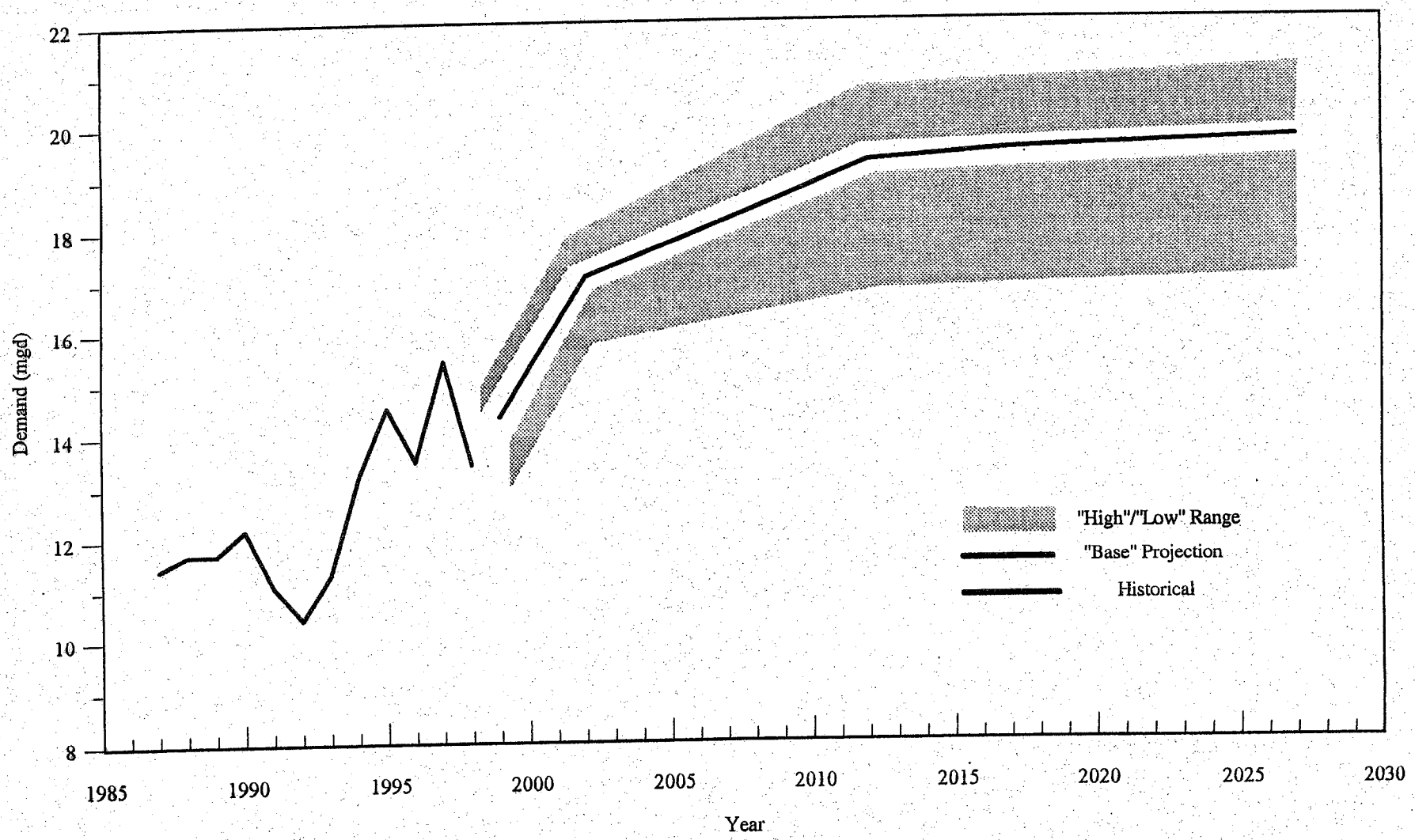


Figure 2-5
PVWC Maximum Day Demand Projections



line at 2012 indicates that the service area is substantially built out, and that residual growth from 2012 to 2027 is anticipated to occur at a slower rate.

SECTION 3
SOURCE OF SUPPLY

3.1 OVERVIEW

PVWC provides water to its customers from 7 groundwater wells ranging in depth from 1,145 feet to 1,743 feet. Six of the wells are owned by PVWC. The seventh well, Well PCX-1, is operated by PVWC in accordance with an agreement with the well's owner, the SRP, to treat the well at the MRTF. The rated well pump capacities for these wells range from 2,200 gpm to 2,500 gpm. The characteristics of these wells, water quality, and treatment are discussed in this section, except that details regarding the treatment processes/chemical usage and instrumentation and controls are discussed in Section 5.

Available well production capacity is compared to projected demands as one means for assessing source of supply adequacy. The status of groundwater regulations is also reviewed with respect to the long-term adequacy of PVWC's existing well supply. Finally, alternatives for obtaining additional sources of supply to meet increasing demands or to respond to the groundwater regulations are presented. For example, utilization of the Company's CAP allocation and membership in the CAGRD are discussed within this context.

3.2 EXISTING SOURCE OF SUPPLY

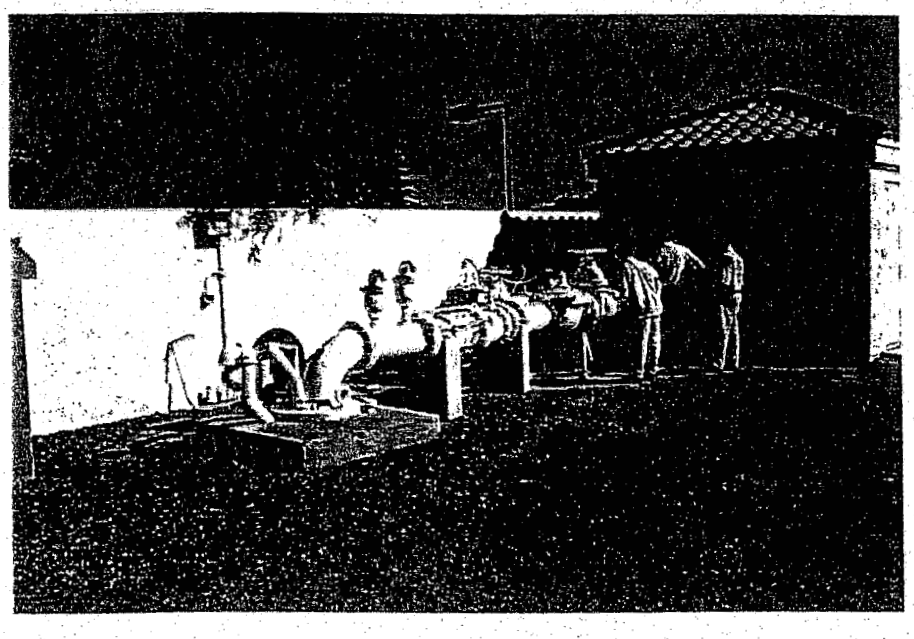
PVWC obtains 100 percent of its source of supply through groundwater wells constructed within its service area. The Water Company also has maintained an allocation for water from the CAP. The groundwater supply facilities are discussed in this section. The Water Company's CAP subcontract is discussed in Section 3.5 relative to future source of supply alternatives. Discussions were held in the past regarding the possible construction of emergency interconnections with the City of Phoenix, but none exist at present. The distribution system is also not interconnected with the COS, which is the other major municipal water provider that is contiguous with PVWC's service area.

3.2.1 Well Supply Facilities

Water pumped from Well PCX-1 and Well Nos. 14 and 15 is treated via aeration to remove VOCs. Otherwise, water produced from the wells is of good quality and generally requires treatment for disinfection only before being delivered to the distribution system. Well Nos. 16 and 17 were designed to provide disinfection with sodium hypochlorite and deliver water directly to the distribution system. A photograph of the wellhead, discharge piping, appurtenances, and treatment building for PVWC's newest well, Well No. 17, is shown as Exhibit 3-1.

Exhibit 3-1

PVWC Well No. 17



Water from Well Nos. 16 and 17 is diverted to the MRBS Tanks upon startup to prevent air and sand from entering the distribution system. PVWC recently installed a pipeline to deliver startup water from Well No. 17 to the site for Well No. 16, where it is combined with startup water from Well No. 16 and flows to the MRBS.

Wells No. 11 and 12 are located at the MRBS and pump water to a 0.2-MG ground storage tank, which serves to provide sand removal at startup. Water flows by gravity from this tank into two reservoirs (Miller Road Tank Nos. 1 and 2), which have a combined capacity of 0.50 MG. Distributive pumps at the MRBS deliver water from the tanks to the distribution system.

Raw water from Well Nos. 14 and 15 and SRP's well (Well PCX-1) is directed to the MRTF, located adjacent to Well No. 15, before being delivered to the distribution system. As discussed in detail in Section 5, treatment processes at the MRTF consists of packed column aeration for TCE removal and sodium hypochlorite addition for disinfection. Both Well PCX-1 and Well No. 15 are receiving aeration treatment at the MRTF. Aeration treatment will be initiated for Well No. 14 upon detection of TCE.

3.2.2 Hydrogeology

The aquifer used by PVWC is a portion of a larger region of alluvial basins located in the southwestern United States. The alluvial basins cover portions of California, Nevada, Utah, Arizona and New Mexico. This type of aquifer is generally a valley or basin surrounding or surrounded by mountain ranges. The basin is filled with material eroded from the mountains. This alluvial fill is an excellent aquifer material with high productivity and large storage capacity.

The region relies heavily on groundwater, primarily for agricultural uses. It has been estimated that more than half of the groundwater produced in the United States is pumped from the aquifers in this region. It was once thought that the supply of groundwater in the area was inexhaustible due to the great storage capacity. However, continuous long-term pumping has far exceeded the recharge from natural sources. Pumping practices have resulted in groundwater mining. Precipitation in many areas is usually less than 15 inches per year and is normally poorly distributed during the year.

A cross-section of the geology of the aquifer in the vicinity of the Water Company's well sites reveals three distinct layers over the bedrock. The upper layer, referred to as the Upper Alluvium Unit, consists of clay, silt, and gravel, and averages approximately 150 feet in thickness. A middle layer referred to as the Middle Alluvium Unit, consists mainly of clay or a silt/clay mixture and is approximately 500 feet thick. The bottom layer, referred to as the Lower Alluvium Unit, consists mainly of sand and gravel, and is over 900 feet thick in some locations. Historical well data indicate that the Lower Alluvium Unit provides much greater yields than the Upper and Middle Alluvium Units.

PVWC's six wells and SRP Well PCX-1 are located in the far eastern portion of the service area along Miller Road in the COS. The well sites are adjacent to the Arizona Canal which parallels Miller Road. The area near the wells is residential. The area east of Miller Road is the only location with sufficient saturated thickness for the development of large-capacity wells. The aquifer rises sharply to the west and is nonexistent near the mountains bounding the service area.

Well construction characteristics are summarized in Table 3-1. The six PVWC wells were constructed between 1959 and 1993. All wells are screened in the Lower Alluvium Unit. Casing and screen sizes vary among the wells. The wells have a gravel packing from the top to the bottom. Well Nos. 11, 12, and 15 are partially screened in the Middle Alluvial Unit. The water pumped from PVWC's well field is primarily

Table 3-1

Summary of Well Characteristics

Well Number	Year Drilled/ Rebuilt	Well Depth (Feet) (1)	Screened Interval (Feet) (1)	Pump Type	Pump HP	Depth of Pump Setting (Feet)	Well Size (Inches in Diameter)		Water Level (ft.) (1)		Specific Capacity (gpm/ft.)	Well Capacity (gpm)			
							Casing (1)	Column Pipe	Static (2)	Pumping		Rated Pump Capacity	Sustainable Yield	Maximum 24-Hour (3) (Summer)	Peak (4) (Summer)
11	1959	1,372	509-1,342	Vertical	300	550	20/16	10	384	398	157	2,200	2,100	4,200	4,200
12	1962	1,301	500-584 595-1,265	Vertical	300	550	24/20	10	382	396	157	2,200	2,100	(5)	(5)
14	1964/65	1,743	700-1,730	Submersible	400	520	20/8	10	382	390	263	2,100	2,100	2,100	2,100
15	1968/69	1,430	500-1,424	Submersible	400	505	20/18/16	10	381	393	183	2,200	2,100	2,150	2,275
16	1980	1,500	650-1,500	Submersible	600	540	18	12	392	408	138	2,200	2,200	2,500	2,650
17	1993	1,145	620-1,125	Submersible	600	570	20/16	14	382	N/A	N/A	2,500	2,500	2,250	2,400
PCX-1 (6)	1996/97	1,245	720-1,240	Submersible	600	350	20/16	12	262	317	40	2,200	2,300	2,100	2,175
												22.46 18.86	22.18 18.58	22.03 18.43	22.75 18.94

Notes:

N/A - not available
(1) Below ground elevation.
(2) Static water levels reported by Water Company for Summer 1998.
(3) Estimated 24-hour sustainable capacity throughout the summer months (1997).
(4) Estimated peak delivery capacity -- not sustainable over 24-hour periods in the summer months (1997).
(5) Well Nos. 11 and 12 are not individually metered. Above estimate reflects combined capacities for Well Nos. 11 and 12.
(6) Owned and maintained by SRP.

obtained from the Lower Alluvium Unit. The Water Company previously relied on wells screened in the Upper Alluvium Unit. These wells, Well Nos. 6 and 7, were capped and retired in 1998.

Historical water level records are available for Well No. 11, which is oldest active PVWC source of supply. The water level data for Well No. 11 are considered to be representative of conditions throughout the well field due to its close proximity to the other PVWC wells and similarities in construction. These data were analyzed in conjunction with a hydrogeologic study conducted in 1987. At that time a general decline in water levels was observed, which corresponded to the regional decline in groundwater levels.

The water table had declined from an average depth below the land surface of 309 feet in 1962 to 395 feet in 1987, corresponding to an average rate of decline of 3.45 feet per year. Seasonal variations in static water levels averaged 36 feet, with a maximum variation of 62 feet occurring in 1984. A regression of winter data indicates that the static water level in Well No. 11 declined at a rate of 5.2 feet per year from 1962 to 1984. The rate of decline was 4.2 feet per year for the period from 1962 to 1987; however, water levels have increased at the rate of about 6.7 feet per year between 1984 and 1987.

Projections of future water level declines and the prospects of future well yields were also discussed in the 1987 hydrogeology study. Aquifer characteristics and the performance of the PVWC wells were analyzed to determine the effect of declining water levels. It was estimated that the storage coefficient and transmissivity were 0.12 and 175,000 respectively. Based upon the aquifer characteristics, the ability to drill replacement wells to a greater depth, and the historic rate of water level decline, the 1987 hydrogeologic study indicated that a water supply would be available to meet the system's needs for at least 165 years.

More recent water level data, as well as other hydraulic and water quality data were compiled and presented in two hydrogeologic reports that were completed by a local hydrogeologist in 1995 and 1996. The primary purpose of these reports was to present the results of field tests and groundwater modeling relative to the migration of a contaminant plume towards the PVWC well field (see Section 3.2.3). In particular, these reports attempted to predict the time of arrival and contaminant concentrations in response to various well pumping scenarios.

The 1996 (Phase II) report includes a hydrograph for Well No. 15 that illustrates an increasing trend of water levels from 1984 through 1994. A linear regression of the maximum water levels (winter) over this

period indicates increasing water levels at the rate of 7.2 feet per year, which is consistent with the trend exhibited by Well No. 11 between 1984 and 1987.

The reason for the significant discrepancy between the long-term and recent water level trends in PVWC's well field is not known. However, the recovery of water levels in the wells may be attributed to reduced pumping by the COS and SRP from their well fields upon the discovery of groundwater contamination in the mid 1980's. During 1994, the COS placed in service a treatment facility that has enabled it to resume pumping from its well field. COS's resumption of pumping in 1994 is consistent with the hydrograph for Well No. 15, which appears to show a trend of declining water levels beginning again in 1994. This observation may also be related to annual weather conditions affecting the amount of groundwater withdrawals and recharge to the aquifer.

3.2.3 Water Quality and Source Protection

Groundwater quality varies throughout central Arizona. In general, the hydrogeologic characteristics of the aquifer in Paradise Valley are such that high concentrations of naturally occurring minerals and metals do occur. Concentrations of these dissolved minerals may exceed EPA and State limits, particularly in the case of the Middle Alluvium Unit.

Water Company records indicate that some of the wells are partially screened in the Middle Alluvium Unit, which may account for the low levels of arsenic and chromium that have been detected in water from the wells. Concentrations of chromium detected in PVWC wells average about 25 ug/L, but have been detected at concentrations approaching 50 ug/L in Well Nos. 11 and 12. These levels are below the MCL for chromium of 100 ug/L. The source of chromium may be from openings in the casing within the Middle Alluvium Unit.

Elevated concentrations of nitrate exceeding the MCL have been observed in water from Well No. 17. Upper portions of the Lower Alluvium Unit have been associated with higher levels of nitrates, and down flow through the casing when the pump is off is considered the likely pathway for migration of the nitrates to the lower portions of the aquifer in which Well No. 17 is screened. Other PVWC wells, including Well Nos. 11, 12, and 16, have exhibited maximum nitrate concentrations of less than half of the nitrate MCL. A more detailed discussion of alternatives for mitigating the elevated nitrate concentrations in Well No. 17 is presented in Section 5.

As pumping continues to lower the water level in Paradise Valley and the surrounding area, the chemical characteristics of the water may change. Also, saline water from the lower portions of the aquifer may cause an increase in the level of chlorides. Continued monitoring will provide an indication of chemical changes in the groundwater supply. Routine testing of water in the PVWC system will allow monitoring of these and other water quality constituents so that plans can be implemented to satisfy any water quality needs.

The aquifer in the vicinity of PVWC's well field was contaminated by TCE. TCE initially contaminated a number of the COS wells south of the PVWC well sites. Industrial manufacturing facilities operated by Motorola, Smith Kline-Beecham, and Siemens have been determined to be the source of the contamination. Motorola and the other two participating companies, known as the NIBW Participating Companies (PCs), have paid for the construction and operation of treatment facilities for the COS and PVWC. As part of the arrangement with the PCs, water from an SRP well, Well PCX-1, is being treated on a continuous basis at the MRTF. Well PCX-1 is located on the east side of the Arizona Canal, about 3,000 feet south of the MRTF. This well has exhibited TCE concentrations of up to 19 ug/L. Water from Well Nos. 14 and 15 is also pumped to the MRTF. However, TCE has not yet been detected in Well No. 14, and the maximum concentration of TCE detected in water from Well No. 15 has not exceeded 1.0 ug/L. TCE levels in well No. 15 are increasing at a rate of about 0.1 ug/L every 1 to 2 months. The MRTF has been designed to treat maximum influent TCE concentrations of 200 ug/L and to accommodate expansion to treat flows from other wells in the event that the contamination plume spreads. Pumpage from Well PCX-1 appears to effectively capture a significant portion of the contaminant plume. Additional characteristics of the MRTF construction and operation are discussed in Section 5.

PVWC has a mutually beneficial agreement with SRP to continuously treat water from SRP's Well PCX-1. Prior to the discovery of contamination, SRP pumped water from Well PCX-1 into the Arizona Canal for downstream municipal and irrigation uses. The agreement between PVWC and SRP stipulates that water from the well may be treated and delivered to the Water Company's distribution system provided that an equal quantity of aerated water is returned to the canal on an annual basis. Continuous pumping of Well PCX-1 is intended as a measure to slow the advance of the groundwater plume toward the Water Company's well field. PVWC banks water by pumping water from Well Nos. 14 and 15 to the Arizona Canal during the winter low demand months, thereby allowing continuous use of Well PCX-1 during peek summer demand periods.

Recent water quality sampling for radon indicates that this chemical is present in all of PVWC's wells in concentrations ranging from about 300 pCi/L to 500 pCi/L. The USEPA is currently considering a radon standard to be proposed in August 1999. USEPA has stated that the proposed MCL may be as low as 100 pCi/L; therefore, radon removal may be necessary for the PVWC wells. Radon is already being removed at Well Nos. 14 and 15 and PCX-1 through the MRTF aeration towers. A conceptual approach for enabling all of PVWC's wells to be provided with treatment for radon removal, if necessary, is in Section 5.3.2.

The Water Company does not maintain any active underground storage tanks. A 30-gallon above ground gasoline tank, located at the operations building, is used for the standby power generator for the control panel. Containment has been provided for this tank.

Water in the PVWC service area is routinely monitored by the American Water Works Service Company Laboratory in Belleville, Illinois. Compliance microbiological testing is performed by a local commercial laboratory. Minimal wet chemistry and coliform tests are routinely performed at the MRTF. Water quality monitoring results have shown that the water provided to PVWC customers meets all requirements of the USEPA and the State of Arizona. A summary of raw water quality sampling results is presented in Appendix A.

The wellheads, discharge piping, and appurtenant equipment for Well Nos. 15 and 17 are exposed to the outdoor elements. However, both wellheads are located on sites that are enclosed by walls with locked access gates. Also, the treatment equipment, instrumentation, and chemicals are located indoors. The electrical switch gear for Well No. 14 is located in a locked, brick building. The wellhead is located adjacent to the building. The site for Well No. 14 is not fenced. Well Nos. 11 and 12 are on a relatively large, unfenced site that includes the MRBS and storage tanks. Well No. 16 is located about 200 feet north of the MRBS facility on the same Water Company-owned property. Vehicle access to the sites is restricted by a locked cable. The wellheads and vertical turbine pump motors for these wells are located outdoors, but are sheltered from direct sunlight. With the exception of Well No. 16, electrical system components and instrumentation are located within brick buildings. The electrical switch gear and pump for Well No. 16 were replaced in early 1999.

3.2.4 Well Capacity

Table 3-1 summarizes the well construction and capacity characteristics of PVWC's well supplies. Well Nos. 16 and 17 have rated capacities of 2,200 gpm and 2,500 gpm, respectively. Well Nos. 11 and 12 are also equipped with pumps having rated capacities of 2,200 gpm. Water from Well Nos. 11 and 12 is delivered to the Main Pressure Zone via three (3) distributive pumps. Two of the distributive pumps have rated capacities of 800 gpm, and the capacity of the third pump is estimated to be 2,800 gpm. Well No. 15 and Well PCX-1 are equipped with pumps having rated capacities of 2,100 gpm and 2,200 gpm, respectively. The rated capacity of Well No. 14 is 2,100 gpm. Water from these three wells is pumped to the MRTF and into the distribution system via three (3) distributive pumps with rated capacities of 3,300 gpm each.

The rated total and reliable capacities of the existing wells are 22.5 mgd and 18.9 mgd, respectively. Available operating data from Summer 1997 were reviewed to verify that the wells and existing pumping equipment are capable of producing water at the rated capacities. Data were not available for Well Nos. 11 and 12 individually. However, the total flow from MRBS is included in Table 3-1 since it is representative of the combined, minimum sustainable well capacity of Well Nos. 11 and 12. Similarly, metered flow data for Well PCX-1 were not available until after 1997. Accordingly, the capacity of Well PCX-1 was estimated by subtracting the combined flow from Well Nos. 14 and 15 from the total flow rate through the air stripping towers at the MRTF.

A trend of gradually declining pumping rates was observed for Well Nos. 16 and 17 throughout the summer. This trend is likely associated with a seasonal reduction in the groundwater level in the aquifer in the vicinity of these wells. The pumping rate for Well No. 17 appeared to recover and begin to increase at the beginning of September, while the pumping rate for Well No. 16 continued to decline throughout the month of September. Supervisory Control and Data Acquisition (SCADA) data also exhibited hourly fluctuations of between 100 gpm and 200 gpm for these wells due to changes in system pressures. The pumping rates for the other wells were less variable.

These factors were considered in assigning the values of two additional measures of well capacity shown in the two rightmost columns of Table 3-1. The maximum 24-hour well capacity reflects the estimated well capacities that appear to be sustainable over a 24-hour continuous pumping period throughout the summer months. The peak well capacity represents the observed peak hourly flow that could be produced, but not

sustained, for 24 hours of continuous pumping. The values were estimated based on a graphical analysis of observed well production rates.

The operation of PVWC's wells is dictated by the plume management strategy and by operational considerations based on seasonal changes in water demand. Well PCX-1 and Well Nos. 14 and 15 are operated as base load pumps in an effort to contain the spread of the VOC contaminant plume. Well No. 17 is operated as a base load well from May through October when system demands are high enough to allow it to be operated continuously. Operation of Well No. 17 in this manner is consistent with effective VOC plume management since Well No. 17 is furthest from the contaminant plume and is therefore least likely to cause the spread of the contaminant plume. Year-round pumping of Well No. 17 may also enable the nitrate concentration to be reduced. A portion of the off-peak production from Well No. 17 would need to be diverted to the Arizona Canal (see discussion for Project A-7 at the end of Section 5). The operating sequence for the remaining wells consists of Well Nos. 16, 12, and 11. Well No. 11 is the closest well to the contaminant plume for which no treatment facilities have been constructed. Therefore, pumpage from Well No. 11 is minimized to reduce any tendency for contamination to spread northward.

The sum of the maximum 24-hour well capacities of 22.0 mgd is close to the total rated capacity of 22.8 mgd. The corresponding maximum day reliable well capacity is 18.4 mgd. The capacities of individual wells ranged from 2,100 gpm to 2,500 gpm. Overall, the estimated peak flow capacities are not significantly different from the rated capacities. However, Well No. 16 appears to be capable of producing at a rate about 20 percent higher, while the peak rate for Well No. 17 is estimated to be about 100 gpm (4 percent) lower.

3.3 SOURCE OF SUPPLY ADEQUACY

A comparison of the "base" scenario demand projections developed in Section 2 with the existing well supply capacity is presented in Table 3-2. The existing total well capacity and maximum day reliable well capacity are adequate to meet projected average day demands to beyond the current planning horizon. In addition, the total well capacity is anticipated to be adequate to meet projected maximum day demands for the "base" scenario (shown in Table 3-2), as well as the "high" scenario demand (21 mgd - from Table 2-5) throughout this time period. The reliable well capacity (with the largest unit out of service) is also capable of supplying the projected maximum day demand until 2007; however, increasing demand is projected to result in a deficit of 0.82 mgd by 2012. In the event that future maximum day demands track the "low" scenario projections (17.18 mgd by 2012 - from Table 2-5), the existing maximum day reliable

well capacity would be adequate throughout the current planning horizon. However, the deficit would increase to 2.55 mgd in the event that future demands coincide with the "high" scenario projections.

Table 3-2

Well Supply Adequacy

Year	"Base" Scenario Avg. Day Demand (mgd)	"Base" Scenario Max. Day Demand (mgd)	Total Well Capacity (mgd)	Reliable Well Capacity (mgd)	Max. Day Rel. Cap. Surp./Def. (mgd)
1997	9.45	15.41	22.03	18.43	3.02
2002	10.04	17.06	22.03	18.43	1.37
2007	10.68	18.16	22.03	18.43	0.27
2012	11.32	19.25	22.03	18.43	-0.82

Table 6-4 in Section 6.3.2.1 provides a summary of the diurnal peaking characteristics of the PVWC System. The peak hour ratios range from 1.35 to 1.63. The peak hour demand period generally occurs between the hours of 4:00 AM to 7:00 AM. A discussion of the benefits of maintaining well/production capacity in excess of maximum day demand is provided in Section 6.3.3.4.

As noted above, projections for source of supply adequacy are based on the existing pumping capacities of the wells. PVWC maintains a regular maintenance program for its well supplies that includes the periodic replacement of well pumps and related equipment, as necessary, to ensure operational reliability. With respect to recent pump replacements, the capacity of the new pumps have matched the old pumps, as well as the historic yields of the wells. Overall, the capacity of PVWC's well field has not declined due to the effects of declining regional groundwater levels, and information is not currently available which would support projections for reduced future well capacities. Therefore, the analysis of well supply adequacy presented in Table 3-2 is based on the current total and reliable well capacities.

3.4 GROUNDWATER REGULATIONS

The purpose of this section is to provide an overview of the regulatory programs that may impact PVWC's source of supply in the future. In addition to a continued emphasis on conservation, these regulations may

result in a need to implement renewable water resource strategies. An example of one such alternative is discussed in Section 3.5.

An overview of the Groundwater Management Act is discussed in Section 3.4.1. Section 3.4.2 provides a summary of the First and Second Management Plans (FMP and SMP). The basic and alternative conservation requirements for the Third Management Plan (TMP) are reviewed in Section 3.4.3. The Assured Water Supply (AWS) program requirements are discussed in Section 3.4.4.

3.4.1 Groundwater Management Act

Population growth in the Phoenix metropolitan area has dramatically increased the demand for water for domestic, commercial, and industrial uses. The resulting high consumption and the limited amount of renewable sources of water made this resource a major issue throughout the State of Arizona. In 1980, the State of Arizona enacted the Groundwater Management Act creating a framework for management and regulation of the withdrawal, transportation, use and conservation of groundwater. The overall goal of the Groundwater Management Act is to eliminate groundwater mining by 2025.

In order to implement the Act, a number of AMAs were created. The AMAs are geographical areas designated for special groundwater management and regulation. PVWC is included in the Phoenix AMA which covers a majority of Maricopa County. The ADWR is required to develop a management plan for the AMAs for each of five time periods through 2025. The management plans are to include a continuing mandatory conservation program designed to achieve reductions in the withdrawal of groundwater. Conservation is mandated for agricultural, industrial and municipal water providers. As discussed in the following sections, the management plans provide specific measures that are intended to enable the Groundwater Management Act goal to be achieved.

3.4.2 First and Second Management Plans

The main thrust of the First and Second Management Plans was a mandated reduction in the per capita consumption of water through conservation measures. January 1, 1987 was the initial compliance date of the First Management Plan (FMP) imposed on the Phoenix AMA, which includes PVWC.

The ADWR's FMP required restrictions on the amount of water withdrawn and distributed by water providers. The FMP required PVWC to reduce the total amount of water provided to its customers by achieving a target maximum GPCD rate on an annual basis. The FMP also imposed restrictions on water

use by turf-related facilities. Examples of turf-related facilities include golf courses, resorts, or developments having large areas of grass or ornamental vegetation. There are three turf-related facilities that are currently served by PVWC: PVCC, Mountain Shadows Resort, and the Kiva Elementary School.

The 1980 calendar year was selected as the baseline for calculating target GPCD rates. The 1980 consumption rate for PVWC was 884 GPCD, one of the highest rates in the Phoenix AMA. Under the First Management Plan, PVWC was required to achieve an 11% reduction from this rate to a maximum rate of 787 GPCD beginning in 1987. GPCD rates calculated by ADWR for the years 1987 through 1991 exceeded this target rate. PVWC disputed the GPCD rates calculated by ADWR, but negotiated a Stipulation and Consent Order with the ADWR whereby the Water Company agreed to implement the conservation measures previously discussed in Section 2.2. As a private water company, PVWC does not have the authority to implement or enforce mandatory GPCD requirements.

The SMP became effective in 1992 and will remain in effect until 2001, which is the anticipated implementation date for the TMP. The SMP continued the conservation programs instituted during the FMP. In the SMP, ADWR developed an approach for determining the conservation "potential" for each municipal provider. ADWR reduced the target GPCD rates for large providers based on the perceived conservation potential. The conservation program requires that PVWC maintain a maximum GPCD rate of 787 through 1994, 731 through the year 1999, and 681 for the Year 2000. However, as a result of the Stipulation and Consent Order, PVWC's effective GPCD target for 1992, 1993, and 1994 was 972 GPCD.

In addition, an Alternative Conservation Program (ACP) and Non-Per Capita Conservation Program (NPCCP) were instituted during the SMP period. The ACP permits providers who can demonstrate an overall reduction in groundwater pumping to comply with the SMP by meeting a target residential GPCD rate and by implementing prescribed nonresidential conservation measures. The NPCCP was instituted in 1995 to allow large providers to comply with the SMP by agreeing to reduce their groundwater use and by implementing conservation measures recommended by ADWR.

The Second Management Plan also required that distribution system losses not exceed ten percent on an annual or three-year average basis. PVWC has maintained an UAF loss of approximately 8 percent, and therefore, continues to meet this requirement.

3.4.3 Third Management Plan

The ADWR issued a draft of the TMP for industrial, agricultural, and municipal water providers within the Phoenix AMA in March 1998. The TMP is expected to be adopted by the end of 1999, following a formal public notification and hearings process. The TMP will become effective at the beginning of 2001 (2 years after adoption) and will remain in effect through 2009. The draft TMP includes a continued emphasis on the municipal provider's GPCD rate as the primary conservation tool.

The primary conservation requirement of the TMP is anticipated to be based on the GPCD Program. This program is similar to the conservation requirements contained in the FMP and SMP in that water providers could comply with the TMP by meeting an assigned GPCD target. However, lower GPCD targets are expected to apply for the TMP to reflect ADWR's perceived opportunities to increase water use efficiency based on analyses conducted during the SMP. For example, the target total GPCD for PVWC under the TMP is anticipated to be 681. PVWC's reported actual total GPCD rate was 899 in 1994, which was second highest among 33 large municipal providers in the Phoenix AMA and reflects the unique character of the PVWC customer base. In consideration of the recent trend toward higher water consumption in its service area (recently, PVWC's GPCD has exceeded 1,000), the Water Company is unlikely to comply with the TMP under the Total GPCD program.

The draft TMP also includes an Alternative Conservation Program (ACP) that was first instituted during the compliance period for the SMP. This program provides flexibility by establishing a target GPCD value based on residential water use only, use of "best management practices" (BMP) to address nonresidential water use, and an overall limit on the amount of groundwater usage based on the total groundwater withdrawals (for all uses) from 1980 to 1989. However, the program is designed to provide large municipal providers who serve a disproportionate amount of water to nonresidential customers an alternative method of complying with the groundwater code.

Under the ACP, the target residential-only GPCD for PVWC will reportedly correspond to the average of actual residential GPCD rates from 1992 through 1996. Given the trend toward higher residential consumption rates, PVWC is unlikely to comply with this part of the ACP. Furthermore, the estimated average annual total groundwater withdrawal from 1980 to 1989 was only 6.85 mgd. Reducing PVWC's total future usage to this level appears to be unlikely. For example, this amount was exceeded every year since 1987 except 1992. In 1997, PVWC's usage exceeded the amount by 2.6 mgd. In addition, the difference between the average groundwater withdrawal from 1980 to 1989 (6.85 mgd) and the projected

2012 average day demand of 11.3 mgd is greater than PVWC's CAP allocation (2.89 mgd), which is PVWC's only available renewable water resource that could be used to offset groundwater pumping. Therefore, the Water Company would need to identify an additional source(s) of non-groundwater as a means for reducing its annual total reliance on groundwater. Unless this can be accomplished (and PVWC's residential usage reduced), PVWC's would not be able to comply with the TMP through the ACP.

The draft TMP also contains a Non-Per Capita Conservation Program (NPCCP). Under the NPCCP, water providers may be allowed to implement recommended conservation measures (RCMs) that are negotiated with the ADWR instead of meeting GPCD requirements. However, in order to qualify for the NPCCP, water providers must be taking steps to reduce groundwater use to the amount replaced through recharge by 2010. Obtaining designation as an AWS (discussed in the following section) would be one means for doing this. Alternatively, water providers may qualify for the NPCCP without being designated as an AWS by agreeing to incremental reductions in groundwater usage so as to completely eliminate the use of groundwater by 2010. PVWC's compliance with the TMP under the NPCCP is therefore dependent on obtaining an AWS designation or developing an alternate means for eliminating its dependence on nonrenewable groundwater supplies.

The existence of the 1980 Groundwater Management Act and the impending adoption of the TMP as a means for implementing its goals and objectives complicates water supply planning for PVWC. For example, although it may be possible to develop additional groundwater wells for the purpose of providing adequate maximum day reliable capacity, the use of additional groundwater may be viewed as being inconsistent with the 1980 Groundwater Management Act goal of reducing groundwater withdrawals for the Phoenix AMA to safe yield levels by 2025.

3.4.4 Assured Water Supply Program

The AWS program is designed to support the goal of the Groundwater Code to reduce groundwater withdrawals within the Phoenix AMA to safe yield levels by 2025. Originally developed as a means for ensuring that adequate water supplies were available for new subdivisions, the current program has evolved over a period of about 25 years in which its role in assuring water supply availability to all users has increased. The current program, adopted on February 7, 1995, requires that all new subdivisions within the Phoenix AMA demonstrate that enough water is available to meet its demands for at least 100 years, or that the subdivision be located within the service area of a water provider who has been designated as an

AWS by virtue of a similar demonstration for its entire service area. In any case, water providers are not obligated to obtain an AWS designation.

Many of the large municipal water providers in the Phoenix AMA, including both the City of Phoenix and the COS have applied for AWS designation status as a means for sustaining growth and expansion. The AWS status relieves the burden on developers to obtain individual AWS certificates, thereby enhancing the development potential. In contrast, obtaining status as a designated AWS is less important for supporting development in the town of Paradise Valley, where there are a limited number of parcels of land that would qualify as subdivisions. Although subdivisions for commercial and industrial uses, as well as residential, are subject to the AWS requirements, the technical definition of a subdivision essentially excludes hotels/resorts, golf courses, and many types of commercial development. For example, apartment complexes are explicitly excluded from the AWS requirements.

Between September, 1988 and August, 1995, PVWC held an AWS designation based upon a physical demonstration of water availability to the ADWR. A technical report supporting this demonstration was prepared in October, 1987 by A-N West, Inc. This demonstration was based on both available groundwater within the aquifer and use of the PVWC's CAP allocation. However, new administrative criteria were instituted in early 1995 which severely limited PVWC's ability to rely on groundwater for achieving designated AWS status. These criteria made achieving an AWS designation much more difficult in light of PVWC's relatively small CAP allocation and high groundwater use. For this reason, and because the service area was substantially built-out, PVWC allowed its AWS designation to lapse by not submitting a renewal application by the deadline of August 7, 1995.

The new administrative criteria for the AWS program appear to provide a mechanism for gaining credit for the use of "exempt" groundwater, incidental recharge, and recharge through membership in the CAGRD. These factors may be considered along with PVWC's CAP allocation in demonstrating a 100-year water supply. Accordingly, AWS designation may be beneficial to PVWC with respect to compliance with the TMP under the NPCCP.

A number of criteria must be met in order to obtain AWS designation. First, water must be demonstrated to be physically and continuously available to meet current and projected demands for at least 100 years. With respect to groundwater availability, the 1995 rules specify a maximum depth-to-water level standard of 1,000 feet, which is 200 feet higher (200 feet less available saturated thickness) than the level previously

used to assess availability under the AWS. Furthermore, ADWR may evaluate the physical availability of groundwater on a sub-regional basis to take into account the impact of planned groundwater withdrawals by the City of Phoenix, the COS, and others for their own demonstrations of physical availability. Accordingly, the amount of groundwater that ADWR considers available to PVWC may be less than if calculated based on regional data. The entire amount of PVWC's CAP allocation may be considered to be physically available provided that PVWC can implement a means for obtaining delivery of CAP -- either directly or indirectly.

The other major criterion is management goal consistency. The management goal is to reduce groundwater withdrawals to safe yield levels by 2025. Safe yield is defined by the Groundwater Code as "the long-term balancing of groundwater withdrawals with the amount of water naturally and artificially recharged to AMA aquifers." The management goal consistency criterion is concerned with demonstrating that renewable sources of supply are used such as: CAP allocation, other surface water, effluent, water exchange agreements, membership in the CAGRD, and others. PVWC would also receive a one-time mined groundwater allocation equal to 7.5 times the 1994 water usage, and this may be planned for use at any time within the 100-year period. However, this allocation is intended to be used to allow renewable supplies to be phased in. The mined groundwater allocation plus incidental recharge represents the maximum total groundwater apportionment that is considered available. The amount of water that is considered to be naturally recharged is referred to as incidental recharge. For the purpose of attaining AWS status, incidental recharge is considered to be a minimum of 4 percent of the demand in the previous year, although the water provider may demonstrate a higher allowance. Groundwater withdrawals in excess of the mined allocation and incidental recharge would need to be offset by additional recharge or through membership in the CAGRD.

In addition to these criteria, applicants for designated AWS status must demonstrate that the water quality of proposed sources meets applicable water quality standards. In order to qualify for the NPCCP, PVWC would also need to show consistency with the management plan by participating in conservation programs negotiated with the ADWR for residential and nonresidential customers. Finally, PVWC would need to show ACC approval for financing the construction of any water supply facilities needed to carry out its AWS program.

3.5 SOURCE OF SUPPLY ALTERNATIVES

The purpose of this section is to discuss source of supply alternatives that may be considered by the Water Company to address projected supply deficiencies and/or the need to implement renewable water resource strategies. The alternatives discussed are those that are considered to be feasible alternatives in consideration of PVWC's existing sources of supply, service area characteristics, and geographic location.

The possibility of developing additional groundwater supplies as a means for providing adequate maximum day reliable capacity is discussed in Section 3.5.1. The CAP is described in Section 3.5.2, including an overview of the administrative role of the CAWCD with respect to CAP. Technical aspects of the CAGRD are presented in Section 3.5.3. Potential regional sources of purchased water are summarized in Section 3.5.4.

3.5.1 Additional Groundwater Supply

As discussed in Section 3.3, PVWC is facing a projected maximum day reliable well capacity deficit of 0.8 mgd. The construction of an additional well supply is a feasible alternative for eliminating the projected deficit. Groundwater regulations intended to encourage a reduction in the volume of groundwater withdrawn do not apply to the construction of a new well. PVWC could construct and equip a new well subject only to the availability of a suitable well site and adequate hydrogeologic conditions.

PVWC and the SRP recently reached an agreement that would involve an exchange of SRP's groundwater for PVWC's CAP allocation (see Section 3.5.2.5). In addition to providing a means for PVWC to utilize its CAP allocation, the arrangement would also provide PVWC with the use of another SRP well along the Arizona Canal. Use of the well would provide PVWC with sufficient well supply capacity for the foreseeable future. Accordingly, the implementation of PVWC's use of the SRP well is discussed as recommended Project A-2 in Section 3.6.

Another possibility would be the conversion of two monitoring wells (PG-40 and PG-41) located about 1,500 feet south of the MRTF to production wells. These wells are reportedly capable of producing a total supply of about 1,200 gpm. Therefore, conversion of one of these wells would be adequate to eliminate the projected deficit through at least 2012. A potential disadvantage with this alternative is the likelihood that the monitoring wells (which are located closer to the plume than Well Nos. 14 and 15) would require treatment at the MRTF. In the event that the plume migration eventually impacts Well Nos. 14 and 15, as well as the monitoring wells, the existing treatment and distributive pumping capacity of the MRTF may

require expansion sooner than might otherwise be needed. Conversely, the use of a production well closer to the existing plume may be beneficial for further slowing the rate of plume migration such that the existing PVWC wells would not require treatment at all.

The monitoring wells were constructed as 8-inch wells, which is larger than the 4-inch diameter wells that are typically used for water quality monitoring. The existing pipeline from Well PCX-1 to the MRTF was installed with flanges to accommodate connections to the monitoring wells. Use of the existing pipeline to convey water from the monitoring wells to the MRTF would require aeration of the commingled well water, whether or not the monitoring wells had become contaminated.

In the event that the existing SRP or PVWC monitoring wells cannot be used, a new well could be considered. A possible location for the well would be in the vicinity of Indian Bend Road and Scottsdale Road north of PVWC's existing wells. PVWC does not currently own a well site in this part of the Town of Paradise Valley; therefore, a new site would have to be obtained. A site north of the existing wells is anticipated to beneficial with respect to the NIBW contaminant plume management strategy. However, the occurrence of elevated nitrate concentrations in Well No. 17 and in wells operated by the City of Phoenix in the Mockingbird system indicates that treatment would likely be needed. In addition, a transmission main would need to be installed to connect the well site to the existing PVWC distribution system.

Although additional groundwater sources offer relatively low cost and are consistent with PVWC's existing operations, potential disadvantages include: inconsistency with possible requirements pertaining to the use of renewable supplies, the potential for increasing problems associated with land subsidence, and potential for negatively impacting plume migration.

3.5.2 Central Arizona Project (CAP)

3.5.2.1 Overview

The CAP canal first began delivering water from the Colorado River in 1985. The overall cost of the project, which was substantially completed in late 1993, was $4 billion. The CAP is a 336-mile long series of concrete canals, tunnels, siphons, and pipelines from the Colorado River near Parker to Tucson. It is capable of delivering a maximum of 1.8 million acre-feet (about 1,600 mgd) in high run-off seasons, or about 64 percent of the State of Arizona's federal entitlement of 2.8 million afy. The CAP's estimated annual capacity is 1.5 million afy.

In addition to providing a renewable water supply, the CAP project also includes electric power generation, recreation, wildlife management, and flood control. The CAP has more than 80 major customers, of which approximately 75 percent are municipal and industrial users, 13 percent are irrigation districts, and 12 percent represent the Indian Community. During 1997, a total of 1.4 million acre-feet of water was delivered from the CAP. The CAP is an interruptible supply with outages occurring on a seasonal basis to allow maintenance of the canal system. According to PVWC's CAP subcontract, outages as long as 6 months are possible.

3.5.2.2 Central Arizona Water Conservation District

The Central Arizona Water Conservation District (CAWCD) is a political subdivision of the State of Arizona that was formed in 1971 to provide a means for Arizona to repay the federal government for the reimbursable costs of constructing the CAP. CAWCD maintains responsibility for operating, maintaining, and managing the CAP for the benefit of its service area, which includes Maricopa, Pima, and Pinal Counties. The CAWCD is also responsible for planning and implementing groundwater replenishment projects through the CAGRD (see Section 3.5.3).

During 1996, the State of Arizona enacted legislation which created the Arizona Water Banking Authority (AWBA). The AWBA's purpose is to enable the State of Arizona to more fully utilize its allotment of Colorado River water. It does this by purchasing a portion of Arizona's unused allotment and transporting the water through the CAP to underground aquifers in central Arizona or to be used by irrigation water districts in lieu of groundwater pumping. The AWBA is managed by a 5-member commission and funded by groundwater pumping fees, a four-cent property tax collected by CAWCD, and a State General Fund appropriation.

3.5.2.3 PVWC's CAP Allocation and Cost

An alternative to a portion of its present groundwater supply is available to PVWC. PVWC has signed a subcontract with the CAWCD to receive 3,231 afy of untreated water from the CAP. PVWC has not utilized this water, nor does it have a physical means for obtaining its allocation directly from the CAP canal. However, the CAP subcontract has been maintained as a potential future source of supply.

There are two different costs associated with maintaining and using PVWC's CAP allocation. The first represents the payment of capital charges for securing the CAP allocation for future use. These charges are based on PVWC's full CAP allocation and are owed on an annual basis regardless of the amount of

current CAP usage. Current users of CAP water also pay a water delivery charge. The water delivery costs vary in proportion to the quantity of CAP water use based on fixed operating and maintenance (O&M) expenses and variable energy (pumping) costs.

During 1998, the overall water delivery rate was $65 per acre-foot, consisting of a fixed O&M charge of $29 per acre-foot and energy charge of $36 per acre-foot. Fixed O&M costs are paid according to the annual quantity of water ordered, whether delivered or not. The $29 per acre-foot charge for 1998 was based on $42.5 million of expenses and projected deliveries of 1.48 million acre-feet. Pumping energy costs are collected only for water actually delivered. The delivery rate for 1999 is $69 per acre-foot and is projected to increase to $70 per acre-foot in the Year 2000 and $75 per acre-foot by the Year 2003.

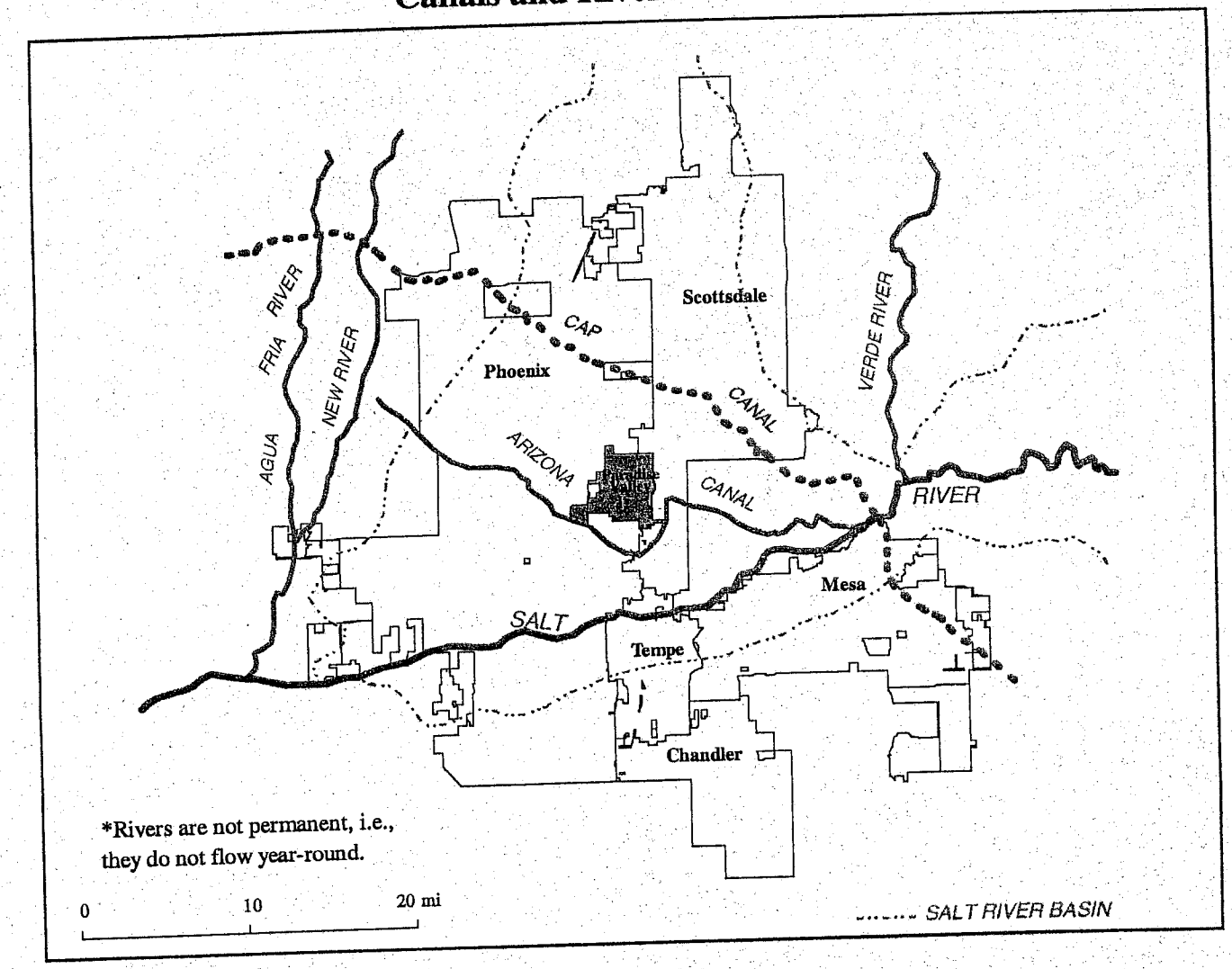
Originally, the cost of holding a CAP water subcontract was $7 per acre-foot per year. The capital charge rose to $39 per acre-foot in 1997 and $48 per acre-foot in 1998 and is projected to increase to $54 per acre-foot by 2000, after which time it will remain fixed at this level. As a private water company, PVWC has been unable to recover the CAP holding costs through its water rates due to its inability to make its CAP subcontract used and useful. Accordingly, PVWC discontinued its payment of the CAP allocation holding cost in 1995. Payments that are in arrears would have to be made current before PVWC could receive any of its CAP allocation. Based on 1999 CAP charges, PVWC's total annual cost for full use of its CAP allocation is about $400,000

3.5.2.4 CAP Usage Alternatives

Water from the CAP is generally used in three ways: 1) direct treatment and delivery, 2) treatment and blending with other sources, and 3) recharge. The CAP costs discussed in the previous section are for the delivery of untreated CAP water to a designated point along the CAP Canal only. Individual subcontractors are responsible for the capital and O&M costs associated with raw water pumping and transmission, treatment, and distribution facilities. Accordingly, the overall cost of CAP will depend on how it is ultimately utilized for public water supply purposes. CAP water is derived from surface supplies and must receive a corresponding level of treatment in order for it to be suitable for direct use in potable water systems. However, reduced treatment requirements may apply in the event that the water is blended, recharged, or used in a non-potable application.

Exhibit 3-2 shows the location of the CAP canal in relation to the Town of Paradise Valley. At its closest point, the CAP canal is about 8 miles north of the PVWC service area. PVWC has no existing provisions

Exhibit 5-2
Paradise Valley Area
Canals and River Features*



for obtaining water directly from the CAP Canal. For these reasons, direct delivery of PVWC's CAP allocation is not considered to be a feasible alternative. Originally, PVWC had anticipated obtaining its CAP allocation via a purchased water agreement with the City of Phoenix. However, the parties were unable to negotiate an agreement that would have provided for the treatment and delivery of treated CAP water from the City of Phoenix.

CAP exchanges are potential alternatives to taking direct delivery of CAP water. As opposed to a transfer, in which PVWC would permanently relinquish its CAP allocation to another provider in return for monetary compensation (for costs incurred by PVWC in acquiring and holding the CAP allocation), exchanges offer the advantage of enabling the Water Company to receive the equivalent of its CAP allocation via means that are more immediately available and potentially involve fewer regulatory hurdles. The use of the equivalent of its CAP allocation through exchange agreements is also consistent with the Groundwater Management Act's goal of minimizing groundwater mining, and CAP water exchanges could represent a cost-effective approach to complying with the requirements of the TMP.

A potential water exchange agreement involving PVWC's CAP allocation and the SRP is described in Section 3.5.2.5. Another possibility is to use the CAP allocation in exchange for recharge credits to the CAGRD. The District is discussed in Section 3.5.3. PVWC's CAP allocation might also be useful in conjunction with a possible purchased water arrangement that involves a CAP exchange with the City of Phoenix or COS.

3.5.2.5 Salt River Project Exchange

The SRP delivers water from surface supplies and well fields to irrigation users in the Phoenix metropolitan area through a series of canals. One of these canals, the Arizona Canal, is located adjacent to the PVWC service area in the COS. A connection completed in 1994 can transfer CAP water into the top of SRP's canals near the Granite Reef Dam. As a result, these canals, including the Arizona Canal, can be used to deliver CAP water to users that would otherwise receive water from SRP's own sources only. A photograph looking south along the west side of Arizona Canal at the McDonald Drive bridge crossing is shown as Exhibit 3-3. The photograph was taken from a point along the Canal adjacent to Well No. 14. The tops of the roofs enclosing the MRTF stripping towers are visible to the right of the nearest telephone pole. The Arizona Canal is approximately 100 feet wide at this location

Exhibit 3-3

Arizona Canal - Scottsdale, Arizona

During 1997, PVWC and the SRP signed a formal agreement that facilitates PVWC's use of SRP Well PCX-1 in exchange for the delivery of an equal volume of water to the Arizona Canal from PVWC's other wells. The agreement is beneficial to PVWC because it provides an additional source of supply for meeting peak period demands. The SRP benefits from the treatment of the contaminated Well PCX-1. Both PVWC and the SRP benefit from the pumpage and treatment of contaminated water from Well PCX-1 to the extent that this is effective in preventing further contamination of their well supplies.

During 1998, PVWC and the SRP reached an agreement in principle to amend their existing agreement to allow for the exchange of PVWC's CAP water for water from SRP's Well PCX-1 and Well 22.6, which is located across the Arizona Canal from Well No. 14. This agreement would involve the SRP taking PVWC's CAP allocation at its CAP/SRP Interconnection Facility (CSIF) and would offset the need for PVWC to repay usage from Well PCX-1 with pumpage from Well Nos. 14 and 15 into the Arizona Canal. However, PVWC would have to continue to pump water the Arizona Canal to the extent that the combined pumpage from Well PCX-1 and Well 22.6 exceeds PVWC's CAP allocation.

In addition to the estimated capital cost of $250,000 for constructing the facilities needed to implement the use of SRP Well 22.6 (see Project A-2), PVWC will face annual costs associated with the retention and purchase of CAP water, as well as expenses payable to the SRP for transportation of PVWC's CAP water through the Arizona Canal and an administrative charge. These cost increases would be partially offset by a reduction in the groundwater withdrawal fee payable to the ADWR and possibly by a power savings associated with pumping water from Wells PCX-1 and SRP 22.6. Details on cost responsibilities will be determined in final negotiations with the SRP, which are pending the outcome of PVWC's rate case. The capital cost savings for the agreement may be estimated to be as high as $2,750,000, which corresponds to the difference between the estimated $3 million cost for constructing a new well, treatment facility, and pipeline and the cost of Project A-2.

The SRP would benefit from the increased flexibility in the use of PVWC's CAP allocation as compared to groundwater delivered to the Arizona Canal. For example, SRP could potentially receive PVWC's full CAP allocation in one day and divert it to any of its canals. In contrast, the present agreement only enables the SRP to receive exchange water from PVWC in the Arizona Canal on an annual basis. The agreement would be beneficial to PVWC because it provides a means for using its CAP allocation, as well as providing an additional well that may be used to meet peak day demands.

Use of PVWC's CAP allocation (a renewable water resource) would reduce groundwater withdrawals and would therefore be consistent with the goals of the Groundwater Management Act. Furthermore, capital costs and O&M expenses associated with the implementation of the agreement appear to be relatively low, especially in comparison to the cost of other means for utilizing PVWC's CAP allocation and providing for additional reliable capacity. The benefits of the agreement have been recognized, in principle, in the testimony of the ACC and Residential Utility Consumer Office (RUCO) on PVWC's application for an increase in rates based, in part, on the recovery of its CAP-related costs. The agreement has also been endorsed by ADWR's Director of the Phoenix AMA.

TMP Compliance Assessment of Water Exchange Agreement

While consistent with the Groundwater Management Act, it is unclear how PVWC's anticipated reduction in groundwater usage as a result of the proposed CAP water exchange will be recognized toward compliance relative to the TMP. As discussed previously, obtaining status as a designated AWS and achieving compliance through the NPCCP appears to be the only mechanism for gaining credit for the use of renewable water supplies. For example, PVWC's CAP allocation could be considered along with its

groundwater allocation, incidental recharge credit, and credits through membership in the CAGRD in its 100-year water supply budget.

The number of credits that PVWC may need to obtain through membership in the CAGRD could be reduced in the event that credits for "exempt groundwater" could be obtained. Exempt groundwater is groundwater pumped and treated from wells that have poor quality. The exempt groundwater concept, in general, appears to be beneficial to PVWC. Recognition of exempt groundwater status for PVWC Well Nos. 14 and 15 in particular is consistent with USEPA's anticipated Final Consent Decree for the NIBW Superfund site, which will require operation of these wells as part of the remedy for the VOC contamination. Exempt groundwater status would also likely apply to the use of monitoring wells (PG-40 and PG-41), which were discussed as possible alternatives for obtaining additional groundwater supply capacity. Similarly, the recent discovery of nitrate contamination in Well No. 17 may qualify this well for exempt groundwater status. Any of PVWC's groundwater supplies deemed as exempt groundwater would potentially be considered by ADWR as the equivalent of a renewable water resource for the purpose of evaluating TMP compliance.

The proposed CAP water exchange with SRP may not minimize the number of groundwater recharge credits needed by PVWC in the event that exempt groundwater is recognized by ADWR. This is because PVWC would be unlikely to receive a credit for exempt groundwater for use of Well PCX-1 as well as use of its CAP allocation. While the CAP water exchange agreement may not minimize the number of groundwater recharge credits required, it will be beneficial for helping to comply with the TMP, as well as for providing reliable source of supply capacity for meeting existing and projected maximum day demands.

3.5.3 Central Arizona Groundwater Replenishment District

The Central Arizona Groundwater Replenishment District (CAGRD) was created by the Arizona legislature in 1993 to serve as a division of the CAWCD. The primary purpose of the CAGRD is to provide a mechanism for developers and water providers to demonstrate an AWS. The CAGRD accomplishes this by creating recharge projects to replenish groundwater that is pumped from aquifers in the CAWCD's three-county service area.

As discussed in Section 3.4.4, the AWS Rules require that all new subdivisions within the Phoenix AMA demonstrate that a sufficient quantity of water is continuously available to satisfy the water demands of the development for a period of 100 years and that groundwater pumped from within an AMA may not be the

basis for that demonstration. Alternatively, a subdivision is not required to demonstrate an AWS if it is located within the service area of a water provider who has demonstrated an AWS. Accordingly, membership in the CAGRD is available to both owners of subdivisions and municipalities or private water companies desiring to demonstrate an AWS.

Currently, there are three subdivisions within the PVWC service area that are members of the CAGRD. PVWC is responsible for maintaining records on water delivery information for the customers in these subdivisions and submitting this information to the CAGRD for their use in calculating the replenishment assessment.

Membership in the CAGRD enables a municipality, private water company, or individual subdivision to offset its "excess groundwater" usage through the payment of a replenishment tax, the proceeds of which are used to fund the CAGRD's recharge projects. Excess groundwater usage is the annual amount of groundwater withdrawn that exceeds the total groundwater allocation established by the AWS Rules for the member service area or subdivision. The amount of excess groundwater that is subject to the replenishment tax may be reduced by any replenishment credits that are applied by the member.

The CAGRD must recharge the total amount of excess groundwater pumped in each AMA, and recharge must be accomplished in the same AMA as the excess groundwater withdrawals. It does this through two types of recharge projects -- direct and groundwater savings. Direct recharge projects refer to the use of underground facilities to store water. This is accomplished by flooding a site and allowing water to percolate through the soil and into the aquifer. CAGRD has participated in three State Demonstration projects and in the identification of additional sites for project development. Potential recharge sites are carefully screened to ensure adequate aquifer permeability and storage capacity, lack of soil contamination, and suitability for future recovery of the stored water.

The Granite Reef Underground Storage Project (GRUSP) began operation in 1994 as a joint recharge project for the SRP and the Cities of Phoenix, Scottsdale, Chandler, Mesa, Gilbert, and Tempe. The CAGRD contracted with the SRP to use SRP's share of GRUSP's capacity, and through 1996, had stored more than 150,000 acre-feet of excess CAP water at the site. Use of the GRUSP provides the cities and SRP with recharge credits that may be used to offset groundwater pumping. The annual recharge capacity at the GRUSP site is 200,000 acre-feet.

The other type of recharge project -- groundwater savings facilities -- are not physical facilities, rather they are a form of indirect recharge. For this type of project, the CAGRD reaches agreements with municipal water providers, irrigation districts or other entities with renewable sources, e.g., CAP water, to use these sources in lieu of groundwater pumping. In return for their use of renewable sources, these entities receive recharge credits that may be used toward pumping groundwater in excess of their own groundwater allocations in the future.

Members of the CAGRD are obligated to pay a replenishment tax according to the total number of acre-feet of excess groundwater they deliver to their subdivision or service area during a year, less any replenishment credits. Member service area agreements (those between water providers and the CAGRD) include a minimum amount of groundwater that must be reported as excess groundwater. This amount increases from 1/15th to 10/15ths of the total groundwater pumped for 1999 and 2008 through 2014, respectively. The minimum excess use for each year must be reported and is included in the service area replenishment obligation regardless of whether the excess usage actually occurred. It is intended to lower the assessment rate to individual members by contributing funding toward CAGRD's fixed administrative costs, as well as the cost of constructing additional recharge facilities.

The assessment rate is based on the actual overall cost incurred by the CAGRD in providing replenishment equal to the total excess groundwater usage. There are three basic categories of cost, including: (1) fixed administrative cost, (2) cost of replenishment water, e.g., CAP, and (3) cost of recharge facilities. During 1997, the total assessment rate of $177 per acre-foot consisted of individual cost components for administration, replenishment water, i.e., cost of CAP, and recharge facilities of $52 per acre-foot, $115 per acre-foot, and $10 per acre-foot, respectively. The total assessment rate is anticipated to be a single, flat rate regardless of the amount of excess usage reported.

Based on 1997 figures, the cost of CAP purchased through the CAGRD replenishment program ($115 per acre-foot) was more expensive than the rate charged to CAP municipal and industrial subcontractors of $106 per acre-foot. Therefore, the exchange of PVWC's CAP water allocation would appear to be more cost-effective than relinquishing PVWC's CAP allocation and paying the full replenishment rate. However, it is not clear whether the CAGRD would permit the direct exchange of CAP water in this manner, or whether other costs would apply. In addition, administrative and recharge facility costs would still apply.

The CAGRD assessment rate will be subject to change in the future. For example, the component related to administrative costs should decline as these relatively fixed expenses are spread over a larger membership. The cost of replenishment water will increase in accordance with anticipated increases in the cost of CAP. Recharge facility-related costs will vary depending on the type of recharge that is employed. For example, the recharge facility cost for 1997 reflects the use of groundwater savings facilities and direct recharge at GRUSP. Since there is limited capacity associated with both GRUSP and groundwater savings facilities, additional facilities will need to be constructed. Accordingly, the construction and O&M costs associated with future recharge facilities will result in an increase in the recharge facility component of the CAGRD assessment rate.

Membership in the CAGRD represents a potential alternative for meeting the requirements of the TMP. However, membership in the CAGRD may only pertain to water systems and subdivisions that are attempting to achieve designated AWS status. In addition, the cost-effectiveness of CAGRD membership for PVWC will depend on the nature of future recharge projects, as well as the overall membership level.

3.5.4 Purchased Water Alternatives

Purchased water from the City of Phoenix and/or COS represent potential alternatives for eliminating the projected maximum day reliable capacity deficit. Purchased water may also be beneficial for meeting the TMP requirements to the extent that PVWC is required to reduce its groundwater pumpage. However, purchased water from the City of Phoenix and COS is not anticipated to be cost-effective relative to other alternatives, primarily because of the high cost of purchased water. In addition, PVWC would need to confirm the availability of supply. For example, the City of Phoenix and COS may or may not have excess supplies with respect to their applications for designated AWS status. PVWC's CAP allocation might be useful in this respect and could offset the portion of COP's or COS's purchase price related to obtaining a raw water supply. An interconnection with the City of Phoenix is recommended for construction as Project B-3 to address a supply reliability deficiency. Once established, this interconnection would provide a means for mutually beneficial water exchanges with the City of Phoenix.

3.6 SUMMARY AND RECOMMENDATIONS

PVWC is facing three potential source of supply issues. One issue is its CAP allocation, which it has held but not used since it was obtained in the mid 1980's. The second issue is increasing water demands, which are projected to result in a maximum day reliable well capacity deficit by 2009. The deficit is projected to

increase to 0.82 mgd by 2012. The final issue is PVWC's compliance status for the TMP. The TMP may necessitate the use of supplies other than groundwater in meeting customer demand.

The proposed CAP water exchange agreement with the SRP offers a potential solution to these issues. A capital improvement project needed to implement this agreement is discussed as Project A-2 in this section. Project A-2 is adequate for enabling PVWC's CAP allocation to be fully utilized and is anticipated to eliminate the projected maximum day reliable well capacity deficit. However, its ability to address all potential TMP requirements is uncertain. PVWC should consider additional information, as available from ADWR, regarding its interpretation of certain elements of the TMP and AWS, e.g., definition of "exempt groundwater" and CAGRD membership requirements. This information should be reviewed to enable a better assessment of the benefits of Project A-2 and the CAP water exchange agreement, in general, with respect to its TMP compliance status.

Other alternatives described in Section 3.5 may need to be considered in the event that the proposed CAP water exchange agreement and Project A-2 cannot be implemented, or if other programs are needed to cost-effectively meet the TMP requirements. These programs include: membership in the CAGRD, purchased water or CAP exchanges with the City of Phoenix and/or COS, and the development of additional well capacity -- either at a new site, or through conversion of existing monitoring wells to production wells.

Project A-2

CONSTRUCT FACILITIES FOR USE OF SRP WELL 22.6

Design: 6 to 8 months
Construction: 4 to 6 months

Estimated Cost: $250,000

Description:

A proposed agreement between PVWC and SRP will provide for PVWC's use of an existing SRP well. This well is located across the Arizona Canal from Well No. 14 in western Scottsdale. The well is currently used by SRP to divert groundwater into the Arizona Canal for the benefit of its downstream irrigation and municipal customers In accordance with the proposed agreement, the construction of facilities that would facilitate PVWC's use of the well is recommended. In addition to supplementing the capacity of SRP Well PCX-1 to enable an amount equal to PVWC's full CAP allocation of 3,231 afy to be withdrawn on an annual basis, SRP Well 22.6 will provide an additional source for eliminating the projected maximum day reliable well capacity deficit. Construction of the needed facilities is recommended pursuant to ACC's anticipated approval of rate recovery of PVWC's CAP-related costs.

The estimated pumping capacity of Well 22.6 is 2,100 gpm, which is consistent with the yield of PVWC's existing wells and SRP's Well PCX-1. Well 22.6 is reported to be partially screened within the Middle Alluvium Unit, although information on its total depth or other well characteristics is not available. Water quality is also reported to be similar to PVWC's existing wells, with the potential for somewhat higher concentrations of radon, chromium, nitrate, and arsenic as a result of being screened in the Middle Alluvium Unit. It has not been impacted by the contaminant plume affecting Well PCX-1. Accordingly, disinfection is the only anticipated treatment need. Although not specifically evaluated as part of prior groundwater modeling, use of Well 22.6 as a supplemental well to Well PCX-1 is not anticipated to result in any adverse effects with respect to contaminant plume migration.

The well is currently equipped with a vertical line-shaft pump capable of delivering water to the water surface elevation of the Arizona Canal. This pump will require modification or replacement to enable water to be supplied directly to the PVWC distribution system. Therefore, the existing vertical pump and

motor should be replaced with a submersible pump. However, the replacement of the pump is anticipated to be funded by the SRP, who will also retain ownership of the well. The estimated total project cost for this project of $250,000 primarily reflects the installation of a pipeline that would extend the wellhead beneath the Arizona Canal and connect directly to the distribution system along Miller Road between Well No. 14 and the MRBS. The cost estimate also includes the construction of a meter vault and electrical and SCADA improvements.

SECTION 4
REGIONALIZATION

4.1 OVERVIEW

PVWC provides water service to customers located in the Town of Paradise Valley, COS, and portions of unincorporated Maricopa County. The Town of Paradise Valley is surrounded by the City of Phoenix and COS. Portions of the Town of Paradise Valley are also served by the City of Phoenix and by the Berneil Water Company. In late 1998, PVWC acquired the former Mummy Mountain Water Company, which had been PVWC's only wholesale customer. The acquisition of Mummy Mountain Water Company added about 60 retail customers to PVWC's residential customer base.

During 1996 and 1997, PVWC participated in preliminary negotiations with the City of Phoenix with respect to the potential acquisition of the portions of its water system located within the Town of Paradise Valley. Discussions were discontinued by mutual agreement during 1998. Similarly, owners of the Berneil Water Company have not been receptive to past acquisition inquiries by the Water Company. Because of PVWC's location and small size relative to that of the City of Phoenix and COS, regionalization opportunities which would result in an increased customer base for PVWC appear, at present, to be limited. However, the level of local interest and activity in regionalization discussions and proposals is subject to change in response to changes in the regulatory, political, and economic environments. Therefore, information on several regional water suppliers is presented in Section 4.2 to provide a basis for assessing regionalization opportunities as they may evolve in the future.

Regionalization is also concerned with local, regional, and statewide issues affecting water supply systems. These issues often impact both small and large systems, although the effects may vary especially if the form of ownership, i.e., public vs. private, is different. As discussed in Section 3, the primary issue facing water systems in the Phoenix area is the water supply and regulations aimed at reducing reliance on groundwater sources through the use of CAP water and other renewable water supplies. Regional water supply issues are important to PVWC to the extent that it shares and has a direct interest in the efficient use of limited resources and has the opportunity to lead or participate in regional solutions. Section 4.3 reviews the status of regional water supply resources.

As part of the American Water System (AWS), PVWC benefits from having access to technical and operating expertise and financial and management resources. These resources complement PVWC's own efforts in providing reliable and efficient water supply services to its customers. For example, the

economies of scale associated with AWWSC's materials management program provides an opportunity for PVWC to realize significant discounts on materials, e.g., pipe, hydrants, meters, etc. AWWSC's resources also provide the means for pursuing regionalization opportunities based on municipal privatization or contracts for operation and management of private systems. Conceptual opportunities based on these regionalization approaches, as they may apply in the State of Arizona, are discussed in Section 4.4.

4.2 REGIONAL WATER PROVIDERS

Table 4-1 provides a brief description of five water purveyors located in proximity to PVWC. The location of each was illustrated previously on Exhibit 2-1.

Table 4-1

Regional Water Suppliers

System	Miles of Pipes	Service Area (Sq. Mi.)	No. of Tanks	Groundwater		Surface Water	
				No. of Wells	Peak Hour Production (mgd)	No. of WTPs	Capacity (mgd)
City of	5,700	500	37	50	40	5	600*
Phoenix	1,100	160	39	32	38	1	50
COS	771	180	7	9	---	2	50, 40
Tempe	700	57	3	16	15	2	30, 10
Glendale	N/A	1.5	N/A	2	N/A	0	--
Berneil Water Co.							

N/A - Not Available

Reference: AWWA Water Stats\Survey (1996) (Except Berneil Water Company)

* Total Capacity

The PVWC system is bordered by two larger water purveyors, the City of Phoenix to the west and the COS to the east. While not directly located adjacent to the PVWC system, the other systems are located within a ten miles radius. A summary of each of these systems is provided below.

4.2.1 City of Phoenix (City of Phoenix)

4.2.1.1 General

The City of Phoenix water system serves a population of 1.2 million, including a population of 30,000 served via wholesale accounts. This reflects a total customer base of approximately 360,000. Water demand currently ranges from a high of 430 mgd during the summer to 156 mgd during the winter months, with a historic high of 432 mgd recorded on August 7, 1995. The annual average water demand is 285 mgd.

About 83 percent of the COP's water comes from the Salt, Verde, and Colorado rivers, while the remaining 17 percent is obtained from groundwater, recycled wastewater, and other sources. As indicated in Table 4-1, the City of Phoenix produces water from these supplies via 50 active wells and 5 surface water treatment plants. The COP's two wastewater and two wastewater reclamation plants have the capacity to treat over 200 mgd of wastewater from the City of Phoenix, Glendale, MESA, COS, and Tempe.

Distribution storage within the City of Phoenix system is provided by a total of 37 reservoirs. These reservoirs have a combined storage capacity of 461 MG. The transmission and distribution piping grid is comprised of a total of 5,700 linear pipe miles, encompassing a service area of about 500 square miles.

4.2.1.2 Town of Paradise Valley Served by City of Phoenix

Part of COP's service area lies within the Town of Paradise Valley. The largest area is located north of Mummy Mountain and is generally referred to as the "Mockingbird System". It encompasses the entire portion of Town of Paradise Valley north of Mockingbird Lane in the west and north of Indian Bend Road in the east, excluding the service area of the Berneil Water Company (in the northeast corner of the Town). The City of Phoenix also serves the area bounded by Lincoln Drive, 32nd Street, 40th Street, and the Arizona (SRP) Canal in southwest Paradise Valley and a small area in southeast Paradise Valley east of Scottsdale Road. Approximately 80 percent of the City of Phoenix demand within Paradise Valley occurs in the Mockingbird system. The majority of the remaining 20 percent occurs in the southwest corner of the Town.

The customer profile for the COP-served areas is similar to PVWC, with about 96 percent of the total number of customers (about 2,400 in 1996) classified as residential. However, consumption by residential customers comprises a larger percentage of the total water sales for the COP-served areas (about 90

percent) compared to about 65 percent for PVWC. Residential growth has historically occurred at the rate of about 55 customers per year. Residential water consumption per customer has averaged about 1,360 gpcd over the past 5 years, which is more than 250 gpcd higher than PVWC's average residential consumption factor for the same period. Commercial and "other" customer growth are stable, the former at a rate of 2 or 3 customers per year. Water consumption factors for these customer categories have also been relatively stable over the past 5 years.

The Mockingbird System is being supplied from several unmetered interconnections at various points along the City of Phoenix/Town of Paradise Valley corporate boundary. The primary supply is via a 24-inch main that extends south along 56th Street to the vicinity of Mountain View Road. The City of Phoenix has recently installed improvements to extend the transmission capacity within the Mockingbird System. The City of Phoenix also maintains two well facilities within the Mockingbird System. Well No. 234 is located along Double Tree Road, west of Indian Bend Wash. This well was constructed in 1975, and at that time, had a rated capacity of 1,200 gpm. The current capacity of the well is estimated to be about 575 gpm. Well No. 235 is located along Morning Glory Drive, west of Indian Bend Wash. The current capacity of Well No. 235 is estimated to be about 1,900 gpm. The wells are used on a limited basis to supplement the supply capacity from other City of Phoenix sources during peak period demands. The wells alone are inadequate to meet the peak demands of the entire Mockingbird System.

A 0.5-MG ground storage tank is located at one of the Mockingbird System's well sites. This is the only large storage facility operated by the City of Phoenix in the Town of Paradise Valley. Water from the well is routed through the storage tank and pumped to the distribution system. The Mockingbird System also includes a number of smaller hydro-pneumatic systems that serve customers located in the northern and eastern foothills of Mummy Mountain. In some cases, these systems are operated in stages to serve customers at progressively higher elevations. Small pipe sizing within the majority of the Mockingbird System has limited available fire flow, and in some cases, the ability to provide adequate service during peak demand periods.

The southwest portion of the Town of Paradise Valley is supplied from several unmetered connections along 32nd Street, 36th Street, and Lincoln Drive, and is well integrated with the larger City of Phoenix system. There are no independent well supplies or storage facilities serving this portion of the Town of Paradise Valley.

The distribution grids for the PVWC system and COP's Mockingbird System and service area within the southwest corner of the Town of Paradise Valley are located within close proximity to one another, although no interconnections exist. A 12-inch City of Phoenix main also traverses the PVWC system along Invergordon Road. This main provides a connection between the southeastern portion of the Mockingbird System and part of the City of Phoenix system located southeast of Camelback Mountain.

A preliminary analysis of the distribution systems indicates that the construction of interconnections at several locations would be beneficial for improving reliability within both PVWC and the City of Phoenix. The possibility for formally integrating the systems would provide other potential operational advantages (although very costly), including consolidation of the large number of hydro-pneumatic systems and reinforcement of the transmission capacity throughout the Town of Paradise Valley.

4.2.2 City of Scottsdale (COS)

The COS serves a population of 168,000 persons or approximately 61,000 customers. About 54 percent of the City's water comes from the Salt, Verde and Colorado rivers. The average and maximum day system delivery in 1996 were 47 mgd and 60 mgd, respectively. City reservoirs have a combined storage capacity of 41 MG.

Currently, PVWC does not have any interconnections with the COS, and the availability of supply at possible interconnection locations with the COS is not known. Since these interconnections would be limited to adjacent areas in the eastern part of Town of Paradise Valley, they would not be beneficial for offsetting transmission improvement needs for serving western parts of the PVWC service area.

COS relies on the use of groundwater to provide a major part of its annual average and peak day needs. Due to limited distribution storage, COS uses well capacity to assist in meeting peak hourly demands. Approximately 40 to 50 of the COS's groundwater wells are located in close proximity to PVWC's facilities in the western part of the COS. The COS has constructed an aeration facility to treat groundwater wells that were contaminated by the same plume affecting PVWC's wells. The facility was placed on-line in 1994.

In addition to its groundwater supply, the COS also utilizes treated CAP and SRP entitlement water (Salt and Verde Rivers) delivered through the City of Phoenix system. The COS recently completed an expansion of its existing CAP water treatment plant from 22 mgd to 50 mgd.

In 1993, a reclaimed water distribution system was constructed to deliver reclaimed water from the future Water Campus Project to golf courses located north of the CAP Canal. The COS currently uses this distribution system to deliver raw CAP water for irrigation of the golf courses in northern Scottsdale. Upon completion, the City's Water Campus Project will include a Regional Water Reclamation Plant (for irrigation water), an Advanced Water Treatment Plant (for recharge water), recharge wells, and off-site sewer interceptors and force mains. Construction of the Water Campus Project was determined to be more cost-effective than the construction of additional water and wastewater plant capacity and the purchase of additional surface supplies. The planned capacity for this facility, which will treat wastewater in northern Scottsdale, is 33.4 mgd.

The use of groundwater recharge and recovery will enable the surface water plants to be operated at a base rate while meeting peak demands from wells without mining groundwater on an annual basis. The groundwater recharge facilities provide the flexibility to store treated water for future withdrawal during times when wastewater flows exceed the demand for irrigation water.

4.2.3 Tempe

The City of Tempe is located about 4 miles south of Town of Paradise Valley. In 1996, the water system served a population of about 161,000 persons through 40,000 service connections. The average and maximum day demands for the same year reached 64 mgd and 94.7 mgd, respectively.

All of the City's water supply comes from the Salt, Verde and Colorado rivers. Additionally, seven groundwater wells are maintained for emergency use. City reservoirs have a combined storage capacity of 64 MG. The City of Tempe operates a 3.25-mgd wastewater reclamation plant. Effluent from this facility is used for irrigation of golf courses and parks.

4.2.4 Glendale

The City of Glendale is located about 10 miles west of Town of Paradise Valley. The water system served a population of 173,000 persons or 44,000 customers in 1996. The average day system delivery was 29 mgd, while the maximum day for that year reached 43 mgd.

About 72 percent of the City's water comes from the Salt, Verde and Colorado rivers. City reservoirs have a combined storage capacity of 32 MG.

4.2.5 Berneil Water Company

Berneil is located in the northeastern corner of the Town of Paradise Valley and is bordered from the north by Mountain View Road, Mockingbird Road to the south, Scottsdale Road to the east, and Invergordon Road to the west. The system serves 500 customers (approximately 1,500 persons) in a 1.5-square mile area. The CAP subcontract for Berneil totals 432 afy.

The Berneil system is supplied by two wells, including a 2,000 gpm well installed in 1996. A third public water supply well has been abandoned. An interconnection with the COS was planned for construction in conjunction with road work. ADWR records also show the existence of two additional wells owned by the Berneil Water Company that are designated for irrigation use.

4.3 REGIONAL WATER SUPPLY RESOURCES

The population of the State of Arizona continues to soar as the 21st century approaches. The sustainability of growth and development is largely dependent upon the adequacy of regional water supplies. A large portion still is pumped from saturated underground layers. However, other sources are being used to supplement the groundwater supply.

The Phoenix Active Management Area (AMA) is located in central Arizona and encompasses a land area of about 5,646 square miles. The Phoenix AMA includes 23 cities and towns, 37 irrigation districts and several Indian communities. During 1994 a total of approximately 1.88 million acre-feet (about 600 billion gallons) of water was supplied to Phoenix AMA customers. Approximately 40 percent was consumed by municipal users.

Table 4-2 summarizes the various sources used to supply water to several municipalities within the Phoenix metropolitan area.

Table 4-2

Area Water Supply [1]

City	Ground Water (%)	Surface Water (%)		Reused Effluent (%)
		CAP	SRP	
Apache Junction	63	37	0	0
Carefree	100	0	0	0
Cave Creek	47	46	0	7
Chandler	34	8	58	0
Fountain Hills	29	62	0	9
Gilbert	49	0	41	10
Mesa	21	32	47	0
Paradise Valley	100	0	0	0
Phoenix	7	25	58	10
Scottsdale	44	43	11	2
Tempe	0	8	91	1
Average	45	24	28	3

(1) Source: Arizona Department of Water Resources. (The Tribune, Sunday, March 8, 1998).

As shown in the table, PVWC and Carefree water systems rely entirely on groundwater. On the other hand, Tempe's supplies are derived primarily from surface sources with a very small amount of reclaimed water. In 1996, groundwater accounted for an average of 45 percent of the cities' water supplies, while the use of surface water sources provided an average of 52 percent.

4.3.1 Salt River Project (SRP)

The SRP is a federal agency providing electricity and water to over one-half million customers in the Phoenix metropolitan area. SRP is the nation's third largest public power utility and is metropolitan Phoenix's largest supplier of electricity. It is also the largest supplier of water in the State of Arizona. The SRP supplies water to various municipalities, as well as to agricultural and urban irrigators.

On an annual basis, the SRP delivers more than 1 million acre-feet (about 900 mgd) of water to its customers. Approximately 30 percent of the water is used for irrigation, with the remainder delivered for

use by urban customers. As recently as 20 years ago, the majority of the water was supplied for use in irrigation.

The majority of SRP's water supply originates in the Salt River watershed and is captured and stored in Roosevelt Lake and several other reservoirs. Water is also obtained from the Verde River, on which Horseshoe Lake and Bartlett Reservoir serve as storage reservoirs. The turnout at the Granite Reef Diversion Dam provides SRP with the additional capability of obtaining Colorado River water from the CAP canal. These surface supplies are also supplemented by groundwater. The SRP maintains and operates the dams that control the blending of the various surface supplies utilized, as well as the groundwater wells and series of over 1,200 miles of canals that carry the water throughout its 240,000-acre service area. The SRP has approximately 250 groundwater wells that are designated for irrigation use with in the Phoenix AMA. Several of these wells are located adjacent to PVWC's service area in western Scottsdale.

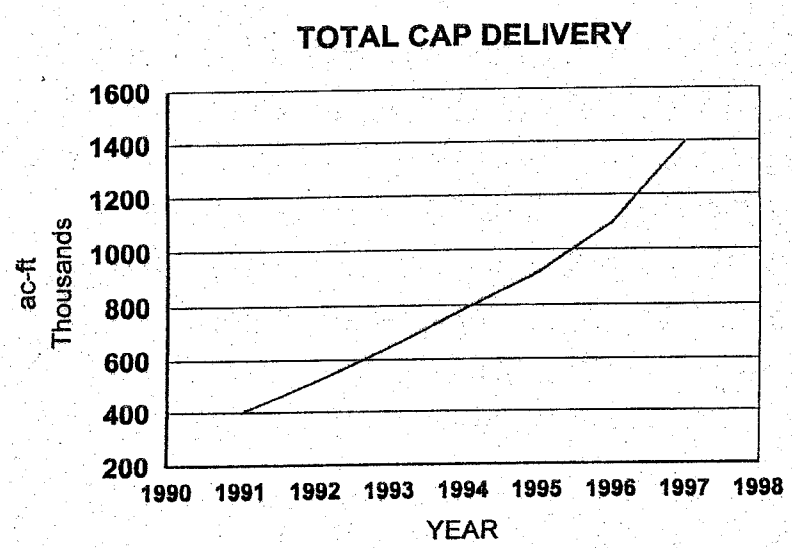
4.3.2 Central Arizona Project (CAP)

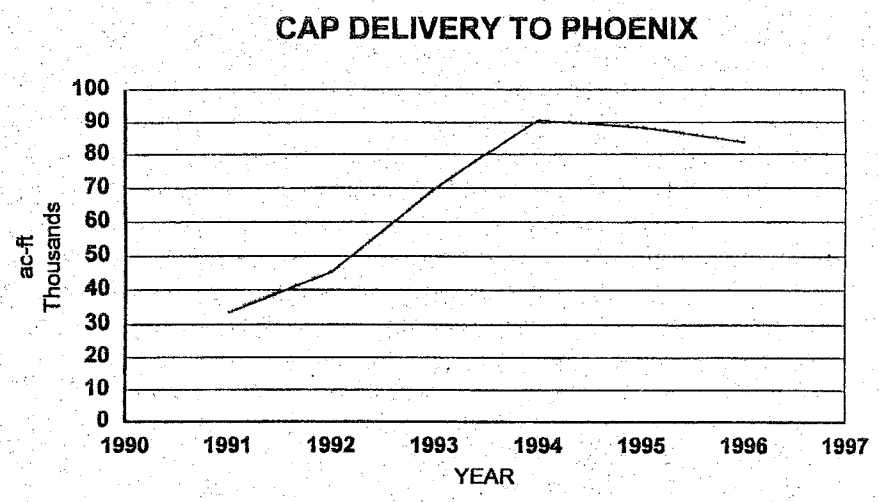
Water deliveries from the CAP have become an increasingly important renewable water supply source throughout the State of Arizona. As shown in the upper right-hand corner of Figure 4-1, overall CAP usage increased at an average annual rate of almost 25 percent, from 400,000 acre-feet in 1991 to 1.4 million acre-feet in 1997. The CAP delivery in 1997 represented 93 percent of the annual CAP capacity and one-half of the State of Arizona's 2.8 million acre-feet allocation of water from the Colorado River. Recharge facilities have been important for enabling CAP deliveries beyond the existing capacity of subcontractors to obtain and utilize the water through direct means. Although data were not available, total CAP deliveries had been expected to reach the annual capacity of 1.5 million acre-feet in 1998.

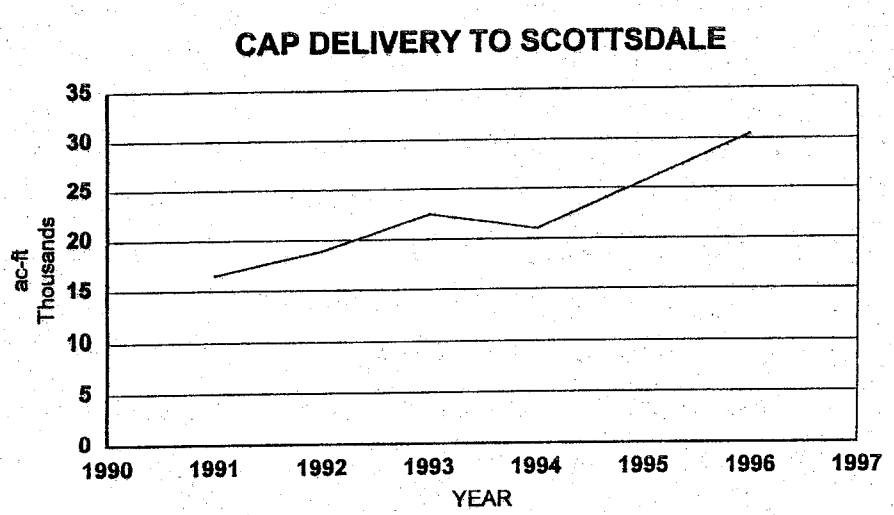
The available 1.5-million acre-feet of CAP capacity was originally allocated in the following proportions to agricultural, Indian, and M&I users: 37 percent, 21 percent, and 42 percent. However, as shown on Figure 4-2, the actual proportion of CAP water use as of 1997 was different, with agricultural representing over 50 percent of the total CAP deliveries. This difference is related to a variety of issues, all revolving around the economics of CAP, including the increasing cost of retaining and using the CAP allocation relative to other alternatives. In many cases this has resulted in organizations declining acceptance of their CAP allocations or transferring/assigning the allocation to others. Alternatively, CAP subcontractors have negotiated exchange agreements whereby CAP water is used indirectly, through a second party, while the subcontractors retain control of their CAP allocations.

Figure 4-1

Historic CAP Water Deliveries







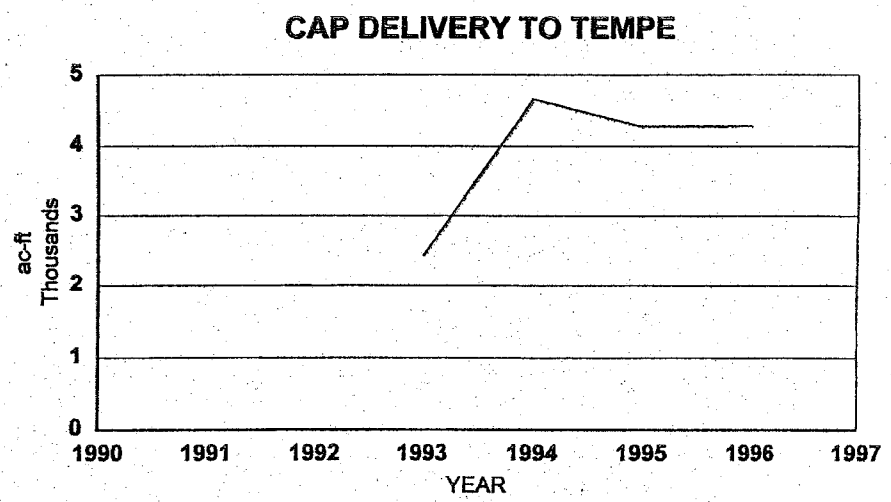
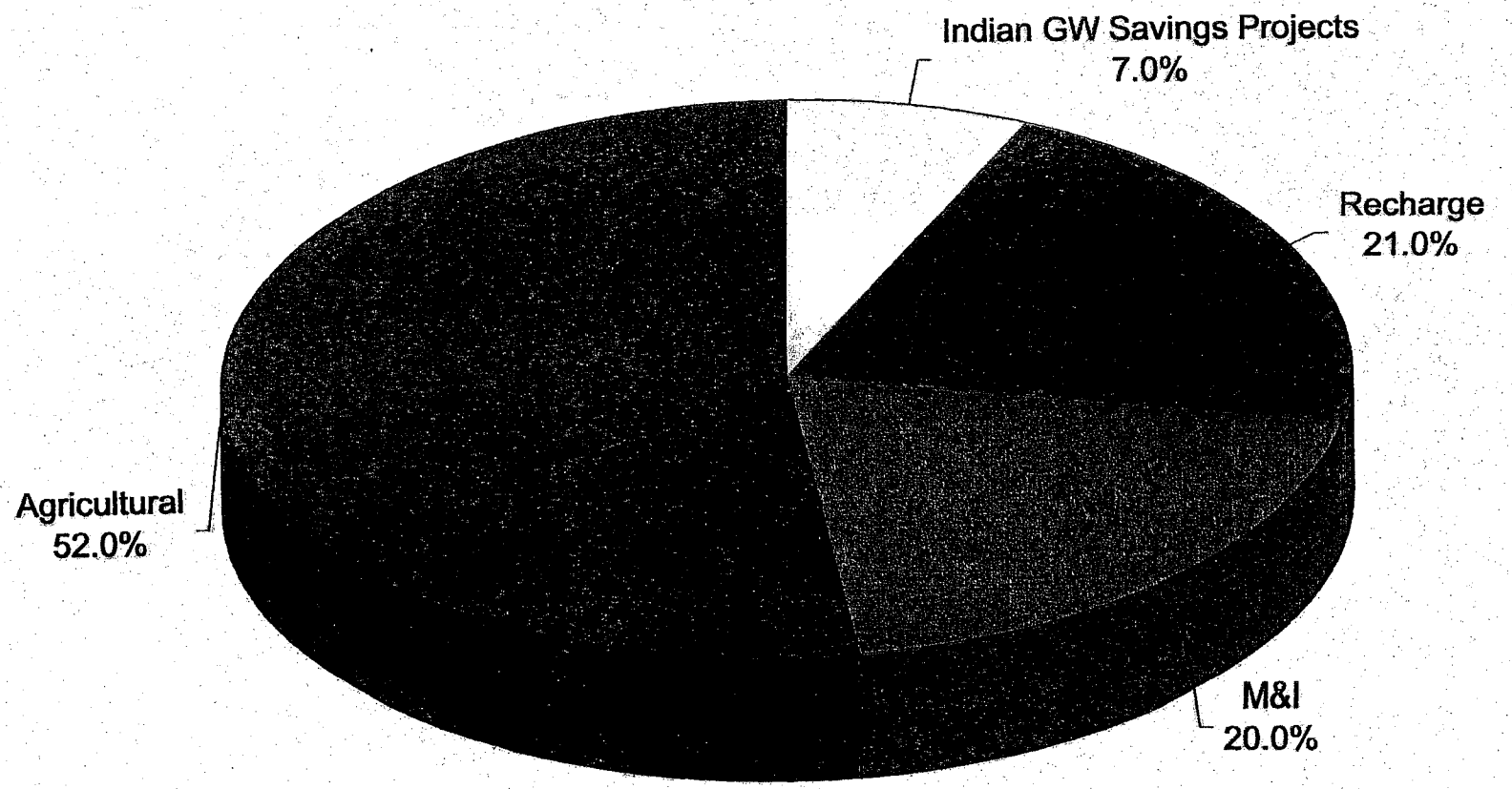


Figure 4-2

1997 CAP Water Deliveries



Large cities in the Phoenix metropolitan have been fairly aggressive in obtaining additional CAP allocations through assignment or transfer from others. As noted in Section 3, obtaining an Assured Water Supply is a key incentive for the large municipalities to use renewable water supplies. Information on the status of CAP subcontracts in early 1997 indicated that the COS, for example, had obtained or was negotiating for subcontracts that would increase its original allocation by one-third from about 37,000 afy to almost 50,000 afy. The City of Phoenix and City of Tempe had original CAP allocations of about 114,000 afy and 4,300 afy, respectively. In comparison, about 28 private water companies in Arizona had originally obtained CAP subcontracts totaling 70,000 afy, or about 5 percent of the total annual CAP capacity. Figure 4-1 indicates that each of the municipal water systems are using a large percentage of their CAP allocations.

Currently, several non-profit organizations in the Phoenix metropolitan area are involved with regionalization activities specifically related to the development, planning, coordination, and financing of CAP use alternatives. The Arizona Municipal Water Users Association and West CAPS are among these organizations.

4.3.2.1 Arizona Municipal Water Users Association

The Arizona Municipal Water Users Association (AMWUA) is a non-profit organization established in 1969 by the cities of Phoenix, Mesa, Glendale, Tempe, Scottsdale, Chandler, Goodyear, Peoria and Gilbert for the development of an urban water policy. Funded by the member cities, AMWUA represents and assists them in areas of water resource management that require a coordinated effort by the cities. The AMWUA participated in financial arrangements needed to complete the CAP and is exploring possibilities for artificial groundwater recharge and other water supply augmentation alternatives. AMWUA is also involved with regional water legislation, water conservation and coordinated water resource management planning efforts.

4.3.2.2 WestCAPS

WestCAPS is a coalition formed by twelve CAP subcontractors in the west Salt River Valley Basin. It includes among its members: Arizona State Land Department, Arizona Water Company, Town of Buckeye, Citizens Utilities Company, Litchfield Park Water Service Company, Sunrise and Westend Water Companies, West Maricopa Combine, and the cities of Glendale, Goodyear, Peoria, Phoenix, and Surprise.

WestCAPS was formed in order to combine efforts in the planning and management of water resources by each of the member organizations. It also attempts to reconcile concerns regarding big cities' strive to promote growth through AWS with the inability of smaller cities, towns and private water companies to utilize their CAP allocations.

4.3.3 Groundwater Recharge

Groundwater recharge programs represent an important water management tool in the Phoenix metropolitan area and in other areas of the State of Arizona. As discussed in Section 3.5.3, the CAGRD uses the creation of recharge projects to assist developers and water providers in identifying renewable water supply sources. Its direct and indirect, i.e., groundwater savings, recharge projects provide beneficial ways to use CAP. Similarly, the AWBA provides a means for enabling the State of Arizona to more fully utilize its allotment of Colorado River Water.

Recharge activities in the Phoenix AMA have focused on the GRUSP. The development of a groundwater recharge facility on the Agua Fria River and a separate investigation at another site on Queen Creek near Higley are other recharge activities being conducted under the State Demonstration Authority.

The Agua Fria River Project will be located between the CAP siphon crossing and Happy Valley Road. Untreated CAP water will be released from CAP's siphon structure directly into the Agua Fria River bed, flowing along the river until it flows into spreading basins or infiltrates into the river bed directly. The design recharge capacity of the facility is 100,000 afy. The Agua Fria River Project is planned for operation by late 1999.

In addition to CAGRD programs involving the recharge of untreated CAP water, direct recharge projects are also being undertaken which involve the use of treated wastewater.

4.4 PRIVATIZATION

Privatization activities include the sale of publicly-owned water and wastewater operating assets or water/wastewater franchises. This type of privatization is motivated by a variety of factors; however, increased efficiency in management and operational effectiveness and the desire to free up capital resources needed for other public programs are often cited as the primary reasons. Privatization activities also include operating and maintenance (O&M) contracts. O&M contracts represent a form of privatization where the public entity contracts for the day-to-day operational services, while maintaining ownership and

control of the assets. These contracts usually involve most if not all of the functional responsibilities associated with the utility. A more limited form of privatization involves the use of outsourcing, whereby one or more specific functions are contracted out to a private firm, while the municipality maintains overall control of operations.

The water and wastewater operations of several large Arizona cities, including the COS and City of Phoenix, contribute operating income to their respective overall City budgets. These municipal systems make extensive use of contractors to perform auxiliary services, but have not contracted out their overall operations. For example, the COS contracts out for cleaning, equipment repair and community conservation classes, as well as public relations activities. The City of Phoenix has outsourced its meter repair and distribution main maintenance, in addition to engineering work on capital projects. The City of Glendale is currently outsourcing its collection, lab work, and public relations functions.

4.5 RECOMMENDATIONS

At present, PVWC does not have any interconnections with the City of Phoenix or COS. The construction of an emergency interconnection with the City of Phoenix is recommended to improve the reliability of supply to the western part of PVWC's service area. The details of this interconnection are discussed as part of Project B-3 in Section 6.

Additional regionalization opportunities include PVWC's participation in privatization activities. While not a large system relative to its municipally-owned neighboring water systems, PVWC has a stake in many of the same water supply issues that these systems face. It has also gained considerable experience and legal and regulatory knowledge from its ongoing efforts to identify an appropriate CAP use alternative, as well as from its dealings with the NIBW Superfund site. At the same time, it has undertaken a program of improvements to increase the level of service and reliability to its system.

Water supply-related issues throughout the State of Arizona should continue to provide opportunities for private involvement in the creation and implementation of innovative solutions. The need to effectively manage water rights and utilize renewable water supplies are anticipated to be the primary driving forces for these opportunities. As an outlet for the additional resources of the American Water System, PVWC should look for ways in which these resources could be applied as solutions to regional water supply needs.

SECTION 5
PRODUCTION

5.1 OVERVIEW

PVWC owns and operates several production facilities for the purpose of treating its raw water supply and delivering finished water to the distribution system. These facilities include the Miller Road Treatment Facility (MRTF), Miller Road Booster Station (MRBS), and Well Nos. 16 and 17, which deliver water to the distribution system directly. Treatment processes include aeration at the MRTF and the application of sodium hypochlorite for disinfection at all production facilities.

5.2 DESCRIPTION AND EVALUATION OF EXISTING FACILITIES

5.2.1 Miller Road Treatment Facility

5.2.1.1 Overview

The NIBW Participating Companies (PCs) and PVWC identified a contaminant plume, which is mostly comprised of TCE in an area south of PVWC's existing well field. As a result of the northerly movement of the plume toward PVWC's well field, the PCs entered into an agreement with PVWC whereby the PCs would provide treatment needed to mitigate the effects of the plume on PVWC's groundwater supply. The MRTF was constructed in response to this treatment need. While owned and operated by PVWC, the PCs agreed to pay the operating and maintenance costs associated with this facility.

5.2.1.2 Facilities Description

The MRTF is located on a 7-acre site at the southeast corner of the intersection of Miller Road and McDonald Drive within the COS. In addition to the treatment facility, which was completed in 1996, Well No. 15 is also located within an 8-foot high finished masonry wall around the perimeter of the site. The wall provides security and acts as a buffer to the surrounding residential area. The site is large enough to accommodate an expansion of the existing facilities to provide treatment for additional wells should the need arise. The site is landscaped and includes storm water drainage and retention facilities.

The existing treatment facility is comprised of three (3) air stripping towers, a below ground clearwell, sodium hypochlorite generation and feed system, variable speed distributive pumps, GAC off-gas treatment units, and ancillary facilities. The MRTF treats water from Well Nos. 14 and 15 and Well PCX-1. In the event that additional wells require treatment in the future, the treatment capacity would need to be expanded by adding an air stripping tower(s), clearwell, off-gas treatment unit(s), and room for additional

additional electrical/instrumentation equipment. The sodium hypochlorite generation and storage room, and office, are sized to accommodate the ultimate treatment needs of the MRTF.

As depicted on Exhibit 5-1, the existing MRTF includes an air stripping tower room, clearwell, sodium hypochlorite generation and storage room, miscellaneous storage room, electrical/instrumentation room, and an off-gas treatment area. The air stripping tower room is the main room in the facility. It houses the air stripping towers, air blowers and ductwork, distributive pumps, influent and effluent tower piping, sodium hypochlorite piping, clearwell access areas, and chlorine residual analyzer booster pump. A photograph of the inside of the air stripping room is shown as Exhibit 5-2. This photograph shows the base of the air stripping towers, inlet piping and distributive pumps located along the south wall (facing west).

Exhibit 5-2
Air Stripping Tower Room

The clearwell is located beneath the air stripping room floor. The clearwell measures approximately 80 feet wide by 90 feet long and has an average depth of 10 feet. The total volume of the clearwell is about 0.4 MG, of which about one-third is utilized in the course of normal clearwell water level fluctuations from Elevation 1277 to Elevation 1280. As shown on Exhibit 5-1, five baffle walls create a serpentine flow pattern, which maximizes chlorine detention time and eliminates short-circuiting and dead space. Water enters the clearwell at the southeast corner of the clearwell and exits in the southwest corner where

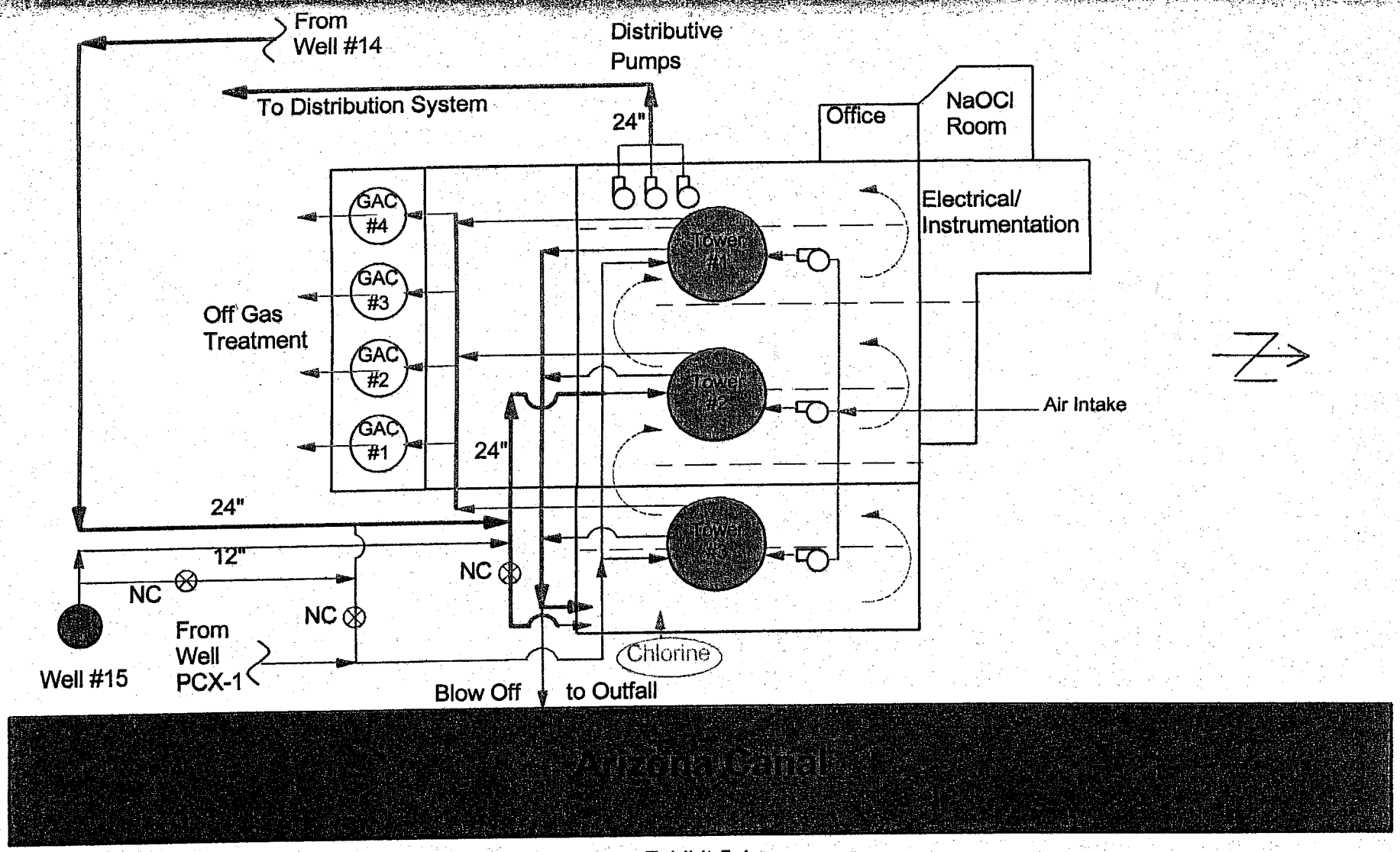


Exhibit 5-1
Miller Road Treatment Facility (MRTF)

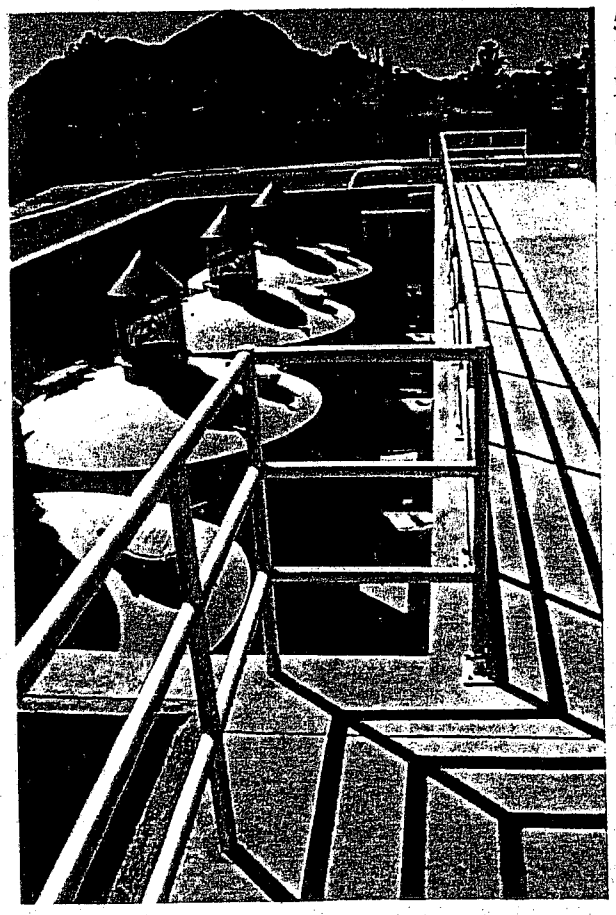
the vertical distributive pump column pipes are located. Water discharged to the distribution system is metered through a 24-inch venturi meter.

The sodium hypochlorite room is located at the northwest corner of the facility. It includes the equipment for generating (via electrolysis of a salt solution) and storing sodium hypochlorite solution, which is used as the disinfectant. Sodium hypochlorite is stored in a 3,000-gallon storage tank with secondary containment. A 55-gallon brine storage tank, sodium hypochlorite generator, and two metering pumps are also installed within the containment area. A two-week supply of salt bags are stored on pallets within the sodium hypochlorite room. Leak detection is provided within a secondary containment area in the unlikely event of a spill. An eye wash/shower station is also installed in the sodium hypochlorite room.

The electrical/instrumentation room houses the facility's 480-volt switch gear and variable frequency drives (VFDs) for each of the three distributive pumps. Instrumentation includes motor control centers, well pump starters, remote telemetry units (RTUs), a transformer, and a lighting panel. Two separate electrical feeds via two independent utility transformers provide electrical power to the facility, including Well No. 15.

A rest room, equipped with a sink and toilet, chlorine residual analyzers, and a personal computer for monitoring the status of all treatment modules are located in the storage/control room adjacent to the sodium hypochlorite and air stripping tower rooms. Four vapor-phase GAC contactors are located outdoors at the southeast corner of the MRTF. The contactors are located in a recessed, concrete vault. Exhibit 5-3 is a photograph of the GAC vessels looking west along the south wall of the facility. The masonry wall enclosing the site and Camelback Mountain are pictured in the background.

Exhibit 5-3
GAC Vessels



5.2.1.3 Process Description

Raw water is directed to the tops of the packed tower aerators where it flows down through the packing material (countercurrent to the air flow) and discharges into pipes leading to the clearwell. Each of the aerators is about 46 feet tall, measures 10 feet in diameter, and is packed with 2-inch Jaeger Tripacks. The air to water ratio for each tower is 40:1 based on design water and air flow rates of 2,100 gpm and 11,300 cubic feet per minute (cfm), respectively. The tower characteristics were designed to treat a maximum TCE influent concentration of 200 ug/L down to an achievable effluent concentration of 0.5 ug/L, corresponding to a 99.75 percent removal efficiency.

Disinfection is accomplished via the addition of sodium hypochlorite solution through diffuser pipes located between the discharge manifold and baffle wall at the clearwell inlet. Clearwell inlet baffles spanning the width of the first pass of the clearwell are provided to aid in the mixing of the sodium hypochlorite. Two chemical metering pumps are provided to feed the liquid chlorine solution. The chlorinators are paced based on the raw water flow. Chlorine residual analyzers are provided at the clearwell influent and effluent. A typical chlorine residual in the plant effluent is 0.9 mg/L.

At present, Well PCX-1 and Well No. 15 are being aerated. Well PCX-1 is treated through Tower No. 2 or Tower No. 3, while Well No. 15 is being delivered to Tower Nos. 1 or 2. Water from Well No. 14 is currently sent directly to the clearwell, bypassing the air stripping towers altogether.

The influent piping scheme provides the operational flexibility to deliver the combined flow from Well PCX-1, Well No. 14, and Well No. 15 to the three towers, or to combine water from any combination of

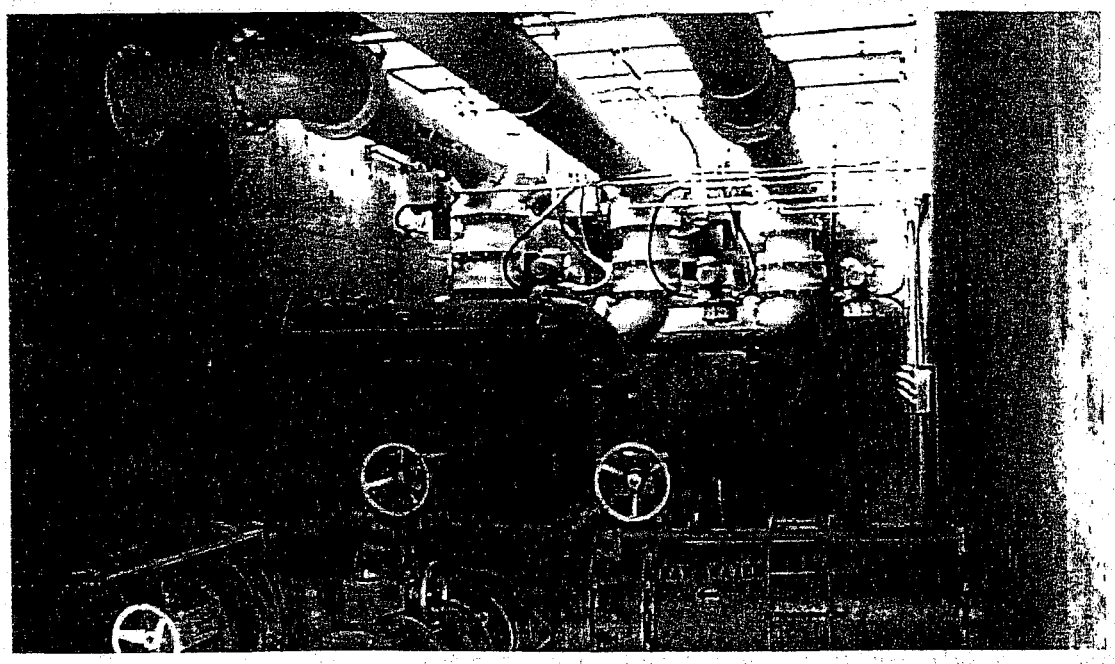
two wells to two towers and water from the third well to the third tower. These combinations can be used to provide treatment for the wells in the most efficient manner, depending on the raw water contaminant levels and treatment objective.

The plant influent piping is configured in such a manner as to enable water from Well No. 14 to be combined (blended) with aeration tower effluent from Well No. 15 and Well PCX-1 in the clearwell. As shown on Exhibit 5-1, aeration tower effluent flows to the clearwell or is directed to the Arizona Canal. Water flowing by gravity through a 24-inch pipe to the Arizona Canal outfall is not chlorinated. Well startup water can also be blown off to the canal after passing through the treatment towers. Well startup water cannot be delivered to the canal prior to passing through the air stripping towers.

In addition to providing a means for blowing off well start up water, the ability to divert water to the canal enables PVWC to repay the SRP for water used from its Well PCX-1, which is operated on a continuous basis to intercept the contaminant plume. As discussed in Section 3, water from Well Nos. 14 and 15 is diverted to the canal during off-peak periods to pay back the SRP for the use of Well PCX-1 during peak demand periods when this capacity is unavailable. Exhibit 5-4 is a photograph of the piping that permits water to flow to the clearwell or be diverted to the Arizona Canal. Raw water piping from Well No. 14 (24-inch) and Well No. 15 are also shown in the foreground.

The air stripping towers include PVC piping to facilitate periodic cleaning of the packing material with an acid wash solution. Quick disconnects are provided to enable the acid solution to be pumped from a delivery truck through the towers. The acid solution is neutralized and disposed into the sanitary sewer. Due to the moderate levels of iron in the well water, annual cleaning of the media is recommended to maintain the aeration process efficiency.

Exhibit 5-4
Clearwell Inlet Piping



Off-gas from the packed tower aerators is treated via a series of four GAC treatment units. Each contactor measures approximately 12-feet in diameter and about 10 feet high. Air heaters are provided upstream of the GAC units to reduce the relative humidity of the off-gas from 100 percent to 60 percent, thereby improving off-gas treatment performance and prevent blinding of the GAC media. The GAC contactors were designed for periodic removal of the spent GAC and regeneration at an off-site facility.

Treated water is pumped from the clearwell into the distribution system by any of three distributive pumps, which are operated in parallel. The distributive pumps are located in the last pass of the clearwell. The pump heads and motors are mounted on the air stripping tower room floor; pump bowls and column pipes are suspended below the floor into the clearwell. A VFD is provided for each pump to provide a means for maintaining a constant clearwell water level. The nominal capacity of each pump is 3,300 gpm. The adequacy of the pumping capacity at the MRTF is discussed in Section 6.3.2.

5.2.2 Miller Road Booster Station Facilities

The MRBS is located on a large tract of land bordering the Arizona Canal about halfway between McDonald Drive and Lincoln Drive. Exhibit 5-5 is a schematic of the MRBS facilities. It shows the locations of Well Nos. 11 and 12, storage tanks, sodium hypochlorite building and distributive pumps.

Recently, PVWC replaced the gaseous chlorine systems at the MRBS with liquid (12.5 percent) sodium hypochlorite systems. The sodium hypochlorite solution is fed from a 55-gallon carboy at the MRBS. The sodium hypochlorite carboys and chemical metering pumps are housed in insulated, ventilated, wooden enclosures. The sodium hypochlorite application point is on the discharge side of the booster pumps, as indicated on Exhibit 5-5.

The MRBS Tanks are operated in series and at the same water level. Water from Well Nos. 11 and 12 is directed to the 0.2-MG storage tank (Tank No. 3), which was originally built to remove sand from the raw water. Water overflows from this tank into Tank Nos. 1 and 2. The valves are configured so that water from Tank No. 1 flows to Tank No. 2 from which it is pumped to the distribution system. The water level in the tanks controls the operation of the wells. Any overflow from Tank No. 1 is directed to a small catch vessel from which it can be diverted to the Arizona Canal. Overflow releases to the Arizona Canal do not occur on a regular basis.

The accumulation of sand from the wells is not significant enough to require regular cleaning of the sand trap. Prior to its recent draining and structural inspection, the sand trap had not been drained for the purpose of removing accumulated sand for over 10 years.

The three distributive pumps are located outdoors. The two smaller pumps are located under a roof, and the sides of the larger pump are enclosed within a sound barrier. The horizontal centrifugal pumps are installed at grade. The facility was designed to accommodate a total of 4 pumps, but the fourth pump was never installed. The adequacy of the pumping capacity at this facility is discussed in Section 6.3.2.

The old age of the facilities plus exposure to the elements has taken a toll on the overall condition of the storage tanks and pumping facilities. Improvements are needed to address safety/structural issues associated with the storage tanks. As discussed in Section 3, the reliable capacity of the pumps limits the combined distributive pumping capacity of Well Nos. 11 and 12.

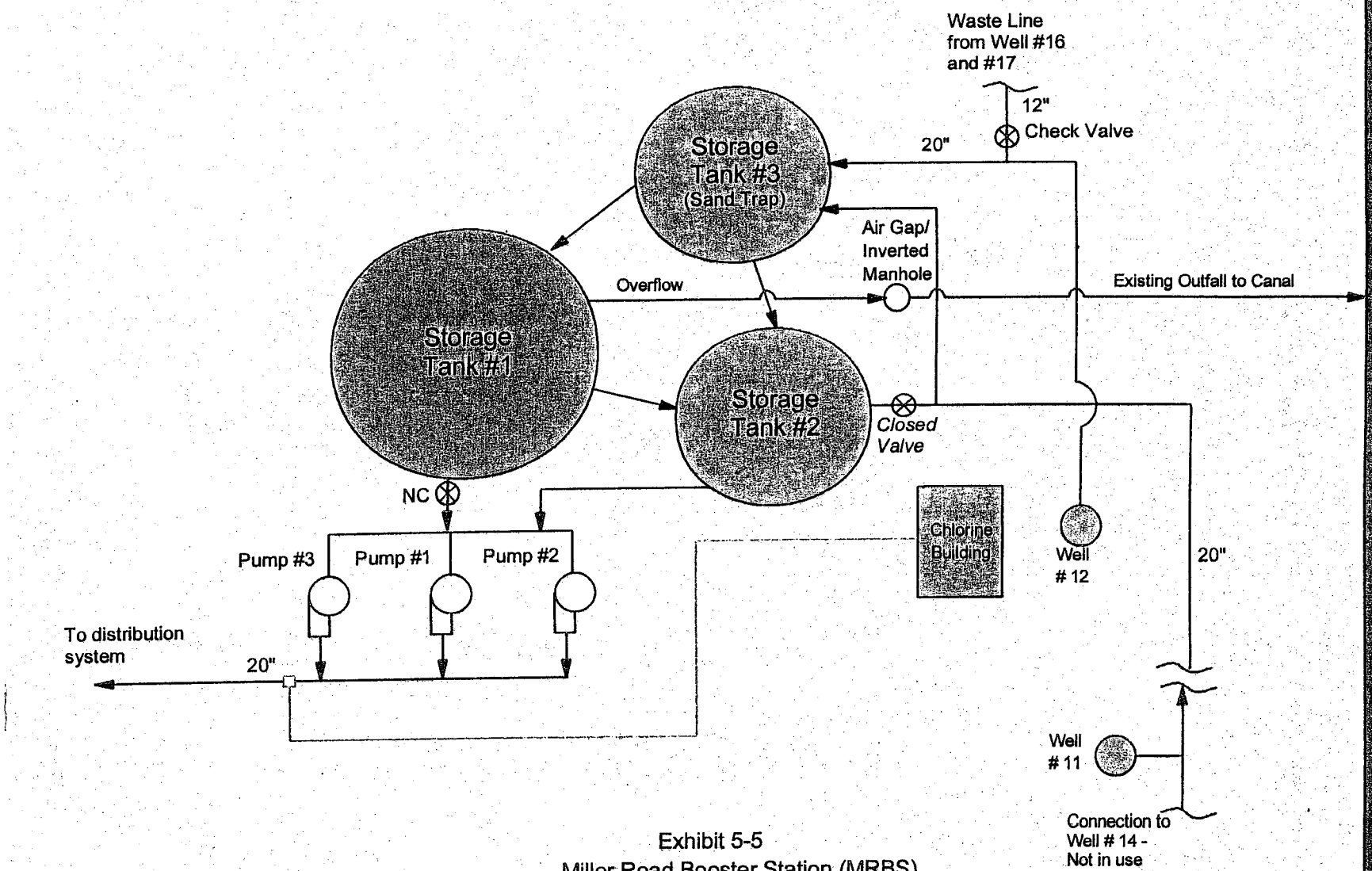


Exhibit 5-5
Miller Road Booster Station (MRBS)

Project A-7 addresses needed modifications to the MRBS facilities. These modifications include the construction of a new pump building, the replacement of existing pumps, and the installation of standby power facilities. These improvements would enable the tanks to function as distribution storage, as well as serving as equalization for Well Nos. 11 and 12. The construction of a metered outfall and separate blow off piping from the wells should also be considered to enable PVWC to obtain credit toward the repayment of water under its exchange agreement with SRP for any startup water diverted from Well Nos. 11, 12, 16, or 17.

While not recommended, possible alternative to the construction of improvements to the MRBS is its retirement in conjunction with the construction of a new storage tank for the PVWC system. In the event that the MRBS facilities are retired, an outfall to the Arizona Canal would still need to be constructed to provide a means for blowing off well startup water, as well as for relieving water and air in the event of high discharge pressures. The outfall should be metered to enable PVWC to gain credit towards repaying its exchange agreement with the SRP. The retirement of the MRBS facilities would also require that Well Nos. 11 and 12 be converted to pump to the distribution system directly. In addition, Well Nos. 11, 12, and 16 would need to be equipped with pressure relief/surge anticipator valves to enable water to be blown off to the Arizona Canal. Additional control instrumentation and SCADA program modifications would also be needed. Any plans to retire the MRBS facilities should consider the impact on the possible need to reduce elevated nitrate concentrations in Well No. 17 (see Section 5.4.1).

5.2.3 Well Nos. 16 and 17 Facilities

Well No. 16 is located approximately 200 feet north of the MRBS property. Water from Well No. 16 is disinfected and delivered directly to the distribution system. Sodium hypochlorite is fed from 55-gallon drums. Startup water from Well No. 16 is piped to the sand trap (0.2-MG tank) at the MRBS.

Well No. 17 is located along Lincoln Drive near its intersection with Miller Road. This well site is surrounded by a gated, residential community. The well site is enclosed by a 8-foot high masonry wall.

The well head is located outdoors. A building is provided to house the electrical equipment and instrumentation, as well as the sodium hypochlorite feed system. A 12.5 percent sodium hypochlorite solution is applied for disinfection at Well No. 17. Sodium hypochlorite is only applied to water that is delivered to the distribution system. Chlorine is fed at an average dosage of 0.9 mg/L.

Well startup water that is blown off to the MRBS Tank is not chlorinated. A dedicated pipeline was installed to deliver the startup water from Well No. 17 to the MRBS site. Well No. 17 is equipped with a pressure relief/surge anticipator valve, which enables water to be directed to the Miller Road Tanks in the event that the discharge pressure at the well exceeds 150 psi. The purpose of this valve is to prevent air from entering the distribution system and to prevent water hammer during pump startup and shutdown. Use of the MRBS tanks for receiving blow-off water from Well No. 17 has not resulted in any water quality concerns for water distributed to the system from the MRBS. As noted previously, all water is chlorinate prior to being distributed to the system.

5.2.4 Instrumentation, Monitoring and Control Systems

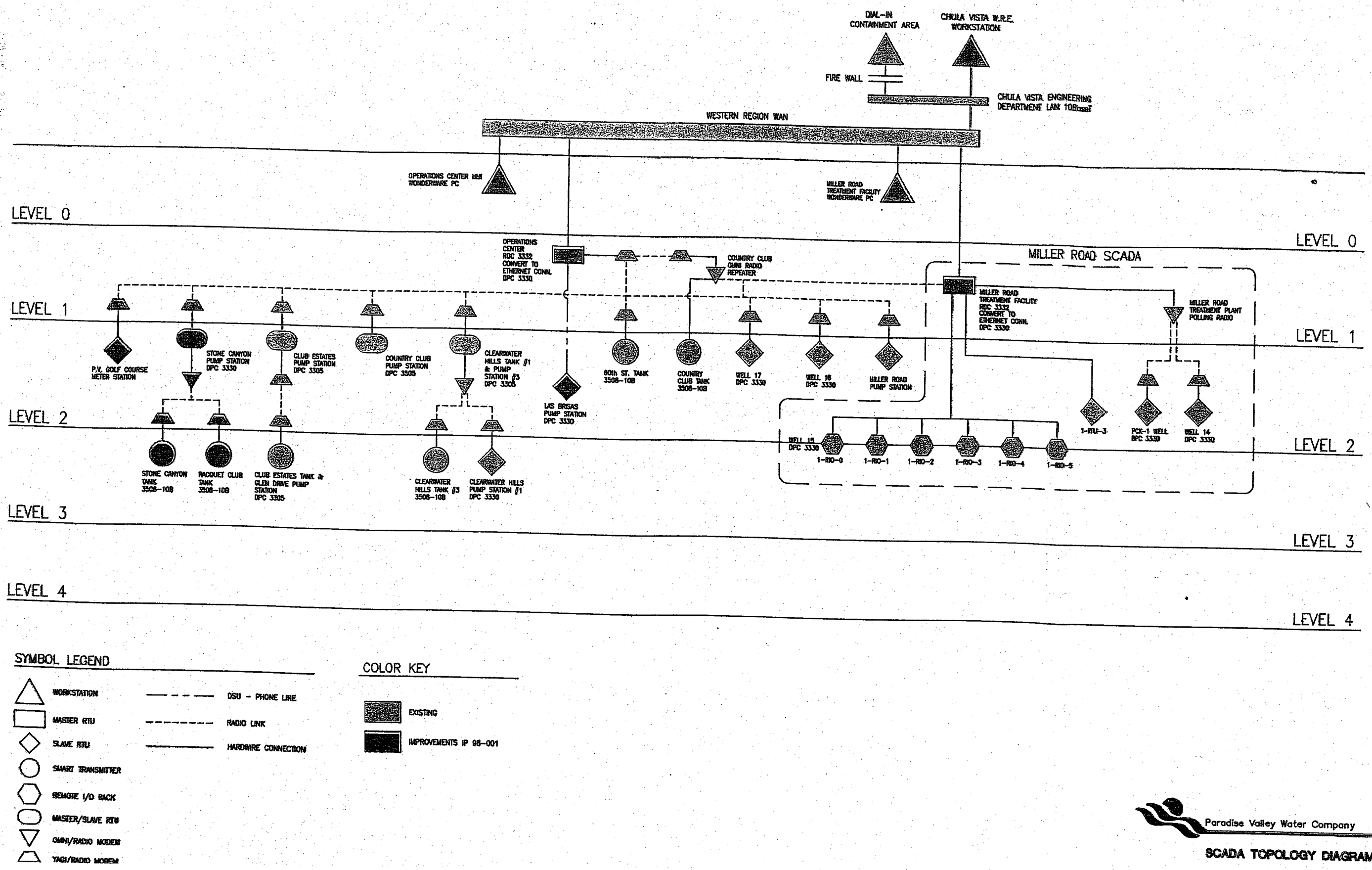
The MRTF is manned during one 8-hour shift, five days a week. The remaining facilities are unmanned and are controlled automatically. An operator's station for remote monitoring and control of real-time facility status, as well as trending historical data, is provided at the MRTF, as well as at the PVWC Operations Center. Personal computers serve as the operator interface at these locations. Data communications are sent from remote facilities via radio telemetry to the SCADA system, which can also be monitored from both locations.

A diagram of the PVWC SCADA topology is shown as Exhibit 5-6. Much of the instrumentation and communications have been completed. Phase 4 of the SCADA system improvements are highlighted on the exhibit and are currently being completed in conjunction with IP 98-01.

The water level in the 60th Street Tank is used to control the operation of the MRTF distributive pumps. In the automatic mode, all well pumps are controlled (started/stopped) based on the water level in the 60th Street Tank using pre assigned start and stop points. Operation of Well Nos. 11 and 12 is controlled by the water level in the Miller Road Tanks.

Alarms and automatic shutoffs are provided for the distributive and well pumps at the MRTF based on High/Low clearwell level, chlorine residual, and discharge pressure. An RTU is provided to transmit signals to the automatic dialer system based on building smoke, fire, and intrusion, as well as for the various process-related parameters.

During 1998 and the first quarter of 1999, PVWC undertook a program to comprehensively review the status of its various computer systems and microprocessor-based controls with respect to the Year 2000



Paradise Valley Water Company

SCADA TOPOLOGY DIAGRAM

roll over. As a result of this review, PVWC determined that its SCADA system was not Year 2000 compatible and is in the process of replacing components to achieve compliance by mid 1999. PVWC is also in the process of conducting field testing of embedded processors and/or obtaining certification from the equipment manufacturers that the date codes are Year 2000 compliant. Testing is being performed to ensure interfacing compatibility for all essential instrumentation. Measures being taken to achieve Year 2000 compliance for the MRTF control equipment is being funded by the PCs.

5.3 WATER QUALITY

5.3.1 Aerator Performance

In addition to greater than 99 percent removal of TCE, other influent pollutants for which the air stripping towers were designed to achieve greater than 99 percent removal include: 1,1,1-Trichloroethane (1,1,1-TCA), 1,1-Dichloroethylene (1,1-DCE), and Tetrachloroethylene (PCE). The air stripping towers are also designed to achieve 97 percent removal of chloroform. However, to date, none of these contaminants have been detected in well samples.

PVWC takes raw water samples from each well and monitors these samples for the presence of VOCs on a monthly basis. At present, the maximum observed concentration of TCE in Well PCX-1 is 19.5 ug/L. During 1998, Well No. 15 exhibited TCE concentrations up to 1.0 ug/L. TCE has not been detected in Well No. 14 nor any of PVWC's other wells located north of the MRTF.

The increasing trend of raw water TCE levels from Well No. 15 indicates the possibility of exceeding 1.0 ug/L by Summer 1999. In the event that the concentration of TCE in Well No. 15 exceeds 1.0 ug/L, PVWC would consider implementing bimonthly sampling of the raw water supply. At present, water from Well No. 15 is blended with water from Well PCX-I and Well No. 14 (when operated), to achieve non detectable TCE levels in the finished water.

PVWC operating personnel monitor the air stripping tower and clearwell effluents for TCE on a monthly basis. Initially, weekly sampling was employed to verify process performance. All effluent samples have exhibited non detectable concentrations of TCE and other VOCs, indicating greater than 99.9 percent removal.

5.3.2 Additional Water Quality Parameters

Extensive water quality testing is accomplished by the Water Company on periodic schedules depending on the test parameters. The test parameters cover all regulatory requirements plus additional parameters over and above federal and state requirements, as selected by the Company to ensure that water of satisfactory quality is provided to Company customers. Test frequencies vary from daily to quarterly or in some cases semiannually.

A summary of the water quality produced by PVWC during 1997 is shown in Appendix A. These data reflect the range of sampling results for all of PVWC's wells (except Well PCX-1, which was not operational until late 1997). The composite results represent samples taken from the sources, as opposed to the points of entry to the distribution system. However, with the exception of TCE levels at the MRTF, these results reflect finished water quality because of the limited treatment employed for PVWC's groundwater supplies.

Parameters tested include VOCs, nonvolatile organic chemicals, SOCs, pesticides and inorganic chemicals/microbes/radionuclides. The information included in Appendix A summarizes the results for some of the parameters within these categories. The full results of all individual water quality tests, which show the results by test location and date, are too voluminous to include in this report, but these data are maintained by PVWC and are submitted to the regulatory agencies for review and record-keeping purposes.

Although test results show that finished water meets or is better than all applicable water quality standards, the occurrence of certain water quality parameters is of more significance than others. As a result, their levels have historically been monitored more closely by the Water Company to detect any trend that might indicate the need for remedial measures in the future. These parameters include: arsenic, chromium, fluoride, iron, and nitrates and are associated with the mineral composition of the Middle Alluvium Unit. While PVWC's wells are constructed with blank casing to avoid contact with the Middle Alluvium Unit, some connection between this unit and the Lower Alluvium Unit is likely, particularly in the case of PVWC's oldest active well, Well No. 11. In addition to these parameters, PVWC's wells exhibit varying concentrations of radon.

The interim MCL for arsenic is 0.05 mg/L. The maximum concentration for arsenic measured in PVWC's wells during 1997 is about 20 percent of this standard. The USEPA is obligated to propose a final standard by January 1, 2000 and to promulgate a final MCL within one year of that date. Regulation at the lower end of the range of MCLs currently under consideration may necessitate the use of blending to achieve acceptable arsenic levels in the finished water.

Concentrations of chromium and nitrate have remained fairly constant over the past 10 years. In the case of chromium, maximum concentrations have remained at about 70 percent of the Arizona Department of Health Services standard of 0.05 mg/L. Similarly, maximum nitrate concentration have generally remained below 50 percent of the state and federal MCL of 10 mg/L, as indicated in Appendix A.

As noted in Section 3, an elevated nitrate concentration was observed for Well No. 17 during 1997. This concentration is not included in the finished water data because the sampling occurred during the annual spring startup of Well No. 17, at which time water is delivered to waste. Past operational experience has indicated that the nitrate concentration is reduced after the initial startup period. In early 1999, sampling for nitrates was conducted prior to spring startup activities for Well No. 17. At this time, the nitrate concentration in Well No. 17 was 11 mg/L, exceeding the 10 mg/L MCL for nitrate and requiring the well to be taken out-of-service and physically disconnected from the system.

PVWC is attempting to lower nitrate levels through continuous pumping in an effort to "flush out" the higher nitrate-containing water that may have migrated into the local aquifer during the winter. PVWC's experience with the NIBW Superfund site provided some evidence that inactive wells may serve as a conduit for transporting contaminants from the upper to lower levels of the aquifer Lower Alluvium Unit (LAU) in which Well No. 17 is screened. A local hydrogeological consulting firm has noted that elevated nitrate levels are typically found in the upper levels of the LAU.

PVWC received approval from the Maricopa County Environmental Services Department for a blending plan that would involve the delivery of water from Well No. 17 through the surge line to the MRBS tanks. The plan involves the blending of water from Well No. 17 with water from Well No. 12 in the MRBS tanks and delivery to the system via the MRBS distributive pumps. Since water containing nitrate concentrations exceeding the MCL cannot be delivered to the Arizona Canal, the blending plan represented the only short-term option for determining whether or not nitrate levels could be reduced through continuous pumping.

In the event that the concentrations of nitrates in Well No. 17 can be reduced to below the MCL using the pumping approach (as of June 1999, nitrate levels had been reduced to about 9 mg/L), PVWC may need to adopt a different operating plan to avoid prolonged periods of inactivity for Well No. 17. At present, Well No. 17 is operated more or less continuously during PVWC's peak summer period of May through October. Use of Well No. 17 (the furthest well from the contaminant plume) as a base load well during the summer months is consistent with the plume management strategy. However, system demands during the winter months are not high enough to support continuous operation of Well No. 17, and since Well No. 17 is prone to the production of entrained air, and is therefore not conducive to operation on an intermittent basis, it is inactivated during the winter months. A future nitrate management strategy may require periodic operation of Well No. 17 during the winter months.

Other non-treatment options include an investigation of the well construction characteristics to test the down-hole flow rate and isotopic testing to determine whether there is a connection between the higher nitrate levels in Well No. 17 and other local surface water or groundwater sources containing elevated nitrate concentrations. A possible remedial measure associated with the findings from these tests includes the reconstruction of the well to extend the length of the blank casing so as to prevent the down-hole migration of nitrates. However, decreasing the screened portion of the well may reduce the yield of the well.

Direct treatment options, i.e., ion exchange, for the removal of nitrate from Well No. 17 would be expensive and precluded by the small size of the site for Well No. 17. Off-site treatment at the site for Well No. 16 or the MRBS would be possible, although at a higher cost than blending water with Well No. 16 or Well Nos. 11 and/or 12 at the MRBS. As discussed above, essential facilities to deliver and blend water from Well No. 17 at the MRBS are already in place. Additional treatment facilities could be added in the future, as needed, to address the occurrence of higher nitrate concentrations at Well No. 17 or Well Nos. 11 and 12 that would prevent blending from providing adequate reduction of the nitrate concentration in the blended water.

Facilities for blending water from Well No. 17 with water from Well No. 16 would need to be provided. In this case, the mode of blending would likely be via an in-line, static mixer. This would eliminate the need for a second pumping stage. However, this would be undesirable from an operational standpoint since this would require operation of Well No. 16 whenever Well No. 17 is operated. This reduces flexibility and poses a reliability risk in the event that Well No. 16 is out-of service. Delivery of water from Well No. 17

to the MRBS provides increased operational flexibility due to the buffering capacity of the MRBS tanks, as well as the availability of multiple wells (Well Nos. 11 and 12) for blending.

The recommended approach is for PVWC to continue to pursue well/aquifer-related remedial measures that would enable water from Well No. 17 to be delivered to the distribution system at the Well No. 17 site. If these measures are not feasible, either because the required reduction in nitrate concentrations cannot be achieved at all, or if the measures needed to achieve the reductions, i.e. changed operating plan for Well No. 17 or blanking off additional well casing, cannot be implemented without causing other problems, then blending at the MRBS tanks would be the recommended alternative project. Improvements needed to implement the blending approach are discussed as part to Project A-7, which involves the conversion of the MRBS Tanks to distribution storage.

The nitrate concentration trends for Well Nos. 11, 12, 16, and 17 should be closely evaluated prior to constructing improvements based on a blending approach. Since Well Nos. 11, 12, and 16 are relatively close to Well No. 17, there is the potential for higher nitrate levels to be experienced in these wells, particularly if blending with Well No. 17 necessitates a different operating plan for these wells. Higher nitrate concentrations might preclude the use of blending as a viable alternative to treatment.

The federal primary and secondary MCLs for fluoride are 4.0 mg/L and 2.0 mg/L, respectively. The standard is based on air temperature. As a result, the corresponding state standards are 2.4 mg/L and 1.4 mg/L. The lower standards in Arizona reflect the likelihood for increased water consumption and correspondingly higher mass dose of fluoride. During 1998, fluoride concentrations in PVWC's wells occurred in the range of 0.35 mg/L to 0.89 mg/L, with an average concentration of 0.49 mg/L.

Iron is present in concentrations less than the federal secondary and state standard of 0.3 mg/L. The presence of iron in the raw water is noticeable at the MRTF in the form of a slight, reddish/rust colored deposit on the packing material. This discoloration occurs due the oxidation and precipitation of iron during within the aeration process.

A proposed radon MCL is anticipated in August 1999. The radon regulation will also contain a multimedia mitigation provision that would establish an alternative maximum contaminant level (AMCL) that could be met by water systems in recognition of background radon levels higher than the contribution of radon from water to air at the MCL. The AMCL will probably be set at 4,000 pCi/L.

Historical radon levels in PVWC's wells have ranged from about 100 pCi/L to 1,200 pCi/L. Therefore, regulation at the proposed MCL would likely require the installation of radon treatment facilities. However, meeting the higher AMCL and participating in a multimedia mitigation program appears to be a viable alternative for enabling PVWC to comply with the future radon regulation. In addition, the aeration towers presently installed at the MRTF would be capable of removing radon in water from wells presently delivered to the MRTF. In addition, PVWC could adopt an approach for providing centralized aeration treatment for other wells in the event that radon removal is needed. This approach could be adapted from an existing contingency plan for providing transmission and expanded aeration treatment capacity at the MRTF in the event that VOC contamination were to spread to PVWC's other wells.

5.4 SUMMARY

In general, PVWC's production facilities adequately serve PVWC's customers in terms of water quality, protection of the environment, safety, capacity, and reliability. As discussed in Section 3, continued growth in customer demand is projected to result in inadequate reliable production capacity by the end of the current planning horizon. Accordingly, a new well has been recommended. In addition, improvements related to the MRBS pumping capacity and delivery of water from Well Nos. 11 and 12 are discussed in Section 6 in conjunction with recommended Project A-7. This project also addresses the possible need for improvements to facilitate blending of Well No. 17 due to elevated nitrate concentrations, as well as the need to provide an outfall for delivering startup water from the wells to the Arizona Canal.

The contamination of PVWC's well field beyond those wells (Well PCX-1, Well No. 15, and Well No. 14) for which water is already sent to the MRTF, while unlikely, could be treated through the planned, phased expansion of the MRTF. Since such expansion would be paid for by the PCs, this would not have an impact on PVWC's capital investment program needs.

SECTION 6
DISTRIBUTION

6.1 OVERVIEW

PVWC serves approximately 4,600 customers from a distribution system comprised of ten pressure gradients. Water is delivered to the Main Zone directly from the wells, MRBS, and MRTF. Water is supplied to the other pressure zones via booster pumping from the Main Zone. The number of customers ranges from several thousand in the Main Zone to less than a dozen in the smaller hydro-pneumatic pressure zones. The pressure gradients range from about Elevation 1520 in the Main Zone to Elevation 2100 in the Highcliff Drive Zone.

Water is delivered through a distribution network consisting of more than 120 miles of mains, ranging in size from 1- to 24-inches in diameter. Pipeline materials include cast-iron, concrete, galvanized, cement asbestos, welded steel, ductile iron, and PVC C-900. Cast-iron and asbestos are the most commonly used materials, especially for the smaller-diameter pipes.

During 1996, PVWC implemented improvements to its distribution monitoring system that involved the replacement of tone-type telemetry equipment with a digital control system. The improved system includes a central monitoring and control workstation at the Casa Blanca Operations Center and RTUs and radio communications capabilities at key production and distribution facilities. The new system enables real-time monitoring and control, as well as computerized recording, trending, and storage of historical operating data. Additional improvements were installed during 1997 and 1998, which enabled key operating data to be monitored and recorded. Telemetry is provided to control Well Nos. 14, 15, 16 and 17 and the Miller Road booster pumps from the level in the 60th Street tank. Signals are also sent to the central control panel at the production/distribution center to monitor tank levels and pump status and flow.

Distribution storage is provided by two standpipes and seven reservoirs with a combined capacity of 2.2 MG. Hydro-pneumatic tanks provide pressure for two small pressure zones. Excluding the well supplies and production facilities, there are a total of eight booster pumping facilities.

The PVWC distribution system has been improved significantly over the past several years. These improvements include the installation of new transmission mains and pumping facilities, as well as the distribution system monitoring and control systems. As a result of these improvements, the PVWC customers have not experienced the water outages or severe low pressures that were previously associated

with excessive pressure losses in inadequately sized transmissions mains, failure of mechanical and electrical equipment, and unreliable telemetry equipment.

This section provides a summary of the existing physical and operating characteristics of the PVWC distribution system. It includes a description of the pressure zones, distribution storage, and pumping facilities. The results of computerized hydraulic model analyses are presented with respect to the system's ability to meet existing and projected peak system demands and recommended fire flow capacities. This section also identifies deficiencies and presents recommended improvements that will maintain adequate and reliable service.

6.2 SUMMARY OF KEY ISSUES

The most important issue facing PVWC's distribution system is a large equalization storage deficit. This deficit results in lower system reliability, less efficient operation of sources of supply and production facilities, and limits fire flows and pressures under peak demand conditions. The largest deficit is present in the Main Zone. Currently, this deficit is partially offset through the use of well production capacity. In addition, storage from the Country Club tanks can be delivered to the Main Zone to supplement the limited storage capacity in the Main Zone. An analysis of storage alternatives is presented in Section 6.3.3. Corresponding project recommendations are included in Section 6.4.

While distribution pressures are generally adequate, there are some customers located at higher ground elevations that cannot be supplied with pressures of at least 20 psi under all normal operating conditions. These areas are generally located west of Tatum Boulevard in the Main and Country Club Zones and in high elevation areas of the Clearwater Hills Zone. This is attributed to high friction loss through the small-diameter mains, as well as lowered water levels in the storage tanks under peak demand conditions.

The majority of the smaller-diameter mains were installed prior to 1970 when customer demands were significantly lower. As system demands increased, many of these mains have become undersized. The problems with small main sizing are exacerbated by the absence of adequate distribution storage to offset the need to transmit peak hourly flows from the system's sources of supply.

6.3 DESCRIPTION AND EVALUATION OF EXISTING FACILITIES

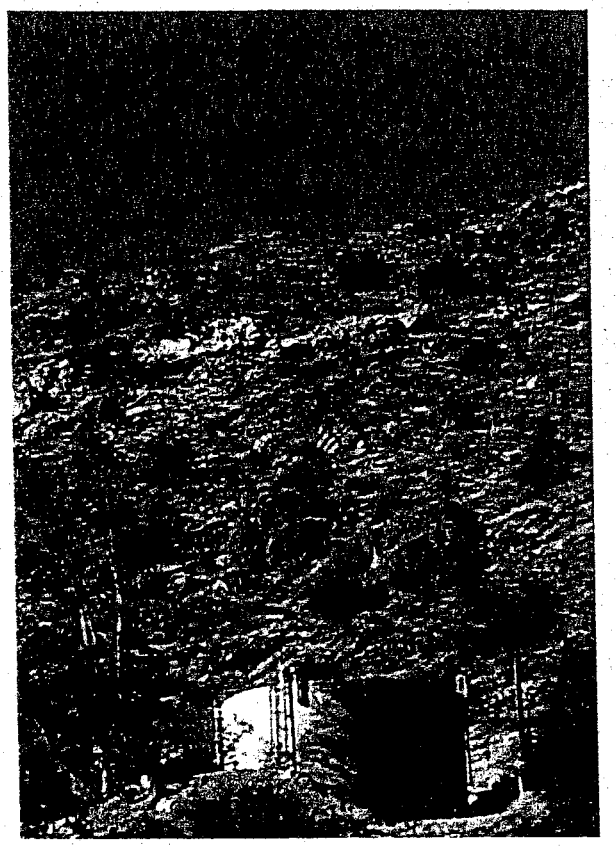
6.3.1 Pressure Zones

The distribution system operated by PVWC has been developed over many years, and consists of a total of ten pressure zones, including a Main Zone and several high lift zones. These pressure zones are illustrated on Exhibit 6-1 and described in the following paragraphs. "Ground elevations" refer to the general range of U.S.G.S. elevations within each pressure zone and are not necessarily the elevations of existing or future customers within the zones. The impact of customer elevations on distribution storage is discussed in Section 6.3.3.

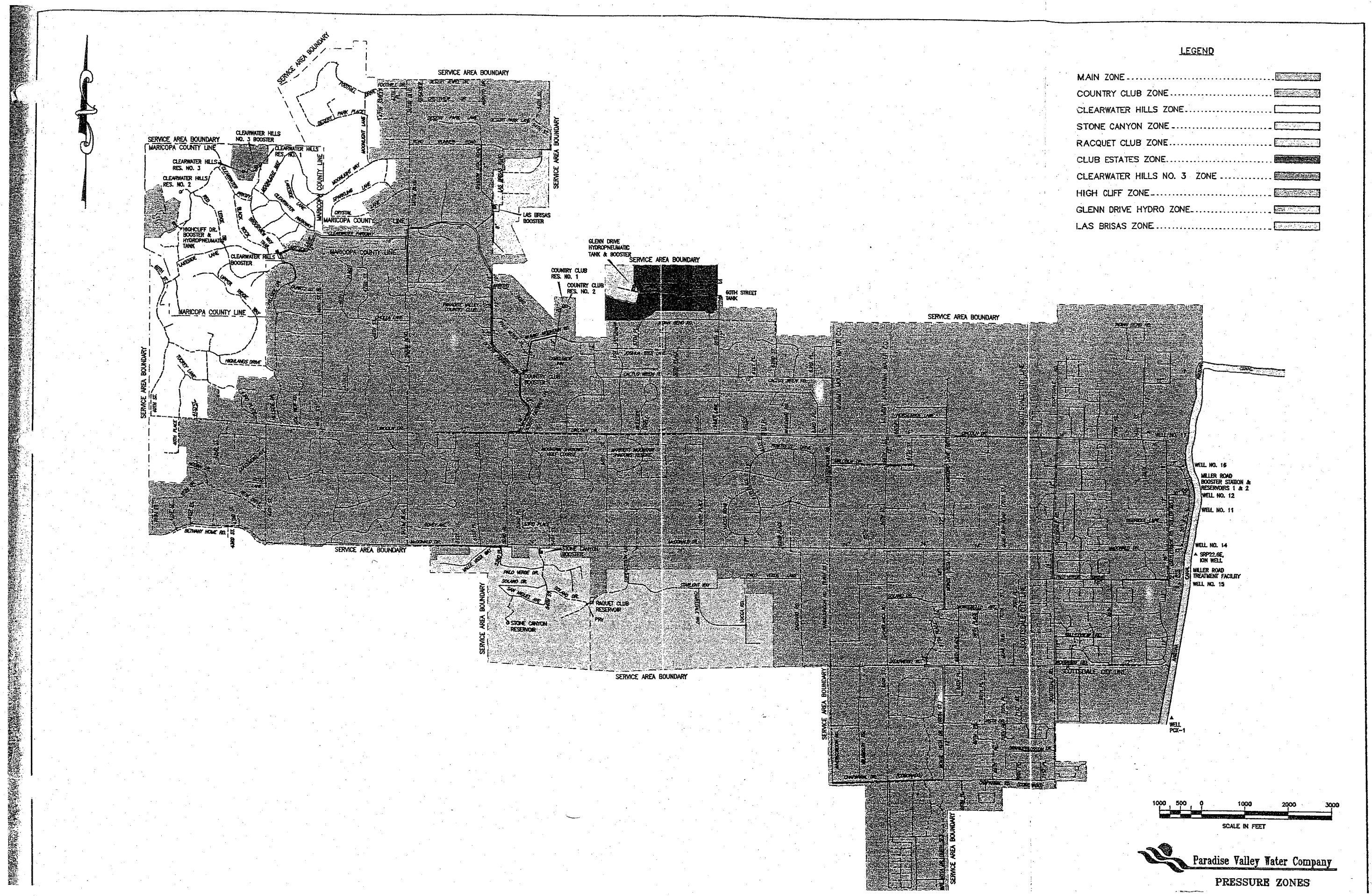
The Main Zone comprises the majority of the distribution system and is served directly by Well Nos. 16 and 17, the MRBS (Well Nos. 11 and 12), and the MRTF (Well Nos. 14 and 15 and Well PCX-1). Based on an analysis of peak demand periods during Summer, 1997, the Main Zone accounts for about 75 percent of the maximum system demand. Two of PVWC's largest customers — the PVCC and Marriott's Mountain Shadows Resort — are served from the Main Zone.

The gradient is established at Elevation 1527 by the overflow level of the 60th Street Tank, which is the only distribution storage tank within the Main Zone. The Main Zone encompasses portions of the Town of Paradise Valley and COS, as well as small, isolated areas of unincorporated Maricopa County. Ground elevations in the Main Zone range from about Elevation 1280 near the Arizona Canal to above Elevation 1400 in areas west of Tatum Boulevard, as well as in the foothills of Mummy and Camelback Mountains. Photographs of the 60th Street Tank and the view across the Main Zone from the base of this tank toward Camelback Mountain are provided as Exhibits 6-2 and 6-3, respectively.

Exhibit 6-2
60th Street Tank

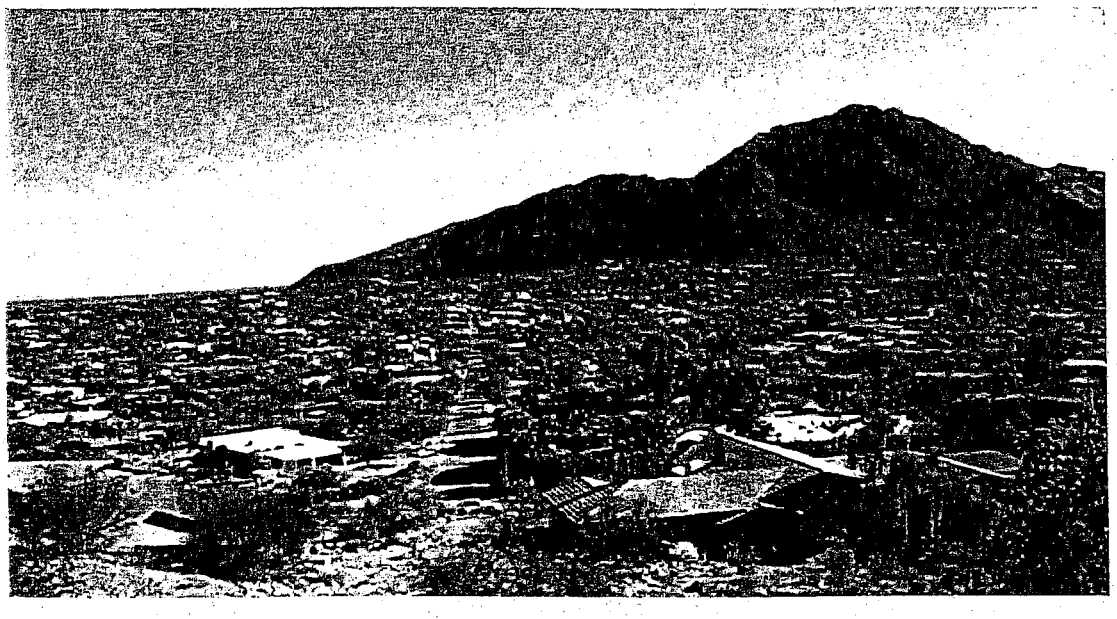


Distribution mains in the Main Zone range in size from 2-inch to 24-inches in diameter. Major


LEGEND
MAIN ZONE
COUNTRY CLUB ZONE
CLEARWATER HILLS ZONE
STONE CANYON ZONE
RACQUET CLUB ZONE
CLUB ESTATES ZONE
CLEARWATER HILLS NO. 3 ZONE
HIGH CLIFF ZONE
GLENN DRIVE HYDRO ZONE
LAS BRISAS ZONE
SERVICE AREA BOUNDARY
MARICOPA COUNTY LINE
CLEARWATER HILLS NO. 3 BOOSTER
CLEARWATER HILLS RES. NO. 1
CLEARWATER HILLS RES. NO. 3
CLEARWATER HILLS RES. NO. 2
HIGHCLIFF DR. BOOSTER & HYDROPNEUMATIC TANK
CLEARWATER HILLS BOOSTER
LAS BRISAS BOOSTER
GLENN DRIVE HYDROPNEUMATIC TANK & BOOSTER
COUNTRY CLUB RES. NO. 1
COUNTRY CLUB RES. NO. 2
60TH STREET TANK
COUNTRY CLUB BOOSTER
STONE CANYON BOOSTER
RACQUET CLUB RESERVOIR
STONE CANYON RESERVOIR
PRV
SCOTTSDALE CITY LINE
WELL NO. 16
MILLER ROAD BOOSTER STATION & RESERVOIRS 1 & 2
WELL NO. 12
WELL NO. 11
WELL NO. 14
SR922.6E, ION WELL
MILLER ROAD TREATMENT FACILITY
WELL NO. 15
WELL PCX-1
1000 500 0 1000 2000 3000
SCALE IN FEET
Paradise Valley Water Company
PRESSURE ZONES

mains in the portion of the distribution system east of 68th Street consist of 16-inch mains along Lincoln Drive and McDonald/Palo Verde Drives and a 12-inch main along Jackrabbit Road. Main sizing along Lincoln and McDonald Drives west of 68th Street to 52nd Place decreases to 12-inch and increases to 24-inch, respectively. The majority of the mains comprising the remainder of the Main Zone distribution grid are 6- and 8-inches in diameter.

Exhibit 6-3
View South from 60th Street Tank



The Country Club Zone is the next largest pressure zone. Its estimated portion of the system-wide peak period demand is about 15 percent. The Camelback Inn is one of PVWC's largest customers and is served from the Country Club Zone. Water is also delivered through the Country Club Zone to customers in the Clearwater Hills, Clearwater Hills III, and Highcliff Drive Zones.

As shown on Exhibit 6-1, the Country Club Zone encompasses an area of the Town of Paradise Valley (and small portion of unincorporated Maricopa County) located north of Lincoln Drive between Mummy Mountain Road and Hillside Drive. It is bounded to the north by Desert Jewel Drive. Ground elevations in the pressure zone range from about 1350 to about 1600 feet above sea level. However, the majority of the customers are located at about Elevation 1400 to 1500.

The Country Club Zone gradient is supported by two ground storage tanks with overflows at Elevation 1562. These tanks are located next to each other in the northeast corner of the pressure zone. The Country Club distribution piping grid is comprised of mains ranging from 4-inches to 16-inches in diameter.

Water is delivered to the Country Club Zone via the Country Club Booster Station (B.S.) This booster station is located near the intersection of Desert Fairways Drive and Mummy Mountain Road. The booster station is fed from parallel 16-, 12-, and 6-inch mains along Desert Fairways Drive and discharges into a 10-inch main, increasing to 12-inches along Mummy Mountain Road and a 12-inch main, which feeds 16- and 8-inch mains along Desert Fairways Drive.

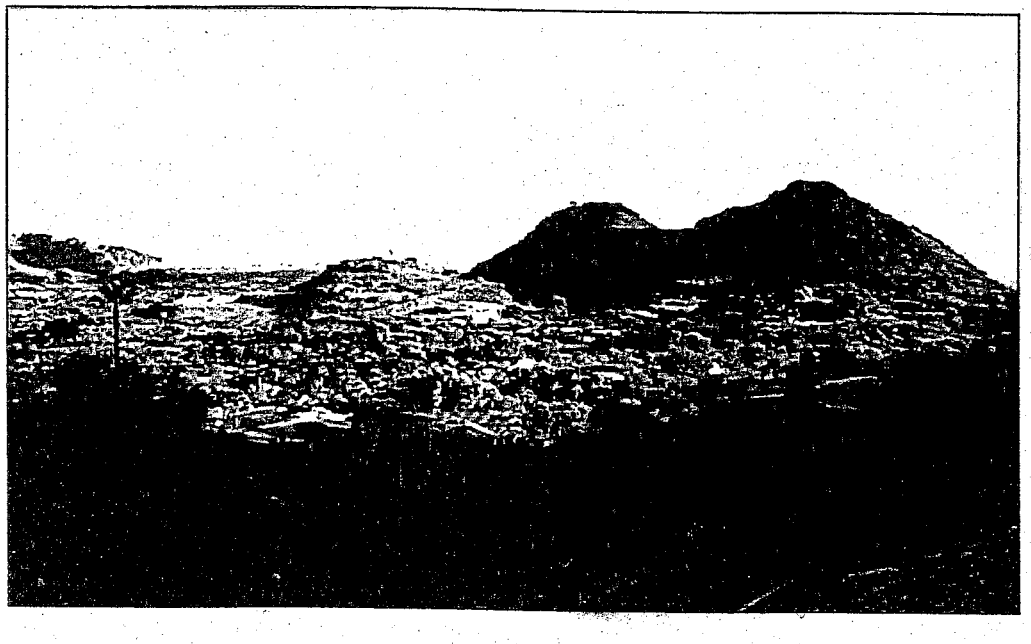
The Country Club Zone is configured such that the storage tanks cannot support a high enough gradient to maintain adequate pressures throughout the pressure zone. Therefore, the Country Club B.S. is operated based on pressure in the Country Club Zone, rather than from the level in the Country Club tanks. The Country Club tanks are prevented from overflowing by a check valve on the inlet/outlet pipeline which only allows flow out of the tank. Water is permitted to fill through a 3-inch bypass pipe, which restricts flow into the tank to a rate that does not result in low pressures within the zone.

The Country Club tanks are also used to provide supplemental storage to the Main Zone during periods when the water level in the 60th Street tank falls below 15 feet. Upon falling below 15 feet, automatic valves located adjacent to the Country Club B.S. enable water to flow from the Country Club tanks to the suction side (Main Zone) of the Country Club B.S. When operated in this manner, the Country Club tanks effectively serve as Main Zone storage. Upon recovery of the 60th Street tank, the automatic valves reverse (close), enabling the Country Club tanks to refill.

The Clearwater Hills Zone is served by the Clearwater Hills B.S. from the Country Club Zone. The Clearwater Hills gradient is established at about Elevation 1732 by the overflow elevations of the Clearwater Hills Tank Nos. 1 and 2. Although the reservoirs have the same overflow elevations, they are located in different parts of the zone. The zone serves a primarily residential area with homes located in the foot hills and on the sides of the Phoenix Mountains. The pressure zone is mostly located in unincorporated Maricopa County; however, its southern portion extends southward into the Town of Paradise Valley in an area generally bounded by Lincoln Drive and Tatum Boulevard.

Ground elevations in the Clearwater Hills Zone range from less than 1400 feet to about 1680 feet. Highest ground elevations are located in the northwest portion of the pressure zone. Exhibit 6-4 is a view of the Clearwater Hills Zone looking south from the base of Clearwater Hills Tank No. 1. A relatively small number of customers located at or above Elevation 1660 are served via boosted gradients within the Clearwater Hills Zone. One of these boosted zones, Clearwater Hills III Zone is supplied from a booster station that takes suction from the Clearwater Hills Zone near the base of Clearwater Hills Tank No. 1. Water is pumped to Clearwater Hills Tank No. 3, which is located west of Silvercrest Way and has an overflow at about Elevation 1760.

Exhibit 6-4
View South from Clearwater Hills Tank No. 1



The second boosted zone is a hydro-pneumatic system that serves customers along Highcliff Drive. The Highcliff Drive system establishes a gradient that varies from about Elevation 2070 to Elevation 2115.

Distribution piping throughout the Clearwater Hills Zone predominantly consists of 4- and 6-inch mains. Accordingly, the piping network supports limited available fire flow capacity. In addition, customers at higher ground elevations may experience marginal pressures during peak demand periods. Overall, the Clearwater Hills Zone is the third largest, accounting for about 8 percent of the system-wide maximum day demand.

A small booster station was constructed along Las Brisas Road, within the County Club Zone, to increase pressures to twelve existing customers located at higher ground elevations in the Montana de Bonitas Casas development. The booster station was recently relocated to a lower elevation within the development The original booster station was replaced with a prefabricated unit, equipped with pumps capable of meeting peak demands and fire flows. The booster pumps in this station are equipped with VFDs to efficiently sustain pressure in the development. The Las Brisas Zone will be expanded to provide service to an additional 24 customers. Some of these customers will be served through a pressure regulating valves (PRV), but the gradient will be higher than the Country Club Zone gradient.

The Stone Canyon and Racquet Club Zones are located along the southern boundary of the service area in the foothills of Camelback Mountain. The Stone Canyon Zone is served directly from the Main Zone via the Stone Canyon B.S. Water is pumped from the booster station to the overflow of the Stone Canyon reservoir, which is located at Elevation 1694. Ground elevations in the service area range from about 1420 feet to 1650 feet above sea level. Distribution mains in the Stone Canyon Zone are generally 4- and 6-inches in diameter.

The Racquet Club Zone is located to the east of the Stone Canyon Zone. It is supplied from the Stone Canyon Zone through a PRV. The PRV functions as an altitude valve to prevent the Racquet Club Tank from overfilling. The overflow of the Racquet Club Tank establishes a gradient at about Elevation 1555 for the Racquet Club Zone. Estimated ground elevations for Racquet Club Zone customers range from 1420 to 1540 feet above sea level.

One of the system's largest customers, the Tennis Ranch, Inc. is located within the Racquet Club Zone, as are several of the system's largest residential water users. The distribution grid is comprised of 4-inch and 6-inch diameter mains, which form a linear, un-looped system. The Racquet Club Zone is isolated from the Main Zone along its eastern boundary by several closed valves on small-diameter (2-inch) mains.

The Club Estates Zone is located in the north-central part of the service area along the southern slope of Mummy Mountain. The gradient of the Club Estates Zone is established at about Elevation 1662 by the overflow level of the Club Estates standpipe. Water is supplied to the Club Estates Zone from the Club Estates B.S., which takes suction from the Main Zone near the intersection of 59th Place and Indian Bend Road. Distribution piping within the Club Estates Zone is comprised of 6-inch mains along 59th Place, Glenn Drive, 57th Place, and Indian Bend Road.

A small hydro-pneumatic pump and pressure tank system is located along Glenn Drive at the base of the Club Estates Tank. The system supplies the Glenn Drive Zone, which has a gradient ranging from about Elevation 1800 to Elevation 1900. This zone serves a small number of customers located at higher elevations along Glenn Drive.

6.3.2 Pumping

Water is delivered to the Main Zone directly from the service area's wells and production facilities. The adequacy of the wells for meeting current and projected maximum day demands was reviewed in Section 3.3. However, since water from the majority of the wells is delivered to the system via the production facilities, the distributive pumping capacity of these facilities was also evaluated for adequacy with respect to system demands. Since all of the service area's water supply is delivered through the Main Zone, the capacity of the distributive pumps must be sufficient to meet the system-wide maximum day demand.

Table 6-1 presents a summary of the distributive pumping capacity to the Main Zone. It includes the well pumps for Well Nos. 16 and 17 and three pumps each for the MRBS and MRTF. The total distributive pumping capacity of the MRBS and MRTF exceeds the available well capacity to these stations. However, the reliable distributive pumping capacity at the MRBS is less than the combined well capacity. The loss of MRBS Pump No. 3 would limit the reliable distributive pumping capacity to the Main Zone to 18.3 mgd. While a reliable capacity of 18.3 mgd is sufficient to meet historical maximum day demands, as well as projected system-wide maximum day demands for the near future, it is less than the projected 2012 maximum day demand of 19.25 mgd.

Table 6-1

Main Zone Distributive Pumping Capacity

Facility	Wells	Combined Well Capacity (gpm) (1)	Distributive Pumps	TDH (feet)	Rated Capacity (gpm)	Distributive Pumping Capacity (gpm) (2, 3)
Well No. 16	16	2,500	---	---	---	2,500
Well No. 17	17	2,250	---	---	---	2,250
MRBS	11, 12	4,200	No. 1	335	800	
			No. 2	335	800	
			No. 3	335	2,800	
			MRBS			4,200
MRTF	14, 15, PCX-1	6,350	A	360	3,300	
			B	360	3,300	
			C	360	3,300	
			MRTF			6,350
	Totals (mgd):	22.03				22.03
	Reliable (mgd):	18.43				18.29

Notes:

(1) From Table 3-1
(2) Totals for MRBS and MRTF are limited by total available well capacity
(3) Reliable distributive pumping capacity for the system reflects loss of MRBS Pump No. 3

As discussed in Section 3, the addition of SRP Well 22.6 is anticipated to provide adequate reliable source of supply capacity throughout the current planning horizon. The importance of this well for assisting in meeting peak hourly demands is discussed in Section 6.3.3.4. At present, SRP Well 22.6 is not anticipated to require treatment for TCE removal at the MRTF. This provides some flexibility in the alternatives for distributing water from the well to the PVWC distribution system. These alternatives include the following:

1) Deliver water from SRP Well 22.6 directly to the distribution system

2) Deliver water from SRP Well 22.6 to MRBS

The first alternative would require modifying/replacing the existing well pump to pump to the Main Zone gradient, and would provide adequate distributive pumping capacity throughout the current planning horizon. As discussed above, the reliable pumping capacity of the MRBS is less than the available well capacity. Therefore, rerouting SRP Well 22.6 to the MRBS would not add to the system's reliable distributive pumping capacity. The installation of an additional distributive pump at the MRBS or the possible conversion of Well Nos. 11 and/or 12 to pump to the distribution system directly would be needed to provide adequate distributive pumping capacity.

The recommended approach is to deliver water from SRP Well 22.6 directly to the distribution system along Miller Road and to provide additional distributive pumping capacity at the MRBS. This approach is consistent with recommended Project Nos. A-6 and A-7, which involve reinforcement of the east-west transmission main capacity along Miller Road (and others), and construction of a new MRBS, respectively.

A summary of PVWC's existing booster pumping facilities is presented in Table 6-2. Table 6-2 indicates the suction and discharge pressure zones for the facilities along with the rated capacities for the individual pumps and the total and reliable pumping capacities for each facility. The adequacy of these facilities depends on the total demand within the zone and desired rate of delivery from the zone into any other zones. The demands that must be met within each zone are the current and projected maximum day demands plus any increment of peak hourly demand or fire flow that cannot be satisfied from existing or future distribution storage facilities within each zone. An analysis of distribution storage adequacy is presented in Section 6.3.3.

Table 6-2

Booster Pumping Capacity

Booster Pumping Facility	"From" Zone	"To" Zone	Distributive Pumps	TDH (feet)	Rated Capacity (gpm)
Country Club B.S.	Main	Country Club	No. 1	100	900
			No. 2	100	900
			No. 3	100	900
			No. 4	100	900
			Total:		3,600
			Reliable:		2,700
Clearwater Hills B.S.	Country Club	Clearwater Hills	No. 1	175	825
			No. 2	175	825
			No. 3	175	825
			Total:		1,700 (1)
			Reliable:		1,350
Stone Canyon B.S.	Main	Stone Canyon (and Racquet Club via pressure reduction)	No. 1	250	180 wrong
			No. 2	250	180
			Total:		360
			Reliable:		180
Club Estates B.S.	Main	Club Estates	No. 1	150	100
			No. 2	150	100
			Total:		200
			Reliable:		100
Clearwater Hills III B.S.	Clearwater Hills	Clearwater Hills III	No. 1	160	70
			No. 2	160	70
			Total:		140
			Reliable:		70
Highcliff Drive B.S.	Clearwater Hills	Highcliff Drive Hydro-Pneumatic	No. 1	410	60
			No. 2	410	60
			Total:		120
			Reliable:		60
Glen Drive B.S.	Club Estates	Glen Drive Hydro-Pneumatic	No. 1	180	25
			No. 2	180	25
			No. 3	180	25
			Total:		75
			Reliable:		50
Las Brisas B.S.	Country Club	Montana de Bonitas Casas Development	No. 1	170	43 (2)
			No. 2	170	43 (2)
			No. 3	170	500
			Total:		586
			Reliable:		86

Notes:

(1) Model-predicted results reflect pump operation at a higher TDH.

(2) Existing pumping capacity -- replacement with 100-gpm pumps is anticipated upon expansion of the zone.

In the absence of adequate equalization storage, available pumping capacity to a zone is considered to be adequate if the reliable capacity exceeds the peak hourly demand and the total capacity exceeds the sum of the maximum day demand and needed fire flow rate. The needed fire flow rate is the average rate of flow for the duration of the fire event that is needed to offset storage that is not available within the zone. The available fire reserve storage volume is the total storage less the needed equalization volume and any ineffective storage.

The Country Club B.S. consists of an above-ground, masonry building. A single room within the building contains the pumps, piping and valves, pump controls, electrical equipment, and instrumentation. As shown in Table 6-2, the station is equipped with four identical booster pumps, each having a capacity of 900 gpm at 100 feet total dynamic head (TDH). Two VFDs were installed at the Country Club B.S. during 1998. The VFDs enable the pumps to maintain a constant discharge pressure and improve operating efficiency. The rated total and reliable capacities of the Country Club B.S. are 3,600 gpm and 2,700 gpm, respectively.

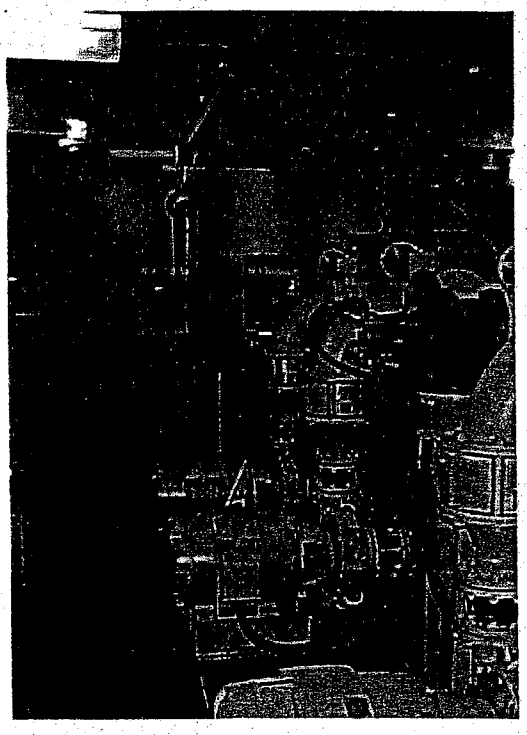
Since the Country Club Zone is operated without the benefit of the full volume of storage available in the Country Club Tanks, the pumps currently must deliver a portion of the Zone's peak hourly demands. The recommended permanent conversion of the Country Club Tanks to the Main Zone (see Section 6.3.3 and IP 99-04) will necessitate that the pumps satisfy the Zone's total peak hourly demands and fire flow need. The Country Club B.S. must also meet the maximum day demand of the Clearwater Hills Zone, as well as the peak hour demand and fire flow needs of the Clearwater Hills Zone that cannot be met from storage within this Zone.

Computerized hydraulic modeling indicates that the Country Club B.S. is adequate for meeting the current demands and fire flows of the Country Club Zone, and should provide adequate service following the completion of IP 99-04. However, operation of the Country Club Zone as a closed system is anticipated to become less reliable with increasing demand, as evidenced by decreasing model-predicted suction pressures at the Clearwater Hills B.S. for the results of projected 2012 model runs. The model-predicted pumping deficiency could be addressed, as discussed in Project B-11, through the retirement of the Country Club B.S., conversion of existing Country Club Zone customers to direct service from the Main Zone, and installation of a new main along Tatum Boulevard to support higher pressures at the Clearwater Hills B.S. during peak demand periods.

A photograph of the interior of the Clearwater Hills B.S. is shown as Exhibit 6-5. The prefabricated, below grade facility was placed in service during 1996. Three end-suction, centrifugal pumps are installed, with each having a rated capacity of 825 gpm at a TDH of 175 feet. The booster station is also equipped with a VFD. The total and reliable capacities of this booster station are estimated to be 1,700 gpm and 1,350 gpm, respectively. The estimated capacities are based on the results of computerized hydraulic model analyses, which reflect the impact of parallel pump operation and predicted total pump head conditions.

The Clearwater Hills B.S. is operated to attempt to maintain a minimum water level of 14 feet in the Clearwater Hills Nos. 1 and 2 Tanks. The existing volume of storage in the tanks above this level, about 0.08 MG, is less than the equalization storage need for the zone. Therefore, equalization storage must be borrowed in the form of increased pumping from the Country Club Zone to prevent the tanks from being drawn down below this level on the maximum demand day. For example, the calculated pumping capacity from the Country Club Zone that would prevent the tanks from emptying below 14 feet is 1,275 gpm (1.84 mgd) for a projected 2012 maximum day demand of 1.45 mgd in the Clearwater Hills Zone. According to Table 6-2, the existing reliable capacity of the Clearwater Hills B.S. is adequate to produce this flow rate, provided that the minimum suction pressure at the Clearwater Hills B.S. is maintained above 35 psi to 40 psi.

Exhibit 6-5
Clearwater Hills B.S.



The needed fire reserve volume in the Clearwater Hills Zone of 0.18 MG cannot be met from storage within the Clearwater Hills Zone. Assuming that the full volume of storage below 14 feet would be available for fighting a fire, an additional volume of at least 0.06 MG would need to be provided from the Country Club Zone. The pumping rate to be delivered over a 2-hour period to meet this need and satisfy the projected maximum day demand is 1,530 gpm. Since this flow rate is less than the total capacity of

the booster station, the existing total pumping capacity is projected to be adequate throughout the current planning horizon.

While the total pumping capacity is projected to be adequate, use of fire reserve volume that causes the water level in the Clearwater Hills Tanks to fall below 14 feet is predicted to result in pressures less than 20 psi near the suction of the Highcliff Drive Hydro-pneumatic Station. For example, if three pumps were operated to produce about 1,700 gpm during a fire event on the 2012 maximum demand day, the resulting pressure near the intersection of Highcliff Drive and Clearwater Parkway is predicted to be about 15 psi. Relocation of not more than about a half dozen customers that would possibly be affected by this situation to the Highcliff Drive Zone should be considered.

The Club Estates, Clearwater Hills III, Highcliff Drive, and Glenn Drive Zones do not have sufficient total pumping capacity and storage to meet the system's minimum fire flow need. However, since there are no fire hydrants within these zones, their booster pumping facilities are not considered to be deficient with respect to the maximum day demand plus fire flow criterion. Also, insufficient data were available to conduct detailed analyses of the equalization storage needs for these zones. However, the pumping and storage facilities are reported to be adequate for meeting peak instantaneous demands for the zones that they serve.

The Stone Canyon B.S. was recently replaced. The new station is designed to provide adequate fire flow via pumping from the Main Zone since distribution storage within the Stone Canyon Zone is insufficient for this purpose. Similarly, the new Las Brisas B.S. now provides adequate reliable capacity for meeting peak domestic demands and fire flow within the Montana de Bonitas Casas development.

6.3.3 Storage

A summary of PVWC's distribution storage facilities is presented in Table 6-3. The capacities of the storage tanks range from about 20,000 gallons to 0.5 MG. With the exception of the Country Club and MRBS tanks, all storage tanks function as floating storage within their respective pressure zones. The current operating status of the Country Club Tanks was described in Section 6.3.1. The Miller Road Tanks provide flow equalization for Well Nos. 11 and 12 and the MRBS distributive pumps.

The overflow elevations for the tanks range from 1,300 feet to 1,760 feet above sea level. Table 6-3 also indicates the maximum elevation for which each storage tank is able to maintain a minimum pressure of 20

Table 6-3

Summary of Distribution Storage Facilities

Tank Name	Year Built	Pressure Zone (1)	Type	Capacity (MG)	Diameter (Feet)	Tank Height (Feet)	Overflow Elev. (Ft.-USGS)	Maximum Service Area Elev. (FT.) (3)	Service Area Ground Elev. Range (Ft.) (4)
60th Street	1969	Main	Ground	0.2	50	23.9	1527.1	1457	1280-1440
Miller Road No. 1	1965	Main (2)	Ground	0.15	36	19.9	1299.5	N/A	1280-1440
Miller Road No. 2	1965	Main (2)	Ground	0.35	55.4	19.9	1299.5	N/A	1280-1440
Miller Road No. 3	1965	Main (2)	Ground	0.2	37	23.9	1303.5	N/A	1280-1440
Racquet Club	1955	RC	Ground	0.1	27.1	23..9	1555	1509	1400-1550
Stone Canyon	1955	SC	Ground	0.095	26.1	23.8	1694	1624	1420-1650
Country Club No. 1	1987	CC	Ground	0.5	60.1	23.9	1562.3	1492	1355-1500
Country Club No. 2	1987	CC	Ground	0.36	50.6	23.9	1562.3	1492	1355-1500
Clearwater Hills No. 1	1956	CWH	Ground	0.1	27.1	23.9	1731.6	1662	1400-1660
Clearwater Hills No. 2	1965	CWH	Ground	0.1	27.1	23.9	1731.6	1662	1420-1660
Clearwater Hills No. 3	1968	CWHIII	Standpipe	0.022	13.8	20	1760.5	1694	1600-1740
Club Estates	1961	CE	Standpipe	0.032	16.1	19.9	1661.9	1596	1450-1650

Notes:

(1) RC=Racquet Club, SC=Stone Canyon, CC=Country Club, CWH=Clearwater Hills, CWHIII=Clearwater Hills No. 3, CE=Club Estates

(2) Tanks provide pump equalization only. Pumping capacity from Miller Road Booster Station is inadequate for the tanks to be considered as distribution storage.

(3) Maximum elevation within pressure zone for which a minimum pressure of 20 psi can be maintained under static conditions with storage nearly depleted.

(4) Represents general extents of service area. Steep topography of the higher pressure zones precludes and exact analysis of customer elevations. Pumps/hydro-pneumatic systems are installed for some customers to increase pressures.

psi under static flow conditions. These elevations are compared to the approximate range of ground elevations served by the tanks as a means for determining whether any portion of the available storage should be considered ineffective for meeting storage needs. In several cases, the maximum ground elevation exceeds the maximum elevation at which 20 psi can be maintained. However, this analysis is complicated by the steep slopes in the upper pressure zones and the associated difficulty in ascertaining whether actual customer meter locations are above or below the tank bottom elevations. In addition, large-scale development has not occurred and is not anticipated at high ground elevations. Individual booster pumps and hydro-pneumatic systems are installed for a small number of customers receiving marginal pressures and could be provided for future customers at high ground elevations. Therefore, storage in the higher pressure zones is considered to be fully effective.

The estimated minimum static pressures for the Main, Country Club, and Clearwater Hills Zones are about 27 psi, 17 psi, and 25 psi, respectively. Therefore, existing storage in the Main and Clearwater Hills Zones is considered to be fully effective with respect to customer elevations throughout the zones. Although the minimum static pressure for direct service from the Country Club Zone is less than 20 psi, the recent replacement of the Las Brisas B.S. enables customers below Elevation 1492 to be served from a boosted zone. In addition, while storage within the Country Club Tanks is not considered floating storage, water within the tanks can be drained to the Main Zone and then pumped through the Country Club B. S. into the zone. therefore, it is considered to be 100 percent effective. Available floating storage in the remaining zones is also considered to be 100 percent effective.

The storage tanks have similar characteristics — all are welded steel storage tanks constructed as ground storage reservoirs or standpipes. Most of the tanks were constructed during the 1950's and 1960's. During late 1996, ten of the systems tanks were inspected and were found to require remedial work, including re-coating and the completion of various structural modifications to address sanitary and safety concerns. This work was completed for 5 tanks during 1998, and similar structural improvements have been recommended for 3 additional tanks for completion during the Year 2000.

6.3.3.1 Demand and Equalization Analysis

The storage analysis for the PVWC system is based on available SCADA data from March 1997 to October 1997. Unfortunately, distribution system monitoring information was not available for a period of time from late July to about mid-August, which is when the reported historic maximum day demand of 15.41 mgd occurred. Therefore, data from this period could not be included in the equalization analysis, and data from the next highest system delivery period between 6/18/97 and 7/22/97 were used. (The maximum 24-hour average system delivery during this period of time was 14.1 mgd). Storage analyses were conducted for the system's four primary pressure zones, (Main, Country Club, Clearwater Hills, and Stone Canyon/Racquet Club) during this time period. The storage needs for the remaining pressure zones are included in the needs for the primary zones because insufficient distribution system monitoring data were available to evaluate their storage needs separately. The equalization analysis results are summarized in Table 6-4.

The demand characteristics that are summarized in Table 6-4 were identified based on the results of peak hour analyses for each 24-hour period from 6/18/97 to 7/22/97 rather than for a single maximum demand day. This approach was taken to compensate for the lack of reliable historic data, which would normally be used to substantiate the peak usage characteristics for a maximum demand day in any one year. Furthermore, this approach enabled the maximum day demands for each of the primary pressures zones to be identified independently. As shown in Table 6-4, the resulting total system demand of 14.75 mgd is greater than the system-wide maximum day demand during this time period of 14.1 mgd and may be more indicative of the usage characteristics for the reported maximum day demand of 15.41 mgd.

In general, the diurnal demand patterns for each pressure zone are similar, with peak hourly demands occurring between 4:00 and 7:00 in the morning and minimum hour demands occurring from 2:00 to 6:00 in the afternoon. This pattern is consistent with efficient water usage practices by PVWC's customers for outdoor landscaping. Less wind and lower evaporation rates in the morning hours enable more of the applied water to reach the vegetation.

The ratio of peak hour to maximum day demands ranged from 1.35 in the Country Club Zone to 1.63 for the Clearwater Hills Zone. Minimum hour demands ranged from 55 to 64 percent of the maximum day demands. Estimated equalization rates varied from 10 percent for the Country Club Zone to 20 percent for the combined Stone Canyon and Racquet Club Zone. The equalization rates included in Table 6-4 reflect the maximum equalization rates observed for each pressure zone.

Table 6-4

Summary of Maximum Day Diurnal Demand Characteristics (1)

Pressure Zone	Demand (mgd)			Time		Ratio (to Maximum Day Demand)		Max. Equal. Rate (Percent)
	Maximum Day	Peak Hour	Minimum Hour	Peak Hour	Minimum Hour	Peak Hour	Minimum Hour	
Main (2)	11.0	16.2	6.25	6:00-7:00 am	2:00-3:00 pm	1.48	0.57	15
Country Club (3)	2.3	3.16	1.48	5:00-6:00 am	3:00-4:00 pm	1.35	0.64	10
Clearwater Hills (4)	1.11	1.8	0.61	4:00-5:00 am	5:00-6:00 pm	1.63	0.55	18
Stone Canyon/ Racquet Club (5)	0.37	0.59	0.22	4:00-5:00 am	9:00-10:00 am	1.59	0.58	20
Totals:	14.75	21.75	8.56	---	---	---	---	---

Notes:

(1) Based on analysis results for 6/18/97 - 7/22/97. Results reflect maximum day demand periods for the individual pressure zones and are not coincidental.

(2) Main Zone demands include the Club Estates and Glen Drive Zones. Results are approximate as actual flow from the Country Club Tanks to the Main Zone was not measured.

(3) Results are approximate as actual flow from the Country Club Tanks to the Main Zone was not measured.

(4) Clearwater Hills Zone demands include the Clearwater Hills III and Highcliff Drive Zones.

(5) Data reflects combined characteristics since data were not available to calculate them separately. Minimum hour demands more typically occur between 2:00 and 6:00 pm.

According to Table 6-4, approximately three-quarters of the total demand of 14.75 mgd is attributed to consumption within the Main Zone (including the Club Estates and Glen Drive Hydro-pneumatic Zones). About 16 percent of the maximum day demand is attributed to the Country Club Zone. The Clearwater Hills Zone (including the Clearwater Hills III Zone and Highcliff Hydro-pneumatic Zones) and combined Stone Canyon/Racquet Club Zone accounted for about 7.5 percent and 2.5 percent of the total demand.

Although the Country Club Tanks are located within the Country Club Zone, automatic valves have been installed near the Country Club B.S. to enable the tanks to contribute water to the Main Zone. A review of water level data for the 60th Street Tank indicated that this occurred on several occasions between 6/18/97 and 7/22/97. Since the flow from the tanks to the Main Zone is not metered, the demand characteristics for the Main and Country Club Zones reflect the use of approximations for the rate of flow from one zone to the other in the equalization analysis. Similarly, demand characteristics for the Stone Canyon Racquet Club Zone are combined because the rate of flow from the Stone Canyon Zone to the Racquet Club Zone was not metered.

System Equalization and PVCC Diurnal Usage

One of the key findings from the peak hour analysis for the PVWC system was that neither the equalization volume nor the equalization rate (equalization volume as a percentage of the corresponding 24-hour average demand) was correlated with the magnitude of the 24-hour average demand for the period from 6/18/97 to 7/22/97. Higher equalization needs did not necessarily correspond to higher system demands. A review of the diurnal water usage pattern for PVWC's largest customer, the Paradise Valley Country Club (PVCC), provides an explanation for this occurrence.

The results of an evaluation of the usage patterns for filling PVCC's golf course lake and its impact on equalization storage needs in the Main Zone are shown in Table 6-5. This evaluation was conducted for three separate 24-hour periods during the period from 6/18/97 to 7/22/97. These data indicate that PVCC's usage pattern has a strong influence on PVWC's equalization storage needs. For example, the actual equalization volume for the Main Zone for the 24-hour period beginning on 6/27/97 and ending on 6/28/97 was 1.35 MG, corresponding to an equalization rate of 13.5 percent. The average Main Zone (including PVCC and Stone Canyon/Racquet Club Zone) and PVCC demands during this period of time were 10 mgd and 0.9 mgd, respectively. In the event that PVCC had not taken any water (and system

Table 6-5

Impact of PVCC Usage on Main Zone Equalization Storage Need (1)

24-Hour Period	Equalization Volume (MG)			Equalization Rate			Main Zone Demand (mgd)	PVCC Demand (mgd)
	Actual	Without PVCC Usage	Optimal PVCC Usage	Actual	Without PVCC Usage	Optimal PVCC Usage		
6/20/97 - 6/21/97	1.21	1.01	0.65	12.2%	11.6%	6.5%	9.94	1.24
6/27/97 - 6/28/97	1.35	1.03	0.75	13.5%	11.3%	7.5%	9.98	0.89
7/09/97 - 7/10/97	0.83	0.99	0.59	7.8%	10.8%	5.5%	10.67	1.49
Average:	1.13	1.01	0.66	11.2%	11.2%	6.5%	10.20	1.21
Average Savings:	---	0.12	0.47	---	-0.07%	4.67%	---	---

Notes:

(1) Stone Canyon/Racquet Club Zones demand is included as data were not available to exclude it.

demand had otherwise remained the same), the needed equalization volume would have been reduced to 1.03 MG, and the corresponding equalization rate would have been 11.3 percent.

In contrast, Table 6-5 indicates that the system equalization need was only 0.83 MG (7.8 percent) when the corresponding system demand was 10.67 mgd during the period from 7/09/97 to 7/10/97. The equalization volume would have been 0.99 MG (10.8 percent) had PVCC not used any water for lake filling activities, which is similar to the predicted volume for the period from 6/27/97 to 6/28/97 without PVCC usage. In this case, increased PVCC usage (1.49 MG vs. 0.89 MG) resulted in a decrease in the system equalization need even though the system demand was higher. Although not evident from the data presented in Table 6-5, the reduced system equalization need for the period from 7/09/97 through 7/10/97 compared to 6/27/97 through 6/28/97 is related to the timing of PVCC's usage, as well as the amount of PVCC's usage.

As a result of service difficulties experienced by PVWC prior to initiation of its major capital improvement program in 1995, PVCC agreed to limit its lake filling water usage to the hours between 1:00 PM and 5:00 AM. Adequate water supply was not available for PVCC to refill its lake during the system's peak hourly demand period. This situation changed following the completion of several large transmission main projects during 1996. Although the PVCC agreement on its diurnal water usage for lake filling had not been rescinded, PVCC was physically able to obtain delivery at relatively high rates even during the system peak demand period. This occurred during the 24-hour period from 6/27/97 through 6/28/97, when PVCC used an average of 1,850 gpm from about 5:00 AM through 2:00 PM. For the period from 7/09/97 through 7/10/97, PVCC used an average of 1,900 gpm from about 2:00 PM through 3:00 AM. In the latter case, PVCC's usage in accordance with the agreement enabled a savings in the needed volume of equalization storage for the PVWC system.

Although PVCC's actual usage on 7/09/97 through 7/10/97 reduced the system equalization storage need, an optimized diurnal usage pattern would result in further savings. According to Table 6-5, optimization of PVCC's usage pattern would have reduced the equalization volume to 0.59 MG or 5.5 percent of the system demand for this time period and achieved similar reductions for the other time periods. Table 6-5 indicates that an average savings of about 0.5 MG could have been realized by changing the Country Club's diurnal usage pattern for lake filling. Achieving a more optimal diurnal usage pattern for PVCC and possibly other large PVWC customers could reduce the equalization storage needs for the PVWC system. However, the ability to achieve these savings would depend on whether the optimal usage pattern

from the standpoint of minimizing PVWC's equalization storage need is consistent with the customers' abilities to accommodate changed water usage patterns.

PVCC has indicated a willingness to consider a lake filling pattern that is beneficial to PVWC while still meeting their goal of keeping their irrigation lake at a consistent level. PVWC and PVCC reached an agreement to be implemented on a trial basis during the Summer 1999, in which PVCC will limit usage to a maximum of 500 gpm from 1:00 AM to 1:00 PM and 1,500 gpm from 1:00 PM to 1:00 AM. PVWC intends to assess the impacts of this agreement and possibly extend it for a period of 5 years.

6.3.3.2 Fire Flow Needs

A total of about 450 fire hydrants are distributed throughout PVWC's distribution system, with the exception that no fire hydrants are located in the Club Estates, Glen Drive, Clearwater Hills III, or Highcliff Drive Zones.

A minimum fire flow need of 1,500 gpm has been indicated by the ISO for the majority of the distribution system. This fire flow is higher than the minimum fire flow guideline for the Town of Paradise Valley of 500 gpm. The recommended duration for a fire flow of 1,500 gpm is 2 hours. This need applies to all zones except the Main Zone, where needed ISO fire flows exceed 3,500 gpm. Higher fire flows in the Main Zone are associated with PVWC's resort customers. Therefore, a minimum fire flow need of 3,500 gpm and corresponding fire flow duration of 3 hours was applied for the Main Zone.

6.3.3.3 Storage Analysis

Table 6-6 summarizes the estimated storage needs for each of the primary pressure zones for 1997 and the projected needs for 2012. The 2012 maximum day demands in each pressure zone were estimated based on the overall system maximum day demand projection of 19.25 mgd and by assuming that the estimated distribution to each pressure zone would remain the same as in 1997. The projected equalization rates are the same as those presented in Table 6-5. These rates would apply in the event that the usage patterns of PVCC and other large customers could not be modified.

The needed equalization volume in the Main Zone is projected to increase from 1.65 MG in 1997 to 2.15 MG by 2012. The total storage deficit is projected to increase from 2.08 MG in 1997 to 2.58 MG in 2012. A storage surplus of 0.45 MG in the Country Club Zone is projected to decline to 0.38 MG by 2012. This storage is capable of being utilized within the Main Zone, as discussed previously.

Table 6-6

Estimated Storage Needs

	Main Zone		Country Club Zone		Clearwater Hills Zone		Stone Canyon/ Racquet Club Zone		Totals	
	1997	2012	1997	2012	1997	2012	1997	2012	1997	2012
Maximum Day Demand (mgd) (1)	10.97	14.30	2.30	3.02	1.11	1.45	0.37	0.48	14.75	19.25
Required Effective Storage										
-Hourly Fluctuations										
Equalization Rate (%)	15	15	10	10	18	18	20	20	—	—
Volume Required (MG) (2)	1.65	2.15	0.23	0.30	0.20	0.26	0.07	0.10	2.15	2.80
		0.63 difference 2.78								
-Fire Flow										
Basic Fire Flow (gpm)	3,500	3,500	1,500	1,500	1,500	1,500	1,500	1,500	—	—
Duration (hr)	3	3	2	2	2	2	2	2	—	—
Volume Required (MG)	0.63	0.63	0.18	0.18	0.18	0.18	0.18	0.18	1.17	1.17
-Total Volume Required (MG) (Equalization + Fire Flow)	2.28	2.78	0.41	0.48	0.38	0.44	0.25	0.28	3.32	3.97
Available Effective Storage										
-Total Storage Available (MG) (3)	0.20	0.20	0.86	0.86	0.20	0.20	0.20	0.20	1.46	1.46
-Eff. Storage Avail. @ 20psi (MG)	0.20	0.20	0.86	0.86	0.20	0.20	0.20	0.20	1.46	1.46
-Projected Storage Deficit/Surplus (MG)	-2.08	-2.58	0.45	0.38	-0.18	-0.24	-0.05	-0.08	-1.86	-2.52

Notes:

(1) 1997 maximum day demands from Table 6-4. Projected 2012 figures are based on the overall system projection with the same zone weights as in 1997.

(2) Estimated equalization percentages from Table 6-4.

(3) Main Zone excludes Miller Road and Club Estates Tanks; Clearwater Hills Zone excludes Clearwater Hills No. 3 Tank; Stone Canyon Zone includes Racquet Club Tank.

2.8 -0.2 2.6 need 0.5 higher intakes

The volume of storage provided in the Clearwater Hills Zone is marginally adequate; however, the zone lacks sufficient fire reserve capacity. It is facing existing and projected total storage deficits of 0.18 MG and 0.24 MG in 1997 and 2012, respectively. The volume of the Clearwater Hills III Tank is too small to be considered beneficial with respect to these deficits.

The combined Stone Canyon/Racquet Club Zone is projected to have adequate equalization storage and only a small deficit with respect to fire reserve capacity. However, storage within the Racquet Club Zone cannot be used within the Stone Canyon Zone because it is at a lower gradient. Therefore, the existing and projected total storage deficits in the Stone Canyon Zone are higher than those shown in Table 6-6.

The results of this analysis indicate that the system is facing existing and projected storage deficits of 1.86 MG and 2.52 MG, respectively. The existing deficit has been offset, operationally, by the use of excess storage from the Country Club Tanks and the use of distributive pumping capacity from the wells and production facilities. Since the storage deficits are primarily associated with the Main Zone, an approach involving the construction of a single, large storage tank is recommended. The recommended sizing for such a tank would be 3 MG. However, in light of the possibility for reducing the equalization storage need (through optimization of PVCC usage, for example) and other considerations, an alternative approach to analyzing PVWC's distribution storage adequacy is presented in the following section.

6.3.3.4 Revised Storage Analysis and Storage Alternatives

A revised storage analysis is shown in Table 6-7 based on the needs for the combined Main, Country Club, and Clearwater Hills Zones. The effective equalization rate for the combined zones is estimated to be 13 percent, and this rate reflects the sum of the diurnal demand curve for the Main Zone, including usage by the PVCC, and the Country Club Zone supply curve (which in turn reflects the supply curve for the Clearwater Hills Zone). The combined demand in these zones is estimated to account for over 97 percent of the total system maximum day demand. Presentation of the storage needs on a combined basis is consistent with a storage approach based on the construction of a single, large storage tank located in the Main Zone rather than providing additional storage within each individual pressure zone. The combined zone analysis also assumes that a fire reserve capable of satisfying the system's largest fire flow need would be provided. According to this approach, the resulting storage deficit for the combined zones is 1.64 MG, and the deficit is projected to increase to 2.21 MG by 2012.

Table 6-7

Alternative Storage Need Analysis

	Combined CWH, CC and Main Zones		Stone Canyon/ Racquet Club Zone		Totals	
	1997	2012	1997	2012	1997	2012
Maximum Day Demand (mgd)	14.38	18.77	0.37	0.48	14.75	19.25
Required Effective Storage						
-Hourly Fluctuations						
Effective Equalization Rate (%)	13	13	20	20	---	---
Volume Required (MG)	1.87	2.44	0.07	0.10	1.94	2.54
-Fire Flow						
Basic Fire Flow (gpm)	3,500	3,500	---	---	---	---
Duration (hr)	3	3	---	---	---	---
Volume Required (MG)	0.63	0.63	---	---	0.63	0.63
-Total Volume Required (MG) (Equalization + Fire Flow)	2.50	3.07	0.07	0.10	2.57	3.17
Available Effective Storage						
-Total Storage Available (MG)	0.86	0.86	0.20	0.20	1.06	1.06
-Eff. Storage Avail. @ 20psi (MG)	0.86	0.86	0.20	0.20	1.06	1.06
-Projected Storage Deficit/Surplus (MG)	-1.64	-2.21	0.13	0.10	-1.51	-2.11

As shown in Table 6-7, available storage for the combined zones is 0.86 MG, and this volume reflects the capacity of the Country Club Tanks. Following the planned conversion of these tanks to the Main Zone in conjunction with IP 99-04, the 60th Street Tank will be submerged below the new system gradient and will not provide effective storage to the Main Zone. Therefore, the total volume of the 60th Street Tank, 0.2 MG, is not included in Table 6-7. However, the 60th Street Tank and the MRBS Tanks, with pumping modifications, represent existing storage that could be considered as part of alternatives to the construction of a large storage tank. As discussed below, these alternatives are based on the use of well capacity in lieu of storage and minimization of the equalization storage need through optimization of PVCC usage.

Well Capacity Offset

Historically, the Water Company has relied on its excess (reliable) well capacity to offset the lack of adequate distribution storage to meet diurnal demand variations. PVWC's existing reliable well capacity exceeds the historic maximum day demand by about 3 mgd. However, by 2012, a deficit of 0.8 mgd is projected. This deficit is anticipated to be eliminated as a result of the completion of recommended Project A-2, which provides for PVWC's use of SRP Well 22.6. Incorporation of this well is projected to result in an excess well capacity of 2.2 mgd through 2012. This capacity is capable of offsetting about 0.85 MG of equalization storage, reducing the projected 2012 deficit in Table 2-1 to 1.36 MG. This deficit is more than can be reduced by the available storage in the 60th Street and MRBS Tanks. Therefore, reliance on SRP Well 22.6 alone is not a feasible long-term alternative to the construction of additional distribution storage.

A second new well would be needed to make this approach feasible. The construction of a new 3-mgd well would translate to a 1.69-MG reduction in the needed equalization volume by 2012, resulting in a deficit of 0.52 MG. This deficit could be eliminated by constructing a booster station to make storage in the 60th Street Tank usable and by converting the MRBS Tanks to distribution storage.

The construction of an additional well would allow PVWC to meet peak hour needs, but would not result in taking any more water from the aquifer then if distribution storage was provided for this purpose. Since the well would not increase PVWC's total groundwater withdrawal, it should not result in issues with respect to the Groundwater Management Act.

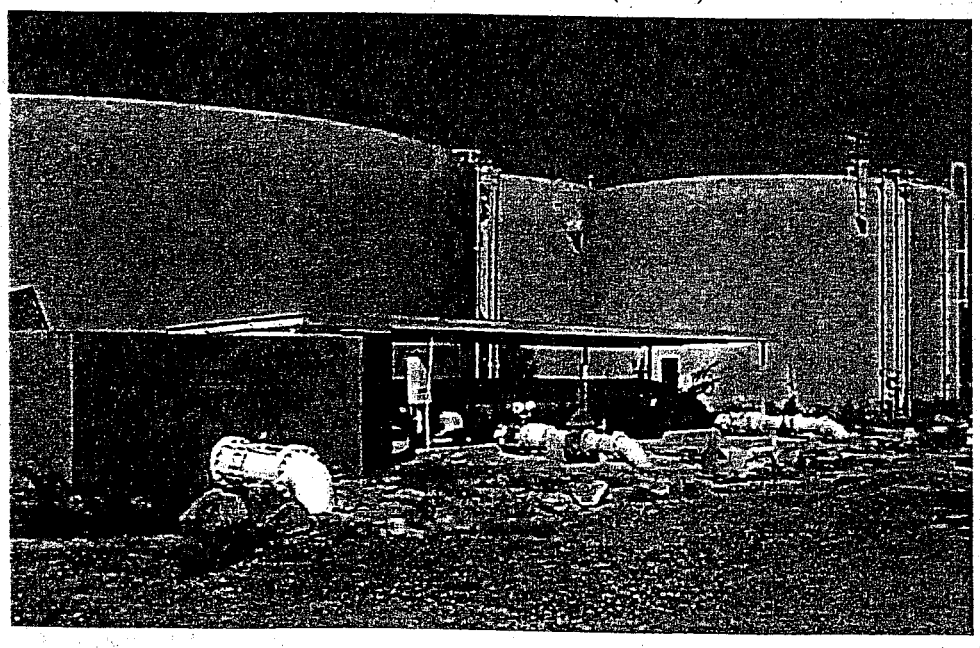
PVCC Agreement

PVWC has an agreement with the PVCC restricting the time periods duing which the Country Club is able to use water for filling its golf course lakes. Historical data indicates that the agreement has not been effective for minimizing the equalization storage need, and PVCC usage could be optimized further. Optimization of PVCC's usage pattern is estimated to reduce the combined zone's equalization storage need from 2.44 MG to 1.52 MG. Use of excess well capacity resulting from the recommended completion of Project A-2 is predicted to reduce the needed equalization volume by an additional 0.62 MG. The remaining storage deficit of 0.67 MG could be eliminated by converting the MRBS Tanks to distribution storage and installing booster pumps to enable the 60th Street Tank to be used following the conversion of the Country Club Tanks to the Main Zone.

At present, the storage tanks at the MRBS do not provide distribution storage because of limited pumping capacity. These storage tanks could be used as distribution storage by installing additional pumping capacity or by converting Well Nos. 11 and 12 so that they pump directly into the distribution system. Use of these tanks as distribution storage would reduce the storage deficit in the Main Zone. A photograph of the MRBS tanks and booster pumps is shown as Exhibit 6-6.

Exhibit 6-6

Miller Road Booster Station (MRBS)



A booster station would be needed to make storage in the 60th Street Tank useful upon conversion of the Country Club Tanks to the Main Zone. The booster pumps would provide a means for pumping water from the 60th Street Tank to the higher Main Zone gradient.

The conversion of the Racquet Club Tank to the Main Zone would not significantly change the overall storage status for the PVWC system. The primary benefit would be to enable available fire flow to be increased by connecting the Racquet Club Zone to the Main Zone at several locations and replacing small-diameter mains.

In addition to the storage analyses indicating facilities needed to provide adequate storage for each of the alternatives, distribution system hydraulics, system reliability, operating expenses, and other factors were also considered in the evaluation of the alternatives and are discussed in the following section.

6.3.3.5 Analysis of Storage Alternatives

Table 6-8 provides a summary of the storage alternatives and their cost components. Corresponding project numbers are shown for the recommended capital projects. The reader is referred to the discussion of these projects at the end of this section for an explanation of each project. Notes are provided in Table 6-8 for some of the cost components not discussed elsewhere in this report. Recommendations regarding emergency power are discussed in greater detail in Section 6.3.3.6.

The PVCC Agreement approach has the lowest net present value and total annualized capital and O&M costs of $4.3 million and $600,000, respectively, and is the recommended approach for meeting the system's storage needs. The construction of a distribution storage tank is also recommended as a desirable long-term reliability improvement. This project would be needed immediately in the event that the approach based on a modified PVCC Agreement cannot be implemented effectively or if PVWC is unable to secure the use of SRP Well 22.6.

The schedule of project cash flows used in the economic analysis of storage alternatives was selected so as to provide adequate storage capacity throughout the planning horizon. The timing does not match the CPS priority for all projects. For example, projects involving the installation of pipelines along Lincoln Drive cannot be completed until 2005 due to a moratorium imposed by the Town of Paradise Valley. However, these differences are not significant and would not change the recommended least cost approach.

Table 6-8

Summary of Storage Alternative Costs

Cost Category	Project No. (1)	Cost Items	STORAGE ALTERNATIVES: New Storage Tank Cost	New Storage Tank Year(s)	Well Capacity Offset Cost	Well Capacity Offset Year(s)	PVCC Agreement Cost	PVCC Agreement Year(s)	Notes
Sources of Supply	A-2	SRP Well 22.6	$250,000	2009	$250,000	2002	$250,000	2002	(2)
	---	Reequip Well Nos. 11 AND 12 to pump to dist. system	$550,000	2004	---	---	---	---	
	---	New Well Indian Bend/Scottsdale Roads	---	---	$2,500,000	2006	---	---	(3)
	---	Operating expense -- Well Nos. 11 and 12	$35,000	2002-A	$20,000	2002-A	$20,000	2002-A	(4)
Storage Tanks	---	60th Street Tank Structural Improvements	---	---	$40,000	2000	$40,000	2000	
	---	60th Street Tank Painting	---	---	$50,000	2000/2015	$50,000	2000/2015	
	B-10	Construct New Tank and Pumping Station	$5,000,000	2002	---	---	---	---	
	---	MRBS Tanks Structural Improvements	---	---	$75,000	2000	$75,000	2000	
	---	MRBS Tanks Painting	---	---	$100,000	2000/2015	$100,000	2000/2015	
Booster Stations	A-7	Construct New MRBS Bldg. & Modify Existing Facilities	---	---	$1,000,000	2002	$1,000,000	2002	
	---	Pumping Cost for MRBS Dist. Pumps	---	---	$35,000	2002-A	$35,000	2002-A	
	---	Pumping Cost for New Tank Pumping Station	$30,000	2003-A	---	---	---	---	
	B-9	Construct Booster Station for 60th Street Tank	---	---	$300,000	2000	$300,000	2000	
	---	Operating Expense -- 60th Street Tank Booster	---	---	$10,000	2000-A	$10,000	2000-A	
	---	Operating Expense -- Country Club Booster Station	---	---	$30,000	2003-A	$30,000	2003-A	
Transmission Mains	B-2	Install 4,800'-16" along Lincoln Drive	$700,000	2002	$700,000	2007	$700,000	2007	
	---	3,200'-16" along Indian Bend and 74th St. to Lincoln	---	---	$500,000	2006	---	---	
	---	14,500'-16" along Lincoln Dr. and Miller Road	$2,200,000	2009	$2,200,000	2006	---	---	(5)
	B-11	4,800'-16" along Tatum Lincoln to Desert Fairways	$750,000	2003	---	---	---	---	
	---	COP Reinforcement -- 2,600'-12" along Lincoln - 36th to 40th	---	---	$350,000	2003	$350,000	2003	
	B-3	Emergency Interconnect @ 40th/Lincoln (1,500 gpm)	---	---	$100,000	2003	$100,000	2003	
	B-3	2,700'-16" along Lincoln - 40th to 44th Streets	---	---	$400,000	2003	$400,000	2003	
	---	COP Interconnection - CAP-related expense	---	---	$10,000	2003-A	$10,000	2003-A	(6)
Emergency Power	B-10	Standby power @ New Tank Pumping Station	(7)	2002	---	---	---	---	
	---	Standby power for Well Nos. 11 or 12	$250,000	2004	---	---	---	---	
	B-11 (Alt.)	Standby power for Country Club Booster Station	---	---	$250,000	2003	$250,000	2003	
	A-7	Standby power for MRBS Pumps and Well No. 12	---	---	$400,000	2002	$400,000	2002	
	A-7	Standby power for Well No. 11	---	---	$200,000	2002	$200,000	2002	
COST SUMMARY		Total Capital Cost:	$9,700,000		$9,265,000		$4,065,000		
		Annual O&M:	$65,000		$120,000		$120,000		
		Net Present Value (8):	$7,800,000		$7,700,000		$4,300,000		
		Total Annualized Capital and O&M (9):	$1,100,000		$1,100,000		$600,000		

Notes:

1) For those capital cost items comprising recommended projects (or alternatives).
2) Projected max. day reliable well capacity deficit by 2009. Needed by 2002 in lieu of storage.
3) Includes capital cost of treatment facilities, but not the associated incremental operating costs.
4) Higher power cost for storage alternative due to increased discharge head needed to meet distribution system gradient.
5) Project need is to facilitate adequate storage refill with simultaneous use by PVCC.
6) Annual expense to cover COP charges for maintaining emergency interconnection, including CAP-related fees.
7) Standby power cost included in new tank and pump station cost estimate.
8) Discounted at 9 percent for 20 years; no salvage, no additional tank maintenance; all costs escalated by 2.5 percent per year from 1999.
9) Annual cost of capital = 16.54 percent

6.3.4 Emergency Power

The system's ability to provide service to its customers during a power outage was reviewed. This analysis is based on the system's ability to meet 50 percent of the projected average day demand over a 24-hour period. This quantity is projected to increase from 4.73 mgd in 1997 to 5.66 mgd by 2012. At present, the total volume of distribution storage available to PVWC customers via gravity flow, 1.5 MG, is inadequate to satisfy this need. In addition, none of PVWC's distributive pumping facilities are equipped with standby power. Therefore, additional storage and/or standby power facilities are needed. To meet the emergency power needs, the MRBS and both Well Nos. 11 and 12 could be equipped with standby power. The combined capacities of the wells would be sufficient to satisfy the emergency power need.

The degree of electrical power reliability that is provided to the Water Company's wells and distributive pumping facilities is a factor that should be considered relative to the need for providing standby power for PVWC's wells. The electrical power system includes the ability to supply each facility with electricity from either of two separate electrical feeds. Historically, the wells and treatment plant have been subject to infrequent power outages of short duration. Both the Country Club and Clearwater Hills Booster Stations are equipped to connect to a portable emergency power generator. However, since it pumps into a pressure zone with no floating storage, the Country Club B.S. should be equipped with standby power. However, this need could be offset in the event that the Country Club Zone is combined with the Main Zone, as recommended in Project B-11.

6.3.5 Main Sizing/Fire Flow Availability

Portions of the PVWC system contain a substantial amount of unlined, small-diameter mains, as indicated on Figures 6-1 and 6-2. These mains limit flows and are a source of maintenance problems. Moreover, the smaller mains cannot support fire hydrants, resulting in relatively sparse hydrant spacing in many areas of the system. These problems can be attributed to the nature of the PVWC distribution system, which developed over a number of years in which pipeline design standards throughout the water utility industry were below current standards.

An evaluation of the PVWC distribution system's ability to transmit fire flow was evaluated based on ISO data and computerized hydraulic modeling results. The computerized hydraulic model was used to conduct a system-wide fire flow analysis for the purpose of identifying locations with predicted available fire flows less than 1,500 gpm. Improvement projects were developed to address areas with significant deficiencies that could be addressed through the installation of larger-diameter mains along major roadways. The

Figure 6-1
Distribution Pipe Materials

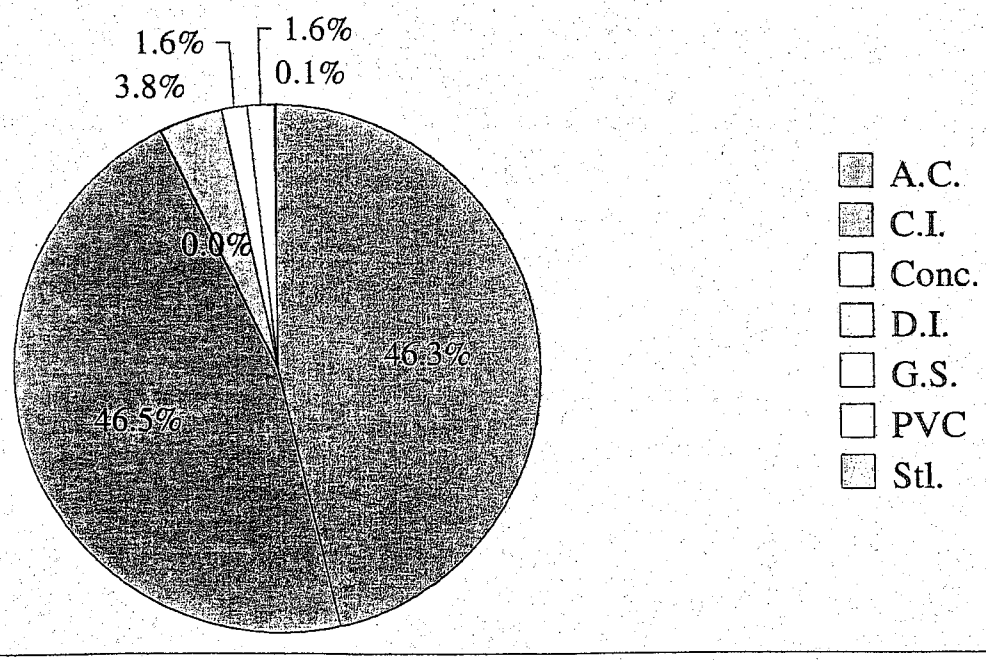
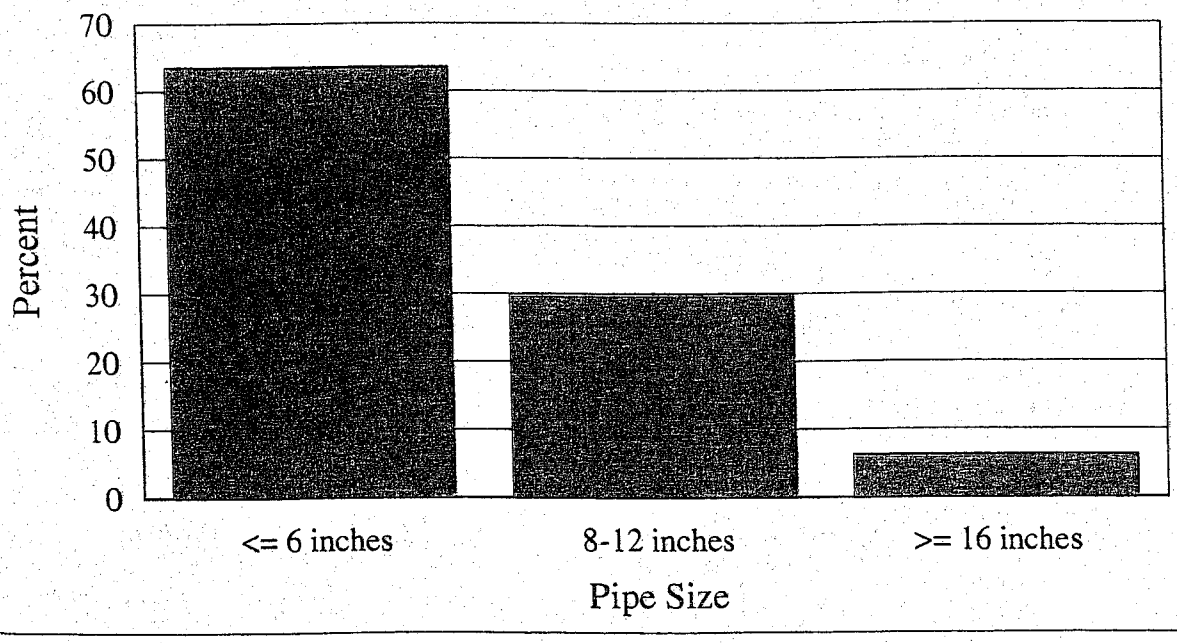


Figure 6-2
Distribution Pipe Size



following is a list of locations in which small main sizing contributes to model-predicted available fire flows that are less than 1,500 gpm:

1) Ingleside Circle, south of Cactus Wren Road - 900 gpm
2) Marriott Mountain Shadows Resort - 1,100 gpm
3) Kiem Drive/Bethany Home Road - 800 gpm
4) Camelback Road at Casablanca - 1,200 gpm
5) 57th Place/Indian Bend Road - 700 gpm
6) Starlight Way/Cameldale Way - less than 500 gpm

These existing flows are recommended to be improved in conjunction with PVWC's small main replacement program (Project A-8).

As system demand increases, the incidence of main breaks or other service interruptions are also likely to increase in areas that have experienced these problems in the past. Raising the Main Zone gradient by converting the Country Club Tanks will have a similar effect, although this can be partially offset by the installation of Project A-6, which will strengthen the connection between the wells and the distribution system. Although pressures are anticipated to increase in both the Main and Country Club Zones, the increased pressures alone will not significantly improve available fire flows in areas with small main sizing. PVWC's small main replacement program will therefore have an important role in helping to increase flows, as well as reducing the incidence of main breaks and service disruptions in the future.

6.4 RECOMMENDATIONS

The project recommendations presented on the following pages were developed to address the issues and deficiencies identified in Sections 6.2 and 6.3. The projects are illustrated on Exhibit 6-7 at the end of this section. These projects are classified according to the recommended priority for construction. Alternative projects that were considered are also discussed. The estimated total costs for the projects are shown in 1999 dollars.

Investment Project 99-04

CONVERT COUNTRY CLUB TANKS TO MAIN ZONE

Design: 4 months
Construction: 5 months

Estimated Cost: $ 150,000

Description:

The conversion of the Country Club Tanks to the Main Zone is recommended to enable the volume of these tanks to be used more fully and effectively. The new Main Zone gradient will be raised by about 35 feet (15 psi), which is the difference in overflow elevations between the Country Club and 60th Street Tanks.

The conversion of the Country Club Tanks will result in a higher suction pressure at the Country Club B.S. Under peak hour conditions, the model-predicted pressure increased from 52 psi to 74 psi with two pumps operating. The booster station flow and discharge pressure is also predicted to increase by about 300 gpm and 11 psi, respectively. The suction pressure at the Clearwater Hills B.S. is predicted to increase from 28 psi to 38 psi, with a corresponding increase in output from about 650 gpm to 900 gpm with one pump operating, Low pressures near the intersections of Roadrunner Road and Desert Vista Road and along Foothill Drive are also predicted to increase above 20 psi.

The conversion of the Country Club Tanks will increase available fire flows to above 1,500 gpm in areas close to the Country Club Tanks. Available fire flow on the north side of the Camelback Inn is predicted to increase from about 1,400 gpm to over 3,500 gpm.

As a result of the conversion of the Country Club Tanks to the Main Zone, the 60th Street Tank will be submerged below the new Main Zone gradient. The installation of a pump to make the 60th Street tank volume usable is addressed as Project B-9.

Converting the tanks to the Main Zone will involve a number of valve changes. One change involves the removal of a check valve located on an 8-inch main along Mummy Mountain Road in the vicinity of the 20-inch fill line for the Country Club Tanks. The check valve is currently configured to allow flow from

the tank to enter the Country Club Zone, but does not allow water to fill the tanks in the event that the Country Club Tank gradient is higher than the water level in the tanks. A gate valve in this vicinity should be closed to prevent flow between the Country Club Zone and Main Zone.

Existing piping and valves at the Country Club Tanks should be reconfigured to enable the tanks to empty and refill freely. Specifically, a 10-inch valve that is normally closed should be opened, and a check valve on a second 10-inch pipe should be removed to enable the tank to be refilled, as well as emptied, through this pipe. At present, the Country Club Tanks are filled through a 3-inch pipe to maintain a higher system gradient.

An existing closed valve isolating the 20-inch Country Club Tank fill line from a 12-inch main at the north side of Camelback Inn should be opened. In addition, existing valves at the Country Club B.S. that permit water from the Country Club Tanks to enter the Main Zone and isolate the Country Club Zone on a temporary basis should be set in these positions on a permanent basis. As a result of these valve changes, the Country Club Tanks will be connected to the Main Zone through a 12-inch main (near the north side of the Camelback Inn) and parallel 12-inch mains (along Mummy Mountain Road), reducing to a short section of 8-inch main in the vicinity of the Country Club B.S. The short section of 8-inch main is a restriction between the parallel 12-inch mains and parallel 6-, 10-, and 12-inch mains that supply the Country Club B.S. from parallel 6-, 12-, and 16-inch mains along Desert Fairways Drive. Although computerized hydraulic modeling analysis did not indicate that the restriction would cause any significant hydraulic deficiencies with respect to refilling the Country Club Tanks, replacement of this section of 8-inch main should be considered for increased reliability and to reduce the friction loss experienced during storage refill. The estimated project cost also reflects needed valving and instrumentation improvements.

While removal of the restriction would improve the ability to refill the storage tank, it would also increase the rate of flow from the tank. As a result, operation of the Country Club B.S. pumps and withdrawals by the PVCC may result in a more rapid depletion of the Country Club Tanks than if the smaller main was left in place. Obtaining supply from the system, i.e., the large mains in Desert Fairways Drive, 52nd Place, and McDonald Drive, for these uses and reserving storage may be beneficial for system operation and could be accomplished by installing a butterfly valve in the bypass or foregoing the bypass around the booster station altogether in favor of a reinforcement to the Country Club Tanks from the east side of Camelback Inn. The retirement of the Country Club B.S (Project B-11) would create the equivalent of a bypass reinforcement as a result of opening valves separating the pressure zones.

Project A-1

INSTALL PVCC LAKE METER AND ELECTRICAL/ SCADA IMPROVEMENTS

Design: 2 months
Construction: 1 month

Estimated Cost: $ 150,000

Description:

A review of chart recordings of water usage for PVCC lake filling during a peak demand period in 1997 indicated that PVCC had withdrawn water during the system peak hour demand, increasing the equalization storage need for the system. In addition, PVCC usage during the system's daily peak demand period does not meet the terms of the water usage agreement with PVWC. The ability to monitor and effectively enforce, as necessary, the existing agreement and any future agreements with the PVCC will be critical to maintaining adequate equalization volume given the existing storage deficit in the PVWC system. The existing meter and chart recorder do not provide this capability. Therefore, the installation of a new meter and SCADA instrumentation is recommended to enable PVCC usage to be monitored on a continuous basis. This capability should enable PVWC to ensure that PVCC's future usage is consistent with restrictions on hours of operation, maximum instantaneous usage rate, as well as its annual turf user allotment. In addition to the water meter and SCADA instrumentation, this project should provide for the installation of needed electrical service to the PVCC meter location.

Project A-3

INSTALL 8,000 FEET OF 24-INCH MAIN ALONG INVERGORDON AND JACKRABBIT ROADS

Design: 3 months
Construction: 10 months

Estimated Cost: $ 1,300,000

Description:
The installation of 8,000 feet of 24-inch main is recommended along Invergordon and Jackrabbit Roads from McDonald Drive to Scottsdale Road. The new mains should replace existing 4- and 6-inch mains along the entire length of the pipeline route. The project will increase available fire flow from about 1,200 gpm to above 5,000 gpm. In conjunction with Project A-6, this project will reinforce the east-west transmission capacity in the southeastern part of the Main Zone, while improving reliability and reducing headloss across the system. The relatively high priority for the project reflects the above benefits, as well as Water Company concerns regarding the poor condition of existing mains along the recommended pipeline route, which has required frequent maintenance to address main breaks and leakage.

A pipeline diameter of 24 inches is consistent with the sizing of the existing east-west transmission main along McDonald Drive and is recommended for project budgeting purposes. A reduction in the pipeline sizing to 16 or 20 inches along Invergordon Road and the portion of Jackrabbit Road extending west of Monte Vista Drive may be considered during the design phase and should be implemented if it would result in a significant construction cost savings.

Project A-4

INSTALL 200 FEET OF 8-INCH MAIN ON SUCTION SIDE OF CLEARWATER HILLS B.S.

Design: 1 month
Construction: 1 month
Estimated Cost: $100,000

Description:

Approximately 200 feet of 8-inch main is recommended for installation to provide a distribution loop between the 16-inch suction main to the Clearwater Hills B.S. along Lakeside Lane and two existing 8-inch mains along Hillside Drive. The 8-inch mains are currently dead-ended.

The project will increase model-predicted peak hour pressures from about 17 psi to 36 psi for Country Club Zone customers located near the intersection of Indian Bend Road and Hillside Drive and those at higher ground elevations along Quartz Mountain Road. In addition, this project is predicted to increase peak hour pressures along Hillside Drive near the suction of the Clearwater Hills B.S. from close to zero to 20 psi. As part of this project, an 8-inch main along Lakeside Lane that is currently dead-ended near the suction side of the Clearwater Hills B.S. should also be connected to the 16-inch main.

The estimated total project cost of $100,000 reflects anticipated construction difficulties due to steep slopes and the need to obtain easements through private property.

Alternative:

Existing main sizing along Hillside Drive south of the Clearwater Hills B.S. consists of parallel 4- and 6-inch cast iron mains. While the recommended project will increase peak hour pressures, the small main sizing will prevent a significant increase in fire flow availability. Accordingly, PVWC should consider the installation of a 12-inch main for this project and the eventual replacement of the small mains along Hillside Drive from the Clearwater Hills B.S. to Lincoln Drive (about 4,500 feet). Connection to the Main Zone at Lincoln Drive would be possible following the completion of Project B-11.

Project A-5

INSTALL 4,000 FEET OF 16-INCH MAIN ALONG MCDONALD DRIVE

Design: 5 months
Construction: 6 to 12 months

Estimated Cost: $ 750,000

Description:
The installation of 4,000 feet of 16-inch main is recommended along McDonald Drive from Marston Drive to 52nd Place. The new main should replace old 8-inch cast iron and cement asbestos pipes that limit fire flow and are a maintenance concern to the Water Company. In conjunction with recommended Project B-1, this project will increase the available fire flow and increase supply reliability to customers at higher ground elevations west of 44th Street. The higher priority for this project relative to Project B-1 is due to the Town of Paradise Valley's plan to reconstruct the intersection at Tatum Boulevard and McDonald Drive in 2000/2001. The Town has requested PVWC to replace any of the mains in this area prior to commencement of its road reconstruction project.

Project A-6

INSTALL 6,600 FEET OF 24-INCH MAIN ALONG MILLER ROAD, PALO VERDE DRIVE, AND OTHERS

Design: 4 months
Construction: 8 to 10 months

Estimated Cost: $ 1,300,000

Description:
The installation of 6,600 feet of 24-inch main is recommended along Miller Road, Palo Verde Drive, 74th Street, and Jackrabbit Road from the 20-inch discharge main at the MRBS to the intersection of Scottsdale and Jackrabbit Roads. Existing 16-inch mains along Miller Road and Palo Verde Drive and 8- and 6-inch mains along 74th Street and Jackrabbit Road, respectively, should be paralleled or replaced.

Currently, a 16-inch main along Palo Verde Lane, a 16-inch main along Lincoln Drive, and a 12-inch main along Jackrabbit Road are the only major transmission mains between the main part of the distribution system and PVWC's sources of supply. These mains form the equivalent of a weak 24-inch main. At supply rates approximating the projected 2012 maximum day demand, the head losses through these mains range from 10 to 19 feet per thousand feet of main. Also, velocities in the 16-inch mains in Lincoln Drive and Palo Verde Drive are over 8 feet per second. As such, these mains represent a restriction in the east-west transmission capacity. The anticipated operational benefit of the project will be to reduce required discharge pressures at PVWC's wells and production facilities. This project is predicted to enable these pressures to be maintained within about 5 to 10 psi higher than current maximum pressures following the conversion of the Country Club Tanks to the Main Zone project (IP 99-04).

In addition, the project will increase the reliability of supply to the system. In the event of a main break along either of the existing 16-inch mains, the remaining mains would not be adequate to the system, and customer outages would likely occur. This project is needed to enable the benefits associated with Project A-3 to be fully realized.

Project A-7

CONSTRUCT NEW MILLER ROAD B.S., SRP OUTFALL, AND RELATED FACILITY MODIFICATIONS

Design: 12 to 18 months
Construction: 6 to 12 months

Estimated Cost: $1,600,000

Description:
The construction of a new MRBS is recommended to enable the MRBS Tanks to function as distribution storage. Additional capacity is needed to eliminate a reliable capacity deficit with respect to the delivery of water from Well Nos. 11 and 12 (via the storage tanks), as well as to provide a storage contribution from the MRBS Tanks. In addition, the existing facilities do not include a permanent enclosure, and the electrical equipment, in particular, is very old. A new building is recommended to house the pumps, sodium hypochlorite feed system, electrical equipment, instrumentation and controls, and standby power. With increased pumping capacity and operating times, an enclosed building for the booster pumps is recommended to minimize the noise impact on the residential surroundings.

Currently, water from Well Nos. 11 and 12 and startup water from Well Nos. 16 and 17 is diverted to the MRBS Tanks to provide a means for controlling surge and air/sand removal. After startup, water from Well Nos. 16 and 17 is diverted to the distribution system directly through a different set of pipes. Water from Well Nos. 11 and 12 is continually pumped through MRBS Tanks, from which it is delivered to the distribution system via the MRBS distributive pumps. The construction of an outfall on the Arizona Canal is also recommended to enable well startup water to be metered and delivered to the Arizona Canal in conjunction with the conversion of the MRBS Tanks to distribution storage.

The estimated total project cost of $1,600,000 is based on the design and construction of a booster station equipped with five pumps. A consideration for the pump sizing is the continual benefit of having several small pumps at the MRBS to equalize the rate of pumping from PVWC's large well pumps and the distributive pumps at the MRTF. Accordingly, three pumps sized at 2,000 gpm and about 325 feet of TDH and two 1,000-gpm pumps are recommended. The estimated total project cost also includes new electrical equipment, a liquid chlorine feed system, instrumentation and controls, and two standby power

generators. One of the generators will operate Well No. 12, two large distributive pumps, and essential instrumentation, chemical equipment, and lighting within the booster station building. The second generator will be designed to operate Well No. 11, which is not close enough to the MRBS for standby power to be efficiently accommodated by a single generator located in the new booster station building.

Alternatives:

A contingency project is needed in the event that blending is required to reduce the nitrate concentration in Well No. 17. In this case, water from Well No. 17 should be delivered to the MRBS tanks for blending with Well No. 12. A replacement pump should be installed in Well No. 17 to enable it to pump to the lower elevation of the MRBS Tanks. The existing well pump for Well No. 17 should be installed in Well No. 11, and piping should be installed to enable water from Well No. 11 to be pumped directly to the distribution system. Prior to implementing this alternative, computerized hydraulic modelling should be performed to check the adequacy of the 20-inch discharge pipe from the MRBS to the existing 12- and 16-inch mains along Miller Road. The replacement of the oil-lubricated well pump for Well No. 12 with a submersible pump should also be considered.

Project A-8

CONSTRUCT SMALL MAIN REPLACEMENTS

Design: Ongoing program
Construction: Ongoing program

Estimated Annual Cost: $ 200,000

Description:
The Water Company should continue its implementation of an annual program for replacing small mains, relocating hydrants, and looping the distribution grid. These projects should be coordinated with recommended improvements that enhance system reliability, address historical maintenance problems, and/or correct specific fire flow deficiencies based on ISO rating results.

The deficient areas listed in Section 6.3.5 should be considered for improvement as part of this project. The timing, actual locations, and main sizing for projects to install mains in these and other areas of the system should be based on the maintenance history and other criteria discussed in Section 1.6.2.4. The estimated total project cost reflects the projected annual expenditure that should be budgeted for small main replacements for at least the next 5 years. The duration of this project, as well as the annual expenditure, can be adjusted as financial resources dictate.

To the extent possible, any hydrant flushing programs should be completed in conjunction with the collection of field test data by the Water Company and/or Fire Department that may used to document actual low flow areas. In addition to their use in establishing annual priorities for small main replacement projects, they will also serve to provide information for updating the computerized hydraulic model calibration.

Project A-9

INSTALL 800 FEET OF 12-INCH MAIN ALONG SUPERSTITION LANE

Design: 3 months
Construction: 2 months
Estimated Cost: $ 100,000

Description:
The incorporation of the Racquet Club Zone into the Main Zone is recommended to improve pressures and available fire flow. Pipe sizing in the zone is limited to 6- and 4-inch mains, which are un-looped and form a linear grid with the Racquet Club Tank and PRV from the Stone Canyon Zone on the western end and several large customers on the east side. Computerized hydraulic modeling indicates the potential for pressures less than 20 psi under peak hour flow conditions. Available fire flows are also predicted to be negligible.

The Racquet Club Zone should be incorporated into the Main Zone by installing 800 feet of 12-inch main along Superstition Lane from the 24-inch main along McDonald Drive to an existing 6-inch main at Starlight Way. A second feed to the existing Racquet Club Zone should be established along Yucca Road in conjunction with Project A-10. The existing 4-inch mains along Starlight Way and Cameldale Way should be replaced in conjunction with Project A-8 to increase available fire flows and to provide a stronger connection from the east side of the system.

Project A-10

INSTALL 1,700 FEET OF 8-INCH MAIN ALONG YUCCA ROAD

Design: 2 months
Construction: 3 months

Estimated Cost: $ 200,000

Description:

The installation of 1,000 feet of 8-inch main is recommended along Yucca Road from McDonald Drive to Cameldale Way. A new 12-inch main should be installed a distance of approximately 700 feet from McDonald Drive to Palo Verde Lane. The remainder of the project should be installed as 8-inch main, which will replace existing 2.5-inch wrought steel and 4-inch cement asbestos pipe. The improvement will increase available fire flow to the eastern section of what is currently part of the Racquet Club Zone. The new mains should be installed with valves opened, allowing the Racquet Club Zone to be incorporated into the Main Zone. This project should also provide for the replacement of a 4-inch wrought steel pipe along Palo Verde Lane.

Project B-1

INSTALL 4,400 FEET OF 16-INCH MAIN ALONG 44TH STREET AND MCDONALD DRIVE

Design: 5 months
Construction: 6 to 12 months

Estimated Cost: $ 800,000

Description:
The installation of 4,400 feet of 6-inch main is recommended along 44th Street from Lincoln Drive to McDonald Drive and along McDonald Drive from 44th Street to Marston Drive. The new main should replace old 6- and 8-inch cast iron and cement asbestos pipes that limit fire flow and are a maintenance concern to the Water Company. In addition, available peak demand flows and fire flows are among the lowest in the Main Zone due to the main sizing and higher ground elevations west of 44th Street. The recommended pipeline will increase the available fire flow and increase supply reliability to customers in this part of the service area.

Project B-2

INSTALL 4,800 FEET OF 16-INCH MAIN ALONG LINCOLN DRIVE

Design: 3 months
Construction: 4 to 8 months

Estimated Cost: $700,000

Description:
The installation of a total of about 4,800 feet of 16-inch main is recommended along Lincoln Drive from an existing 16-inch main along Lincoln Drive at Mountain View Road to an existing 16-inch main at 52nd Place and along Lincoln Drive from the intersection of 44th Street and Lincoln Drive to an existing 16-inch main along Lincoln Drive at Hillside Drive. The new mains should replace existing 6-inch and 12-inch mains along this route.

The priority for this project corresponds to the recommended timing for Project B-3 and the planned 5-year moratorium on road construction beginning in the middle of the Year 2000. Completion of this project will replace several old mains and will increase the fire flow capacity along Lincoln Drive. The portion of the project extending from Tatum Boulevard to 52nd Place would be needed in conjunction with the construction of a storage tank and pumping station at the intersection of Tatum Boulevard and Lincoln Drive (see Project B-10).

The installation of these mains is anticipated to increase available fire flow along Lincoln Drive. Current model-predicted available fire flows west of 48th Street range from about 700 gpm (near 42nd Street) to about 1,500 gpm. This project is predicted to increase available fire flow to above 3,500 gpm at all locations along the pipeline, as well as increasing flow to above 2,000 gpm in the vicinity of 42nd Street and Lincoln Drive.

Project B-3

CONSTRUCT INTERCONNECTION WITH CITY OF PHOENIX AND INSTALL 2,700 FEET OF 16-INCH MAIN ALONG LINCOLN DRIVE

Design: 3 to 6 Months
Construction: 6 to 9 Months

Estimated Cost: $ 500,000

Description:
The installation of an interconnection with the City of Phoenix is recommended to provide increased reliability in the event of a main break or other emergency affecting PVWC's ability to deliver water from its sources of supply to its customers. As PVWC's sources of supply are located at the eastern end of the system, the western portion of the distribution system would be the most vulnerable to a main break along McDonald or Lincoln Drives. Therefore, an interconnection with the City of Phoenix along Lincoln Drive at the existing system boundary at 40th Street is recommended. A moratorium on repaving along Lincoln Drive until 2005 precludes the installation of pipeline projects needed to facilitate the use of the interconnection. The recommended priority for this project reflects this limitation.

In addition to the interconnection, approximately 2,700 feet of 16-inch main would need to be installed along Lincoln Drive from 40th Street to 44th Street. The existing 6-inch main along this route presently supplies customers in the Clearwater Hills Zone. Although the conversion of the Country Club Tanks (IP 99-04) will raise the Main Zone gradient enough to allow this main and associated customers to be converted back to the Main Zone, the capacity of the 6-inch main is inadequate for the delivery of emergency flows into the PVWC system. This main should be replaced with the exception that the section between 40th Street and 40th Place should be kept in service to maintain a distribution loop in the Clearwater Hills Zone.

The City of Phoenix system has a 12-inch main that extends along Lincoln Drive from the west to the vicinity of 40th Street. This main connects to a COP-owned storage tank at the intersection of Lincoln Drive and 36th Street -- a distance of about 2,600 feet from the proposed interconnection location. The storage tank is tied into the City of Phoenix system via a 20-inch main that extends west along Lincoln Drive and an 18-inch main that extends south along 36th Street. Information from City of Phoenix

hydraulic modeling of their distribution system in 1996 indicated that their system could sustain a flow of about 1,500 gpm at an hydraulic grade line (HGL) at Elevation 1500 (40 psi) under peak hour conditions. A somewhat higher flow and gradient are likely under non-peak hour conditions. Although the City of Phoenix gradient is anticipated to be lower than the PVWC gradient upon completion of IP 99-04, gravity supply from the interconnection should provide pressures above 20 psi to most PVWC Main Zone customers under emergency conditions. Verification through field testing of actual hydraulic conditions in both systems is recommended, and provisions for the connection of a generator-powered, low-head pump (in the event of an emergency) should be incorporated into the interconnection design, if determined to be necessary.

The 2,600 feet of existing 12-inch main in the City of Phoenix system should be paralleled with a new 12-inch main or replaced with a 16-inch main if the existing main is found to significantly restrict the capacity of the interconnection. The extension of a main improvement an additional 2,600 feet west from 40th Street to 36th Street is estimated to cost about $350,000, if needed.

In addition to providing emergency supply capability, the interconnection may eventually serve to connect the PVWC and COP-served water systems in the Town of Paradise Valley. While neither the acquisition of the COP-served areas of the Town of Paradise Valley nor need for additional source of supply capacity is anticipated at present, the interconnection would provide a means for integrating the systems in the future.

The installation of the large-diameter pipe at the end of the system would likely create a water stagnation problem if not used on a consistent basis. One alternative for preventing this problem would be to install a pump in the interconnection vault that is capable of delivering water from the City of Phoenix gradient to the PVWC Main Zone gradient on a periodic basis. Another option would be to deliver, via gravity flow, the minimum amount of water to the City of Phoenix necessary to prevent stagnation. Alternatively, PVWC may be able to bleed water from the Clearwater Hills Zone into the main for this purpose.

Project B-4

INSTALL 1,900 FEET OF 12-INCH MAIN ALONG TATUM BOULEVARD

Design: 4 months
Construction: 4 months

Estimated Cost: $ 250,000

Description:
The installation of 1,900 feet of 12-inch main along Tatum Boulevard from Desert Fairways Drive to Roadrunner Road is recommended to increase pressures under peak hour demand conditions and improve available fire flow. Computerized hydraulic analysis indicates that this project would increase peak hour pressures along Foothill Drive west of Tatum from 21 psi to 28 psi. The project will also increase available fire flow along Tatum Boulevard and Roadrunner Road from about 1000 gpm to over 1,500 gpm. Available fire flows along Desert Jewel Drive are also predicted to be increased from less than 250 gpm to between 500 gpm and 750 gpm.

Project B-5

INSTALL 2,700 FEET OF 12-INCH MAIN ALONG CHAPPARAL DRIVE

Design: 4 months
Construction: 4 months

Estimated Cost: $ 300,000

Description:
The installation of 2,700 feet of 12-inch main along Chapparal Drive is recommended from an existing 12-inch main at Monte Vista Drive to Scottsdale Road. The 12-inch main should replace an existing 4-inch main along the pipeline route. This project is predicted to increase available fire flow along Chapparal Drive from between 900 and 1,200 gpm to about 3,000 gpm.

Project B-6

INSTALL 1,900 FEET OF 12-INCH MAIN ALONG TATUM BOULEVARD AND CHOLLA LANE

Design: 4 months
Construction: 4 months

Estimated Cost: $ 200,000

Description:

The installation of 1,900 feet of 12-inch main is recommended along Tatum Boulevard and Cholla Lane from the end of an existing 8-inch main along Tatum Boulevard to 47th Street. This project will increase available fire flow in the vicinity of 46th Place and 47th Street that are presently less than 1,000 gpm. This project will also increase pressures in an area bounded by Indian Bend Road, 46th Street, Hillside Drive, and Joshua Tree Lane.

The pipeline sizing for the Tatum Boulevard portion of the project may be increased to 16 inches in consideration of the future completion of Project B-11, resulting in the integration of the Main and Country Club Zones.

Project B-7

INSTALL 2,500 FEET OF 12-INCH MAIN ALONG LAKESIDE LANE AND OTHERS

Design: 3 months
Construction: 3 to 5 months

Estimated Cost: $ 800,000

Description:

The installation of 2,500 feet of 12-inch main along Lakeside Lane, Brookview Way, Crystal Lane, Clearwater Parkway, and Moonlight Way from the discharge of the Clearwater Hills Booster Station to Moonlight Way is recommended. This project will replace existing 6- and 4-inch mains along the project route and reduce head losses that are predicted to be greater than 20 feet per thousand feet of main. This project is predicted to increase peak hour pressures along Foothill Drive north of its intersection with Desert Park Place from 14 psi to about 60 psi. This project is also predicted to increase available fire flow in this area from less than 200 gpm to between 500 and 750 gpm. This is the highest fire flow that can be supported without further reinforcement along Moonlight Way and Moonlight Lane. These additional improvements should be considered in conjunction with recommended Project A-8.

Project B-8

CONSTRUCT NEW OPERATIONS CENTER AT MRTF

Design: 12 months
Construction: 12 months

Estimated Cost: $ 1,300,000

Description:

The construction of a new operations center at the MRTF is recommended to replace the existing facility, which is located in residential area of the Town of Paradise Valley. The relocation of the facility to the MRTF will eliminate complaints from adjacent homeowners regarding the aesthetic appearance of the existing operations center. The centralization of the operations center facilities and the existing MRTF facilities should improve the efficiency of activities that presently involve significant coordination and/or travel between the two locations.

The subsequent sale of PVWC's existing operations center is anticipated to offset a substantial portion of the total estimated project cost of $1,300,000, as it is presently located in a residential area with high home values.

Alternative:

The MRBS site adjacent to Well Nos. 11 and 12 represents a potential alternate location for the operations center. Construction of an operations center at the MRBS site would potentially result in some cost savings relative to the recommended project, particularly if the alternative was completed in conjunction with the modifications to the MRBS involving replacement of distributive pumping facilities and construction of standby power facilities.

Project B-9

CONSTRUCT BOOSTER STATION AT 60TH STREET TANK

Design: 3 to 6 months
Construction: 6 months

Estimated Cost: $ 300,000

Description:
The construction of a prefabricated booster station is recommended to enable the volume of the 60th Street Tank to be used to assist in meeting the equalization storage needs of the PVWC system. Upon completion of IP 99-04, the Main Zone gradient will be increased by about 35 feet, resulting in the submergence of the 60th Street Tank. The booster station should be equipped with two 600-gpm pumps. One pump is sufficient to deliver the volume of the tank in about 5 hours. With the Country Club Tanks serving as floating storage in the Main Zone, the 60th Street Tank must be able to deliver its full volume within the peak demand period. A second pump should be provided for reliability and could also be used to supplement the pumping capacity in the event of an emergency requiring additional capacity from the 60th Street Tank.

This is a recommended Priority B project. This will enable the Water Company to gain operating experience with the Country Club Tanks converted to the Main Zone. Needed tank maintenance and painting expenditures can also be deferred.

Project B-10

CONSTRUCT 3.0-MG STORAGE RESERVOIR AND PUMPING STATION

Design: 6 to 18 months
Construction: 12 to 18 months

Estimated Cost: $ 5,000,000

Description:
The construction of a ground reservoir and pumping station is recommended as a long-term reliability improvement for the PVWC system. As discussed in Section 6.3.3, PVWC has a large distribution storage deficit of about 2 MG that is anticipated to increase to 2.5 MG by 2012. A project for providing distribution storage had been recommended previously and was received favorably by PVWC customers and the ACC. Therefore, this project should be moved up to a high priority project in the event that the approach based on a modified PVCC Agreement cannot be implemented effectively or if PVWC is unable to secure the use of SRP Well 22.6 or an equivalent well supply. The construction of the storage tank provides an operating margin of safety in meeting peak hour demands in the event that a well supply must be removed from service due to a mechanical or water quality problem.

The recommended location for the reservoir and pumping station is a lot on the northwest corner of the intersection of Tatum Boulevard and Lincoln Drive. Water from the storage tank should be pumped to and be refilled from the Main Zone. The estimated cost of the project of approximately $5,000,000 includes the construction of a 3-MG storage reservoir and pumping station with standby power capability. Preliminary design recommendations include a concrete ground storage reservoir with a separate inlet/outlet and baffling and a pumping station with a firm pumping capacity of 4,000 gpm, with each of four pumps sized at about 1,500 gpm each and equipped with 100- or 125-HP motors. However, since this project is anticipated to be deferred for a minimum of 5 to 7 years, the sizing of the storage tank and pumps should be reviewed based on information available at that time. For example, operating experience with a modified PVCC Agreement may indicate that the sizing of the storage tank (and pumping facilities) could be reduced. Similarly, the need for standby power may be reduced as a result of the installation of standby power facilities in conjunction with recommended Project A-7.

Project B-11

RETIRE COUNTRY CLUB B.S. AND
INSTALL 4,600 FEET OF 16-INCH MAIN ALONG TATUM BLVD.

Design: 4 to 6 months
Construction: 8 months

Estimated Cost: $ 750,000

Description:
The Country Club B.S. was designed primarily to overcome large friction losses in delivering water from PVWC's sources of supply in the eastern part of the service area to customers in the northern and western portions of the service area. As noted in Section 6.3.1, the majority of the customers in the Country Club Zone would be adequately served from a gradient established by the Country Club Tanks. The recent replacement of a pipeline along Shadow Mountain Road and a booster station (Las Brisas) has enabled service to customers above Elevation 1500 to be improved. In addition, the installation of the 16-inch main along Desert Fairways Drive has increased the available flow to the Clearwater Hills Zone. Many of the needs that the booster station was originally intended to address have been resolved by other means or are anticipated to be eliminated as a result of the completion of other projects included in PVWC's 15-year capital improvement program. Therefore, retirement of the Country Club Zone is recommended as a long-term project for PVWC.

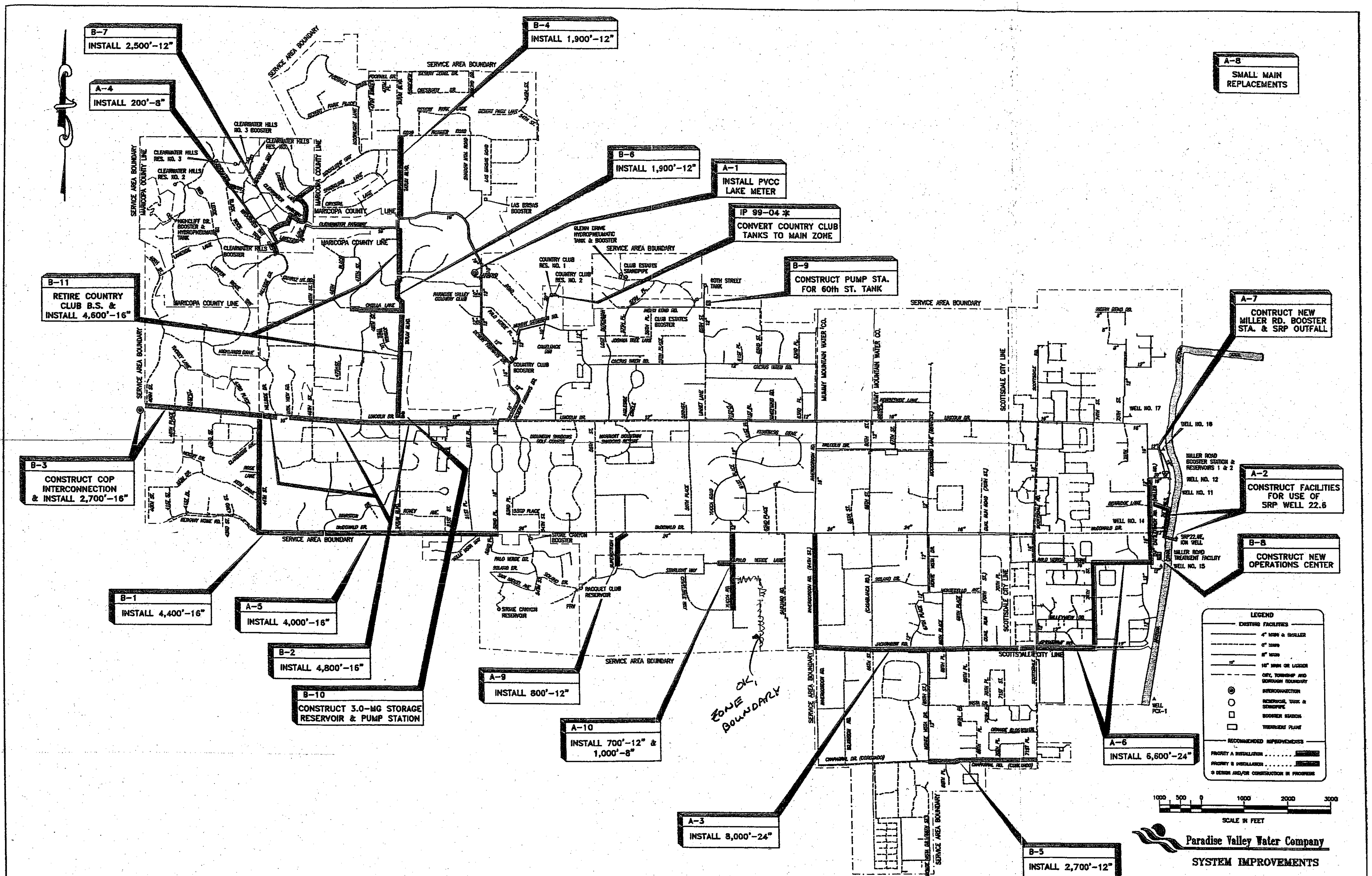
In addition to the physical retirement of the booster station facilities and various zone re-valvings, the installation of 4,600 feet of 16-inch main along Tatum Boulevard is recommended. The purpose of this pipeline would be to provide a means for supporting adequate suction pressures at the Clearwater Hills B.S. via pumping from the ground storage tank recommended as Project B-10. Retirement of the Country Club B.S. would likely require the pipeline and pumping from the new storage tank pump station to support adequate flow under peak hourly demand conditions. For this reason, retirement of the Country Club B.S. would not be recommended prior to the completion of Project B-10.

The recommended transmission main should be installed along Tatum Boulevard from Lincoln Drive to Cholla Lane, and from the end of recommended Project B-6 to the 16-inch main at Clearwater Parkway.

The pipeline should replace old 4- and 6-inch transmission mains located between Lincoln Drive and Cholla Lane and an 8-inch main located north of the 6-inch main extending through the PVCC.

Retirement of the Country Club B.S. offers a number of potential benefits. First, it would provide an annual electric power savings of approximately $30,000. In addition, although the Country Club B.S. is equipped to allow the connection of a portable generator in the event of an emergency, the size of the zone and pumping capacity may justify the construction of standby power facilities, costing about $250,000. This cost would be saved if the station were to be eliminated. Similarly, as noted in Section 6.3.2, increasing demands within the Country Club and Clearwater Hills Zones is projected to result in inadequate reliable pumping capacity. While the pumping capacity could be increased, doing so would be undesirable for such a large zone that is operated as a closed system.

As discussed with respect to IP 99-04, elimination of the zone boundaries would strengthen the refill capacity of the Country Club Tanks, potentially enabling the construction of a reinforcing pipeline around the Country Club B.S. to be avoided. Elimination of other closed valves along 48th Street, 46th Street, and Hillside Drive, for example, would result in improvements to the available fire flow and supply reliability in both zones.



SYSTEM IMPROVEMENTS

EXHIBIT 6-7

System Engineering

Appendix A

Appendix A

Water Quality Summary (1)

Parameter/ Constituent	Units	Value/Concentration		
		Average	Minimum	Maximum
TDS	mg/L	333	235	490
pH		7.7	7.5	7.9
Temperature (T)	deg. C	33.1	31.8	34.0
Calcium (Ca)	mg/L	27.0	22.0	44.0
Magnesium (Mg)	mg/L	27.7	20.0	45.0
Sodium (Na)	mg/L	44.7	34.0	58.0
Potassium (K)	mg/L	2.8	2.5	3.2
Sulfate (SO4)	mg/L	24.5	9.0	61.0
Chloride (Cl)	mg/L	54.6	23.5	109.0
Nitrate (N)	mg/L	3.2	1.7	7 (2)
Fluoride (F)	mg/L	0.48	0.30	0.74
Silicon (Si)	mg/L	30	28	32
Arsenic (As)	ug/L	11	8.2	14
Chromate (Cr)	ug/L	25	10	33

Notes:

(1) From PVWC Well Nos. 11, 12, 14, 15, 16, 17 – September, 1995

(2) Recent samples from Well No. 17 indicated a concentration of 11 mg/L; however, Well No. 17 was not in service at the time of the sampling.

Minerals/Metals/Radionuclides

Year: 1997, except Fluoride (1998)
Company: Paradise Valley
Source: Groundwater - Finished

MCL (mg/L) Federal	MCL (mg/L) State	Parameter	Results (mg/L)	MCL (mg/L) Federal	MCL (mg/L) State	Parameter	Results (mg/L)
		Alkalinity (CaCO3)	NT	0.002	0.002	Mercury (Hg)	<0.0005
0.05-0.2	0.2	Aluminum (Al)	ND			Molybdenum (Mo)	<0.5
0.006	0.006	Antimony (Sb)	<.0002	0.1	0.1	Nickel (Ni)	<.01
0.05	0.05	Arsenic (As)	<0.002-0.011	10	10	Nitrate & Nitrite:	
2	1	Barium (Ba)	<0.05	10	10	Nitrate-Nitrogen (NO3-N	0.28-4.4
0.004	0.004	Beryllium (Be)	<0.0008	1	1	Nitrite-Nitrogen (NO2-N	NT
0.005	0.005	Cadmium (Cd)	<.0002			Potassium (K)	3.4-45
		Calcium (Ca)	25-52	15 pCi/L	15 pCi/L	Gross Alpha	ND-4 (pCi/L)
250	500.0	Chloride (Cl)	36-151	50 pCi/L	50 pCi/L	Gross Beta	ND-4 (pCi/L)
0.1	0.05	Chromium (Cr)	0.014-0.035	5	5	Radium 226+228	ND
1.0-1.3(TT)	1.0-1.3(TT)	Copper (Cu)	<0.02			Radon	130-1200
0.2	0.2	Cyanide	<.005	0.05	0.05	Selenium (Se)	<0.002
2-4	1.4 - 2.4	Fluoride (F)	0.29-0.89	0.05	0.1	Silver (Ag)	<0.0002
0.3	0.3	Iron (Fe)	<.02			Sodium (Na)	43-53
		Hardness (as CaC03)	158-332			Strontium (Sr)	NT
0.015 (TT)	0.015	Lead (Pb)	<0.001-0.007	250	500	Sulfate (SO4)	11-59
		Magnesium (Mg)	23-49	500	1000	TDS	NT
0.05	0.05	Manganese (Mn)	<0.002	0.002	0.002	Thallium (Tl)	ND-0.001
				5	5	Zinc (Zn)	<0.05

Notes:
NT - Not tested during 1997
TT - Treatment Technique based on distribution samples; finished water secondary MCL for copper is 1.0 mg/L
ND - Not detected

Volatile Organics

Year: 1997
Company: Paradise Valley
Source: Groundwater - Finished

MCL (mg/L) Federal	MCL (mg/L) State	Compound	Results (mg/L)	MCL (mg/L) Federal	MCL (mg/L) State	Compound	Results (mg/L)
0.005	0.001	Benzene	<0.0005	0.005	0.005	Dichloromethane	<0.0005
		Bromobenzene		0.005	0.005	1,2-Dichloropropane	<0.0005
		Bromochloromethane			0.0005	1,3-Dichloropropane	<0.0005
		Bromodichloromethane (THM)				2,2-Dichloropropane	
		Bromoform (THM)				1,1-Dichloropropene	
		Bromomethane				t-1,3-Dichloropropene	
		n-Butylbenzene		0.7	0.7	Ethylbenzene	<0.0005
		sec-Butylbenzene				Fluorotrichloromethane	
		tert-Butylbenzene				Hexachlorobutadiene	
0.005	0.0005	Carbon tetrachloride	<0.0005			p-Isopropyltoluene	
0.1	0.07	Chlorobenzene	<0.0005			Methyl Tertiary Butyl Ether (MTBE)	
		Chlorodibromomethane (THM)				Naphthalene	
		Chloroethane				iso-Propylbenzene	
		Chloroform (THM)				n-Propylbenzene	
		Chloromethane		0.1	0.1	Styrene	<0.0005
		o-Chlorotoluene				1,1,1,2-Tetrachloroethane	
		p-Chlorotoluene			0.001	1,1,2,2-Tetrachloroethane	<0.0005
		Dibromomethane		0.005	0.005	Tetrachloroethylene	<0.0005
		m-Dichlorobenzene		1	0.1	Toluene	<0.0005
0.6	0.6	o-Dichlorobenzene	<0.0005	0.1	0.1	Total THM's	0.011-0.036*
0.075	0.005	p-Dichlorobenzene	<0.0005			1,2,3-Trichlorobenzene	
		Dichlorodifluoromethane		0.07	0.07	1,2,4-Trichlorobenzene	<0.0005
	0.005	1,1-Dichloroethane	<0.0005	0.2	0.2	1,1,1-Trichloroethane	<0.0005
0.005	0.0005	1,2-Dichloroethane	<0.0005	0.005	0.005	1,1,2-Trichloroethane	<0.0005
0.007	0.005	1,1-Dichloroethylene	<0.0005	0.005	0.005	Trichloroethylene	<0.0005
0.07	0.006	cis-1,2-Dichloroethylene	<0.0005			1,2,3-Trichloropropane	
0.1	0.01	trans-1,2-Dichloroethylene	<0.0005		1.2	1,1,2-Trichloro-1,2,2-trifluoroethane	<0.0005
						1,2,3-Trimethylbenzene	
						1,2,4-Trimethylbenzene	
						1,3,5-Trimethylbenzene	
				0.002	0.0005	Vinyl chloride	<0.0005
				10	10	Xylenes (Total)	<0.0015

* - Samples collected throughout the distribution system

SOCS/Pesticides

Year: 1997
Company: Paradise Valley
Source: Groundwater - Finished

MCL (mg/L) Federal	MCL (mg/L) State	Compound	Results (mg/L)	MCL (mg/L) Federal	MCL (mg/L) State	Compound	Results (mg/L)
0.002	0.002	Alachlor	<0.0002	0.7	0.7	Glyphosate	<0.006
0.003		Aldicarb		0.0004	0.00001	Heptachlor	<0.00001
0.002		Aldicarb Sulfone		0.0002	0.00001	Heptachlor Epoxide	<0.00001
0.004		Aldicarb Sulfoxide		0.001	0.001	Hexachlorobenzene	<0.0001
		Aldrin				3-Hydroxycarbofuran	
0.003	0.003	Atrazine	<0.0001	0.0002	0.0002	Lindane	<0.00002
		Butachlor				Methomyl	
		Carbaryl				Metolachlor	
0.04	0.018	Carbofuran	<0.0002	0.04	0.04	Methoxychlor	
0.002	0.0001	Chlordane	<0.0001			Metribuzin	
		Cyanazine		0.2	0.2	Oxamyl	<0.002
0.2	0.2	Dalapon	<0.001	0.0005	0.0005	PCB's (1016, 1221, 1232, cont)	<0.0001
0.05		DDT				1242, 1248, 1254, 1260, 1262)	
0.07	0.07	2,4-D	<0.0001	0.001	0.001	Pentachlorophenol	<0.00004
0.0002	0.0002	1,2-Dibromo-3-chloropropane	<0.00001	0.5	0.5	Picloram	<0.0001
		Dicamba				Propachlor	
0.001		Dieldrin				Propazine	
0.007	0.007	Dinoseb	<0.0002	0.05	0.05	Silvex (2,4,5-TP)	<0.0002
	3x10-5	2,3,7,8-TCDD (Dioxin)	ND	0.004	0.004	Simazine	<0.00007
0.02	0.02	Diquat	<0.0004	0.003	0.003	Toxaphene	<0.001
0.1	0.1	Endothall	<0.009	0.0002	0.0002	Benzo(a)Pyrene	<0.00002
0.002	0.0002	Endrin	<0.00001	0.4	0.4	Di-(2-ethylhexyl)adipate	<0.0006
0.00005	0.00005	Ethylene Dibromide	<0.00001	0.006	0.004	Di-(2-Ethylhexyl)phthalate	<0.0006
				0.05	0.05	Hexachlorocyclopentadiene	<0.0001

ND - Non detectable

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G/L ATE	Document Number	Type	Acct	Sub	Task Order	Type	Amount	Description	-Remark-	
21/2005	30184995	JE	105050	31	50051112	W	$ 4,082,509.00	CWIP ACCRUAL-JANUARY 2005	CWIP ACCR	
22/2005	30184995	JE	105050	31	50051112	W	$ (4,082,509.00)	CWIP ACCRUAL-JANUARY 2005	CWIP ACCR	
24/2005	30184993	JE	105050	31	50051112	W	$ 4,082,509.00	CWIP ACCRUAL-JANUARY 2005	CWIP ACCR	
24/2005	30184993	JE	105050	31	50051112	W	$ (4,082,509.00)	CWIP ACCRUAL-JANUARY 2005	CWIP ACCR	
			Account 105050 Total:				**$ -**			
8/2005	40964726	PV	105125	31	50008456	W	$ 60.93	Beus Gilbert PLLC	ID 11164-0001	
1/2005	40966749	PV	105125	31	50008456	W	$ 14,415.05	Beus Gilbert PLLC	ID 11164 0001	
1/2005	40966750	PV	105125	31	50008456	W	$ 3,661.00	Beus Gilbert PLLC	ID 11164-0002	
10/2005	41066350	PS	105125	31	50008455	W	$ 97,237.36	City Of Scottsdale	PV ARF Permits	
23/2005	30205983	JE	105125	31	50008455	W	$ 6,855.23	SABRIX NO TAX CHARGED ACR	41066350	
24/2005	30206309	JE	105125	31	50008455	W	$ (6,855.23)	REV - SABRIX JE		
			Account 105125 Total:				**$ 115,374.34**			
11/2004	30178828	JE	105150	31	50008453	W	$ 532.60	Reverse Post Close CAPX Non PR	CC 299436	
/3/2005	30186916	JE	105150	31	50008453	W	$ (19,892.39)	Reclass charges to correct		
/3/2005	30186916	JE	105150	31	50008455	W	$ 19,892.39	Reclass charges to correct		
/2/2005	40892583	PS	105150	31	50008453	W	$ (250.00)	Maricopa County Env Svc Dept	PV ARF Trans Piping ATC Appli	
21/2005	533	CC	105150	21	50073252	W	$ 13.83	20050421	ANITRIA HAIRSTON	
			Account 105150 Total:				**$ 296.43**			
1/2004	30178840	JE	105200	31	50008453	W	$ 784.62	Reverse Post Close CapEX PR	T2 14224	
1/2004	30178840	JE	105200	31	50008453	W	$ 932.18	Reverse Post Close CapEX PR	T2 14224	
20/2004	14368	T2	105200	31	50008453	W	$ 582.62	Payroll Labor Distribution	Regular	0014
20/2004	14368	T2	105200	31	50008453	W	$ 1,176.94	Payroll Labor Distribution	Regular	0014
20/2004	14368	T2	105200	31	50008455	W	$ 115.38	Payroll Labor Distribution	Regular	0014
/2/2005	14541	T2	105200	31	50008453	W	$ 2,026.25	Payroll Labor Distribution		
16/2005	14750	T2	105200	31	50008453	W	$ (0.04)	Payroll Labor Distribution		
16/2005	14750	T2	105200	31	50008453	W	$ 3,732.16	Payroll Labor Distribution		
16/2005	14750	T2	105200	31	50008455	W	$ 115.38	Payroll Labor Distribution		
16/2005	14750	T2	105200	31	50051251	W	$ 136.00	Payroll Labor Distribution		
/1/2005	14890	T2	105200	31	50008453	W	$ (0.04)	Payroll Labor Distribution		
/1/2005	14890	T2	105200	31	50008453	W	$ 3,541.24	Payroll Labor Distribution		
/1/2005	14890	T2	105200	31	50008455	W	$ 490.38	Payroll Labor Distribution		
/3/2005	30186916	JE	105200	31	50008453	W	$ (29,685.24)	Reclass charges to correct		
/3/2005	30186916	JE	105200	31	50008455	W	$ 29,685.24	Reclass charges to correct		
13/2005	15064	T2	105200	31	50008455	W	$ 2,959.90	Payroll Labor Distribution		
21/2005	15227	T2	105200	31	50008455	W	$ 490.38	Payroll Labor Distribution	Regular	0014
21/2005	15227	T2	105200	31	50008455	W	$ 378.95	Payroll Labor Distribution	Regular	0014
21/2005	15227	T2	105200	31	50008455	W	$ 1,961.56	Payroll Labor Distribution	Regular	0014
21/2005	15227	T2	105200	31	50070288	W	$ 40.87	Payroll Labor Distribution	Regular	0014
13/2005	153[illegible]	T2	105200	31	50008455	W	$ 653.84	Payroll [illegible]or Distribution	Regular	0014

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'13/2005	15375	T2	105200	31	50008455	W	$	310.05	Payroll Labor Distribution	Regular	0014
'13/2005	15375	T2	105200	31	50008455	W	$	1,961.56	Payroll Labor Distribution	Regular	0014
'28/2005	15795	T2	105200	31	50008453	W	$	140.77	Payroll Labor Distribution		
'28/2005	15595	T2	105200	31	50008455	W	$	(0.04)	Payroll Labor Distribution		
'28/2005	15595	T2	105200	31	50008455	W	$	2,271.61	Payroll Labor Distribution		
'28/2005	15795	T2	105200	31	50008455	W	$	(0.04)	Payroll Labor Distribution		
'28/2005	15795	T2	105200	31	50008455	W	$	2,874.48	Payroll Labor Distribution		
'28/2005	15595	T2	105200	31	50051251	W	$	136.00	Payroll Labor Distribution		
'28/2005	15795	T2	105200	31	50051251	W	$	235.23	Payroll Labor Distribution		
'19/2005	30197434	JE	105200	31	50051251	W	$	(507.23)	Reclass charges to correct BU		
'25/2005	15959	T2	105200	31	50008455	W	$	2,079.28	Payroll Labor Distribution		
'25/2005	16154	T2	105200	21	50008455	W	$	1,569.25	Payroll Labor Distribution		
'26/2005	30198668	JE	105200	31	50070288	W	$	(40.87)	CGS APPLIED TO WRONG BU		
'25/2005	16300	T2	105200	21	50008455	W	$	(0.05)	Payroll Labor Distribution		
'25/2005	16300	T2	105200	21	50008455	W	$	1,667.33	Payroll Labor Distribution		
'25/2005	16300	T2	105200	31	50008455	W	$	58.86	Payroll Labor Distribution		
3/5/2005	16428	T2	105200	21	50008455	W	$	784.62	Payroll Labor Distribution		
'22/2005	16596	T2	105200	21	50008455	W	$	(0.04)	Payroll Labor Distribution		
'22/2005	16596	T2	105200	21	50008455	W	$	392.31	Payroll Labor Distribution		
'/1/2005	16745	T2	105200	21	50008455	W	$	126.96	Payroll Labor Distribution		
20/2005	16919	T2	105200	31	50008455	W	$	29.43	Payroll Labor Distribution		
					Account 105200 Total:		**$**	**34,208.04**			
11/2004	30178840	JE	105250	31	50008453	W	$	61.98	Reverse Post Close CapEX PR	T3 14225	
11/2004	30178840	JE	105250	31	50008453	W	$	70.79	Reverse Post Close CapEX PR	T3 14225	
11/2004	30178840	JE	105250	31	50008453	W	$	103.52	Reverse Post Close CapEX PR	T3 14225	
11/2004	30178840	JE	105250	31	50008453	W	$	358.48	Reverse Post Close CapEX PR	T3 14225	
20/2004	14369	T3	105250	31	50008453	W	$	293.18	Friday, Timothy F.	4	
20/2004	14369	T3	105250	31	50008453	W	$	594.31	Gross, Joseph E.	4	
20/2004	14369	T3	105250	31	50008453	W	$	44.24	Friday, Timothy F.	4	
20/2004	14369	T3	105250	31	50008453	W	$	91.10	Gross, Joseph E.	4	
20/2004	14369	T3	105250	31	50008455	W	$	56.90	Lutringer, Steven J.	4	
20/2004	14369	T3	105250	31	50008455	W	$	8.74	Lutringer, Steven J.	4	
1/2/2005	14542	T3	105250	31	50008453	W	$	924.71	Actual Burden Journal Entries		
1/2/2005	14542	T3	105250	31	50008453	W	$	194.49	Actual Burden Journal Entries		
16/2005	14751	T3	105250	31	50008453	W	$	(0.02)	Actual Burden Journal Entries		
16/2005	14751	T3	105250	31	50008453	W	$	1,883.97	Actual Burden Journal Entries		
16/2005	14751	T3	105250	31	50008453	W	$	(0.01)	Actual Burden Journal Entries		
16/2005	14751	T3	105250	31	50008453	W	$	347.82	Actual Burden Journal Entries		
16/2005	14751	T3	105250	31	50008455	W	$	56.90	Actual Burden Journal Entries		
16/2005	14751	T3	105250	31	50008455	W	$	10.68	Actual Burden Journal Entries		
16/2005	14751	T3	105250	31	50051251	W	$	70.94	Actual Burden Journal Entries		

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16/2005	14751	T3	105250	31	50051251	W	$	12.51	Actual Burden Journal Entries	
2/1/2005	14891	T3	105250	31	50008453	W	$	(0.04)	Actual Burden Journal Entries	
2/1/2005	14891	T3	105250	31	50008453	W	$	1,770.96	Actual Burden Journal Entries	
2/1/2005	14891	T3	105250	31	50008453	W	$	(0.01)	Actual Burden Journal Entries	
2/1/2005	14891	T3	105250	31	50008453	W	$	319.99	Actual Burden Journal Entries	
2/1/2005	14891	T3	105250	31	50008455	W	$	237.29	Actual Burden Journal Entries	
2/1/2005	14891	T3	105250	31	50008455	W	$	51.18	Actual Burden Journal Entries	
2/3/2005	30186916	JE	105250	31	50008453	W	$	(16,065.18)	Reclass charges to correct	
2/3/2005	30186916	JE	105250	31	50008455	W	$	16,065.18	Reclass charges to correct	
13/2005	15065	T3	105250	31	50008455	W	$	1,422.11	Actual Burden Journal Entries	
13/2005	15065	T3	105250	31	50008455	W	$	227.67	Actual Burden Journal Entries	
21/2005	15228	T3	105250	31	50008455	W	$	247.11	Friday, Timothy F.	4
21/2005	15228	T3	105250	31	50008455	W	$	183.35	Lutringer, Steven J.	4
21/2005	15228	T3	105250	31	50008455	W	$	972.28	Gross, Joseph E.	4
21/2005	15228	T3	105250	31	50008455	W	$	37.22	Friday, Timothy F.	4
21/2005	15228	T3	105250	31	50008455	W	$	28.82	Lutringer, Steven J.	4
21/2005	15228	T3	105250	31	50008455	W	$	154.45	Gross, Joseph E.	4
21/2005	15228	T3	105250	31	50070288	W	$	20.60	Friday, Timothy F.	4
21/2005	15228	T3	105250	31	50070288	W	$	3.10	Friday, Timothy F.	4
13/2005	15376	T3	105250	31	50008455	W	$	329.47	Friday, Timothy F.	4
13/2005	15376	T3	105250	31	50008455	W	$	150.05	Lutringer, Steven J.	4
13/2005	15376	T3	105250	31	50008455	W	$	972.28	Gross, Joseph E.	4
13/2005	15376	T3	105250	31	50008455	W	$	49.63	Friday, Timothy F.	4
13/2005	15376	T3	105250	31	50008455	W	$	23.49	Lutringer, Steven J.	4
13/2005	15376	T3	105250	31	50008455	W	$	151.83	Gross, Joseph E.	4
28/2005	15796	T3	105250	31	50008453	W	$	40.42	Actual Burden Journal Entries	
28/2005	15796	T3	105250	31	50008453	W	$	10.60	Actual Burden Journal Entries	
28/2005	15596	T3	105250	31	50008455	W	$	(0.04)	Actual Burden Journal Entries	
28/2005	15596	T3	105250	31	50008455	W	$	1,122.33	Actual Burden Journal Entries	
28/2005	15596	T3	105250	31	50008455	W	$	(0.01)	Actual Burden Journal Entries	
28/2005	15596	T3	105250	31	50008455	W	$	178.03	Actual Burden Journal Entries	
28/2005	15796	T3	105250	31	50008455	W	$	(0.04)	Actual Burden Journal Entries	
28/2005	15796	T3	105250	31	50008455	W	$	1,387.01	Actual Burden Journal Entries	
28/2005	15796	T3	105250	31	50008455	W	$	221.01	Actual Burden Journal Entries	
28/2005	15596	T3	105250	31	50051251	W	$	69.05	Actual Burden Journal Entries	
28/2005	15596	T3	105250	31	50051251	W	$	10.24	Actual Burden Journal Entries	
28/2005	15796	T3	105250	31	50051251	W	$	118.73	Actual Burden Journal Entries	
28/2005	15796	T3	105250	31	50051251	W	$	17.77	Actual Burden Journal Entries	
19/2005	30197434	JE	105250	31	50051251	W	$	(299.24)	Reclass charges to correct BU	
25/2005	15960	T3	105250	31	50008455	W	$	1,029.26	Actual Burden Journal Entries	
25/2005	15960	T3	105250	31	50008455	W	$	160.73	Actual Burden Journal Entries	
25/2005	16155	T3	105250	21	50008455	W	$	703.95	Actual Burden Journal Entries	

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25/2005	16155	T3	105250	21	50008455	W	$	123.56	Actual Burden Journal Entries	
26/2005	30198668	JE	105250	31	50070288	W	$	(23.70)	CGS APPLIED TO WRONG BU	
25/2005	16301	T3	105250	21	50008455	W	$	(0.01)	Actual Burden Journal Entries	
25/2005	16301	T3	105250	21	50008455	W	$	826.41	Actual Burden Journal Entries	
25/2005	16301	T3	105250	31	50008455	W	$	28.48	Actual Burden Journal Entries	
25/2005	16301	T3	105250	21	50008455	W	$	(0.02)	Actual Burden Journal Entries	
25/2005	16301	T3	105250	21	50008455	W	$	132.03	Actual Burden Journal Entries	
25/2005	16301	T3	105250	31	50008455	W	$	2.00	Actual Burden Journal Entries	
5/5/2005	16429	T3	105250	21	50008455	W	$	351.99	Actual Burden Journal Entries	
5/5/2005	16429	T3	105250	21	50008455	W	$	61.78	Actual Burden Journal Entries	
22/2005	16597	T3	105250	21	50008455	W	$	(0.02)	Actual Burden Journal Entries	
22/2005	16597	T3	105250	21	50008455	W	$	194.46	Actual Burden Journal Entries	
22/2005	16597	T3	105250	21	50008455	W	$	(0.01)	Actual Burden Journal Entries	
22/2005	16597	T3	105250	21	50008455	W	$	30.37	Actual Burden Journal Entries	
7/1/2005	16746	T3	105250	21	50008455	W	$	63.93	Actual Burden Journal Entries	
7/1/2005	16746	T3	105250	21	50008455	W	$	12.70	Actual Burden Journal Entries	
20/2005	16920	T3	105250	31	50008455	W	$	14.24	Actual Burden Journal Entries	
20/2005	16920	T3	105250	31	50008455	W	$	2.23	Actual Burden Journal Entries	
			Account 105250 Total:				**$**	**19,128.28**		
2/3/2005	30186879	JA	105260	31	50008453	W	$	397.17	FASTR - ALLOC CO23ALLOC	RECORD CONSTRUCTION
2/3/2005	30186916	JE	105260	31	50008453	W	$	(2,342.80)	Reclass charges to correct	
2/3/2005	30186879	JA	105260	31	50008455	W	$	132.29	FASTR - ALLOC CO23ALLOC	RECORD CONSTRUCTION
2/3/2005	30186916	JE	105260	31	50008455	W	$	2,342.80	Reclass charges to correct	
2/3/2005	30186879	JA	105260	31	50008456	W	$	0.74	FASTR - ALLOC CO23ALLOC	RECORD CONSTRUCTION
10/2005	30192158	JA	105260	31	50008453	W	$	(4,490.25)	FASTR - ALLOC CO23ALLOC	RECORD CONSTRUCTION
10/2005	30192158	JA	105260	31	50008455	W	$	6,943.98	FASTR - ALLOC CO23ALLOC	RECORD CONSTRUCTION
10/2005	30192158	JA	105260	31	50008456	W	$	292.75	FASTR - ALLOC CO23ALLOC	RECORD CONSTRUCTION
4/7/2005	30195800	JA	105260	31	50008453	W	$	(10.90)	FASTR - ALLOC CO23ALLOC	RECORD CONSTRUCTION OVERHEAD
4/7/2005	30195800	JA	105260	31	50070288	W	$	1.04	FASTR - ALLOC CO23ALLOC	RECORD CONSTRUCTION OVERHEAD
4/7/2005	30195800	JA	105260	11	50073241	W	$	767.53	FASTR - ALLOC CO23ALLOC	RECORD CONSTRUCTION OVERHEAD
5/3/2005	30199466	JE	105260	31	50070288	W	$	(1.04)	CGS APPLIED TO WRONG BU	
5/5/2005	30199779	JA	105260	31	50008453	W	$	4.75	FASTR - ALLOC CO23ALLOC	RECORD CONSTRUCTION
5/5/2005	30199779	JA	105260	11	50073241	W	$	7.55	FASTR - ALLOC CO23ALLOC	RECORD CONSTRUCTION
5/5/2005	30199779	JA	105260	21	50073252	W	$	0.30	FASTR - ALLOC CO23ALLOC	RECORD CONSTRUCTION
5/9/2005	30203708	JA	105260	31	50008453	W	$	1,227.15	ADJUST CONSTR O/H MARCH 2005	RECORD CONSTRUCTION
5/9/2005	30203718	JA	105260	31	50008453	W	$	2.98	ADJUST CONSTR O/H APRIL 2005	RECORD CONSTRUCTION
5/9/2005	30203738	JA	105260	31	50008453	W	$	(2.18)	ADJUST CONSTR O/H MAY 2005	RECORD CONSTRUCTION
5/9/2005	30203708	JA	105260	31	50008455	W	$	(1,897.74)	ADJUST CONSTR O/H MARCH 2005	RECORD CONSTRUCTION
5/9/2005	30203747	JA	105260	21	50008455	W	$	327.46	RECORD CONSTR O/H JUNE 2005	RECORD CONSTRUCTION
5/9/2005	30203708	JA	105260	31	50008456	W	$	(80.01)	ADJUST CONSTR O/H MARCH 2005	RECORD CONSTRUCTION
5/9/2005	30203718	JA	105260	31	50070288	W	$	(0.28)	ADJUST CONSTR O/H APRIL 2005	RECORD CONSTRUCTION

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6/9/2005	30203747	JA	105260	31	50070288	W	$	(2.91)	RECORD CONSTR O/H JUNE 2005	RECORD CONSTRUCTION
6/9/2005	30203718	JA	105260	11	50073241	W	$	(209.76)	ADJUST CONSTR O/H APRIL 2005	RECORD CONSTRUCTION
6/9/2005	30203738	JA	105260	11	50073241	W	$	(3.46)	ADJUST CONSTR O/H MAY 2005	RECORD CONSTRUCTION
6/9/2005	30203747	JA	105260	11	50073241	W	$	5.89	RECORD CONSTR O/H JUNE 2005	RECORD CONSTRUCTION
6/9/2005	30203738	JA	105260	21	50073252	W	$	(0.14)	ADJUST CONSTR O/H MAY 2005	RECORD CONSTRUCTION
7/7/2005	30207384	JA	105260	31	50008455	W	$	2,550.23	RECORD CONSTR O/H JULY 2005	RECORD CONSTRUCTION
7/7/2005	30207384	JA	105260	11	50073241	W	$	1,480.97	RECORD CONSTR O/H JULY 2005	RECORD CONSTRUCTION
					Account 105260 Total:		**$**	**7,444.11**		
11/2004	30178932	JE	105270	31	50008453	W	$	3,145.42	Reverse Post Close Service Co	JE 30178928
21/2005	30184901	JB	105270	31	50008453	W	$	4,796.52	CP	23 Expenses
2/3/2005	30186916	JE	105270	31	50008453	W	$	(183,216.54)	Reclass charges to correct	
2/3/2005	30186916	JE	105270	31	50008455	W	$	183,216.54	Reclass charges to correct	
18/2005	30189684	JB	105270	31	50008453	W	$	2,211.22	CP	23 Expenses
18/2005	30189684	JB	105270	31	50008455	W	$	1,333.97	CP	23 Expenses
25/2005	30194375	JB	105270	31	50008453	W	$	(426.94)	CP	23 Expenses
25/2005	30194375	JB	105270	31	50008455	W	$	3,135.77	CP	23 Expenses
22/2005	30198234	JB	105270	31	50008453	W	$	28.10	CP	23 Expenses
22/2005	30198234	JB	105270	31	50008455	W	$	3,019.13	CP	23 Expenses
20/2005	30201904	JB	105270	31	50008455	W	$	4,200.04	CP	23 Expenses
24/2005	30206208	JB	105270	31	50008455	W	$	3,789.10	CP	23 Expenses
					Account 105270 Total:		**$**	**25,232.33**		
11/2004	30176471	JE	105275	31	50008455	W	$	(127,821.00)	2004 Year End Accruals	DL Norton
11/2004	30176471	JE	105275	31	50008455	W	$	(127,821.00)	2004 Year End Accruals	DL Norton
11/2004	30176471	JE	105275	31	50008455	W	$	127,821.00	2004 Year End Accruals	DL Norton
11/2004	30176471	JE	105275	31	50008455	W	$	127,821.00	2004 Year End Accruals	DL Norton
11/2004	30178179	JE	105275	31	50008455	W	$	(127,821.00)	2004 Year end accruals	DL Norton
29/2004	40931159	PV	105275	31	50008455	W	$	127,821.00	DL Norton General Contracting	Paradise Valley
11/2005	40941690	PV	105275	31	50008453	W	$	45.59	DEI Professional Services LLC	PROJ 0311610
2/3/2005	30186916	JE	105275	31	50008453	W	$	(15,631.38)	Reclass charges to correct	
2/3/2005	30186916	JE	105275	31	50008455	W	$	15,631.38	Reclass charges to correct	
10/2005	40966640	PV	105275	31	50008455	W	$	127,821.00	DL Norton General Contracting	Paradise Valley Aresenic
22/2005	40976720	PV	105275	31	50008455	W	$	143,017.00	DL Norton General Contracting	PARADISE VALLEY
22/2005	40976720	PV	105275	11	50073241	W	$	47,500.00	DL Norton General Contracting	PARADISE VALLEY
3/4/2005	30191575	JE	105275	31	50008455	W	$	39,980.00	PREOPERTY DEVELOP RELATED COST	
4/5/2005	41011585	PV	105275	31	50008455	W	$	136,432.00	DL Norton General Contracting	PARADISE VALLEY
18/2005	41048508	PV	105275	11	50073241	W	$	148.50	DEI Professional Services LLC	TRAFFIC & PLANN
19/2005	41049606	PV	105275	31	50008455	W	$	4,275.00	DEI Professional Services LLC	INV33845
23/2005	41051496	PV	105275	11	50073241	W	$	5,898.75	DEI Professional Services LLC	0311615 AZAW
23/2005	41051502	PV	105275	11	50073241	W	$	2,850.00	DEI Professional Services LLC	03111615 AZAW
24/2005	41053432	PV	105275	11	50073241	W	$	2,101.55	Technical Solutions	INV050104

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24/2005	41053435	PV	105275	11	50073241	W	$	2,085.60	Technical Solutions	INV050203
24/2005	41053436	PV	105275	11	50073241	W	$	450.00	H & S International LLC	INV20022399
24/2005	41053441	PV	105275	11	50073241	W	$	12,844.24	H & S International LLC	INV20022342
24/2005	41053443	PV	105275	11	50073241	W	$	19,157.08	H & S International LLC	INV2022278
24/2005	41053450	PV	105275	11	50073241	W	$	9,866.16	Technical Solutions	INV050202
24/2005	41053452	PV	105275	11	50073241	W	$	6,832.88	Technical Solutions	INV050103
24/2005	41053453	PV	105275	11	50073241	W	$	7,065.03	Technical Solutions	INV041202
24/2005	41053454	PV	105275	11	50073241	W	$	1,544.17	Floor & Associates Inc	INV3530R
24/2005	41053455	PV	105275	11	50073241	W	$	1,905.00	Floor & Associates Inc	INV3607
24/2005	41053456	PV	105275	11	50073241	W	$	1,080.00	Floor & Associates Inc	INV3553
24/2005	41053458	PV	105275	11	50073241	W	$	1,250.00	Environmental Managers & Audit	INV02999
24/2005	41053460	PV	105275	11	50073241	W	$	2,500.00	Environmental Managers & Audit	INV02998
24/2005	41053463	PV	105275	11	50073241	W	$	7,700.00	Environmental Managers & Audit	INV02997
27/2005	41056373	PV	105275	11	50073241	W	$	2,144.90	Technical Solutions	inv041205
27/2005	41056559	PV	105275	11	50073241	W	$	4,020.60	STEPTOE & JOHNSON (1099 ONLY)-	inv050905
/3/2005	30205556	JE	105275	31	50008455	W	$	9,618.45	SABRIX NO TAX CHARGED ACR	41011585
/3/2005	30205556	JE	105275	11	50073241	W	$	10.47	SABRIX NO TAX CHARGED ACR	41048508
/3/2005	30205556	JE	105275	11	50073241	W	$	415.86	SABRIX NO TAX CHARGED ACR	41051496
/3/2005	30205556	JE	105275	11	50073241	W	$	200.93	SABRIX NO TAX CHARGED ACR	41051502
/3/2005	30205556	JE	105275	11	50073241	W	$	148.16	SABRIX NO TAX CHARGED ACR	41053432
/3/2005	30205556	JE	105275	11	50073241	W	$	31.73	SABRIX NO TAX CHARGED ACR	41053436
/3/2005	30205556	JE	105275	11	50073241	W	$	905.52	SABRIX NO TAX CHARGED ACR	41053441
/3/2005	30205556	JE	105275	11	50073241	W	$	1,350.58	SABRIX NO TAX CHARGED ACR	41053443
/3/2005	30205556	JE	105275	11	50073241	W	$	481.72	SABRIX NO TAX CHARGED ACR	41053452
/3/2005	30205556	JE	105275	11	50073241	W	$	498.08	SABRIX NO TAX CHARGED ACR	41053453
/3/2005	30205556	JE	105275	11	50073241	W	$	76.14	SABRIX NO TAX CHARGED ACR	41053456
/3/2005	30205556	JE	105275	11	50073241	W	$	88.13	SABRIX NO TAX CHARGED ACR	41053458
/3/2005	30205556	JE	105275	11	50073241	W	$	176.25	SABRIX NO TAX CHARGED ACR	41053460
/3/2005	30205556	JE	105275	11	50073241	W	$	542.85	SABRIX NO TAX CHARGED ACR	41053463
/3/2005	30205556	JE	105275	11	50073241	W	$	151.21	SABRIX NO TAX CHARGED ACR	41056373
/3/2005	30205556	JE	105275	11	50073241	W	$	283.45	SABRIX NO TAX CHARGED ACR	41056559
17/2005	41071048	PV	105275	31	50008455	W	$	475.00	DEI Professional Services LLC	PROJECT 03059 2
17/2005	41071050	PV	105275	31	50008455	W	$	2,162.02	DEI Professional Services LLC	PROJECT 03059 2
23/2005	41076852	PV	105275	31	50008455	W	$	6,075.98	Gallagher & Kennedy Attorneys-	ID# 15015-0039-
23/2005	41077113	PV	105275	31	50008455	W	$	29,935.00	DL Norton General Contracting	PARADISE VALLEY
23/2005	30205983	JE	105275	31	50008455	W	$	428.35	SABRIX NO TAX CHARGED ACR	41076852
23/2005	30205983	JE	105275	31	50008455	W	$	2,110.42	SABRIX NO TAX CHARGED ACR	41077113
24/2005	30206309	JE	105275	31	50008455	W	$	(2,110.42)	REV - SABRIX JE	
24/2005	30206309	JE	105275	31	50008455	W	$	(428.35)	REV - SABRIX JE	
24/2005	30206309	JE	105275	31	50008455	W	$	(9,618.45)	REV - SABRIX JE	
24/2005	30206309	JE	105275	11	50073241	W	$	(1,350.58)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(905.52)	REV - SABRIX JE	REV - SABRIX JE

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G/L DATE	Document Number	Type	Acct	Sub	Task Order	Type		Amount	Description	-Remark-
24/2005	30206309	JE	105275	11	50073241	W	$	(542.85)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(498.08)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(481.72)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(415.86)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(283.45)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(200.93)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(176.25)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(151.21)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(148.16)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(88.13)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(76.14)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(31.73)	REV - SABRIX JE	REV - SABRIX JE
24/2005	30206309	JE	105275	11	50073241	W	$	(10.47)	REV - SABRIX JE	REV - SABRIX JE
19/2005	41096986	PV	105275	31	50008455	W	$	835.00	DEI Professional Services LLC	PROJECT 03059 2
19/2005	41096998	PV	105275	31	50008455	W	$	27.85	DEI Professional Services LLC	PROJECT 03059 2
21/2005	41100216	PV	105275	31	50008455	W	$	300.00	Heerup Engineering	PARADISE VALLEY
					Account 105275 Total:		**$**	**630,325.90**		
22/2005	40976720	PV	105280	11	50073241	W	$	2,500.00	DL Norton General Contracting	PARADISE VALLEY
					Account 105280 Total:		**$**	**2,500.00**		
/7/2005	30182386	F0	105350	31	50008453	W	$	681.89	BOOK AFUDC	
/7/2005	30182386	F0	105350	31	50008455	W	$	2,752.59	BOOK AFUDC	
/7/2005	30182386	F0	105350	31	50008456	W	$	16.14	BOOK AFUDC	
/3/2005	30186916	JE	105350	31	50008453	W	$	(8,537.59)	Reclass charges to correct	
/3/2005	30186966	F0	105350	31	50008453	W	$	737.30	BOOK AFUDC	
/3/2005	30186916	JE	105350	31	50008455	W	$	8,537.59	Reclass charges to correct	
/3/2005	30186966	F0	105350	31	50008455	W	$	2,774.46	BOOK AFUDC	
/3/2005	30186966	F0	105350	31	50008456	W	$	16.25	BOOK AFUDC	
10/2005	30192277	F0	105350	31	50008455	W	$	4,128.74	BOOK AFUDC	
10/2005	30192277	F0	105350	11	50073241	W	$	60.56	BOOK AFUDC	
/8/2005	30195845	F0	105350	31	50008455	W	$	4,609.31	BOOK AFUDC	
/8/2005	30195845	F0	105350	11	50073241	W	$	122.55	BOOK AFUDC	
/6/2005	30199851	F0	105350	31	50008455	W	$	4,853.52	BOOK AFUDC	
/6/2005	30199851	F0	105350	11	50073241	W	$	124.41	BOOK AFUDC	
/6/2005	30199851	F0	105350	21	50073252	W	$	0.03	BOOK AFUDC	
/9/2005	30203777	F0	105350	31	50008455	W	$	4,923.43	BOOK AFUDC	
/9/2005	30203777	F0	105350	11	50073241	W	$	241.84	BOOK AFUDC	
/9/2005	30203777	F0	105350	21	50073252	W	$	0.03	BOOK AFUDC	
/7/2005	30207423	F0	105350	31	50008455	W	$	5,321.90	BOOK AFUDC	
/7/2005	30207423	F0	105350	11	50073241	W	$	361.61	BOOK AFUDC	
/7/2005	30207423	F0	105350	21	50073252	W	$	0.03	BOOK AFUDC	

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G/L DATE	Document Number	Type	Acct	Sub	Task Order	Type		Amount	Description	-Remark-
					Account 105350 Total:		$	31,726.59		
1/7/2005	30182386	F0	105375	31	50008453	W	$	1,263.52	BOOK AFUDC	
1/7/2005	30182386	F0	105375	31	50008455	W	$	5,100.37	BOOK AFUDC	
1/7/2005	30182386	F0	105375	31	50008456	W	$	29.91	BOOK AFUDC	
2/3/2005	30186916	JE	105375	31	50008453	W	$	(15,816.19)	Reclass charges to correct	
2/3/2005	30186966	F0	105375	31	50008453	W	$	1,366.13	BOOK AFUDC	
2/3/2005	30186916	JE	105375	31	50008455	W	$	15,816.19	Reclass charges to correct	
2/3/2005	30186966	F0	105375	31	50008455	W	$	5,140.93	BOOK AFUDC	
2/3/2005	30186966	F0	105375	31	50008456	W	$	30.12	BOOK AFUDC	
/10/2005	30192277	F0	105375	31	50008455	W	$	7,650.41	BOOK AFUDC	
/10/2005	30192277	F0	105375	11	50073241	W	$	112.24	BOOK AFUDC	
4/8/2005	30195845	F0	105375	31	50008455	W	$	8,540.84	BOOK AFUDC	
4/8/2005	30195845	F0	105375	11	50073241	W	$	227.06	BOOK AFUDC	
5/6/2005	30199851	F0	105375	31	50008455	W	$	8,993.28	BOOK AFUDC	
5/6/2005	30199851	F0	105375	11	50073241	W	$	230.54	BOOK AFUDC	
5/6/2005	30199851	F0	105375	21	50073252	W	$	0.06	BOOK AFUDC	
6/9/2005	30203777	F0	105375	31	50008455	W	$	9,122.76	BOOK AFUDC	
6/9/2005	30203777	F0	105375	11	50073241	W	$	448.18	BOOK AFUDC	
6/9/2005	30203777	F0	105375	21	50073252	W	$	0.06	BOOK AFUDC	
7/7/2005	30207423	F0	105375	31	50008455	W	$	9,861.19	BOOK AFUDC	
7/7/2005	30207423	F0	105375	11	50073241	W	$	670.08	BOOK AFUDC	
7/7/2005	30207423	F0	105375	21	50073252	W	$	0.06	BOOK AFUDC	
					Account 105375 Total:		$	58,787.74		
2/3/2005	30186916	JE	105399	31	50008453	W	$	(571.32)	Reclass charges to correct	
2/3/2005	30186916	JE	105399	31	50008455	W	$	571.32	Reclass charges to correct	
					Account 105399 Total:		$	-		
	PV Arsenic Facilities (23020203) Total for 2005:						$	925,023.76		

AZAW000402

Report Ran: 7/22/05

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Stipulations for Case:
Paradise Valley Arsenic Removal Facility
109-DR-2004

Unless otherwise stated, the applicant agrees to complete all requirements prior to final plan approval, to the satisfaction of Project Coordinator and the Final Plans staff.

Revised Stipulations are shown in **BOLD CAPS** and ~~strikethrough~~.

PLANNING

APPLICABLE DOCUMENTS AND PLANS:

DRB Stipulations

1. Except as required by the City Code of Ordinances, Zoning Regulations, Subdivision Regulations, and the other stipulations herein, the site design and construction shall substantially conform to the following documents:

    a. Architectural elements, including dimensions, materials, form, color, and texture, shall be constructed to be consistent with the building elevations submitted by DSWA with a date by staff of 12/7/2004. **THE DEVELOPMENT REVIEW BOARD ACCEPTS THE LOWER TANK HEIGHT THAT HAS BEEN PROPOSED, WHICH IS TWENTY TWO (22) FEET TO THE TOP OF THE VENT MEASURED FROM THE CANAL ROAD, OR EIGHTEEN (18) FEET TO THE TOP OF THE TANK WALL AS MEASURED FROM THE CANAL ROAD.**

    b. The location and configuration of all site improvements shall be constructed to be consistent with the site plan submitted by DSWA with a date by staff of 12/7/2004**, AND AMENDED BY LANDSCAPING PLAN DATED JANUARY 2005.**

    c. Landscaping, including quantity, size, and location of materials shall be installed to be consistent with the conceptual landscape plan submitted by McCloskey & Peltz, Inc., with a date by staff of 12/7/2004**, AND AMENDED BY LANDSCAPING PLAN DATED JANUARY 2005.**

ARCHITECTURAL DESIGN:

DRB Stipulations

2. Storage tanks shall be painted/MOTTLED WITH a COMBINATION OF EARTHTONE brown/**GREEN** colors. **AN ACCURATE THREE-DIMENSION RENDERING SKETCH REPRESENTATION OF THE FINAL PATTERN FINISH OF THE TANK SHALL RETURN TO A DEVELOPMENT REVIEW BOARD STUDY SESSION FOR STAFF APPROVAL.**
3. All exterior mechanical, utility, and communications equipment shall be screened by parapet or wall that matches the architectural color and finish of the building. Wall or parapet height for roof-mounted units shall meet or exceed the height of the tallest unit. Wall height for ground-mounted units shall be a minimum of 1' higher than the tallest unit.
4. All exterior conduit and raceways shall be painted to match the building.
5. No exterior roof ladder shall be allowed where they are visible to the public or from an off-site location.
6. Roof drainage systems, if provided, on all buildings shall be interior, except that overflow scuppers are permitted. If overflow scuppers are provided, they shall be integrated with the architectural design. Submit revised elevations with the final plans submittal.
7. Wall enclosures for refuse bins or trash compactors shall be constructed of materials that are compatible with the building(s) on the site in terms of color and texture.

ATTACHMENT B

APPROVED AT DRB 01/272005 – FC

8. All new walls surrounding the site shall be rammed earth with wrought iron accents as shown on the site and landscape plan.
9. No chain link, barbed wire, or other security wire fencing shall be visible to the public or from an off-site location
10. The existing cattle fence along the west property line shall be removed.

SITE DESIGN:

DRB Stipulations

11. Dedicate and improve a 15-foot wide public trail easement running east/west along the northern portion of the site connecting Cattletrack with the Arizona Canal. The easement shall encompass the 5-foot wide trail shown on the site and landscape plan. Trails shall be improved with soil lock, stabilized decomposed granite, or other hard surface.

LANDSCAPE DESIGN:

DRB Stipulations

12. Upon removal of the salvageable native plants the salvage contractor shall submit completed Native Plant Tracking Form as well as a list identifying the tag numbers of the plants surviving salvage operations to the City's Inspection Services Unit within 3 months from the beginning of salvage operations and/or prior to the issuance of the Certificate of Occupancy.
13. **THE FINAL LANDSCAPE PLAN SHALL INCLUDE 72-INCH SIZE BOX TREES PLANTED IN A STAGGERED FORMATION TO CREATE A CONTINUOUS LANDSCAPED SCREEN AS VIEWED FROM THE CANAL, AND SHALL BE SUBMITTED TO A DEVELOPMENT REVIEW BOARD STUDY SESSION FOR STAFF APPROVAL.**

Ordinance

A. Revise the landscape plan to show plantings every seven (7) feet in any one direction between plants or plant canopies.

EXTERIOR LIGHTING DESIGN:

DRB Stipulations

14. All exterior luminaries shall meet all IESNA requirements for full cutoff, and shall be aimed downward and away from property line except for sign lighting. Submit a revised exterior lighting site plan, photometric analysis, and lighting cutsheets on 24" x 36" sheets that show revised lighting fixtures that are full cut-off fixtures. Any bollard lighting fixtures shall contain louvers.
15. The individual luminarie lamp shall not exceed 250 watts.
16. The maximum height from finished graded to the bottom of the any exterior luminiare shall not exceed 16 feet. Any building mounted lighting fixtures shall not exceed 12-feet.
17. All exterior light poles, pole fixtures, and yokes, including bollards shall be a flat black or dark bronze.
18. Incorporate into the project's design, the following:

    Parking Lot and Site Lighting:

    a. The maintained average horizontal illuminance level, at grade on the site, shall not exceed 1.5 foot-candles.
    b. The maintained maximum horizontal illuminance level, at grade on the site, shall not exceed 6.0 foot-candles. All exterior luminaries shall be included in this calculation.
    c. The initial vertical illuminance at 6.0 foot above grade, along the entire property line (or 1 foot outside of any block wall exceeding 5 foot in height) shall not exceed 0.3 foot-candles. All exterior luminaries shall be included in this calculation.

    Building Mounted Lighting:

d. Shall not exceed 12-feet in height.

e. All luminaries shall be recessed or shielded so the light source is not directly visible from property line.

f. Wall mounted luminaries shall contain house side shields, and be mounted on a minimum 4-inch long bracket that is mounted perpendicular to the wall.

VEHICULAR AND BICYCLE PARKING:

DRB Stipulations

19. Bike rack design shall be in conformance with City of Scottsdale M.A.G. Details unless otherwise approved in writing by the City of Scottsdale's Transportation Department.

Ordinance

B. A minimum of four (4) bicycle parking spaces shall be provided.

ADDITIONAL PLANNING ITEMS:

DRB Stipulations

20. Flagpoles, if provided, shall be one piece, conical, and tapered.

Ordinance

C. Prior to final plan approval, a land assemblage application shall be completed and approved by City staff as well as be recorded by City staff with Maricopa County.

RELEVANT CASES:

Ordinance

D. At the time of review, the applicable zoning, DRB, Use Permit, and etc. case(s) for the subject site were: 33-UP-2004

ENGINEERING

The following stipulations are provided to aid the developer in submittal requirements, and are not intended to be all inclusive of project requirements. The developer shall submit engineering design reports and plans that demonstrate compliance with city ordinances, the Scottsdale Revised Code and the Design Standards and Policies Manual.

APPLICABLE DOCUMENTS AND PLANS:

21. Conceptual Drainage Report – Paradise Valley Arsenic Removal Facility, dated November 2004 and by DSWA and Associated firms.
22. Civil Overall Site Plan dated December 2004 and by DSWA.
23. Area Context Site Plan dated December 2004 and by DSWA.

CIVIL IMPROVEMENT PLAN REQUIREMENTS:

DRAINAGE AND FLOOD CONTROL:

DRB Stipulations

24. A final drainage report shall be submitted that demonstrates consistency with the conceptual drainage report approved in concept by the Planning and Development Services Department.
    a. Before the approval of improvement plans by city staff, the developer shall submit two (2) hard copies and one (1) compact disc copy of the complete final drainage report and plan.
25. Basin Configuration:
    a. Basin side slopes shall not be steeper than 4:1, and basin depths shall not exceed 3 feet.
    b. A maximum of 50% of the front open space may be used as a retention/detention basin unless approved by the Project Coordination Manager. Stormwater Storage on Paved Surfaces. Up to 50% of required stormwater storage may be provided in parking areas when the following conditions are met:
    c. Storage system shall be designed to store first 30% of required runoff volume off paved areas (to avoid ponding of nuisance water on pavement).
    d. Parking lot storage areas shall be designed so as to minimize interference with pedestrian traffic. Depth of water shall not exceed six inches within the parking area.

Ordinance

E. On-site stormwater storage is required for the full 100-year, 2-hour storm event. The design of the storage basin capacity shall account for any proposed landscaping improvements. The landscaping improvements within the basins shall not reduce the capacity of the basins under the required volume.
    (1) Basin bleed-off rates shall be set so that the storage basins do not drain completely in less than 24 hours. Storage basins must drain completely within 36 hours.
    (2) Infiltration of stormwater through the basin floor is not acceptable as the sole means of draining the basin. Stormwater storage basins should be designed to meter flow to the historic out-fall point. Where an historic out-fall point does not exist (or metering is not possible), other methods of discharge such as pumps, etc. may be considered.
    (3) Stormwater storage basins may not be constructed within utility easements or dedicated right-of-way (exceptions may be granted with written approval from appropriate utility company).
    (4) Off-site runoff must enter and exit the site as it did historically.
    (5) All development shall be designed to satisfactorily convey the 100-year peak discharge through the site without significant damage to structures.

F. With the final improvement plans submittal to the Plan Review and Permit Services Division, the developer shall submit a final drainage report and plan, subject to City staff approval.

G. Underground Stormwater Storage:

(1) Underground stormwater storage is prohibited unless approval is obtained from the City's Floodplain Administrator.

(2) Drywells are not permitted.

H. Street Crossings:

(1) Watercourse crossings for roads shall be designed to provide for 100-year access to all lots by at least one route. Accessibility will be considered to exist if it can be shown by the engineer that at the time of the peak flow, the depth of flow over the road will not be greater than 1 foot.

ROADWAY, INTERSECTION, AND ACCESS DESIGN:

Streets and other related improvements:

STREET NAME	STREET TYPE	R.O.W. DEDICATION	ROADWAY IMPROVEMENT	CURB TYPE	BIKE PATH, SIDEWALK, TRAILS
Miller/Cattletrack Road	Local	30' R.O.W.	Half-street	None	5' wide trail within new half street R.O.W. dedications.

Ordinance

I. The developer shall submit a detailed striping and signage plan with final plans. The striping and signage plan shall include all existing improvements and striping within 300 feet of the limits of construction, and all signs, striping, or other traffic control devices proposed to accommodate phased and ultimate construction.

INTERNAL CIRCULATION:

DRB Stipulations

26. The developer shall design the dead-end parking aisle in general conformance with the included detail.

Ordinance

J. Parking areas shall be improved with a minimum of 2.5 inches of asphalt over 4 inches of aggregate base, or other acceptable dust-free hard-surface paving material (such as soil lock).

DRB Stipulations

27. Indemnity Agreements:

a. When substantial improvements or landscaping are proposed within a utility easement, an indemnity agreement shall be required. The agreement shall acknowledge the right of the City to access the easement as necessary for service or emergencies without responsibility for the replacement or repair of any improvements or landscaping within the easement.

Ordinance

K. Drainage Easement:

(1) Drainage and flood control easements shall be dedicated to the City to the limits of inundation for all vista corridor washes, and for all stormwater storage basins. All drainage and flood control easements shall be dedicated to the City with maintenance responsibility specified to be that of the property owner.

REFUSE:

DRB Stipulations

28. Refuse enclosures shall be constructed to City of Scottsdale's standards. Details for construction of trash enclosures can be found in the City of Scottsdale Supplements to MAG Standards, standard detail #2146-1 for single enclosures and #2147-1 for double enclosures.

29. Enclosures must:

    a. Provide adequate truck turning/backing movements for a design vehicle of turning radius R (minimum) = 45 feet vehicle length of L = 40 feet.

    b. Be positioned to facilitate collection without "backtracking."

    c. Be easily accessible by a simple route.

    d. Not require backing more than 35 feet.

    e. Not be located on dead-end parking aisles.

    f. Enclosures serviced on one side of a drive must be positioned at a 30-degree angle to the centerline of the drive.

Ordinance

L. Refuse enclosures are required as follows:

    (1) Commercial Building Space: One for 0 to 20,000 s.f., Two for 20,001 to 40,000 s.f., Three for 40,001 to 60,000 s.f., etc.

M. Underground vault-type containers are not allowed.

N. Refuse collection methods, i.e., site plan circulation will be approved at final plan review.

O. Refuse collection can be provided by the City of Scottsdale's Sanitation Division, at 480-312-5600.

WATER AND WASTEWATER STIPULATIONS

The following stipulations are provided to aid the developer in submittal requirements, and are not intended to be all-inclusive of project requirements. Water and sewer lines and services shall be in compliance with City Engineering Water and Sewer Ordinance, the Scottsdale Revised Code and Sections 4 and 5 of the Design Standards and Policies Manual.

WASTEWATER:

DRB Stipulations

30. Wastewater Basis of Design Report. Before the improvement plan submittal to the Plan Review and Permit Services Division, the developer shall obtain approval of the Wastewater Basis of Design Report from the City's Water Resources Department. The report shall conform to the draft Water and Wastewater Report Guidelines available from the City's Water Resources Department.

31. Before the improvement plan submittal to the Plan Review and Permit Services Division, the developer shall obtain approval of the master wastewater report. The improvement plans shall be consistent with the approved master water and wastewater reports. Any design that modifies the approved master report requires from the developer a site-specific addendum to the master report, subject to review and approval by City staff.

32. Existing water and sewer service lines to this site shall be utilized or shall be abandoned by disconnection at the main.

33. Where walls cross or run parallel with public water mains, public sewer mains, or public fire lines the following shall apply:

    a. For walls constructed parallel to these pipes, the walls shall be a minimum of six (6) feet from the outside diameter of the pipe.

b. For walls constructed across or perpendicular to these pipes, the walls shall be constructed with gates or removable wall panels for maintenance and emergency access.

Ordinance

P. All sewage discharged from this development shall meet local and federal pretreatment standards for sewage discharge. The facility may require a City Industrial Users Permit and related monitoring and sampling facility. All development within industrial (I-1) zoned districts shall provide a monitoring manhole.

CONSTRUCTION REQUIREMENTS

DRB Stipulations

34. The developer to submit as-built plans to the Inspection Services Division.

a. As-built plans shall be certified in writing by a registered professional civil engineer, using as-built data from a registered land surveyor.

b. As-built plans for drainage facilities and structures shall include, but are not limited to, streets, lot grading, storm drain pipe, valley gutters, curb and gutter, flood walls, culverts, inlet and outlet structures, dams, berms, lined and unlined open channels, storm water storage basins, underground storm water storage tanks, and bridges as determined by city staff.

Ordinance

Q. Section 404 permits. With the improvement plan submittal to the Plan Review and Permit Services Division, the developer's engineer must certify that it complies with, or is exempt from, Section 404 of the Clean Water Act of the United States. [Section 404 regulates the discharge of dredged or fill material into a wetland, lake, (including dry lakes), river, stream (including intermittent streams, ephemeral washes, and arroyos), or other waters of the United States.]

105

PVWELL 11	RAW	COLLECTED 06/14/05

American Water Works Service Company, Inc.

Quality Control and Research Laboratory – 1115 South Illinois Street
Belleville, Illinois 62220-3102 – Phone: (618)235-3600 – Fax: (618)235-6349

ACCREDITED IN ACCORDANCE WITH nelac

ANALYSIS REPORT

PROCESS

ARIZONA-AMERICAN WATER COMPANY
PV DISTRICT
P.O. BOX 158
SCOTTSDALE AZ 85252

Date of Report: 06/22/05
Certification Number: AZ 0068
PWS ID: AZ0407056
County: MARICOPA

Send Report to: L. BERRY
LAB DOCUMENT

Report Summary

Location.	PVWELL 11	Collection Date:	06/14/05	Received Date:	06/16/05
Sample Type	RAW	CollectionTime:	10:05	Received Time:	09:04
Sampler.	L BERRY			Received Temp:	13 °C

Disclosures:

Results are at or above the reporting limit for the following analytes:
ARSENIC

No deviations from the method criteria were noted unless listed below.

Process Sample - Analyte(s) is(are) not acceptable for compliance purposes.

Report Details

Sample Number: CJ31514 Sample Status: REPORT QUEUE

	Qualifier Code	Method	State Code	MCL	Reporting Limit	Result	Unit	Analyst	Analysis Date / Time	
ARSENIC		200 8R5.4	1005	0.05	0.001	0.014	mg/l	CR	06/17/05	15:36

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If you have any questions, concerning this report, please don't hesitate to call the Laboratory Director at (618) 235-3600.

Prepared By: Documentation Department
Reviewed By: QA/QC Review
Finalized By: Cheryl D. Norton, Laboratory Director

2005 | 05060065 COC AND REPORT NUMBER | AZ 705 | A

Starting Sample: CJ31514

See back of page for explanation of terms used.

AZAW000386

PVWELL12	RAW	COLLECTED 06/14/05

American Water Works Service Company, Inc.

Quality Control and Research Laboratory – 1115 South Illinois Street
Belleville, Illinois 62220-3102 – Phone: (618)235-3600 – Fax: (618)235-6349

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ANALYSIS REPORT

PROCESS

ARIZONA-AMERICAN WATER COMPANY
PV DISTRICT
P.O. BOX 158
SCOTTSDALE AZ 85252

Date of Report: 06/22/05
Certification Number: AZ 0068
PWS ID: AZ0407056
County: MARICOPA

Send Report to: L. BERRY
LAB DOCUMENT

Report Summary

Location:	PVWELL12	Collection Date:	06/14/05	Received Date:	06/16/05
Sample Type:	RAW	CollectionTime:	09:55	Received Time:	09.04
Sampler:	L.BERRY			Received Temp:	13°C

Disclosures:

Results are at or above the reporting limit for the following analytes:
ARSENIC

No deviations from the method criteria were noted unless listed below.

Process Sample - Analyte(s) is(are) not acceptable for compliance purposes.

Report Details

Sample Number: *CJ31512* *Sample Status:* *REPORT QUEUE*

	Qualifier Code	Method	State Code	MCL	Reporting Limit	Result	Unit	Analyst	Analysis Date / Time	
ARSENIC		200.8R5.4	1005	0.05	0.001	0.011	mg/l	CR	06/17/05	15:30

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Prepared By: Documentation Department
Reviewed By: QA/QC Review
Finalized By: Cheryl D. Norton, Laboratory Director

2005 | 05060063 COC AND REPORT NUMBER | AZ 705 | A

Starting Sample: CJ31512

See back of page for explanation of terms used

PVWELL 14	RAW	COLLECTED	06/14/05

American Water Works Service Company, Inc.

Quality Control and Research Laboratory – 1115 South Illinois Street
Belleville, Illinois 62220-3102 – Phone: (618)235-3600 – Fax: (618)235-6349

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ANALYSIS REPORT

PROCESS

ARIZONA-AMERICAN WATER COMPANY
PV DISTRICT
P O. BOX 158
SCOTTSDALE AZ 85252

Date of Report: 06/22/05
Certification Number: AZ 0068
PWS ID: AZ0407056
County: MARICOPA

Send Report to: L. BERRY
LAB DOCUMENT

Report Summary

Location:	PVWELL 14	Collection Date:	06/14/05	Received Date.	06/16/05
Sample Type	RAW	CollectionTime:	10:10	Received Time:	09:04
Sampler:	L BERRY			Received Temp:	13 °C

Disclosures:

Results are at or above the reporting limit for the following analytes:
ARSENIC

No deviations from the method criteria were noted unless listed below.

Process Sample - Analyte(s) is(are) not acceptable for compliance purposes.

Report Details

Sample Number: *CJ31515* *Sample Status.* *REPORT QUEUE*

	Qualifier Code	Method	State Code	MCL	Reporting Limit	Result	Unit	Analyst	Analysis Date / Time
ARSENIC		200.8R5.4	1005	0.05	0.001	0.011	mg/l	CR	06/17/05 15 39

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Prepared By: Documentation Department
Reviewed By: QA/QC Review
Finalized By: Cheryl D. Norton, Laboratory Director

Starting Sample: CJ31515

2005	05060066 COC AND REPORT NUMBER	AZ 705	A

See back of page for explanation of terms used.

AZAW000388

PVWELL 15	RAW	COLLECTED	06/14/05

American Water Works Service Company, Inc.

Quality Control and Research Laboratory – 1115 South Illinois Street
Belleville, Illinois 62220-3102 – Phone: (618)235-3600 – Fax: (618)235-6349

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ANALYSIS REPORT

PROCESS

ARIZONA-AMERICAN WATER COMPANY
PV DISTRICT
P.O. BOX 158
SCOTTSDALE AZ 85252

Date of Report: 06/28/05
Certification Number: AZ 0068
PWS ID. AZ0407056
County: MARICOPA

Send Report to: L. BERRY
LAB DOCUMENT

Report Summary

Location:	PVWELL 15	Collection Date:	06/14/05	Received Date:	06/16/05
Sample Type	RAW	CollectionTime:	10:30	Received Time:	09:04
Sampler:	L.BERRY			Received Temp:	13 °C

Disclosures:

Results are at or above the reporting limit for the following analytes:
ARSENIC

No deviations from the method criteria were noted unless listed below.

Process Sample - Analyte(s) is(are) not acceptable for compliance purposes.

Report Details

Sample Number: *CJ31517* *Sample Status:* *REPORT QUEUE*

	Qualifier Code	Method	State Code	MCL	Reporting Limit	Result	Unit	Analyst	Analysis Date / Time	
ARSENIC		200.8R5.4	1005	0.05	0.001	0.009	mg/l	SK	06/23/05	16.02

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Prepared By: Documentation Department
Reviewed By: QA/QC Review
Finalized By: Cheryl D. Norton, Laboratory Director

1005	05060068 CQC AND REPORT NUMBER	AZ 705	A

Starting Sample: CJ31517

See back of page for explanation of terms used.

AZAW000389

PVWELL17	RAW	COLLECTED	06/14/05

American Water Works Service Company, Inc.

Quality Control and Research Laboratory – 1115 South Illinois Street
Belleville, Illinois 62220-3102 – Phone: (618)235-3600 – Fax: (618)235-6349

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ANALYSIS REPORT

PROCESS

ARIZONA-AMERICAN WATER COMPANY
PV DISTRICT
P.O. BOX 158
SCOTTSDALE AZ 85252

Date of Report. 06/22/05
Certification Number. AZ 0068
PWS ID: AZ0407056
County: MARICOPA

Send Report to: L. BERRY
LAB DOCUMENT

Report Summary

Location.	PVWELL17	Collection Date:	06/14/05	Received Date:	06/16/05
Sample Type	RAW	CollectionTime:	09:40	Received Time.	09 04
Sampler:	L.BERRY			Received Temp	13 °C

Disclosures:

Results are at or above the reporting limit for the following analytes:
ARSENIC

No deviations from the method criteria were noted unless listed below.

Process Sample - Analyte(s) is(are) not acceptable for compliance purposes.

Report Details

Sample Number: *CJ31510* *Sample Status:* *REPORT QUEUE*

	Qualifier Code	Method	State Code	MCL	Reporting Limit	Result	Unit	Analyst	Analysis Date / Time	
ARSENIC		200.8R5 4	1005	0.05	0.001	0.010	mg/l	CR	06/17/05	15:24

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If you have any questions, concerning this report, please don't hesitate to call the Laboratory Director at (618) 235-3600.

Prepared By: Documentation Department
Reviewed By: QA/QC Review
Finalized By: Cheryl D. Norton, Laboratory Director

2005 | 0000001 COC AND REPORT NUMBER | AZ | 705 | A

Starting Sample: **CJ31510**

See back of page for explanation of terms used.

PVWELL PCX-1	RAW	COLLECTED 06/14/05

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ANALYSIS REPORT

PROCESS

ARIZONA-AMERICAN WATER COMPANY
PV DISTRICT
P.O. BOX 158
SCOTTSDALE AZ 85252

Date of Report: 06/28/05
Certification Number: AZ 0068
PWS ID: AZ0407056
County: MARICOPA

Send Report to: L. BERRY
LAB DOCUMENT

Report Summary

Location:	PVWELL PCX-1	Collection Date:	06/14/05	Received Date:	06/16/05
Sample Type	RAW	CollectionTime:	10:45	Received Time.	09:04
Sampler.	L.BERRY			Received Temp:	13 °C

Disclosures:

Results are at or above the reporting limit for the following analytes:
ARSENIC

No deviations from the method criteria were noted unless listed below.

Process Sample - Analyte(s) is(are) not acceptable for compliance purposes.

Report Details

Sample Number: *CJ31518* *Sample Status:* *REPORT QUEUE*

	Qualifier Code	Method	State Code	MCL	Reporting Limit	Result	Unit	Analyst	Analysis Date / Time	
ARSENIC		200.8R5.4	1005	0.05	0 001	0.008	mg/l	SK	06/23/05	16:05

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If you have any questions, concerning this report, please don't hesitate to call the Laboratory Director at (618) 235-3600.

Prepared By: Documentation Department MB
Reviewed By: QA/QC Review
Finalized By: Cheryl D. Norton, Laboratory Director CN

2005	05060069 COC AND REPORT NUMBER	AZ 705	A

Starting Sample: CJ31518

See back of page for explanation of terms used.

PVPOE4	EFF	COLLECTED	06/14/05

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Belleville, Illinois 62220-3102 – Phone: (618)235-3600 – Fax: (618)235-6349

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ANALYSIS REPORT

PROCESS

ARIZONA-AMERICAN WATER COMPANY
PV DISTRICT
P.O. BOX 158
SCOTTSDALE AZ 85252

Date of Report. 06/22/05
Certification Number: AZ 0068
PWS ID: AZ0407056
County: MARICOPA

Send Report to. L. BERRY
LAB DOCUMENT

Report Summary

Location:	PVPOE4	Collection Date:	06/14/05	Received Date:	06/16/05
Sample Type	EFF	CollectionTime:	10:00	Received Time:	09:04
Sampler:	L.BERRY			Received Temp:	13 °C

Disclosures:

Results are at or above the reporting limit for the following analytes:
ARSENIC

No deviations from the method criteria were noted unless listed below.

Process Sample - Analyte(s) is(are) not acceptable for compliance purposes.

Report Details

Sample Number: *CJ31513* *Sample Status.* *REPORT QUEUE*

	Qualifier Code	Method	State Code	MCL	Reporting Limit	Result	Unit	Analyst	Analysis Date / Time	
ARSENIC		200.8R5.4	1005	0.05	0.001	0.013	mg/l	CR	06/17/05	15.33

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Prepared By: Documentation Department
Reviewed By: QA/QC Review
Finalized By: Cheryl D. Norton, Laboratory Director

-005

05060064	AZ	A
COC AND REPORT NUMBER	705	

Starting Sample: CJ31513

See back of page for explanation of terms used.

AZAW000392

PVPOE5	EFF	COLLECTED 06/14/05

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ANALYSIS REPORT

PROCESS

ARIZONA-AMERICAN WATER COMPANY
PV DISTRICT
P O. BOX 158
SCOTTSDALE AZ 85252

Date of Report: 06/28/05
Certification Number: AZ 0068
PWS ID: AZ0407056
County: MARICOPA

Send Report to: L. BERRY
LAB DOCUMENT

Report Summary

Location:	PVPOE5	Collection Date:	06/14/05	Received Date:	06/16/05
Sample Type	EFF	CollectionTime:	10:35	Received Time:	09:04
Sampler:	L.BERRY			Received Temp.	13 °C

Disclosures:

Results are at or above the reporting limit for the following analytes:
ARSENIC

No deviations from the method criteria were noted unless listed below.

Process Sample - Analyte(s) is(are) not acceptable for compliance purposes.

Report Details

Sample Number: *CJ31516* *Sample Status:* *REPORT QUEUE*

	Qualifier Code	Method	State Code	MCL	Reporting Limit	Result	Unit	Analyst	Analysis Date / Time	
ARSENIC		200.8R5.4	1005	0.05	0.001	0 008	mg/l	SK	06/23/05	15:59

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Prepared By: Documentation Department MB
Reviewed By: QA/QC Review
Finalized By: Cheryl D. Norton, Laboratory Director

2005 | 05060067 COC AND REPORT NUMBER | AZ 705 | A

Starting Sample: **CJ31516**

See back of page for explanation of terms used.

AZAW000393

WELL 16 (PVPOE6)	EFF	COLLECTED 06/14/05

American Water Works Service Company, Inc.

Quality Control and Research Laboratory - 1115 South Illinois Street
Belleville, Illinois 62220-3102 - Phone: (618)235-3600 - Fax: (618)235-6349

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ANALYSIS REPORT

PROCESS

ARIZONA-AMERICAN WATER COMPANY
PV DISTRICT
P.O. BOX 158
SCOTTSDALE AZ 85252

Date of Report: 06/22/05
Certification Number: AZ 0068
PWS ID: AZ0407056
County: MARICOPA

Send Report to: L. BERRY
LAB DOCUMENT

Report Summary

Location:	WELL 16 (PVPOE6)	Collection Date:	06/14/05	Received Date:	06/16/05
Sample Type	EFF	CollectionTime.	09:45	Received Time.	09:04
Sampler:	L.BERRY			Received Temp.	13°C

Disclosures:

Results are at or above the reporting limit for the following analytes:
ARSENIC

No deviations from the method criteria were noted unless listed below.

Process Sample - Analyte(s) is(are) not acceptable for compliance purposes.

Report Details

Sample Number: *CJ31511* *Sample Status* *REPORT QUEUE*

	Qualifier Code	Method	State Code	MCL	Reporting Limit	Result	Unit	Analyst	Analysis Date / Time	
ARSENIC		200.8R5.4	1005	0.05	0.001	0.013	mg/l	CR	06/17/05	15.27

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Prepared By: Documentation Department
Reviewed By: QA/QC Review
Finalized By: Cheryl D. Norton, Laboratory Director

2005 | 05060062 COC AND REPORT NUMBER | AZ 705 | A

Starting Sample: CJ31511

See back of page for explanation of terms used.

AZAW000394

106

COPY

"We, the undersigned, understand that in order to comply with new drinking water standards set forth by the United States Environmental Protection Agency (EPA) that become effective in January, 2006 that it will be necessary for the Arizona American Water Company to significantly modify their facility located at 6215 North Miller Road. We have seen the design and support the efforts of Arizona American Water Company to meet these new requirements and develop a facility compatible with the surrounding neighborhoods."

Print Name	Signature	Address	Date
1. JOANN THOMPSON	Joann Thompson	7758 E Rose Ln.	11-18-04
2. Mereyda Rivera	Mereyda Rivera	7767 E. Rose Ln	11-18-04
3. LENORE CLANCY	Lenore Clancy	7734 E BERRIDGE LN	11-18-04
4. Donald Wong	Donald Wong	6270 N 78th St #319	11/22/04
5. Anne Pekkoen	Edward [illegible]	6270 N 78 St #334	11/22/04
6. Barton Siegel	Barton Siegel	6270 N 78th St #337	11/22/04
7. ADAM ABRAHAM	[illegible]	6270 N 78th #340	11/22/04
8. IAN MACRAE	Ian MacRae	7743 ROVEY AVE	11/23/04
9. PJ Gaughan	PJ Gaughan	7757 ROVEY AVE	11/23/04
10. NORMA CONWAY	Norma Conway	7761 E. Rovey Ave	11/23/04
11. Bob Edwards	R. Edwards	7754 E ROVEY AVE	11/23/04
12. MARIAN D. Coleman	Marian D. Coleman	7524 E. Berridge Lane	11/23/04
13. Lillian Loffmann	Lillian Loffmann	7502 E Berridge Lane	11/23/04
14. DOUGLAS WATTIER	Douglas Wattier	Please avoid walls	11/23/04
15. AMY LOFGREN	[illegible]		
16. Eric Kampanger	Eric J. Kampanger	7220 E. Camino Santo, Scotts 85260	11-23-2004
17. Amy Lofgren	[illegible]	7722 E. Berridge Ln 85250	11.23.2004
18. NILS LOFGREN	[illegible]	" " "	11.23.04
19. ERIK WAGNER	[illegible]	7770 E. Rovey Ave	1-17-05
20. Juhee Park	Juhee Park	7728 E. Rovey ave.	1-17-05

COPY

"We, the undersigned, understand that in order to comply with new drinking water standards set forth by the United States Environmental Protection Agency (EPA) that become effective in January, 2006 that it will be necessary for the Arizona American Water Company to significantly modify their facility located at 6215 North Miller Road. We have seen the design and support the efforts of Arizona American Water Company to meet these new requirements and develop a facility compatible with the surrounding neighborhoods."

Print Name	Signature	Address	Date
1. LARRY MANCOUR		6270 N 78th St LOT 328	11/23
2. Mary Grosschidin		6270 N 78th St. #339 Sc.	11/23
3. W. GARTH JACQUES		6020 N 77 Pl 85250	11/23
4. Cassy Luthik		6008 N 77 Pl	11/23
5. ROGER GRANT		6002 N. 77 PLACE 85250	11/23
6. Stephanie Grant		6002 N. 77th Place 85250	11/23
7. Walter Mathan		7719 E Rovey	
8. Timothy L. Chalmers		7734 E Rovey Ave 85250	11/23
9. DAVID SCHUERMANN		7737 E. ROVEY AVE 85250	11-22
10. Patricia Brady		7767 E. Rovey Ave 85250	11-23
11. Tammy Gonzales		6344 N. Cattle Ranch Rd	11/23/04
12. Maree Searcy		7550 Whispering Winds Rd Scot 85250	11/23
13. KEITH SEARCY		" "	"
14. HOLLY LATUNSKI		6111 N. 77th pl	1-17-05
15. Michelle		6129 N 77th Place	1-17-05
16. JEREMY RHODES		6114 N. 77th PLACE	1/17-05
17. Roger Torrow		707 N 77th PLACE	1/17/
18. Beverly Torrow		707 N 77th PLACE	1/17/
19. Michael J. Patton		6026 N. 77th Pl	1/20/05
20. HEATHER ANCO		7725 E. ROVEY AVE	1/17/05

"We, the undersigned, understand that in order to comply with new drinking water standards set forth by the United States Environmental Protection Agency (EPA) that become effective in January, 2006 that it will be necessary for the Arizona American Water Company to significantly modify their facility located at 6215 North Miller Road. We have seen the design and support the efforts of Arizona American Water Company to meet these new requirements and develop a facility compatible with the surrounding neighborhoods."

Print Name	Signature	Address	Date
1. JEANNE THOMPSON	Jeanne Thompson	7758 E Rose Ln.	11-18-04
2. Nereyda Rivera	Nereyda Rivera	7767 E. Rose Ln	11-18-04
3. LENORE CLANCY	Lenore Clancy	7734 E BERRIDGE LN	11-18-04
4. Donald Low	Donald Low	6270 N 78th ST #319	11/22/04
5. Anne Pekurski	[illegible]	6270 N 78 ST #354	11/22/04
6. Barton Siegel	[illegible]	6270 N 78th ST #355	11/22/04
7. ADAM ABRAHAM	[illegible]	6270 N 78th #340	11/22/04
8. IAN MACRAE	Ian MacRae	7743 ROVEY AVE	11/23/04
9. PJ Gaughan	PJ Gaughan	7757 ROVEY AVE	11/23/04
10. NORMA CONWAY	Norma Conway	7761 E. Rovey Ave	11/23/04
11. Bob Edwards	R. Edwards	7764 E Rovey AVE	11/23/04
12. MARIAN D. COLEMAN	Marian D. Coleman	7534 E. Berridge Lane	11/23/04
13. Lillian Loffmann	Lillian Loffmann	7502 E Berridge Lane	11/23/04
14. DOUGLAS WATTIER	Douglas Wattier	Please avoid walls	11/23/04
15. Amy Lofgren	[illegible]		
16. Eric Kampanger	Eric J. Kampanger	7220 E. Camino Santo, Scotts 85260	11-23-2004
17. Amy Lofgren	[illegible]	7472 E. Berridge Ln 85260	11.23.2004
18. NILS LOFGREN	[illegible]	" " "	11.23.04
19.			
20.			

"We, the undersigned, understand that in order to comply with new drinking water standards set forth by the United States Environmental Protection Agency (EPA) that become effective in January, 2006 that it will be necessary for the Arizona American Water Company to significantly modify their facility located at 6215 North Miller Road. We have seen the design and support the efforts of Arizona American Water Company to meet these new requirements and develop a facility compatible with the surrounding neighborhoods."

Print Name	Signature	Address	Date
1. LAREE MANCOUR	[illegible]	6270 N 78th St LOT 328	11/23
2. Mary Gorosh	[illegible]	6270 N 78th St. #339 Sc.	11/23
3. W. GARTH JACQUES	[illegible]	6020 N 77 Pl 85250	11/23
4. Cassy [illegible]		6008 N 77 Pl	11/23
5. ROGER GRANT	Roger Grant	6002 N. 77 PLACE 85250	11/23
6. Stephanie Grant	Stephanie Grant	6002 N. 77th Place 85250	11/23
7. Walter Nathan		7719 E Rovey	
8. Timothy L. Chalmers	[illegible]	7734 E Rovey Ave 85250	11/23
9. DAVID SCHUERMANN	[illegible]	7737 E. Rovey Ave 85250	11-22
10. Patricia Brady	[illegible]	7767 E. Rovey Ave 85250	11-23
11. ~~[illegible]~~	[illegible]	6342 W. Cattle Ln 85250	11/23/04
12. Marcé Stearey	Marcé Stearey	7550 Enchanting Winds Rd Scot	11/23
13. KEITH SEARCY	[illegible]	" "	"
14.			
15.			
16.			
17.			
18.			
19.			
20.			

"We, the undersigned, understand that in order to comply with new drinking water standards set forth by the United States Environmental Protection Agency (EPA) that become effective in January, 2006 that it will be necessary for the Arizona American Water Company to significantly modify their facility located at 6215 North Miller Road. We have seen the design and support the efforts of Arizona American Water Company to meet these new requirements and develop a facility compatible with the surrounding neighborhoods."

Print Name	Signature	Address	Date
1. Nick Johnson	[illegible]	6138 N. 77th Pl	11/18
2. DICK HEIGHBERGER	[illegible]	7731 E. ROSE LN	11/18
3. LETICIA LEON	[illegible]	7761 E Rose Ln.	11/18
4. Lois Holt	LOIS HOLT	6452 N. 77th Way	11/19
5. Lisa Westbrook	Lisa Westbrook	6454 N 77th	11/19
6. JOSEPH NESSIM	[illegible]	6438 N 77th Way	11/19
7. Sabrina HICKS	[illegible]	6429 N. 77th Way	11/19
8. [illegible]	[illegible]	6417 N 77TH WAY	11/19
9. Robert Bancroft	Joseph Bancroft	6435 N. 77th Place	11/19
10. [illegible] Jermann	[illegible] Jermann	6420 N. 77th Place	11-19
11. Kelly Fitzgerald	Kelly Fitzgerald	6424 N 77th Place	11-19
12. Shelly Carter	Shelly Carter	6428 N. 77th Pl.	11/19
13. [illegible]	[illegible]	6432 N-79 Pl	11/19
14. MATTHEW WAJKNO	[illegible]	6350 N 78TH ST. #267	11/19
15. Cari Shook	Cari Shook	6350 N. 78th St #277	11/19
16. LYNN HANSON	Lynn Hanson	6350 N. 78th St. #281	11/19
17. [illegible]	[illegible]	6350 N. 78th St. #309	11/19
18. MICHAEL VERNIMB	Michael Vernimb	6350 N 78th #317	11/19
19. T. MATTHEW SANKS	[illegible]	6350 N. 78th St #290	11/19
20. SPENCER [illegible]	S. [illegible]	6350 N. 78th St # 294	11/19

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Arizona American Water

Via Certified Mail

Legal

Name Craig A. Marks
Phone (623) 445-2442
Fax (623) 445-2451
E-Mail Craig.Marks@amwater.com

Ms. Kirsten Kueffner
Trustee,
Kirsten K. Kueffner Family Living Trust
16658 N 106th Way
Scottsdale AZ 85255

January 25, 2005

Property Encroachment

Dear Ms. Kueffner:

The Trust is the registered owner of Parcel No. 174-13-005, at 6207 N. Miller Road, Scottsdale, AZ 85250. We believe that for a number of years, building material from Kueffner Contracting has been stored on adjoining Parcel No. 174-13-934, at 6215 N. Miller Road—and possibly on Parcel Nos. 174-13-931 and 174-13-932 to the north of Parcel No. 174-13-934—all of which belong to the Arizona American Water Company. Arizona American has never granted permission for this practice.

As you know, in order to comply with the Federal mandate governing water quality standards, Arizona American will soon begin construction of an arsenic-removal facility on this site. Arizona American therefore requests that you remove all material from this property by March 1, 2005. Any material not removed by this date will be disposed of at the company's discretion.

Very truly yours,

Craig A. Marks

Craig A. Marks

Arizona American Water

101 Corporate Center
19820 N. 7th Street -
Suite 201
Phoenix, Arizona 85024
USA

T +1 623 445 2400
F +1 623 445 2451
I www.amwater.com

RWE GROUP

108

The Kueffner Company, Inc.

GENERAL CONTRACTING

FINE WOODWORK

EUROPEAN CRAFTSMANSHIP
A FAMILY TRADITION SINCE 1905

January 17, 2005

Honorable Mayor Mary Manross
3939 N. Drinkwater Blvd.
Scottsdale, AZ. 85251

Re: Case #33-UP-2004, et al.

Your Honor Mary Manross,

We are being short circuited in the above entitled case. In applicant's (Arizona American Water) effort to "fast track" this case, we as a result have not received due process.

Through its hired firm 'Technical Solutions' (Susan Bittersmith) applicant has made no meaningful dialog, gave no meaningful information, nor endeavored to do its "due diligence" with us specifically. When I asked Mr. John Berry by phone the actual name of the person or persons who own the water company he did not respond forthrightly, Why? We cannot help but wonder, what effort they are making with our neighbors. All they (Technical Solutions) came to us and wanted was our acquiescence to their wants.

At the City Council meeting of 01-11-05 Mr. Berry presented irrelevant and misleading information about us. What meetings occurred if they could be called meetings, were unannounced walk-ups by personnel of Technical Solutions lasting at most three to five minutes. What written info that was presented was taken back, so we could not study. All this took place at Christmas time. I feel we are being put upon by over bearing tanks, collectively over 200 feet wide and 28 feet high across our eastern property line.

In one day of knocking on neighbors' doors my sons Roland and Wilhelm found several neighbors unaware of the water company's intentions and voiced opposition to above ground tanks. One neighbor Mr. Eric Nesvig came to the Historic Preservation Meeting of 01-13-05 to voice his opposition to above ground tanks. Even a 90 year old gentleman wanted to be there in opposition to the monstrosities (proposed tanks). The ground swell is rising and we will have more people opposed to above ground tanks. If it does happen, we believe these presently proposed tanks would be the <u>only</u> above ground tanks built post year 2000 in Scottsdale. This action by Scottsdale is binding the people for many years to these unsightly and dangerous tanks along a scenic path and will

7 NORTH CATTLE TRACK ROAD, UNIT 1 • SCOTTSDALE, ARIZONA 85250 • CONTRACTORS LIC. NO. 46778 • BUS. 480-948-6758 • FAX 480-443-8119

The Kueffner Company, Inc.

GENERAL CONTRACTING

FINE WOODWORK

EUROPEAN CRAFTSMANSHIP
A FAMILY TRADITION SINCE 1905

forever block our neighbors' view of Camelback Mountain and Mummy Mountain! No more beautifill sunsets behind the Praying Monk! Homes and lot will significantly decrease in value as a result of this project!

We are considering and seeking competent advise of counsel. And if deemed by us to be appropriate we shall go forward with our recourse.

Sincerely,

Kirsten K. Kueffner

Kirsten K. Kueffner

c.c.

Council Member-Betty Drake
Council Member-Wayne Ecton
Council Member-W.J. Lane
Council Member-Robert Littlefield
Council Member-Ron McCullagh
Council Member-Kevin J. Osterman

NORTH CATTLE TRACK ROAD, UNIT 1 • SCOTTSDALE, ARIZONA 85250 • CONTRACTORS LIC. NO. 48776 • BUS. 480-948-6758 • FAX 480-443-8119

109

AMERICAN WATER
ARSENIC REMOVAL FACILITY

USE PERMIT APPLICATION

FILED: October 28, 2004
REVISED:
REVISED:
REVISED:

PC HEARING DATE:

CC HEARING DATE:

USE PERMIT APPLICATION LIST

SCHEDULE A MEETING WITH YOUR PROJECT COORDINATOR *BEFORE* SUBMITTING APPLICATION.

This Application list has been prepared to assist you in submitting a complete and successful application to the City of Scottsdale. At the required pre-application meeting, a Project Coordinator will check off the items on this Application List that are required with your submission. **Please call 480-312-7000 if you have any questions concerning this application and to schedule your submittal meeting.**

PUBLIC UTILITY BUILDING IN R1-43

CASE # 239-PA-2004

PART I -- GENERAL REQUIREMENTS

✓ 1. **USE PERMIT APPLICATION LIST** (this list)

✓ 2. **COMPLETED APPLICATION FORM** (form provided)

✓ 3. **APPLICATION FEE $** 2045

✓ 4. **LETTER OF AUTHORIZATION** (from property owner(s) if the property owner did not sign the application form)

✓ 5. **CURRENT TITLE REPORT:** 8-1/2" x 11" - 1 copy
- A) Not older than 30 days
- B) Must show current owner
- C) Include Schedule A and Schedule B
- D) Commitment of Title is not acceptable

✓ 6. **LEGAL DESCRIPTION:**
8-1/2" x 11" - 2 copies — ENTIRE property

✓ 7. **PROJECT NARRATIVE** (~~form provided~~)

✓ 8. **PROVIDE A COMBINED CONTEXT AERIAL AND CONTEXT SITE PLAN:**
Full size - 2 copies
11" x 17" - 1 copy
AERIAL SHALL NOT BE MORE THAN 1 YEAR OLD AND SHALL INCLUDE AN OVERLAY OF THE SITE PLAN showing lot lines, tracts, easements, street locations /names and surrounding zoning for a radius from the site of:

_____ 500 foot
✓ 1/4 mile
_____ 1 mile
_____ other

Show the proposed site plan in relation to surrounding development including the following:

1) Building footprints and other site improvements such as drives, parking areas, site walls (indicate height of buildings and site walls);
2) Label surrounding zoning and land uses;
3) Streets including sidewalks, and any surrounding driveways or intersections;
4) Show bike paths and trails; and
5) Development plans approved by the Development Review Board during the past year that have not been constructed. (Approved plans are available at the Scottsdale Records Division at 7447 E. Indian School Road, Suite 105).

✓ 9. **EXISTING CONDITIONS PHOTO EXHIBIT: PROVIDE PHOTOS MOUNTED OR PRINTED ON 8-1/2"x11" PAPER** - FOR INCLUSION IN THE PACKETS. Printed digital photos are OK.

- Photos mounted on cardboard, foamboard, particleboard, posterboard or other material will not be accepted.
- See attached Existing Conditions Photo Exhibit graphic showing required photograph locations and numbers.
- Provide 1 color original set ~~and 15 color copy sets.~~

✓ 10. **ASSESSOR'S MAP** (obtain from Records) identifying parcel(s); project location is to be **clearly marked:**
8-1/2" x 11" - 2 copies ENTIRE AREA

✓ 11. **SITE LOCATION MAP** (quality suitable for reproduction - sample attached) ENTIRE property

✓ 12. **NEIGHBORHOOD INVOLVEMENT (see attached packet for requirements)** See ZONING requirements

___ 13. **SCHOOL DISTRICT NOTIFICATION:** map attached (see attached Community Input Certification form)

✓ 14. **POLICY** for Appeal of Required Dedications or Exactions (copy provided to applicant) ATTACHED

✓ 15. **ARCHAEOLOGICAL RESOURCES: (information sheets provided)**

- ✓ 1. **Certificate of No Effect / Approval Application Form (provided)**
- ✓ 2. Archaeology Survey and Report - **3** copies See ZONING
- ___ 3. Archaeology 'Records Check' Report Only - **3** copies
- ___ 4. Copies of Previous Archeological Research - **1** copy

___ 16. **HISTORIC PROPERTY:** (existing or potential historic property)

- ___ 1. Narrative describing proposal to preserve the historic character or compliance with property's existing Historic Preservation Plan.

___ 17. **COMPLETED AIRPORT COMMUNICATION FORM:** Your property is located within the vicinity of the Scottsdale Municipal Airport (within 20,000 foot radius of the runway; **information packet provided)**

✓ 18. **SITE POSTING REQUIREMENTS** and **AFFIDAVIT** Decal provided.

PLAN SIZE • Full Size – Minimum = 24" x 36" Maximum = 30" x 42"
Full size must be folded to specifications – see attached instructions

PART II -- REQUIRED PLANS & RELATED DATA

✓ 1. **SITE PLAN** (include all existing or approved site plan data on all adjacent property within 100 feet of the site - see attached Site Plan Submittal requirements list):
Full size - 2 copies
11" x 17" - 1 copy
Digital - 1 copy (See Digital Submittal Plan Requirements)
~~PLEASE PROVIDE 15 ADDITIONAL SETS FOR CITY DEPARTMENAL REVIEW~~ - VR

✓ 2. **PROJECT DATA SHEET** (form provided) See ZONING

___ 3. **SITE PLAN WORKSHEET:** including calculations (sample attached)
Full size - 1 copy

___ 4. **FLOOR PLANS:** (The following building code data shall be included: occupancy group(s); type of construction; floor area, height and number of stories, occupant load. The preceding data shall be determined n accordance with the currently adopted edition of the Uniform Building Code.)
Full size - 1 copy
11" x 17" - 1 copy
Digital - 1 copy (See Digital Submittal Plan Requirements)

___ 5. **FLOOR PLAN WORKSHEET:** (including calculations)
Full size - 1 copy

✓ 6. **ELEVATIONS:** CONCEPTUAL
Full size - 1 copy
11" x 17" - 1 copy
Digital - 1 copy (See Digital Submittal Plan Requirements)

✓ 7. **CONCEPTUAL LANDSCAPING PLAN:**
Full size - 1 copy
11" x 17" - 1 copy

Screening
Rural character
Wall location

___ 8. **CORPORATE IMAGE FEATURES**

___ 9. **LIGHTING DETAILS AND CUT SHEETS:**
Full size - 1 copy

___ 10. **PHOTOMETRIC ANALYSIS** with horizontal foot candle diagram
Full size - 1 copy

✓ 11. **LIGHTING SITE PLAN**, include all lighting (free standing, building mounted, canopy, landscaping, etc.)
Full size - 1 copy

___ 12. **TRAFFIC IMPACT STUDY** (Refer to Guidelines) - 3 copies

✓ 13. **PARKING STUDY** - 3 copies

✓ 14. **TRIP GENERATION COMPARISON** - 3 copies

✓ 15. **PARKING MASTER PLAN:** 3 copies (required for reduction of ordinance requirements)

✓ 16. **DRAINAGE REPORT:** See Sec. 2-202 of the City's Design Standards & Policies Manual for specific submittal and content requirements. The report shall be bound (3 ring, GBC or coil wire, no staples) with card stock front and back covers, and must include all required exhibits, full color aerial/topo maps and preliminary grading and drainage plans. Full size plans/maps shall be folded and contained in pockets.
8-1/2" x 11" - 2 copies of the Drainage Report including full size plans/maps in pockets
Digital - 1 copy (See Digital Submittal Plan Requirements)

PLAN SIZE * Full Size – Minimum = 24" x 36" Maximum = 30" x 42"
Full size must be folded to specifications – see attached instructions

Planning & Development Services will not process project applications until the Drainage Report contains sufficient information in detail, scale and clarity for review.

NOTICE - DRAINAGE REQUIREMENTS
Be advised that obtaining these permits or providing the Special Inspection Checklists and Certificate of Special Inspection of Drainage Facilities may be a lengthy process and may affect the timing of your project.

SECTION 404 PERMITS. Prior to issuance of any City permits, developers must submit the City of Scottsdale Section 404 Certification Form.

NPDES. A NPDES Notice of Intent and Storm Water Pollution Prevention Plan may be required (see DSPM Guidelines).

SPECIAL INSPECTIONS AND CERTIFICATION. Prior to the issuance of Certificates of Occupancy and/or Letters of Acceptance by the Inspection Services Division, the developer, at its expense, shall submit the Certificate of Special Inspection of Drainage Facilities, Certificate of Compliance and all special Inspection Checklists required by the Project Quality/Compliance Div.

____ 17. **ESL ADDENDUM** (refer to Guidelines) - **2** copies (forms provided)

✓ 18. **OTHER** USE PERMIT CRITERIA NARRATIVE
PLAN OPERATION + NOISE STUDY NARRATIVE

PART III – SUBMITTAL REQUIRMENTS AFTER HEARING DATE DETERMINED Presentation Packet

*** **NOTE: EACH CHECKED ITEM INDICATED BELOW REQUIRES THE FOLLOWING NUMBER OF COPIES:** 11" x 17" - **16 COLOR COPIES STAPLED IN SETS** (A set consists of one of each required 11"x17")
8-1/2" x 11" - **2** color or black and white copies

✓ A. Context aerial and context site plan
✓ B. Site plan
✓ C. Floor plans
✓ D. Elevations
✓ E. Landscape plans
____ F. Other ____

Tim Curtis
PROJECT COORDINATOR

8/2/2004
DATE

PLAN SIZE *Full Size – Minimum = 24" x 36" Maximum = 30" x 42"
Full size must be folded to specifications – see attached instructions

Project Application

Schedule a meeting with your project coordinator before submitting your application.

Date: October 25, 2004 Project No.: 239 - PA - 2004

Coordinator: Case No.:

Case Type:
- ☐ General Plan Amendment
- ☒ Use Permit
- ☐ Land Division
- ☐ Text Amendment
- ☐ Rezoning
- ☐ Development Review
- ☐ Variance
- ☐ Other:
- ☐ Preliminary Plat
- ☐ Master Sign Program
- ☐ Abandonment

Project Name: PV Arsenic Removal Facil Associated Case(s): N/A

Project Address: 6215 N. Miller Road, Scottsdale, AZ 85250

Current Zoning District R1-43&SC-HP Parcel Number(s): 174-31,32,34,35 Quarter Section:

Request: Use Permit for a public utility/operation of an arsenic removal facility and change of a legally non-conforming use.

The property owner shall designate an agent as the coordinator for the project. This person (the applicant) shall attend pre-application conferences and public hearings, will receive the agenda, recommendations, and case reports, and will communicate all case information to other parties as required. **All contact for this project will be made through the applicant listed below.**

Owner Contact: Aaron Ashcroft
Company: Arizona American Water
Phone: 623-445-2418 Fax: 623-445-2454
E-mail: aashcroft¶amwater.com
Address: 19820 N. 7th St., Suite 201 Phoenix, AZ 85024

Developer Contact: Chip Norton
Company: DL Norton General Contracting
Phone: 480-998-3913 Fax: 480-998-3921
E-mail: cnorton¶dlnorton.com
Address: 7730 E. Evans Scottsdale, AZ 85206

Architect Contact: Michael Willis
Company: Michael Willis Architects
Phone: 415-957-2750 Fax: 415-957-2780
E-mail: mwillis¶mwarchitects.com
Address: 246 1st Street, Suite 200 San Fransico, CA 94105

Engineer Contact: Robert McCandless
Company: Damon Williams Assoc.
Phone: 602-217-1034 Fax: 602-265-5632
E-mail: rmccandless¶dswa.com
Address: 2355 E. Camelback Rd.Ste. 700 Phoenix, AZ 85016

Applicant Contact: John V. Berry/Joe Goforth Company: Beus Gilbert PLLC
E-mail: jberry¶beusgilbert.com Phone: 480-429-3003 Fax: 480-429-3100
Address:

For AAW 10/25/04 — For BG PLLC 10/25/04

Owner Signature Date Applicant Signature Date

OFFICIAL USE ONLY

Coordinator Signature: E-mail: @ScottsdaleAZ.gov Phone: 480-312-

This application needs a: ☐ New Project Number or ☐ Old Project Number: Date:

Planning and Development Services Department
7447 E Indian School Road, Suite 105, Scottsdale, AZ 85251 • Phone: 480-312-7000 • Fax: 480-312-7088

009768

WELLS FARGO BANK ARIZONA, N.A.
PHOENIX, AZ 85014
91-527-1221

DSWA
DAMON S. WILLIAMS ASSOCIATES, L.L.C.
2355 EAST CAMELBACK ROAD, SUITE 700
PHOENIX, AZ 85016
PHONE 602-265-5400

CHECK DATE September 30, 2004

PAY Two Thousand Forty Five and 00/100 Dollars

AMOUNT $2,045.00

TO City of Scottsdale

Security Features Included. Details on back.

John H Matta

⑈009768⑈ ⑆122105278⑆0608843355⑈

DAMON S. WILLIAMS ASSOCIATES, L.L.C. 009768

Invoice Number	Date	Voucher	Amount	Discounts	Previous Pay	Net Amount
Application Fee	9/30/04	0012943	2,045.00			2,045.00
		Totals	2,045.00			2,045.00

City of Scottsdale
1 0

AZAW000168

REPORT
OF
RECORD TITLE

No. 103046-00

Definitions:

As used in this Report, the following terms have the following meanings:

"Addressee": the person or entity described by the Company as the Addressee on Schedule A of this Report;

"Company": Title Facts & Agency, Inc., an Arizona corporation;

"Land": the land described or referred to in Schedule A of this Report;

"Public records" those records which under State law documents must be recorded in order to impart constructive notice to purchasers for value and without knowledge.

SUBJECT TO THE TERMS AND LIMITATION OF LIABILITY CONTAINED ON THE REVERSE SIDE HEREOF AND AGREED TO BY ADDRESSEE BY THE ACCEPTANCE AND USE OF THIS REPORT, THE COMPANY HEREBY REPORTS THE FOLLOWING TO THE ADDRESSEE:

The Company has caused to be examined those items of public record shown in the title plant indices of the issuing Company that affect the title to the land described in Schedule A herein and sets forth under Schedule B herein those matters found to be pertinent to said land. No attempt has been made to report on the possible defects in the title to said land not shown by the public records but which could affect the title to said land.

Title Facts & Agency, Inc.

President

700 W. Campbell Ave., Phoenix, AZ 85013 -- 602.265.8622

RE: Arizona-American Water Co.

ADDENDUM

Attached to and forming a part of

Report No. 103046-00

issued by

Title Facts & Agency, Inc.

The referenced report is hereby amended as to the following particulars and none other:

The Effective Date of said Report is hereby changed to: October 13, 2004.

All other matters set forth in said report remain unchanged.

Date: October 22, 2004

Title Facts & Agency, Inc.

By:

President

Title Facts & Agency 700 W. Campbell Ave., Suite 15, Phoenix, AZ 85013-2691 (602) 265-8622 Fax (602) 265-8712

Schedule A

Report No. 103046-00

1. **Addressee:**

   Damon S. Williams Associates, Inc.
   2355 E.Camelback Rd., Ste 700
   Phoenix, AZ 85016

   Re: Arizona-American Water Co.

2. **Effective Date:**

   August 11, 2004

3. **The estate or interest in the land described herein and which is covered by this report is:**

   A fee simple

4. **The current record owner of the estate or interest in the land is:**

   Arizona-American Water Company, an Arizona corporation, which acquired title as Paradise Valley Water Co., an Arizona corporation

5. **The land that is the subject of this report is described as follows:**

   See Exhibit "A" attached hereto and made a part hereof

Schedule B

Report No. 103046-00

1. The following matters appearing in the public records but which are not specifically reported herein:

   (A) Unpatented mining claims; (B) Reservations or exceptions in Patents or in acts authorizing the issuance thereof; (c) Water rights, claims or title to water.

2. 2004 Taxes.

   First half due and payable September 1, 2004 and delinquent on November 1 of that year; Second half payable on or before March 1 of the following year, and delinquent May 1 of the following year.

3. Liabilities and Obligations imposed upon said land by reason of its inclusion within the following District(s):

   District
   - Salt River Project Agricultural Improvement And Power District and Agricultural Improvement Districts.
   - East Valley Institute Of Technology

4. Easement affecting a portion of said land for the purposes stated herein, and incidental purposes;

   For : Electric lines
   Recorded : 06-26-1956 in Docket 1933, page 407

5. Easement affecting a portion of said land for the purposes stated herein, and incidental purposes;

   For : Electric lines
   Recorded : 06-26-1956 in Docket 1933, page 408

6. Roadway as shown on map recorded in Book 16 of Road Maps, page 19 over the West 40 feet.

End of Schedule B

Report No. 103046-00

Tax Information

The following information was obtained from the records of the Maricopa County Assessor and Treasurer:

Parcel No.	:	174-13-930
Year	:	2004
Full Year	:	$-0-
Status		
First Half	:	-0-
Second Half	:	-0-
Covers	:	Parcel No. 1

Parcel No.	:	174-13-931
Year	:	2004
Full Year	:	$-0-
Status		
First Half	:	-0-
Second Half	:	-0-
Covers	:	Parcel No. 2

Parcel No.	:	174-13-932
Year	:	2004
Full Year	:	$-0-
Status		
First Half	:	-0-
Second Half	:	-0-
Covers	:	Parcel No. 3

Parcel No.	:	174-13-934
Year	:	2004
Full Year	:	$-0-
Status		
First Half	:	-0-
Second Half	:	-0-
Covers	:	Parcel No. 4

Parcel No.	:	174-13-935
Year	:	2004
Full Year	:	$-0-
Status		
First Half	:	-0-
Second Half	:	-0-
Covers	:	Parcel No. 5

Exhibit "A"

Report No. 103046-00

Parcel No. 1:
(APN 174-13-930)

The North 360 feet of that portion of the Northwest quarter of the Southeast quarter of Section 11, Township 2 North, Range 4 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, described as follows:

Beginning at the Center of said Section 11;

thence South 0° 26′ 41″ West, along the North-South mid-section line of said Section 11, 577.50 feet to the True Point of Beginning;

thence continuing South 0° 26′ 41″ West, 618.75 feet;

thence South 88° 55′ 06″ East, 545.77 feet to the West right of way line of the Arizona Canal;

thence North 14° 23′ 50″ West, along said West right of way line, 642.02 feet;

thence North 88° 55′ 06″ West, 381.34 feet to the True Point of Beginning.

Parcel No. 2:
(APN 174-13-931)

That portion of the Northwest quarter of the Southeast quarter of Section 11, Township 2 North, Range 4 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, described as follows:

Beginning at the Center of said Section 11;

thence South 0° 26′ 41″ West, along the North-South mid-section line of said Section 11, 1196.25 feet to the True Point of Beginning;

thence South 88° 55′ 06″ East, 571.36 feet, more or less, to the West right of way line of the Arizona Canal;

thence Northwesterly along said West right of way line of the Arizona Canal, 268 feet, more or less, to the Southeast corner of property described in Docket 2535, page 247, records of Maricopa County, Arizona;

thence North 88° 55′ 06″ West, along the South line of said property, 502 feet, more or less, to a point on the West line of the Southeast quarter of said Section 11;

thence South 0° 26′ 41″ west, along said West line, 258.75 feet to the True Point of Beginning.

Parcel No. 3:
(APN 174-13-932)

The Northwest quarter of the Southeast quarter of Section 11, Township 2 North, Range 4 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, lying West of the Arizona Canal;

Except the North 1196.25 feet thereof.

Exhibit "A"
(Continued)

Report No. 103046-00

Parcel No. 4:
(APN 174-13-934)

The Southwest quarter of the Southeast quarter of Section 11, Township 2 North, Range 4 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, lying West of the Arizona Canal;

Except the South 996 feet; and

Except beginning 996 feet due North of the Southwest corner of the Southeast quarter of said Section 11;

thence due North 217 feet;

thence due East 402 feet;

thence due South 217 feet;

thence due West 402 feet to the Point of Beginning.

Parcel No. 5:
(APN 174-13-935)

That part of the Southwest quarter of the Southeast quarter of Section 11, Township 2 North, Range 4 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, lying West of the Arizona Canal, described as follows:

Commencing at the South quarter corner of said Section 11;

thence North (assumed bearing) along the North-South mid-section line of said Section 11, a distance of 996.00 feet;

thence East 402.00 feet to the True Point of Beginning;

thence continuing East 248.45 feet to a point, said point being on the High water level of the Arizona Canal;

thence South 10° 39′ 40″ West, along said High water level, 142.63 feet;

thence South 22° 06′ 20″ West, along said High water level, 38.67 feet;

thence West 207.52 feet;

thence North 176.00 feet to the True Point of Beginning.

T. 2 S.
R. 1 E. Sec. 11
Sec. 11, 27-13

EASEMENT FOR ELECTRIC LINE

OK 1033 PG 408

In consideration of One Dollar ($1.00), the receipt of which is hereby acknowledged, we grant Arizona Public Service Company, hereinafter called "Company", its successors and assigns, an easement to construct, operate and maintain electric lines and poles from across, over and under the surface of the following described premises in Maricopa County, Arizona:

All that part of the West Half (Quarter) of Southeast Quarter of Section 11, Township 2 North, Range 1 East of the Gila and Salt River Base and Meridian, lying East of the Arizona Canal, except the following described parcels:

Beginning 996 feet due North of the Southeast corner of the Southeast quarter of said Section 11, running thence due North 217 feet; thence due West 407 feet; thence due South 217 feet; thence due East 407 feet to the point of beginning; and

Except

Beginning at the Southeast corner of the Southeast quarter of said Section 11, running due North 174 feet; thence due West to the West boundary of the Arizona Canal; thence South along the Canal to the South line of the Section; thence due East along Section line to the point of beginning

along the following described line on the above described premises:

Beginning at a point on the Easterly property line approximately 259 feet North of the South property line; thence on a line bearing North 32° 28' 22" East a distance of approximately 90 feet; thence on a line bearing North 12° 5' East a distance of approximately 200 feet; thence on a line bearing North 10° 02' West a distance of approximately 100 feet to a point on the North property line, said point being approximately 30 feet West of the said Easterly property line.

together with the rights to repair, replace, maintain and remove said lines and poles from said premises, [illegible] the Company, [illegible] with its construction or maintenance [illegible] and to permit the attachment of wires of any other Company to such poles. By accepting this easement the Company agrees to exercise reasonable care to avoid damage to said premises and all property thereon [illegible] thereon.

Dated [illegible]

WITNESS:

STATE OF ARIZONA

County of [illegible]

The foregoing [illegible] was acknowledged before me this [illegible] day of [illegible] 19[illegible]

by [illegible]

Witness my hand and official seal [illegible]

My [illegible]

AZAW000176

EASEMENT FOR ELECTRIC LINE

BK 1033 PG 407

In consideration of One Dollar ($1.00), the receipt of which is hereby acknowledged, the Arizona Public Service Company, (hereinafter called "Company") its successors and assigns, an easement to construct, operate and maintain electric lines and poles upon, across, over and under the surface of the following described premises situate in Maricopa County, Arizona:

All that part of the Northwest quarter of the Southeast quarter of Section 11, Township 2 North, Range 1 East of the Gila and Salt River Base and Meridian, lying West of the Arizona Canal; and more particularly described as beginning 15 rods South of the Northeast corner of the Northwest quarter of Section 11, Township 2 North, Range 1 East of the Gila and Salt River Base and Meridian and run thence South along the West boundary line 17 rods; thence West to about 150 feet more or less to the West boundary line of the right of way of the Arizona Canal; thence North along the West boundary line of the Arizona Canal to the intersection with the North line of the above mentioned quarter section; thence East about 300 feet more or less to the point of beginning.

along the following described line on the above described premises:

Beginning at a point on the South property line approximately 30 feet West of the Easterly property line; thence on a line bearing North 11° 00' West a distance of approximately 1,000 feet to a point point of said Easterly property line and identical with the West right of way line of the Arizona Canal.

together with the rights to repair, replace, maintain and remove said lines and poles from said premises, to trim or remove any trees or shrubs that in the judgment of the Company, may interfere with the construction or endanger the operation of said lines, and to permit the attachment of wires of any other Company to such poles. By accepting this easement the Company agrees to exercise reasonable care to avoid damage to said premises and all property thereon.

Fred W. Carroll
Lord of Carroll

Dated: May 21, 1956

WITNESS:

STATE OF ARIZONA
County of Maricopa } ss.

The foregoing was acknowledged before me this 21 day of MAY, 1956

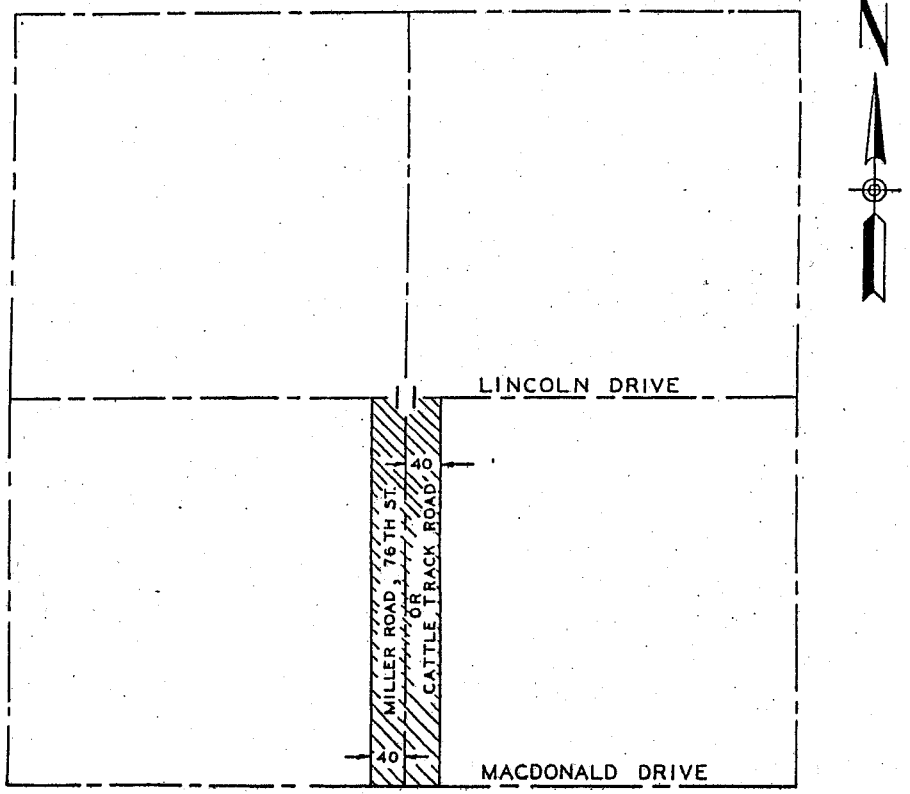
W. CARROLL
LORD N. CARROLL

My Commission Expires:

Notary Public

DESIGNATED COUNTY ROAD
A PLAT

16-1



SHOWING DESIGNATION AS A COUNTY HIGHWAY THE FOLLOWING DESCRIBED LINES TO-WIT:

A roadway Eighty (80) feet in width being Forty (40) feet on each side of the North-South midsection line lying between the Southeast One-quarter and the Southwest One-quarter (SE¼ and SW¼) of Section Eleven (11), Township Two (2) North, Range Four (4) East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona; known as MILLER ROAD, 76th STREET or CATTLE TRACK ROAD from Macdonald Drive North to Lincoln Drive.

OFFICIALLY DESIGNATED JUNE 14, 1965, BY THE BOARD OF SUPERVISORS, MARICOPA COUNTY, ARIZONA.

SAMUEL F. LANFORD
COUNTY ENGINEER

122174 INDEXED PAGED

County Highway
JUN 28 65 4 00
Book 16
19

County Recorder
Deputy Recorder

AZAW000178

SEC. 11 T2N-R4E

ROAD FILE NO. 1702

LEGAL DESCRIPTION

Parcel No. 1 (APN 174-13-931)

That portion of the northwest quarter of the southeast quarter of Section 11, Township 2 North, Range 4 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, described as follows:

Beginning at the center of said Section 11;

thence south 00° 26' 41" west, along the north-south mid-section line of said Section 11, 1196.25 feet to the true point of beginning;

thence south 88° 55' 06" east, 571.36 feet, more or less, to the west right of way line of the Arizona Canal;

thence northwesterly along said west right of way line of the Arizona Canal, 268 feet, more or less, to the southeast corner of property described in Docket 2535, Page 247, Records of Maricopa County, Arizona;

'ence north 88° 55' 06" west, along the south line of said property, 502 feet, more or less, to a point on the west line of the southeast quarter of said Section 11;

thence south 00° 26' 41" west, along said west line, 258.75 feet to the true point of beginning.

Parcel No. 2 (APN 174-13-932)

The northwest Quarter of the southeast quarter of Section 11, Township 2 North , Range 4 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, lying west of the Arizona Canal;

Except the north 1196.25 feet thereof.

Parcel No. 3 (APN 174-13-934)

The Southwest quarter of the Southeast quarter of Section 11, Township 2 North, Range 4 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, lying West of the Arizona Canal;

Except the South 996 feet; and

Except beginning 996 feet due North of the Southwest corner of the Southeast quarter of said Section 11;

thence due North 217 feet;

thence due East 402 feet;

hence due South 217 feet;

thence due West 402 feet to the Point of Beginning.

Parcel No. 4 (APN 174-13-935)

That part of the Southwest quarter of the Southeast quarter of Section 11, Township 2 North, Range 4 East, of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, lying West of the Arizona Canal, described as follows:

Commencing at the South quarter corner of said Section 11;

thence North (assumed bearing) along the North-South mid-section line of said Section 11, a distance of 996.00 feet;

thence East 402.00 feet to the True Point of Beginning;

thence continuing East 248.45 feet to a point, said point being on the High water level of the Arizona Canal;

thence South 10° 39' 40" West, along said High water level, 142.63 feet;

thence South 22° 06' 20" West, along said High water level, 38.67 feet;

thence West 207.53 feet;

thence North 176.00 feet to the True Point of Beginning.

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PROJECT NARRATIVE

PROJECT BACKGROUND

The United States Environmental Protection Agency (USEPA) has lowered the Arsenic Maximum Contaminant Level (MCL) from 50 parts per billion (ppb) to 10 ppb. All community water systems, such as that operated by Arizona American Water (AAW), are required to comply with the new Arsenic standard by January 2006. To comply with the USEPA mandate, AAW proposes to construct a new 19.3 mgd treatment facility using the coagulation-filtration process to remove naturally occurring arsenic from groundwater. This facility will be used to treat groundwater used to supply AAW's Paradise Valley District.

SITE DESCRIPTION

The water supply for AAW's Paradise Valley District is distributed through the Miller Road Booster Station (MRBS), which is located east of Cattletrack Road (Miller Road) and approximately a quarter mile north of McDonald Drive. The MRBS site is the proposed location for the Paradise Valley District's arsenic removal facilities. The site, owned by AAW, consists of five parcels that comprise approximately 8 acres of land. Additional detail on these parcels is summarized below:

Parcel Identifier	Parcel No.	Address	Parcel Size, sf	Current Zoning	Proposed Zoning
1	174-13-931	6237 N. Miller Road	134,992	R1-43	No Change
2	174-13-932	6223 N. Miller Road	69,696	R1-43	No Change
3	174-13-934	6215 N. Miller Road	101,495	R1-43 HP	No Change
4	174-13-935	6195 N. Miller Road	39,204	R1-43 HP	No Change

The Paradise Valley Arsenic Removal Facility (PVARF) will be situated on the south side of the property (Parcel 2, Parcel 3, Parcel 4, and a portion of Parcel 1) and will be constructed over approximately 5 acres of the site.

The groundwater for this district is provided by seven wells: three of which are located on the MRBS property and the remaining wells are located within 2-miles of the site. The groundwater from these seven wells will be treated at this site with provisions for the addition of another well in the future. The facilities necessary for treatment, storage and distribution of water include new filtration vessels, treatment chemical storage and feed facilities, backwash clarification structures, finished water reservoirs, booster pumps, and residual solids thickening and dewatering. New administration, customer service, laboratory, and Supervisory Control and Data Acquisition monitoring facilities will be included at part of the project.

COMMUNITY INVOLVEMENT

AAW has involved the surrounding community in the planning for this project by holding one-on-one meeting with the adjacent property owners and an Open House meeting. Two one-on-one meetings were held with a total of five neighborhood participants. Four citizens attended the Open House meeting. The attendees of these meetings did not voice opposition to the project. They did however

indicate the importance of maintaining the rural character of the property. The neighbors also stated specific considerations which are discussed in the meeting notes and addressed under Project Aesthetics. The outcome of these meetings is detailed in the Citizen Notification and Public Involvement Report included with this Rezoning Application. AAW plans to hold an additional Open House meeting prior to the Planning and Zoning Commission Hearing.

PROJECT AESTHETICS

During the public involvement meetings, the citizens indicated various issues of importance regarding the PVARF that they would like to have considered during the facility design. These issues included impacts on the surrounding community due to noise, odor, traffic and architecture. Each item is discussed in detail in the following paragraphs.

SETBACKS

The required setbacks will be provided from the front, side and rear property boundaries in accordance with the R1-43 zoning requirements (front = 40 feet from property line, side = 20 feet, and rear = 35 feet). The location of the Customer Service Center located along Cattletrack Road will be located an additional 60 feet from the property line providing a total front yard setback of 100 feet.

NOISE

Currently, the well and distributive pumps along with associated valves and instrumentation at the MRBS are located outside. Several neighbors indicated that they can hear the pumps starting. They indicated that the future facilities should have provisions to mitigate noise impacts on the surrounding community. The proposed PVARF will provide fully-enclosed pump rooms which will address the noise impacts expressed by the neighbors.

ODOR

The filtration process used to remove arsenic from the groundwater does not generate odor as a byproduct. The chemical storage and feed facilities that can produce gases under high temperature conditions will be enclosed in an air-conditioned building. This information was discussed with the citizens during the Open House meeting.

TRAFFIC

Cattletrack Road (Miller Road alignment) is classified as a minor collector between McDonald Drive and Lincoln Drive. It is not identified as a major street on the City's Streets Master Plan. Cattletrack consists of two lanes, one lane in each direction. The intersection of Cattletrack and McDonald Drive has a traffic signal.

A traffic study conducted by Scottsdale Engineering & Associates, Inc. indicated that the daily traffic volume along Cattletrack Road (Miller Road alignment) was 1,836 vehicles. The average speed of the vehicles measured was 33 miles per hour (mph); the 85th percentile speed was 40 mph. The study indicates that these volumes and speeds are consistent with a local collector street. Typically, minor collector streets are designed to accommodate traffic volumes of at least 5,000 vehicles per day. There are residential driveways along Cattletrack which are limited in number due to the large lot sizes present in this area.

The traffic volume due to the PVARF will show a modest increase over the current operations due to increased operator attendance at the site, bulk chemical deliveries, and liquid sludge hauling. The estimated traffic volume is shown in the following table:

Type	Trip Frequency	Days Per Week	Vehicle	Trips Per Month	Trips per Workday
Customer	3/day	5	Passenger	60.0	3.0
Employees	20/day	5	Passenger	400.0	20.0
Plant Operators	4/day	7	Passenger	112.0	4.0
Distribution Crews	4/day	5	Single Unit Truck	80.0	4.0
Solids Hauling	1/week		WB-50	4	0.14
Chemical Delivery Ferric	1/month		WB-50	1	0.04
Chemical Delivery Caustic	2/month		WB-50	2	0.07
Chemical Delivery Hypochlorite	3/month		WB-50	3	0.11
Chemical Delivery Polymer	1/month		Single Unit Truck	1	0.04
				Total	31

A WB-50 vehicle (large semi-trailer combination) will be used for the turning radii and geometric layout of plant drives. Plant drives will be 20 feet wide and paved with asphaltic concrete except in the chemical unloading area, which will be concrete. Turning radii will be a minimum of 25 feet on the inside.

ARCHITECTURE

The AAW property is located within an area that maintains a rural character with lots of 35,000 square feet or greater and large setbacks. The properties to the south provide a meandering pedestrian pathway along the street frontage.

The character of the surrounding community will be taken into consideration during the design the buildings and facility fencing to create an environment that interacts with the surrounding community. The outcome of the neighborhood meetings indicated that the facility should maintain a rural character, and the materials of construction should mirror the color and consistency found in the area. AAW has subcontracted Michael Willis Architects to design the buildings and surrounding fence. MWA is participating in the community involvement process to understand and incorporate the architectural needs of this community.

The facility will be setback from the roadway to allow for the open space along the street frontage to be maintained. Although the facility will be fenced, the fence will also be setback from Cattletrack. In addition, the fence design will provide variations in materials of construction and landscaping to blend this structure with the surrounding properties.

McCloskey Peltz will act as the Landscape Architect for the project and are also involved in the public involvement process. There are many large mesquite trees on the eastern boundary of the project site that AAW will maintain through the construction process.

USE PERMIT NARRATIVE

PROJECT BACKGROUND

The United States Environmental Protection Agency (USEPA) has lowered the Arsenic Maximum Contaminant Level (MCL) from 50 parts per billion (ppb) to 10 ppb. All community water systems, such as that operated by Arizona American Water (AAW) in their Paradise Valley District, are required to comply with the new Arsenic standard by January 2006. To comply with the USEPA mandate, AAW proposes to construct a new 19.3 mgd treatment facility using the coagulation-filtration process to remove naturally occurring arsenic from groundwater. This facility will be used to treat groundwater used to supply AAW's Paradise Valley District.

The water supply for AAW's Paradise Valley District is distributed through the Miller Road Booster Station (MRBS), which is located east of Cattletrack Road (Miller Road) and approximately a quarter mile north of McDonald Drive. The MRBS site is the proposed location for the Paradise Valley District's arsenic removal facilities. The site, owned by AAW, consists of five parcels that comprise approximately 8 acres of land. Additional detail on these parcels is summarized below:

Parcel Identifier	Parcel No.	Address	Parcel Size, sf	Current Zoning	Proposed Zoning
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The Paradise Valley Arsenic Removal Facility (PVARF) will be situated on the south side of the property (Parcel 2, Parcel 3, Parcel 4, and a portion of Parcel 1) and will be constructed over approximately 5 acres of the site.

The groundwater for this district is provided by seven wells: three of which are located on the MRBS property and the remaining wells are located within 2-miles of the site. The groundwater from these seven wells will be treated at this site with provisions for the addition of another well in the future The facilities necessary for treatment, storage and distribution of water include new filtration vessels, treatment chemical storage and feed facilities, backwash clarification structures, finished water reservoirs, booster pumps, and residual solids thickening and dewatering. New administration, customer service, laboratory, and Supervisory Control and Data Acquisition monitoring facilities will be included at part of the project.

PROPERTY ZONING

AAW intends to use Parcel Nos. 2, 3, 4, and a portion of Parcel 1 to construct an arsenic removal facility. The facility will be used to remove naturally occurring arsenic from the groundwater prior to distributing this water supply to their customers in this area.

Originally, all four parcels held the R1-43 zoning classification. The property owner to the south, Janie Ellis, decided to pursue a Special Campus, Historic Property (S-C HP) designation for her property. At

the time, the City ordinance for this designation required that at least 12 acres be available to qualify for the designation. In addition, the ordinance allowed the attachment of adjacent property to obtain the required 12 acres. AAW was consulted by Ms. Ellis during this process, and agreed that the adjacent parcels could be used for this purpose. There was no indication at the time that the S-C HP designation would restrict AAW's use of their property.

The R1-43 zoning supports the conditional use of the property for "public utility buildings, structures or appurtenances thereto for public service uses.

AZAW000185

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PLAN OF OPERATION

PROJECT BACKGROUND

The water supply for Arizona American Water's (AAW) Paradise Valley District is distributed through the Miller Road Booster Station (MRBS), which is located east of Cattletrack Road (Miller Road) and approximately a quarter mile north of McDonald Drive. The Paradise Valley District's arsenic removal facilities will be constructed and operated at this location. The site, owned by AAW, consists of five parcels that comprise approximately 8 acres of land. Additional detail on these parcels is summarized below:

Parcel Identifier	Parcel No.	Address	Parcel Size, sf	Current Zoning	Proposed Zoning
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The groundwater for this district is provided by seven wells: three of which are located on the MRBS property and the remaining wells are located within 2-miles of the site. The groundwater from these seven wells will be treated at the PVARF with provisions for the addition of another well in the future. The facilities necessary for treatment, storage and distribution of water include new filtration vessels, treatment chemical storage and feed facilities, backwash clarification structures, finished water reservoirs, booster pumps, and residual solids thickening and dewatering. New administration, customer service, laboratory, and Supervisory Control and Data Acquisition monitoring facilities will be included at part of the project.

OPERATING SCHEDULE

During the course of construction, the MRBS will remain fully operational and accessible in order to maintain water service to AAW's customers in this area. Shutdowns of individual facilities will occur only as needed to allow for completion of pipeline interconnections or other required modifications.

In order to provide continuous water service to the surrounding communities, the PVARF will be in operation 24 hours per day, 7 days per week. The plant will be designed for fully automatic, unattended operation. The plant will be staffed with approximately two operators and occasional maintenance personnel reporting on a daily basis with a flexible schedule. It is likely that their hours on site will be between 7 a.m. to 5 p.m.

In addition to the plant operators and maintenance personnel, the facility will also be staffed with at least one customer service representative. The following table summarizes the anticipated visits to the

facility by AAW's personnel and customers. The hours of operation for the customer service center will be 8 a.m. to 5 p.m.

Type	Trip Frequency	Days Per Week	Vehicle	Trips Per Month	Trips per Workday
Customer	3/day	5	Passenger	60.0	3.0
Employees	20/day	5	Passenger	400.0	20.0
Plant Operators	4/day	7	Passenger	112.0	4.0
Distribution Crews	4/day	5	Single Unit Truck	80.0	4.0
Solids Hauling	1/week		WB-50	4	0.14
Chemical Delivery Ferric	1/month		WB-50	1	0.04
Chemical Delivery Caustic	2/month		WB-50	2	0.07
Chemical Delivery Hypochlorite	3/month		WB-50	3	0.11
Chemical Delivery Polymer	1/month		Single Unit Truck	1	0.04
				Total	**31**

OUTDOOR OPERATIONS

The majority of the treatment facility will be housed within buildings that are designed to mirror the architectural characteristics of the surrounding neighborhood. The facilities that will not be located within a structure include the backwash clarifiers and storage reservoirs.

The backwash clarifiers will consist of square concrete structures that extend approximately 3 ½ feet above the finished grade. The clarifiers will be covered. The operation of the clarifiers is completely automated. Two new storage reservoirs will be constructed to replace three existing reservoirs at this site. The storage reservoirs will be used to house the treated water prior to distribution. The reservoirs consist of welded steel tanks, which will be painted to blend with the surrounding community. The overall height of the reservoirs is 28 feet which is comparable to the existing reservoirs at the site. The operation of these facilities is also automated.

The facility will also provide parking for the customers and employees. The parking will be located behind a gated wall.

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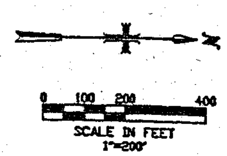

AZAW000188

REVISIONS

PARADISE VALLEY ARSENIC REMOVAL FACILITY
SITE PLAN

ARIZONA AMERICAN WATER COMPANY
PARADISE VALLEY DISTRICT

DAMON S. WILLIAMS ASSOCIATES, LLC
2355 EAST CAMELBACK ROAD, SUITE 700
PHOENIX, ARIZONA 85016

DSWA

DRAWN BY SAR
PROJECT ENG'R CHC
APPROVED RRM

DATE SEPTEMBER 2004
PROJECT 23640003

USE DIMENSIONS ONLY
SCALE 1" = 200'

USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES

2364-0003-SP2

PRELIMINARY

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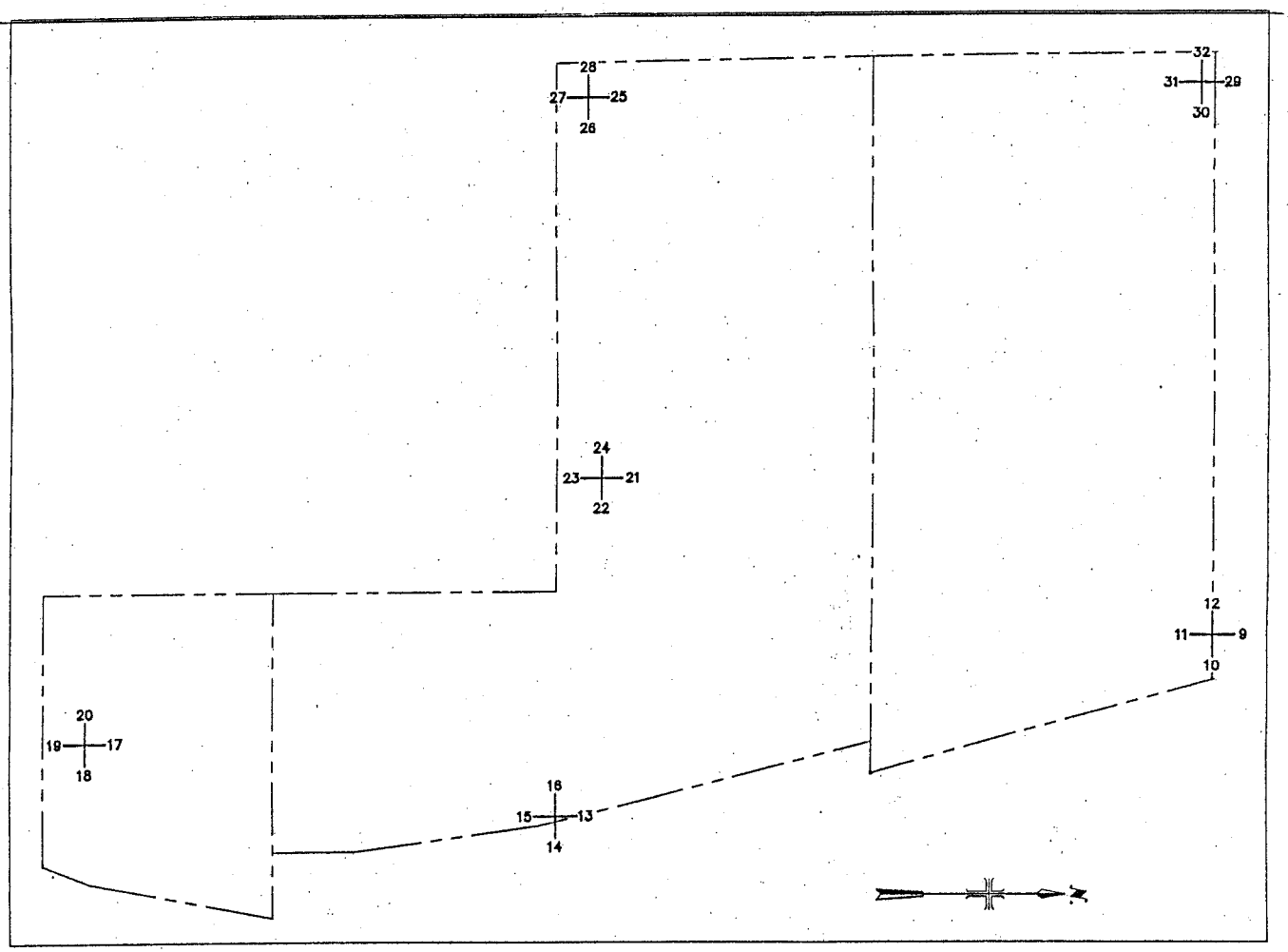
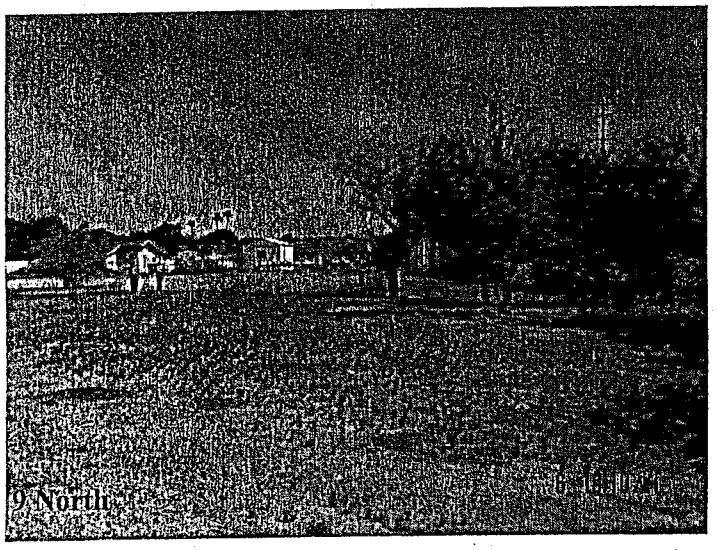


AZAW000189

DSWA DAMON S. WILLIAMS ASSOCIATES, LLC	Designed By RB Drawn By AA Checked By	American Water	Arizona American Water ARSENIC REMOVAL FACILITIES	CIVIL SITE PHOTO KEY MAP



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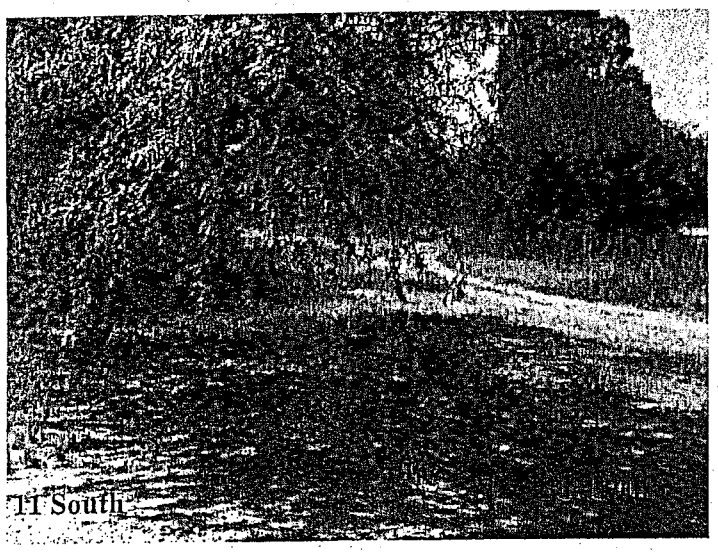

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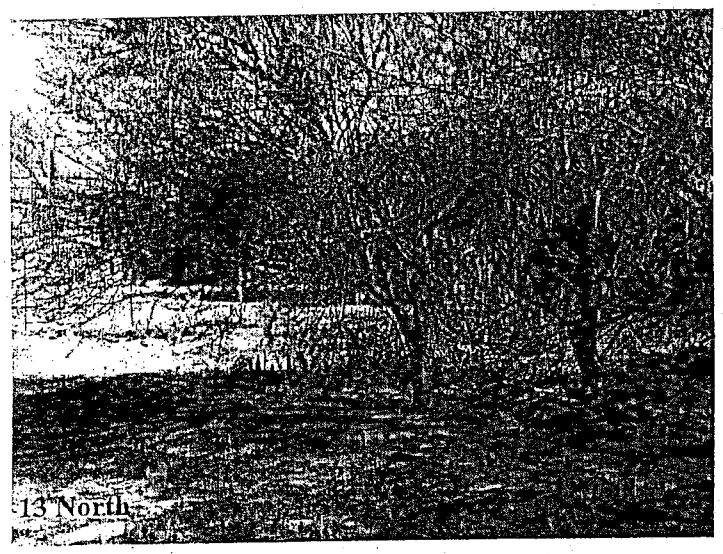

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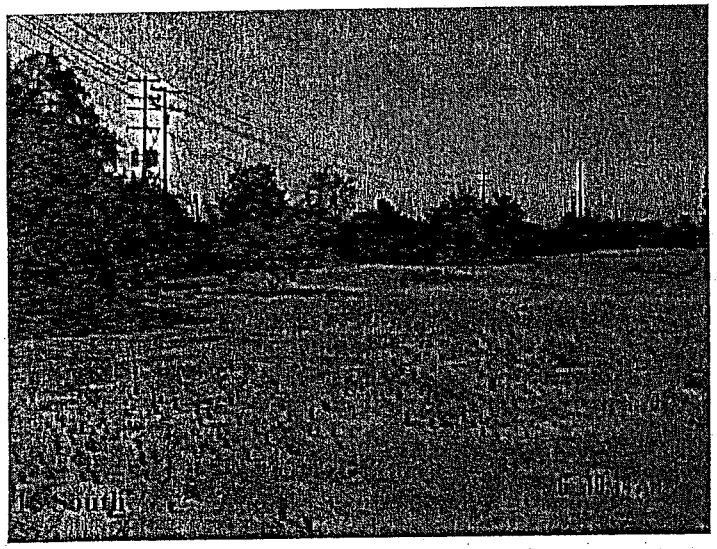

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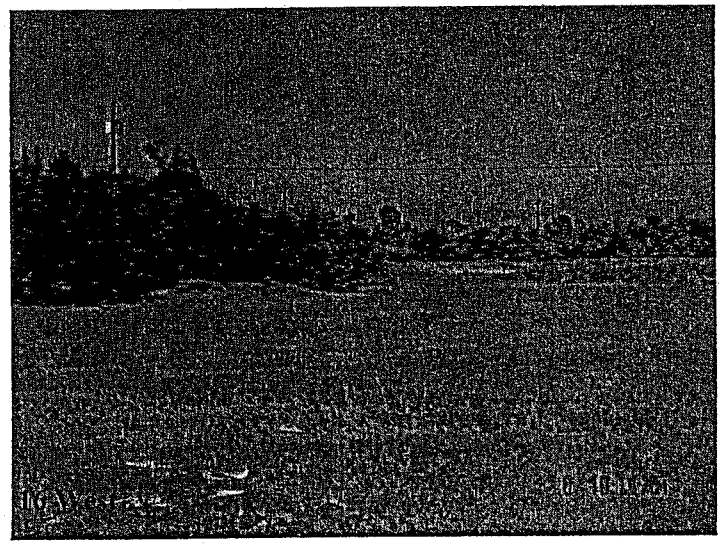

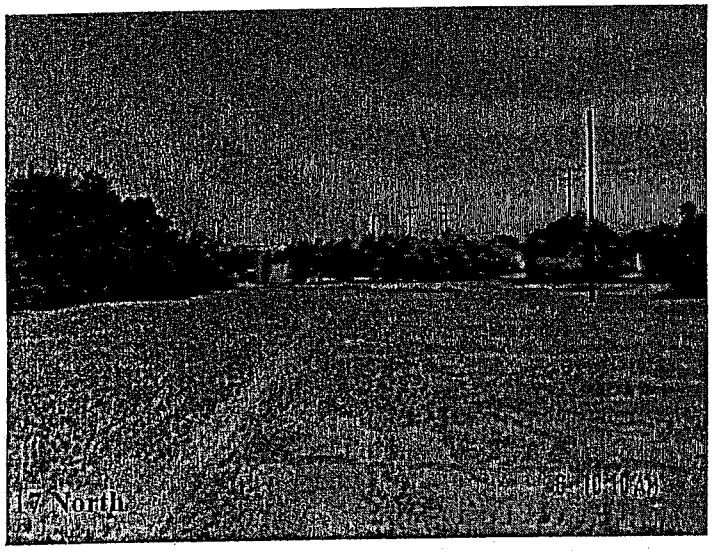

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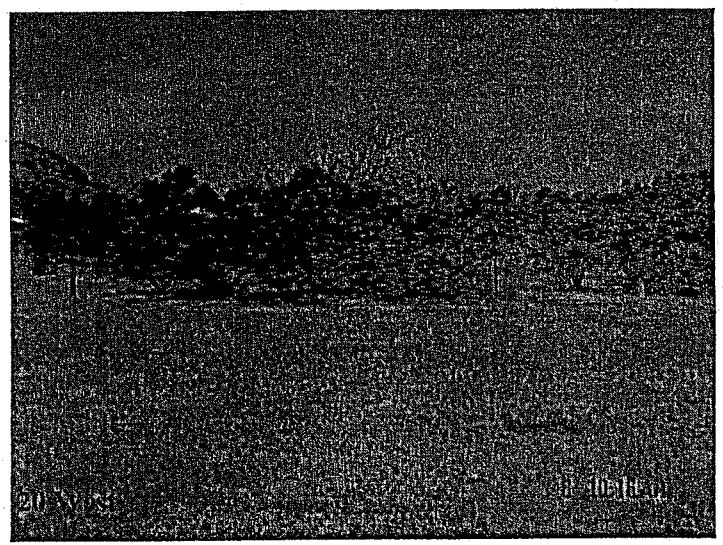

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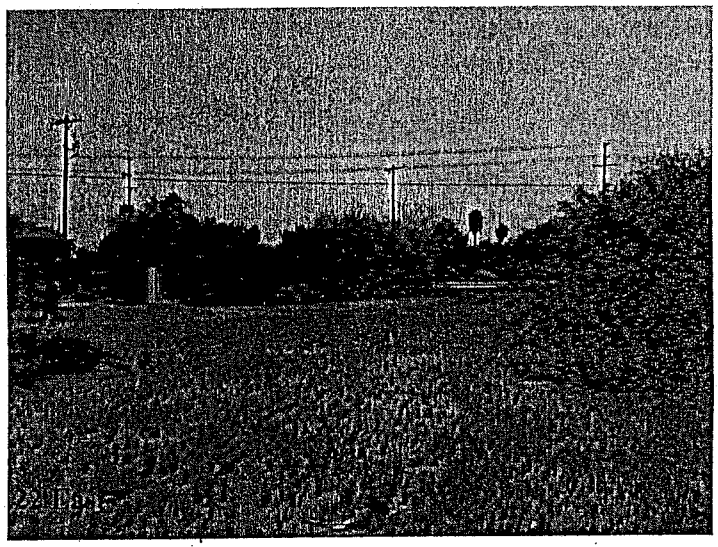

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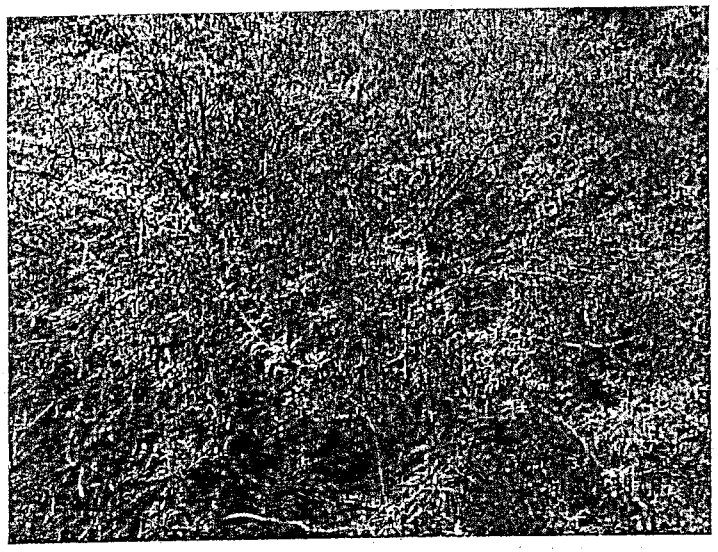

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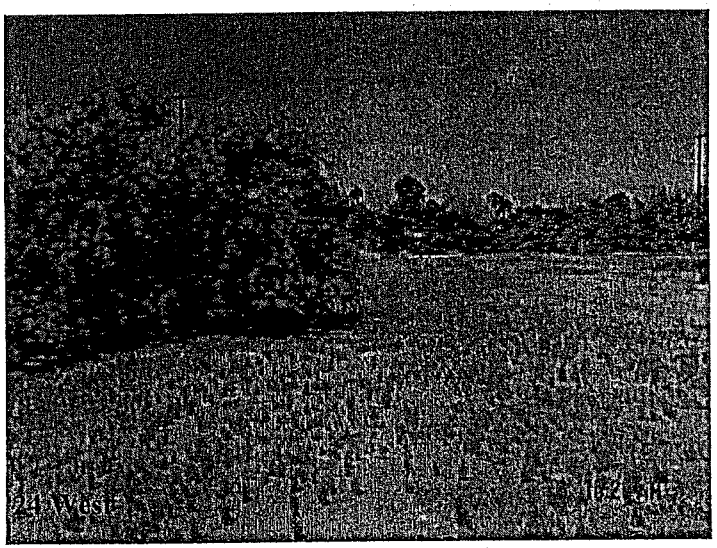

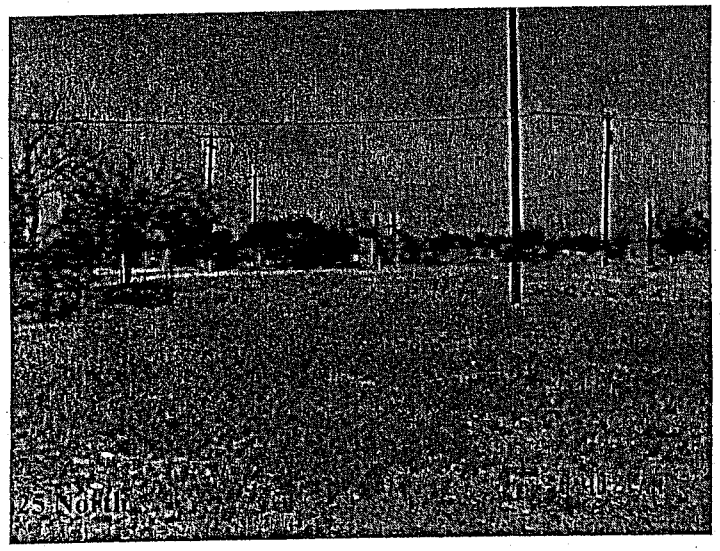

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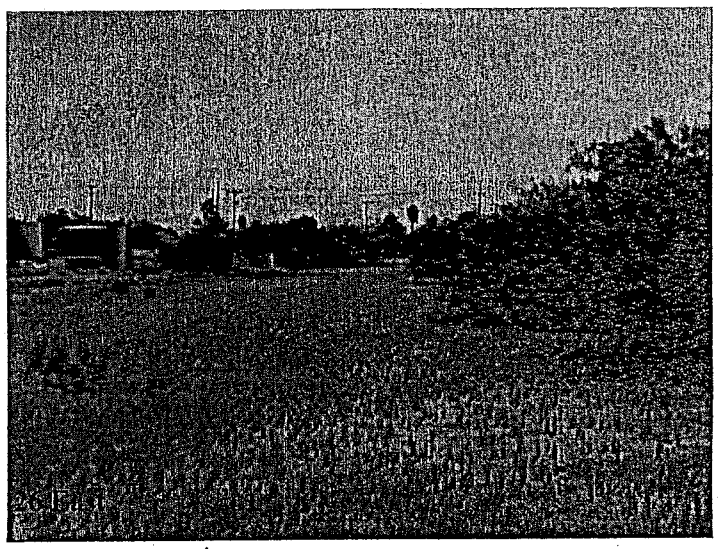

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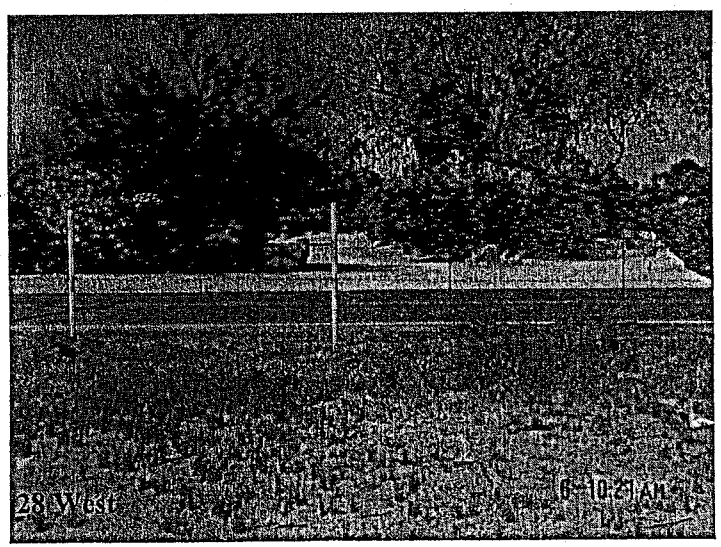

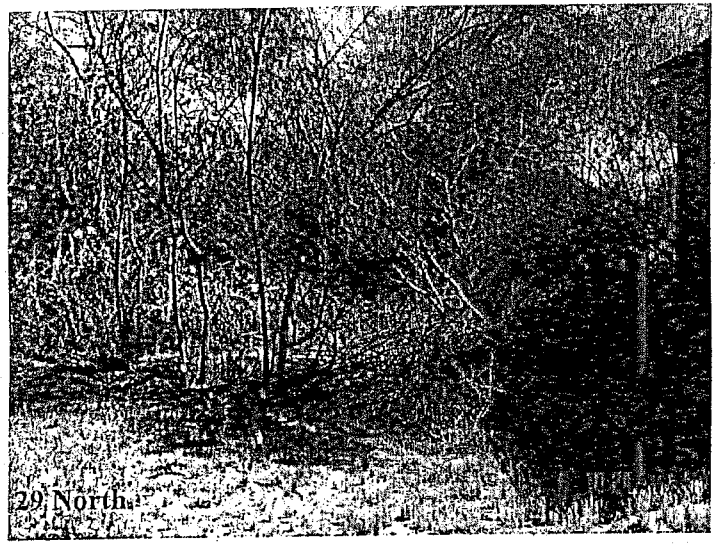

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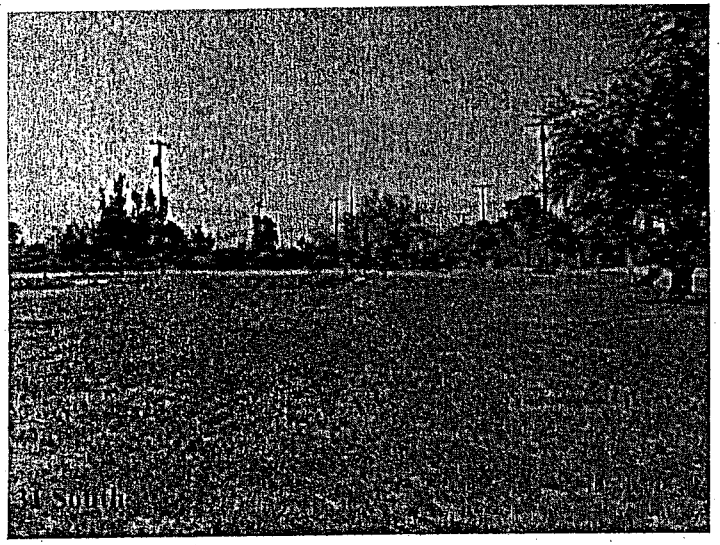


32

MARICOPA COUNTY
OFFICIAL PARCEL MAP
STATE OF ARIZONA

PT. SEC. 11 T02N R04E

MAP ID • 825 - 11 - 04 - 02

LOCATOR GRID

SECTION

1/4 SECTION

1/4 1/4 SECTION

ASSESSOR BOOKS & MAPS WITHIN THIS AREA

BOOK 174	MAP 13
BOOK 174	MAP 21

SUBDIVISIONS

ARROYO VERDE HOMES
MCR 171-17, 1975

COLONY AT SCOTTSDALE
MCR 171-17, 1975

ARROYO VERDE UNIT 2
MCR 218-10, 1980

AZAW000196

SCALE: 1" = 100'

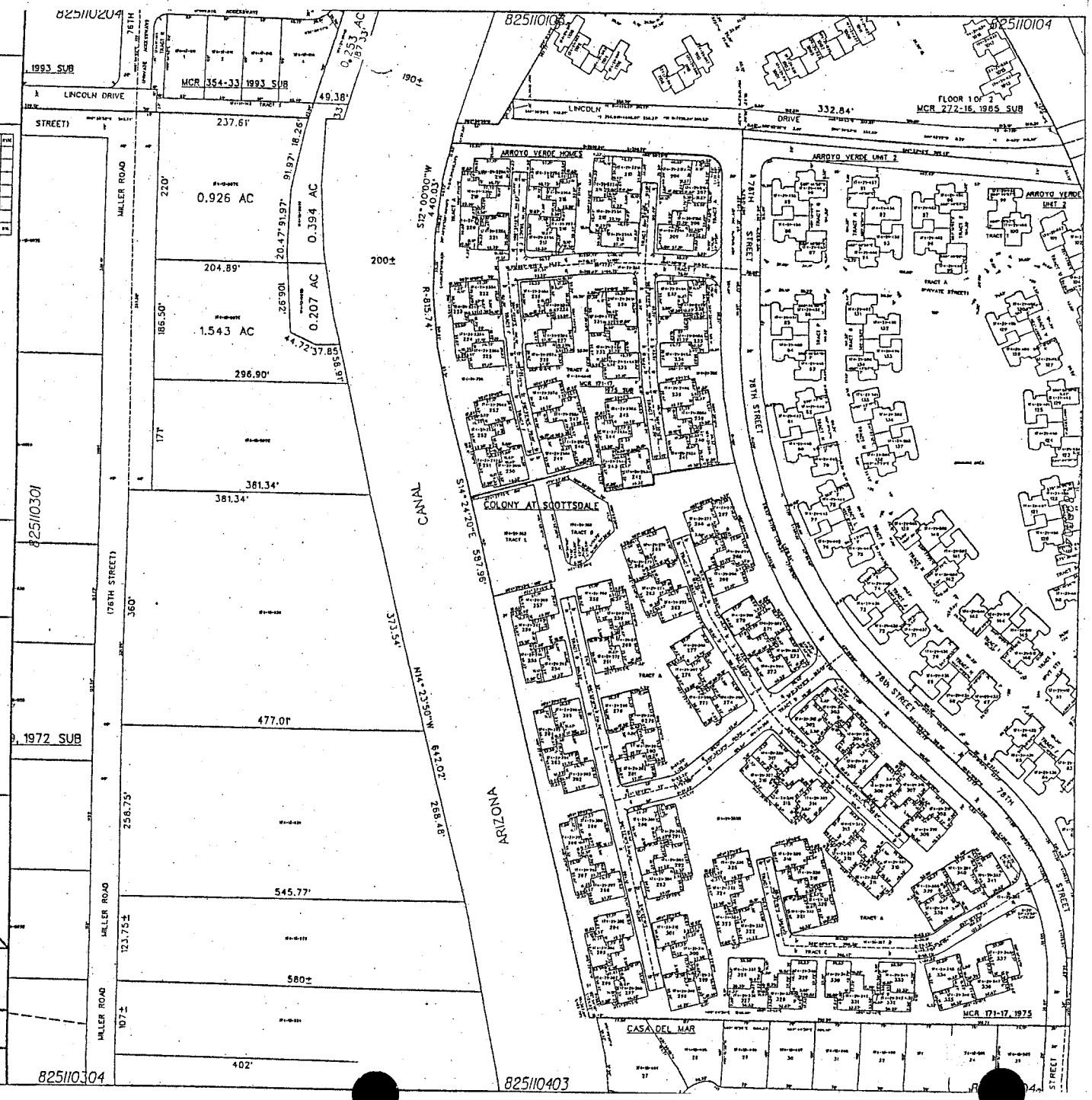
Maricopa County Assessor G.I.S.

MAP GENERATION DATE: 10-30-2002

MARICOPA COUNTY ASSESSOR'S OFFICE
301 W. JEFFERSON ST.
PHOENIX, AZ 85003
www.maricopa.gov/assessor

LEGEND

Disclaimer and Indemnification



MARICOPA COUNTY
...AL PARCEL MAP
... OF ARIZONA

PT. SECTION 11 T02N R04E

MAP ID = 825 - 11 - 04 - 03
Township Range Sheet No. | Section Number | Township Number | Township Range

LOCATOR GRID

SECTION

1/4 SECTION

1/4 1/4 SECTION

ASSESSOR BOOKS & MAPS WITHIN THIS AREA

BOOK 174 MAP 13
BOOK 174 MAP 21

SUBDIVISIONS

CASA DEL MAR
MCR 157-27, 1979

MARTIN MANOR
MCR 157-41, 1974

AZAW000197

SCALE: 1" = 100'

Maricopa County Assessor G.I.S.

REVISION DATE: 9-12-2000

MARICOPA COUNTY ASSESSOR'S OFFICE
301 W. JEFFERSON ST.
PHOENIX, AZ 85003
www.maricopa.gov/assessor

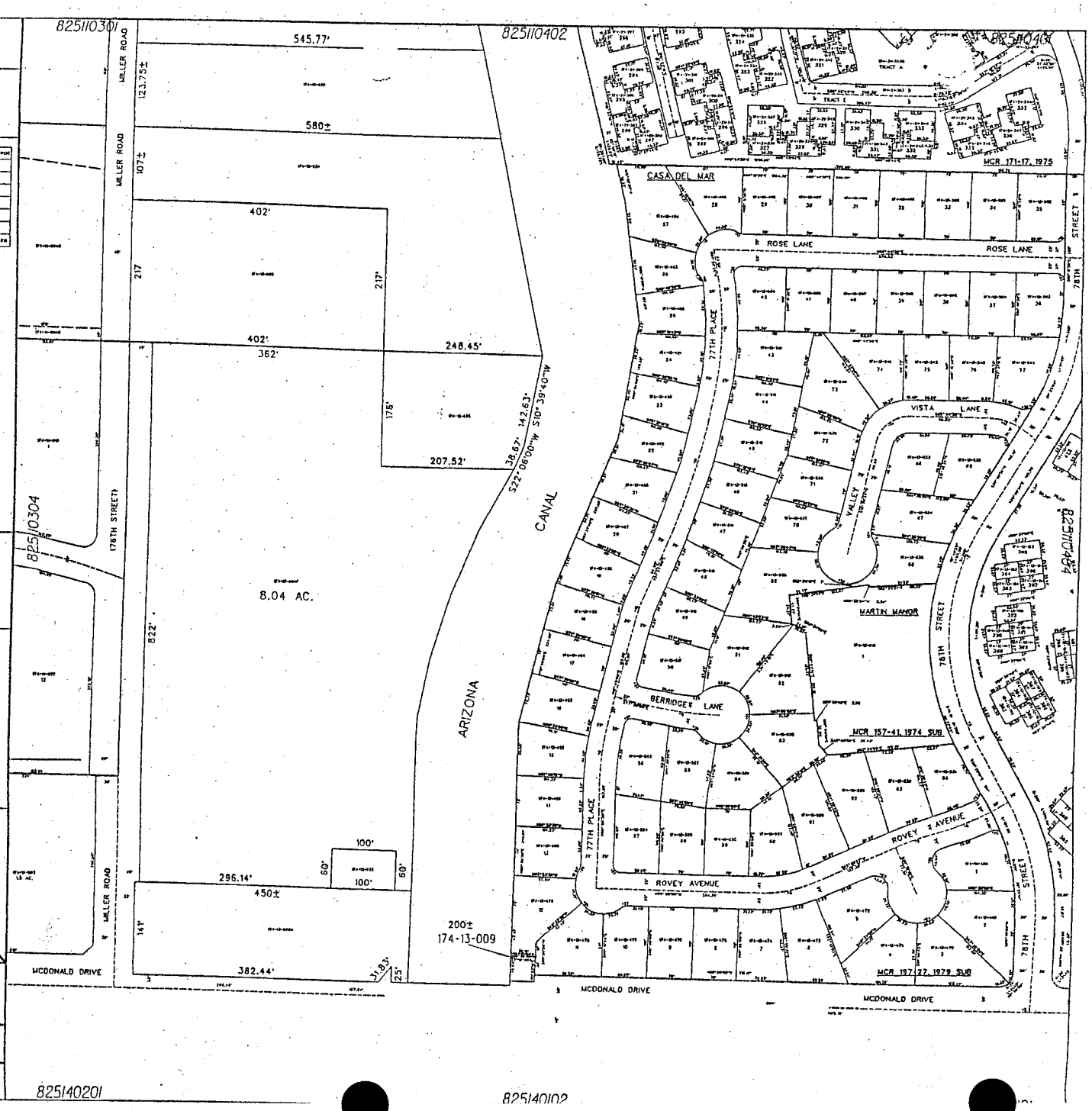
LEGEND:

Subdivision Boundary Line
Subdivision Boundary Corner
Street Centerline
Street Centerline Marker
Section Corner Marker
Indicates change in adjacent boundary
Parcel Boundary Line
Parcel Split Line
Parcel Number
Parcel Boundary Note

REVISION INFORMATION IS LOCATED ON A SEPARATE DOCUMENT

Disclaimer and Indemnification

"The Assessor's Office makes no representation or warranty as to the accuracy or reliability of any of the information contained herein, and does not by ... information, Certain uses of this information may result from the use of this information. ... purchasers or any Maricopa County, Users of this map should ... independently the accuracy or reliability of this information."



239-PA-2004
2N
4P

CITIZEN REVIEW CHECKLIST

The Citizen Review Process is required for all Rezonings, Zoning Ordinance Text Amendments, Zoning Stipulation Amendments, Council Approved Amended Development Standards, and City Council Site Plan Approvals. *If you are filing an application for any other type of project, this is not the correct form.* If you are filing for a General Plan amendment, you must comply with resolution 5135 for neighborhood involvement. For all other applications, you need a Neighborhood Involvement Packet provided by your Project Coordinator. Please contact your Project Coordinator for more information. TIM CURTIS 480-312-4210

This packet has been prepared in conformance with and as a supplement to Sect. 1.305 C, Citizen Review Process of the Zoning Ordinance. The Zoning Ordinance and Checklist requires the applicant to prepare both a Citizen Review Plan and Report. Additional notification is required for the public hearing process pursuant to State Statutes and the Zoning Ordinance of the City of Scottsdale.

July 22, 2004
(Note: This replaces the former Citizen Review Process Checklist dated 1-31-03)

Citizen Review Process Requirements

The Goal of the Citizen Review Process is to ensure notification and community involvement prior to the filing of a formal application. Sect. 1.305 C, Citizen Review Process of the Zoning Ordinance requires that the applicant prepare both a Citizen Review Plan and Citizen Review Report. Steps 1-4 below outline the requirements for the Citizen Review Plan while Step 5 is the requirement for the Citizen Review Report.

Step 1: Provide a written statement to your Project Coordinator, at least two weeks prior to the first open house meeting, outlining the information below. This written statement is your Citizen Review Plan.

(1) How many neighborhood meetings will be held

(2) Where and when they will be held

(3) How and when neighbors will be notified

(4) Who will be notified

(4) When the 'Project Under Consideration" sign will be posted and what it will say

Step 2: Post the Project Under Consideration Sign - (4'x4' Black and White sign) post on-site according to the City's "Project Under Consideration" posting requirements (see attached) at least ten (10) calendar days prior to the first open house meeting. The sign shall include the following:

- Project Information: description of the proposed zoning change, site plan or stipulation modification, or zoning text amendment
- Time, Date and Location of the open house meeting/s
- Applicant and City Staff Contact Information- contact persons and phone numbers to call for more information
- City's web site address: www.scottsdaleAZ.gov/projects/ProjectsInProcess

Keep in mind, an affidavit of sign posting with a time/date stamped photograph of the sign is required with the Citizen Review Report to confirm posting.

Step 3: Send a letter by first class mail to surrounding property owners and interested parties at least ten (10) calendar days* prior to the open house meeting:

Include the following parties:

- All property owners within a 750-foot radius of the site property lines (use Maricopa County Assessor's Office property owner information)
- Scottsdale, Paradise Valley, Carefree and/or other applicable School Districts*
- All homeowner associations (HOA's) located within the 750-foot radius (applicant to locate HOA's and addresses)

* School districts shall be notified 30 days prior to filing the formal application when the rezoning is from a non-residential to a residential district or when it results in greater residential densities.

AZAW000199

The letter must include the following information:

- Time, date and location of the open house meeting,
- Applicant and City staff contacts, telephone numbers and email addresses
- City case file number
- City web site address.
- A detailed description of the project and information concerning the applicant's request.
- Preliminary site plan and/or project location map of the project.

Step 4: **Hold the Open House Neighborhood Meeting** onsite or at a location near the site, within 45 days prior to your formal submittal.

Provide the following:

- Sign-in sheets
- Comment sheets
- Written summary of meeting.

Keep in mind, the sign in and comment sheets, along with a written summary of the meeting will be included in the Citizen Review Report.

Additional Open House Meeting(s)- in some cases more than one applicant-held Open House may be required by the City of Scottsdale Project Coordinator. Additional open house meetings have the same requirements and shall be advertised in the same manner as the first Open House.

Step 5: **Complete a Citizen Review Report-** All citizen outreach and input shall be documented in the Citizen Review Report and shall be submitted with the formal application.

The Citizen Review Report should include:

A. Details of the methods used to involve the public including:

1. Dates and locations of all meetings and all other contacts where neighbors were invited to discuss the applicant's proposal.
2. Copies of letters or other means used to contact neighbors, the school district, and HOA's. Provide the dates mailed, number of mailings, and the listing of addresses.
3. Map showing where notified neighbors are located.
4. Open house sign-in sheets, list of people that participated in the process, comment sheets and written summary of the comments provided at the open house meeting.
5. Completed affidavit of the sign posting with a time/date stamped photo. An example of an affidavit is attached.

B. A written summary of the comments, issues, concerns and problems expressed by citizens during the process including:

1. The substance of the comments, issues, concerns and problems.
2. The method by which the applicant has addressed or intends to address the issues, concerns and problems identified during the process.

POSSIBLE SIGN VENDORS

1. America's Instant Signs
   14425 N. Scottsdale Road, Suite 300
   Scottsdale, AZ 85254
   480-483-0700

2. Chandler Banner & Sign
   3050 S. Country Club, #20
   Mesa, AZ 85210
   480-926-7777

3. Dynamite Signs
   29040 N. 44th Street
   Cave Creek, AZ 85331
   480-585-3031

4. Fast Signs
   7620 East Indian School Rd #104
   Scottsdale, AZ 85251
   480-994-8088

5. Graphic Directions, Inc.
   1527 N. 18th Avenue
   Phoenix, AZ 85007
   602-255-0355

6. Scottsdale Signs
   7904 E. Chaparral Road, Suite 106
   Scottsdale, AZ 85251
   480-994-4000

7. Super Signs
   1335 W. University Drive
   Tempe, AZ 85281
   480-968-2200

This listing is not an endorsement.
You may use any sign provider.

CITIZEN REVIEW / NEIGHBORHOOD INVOLVEMENT

'PROJECT UNDER CONSIDERATION' SIGN POSTING REQUIREMENTS

You are required to post your site at least 10 working days prior to the 1st open house meeting. Please call your Project Coordinator if you have questions.

AZAW000202

Project under Consideration
POSTING SPECIFICATIONS

Early Notification of
Project Under Consideration

Neighborhood Open House Meeting:
Date:
Time:
Location:

Site Address: _____, **Scottsdale, AZ** _____

Project Overview:
- **Description of Request:**
- **Description of Project and Proposed Use:**
- **Site Acreage:**
- **Site Zoning:**

Applicant Contact:
Phone Number
Email Address

City Staff Contact:
Phone Number
Email Address

Pre- Application #:_____ **available at City of Scottsdale: 480-312-7000**

Project information is available at:
www.scottsdaleaz.gov/projects/ProjectsInProcess

Posting Date:

3-1/2" bold letters

2" bold letters

1 bold letters

1-1/2" bold letters

1" bold letters

1-½ bold letters

1" bold letters

¾" bold letters

1. 4' x 4' in size
2. Laminated plywood or MDO board
3. Front, back, and all edges painted with two coats of White acrylic exterior enamel
4. Black lettering sized per above (decals)
5. Sign attached w/ 6 screws to 2 - 4" x 4" x 8' wood poles

SITE POSTING REQUIREMENTS

1. Post site at least 10 working days prior to the 1st open house meeting. Please call your Project Coordinator if you have questions. Maintain posting of signs until notice of hearing sign is installed.

2. You may use the sign vendor of your choice. A list of possible providers can be found on the back of this brochure. The sign specifications are on file with these vendors.

3. <u>Provide the following proof of posting in the Citizen Review / Neighborhood Involvement Report.</u>
   a) Notarized affidavit of posting
   b) Date/Time stamped photo of sign posted on site

4. Signs must be removed within 30 days after a decision at the public hearing is made on your application.

CITIZEN NOTIFICATION AND PUBLIC INVOLVEMENT REPORT

The purpose of this correspondence is to present the Citizen Notification and Public Involvement Report for the Paradise Valley Arsenic Removal Project prior to submittal to the City of Scottsdale in accordance with the City of Scottsdale Citizen Review Process Requirements.

Project: Paradise Valley Arsenic Removal Project
Pre-Application Case Number: 239-2004

Applicant: Arizona American Water
Contact: Robert McCandless, DSWA
602.217.1034
E-mail mccandless@dswa.net

Overview: Rezoning parcels 174—13-934 and 174-13-935 back to R1-43 to allow for construction of a new 19 mgd arsenic removal facility to remove naturally occurring arsenic from well water. Requires Application and Use Permit (Parcels 174-13-930, 931, 932, 934, and 935) following a rezoning approval.

Process Overview:

Before any contact with the City of Scottsdale for the proposed rezoning request, neighbors in adjacent areas and interested parties were notified about the request. The applicant presented the project and solicited their issues, concerns, and recommendations regarding the overall project layout and design. The applicant documented all comments received and has incorporated the recommendations into the preferred concept that is included in the formal application to the City of Scottsdale.

The public communications and input process is two-fold: meeting one-on-one with resident stakeholders and conducting a neighborhood meeting.

Resident Stakeholder One-on-One Meetings. The purpose of the one-on-one resident stakeholder meetings was to preview the project with a few of the immediately impacted neighbors to understand issues, concerns, and challenges that may be facing the project. Participants were contacted by telephone and the meetings were held in residents' homes.

A brief presentation was given that outlined key aspects of the project and questions, comments, and discussion was solicited. The meetings also identified other key stakeholders that should be contacted. The outcome

of the meetings were to understand some of the issues prior to the public open house allowing the consultant team to address them upfront and present ideas to mitigate or resolve any issues.

Prior to the neighborhood public meeting, two meetings with adjacent property owners were held. On July 13, 2004, the applicant met with Mr. and Mrs. Searcy at their home immediately adjacent to the property. Meeting summary notes are included as **Appendix A**. On July 14, 2004, the applicant met with Janie Ellis, 105 Cattletrack, Bernie Gonzales, 6349 N. Cattletrack, and Vern Swaback, 7550 E. McDonald Drive. Meeting Notes are **Appendix B**. On July 28 2004, BJ Gonzales, who is located to the north of the site, called and he asked if aesthetics/noise treatment for Well No. 16 be discussed as part of the open house. He suggested that the well site be screened with a masonry wall and a sound enclosure.

> ***Summary of Comments Received.*** The concerns were focused on the visual impact of the architecture and the landscaping. Noise implications were expressed and traffic was questioned. Neighbors asked about utility routing and zoning implications.
>
> Neighbors contacted indicated that the facility should be enclosed by a wall. The fence and building architecture should capture the rural character of the surrounding neighborhood. The facilities visible from Cattletrack Road should have the appearance of a home and blend with the surrounding community.
>
> The existing Mesquite trees along the canal should remain. Neighbors have indicated that noise was generated during the pump start-up and that is when it is bothersome.
>
> The utility routing should not disturb the mature Mesquite trees that exist adjacent to the canal. Neighbors recommended a proposed alternative alignment to avoid damage to the trees. They suggested considering an alternative alignment along the east side of Cattletrack Road in an existing utility easement and continuation of the pipe along the existing alignment.

Neighborhood Meeting #1. Invitations were sent to 260 residents, homeowner's associations, and interested parties. A neighborhood meeting was held on August 5, 2004 at 5:30 to 7:00 p.m. at the Hilton Scottsdale Resort & Villas, 6333 North Scottsdale Road. A sign-in sheet **(Appendix C)** where people registered is attached. A PowerPoint presentation **(Appendix D)** was given by the applicant and the project's architect facilitated a discussion regarding the project and

recommended suggestions to the project's design. A comment card **(Appendix E)** and handouts **(Appendix F)** were distributed. No comments cards were completed and returned by participants. The handouts included a project fact sheet, vicinity map, and contact sheet. Four residents attended the meeting and most stayed the entire one and half hours asking questions and providing suggestions. Meeting summary notes were completed **(Appendix G)** that documented questions, comments, and suggestions.

Summary of Comments Received. The comments, concerns, and suggestions were similar to the ones that were received during the two one-on-one meetings. There were considerable questions geared at gaining an understanding about the project and the purpose of the removal process. There were questions regarding the current operation in comparison to the future operation and how noise and traffic will differ. Specific comments were received regarding the design of the wall, building architecture, and landscaping.

The perimeter wall is considered an important aspect of the design of the project. The wall should be broken up and decorative. It was suggested that other materials (e.g., iron, adobe) might be incorporated. There was an understanding that the wall would be 8' high but because of the large setback and a lot of landscaping that would be in this setback the height would be acceptable.

The building architecture should blend into the neighborhood and not be a focal point. The buildings should not look too industrial or commercial. It was encouraged that landscaping and the decorative wall could be used to soften the look of the building. It was encouraged not to exceed the existing height of the current tanks on the property for any new structures. The color palette suggested was the darker the better.

Landscaping of the project was another area of considerable discussion. Landscaping should be used as screening on all sides of the property. Maintaining the Mesquite trees along the canal was encouraged as a way to screen the project. It was suggested that along Cattletrack the landscaping should be lush, intense cactus garden so that the beautiful landscaping is the focal point and not the structures. The continuation of the natural pathway along Cattletrack should also be included. The pathway should not be paved but of natural materials to maintain the rural character of the neighborhood.

Notification. All property owners within 750-foot radius **(Appendix H shows the notification map)** from the application's property were invited to attend the meeting. A letter was sent via first class mail to 260 individuals on July 16, 2004. The Community Input Certification is included as **Appendix I.** The letter **(Appendix J)** described the project, identified the applicant, included consultant and city contact information, information regarding the public open house, and project location map was included. A letter will also be sent to all homeowner associations (HOA's) located within the 750-foot radius at least ten days prior to the open house meeting.

Additionally, the property was posted with a "Project Under Consideration" sign. The sign was posted on July 14, 2004. The sign includes project information, the time, date and location of the public open house, applicant and city staff contact information, and the city's web site address. An affidavit of sign posting **(Appendix K)** with a time/date stamped photograph of the sign will be submitted as part of the Public Review Report.

APPENDIX

A	July 13, 2004 Meeting Summary Notes
B	July 14, 2004 Meeting Summary Notes
C	Neighborhood Meeting # 1 Sign-In Sheets
D	Neighborhood Meeting # 1 PowerPoint Presentation
E	Neighborhood Meeting Comment Card
F	Neighborhood Meeting Handouts
G	Neighborhood Meeting # 1 Meeting Summary Notes
H	Notification Map
I	Community Input Certification
J	Neighborhood Meeting Letter Invitation
K	Affidavit of Sign Posting

APPENDIX A

Paradise Valley Arsenic Removal Facility
Stakeholder Meeting
Meeting Summary Notes

Date: July 13, 2004; 6:30 p.m. to 7:00 p.m.
Location: Marcie and Keith Searcy Home
7550 Whispering Winds Road
Scottsdale, AZ 85250

Attendees:
Marcie Searcy
Keith Searcy
Jim Campbell, Paradise Valley Operations Superintendent Arizona American Water Company
Rob McCandless, P.E., Damon S. Williams Associates
Christine Close, Damon S. Williams Associates
Peggy Fiandaca, Partners for Strategic Action, Inc.

Rob McCandless, Project Manager with DSWA gave an overview of the Paradise Valley Arsenic Removal Facility project and distributed a Project Fact Sheet and Site Plan. He mentioned that the DSWA has been hired by Arizona American Water Company in collaboration with D.L. Norton to design/build the facility. Arizona American Water Company (formerly Paradise Valley Water Company) owns and operates the water system serving portions of the Town of Paradise Valley and the City of Scottsdale. The project is a result of new requirements by Environmental Protection Agency (EPA). In January 2000 the EPA lowered the drinking water Maximum Contaminant Level (MCL) for arsenic, the maximum level allowed to be served to the public, from 50 μg/L to 10 μg/L. Rob explained that arsenic is naturally occurring in many of the soils that contact groundwater, particularly throughout the Southwestern U.S. All water systems serving the public are required to achieve compliance with the new arsenic MCL by January 23, 2006.

The purpose of the meeting was to discuss the project with Mr. and Mrs. Searcy and understand their potential concerns or issues. The Searcy's live directly across the street from the existing facility as well as the future improvements. Following is a summary of their comments and questions.

Noise Concerns
The current facility's noise levels impact the Searcy's particular during the late night, early morning hours. When the pumps turn on, the vibration is heard and felt in their home. They also say they can tell when the facility shifts from winter to summer because of the noise.

Rob explained that the motorized equipment will be in buildings which will greatly reduce any noise. The design of the plant will do away with any noise. We are starting new with the facility.

Mr. Searcy asked, "Are their standards for decibels?" Yes, I am not certain at this moment what the standards are for this type of use. The current decibels at the pumps are roughly at 90 db and 55 db at the property line.

Mr. Searcy said he cannot open his doors at night because of the noise. Most of the other residents do not hear the noise like we do. We are in the direct path.

Perimeter Wall

The perimeter wall is proposed to be 8 feet tall. The Searcy's asked to see the elevation of the wall when it is done. They are concerned what the wall might look like particularly from the road.

Wall setback from the road was mentioned as a concern. They would like to see it setback the same distance as the other homes on that side of the street. Landscaping outside the wall so that the wall seems to disappear into the landscaping is desired.

The wall should be aesthetically pleasing. The wall could be stucco with bricks along the top. The top edge could curve to reduce the straight edged feel similar to their wall. The wall should be similar to the walls surrounding fine custom homes and fit within the aesthetic feel of the area.

Landscaping

Landscaping should be used to minimize the visual impact of the facility. Native landscaping consistent with the rural character of the neighborhood is preferred. Use landscaping to minimize the wall as well as any buildings in the facility. The landscaping can also provide buffer for noise.

Property Set Back

The property should mirror the setback of the other properties along that side of Cattletrack. If the road is ever widened, the road widening would be on the AAW side of the road. It would be nice to have natural gravel for pedestrians and/or bicycling in the setback. Set the building(s) back as far as possible so that they do not stick out.

Building Design

The buildings should be designed to fit into the rural character of the neighborhood. It should be designed to look like the homes in the areas. A good example is the Doubletree Water ?????? It is not so huge and it blends with the neighborhood.

Lighting

Be thoughtful about the lighting on the buildings. We understand there are security issues so lighting will be important. But anything you can do to be sensitive to the impact that

lighting has on the neighborhood would be appreciated. No floodlights! The lighting should be "low impact" lighting.

Gate
The design of the gate is important. But more important is that it should be quiet.

Traffic Implications
Jim Campbell explained that the facility will house the AAW administrative offices that might include 6 employees and 2 operators. Currently, at the administrative offices (at another location) get approximately 2 customers per day that visit the site. This low visitation is expected at the new site.

Rob explained that there will be minimal hauling that will occur from this site. The Searcy's would like to see what type of trucks would be doing the hauling, how often, and what the different activities and/or uses at the site might impact them.

Construction Schedule
Rob explained how construction schedule. The Searcy's asked if the perimeter wall be installed first to reduce construction noise. The key to the construction is to be cognizant of the impacts to the neighborhood. Try to keep the confusion and noise to a minimum to protect our quality of life.

Other Questions
What will the height of the facilities? Approximately 20 feet.

Will the existing tanks be removed? Yes to allow more storage capabilities.

What does future property boundary mean? AAW has identified that property (approximately 5 acres) future development opportunity. AAW may sell off that property for residential. However, it is not part of this project or application to the City of Scottsdale.

Paradise Valley Arsenic Removal Facility
Stakeholder Meeting
Meeting Summary Notes

Date: July 14, 2004; 1:00 p.m. to 2:00 p.m.
Location: Janie Ellis Home
6105 Cattletrack
Scottsdale, AZ 85250

Attendees:
Janie Ellis, 6105 Cattletrack
Bernie Gonzales, 6349 N. Cattletrack
Vern Swaback (came late), 7550 E. McDonald Drive
Jim Campbell, Paradise Valley Operations Superintendent Arizona American Water Company
Rob McCandless, P.E., Damon S. Williams Associates
Chip Norton, D.L. Norton General Contracting
Christine Close, Damon S. Williams Associates
Peggy Fiandaca, Partners for Strategic Action, Inc.

Rob McCandless, Project Manager with DSWA gave an overview of the Paradise Valley Arsenic Removal Facility project and distributed a Project Fact Sheet and Site Plan. All participants introduced themselves. He mentioned that the DSWA has been hired by Arizona American Water Company in collaboration with D.L. Norton to design/build the facility. Arizona American Water Company (formerly Paradise Valley Water Company) owns and operates the water system serving portions of the Town of Paradise Valley and the City of Scottsdale. The project is a result of new requirements by Environmental Protection Agency (EPA). In January 2000 the EPA lowered the drinking water Maximum Contaminant Level (MCL) for arsenic, the maximum level allowed to be served to the public, from 50 μg/L to 10 μg/L. Rob explained that arsenic is naturally occurring in many of the soils that contact groundwater, particularly throughout the Southwestern U.S. All water systems serving the public are required to achieve compliance with the new arsenic MCL by January 23, 2006.

The purpose of the meeting was to discuss the project with neighborhood interests to understand their potential concerns or issues. Following is a summary of their comments and questions.

Building Design
Are there any towers proposed? No.
How tall are the tanks? Approximately 24 feet in height.
Are you going to keep the existing tanks? No, they will be replaced.

It will be important for the color of the tanks and any buildings blend in with the natural surrounding. Minimize the look of these facilities with color and landscaping. A good

It will be important for the color of the tanks and any buildings blend in with the natural surrounding. Minimize the look of these facilities with color and landscaping. A good example of this is how the City of Scottsdale screens and builds utility boxes in the northern part of the city. You hardly notice them.

The exterior design of the buildings should match the neighborhood character. So the material of the buildings and facilities will be important. Anything done on this site should enrich the streetscape. Following are some guidelines suggested.

- Lower the building as much as possible
- Reduce the building mass; break up the buildings
- Less reflective the better
- More landscaping the better
- No utility hotspot lighting
- Fencing should be the type around a fine residential development
- Quiet
- If the City tries to impose curb, gutter, and paved sidewalk, fight it vehemently. That is inconsistent with the rural character that the neighborhood desires. Do not let the city impose a standard that is incompatible with the neighborhood.
- Stabilized granite path in the setback would mirror what the other property owners are attempting to do.
- Maintain the rural character

"Be sensitive on the aesthetic side and everything should be okay."

Everyone at the meeting would like to review and provide input into the proposed site plan and facility facades again before they get submitted to the city.

Perimeter Wall
What is the height of the perimeter wall? Approximately 8 feet.

Building Setback
They stressed the importance of maintaining the 40 foot street setback. It is important to mirror the rest of the street with this setback.

Historic Overlay
BJ mentioned that the adjacent property to the AAW site (Kueffner's property) is a HP Overlay. Therefore, this project may have to go before the historic preservation commission. BJ is on that commission. He suggested contacting Don Mazur in the City of Scottsdale Historic Preservation Office.

AAW and Cattletrack Property Boundary
Janie mentioned that she would be interested in discussing further the possible joint use of the area designated for a retention area on the site plan. When the retention area is not filled with water she would like to use it for a small (150 to 200 seat) outdoor venue. She would like to continue discussions with AAW about this possibility.

5 Acre Property Across from the Facility

Janie mentioned that she owns the 5 acre parcels across from the facility gate. She is intending to develop 3 residential lots that will have one entry to the property. She was concerned about the alignment of her entry with the facility entry. She thought there might be some regulations related to alignment of entrances. Her alignment is already recorded on the lot split. She suggested researching the requirements and aligning the facility's entrance if it is a requirement.

Property to the North

BJ owns the property to the north of this site. He asked about AAW's intentions for the future development of that property. Rob explained that it is currently not a part of this particular project, but the intent was to someday sell that property for future residential. It is approximately 5 acres. BJ said that he would be supportive of any development there just as long as it was residential.

BJ asked about the well site in this northern area? Will that be used for the new facility? Rob explained that it would be redirected. Appropriate visual screening of the pump would be appreciated. It would benefit the future development potential of this property as well as screen an eye sore. A good example is what they did to aesthetically screen a pump in the Monterrey Homes project.

Also anything you do to protect the Mesquite trees along the canal is appreciated.

Traffic

Traffic has been an issue for all the recent zoning cases along Cattletrack. There is current traffic data on the website. Present the information upfront and make it a non-issue.

They mentioned that the City of Scottsdale was beginning a project to widen McDonald Road. They suggested that Cory Lee, City of Scottsdale Transportation and Public Works be contacted to understand the project.

Other Questions

Who is going to be the operator of the plant? AAW

What happens to the waste products? They are hauled away. Jim explained the operations at the site.

How is this administrative office different than the existing one? Comparable in size and projected use.

Why wouldn't you do the administrative offices at the south facility? It was not part of the use permit.

What will be done about the large water transmission line? Consider putting it in the 40 foot easement in the front of the facility. That would save the Mesquite trees along the canal.

Other Suggested Individuals to Contact
Edie Arrowsmith, Stable Gallery
Nick and Linda Bernard
Alexander Zink
Diane and Roy Henderson
Kueffner Family

APPENDIX C

Arizona-American Water Company

Arizona-American ater Company
Paradise Valley Arsenic Removal Facility

DS A
And Associated Firms

SIGN IN SHEET – NEIGHBORHOOD MEETING #1
AUGUST 5, 2004; 5:00 P.M.
PLEASE PRINT

NAME	ADDRESS	TELEPHONE	E-MAIL
Aaron Ashcroft	Arizona American Water	623-445-2418	aashcroft@amwa
Peggy Fiandaca PSA		480/816-1811	psainc@cox.net
Damon Williams	DSWA	(602) 217-1020	
Robert Bessett	DSWA	602-217-1011	rbessett@dswa.net

Arizona-American Water Company

Arizona-Amer. .n Water Company
Paradise Valley Arsenic Removal Facility

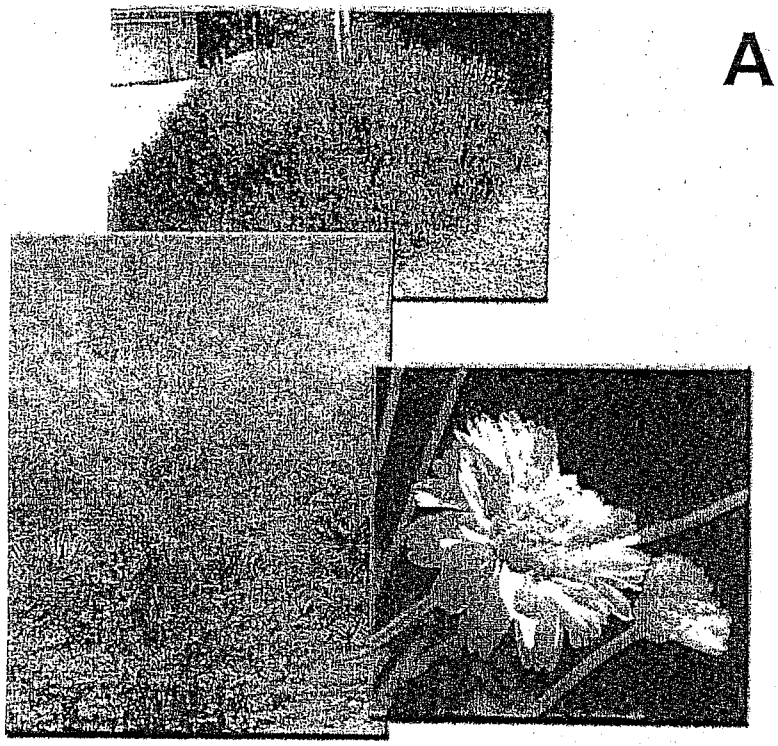
DSWA
And Associated Firms

SIGN IN SHEET – NEIGHBORHOOD MEETING #1
AUGUST 5, 2004; 5:00 P.M.
PLEASE PRINT

NAME	ADDRESS	TELEPHONE	E-MAIL
Rob McCandless	2355 E. Camelback Rd	602 217 1057	rmccandless@dbm.net
Richard Moore	39920 N Cavalier Pass Anthem	(623) 465-2474	moorers@amwater.com
Tim Friday	10820 N. 7th St Phx AZ 85024	(623) 445-2403	tfriday@amwater.com
CHIP NORTON	7750 E. EVANS ROAD	(480) 998-3913	CNORTON@DLNORTON.com
B.J. GONZALES	6344 N. Cattletrack Rd	480 991-3351	
John Hinke	6301 N. 75th St Scott AZ 85250	602-440-4835	jhinke@RCALAW.com
Lance Ondrell	6390 N. 75th St Scottsdale AZ 85250		Acudr5@yahoo.com
Tom Kaufman	7520 E Whispering Winds Rd	4509917241	tomamachopuerto@hotmail

APPENDIX D

American Water



Arizona American Water

Paradise Valley
Arsenic Removal Facility

Open House
Hilton Scottsdale
August 5, 2004
5:30 pm

RWE GROUP

DL Norton

DSWA

Introductions

American Water

- Moderator – Partners for Strategic Action
  - Contact - Peggy Fiandaca
- Owner - Arizona American Water
  - Local Contact – Richard Moore
- Engineer – Damon S. Williams Associates
  - Contact – Robert McCandless
- Builder - DL Norton
  - Contact – Chip Norton

RWE GROUP

DL Norton

DSWA

Project Overview

American Water

- EPA Mandate Background
- Schedule
- Project Location
- Project Components

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EPA Mandate Background

American Water

- Maximum Contaminant Level (MCL)
  - Previous MCL = 0.050 mg/L
  - In 2002, EPA requires that arsenic concentration in drinking water must be less than 0.010 mg/L by January 2006
- Arsenic
  - Naturally occurring mineral
  - Existing wells have arsenic levels of 0.010 to 0.020 mg/L

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Schedule

American Water

- Design Complete February 21, 2005
- Construction Start Early February 2005
- Operational by January 2006

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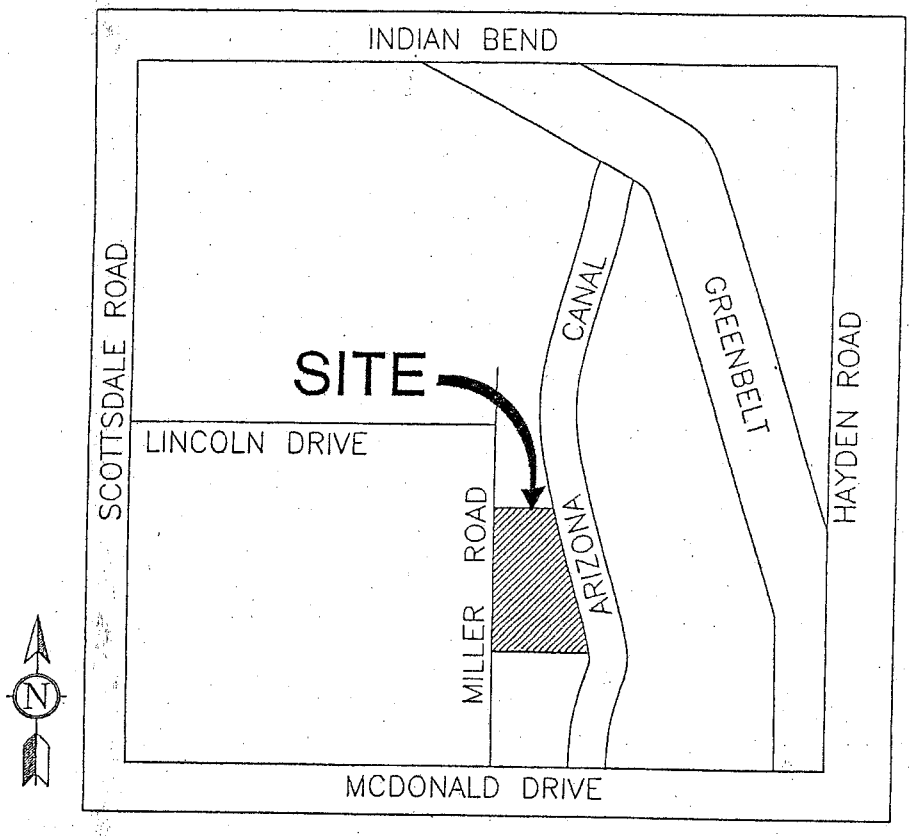
Project Location

American Water



VICINITY MAP
NTS

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Project Components

American Water

- Existing Facility
  - Arizona American Water purchased Paradise Valley Water Company in 1970's
  - Serves 4,600 customers in unincorporated area of Maricopa County to west, parts of City of Scottsdale and Paradise Valley
  - Currently, capable of providing 21 million gallons of water per day

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Project Components

American Water

- Administration/Treatment Building
  - ※ Customer Service Center
  - ※ Employee Break Room
  - ※ Pressure Filter
  - ※ Chemical Feed and Storage Areas
  - ※ Laboratory
  - ※ Booster Pumps
- Filter Press Building
- Washwater Decant Tanks
- New Water Storage Reservoirs

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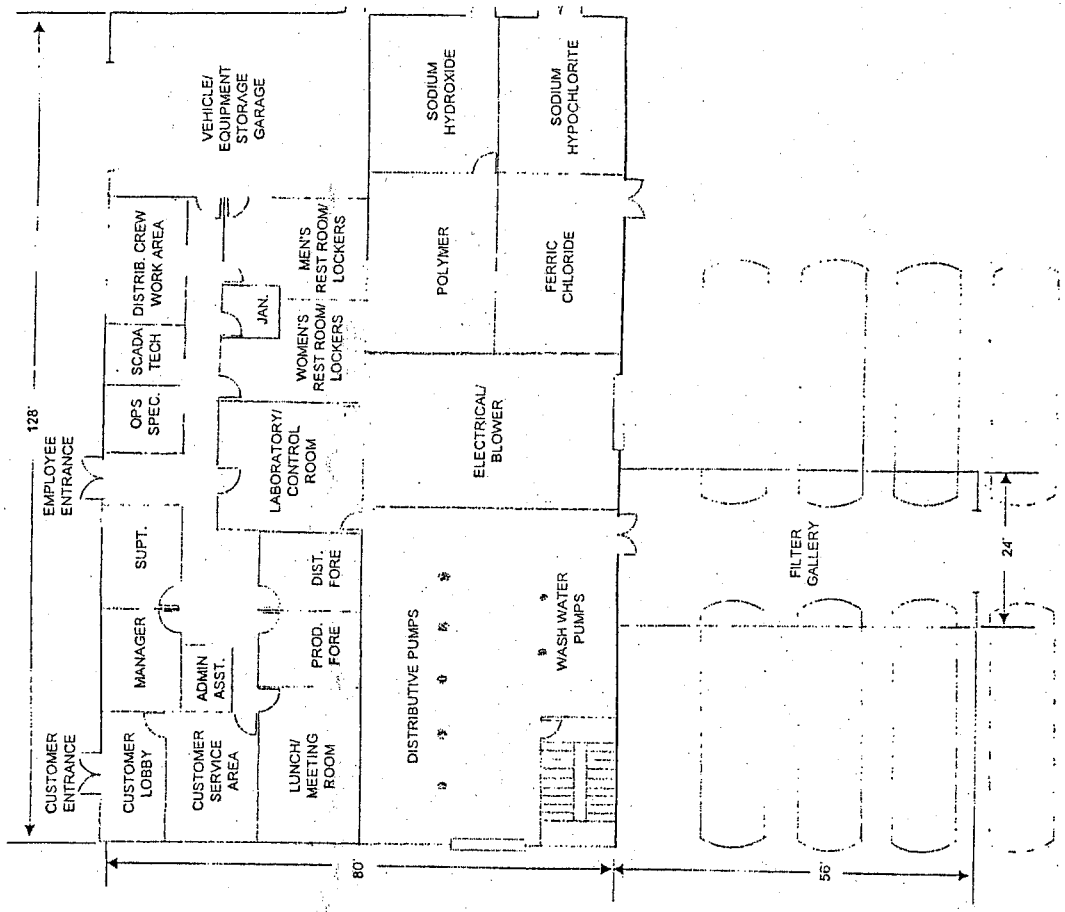
Proposed Building Layout

American Water



N

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DSWA

AZAW000228

Neighborhood Interviews

American Water

- Visual Impact
  - ※ Architecture
  - ※ Landscaping
- Noise Impact
- Traffic
- Utility Routing
- Zoning

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Visual Issues

American Water

- Neighbors contacted to date have indicated that the facility should be enclosed by a wall
- The fence and building architecture should capture the rural character of the surrounding neighborhood
- The facilities visible from Cattletrack Road should have the appearance of a home

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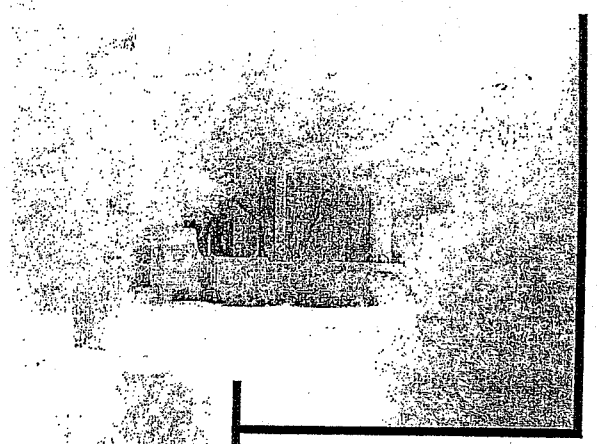
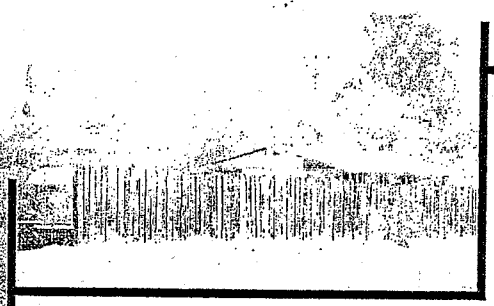
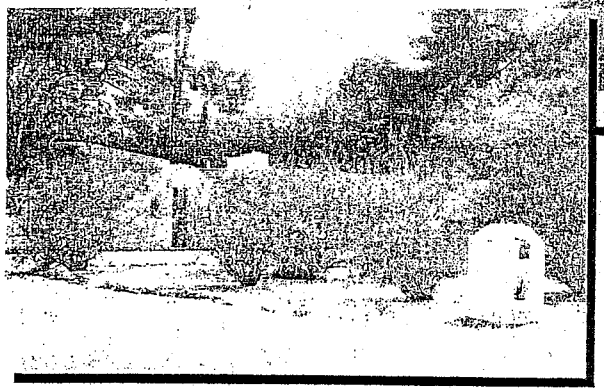
Architecture

American Water

- The architectural character of the proposed building should blend in with the surrounding community







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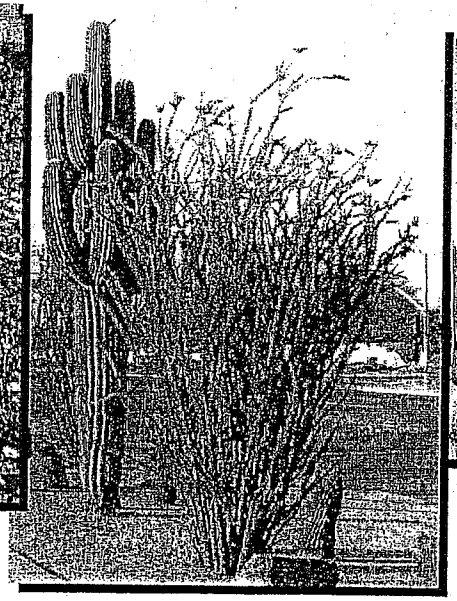
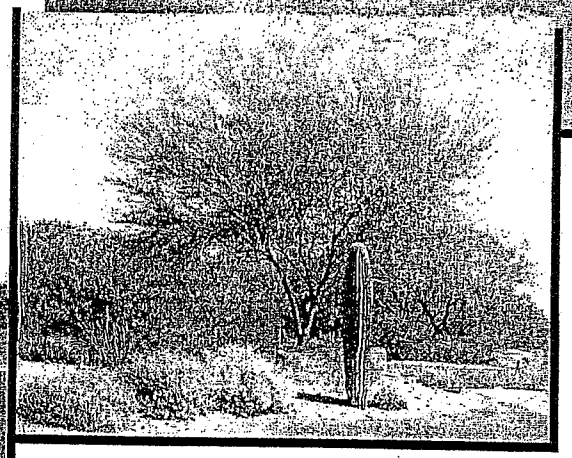
Landscaping

American Water

- The existing mesquite trees along canal should remain





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Noise Issues

American Water

- Noise Study commissioned to determine existing ambient levels
- Neighbors have indicated that noise generated during pump start up is bothersome

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Utility Routing

American Water

- The utility routing should not disturb the mature mesquite trees that exist adjacent to the canal
  - Proposed alternative alignment to avoid damage to the trees
  - Alternative alignment
    - Along the east side of Cattletrack Road in an existing utility easement
    - Continuation of pipe along existing alignment

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Zoning Issues

American Water

- Portion of property currently zoned Special Campus (SC) – Historic Property (HP)
- Original zoning was R1-43
- Property used to provide sufficient acreage to meet the SC – HP zoning requirements
- Zoning ordinance has been modified and additional acreage is no longer required

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Zoning Issues

American Water

- SC-HP zoning does not allow for proposed use
- Requesting zoning change back to R1-43
- R1-43 zoning classification requires a Use Permit

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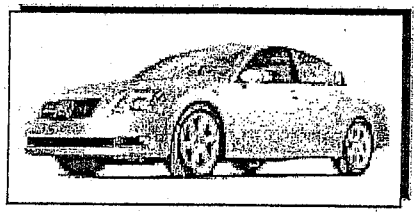
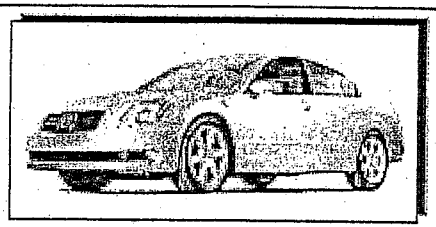
DSWA

Anticipated Traffic Impacts

American Water

Traffic Type	Example	# of Trips
Customer		3 per weekday
Employee/Plant Operators		24 per weekday

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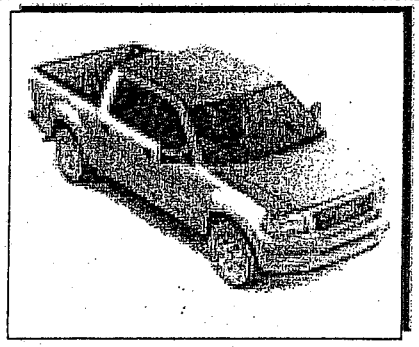
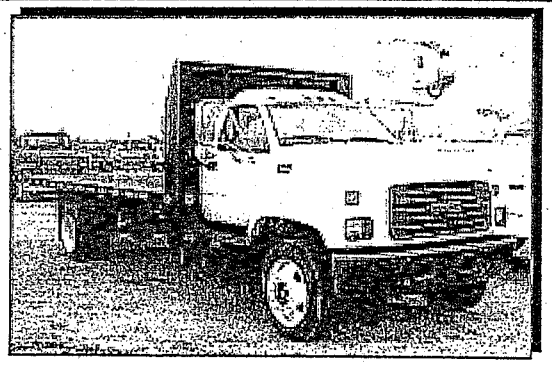
Anticipated Traffic Impacts

American Water

Traffic Type	Example	# of Trips
Employee		4 per weekday
Solids Hauling		1 per week

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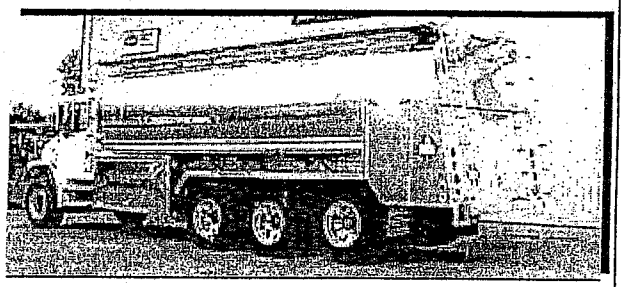
Anticipated Traffic Impacts

American Water

Traffic Type	Example	# of Trips
Chemical Delivery		6 per month

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Traffic Impact Summary

American Water

- Cattletrack Road classified as minor collector
- Existing traffic volume is 1,836 vehicles per day
- Traffic increase due to PVARF will be approximately 31 vehicles per day (< 2%)
- Total future traffic volume 1,867 vehicles per day

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Architectural Concept Planning

Americap Water

- Samples of Local Architecture
- 'Cartooning' by Michael Willis

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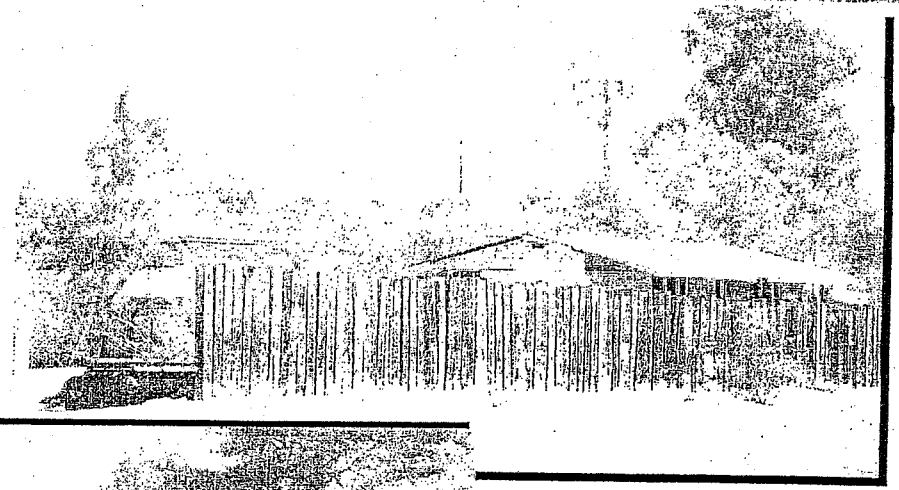
Local Architecture

American Water



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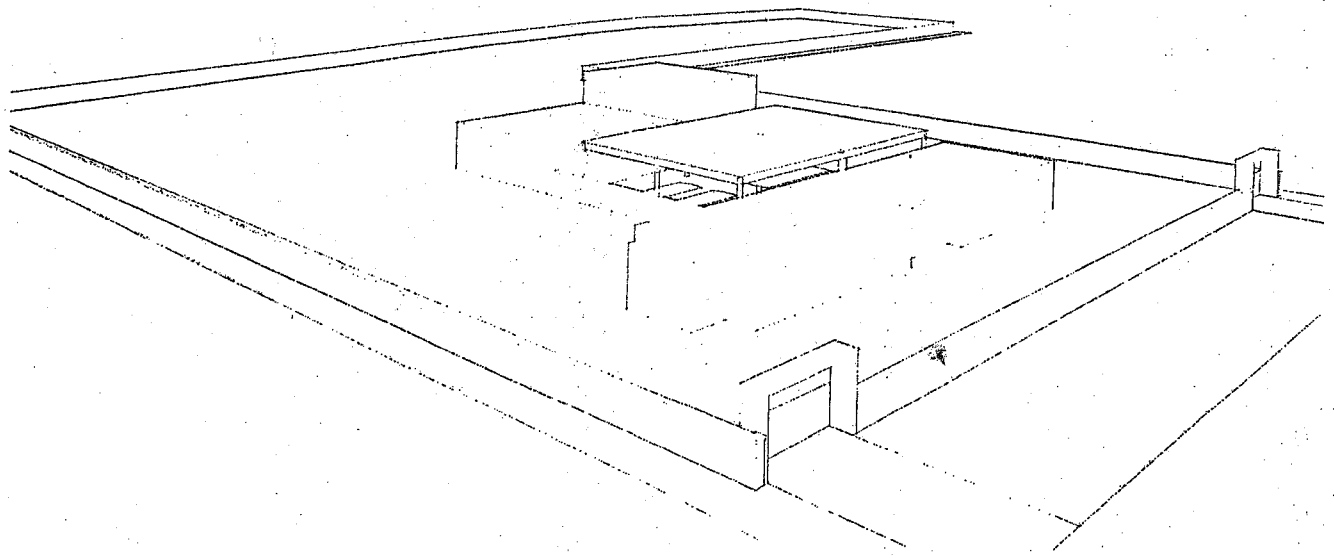
DSWA

Aerial Sketch Views

American Water



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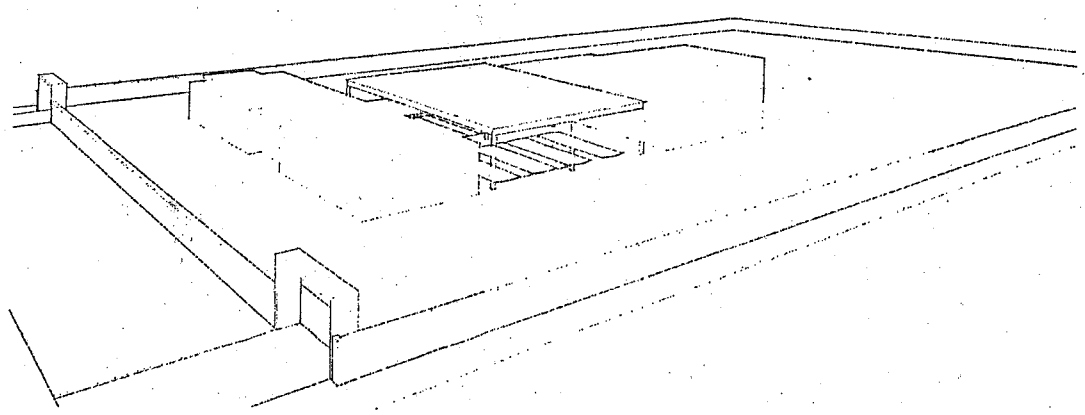
Aerial Sketch Views

American Water



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DSWA

Summary

American Water

- Recap of Key Issues/Direction
  - Concurrent processing of Rezoning Application and Use Permit
- Other Sources of Information

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Summary

American Water

- Future Meetings and Hearings
  - Future neighborhood meeting prior to Planning and Zoning hearing
  - City Planning and Zoning Commission
    - Rezoning Application Hearing (approx. October 2004)
    - Use Permit Hearing (approx. October 2004)
  - City Council (November/December 2004)
  - Design Review Board

RWE GROUP

DL Norton

DSWA

APPENDIX E

Postage
Required

Partners for Strategic Action, Inc.
13771 Fountain Hills Blvd.
Suite 360
Fountain Hills, AZ 85268

Paradise Valley Arsenic Removal Facility
Neighborhood Meeting 1 - August 5, 2004

Your Comments Please

_____

_____

_____

_____

_____

_____

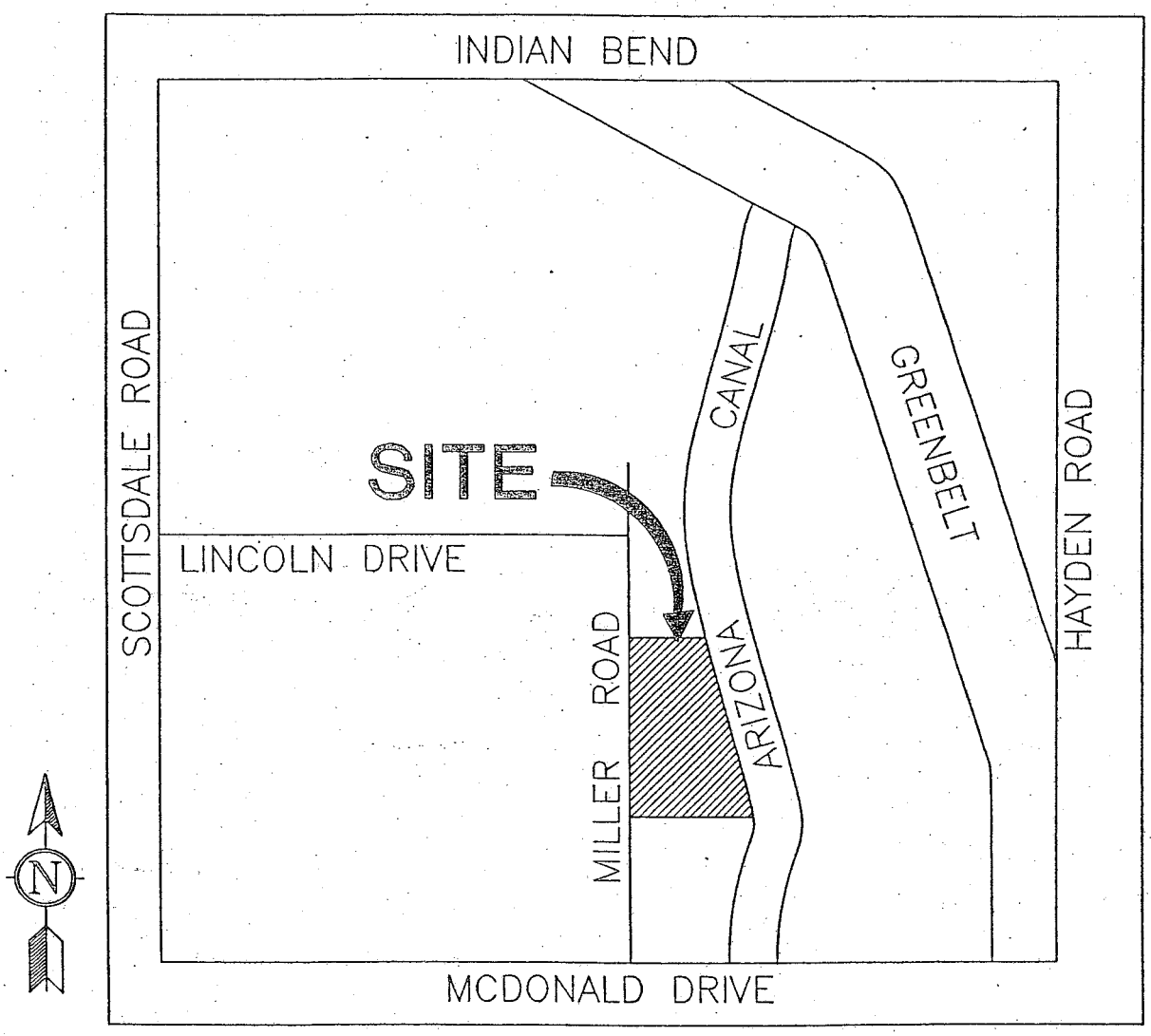
_____

_____

_____

Thank You!

APPENDIX F



VICINITY MAP

NTS

Paradise Valley Arsenic Removal Facility
Fact Sheet

In January 2000, the Environmental Protection Agency (EPA) lowered the drinking water Maximum Contaminant Level (MCL) for arsenic, the maximum level allowed to be served to the public, from 50 µg/L to10 µg/L. Arsenic is naturally occurring in many of the soils that contact groundwater, particularly throughout the Southwestern U.S. All water systems serving the public are required to achieve compliance with the new arsenic MCL by January 23, 2006.

Arizona American Water (formerly Paradise Valley Water Company) owns and operates the water system serving portions of the Town of Paradise Valley and the City of Scottsdale (COS). Water is supplied from a total of seven wells located throughout the service area. . Due to the wells' naturally occurring arsenic levels, treatment is required to ensure that arsenic concentrations in the finished water will be consistently below the pending MCL.

The Paradise Valley Arsenic Removal Facility (PVARF) will be designed and constructed under this contract. The project will be delivered using the design-build process. The design-build team of DL Norton and DSWA will perform the work.

The PVARF will be constructed adjacent to the existing water storage and booster pumping facility on Cattletrack Road approximately 1200 feet north of MacDonald Drive. This facility will consolidate water from multiple well sources and treat the water using a coagulation-filtration process in a split stream mode of operation to produce a blended water quality containing not more than 8 µg/L of arsenic. The treatment process is very similar to that mployed for removal of iron from groundwater, and has been demonstrated to effectively remove arsenic to evels well below the new standard. The design will be able to meet Arizona American Water Company's stated performance goals as follows:

- Finished water arsenic concentration < 8 µg/L (even if up to a 20% increase in concentration occurs in the source water)
- Finished water free chlorine 1.0 – 2.0 mg/L
- Non-corrosive water, which will meet Lead and Copper rule requirements and minimize scale deposition
- Less than the secondary MCL concentrations for iron and manganese
- Fully automated, unattended operation
- Backup power to operate at 50% capacity
- Aesthetic pleasing exterior architectural design
- Minimization of capital and O&M costs including waste disposal

In addition to the treatment process component, the project will include an administrative facility with a customer service area, finished water storage, backwash recovery facilities and an equipment storage area. New raw and finished water transmission mains will be constructed to convey water from the existing Miller Road Treatment Facility south of MacDonald Drive to/from the proposed PVARF.

Arizona-American Water
Paradise Valley Arsenic Removal Facility
Contact List

Arizona-American Water (AAW)

Ashcroft, Aaron L. (AAWC)
19820 N. St., Suite 201
Phoenix, AZ 85024
Bus: (623) 445-2418
Bus. Fax: (623) 445-2454
E-mail: aashcroft@amwater.com

Campbell, Jim (AAWC)
7500 E. McDonald Dr., Suite 102A
Scottsdale, AZ 85252
Bus: (623) 445-2462
Bus. Fax: (480) 483-8314
E-mail: jcampbel@amwater.com

DL Norton

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7730 E. Evans Rd.
Scottsdale, AZ 85260-3410
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Bus. Fax: (480) 998-3921
E-mail: cnorton@dlnorton.com

Damon S. Williams Associates (DSWA)

McCandless, Robert R. (DSWA)
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Bus. Fax: (602) 265-5632
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E-mail: cclose@dswa.net

Partners for Strategic Actions (PSA)

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Dunham, Curtis L. (PSA)
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E-mail: psainc@cox.net

AZAW000251

APPENDIX G

Paradise Valley Arsenic Removal Facility
Neighborhood Meeting#1
Meeting Summary Notes

Date: **August 5, 2004; 5:30 p.m. to 7:00 p.m.**
Location: **Hilton Scottsdale Resort and Villas**
6333 N. Scottsdale Road
Scottsdale, AZ 85250

Attendees:
Bernie Gonzales, 6349 N. Cattletrack
John Hink, 6301 N. 75th Street
Lance Donatell, 6370 N. 78th Street
Tom Kaufman, 7520 E. Whispering Winds Road
Richard Moore, Paradise Valley Operations Superintendent Arizona American Water Company
Damon Williams, Damon S. Williams Associates
Rob McCandless, P.E., Damon S. Williams Associates
Chip Norton, D.L. Norton General Contracting
Christine Close, Damon S. Williams Associates
Peggy Fiandaca, Partners for Strategic Action, Inc.
Tim Friday, Arizona American Water
Aaron Ashcroft, Arizona American Water
Robert Bessett, Damon S. Williams Associates
Michael Willis, Willis Architects

Handouts:
Paradise Valley Arsenic Removal Facility Fact Sheet
Vicinity Map
Project Contact List

Peggy Fiandaca, Moderator welcomed everyone and thanked them for their interest and participation in the meeting. She explained that the purpose of the neighborhood meeting was to present the proposed project and solicit feedback regarding the proposal and ideas for making modifications. Everyone introduced themselves.

Rob McCandless, Project Manager with DSWA gave an overview of the Paradise Valley Arsenic Removal Facility project. He mentioned that the DSWA has been hired by Arizona American Water Company in collaboration with D.L. Norton to design/build the facility. Arizona American Water Company (formerly Paradise Valley Water Company) owns and operates the water system serving portions of the Town of Paradise Valley and the City of Scottsdale. The project is a result of new requirements by Environmental Protection Agency (EPA). In January 2000 the EPA lowered the drinking water

Maximum Contaminant Level (MCL) for arsenic, the maximum level allowed to be served to the public, from 50 μg/L to 10 μg/L. Rob explained that arsenic is naturally occurring in many of the soils that contact groundwater, particularly throughout the Southwestern U.S. All water systems serving the public are required to achieve compliance with the new arsenic MCL by January 23, 2006.

The purpose of the meeting was to discuss the project with neighborhood interests to understand their potential concerns or issues. Following is a summary of their comments and questions.

Questions Discussed

How much arsenic is going to be removed?

Do you know what is going on at the Hayden and McDonald site? Are there any connections to this project?
Answer: The Hayden/McDonald facility is a surface water treatment plant. This site is treating well water. The projects are not related.

What type of noise issues are we talking about? What the difference between the noise currently at the site and in the future?
Answer: The noise should not be a factor as all equipment will be housed in buildings. The noises currently heard at the site are from air relief valves and pumps during start-up.

Will the old booster pumps remain?
Answer: No they will be removed. The wells will remain.

The one pump with a big transformer near my property (BJ Gonzales), can you move it or contain it in some way?
Answer: Yes we are examining ways to contain it. There will be a masonry wall around the whole pad.

Does the water come to this facility first before the plant on the Southside of McDonald?
Answer: Yes

Where is the distribution entry point?
Answer: There are three existing points of entry at this time along Miller/Cattletrack Road

Can you build this facility at the McDonald site instead?
Response: Arizona American Water investigated this suggestion and found that it was not feasible. The needs of the facility could not be accommodated on that site.

Are you going to remove the gas canisters? The current situation seems dangerous.
Answer: Yes

What are the concentration levels?
Answer: 12.5%

What chemicals will be trucked off site?
Answer: None

Are there any fumes from these chemicals?
Answer: NaOCL could emit with heat. Room will be air conditioned.

You are not going to use sand and membrane filters?
Answer: Sand filters will be used.

The water is drinking water, right?
Answer: Groundwater used for drinking water.

Is the height measured off the slab? Can the height be lowered?
Answer: The building heights will vary by type. Maximum height of 24 feet.

How high is the TCE Stripper at the McDonald Road Treatment Facility? Please send me an e-mail with the answer. My concern is with the height. (John Hink)
Answer: E-mail was sent to Mr. Hink on August 17th explaining the total building height is approximately 45 feet above finished grade. This height is measured to the top of the air stripper enclosures.

Does Arizona American Water own the property south of the basin? Is that Janie Ellis' property next to the property?
Answer: No, the property belongs to Janie Ellis.

What is the height of the perimeter wall?
Answer: It is intended to be an 8' perimeter wall that surrounds the entire site with a 10' area from the property line for landscaping. The wall and landscaping will serve as the main visual block from Cattletrack.

Where exactly are the property lines? Where are the boundaries of the zoning lines?
Answer: Shown using graphics

Can you lower the tank heights? Can they put underground a bit?
Answer: It is possible, if necessary.

Shrubs are along the canal right where the new tanks will be, right?
Answer: Yes

Can the entire area be totally screened with a 6' wall near my property (BJ Gonzales)?
Answer: The facility and well 16 will be enclosed.

In the area that you showed a screen cover over equipment can that area be totally enclosed?
Answer: It is not needed and an unnecessary cost that would be passed on to consumers.

Is there anything other than electronics that would need to be covered or protected from the sun in this location?
Answer: Everything will be covered except the filter.

Can you see the canopy from the road?
Answer: Yes

Will the filters be visible from the road?
Answer: Yes, a portion.

What is going to happen on the unimproved area of this site?
Answer: AAW is considering a selling the property.

Is there going to be any impacts on noise and pollution during the construction phase?
Answer: The construction company is very diligent to control dust and noise. There is a criterion that must be met for noise and the company will stay within that criteria. The City of Scottsdale mandates hours of operation during construction.

What type of equipment will be used during construction?
Answer: This is a typical construction site. There will not be large cranes like at the McDonald site. There will be back hoes and water trucks. It is a construction site. There will not be any blasting.
Is there a phasing for the construction (i.e., do the buildings or tanks go first)?
Answer: Due to the very tight timeframe, everything will be done simultaneously.

Are the tanks steel?
Answer: Yes.

Comments
Following are comments made by the residents in attendance. The comments are not intended to represent a consensus of the participants' comments, but a summary of the input received.

Wall

- Break up the look of the perimeter wall
- Build something more than just a block wall; maybe incorporate another material like iron
- Make the wall decorative
- The 8' wall may be too high if it remains a stark wall, but maybe bring the block portion down to 6' and include a mix of materials up to the 8' height

- I have no problem with the height of the 8' wall because the setback from the street is so large; the landscaping in the setback will lessen the visual impact of the wall
- Develop a dense cactus garden so I won't even see the wall
- Must care should be given to the design of the wall; consider adobe

Architecture

- The architecture of the buildings should blend into the neighborhood
- It should not stand out
- The other facility on McDonald looks like a presidio; it does not have landscaping to soften the look
- Use landscaping to soften the look of the buildings
- The height of the back buildings might be an issue. However, if the tanks are no larger than what exists today then that will be okay.
- Consider incorporating Ocotillos into the shade structure (similar to Tom Kaufman's home)
- Do not want an industrial or commercial looking building in this area

Landscaping

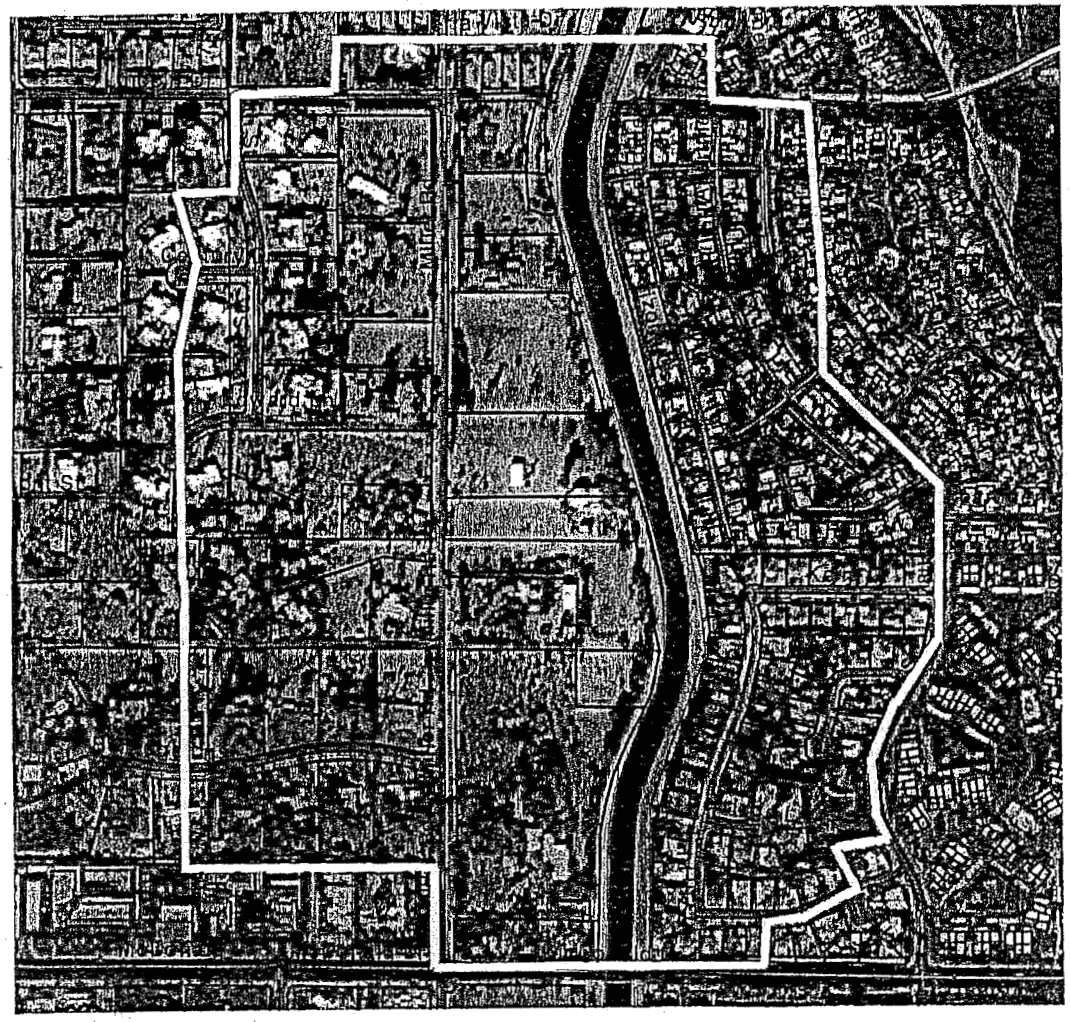
- If the trees must be removed along the canal, you will have a real problem; these trees must be kept to act as a screen
- Along Cattletrack, add massive interesting landscaping and trees to break up the massing of the wall
- Across the canal looking at the site is not a problem if the trees remain
- Along Cattletrack the landscaping should be an intense cactus garden so as I drive along the road I only see beautiful landscaping and not what is behind the wall;
- Don't make the landscaping so perfect, just intense with cactus
- Off center the landscaping along the wall

Other Issues

- In the first 30' setback from Cattletrack, need to continue the meandering pathway; it should be a natural path keeping the rural theme of the area
- The color palette – the darker the better

The meeting was adjourned at approximately 7:10 p.m.

APPENDIX H



Limits of Citizen Notification

Citizen Notification Map

PARADISE VALLEY ARSENIC TREATMENT PLANT – LETTER RECIPIENTS

ADAMS, CHARLES P
7538 E BERRIDGE LN
SCOTTSDALE, AZ 85260

ANDERSON, SANDRA L
6350 N 78TH ST #287
SCOTTSDALE, AZ 85250

ANDRAS, JAMES T & CHRISTINE E
7511 E BERRIDGE LN
SCOTTSDALE, AZ 85250

ARP, WILLIAM J
6451 N 77TH WAY
SCOTTSDALE, AZ 85250

BAAS, THOMAS R & LESLIE K
5 NORRIS
BURR RIDGE, IL 60521

BACON, STEVE E
6350 N 78TH ST 297
SCOTTSDALE, AZ 85250

BARTLETT, STEPHEN C
7728 E ROSE LN
SCOTTSDALE, AZ 85250-4724

BASILONE, ELINORE A
6350 N 78TH ST
SCOTTSDALE, AZ 85253

BASTEN, ROBERT J & TIFFENY E
6350 N 78TH ST, #283
SCOTTSDALE, AZ 85250

BERMAN, RALPH & JACQUELINE
7649 E SIERRA VISTA DR
SCOTTSDALE, AZ 85250

BERNARD, MARYANNE D
6350 N 78TH ST NO 291
SCOTTSDALE, AZ 85250

BERNARD, NICHOLAS W
6234 N CATTLERACK RD
SOTTSDALE, AZ 85250

BERTRAM, DIANA M
PO BOX 5535
SCOTTSDALE, AZ 85261

BONE, ALLAN N
7512 E BERRIDGE LN
SCOTTSDALE, AZ 85250

BOULINEAU, FRED
5514 E ANGELA DR
SCOTTSDALE, AZ 85254

BRANDE, PATRICK W
6350 N 78TH ST 296
SCOTTSDALE, AZ 85250

BRINTON, MICHAEL JOHN
6026 N 77TH PL
SCOTTSDALE, AZ 85250

BROCE, MARY LOU
P O BOX 4986
SCOTTSDALE, AZ 85261

BURTON, EWA J
6350 N 78TH ST
SCOTTSDALE, AZ 85253

BUSSEUIL, SUZANNE K
6132 N 77TH PL
SCOTTSDALE, AZ 85250

BYRD, JOHN EDWARD
6350 N 78TH ST #305
SCOTTSDALE, AZ 85250

CALDWELL, TWILA
7740 E ROVEY AVE
SCOTTSDALE, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

CAN CAMP, ROGER A
6350 N 78TH ST, #275
SCOTTSDALE, AZ 85253

CAPALDI, PATRICIA C
7770 E ROSE LN
SCOTTSDALE, AZ 85253

CASE, SCOTT B
6460 N 77TH WAY
SCOTTSDALE, AZ 85250

CHALMERS, KAREN C
7734 E ROVEY AVE
SCOTTSDALE, AZ 85251

CHOTIN, MORRIS & ELAYNE
962 WYNHAVEN
BALLWIN, MO 63011

CLANCY, MICHAEL & LENORE E
7734 E BERRIDGE LN
SCOTTSDALE, AZ 85250

COCHRAN, ROBERT E & EHRET PAUL
6270 N 78TH ST 325
SCOTTSDALE, AZ 85250

COHEN, RUTH
LINCOLN PLACE
7419 E. CACTUS WREN RD.
SCOTTSDALE, AZ 85250

COLEMAN, MARIAN D
7524 E BERRIDGE LN
SCOTTSDALE, AZ 85253

COMPTON, RALPH S
2519 E JASMINE CIR
MESA, AZ 85213

COOLEY, TIMOTHY F & ROSE M
6032 N 77TH PL
PHOENIX, AZ 85250

COPE-HANEY, MARY MALLORY
6462 N 77TH PL
SCOTTSDALE, AZ 85250

COTNER, CHRISTY A
6270 N 78TH ST UNIT 323
SCOTTSDALE, AZ 85253

COTTER, RICHARD E & MARGARET
6448 N 77TH PL
SCOTTSDALE, AZ 85250

COYNE, SANDRA DEE
6008 N 77TH PL
SCOTTSDALE, AZ 85250

CRIMMINS, C JAMES & MELVA R
19802 N 32ND ST #37
PHOENIX, AZ 85050

CRONIN, MARGARET
7600 LINCOLN HOMEOWNERS ASSOCIATION
7539 E. TUCKEY LN.
SCOTTSDALE, AZ 85250

CURTIS, KEITH & MARLA
6350 N 78TH ST UNIT 316
SCOTTSDALE, AZ 85250

DAVIS, JON C & CINDY M
7746 E VALLEY VISTA
SCOTTSDALE, AZ 85253

DICKIE, BILL K & JOANNE M
7800 E LINCOLN DR, #1102
SCOTTSDALE, AZ 85250

DODSON, JOAN
6437 N 77TH WAY
SCOTTSDALE, AZ 85250

DUBIE, DAVID J
6450 N 78TH ST #212
SCOTTSDALE, AZ 85253

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

DUGAS, SR., JOHN F
6350 N 78TH ST #271
SCOTTSDALE, AZ 85253

DURHAM, ANDREA J
6349 N 78TH ST UNIT 81
SCOTTSDALE, AZ 85253

EISELE, NEELY A & JUDITH E
6350 N 78TH ST 304
SCOTTSDALE, AZ 85253

EWBANK, RICHARD W & JUDITH
7752 E ROSE LN
SCOTTSDALE, AZ 85253

FANCY, THOMAS A & BONITA L
16 CUTLER DR
SAVANNAH, GA 31419

FERA, ANN & ELIZABETH ASHLEY
6350 N 78TH ST UNIT 314
SCOTTSDALE, AZ 85250

FERGUSON, ROGER & SYBIL
PO BOX 519
REXBURG, ID 83440

FERNEDING, MICHAEL T
P O BOX 64011
TACOMA, WA 98464

FILLER, CHARLES A
7721 E VALLEY VISTA LN
SCOTTSDALE, AZ 85250

FORNEY, DAVID E
6270 N 78TH ST, #329
SCOTTSDALE, AZ 85250

FRANSEN, DENNIS R & CHERYL M
2930 PALM DR
BILLINGS, MT 59102

FRAZER, WILLIAM R & LAURA
6464 N 77TH WY
SCOTTSDALE, AZ 85253

FRIEDMAN, ANNE G
7740 E BERRIDGE LN
SCOTTSDALE, AZ 85253

FUJIMOTO, HARRY KENICHI & CLA
6422 N 77TH WAY
SCOTTSDALE, AZ 85250

FULLER, PATRICIA A
6431 N 77TH PL
SCOTTSDALE, AZ 85250

FULTON, BRAD & JONI E
7734 E ROSE LN
SCOTTSDALE, AZ 85253

FUQUA, MARJORIE ROBIN
7631 E SIERRA VISTA DR
SCOTTSDALE, AZ 85250

GAIMARI, PATRICK G
7442 E CENTURY DR
SCOTTSDALE, AZ 85250

GIFFIN, RICHARD G & LAURA L
6102 N 77TH PL
SCOTTSDALE, AZ 85253

GILMORE, MARCIA C
6123 N 77TH PL
SCOTTSDALE, AZ 85053

GIULIANO, JOHN T & CLARA M
308 COMMERCE DR, #A
FORT COLLINS, CO 80524-2759

GLENN, GARRETT D & KAREN L
7731 E VALLEY VISTA LN
PHOENIX, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

GLESSING, ORIVLLE G & LEWIS
6350 N 78TH ST
SCOTTSDALE, AZ 85250

GONZALES, BARNEY J
6349 N CATTLETRACK RD
SCOTTSDALE, AZ 85250

GOODLOE, NANCY KING & JAMES C
6350 N 78TH ST 254
SCOTTSDALE, AZ 85250

GRAHAM, ROBERT A
6270 N 78TH ST #332
SCOTTSDALE, AZ 85253

GRANT, ROGER LEE & STEPHANIE
6002 N 77TH PL
SCOTTSDALE, AZ 85253

GRAWET, LARRY D & SANDRA E
1302 AMETHYST APT A
REDONDO BEACH, CA 90277

GROSDIDIER, MARY C
6350 N 78TH ST 339
SCOTTSDALE, AZ 85253

GROSS, BRUCE H & ROBERT C
3401 MANCHESTER COMMON
FREMONT, CA 94536

GULATTO, PETER J & ROSEMARIE
7734 E VALLEY VISTA
SCOTTSDALE, AZ 85253

GULINO, DAVID G
6127 N 77TH PL
SCOTTSDALE, AZ 85250

GULNAC, GABRIELE JILL
6350 N 78TH ST 274
SCOTTSDALE, AZ 85250

HAJ, MOHAMMAD K
6105 N 77TH ST
SCOTTSDALE, AZ 85250

HALL, STANLEY R & NIKKI L
7628 E EDGEMONT AVE
SCOTTSDALE, AZ 85257-1631

HANNAH, STANLEY L & BETTY M
#5 MARTIN LN
ENGLEWOOD, CO 80110

HANSON, LYNN
6350 N 78TH ST 281
SCOTTSDALE, AZ 85250

HAUSHER, NANCY JEAN
7743 E ROSE LN
SCOTTSDALE, AZ 85253

HEARN, LAUREN
6466 N 77TH PL
SCOTTSDALE, AZ 85250

HEICHBERGER, RICHARD A
7731 E ROSE LN
SCOTTSDALE, AZ 85250

HELTEMES, LEON T & COLLEEN
5201 E CHARTER OAK RD
SCOTTSDALE, AZ 85254

HEMBROCK, ROBERT W
6350 N 78TH ST UNIT 279
SCOTTSDALE, AZ 85253

HENDERSON, ROY S & DIANN C
6337 N 75TH ST
SCOTTSDALE, AZ 85250

HERMANN, HANS & UTE
27471 VIA SEQUOIA
SAN JUAN CAPISTRANO, CA 92675

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

HEVLE, LYMAN C & BETTY A
8348 E VIA DE LOS LIBROS
SCOTTSDALE, AZ 85258-3202

HICKS, SABRINA & STEPHEN
43 STERLING CT
HUNTINGTION, NY 11743

HINK, JOHN A. & MEGAN
6301 N 75TH ST
SCOTTSDALE, AZ 85250

HINOJOSA, DOMINIQUE
6350 N 78TH ST #264
SCOTTSDALE, AZ 85250

HOLT, LOIS G
6452 N 77TH WAY
SCOTTSDALE, AZ 85250

HOSNER, DONALD L & BARBARA
6349 N 78TH ST #88
SCOTTSDALE, AZ 85253

HUNTER, FAITH L
5414 FOREST HIGHLANDS CT
WESTERVILLE, OH 43082

ILLINGWORTH PIERCE, LOUISE
6421 N 77TH WAY
SCOTTSDALE, AZ 85250

JACQUES, WILFRED G & ARLETTA
6020 N 77TH PL
SCOTTSDALE, AZ 85283

JAY, JOHN C & PAULINE F
7770 E VALLEY VISTA LN
SCOTTSDALE, AZ 85250

JERVIS, JR., JOEL R
6350 N 78TH ST NO 258
SCOTTSDALE, AZ 85250

JOHNSON, PETER R
6349 N 78TH ST 80
SCOTTSDALE, AZ 85253

JOHNSON, REID & SHERRY
22111 27TH AVE SE
MAPLE VALLEY, WA 98038

JOHNSTON, DEDE
BRIARWOOD II HOMEOWNERS
ASSOC.
7344 E. KEIM DR.
SCOTTSDALE, AZ 85250

JOHNSTON, DOROTHY J
6350 N 78TH ST 298
SCOTTSDALE, AZ 85250

JONES, JANIE ELLIS
105 CATTLE TRACK RD
SCOTTSDALE, AZ 85250

JONES, JANIE ELLIS
6226 N CATTLETRACK RD
SCOTTSDALE, AZ 85250

JONES, ROBERT C & B JOAN
7752 E VALLEY VISTA LN
SCOTTSDALE, AZ 85253

JOSEPH, STEWART M
PO BOX 32034
PHOENIX, AZ 85064

JOSEPH, JR., JACK
6350 N 78TH ST #269
SCOTTSDALE, AZ 85250

JOUSAN, C MIKE & VICKY
6450 N 79TH ST #217
SCOTTSDALE, AZ 85253

KALFAYAN, SARKIS Y & OVSANNA
7761 E VALLEY VISTA LANE
SCOTTSDALE, AZ 85253

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

KAUFMAN, THOMAS R & CHRYSA L
7520 E WHISPERING WINDS RD
SCOTTSDALE, AZ 85250

KEMPNER, SANDRA
7523 E BERRIDGE LN
SCOTTSDALE, AZ 85253

KING, RONALD J
6350 N 78TH ST
SCOTTSDALE, AZ 85250

KLOENNE, JAY, TIMOTHY, JANI
6442 N 77TH WY
SCOTTSDALE, AZ 85250

KRAMER, WM T & MARIE J
6349 N 78TH ST, #77
SCOTTSDALE, AZ 85250

KROPP, DANIEL P
7526 E WHISPERING WINDS DR
SCOTTSDALE, AZ 85250

KUEFFNER, KIRSTEN K
16658 N 106TH WY
SCOTTSDALE, AZ 85255

LAHAYE, LIZ
7758 E ROVEY
SCOTTSDALE, AZ 85250

LANDON, LINDA JILL
6454 N 77TH PL
SCOTTSDALE, AZ 85250

LARE-TYLER, DANIEL H
6433 N 77TH ST
SCOTTSDALE, AZ 85250

LAUERSDORF, CINDY
6270 N 78TH ST
SCOTTSDALE, AZ 85250

LAVENDER, CAREY MACK
6441 N 77TH WAY
SCOTTSDALE, AZ 85250

LENDVAI, JOHN C & JUANITA M
7722 E VALLEY VISTA LN
SCOTTSDALE, AZ 85253

LESSER, GARY
BRIARWOOD II HOMEOWNERS ASSOC.
7302 E. VALLEY VISTA DR.
SCOTTSDALE, AZ 85250

LEVIN, DANIEL W
7752 E ROVEY AVE
SCOTTSDALE, AZ 85250

LEVY, JASON M
6424 N 77TH PL
SCOTTSDALE, AZ 85250

LEWIS, THOMAS M
6350 N 78TH ST NO 290
SCOTTSDALE, AZ 85250

LIEBERMAN, DAVID L & MARTHA T
4413 N 62ND ST
SCOTTSDALE, AZ 85251-1912

LUKE, K D, SHEILAH ROSE, VERNON
6350 N 78TH ST NO 317
SCOTTSDALE, AZ 85250

LUU NICK & NGUYEN THERESA
6233 N 75TH ST
SCOTTSDALE, AZ 85250

LYSCIO, SCOTT G
6350 N 78TH ST, #295
SCOTTSDALE, AZ 85250

MALUDA, MIROSLAV & JULIA
6044 N 77TH PL
SCOTTSDALE, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

MANCOUR, LAREE
6270 N 78TH ST 328
SCOTTSDALE, AZ 85250

MANZONE, DOMENICO J &
GABRIELLE
6350 N 78TH ST NO 268
SCOTTSDALE, AZ 85250

MARANTETTE, THOMAS L
13654 RONNIE WAY
SARATOGA, CA 95070-5153

MARTIN, STEPHEN & IRMA
7667 E SIERRA VISTA DR
SCOTTSDALE, AZ 85250

MATTINGLY, CHRIS
6426 N 77TH WAY
SCOTTSDALE, AZ 85250

MATTINGLY, L GEORGE & JENNIFER
10040 N 78TH PL
SCOTTSDALE, AZ 85258

MCCARTHY, MARJORIE C & CHRIST
7749 E ROSE LN
SCOTTSDALE, AZ 85250

MCGOOKIN, MICHAEL J
1579 LINCOLN ST 111
SAN RAFAEL, CA 94901

MCGOWAN, ALISON H
6270 N 78TH ST 330
SCOTTSDALE, AZ 85250

MCKALLOR, JON PATRICK & TRICIA
7758 E VALLEY VISTA LN
SCOTTSDALE, AZ 85250

MCKINLEY, PATRICIA L & MICH
7439 E EDWARD ST
SCOTTSDALE, AZ 85253

MCMAHON, DAVID H
6350 N 78TH ST NO 257
SCOTTSDALE, AZ 85250

MCQULLIN, DAWN A
6350 N 78TH ST NO 270
SCOTTSDALE, AZ 85250

MEADOR, DOUGLAS WAYNE & PATRI
6465 N 77TH PL
SCOTTSDALE, AZ 85250

MEDEROS, PATRICIA M
6350 N 78TH ST
SCOTTSDALE, AZ 85243

MIHOK, DOROTHY C
6350 N 78TH ST #272
SCOTTSDALE, AZ 85250

MILLS, WILLIAM E & EVELYN M T
6349 N 78TH ST UNIT 71
SCOTTSDALE, AZ 85250

MISHEK, JAMES & LORINDA
7800 E LINCOLN DR., #1104
SCOTTSDALE, AZ 85250

MITCHELL, STEPHEN F & SHERR
6117 N 77TH PL
SCOTTSDALE, AZ 85253

MORKEN, KATHLEEN R
6350 N 78TH ST 276
SCOTTSDALE, AZ 85250

MOTZ, JANE RUTH
6100 N 78TH ST
SCOTTSDALE, AZ 85253

MURPHY, KRISTOPHER RYAN
6457 N 77TH PL
SCOTTSDALE, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

MUUSERS & DANA BALL, SUZANNE
6350 N 78TH ST NO 259
SCOTTSDALE, AZ 85250

NATHAN, WALTER & GLORIA B
7719 E ROVEY AVE
SCOTTSDALE, AZ 85257

NESVIG, ERIC P & NANNETTE M
6144 N 77TH PL
SCOTTSDALE, AZ 85250

NEWHOUSE, KAY D
6350 N 78TH ST, #301
SCOTTSDALE, AZ 85250

NOTHMAN, JERRY & CORRINE
1533 NE SISKIYOU ST
PORTLAND, OR 97212

NOVAK, JAY PERRY
6447 N 77TH PL
SCOTTSDALE, AZ 85250

OLSON, KAREN S
6450 N 78TH ST #239
SCOTTSDALE, AZ 85253

OTONDO, PATRICIA M & JOSEPH Y
7878 E GAINEY RANCH RD 8
SCOTTSDALE, AZ 85258-1755

OTONDO, CATHERINE M
6313 N 75TH ST
SCOTTSDALE, AZ 85253

OTTOSEN, GLEN R & BONNIE L
7440 E EDWARD LN
SCOTTSDALE, AZ 85250

OWEN, WANDA L
6350 N 78TH ST UNIT 278
SCOTTSDALE, AZ 85250

PADRON, CRISTINA L
6270 N 78TH ST NO 319
SCOTTSDALE, AZ 85250

PAMPEL, MARY ANN
2 AUTUMN PATH LN
PITTSBURGH, PA 15238

PARNIAN, ALI
6270 N 78TH ST 338
SCOTTSDALE, AZ 85253

PARSONS, SANDRA K
6430 N 77TH WAY
SCOTTSDALE, AZ 85250

PASSELL, DANA F
6350 N 78TH ST UNIT 280
SCOTTSDALE, AZ 85250

PAYNE, JODY M
6350 N 78TH ST 299
SCOTTSDALE, AZ 85250

PEAY, HEIDI R
6035 N 77TH PL
SCOTTSDALE, AZ 85250

PETERS, EDWARD H
6350 N 78TH ST 286
SCOTTSDALE, AZ 85250-4703

PETERSEN, ANNE
6270 N 78TH ST, #334
SCOTTSDALE, AZ 85250

PIATT, ROBERTA S
7800 E LINCOLN DR #1100
SCOTTSDALE, AZ 85250

PINNA, JOSEPH
6350 N 78TH ST 261
SCOTTSDALE, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

POOLE, LINDA
LINCOLN PLACE
532 E. MARYLAND AVE. STE. F
PHOENIX, AZ 85012

PUTNAM, ANN GILBERT
6419 N 77TH PL
SCOTTSDALE, AZ 85250

QUAYLE, ROBIN W & WANDA J
6427 77TH PLACE
SCOTTSDALE, AZ 85261

QUESNEL, JR., GERALD W & ANN
6417 N 77TH WY
SCOTTSDALE, AZ 85250

RACZOWSKI, DONALD JAMES & HAR
7731 E ROVEY AVE
SCOTTSDALE, AZ 85250

RANDALL, RANDALL ROBYN
6435 N 77TH PL
SCOTTSDALE, AZ 85250

RANKIN, KERNIT EUGENE & SUSAN
6325 NORTH 75TH ST
SCOTTSDALE, AZ 85250

RATCLIFF, PERRY A & ROBERTA
7439 E LINCLON DR
SCOTTSDALE, AZ 85253

RICHARD, ERIC
6350 N 78TH ST UNIT 293
SCOTTSDALE, AZ 85250

RITTER, DIANE M
6270 N 78TH ST #336
SCOTTSDALE, AZ 85253

RIVERA, ADOLF & NEREYDA
7767 E ROSE LANE
SCOTTSDALE, AZ 85250

ROSENBAUM, JOSEPHINE
6041 N 77TH PL
SCOTTSDALE, AZ 85253

ROSS, LUCY-MEAO
7725 E ROVEY AVE
SCOTTSDALE, AZ 85250

RUDEN, BRADLEY T
6270 N 78TH ST, #335
SCOTTSDALE, AZ 85253

RUGGERI, REBECCA A & SEBASTIAN
6445 N 77TH WY
SCOTTSDALE, AZ 85250

SACHS, KENNETH H
7338 E MARLETTE
SCOTTSDALE, AZ 85250

SALIT, MERYL S
1233 E OCOTILLO RD
PHOENIX, AZ 85014

SANDBERG, RENEE K
6450 N 78TH ST #207
SCOTTSDALE, AZ 85253

SANDLAND, STEVE
6014 N 77TH PL
SCOTTSDALE, AZ 85260

SAUNDERS, SUE BEARDEN
6108 N 77TH PL
SCOTTSDALE, AZ 85254

SCALBERG, PATRICIA A
6270 N 78TH ST NO 333
SCOTTSDALE, AZ 85250

SCHAFFNER, LISA
6270 N 78TH ST NO 322
SCOTTSDALE, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

SCHOLDER, JR., FRITZ W
118 CATTLETRACK RD
SCOTTSDALE, AZ 85253

SCHUCKERT, WILLIAM & WOODARD
6806 N ROCKING RD
SCOTTSDALE, AZ 85250

SCHUCKERT, WILLIAM F &
WOODARD
6114 N 77TH PL
SCOTTSDALE, AZ 85253

SCHULTE, ELEANOR M
7755 E ROSE LN
SCOTTSDALE, AZ 85250

SCUTARI, NICHOLAS P
6418 N 77TH WY
SCOTTSDALE, AZ 85250

SEARCY, ROBERT KEITH & MARCE
7550 WHISPERING WINDS RD
SCOTTSDALE, AZ 85250

SEIBOLD, LEONARD
612 S CONNECTICUT AVE
ROYAL OAK, MI 48067-2929

SEYBOLD, LOUIS R
1019 S 106TH PL 301
OMAHA, NE 68114

SHALIT, BETH
6047 N 77TH PL
SCOTTSDALE, AZ 85250

SHANNON, RICHARD E & PATRICIA
19415 OLD FORT LN
MONUMENT, CO 80132

SHAPIRO, ROBERT A & SHEILA
6349 N 78TH ST, #78
SCOTTSDALE, AZ 85250

SHAUL III, RICHARD B
6439 N 77TH PL
SCOTTSDALE, AZ 85250

SHERWOOD, ANDREW R & JOANN
100 W WASHINGTON STE 1860
PHOENIX, AZ 85003

SHRUM, JAMES W & JUDITH A
9667 TIMBERVALE CT
HIGHLANDS RANCH, CO 80129

SMITH, MONICA, RICHARD E, CAR
6350 N 78TH ST #294
SCOTTSDALE, AZ 85250

SMITH, SCOTT RANDOLPH
7731 E BERRIDGE LN
SCOTTSDALE, AZ 85250

SPINELLI, MATTHEW J & TAULE R
6463 N 77TH WAY
SCOTTSDALE, AZ 85250

STEVENSON, BRIAN R & MARILE C
7743 E BERRIDGE LN
SCOTTSDALE, AZ 85250

STREED, BERNHARD ROY
10682 E BAHIA DR
SCOTTSDALE, AZ 85259

SULLIVAN, BRIAN
6350 N 78TH ST 256
SCOTTSDALE, AZ 85250

SULLIVAN, MICHAEL
6270 N 78TH ST #326
SCOTTSDALE, AZ 85253

SUNDELL, ROBERT & LUNSFORD
6270 N 78TH ST 341
SCOTTSDALE, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

TEMPELMAN, EMMANUEL
7725 E BERRIDGE LN
SCOTTSDALE, AZ 85250

THOMAS, JOHN
7500 E LINCOLN DR
SCOTTSDALE, AZ 85253

THOMPSON, W K & JOAN
7758 E ROSE LN
SCOTTSDALE, AZ 85253

THORMODSGARD, PAUL G & OLIVIA
7764 E ROSE LN
SCOTTSDALE, AZ 85250

TIERNEY, SEAN
6120 N 77TH PL
SCOTTSDALE, AZ 85250

TIMMONS, LYNN ANN
7764 E ROVEY AVE
SCOTTSDALE, AZ 85250

TOMPKINS, KARA R
7800 E LINCOLN DR 1106
SCOTTSDALE, AZ 85250

TRIPODIS, EMMANUEL & LEHANE L.
6350 N 78TH ST 284
SCOTTSDALE, AZ 85250

TUCKER, GAIL S
6350 N 78TH ST #288
SCOTTSDALE, AZ 85250

TURNER, RICHARD
1441 W BLUE RIDGE WAY
CHANDLER, AZ 85248

ULMAN, CLIFF
BRIARWOOD II HOMEOWNERS
ASSOC.
4620 N. 16TH ST. STE. E111
PHOENIX, AZ 85016

ULRICH, ALAN C
6349 N 78TH ST 76
SCOTTSDALE, AZ 85250

VOSS, JANE C
6458 N 77TH PL
SCOTTSDALE, AZ 85250

WAGNER, ERICH J
7770 E ROVEY LN
SCOTTSDALE, AZ 85253

WATKINS, DAVID W & KAREN S
6350 N 78TH ST 267
SCOTTSDALE, AZ 85250

WATTIER, DOUGLAS S & L M
7502 E BERRIDGE LN
SCOTTSDALE, AZ 85253

WEAVER, JENNIFER C
6423 N 77TH PL
SCOTTSDALE, AZ 85250

WEINMANN, MARGIT C
6461 N 77TH PL
SCOTTSDALE, AZ 85250

WEINTZ, HELENE
6350 N 78TH ST 285
SCOTTSDALE, AZ 85250

WEISS, JACK & PEGGY
6245 N 75TH ST
SCOTTSDALE, AZ 85250

WEISZ, DUANE
ARROYO VERDE UNIT II
HOMEOWNERS ASSOCIATION
6249 N. 78TH ST. 66
SCOTTSDALE,AZ 85250

WERNER, JACK C & EVELYN M
6350 N 78TH ST #302
SCOTTSDALE, AZ 85250-4796

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

WESTENDORF, BERNELDA
7746 E ROVEY AVE
SCOTTSDALE, AZ 85253

WHITEMAN, JAMES V & L BETTY
6038 N 77TH PL
SCOTTSDALE, AZ 85253

WINDLE, ALISON K
5211 SAGAMORE RD
PUTNAM STATION, NY 12861

WONG, DONALD H
6720 N 78TH ST 321
SCOTTSDALE, AZ 85250

WOODROW, LESLIE
6350 N 78TH ST STE 303
SCOTTSDALE, AZ 85250

WRIGHT, HAMILTON & JANE P
6349 N 78TH ST, #72
SCOTTSDALE, AZ 85250

ZIMNY, CAROYLN J
7764 E VALLEY VISTA DR
SCOTTSDALE, AZ 85250

ZINK, ALEXANDER M
1561 W LAUREL AVE
GILBERT, AZ 85233

ZINK, ALEXANDER M
6246 N CATTLE TRACK RD
SCOTTSDALE, AZ 85250

ZRAKET, GEORGE A & CAROL W
7537 E BERRIDGE LN
SCOTTSDALE, AZ 85253

Organizations

7522 E. MCDONALD LLC
7522 E. MCDONALD
SCOTTSDALE, AZ 85250

ABC LIVING TRUST
3104 E CAMELBACK RD 263
PHOENIX, AZ 85016

ARROYO VERDE HOMEOWNERS ASSN
6450 N 77TH PLACE
SCOTTSDALE, AZ 85250-4740

B F E PROPERTIES
4480 W PEORIA NO 202
GLENDALE, AZ 85302

CABRILLO SQUARE, C/O EAGLE PROPERTY MANAGEMENT
CABRILLO SQUARE
P.O. BOX 16170
PHOENIX, AZ 85011-6170

CANAL AT CATTLE TRACK LLC
105 CATTLE TRACK
SCOTTSDALE, AZ 85250

FLOOD CONTROL DISTRICT
2801W DURANGO ST
PHOENIX, AZ 85009

KLM REALTY CORPORATION
318 6270 N 78TH ST
SCOTTSDALE, AZ 85250

PHOENIX TITLE & TR CO
P O BOX 158
SCOTTSDALE, AZ 85251

PLATEAU WINDS CORPORATION
523 N BEAVER ST
FLAGSTAFF, AZ 86001

S R P A I & P D
PO BOX 1980
PHOENIX, AZ 85001

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

SCOTTSDALE COLONY
HOMEOWNERS ASSN
PO BOX 1057
SCOTTSDALE, AZ 85252

SIEGEL CORPORATE VENTURES
1820 W MARYLAND AVE STE 5
PHOENIX, AZ 85015

SNAKE RIVER ASSOC
2701 ALCOTT
DENVER, CO 80211

STUDIO ON CATTLETRACK LTD
7550 E MCDONALD DR
SCOTTSDALE, AZ 85253

APPENDIX I

CASE NO: 239-PA-2004
PROJECT LOCATION: 6215 N. Miller Road, Scottsdale, AZ 85250

COMMUNITY INPUT CERTIFICATION

In the City of Scottsdale it is important that all applicants for rezoning, use permit, and/or variances inform neighboring residents, affected school districts, and other parties that may be impacted by the proposed use, as well as invite their input. The applicant shall submit this completed certification with the application as verification that such contact has been made.

Date	Name (person, organization, etc.) and address	Contact Format		
		Meeting	Phone	Letter
7/13/04	Marcie & Keith Searcy 7550 Whispering Winds, Scottsdale	X	X	X
7/14/04	Janie Ellis 6105 N. Cattltrack, Scottsdale	X	X	X
7/14/04	Bernie Gonzales 6349 N. Cattletrack, Scottsdale	X	X	X
7/14/04	Vern Swaback 7550 E. McDonald Drive, Scottsdale	X	X	X
7/16/04	Various (see attached listing)			X
8/5/04	Bernie Gonzales 6349 N. Cattletrack, Scottsdale	X		X
8/5/04	John Hink 6301 N. 75th Street, Scottsdale	X		X
8/5/04	Lance Donatell 6301 N. 78th Street, Scottsdale	X	X	X
8/5/04	Tom Kaufman 7520 E. Whispering Winds Rd., Scottsdale	X		X

Signature of owner/applicant

10/05/04
Date

PARADISE VALLEY ARSENIC TREATMENT PLANT – LETTER RECIPIENTS

ADAMS, CHARLES P
7538 E BERRIDGE LN
SCOTTSDALE, AZ 85260

ANDERSON, SANDRA L
6350 N 78TH ST #287
SCOTTSDALE, AZ 85250

ANDRAS, JAMES T & CHRISTINE E
7511 E BERRIDGE LN
SCOTTSDALE, AZ 85250

ARP, WILLIAM J
6451 N 77TH WAY
SCOTTSDALE, AZ 85250

BAAS, THOMAS R & LESLIE K
5 NORRIS
BURR RIDGE, IL 60521

BACON, STEVE E
6350 N 78TH ST 297
SCOTTSDALE, AZ 85250

BARTLETT, STEPHEN C
7728 E ROSE LN
SCOTTSDALE, AZ 85250-4724

BASILONE, ELINORE A
6350 N 78TH ST
SCOTTSDALE, AZ 85253

BASTEN, ROBERT J & TIFFENY E
6350 N 78TH ST, #283
SCOTTSDALE, AZ 85250

BERMAN, RALPH & JACQUELINE
7649 E SIERRA VISTA DR
SCOTTSDALE, AZ 85250

BERNARD, MARYANNE D
6350 N 78TH ST NO 291
SCOTTSDALE, AZ 85250

BERNARD, NICHOLAS W
6234 N CATTLERACK RD
SOTTSDALE, AZ 85250

BERTRAM, DIANA M
PO BOX 5535
SCOTTSDALE, AZ 85261

BONE, ALLAN N
7512 E BERRIDGE LN
SCOTTSDALE, AZ 85250

BOULINEAU, FRED
5514 E ANGELA DR
SCOTTSDALE, AZ 85254

BRANDE, PATRICK W
6350 N 78TH ST 296
SCOTTSDALE, AZ 85250

BRINTON, MICHAEL JOHN
6026 N 77TH PL
SCOTTSDALE, AZ 85250

BROCE, MARY LOU
P O BOX 4986
SCOTTSDALE, AZ 85261

BURTON, EWA J
6350 N 78TH ST
SCOTTSDALE, AZ 85253

BUSSEUIL, SUZANNE K
6132 N 77TH PL
SCOTTSDALE, AZ 85250

BYRD, JOHN EDWARD
6350 N 78TH ST #305
SCOTTSDALE, AZ 85250

CALDWELL, TWILA
7740 E ROVEY AVE
SCOTTSDALE, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

CAN CAMP, ROGER A
6350 N 78TH ST, #275
SCOTTSDALE, AZ 85253

CAPALDI, PATRICIA C
7770 E ROSE LN
SCOTTSDALE, AZ 85253

CASE, SCOTT B
6460 N 77TH WAY
SCOTTSDALE, AZ 85250

CHALMERS, KAREN C
7734 E ROVEY AVE
SCOTTSDALE, AZ 85251

CHOTIN, MORRIS & ELAYNE
962 WYNHAVEN
BALLWIN, MO 63011

CLANCY, MICHAEL & LENORE E
7734 E BERRIDGE LN
SCOTTSDALE, AZ 85250

COCHRAN, ROBERT E & EHRET PAUL
6270 N 78TH ST 325
SCOTTSDALE, AZ 85250

COHEN, RUTH
LINCOLN PLACE
7419 E. CACTUS WREN RD.
SCOTTSDALE, AZ 85250

COLEMAN, MARIAN D
7524 E BERRIDGE LN
SCOTTSDALE, AZ 85253

COMPTON, RALPH S
2519 E JASMINE CIR
MESA, AZ 85213

COOLEY, TIMOTHY F & ROSE M
6032 N 77TH PL
PHOENIX, AZ 85250

COPE-HANEY, MARY MALLORY
6462 N 77TH PL
SCOTTSDALE, AZ 85250

COTNER, CHRISTY A
6270 N 78TH ST UNIT 323
SCOTTSDALE, AZ 85253

COTTER, RICHARD E & MARGARET
6448 N 77TH PL
SCOTTSDALE, AZ 85250

COYNE, SANDRA DEE
6008 N 77TH PL
SCOTTSDALE, AZ 85250

CRIMMINS, C JAMES & MELVA R
19802 N 32ND ST #37
PHOENIX, AZ 85050

CRONIN, MARGARET
7600 LINCOLN HOMEOWNERS ASSOCIATION
7539 E. TUCKEY LN.
SCOTTSDALE, AZ 85250

CURTIS, KEITH & MARLA
6350 N 78TH ST UNIT 316
SCOTTSDALE, AZ 85250

DAVIS, JON C & CINDY M
7746 E VALLEY VISTA
SCOTTSDALE, AZ 85253

DICKIE, BILL K & JOANNE M
7800 E LINCOLN DR, #1102
SCOTTSDALE, AZ 85250

DODSON, JOAN
6437 N 77TH WAY
SCOTTSDALE, AZ 85250

DUBIE, DAVID J
6450 N 78TH ST #212
SCOTTSDALE, AZ 85253

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

DUGAS, SR., JOHN F
6350 N 78TH ST #271
SCOTTSDALE, AZ 85253

DURHAM, ANDREA J
6349 N 78TH ST UNIT 81
SCOTTSDALE, AZ 85253

EISELE, NEELY A & JUDITH E
6350 N 78TH ST 304
SCOTTSDALE, AZ 85253

EWBANK, RICHARD W & JUDITH
7752 E ROSE LN
SCOTTSDALE, AZ 85253

FANCY, THOMAS A & BONITA L
16 CUTLER DR
SAVANNAH, GA 31419

FERA, ANN & ELIZABETH ASHLEY
6350 N 78TH ST UNIT 314
SCOTTSDALE, AZ 85250

FERGUSON, ROGER & SYBIL
PO BOX 519
REXBURG, ID 83440

FERNEDING, MICHAEL T
P O BOX 64011
TACOMA, WA 98464

FILLER, CHARLES A
7721 E VALLEY VISTA LN
SCOTTSDALE, AZ 85250

FORNEY, DAVID E
6270 N 78TH ST, #329
SCOTTSDALE, AZ 85250

FRANSEN, DENNIS R & CHERYL M
2930 PALM DR
BILLINGS, MT 59102

FRAZER, WILLIAM R & LAURA
6464 N 77TH WY
SCOTTSDALE, AZ 85253

FRIEDMAN, ANNE G
7740 E BERRIDGE LN
SCOTTSDALE, AZ 85253

FUJIMOTO, HARRY KENICHI & CLA
6422 N 77TH WAY
SCOTTSDALE, AZ 85250

FULLER, PATRICIA A
6431 N 77TH PL
SCOTTSDALE, AZ 85250

FULTON, BRAD & JONI E
7734 E ROSE LN
SCOTTSDALE, AZ 85253

FUQUA, MARJORIE ROBIN
7631 E SIERRA VISTA DR
SCOTTSDALE, AZ 85250

GAIMARI, PATRICK G
7442 E CENTURY DR
SCOTTSDALE, AZ 85250

GIFFIN, RICHARD G & LAURA L
6102 N 77TH PL
SCOTTSDALE, AZ 85253

GILMORE, MARCIA C
6123 N 77TH PL
SCOTTSDALE, AZ 85053

GIULIANO, JOHN T & CLARA M
308 COMMERCE DR, #A
FORT COLLINS, CO 80524-2759

GLENN, GARRETT D & KAREN L
7731 E VALLEY VISTA LN
PHOENIX, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

GLESSING, ORIVLLE G & LEWIS
6350 N 78TH ST
SCOTTSDALE, AZ 85250

GONZALES, BARNEY J
6349 N CATTLETRACK RD
SCOTTSDALE, AZ 85250

GOODLOE, NANCY KING & JAMES C
6350 N 78TH ST 254
SCOTTSDALE, AZ 85250

GRAHAM, ROBERT A
6270 N 78TH ST #332
SCOTTSDALE, AZ 85253

GRANT, ROGER LEE & STEPHANIE
6002 N 77TH PL
SCOTTSDALE, AZ 85253

GRAWET, LARRY D & SANDRA E
1302 AMETHYST APT A
REDONDO BEACH, CA 90277

GROSDIDIER, MARY C
6350 N 78TH ST 339
SCOTTSDALE, AZ 85253

GROSS, BRUCE H & ROBERT C
3401 MANCHESTER COMMON
FREMONT, CA 94536

GULATTO, PETER J & ROSEMARIE
7734 E VALLEY VISTA
SCOTTSDALE, AZ 85253

GULINO, DAVID G
6127 N 77TH PL
SCOTTSDALE, AZ 85250

GULNAC, GABRIELE JILL
6350 N 78TH ST 274
SCOTTSDALE, AZ 85250

HAJ, MOHAMMAD K
6105 N 77TH ST
SCOTTSDALE, AZ 85250

HALL, STANLEY R & NIKKI L
7628 E EDGEMONT AVE
SCOTTSDALE, AZ 85257-1631

HANNAH, STANLEY L & BETTY M
#5 MARTIN LN
ENGLEWOOD, CO 80110

HANSON, LYNN
6350 N 78TH ST 281
SCOTTSDALE, AZ 85250

HAUSHER, NANCY JEAN
7743 E ROSE LN
SCOTTSDALE, AZ 85253

HEARN, LAUREN
6466 N 77TH PL
SCOTTSDALE, AZ 85250

HEICHBERGER, RICHARD A
7731 E ROSE LN
SCOTTSDALE, AZ 85250

HELTEMES, LEON T & COLLEEN
5201 E CHARTER OAK RD
SCOTTSDALE, AZ 85254

HEMBROCK, ROBERT W
6350 N 78TH ST UNIT 279
SCOTTSDALE, AZ 85253

HENDERSON, ROY S & DIANN C
6337 N 75TH ST
SCOTTSDALE, AZ 85250

HERMANN, HANS & UTE
27471 VIA SEQUOIA
SAN JUAN CAPISTRANO, CA 92675

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

HEVLE, LYMAN C & BETTY A
8348 E VIA DE LOS LIBROS
SCOTTSDALE, AZ 85258-3202

HICKS, SABRINA & STEPHEN
43 STERLING CT
HUNTINGTION, NY 11743

HINK, JOHN A. & MEGAN
6301 N 75TH ST
SCOTTSDALE, AZ 85250

HINOJOSA, DOMINIQUE
6350 N 78TH ST #264
SCOTTSDALE, AZ 85250

HOLT, LOIS G
6452 N 77TH WAY
SCOTTSDALE, AZ 85250

HOSNER, DONALD L & BARBARA
6349 N 78TH ST #88
SCOTTSDALE, AZ 85253

HUNTER, FAITH L
5414 FOREST HIGHLANDS CT
WESTERVILLE, OH 43082

ILLINGWORTH PIERCE, LOUISE
6421 N 77TH WAY
SCOTTSDALE, AZ 85250

JACQUES, WILFRED G & ARLETTA
6020 N 77TH PL
SCOTTSDALE, AZ 85283

JAY, JOHN C & PAULINE F
7770 E VALLEY VISTA LN
SCOTTSDALE, AZ 85250

JERVIS, JR., JOEL R
6350 N 78TH ST NO 258
SCOTTSDALE, AZ 85250

JOHNSON, PETER R
6349 N 78TH ST 80
SCOTTSDALE, AZ 85253

JOHNSON, REID & SHERRY
22111 27TH AVE SE
MAPLE VALLEY, WA 98038

JOHNSTON, DEDE
BRIARWOOD II HOMEOWNERS
ASSOC.
7344 E. KEIM DR.
SCOTTSDALE, AZ 85250

JOHNSTON, DOROTHY J
6350 N 78TH ST 298
SCOTTSDALE, AZ 85250

JONES, JANIE ELLIS
105 CATTLE TRACK RD
SCOTTSDALE, AZ 85250

JONES, JANIE ELLIS
6226 N CATTLETRACK RD
SCOTTSDALE, AZ 85250

JONES, ROBERT C & B JOAN
7752 E VALLEY VISTA LN
SCOTTSDALE, AZ 85253

JOSEPH, STEWART M
PO BOX 32034
PHOENIX, AZ 85064

JOSEPH, JR., JACK
6350 N 78TH ST #269
SCOTTSDALE, AZ 85250

JOUSAN, C MIKE & VICKY
6450 N 79TH ST #217
SCOTTSDALE, AZ 85253

KALFAYAN, SARKIS Y & OVSANNA
7761 E VALLEY VISTA LANE
SCOTTSDALE, AZ 85253

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

KAUFMAN, THOMAS R & CHRYSA L
7520 E WHISPERING WINDS RD
SCOTTSDALE, AZ 85250

KEMPNER, SANDRA
7523 E BERRIDGE LN
SCOTTSDALE, AZ 85253

KING, RONALD J
6350 N 78TH ST
SCOTTSDALE, AZ 85250

KLOENNE, JAY, TIMOTHY, JANI
6442 N 77TH WY
SCOTTSDALE, AZ 85250

KRAMER, WM T & MARIE J
6349 N 78TH ST, #77
SCOTTSDALE, AZ 85250

KROPP, DANIEL P
7526 E WHISPERING WINDS DR
SCOTTSDALE, AZ 85250

KUEFFNER, KIRSTEN K
16658 N 106TH WY
SCOTTSDALE, AZ 85255

LAHAYE, LIZ
7758 E ROVEY
SCOTTSDALE, AZ 85250

LANDON, LINDA JILL
6454 N 77TH PL
SCOTTSDALE, AZ 85250

LARE-TYLER, DANIEL H
6433 N 77TH ST
SCOTTSDALE, AZ 85250

LAUERSDORF, CINDY
6270 N 78TH ST
SCOTTSDALE, AZ 85250

LAVENDER, CAREY MACK
6441 N 77TH WAY
SCOTTSDALE, AZ 85250

LENDVAI, JOHN C & JUANITA M
7722 E VALLEY VISTA LN
SCOTTSDALE, AZ 85253

LESSER, GARY
BRIARWOOD II HOMEOWNERS ASSOC.
7302 E. VALLEY VISTA DR.
SCOTTSDALE, AZ 85250

LEVIN, DANIEL W
7752 E ROVEY AVE
SCOTTSDALE, AZ 85250

LEVY, JASON M
6424 N 77TH PL
SCOTTSDALE, AZ 85250

LEWIS, THOMAS M
6350 N 78TH ST NO 290
SCOTTSDALE, AZ 85250

LIEBERMAN, DAVID L & MARTHA T
4413 N 62ND ST
SCOTTSDALE, AZ 85251-1912

LUKE, K D, SHEILAH ROSE, VERNON
6350 N 78TH ST NO 317
SCOTTSDALE, AZ 85250

LUU NICK & NGUYEN THERESA
6233 N 75TH ST
SCOTTSDALE, AZ 85250

LYSCIO, SCOTT G
6350 N 78TH ST, #295
SCOTTSDALE, AZ 85250

MALUDA, MIROSLAV & JULIA
6044 N 77TH PL
SCOTTSDALE, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

MANCOUR, LAREE
6270 N 78TH ST 328
SCOTTSDALE, AZ 85250

MANZONE, DOMENICO J &
GABRIELLE
6350 N 78TH ST NO 268
SCOTTSDALE, AZ 85250

MARANTETTE, THOMAS L
13654 RONNIE WAY
SARATOGA, CA 95070-5153

MARTIN, STEPHEN & IRMA
7667 E SIERRA VISTA DR
SCOTTSDALE, AZ 85250

MATTINGLY, CHRIS
6426 N 77TH WAY
SCOTTSDALE, AZ 85250

MATTINGLY, L GEORGE & JENNIFER
10040 N 78TH PL
SCOTTSDALE, AZ 85258

MCCARTHY, MARJORIE C & CHRIST
7749 E ROSE LN
SCOTTSDALE, AZ 85250

MCGOOKIN, MICHAEL J
1579 LINCOLN ST 111
SAN RAFAEL, CA 94901

MCGOWAN, ALISON H
6270 N 78TH ST 330
SCOTTSDALE, AZ 85250

MCKALLOR, JON PATRICK & TRICIA
7758 E VALLEY VISTA LN
SCOTTSDALE, AZ 85250

MCKINLEY, PATRICIA L & MICH
7439 E EDWARD ST
SCOTTSDALE, AZ 85253

MCMAHON, DAVID H
6350 N 78TH ST NO 257
SCOTTSDALE, AZ 85250

MCQULLIN, DAWN A
6350 N 78TH ST NO 270
SCOTTSDALE, AZ 85250

MEADOR, DOUGLAS WAYNE & PATRI
6465 N 77TH PL
SCOTTSDALE, AZ 85250

MEDEROS, PATRICIA M
6350 N 78TH ST
SCOTTSDALE, AZ 85243

MIHOK, DOROTHY C
6350 N 78TH ST #272
SCOTTSDALE, AZ 85250

MILLS, WILLIAM E & EVELYN M T
6349 N 78TH ST UNIT 71
SCOTTSDALE, AZ 85250

MISHEK, JAMES & LORINDA
7800 E LINCOLN DR., #1104
SCOTTSDALE, AZ 85250

MITCHELL, STEPHEN F & SHERR
6117 N 77TH PL
SCOTTSDALE, AZ 85253

MORKEN, KATHLEEN R
6350 N 78TH ST 276
SCOTTSDALE, AZ 85250

MOTZ, JANE RUTH
6100 N 78TH ST
SCOTTSDALE, AZ 85253

MURPHY, KRISTOPHER RYAN
6457 N 77TH PL
SCOTTSDALE, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

MUUSERS & DANA BALL, SUZANNE
6350 N 78TH ST NO 259
SCOTTSDALE, AZ 85250

NATHAN, WALTER & GLORIA B
7719 E ROVEY AVE
SCOTTSDALE, AZ 85257

NESVIG, ERIC P & NANNETTE M
6144 N 77TH PL
SCOTTSDALE, AZ 85250

NEWHOUSE, KAY D
6350 N 78TH ST, #301
SCOTTSDALE, AZ 85250

NOTHMAN, JERRY & CORRINE
1533 NE SISKIYOU ST
PORTLAND, OR 97212

NOVAK, JAY PERRY
6447 N 77TH PL
SCOTTSDALE, AZ 85250

OLSON, KAREN S
6450 N 78TH ST #239
SCOTTSDALE, AZ 85253

OTONDO, PATRICIA M & JOSEPH Y
7878 E GAINEY RANCH RD 8
SCOTTSDALE, AZ 85258-1755

OTONDO, CATHERINE M
6313 N 75TH ST
SCOTTSDALE, AZ 85253

OTTOSEN, GLEN R & BONNIE L
7440 E EDWARD LN
SCOTTSDALE, AZ 85250

OWEN, WANDA L
6350 N 78TH ST UNIT 278
SCOTTSDALE, AZ 85250

PADRON, CRISTINA L
6270 N 78TH ST NO 319
SCOTTSDALE, AZ 85250

PAMPEL, MARY ANN
2 AUTUMN PATH LN
PITTSBURGH, PA 15238

PARNIAN, ALI
6270 N 78TH ST 338
SCOTTSDALE, AZ 85253

PARSONS, SANDRA K
6430 N 77TH WAY
SCOTTSDALE, AZ 85250

PASSELL, DANA F
6350 N 78TH ST UNIT 280
SCOTTSDALE, AZ 85250

PAYNE, JODY M
6350 N 78TH ST 299
SCOTTSDALE, AZ 85250

PEAY, HEIDI R
6035 N 77TH PL
SCOTTSDALE, AZ 85250

PETERS, EDWARD H
6350 N 78TH ST 286
SCOTTSDALE, AZ 85250-4703

PETERSEN, ANNE
6270 N 78TH ST, #334
SCOTTSDALE, AZ 85250

PIATT, ROBERTA S
7800 E LINCOLN DR #1100
SCOTTSDALE, AZ 85250

PINNA, JOSEPH
6350 N 78TH ST 261
SCOTTSDALE, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

POOLE, LINDA
LINCOLN PLACE
532 E. MARYLAND AVE. STE. F
PHOENIX, AZ 85012

PUTNAM, ANN GILBERT
6419 N 77TH PL
SCOTTSDALE, AZ 85250

QUAYLE, ROBIN W & WANDA J
6427 77TH PLACE
SCOTTSDALE, AZ 85261

QUESNEL, JR., GERALD W & ANN
6417 N 77TH WY
SCOTTSDALE, AZ 85250

RACZOWSKI, DONALD JAMES & HAR
7731 E ROVEY AVE
SCOTTSDALE, AZ 85250

RANDALL, RANDALL ROBYN
6435 N 77TH PL
SCOTTSDALE, AZ 85250

RANKIN, KERNIT EUGENE & SUSAN
6325 NORTH 75TH ST
SCOTTSDALE, AZ 85250

RATCLIFF, PERRY A & ROBERTA
7439 E LINCLON DR
SCOTTSDALE, AZ 85253

RICHARD, ERIC
6350 N 78TH ST UNIT 293
SCOTTSDALE, AZ 85250

RITTER, DIANE M
6270 N 78TH ST #336
SCOTTSDALE, AZ 85253

RIVERA, ADOLF & NEREYDA
7767 E ROSE LANE
SCOTTSDALE, AZ 85250

ROSENBAUM, JOSEPHINE
6041 N 77TH PL
SCOTTSDALE, AZ 85253

ROSS, LUCY-MEAO
7725 E ROVEY AVE
SCOTTSDALE, AZ 85250

RUDEN, BRADLEY T
6270 N 78TH ST, #335
SCOTTSDALE, AZ 85253

RUGGERI, REBECCA A & SEBASTIAN
6445 N 77TH WY
SCOTTSDALE, AZ 85250

SACHS, KENNETH H
7338 E MARLETTE
SCOTTSDALE, AZ 85250

SALIT, MERYL S
1233 E OCOTILLO RD
PHOENIX, AZ 85014

SANDBERG, RENEE K
6450 N 78TH ST #207
SCOTTSDALE, AZ 85253

SANDLAND, STEVE
6014 N 77TH PL
SCOTTSDALE, AZ 85260

SAUNDERS, SUE BEARDEN
6108 N 77TH PL
SCOTTSDALE, AZ 85254

SCALBERG, PATRICIA A
6270 N 78TH ST NO 333
SCOTTSDALE, AZ 85250

SCHAFFNER, LISA
6270 N 78TH ST NO 322
SCOTTSDALE, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

SCHOLDER, JR., FRITZ W
118 CATTLETRACK RD
SCOTTSDALE, AZ 85253

SCHUCKERT, WILLIAM & WOODARD
6806 N ROCKING RD
SCOTTSDALE, AZ 85250

SCHUCKERT, WILLIAM F &
WOODARD
6114 N 77TH PL
SCOTTSDALE, AZ 85253

SCHULTE, ELEANOR M
7755 E ROSE LN
SCOTTSDALE, AZ 85250

SCUTARI, NICHOLAS P
6418 N 77TH WY
SCOTTSDALE, AZ 85250

SEARCY, ROBERT KEITH & MARCE
7550 WHISPERING WINDS RD
SCOTTSDALE, AZ 85250

SEIBOLD, LEONARD
612 S CONNECTICUT AVE
ROYAL OAK, MI 48067-2929

SEYBOLD, LOUIS R
1019 S 106TH PL 301
OMAHA, NE 68114

SHALIT, BETH
6047 N 77TH PL
SCOTTSDALE, AZ 85250

SHANNON, RICHARD E & PATRICIA
19415 OLD FORT LN
MONUMENT, CO 80132

SHAPIRO, ROBERT A & SHEILA
6349 N 78TH ST, #78
SCOTTSDALE, AZ 85250

SHAUL III, RICHARD B
6439 N 77TH PL
SCOTTSDALE, AZ 85250

SHERWOOD, ANDREW R & JOANN
100 W WASHINGTON STE 1860
PHOENIX, AZ 85003

SHRUM, JAMES W & JUDITH A
9667 TIMBERVALE CT
HIGHLANDS RANCH, CO 80129

SMITH, MONICA, RICHARD E, CAR
6350 N 78TH ST #294
SCOTTSDALE, AZ 85250

SMITH, SCOTT RANDOLPH
7731 E BERRIDGE LN
SCOTTSDALE, AZ 85250

SPINELLI, MATTHEW J & TAULE R
6463 N 77TH WAY
SCOTTSDALE, AZ 85250

STEVENSON, BRIAN R & MARILE C
7743 E BERRIDGE LN
SCOTTSDALE, AZ 85250

STREED, BERNHARD ROY
10682 E BAHIA DR
SCOTTSDALE, AZ 85259

SULLIVAN, BRIAN
6350 N 78TH ST 256
SCOTTSDALE, AZ 85250

SULLIVAN, MICHAEL
6270 N 78TH ST #326
SCOTTSDALE, AZ 85253

SUNDELL, ROBERT & LUNSFORD
6270 N 78TH ST 341
SCOTTSDALE, AZ 85250

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

TEMPELMAN, EMMANUEL
7725 E BERRIDGE LN
SCOTTSDALE, AZ 85250

THOMAS, JOHN
7500 E LINCOLN DR
SCOTTSDALE, AZ 85253

THOMPSON, W K & JOAN
7758 E ROSE LN
SCOTTSDALE, AZ 85253

THORMODSGARD, PAUL G & OLIVIA
7764 E ROSE LN
SCOTTSDALE, AZ 85250

TIERNEY, SEAN
6120 N 77TH PL
SCOTTSDALE, AZ 85250

TIMMONS, LYNN ANN
7764 E ROVEY AVE
SCOTTSDALE, AZ 85250

TOMPKINS, KARA R
7800 E LINCOLN DR 1106
SCOTTSDALE, AZ 85250

TRIPODIS, EMMANUEL & LEHANE L.
6350 N 78TH ST 284
SCOTTSDALE, AZ 85250

TUCKER, GAIL S
6350 N 78TH ST #288
SCOTTSDALE, AZ 85250

TURNER, RICHARD
1441 W BLUE RIDGE WAY
CHANDLER, AZ 85248

ULMAN, CLIFF
BRIARWOOD II HOMEOWNERS
ASSOC.
4620 N. 16TH ST. STE. E111
PHOENIX, AZ 85016

ULRICH, ALAN C
6349 N 78TH ST 76
SCOTTSDALE, AZ 85250

VOSS, JANE C
6458 N 77TH PL
SCOTTSDALE, AZ 85250

WAGNER, ERICH J
7770 E ROVEY LN
SCOTTSDALE, AZ 85253

WATKINS, DAVID W & KAREN S
6350 N 78TH ST 267
SCOTTSDALE, AZ 85250

WATTIER, DOUGLAS S & L M
7502 E BERRIDGE LN
SCOTTSDALE, AZ 85253

WEAVER, JENNIFER C
6423 N 77TH PL
SCOTTSDALE, AZ 85250

WEINMANN, MARGIT C
6461 N 77TH PL
SCOTTSDALE, AZ 85250

WEINTZ, HELENE
6350 N 78TH ST 285
SCOTTSDALE, AZ 85250

WEISS, JACK & PEGGY
6245 N 75TH ST
SCOTTSDALE, AZ 85250

WEISZ, DUANE
ARROYO VERDE UNIT II
HOMEOWNERS ASSOCIATION
6249 N. 78TH ST. 66
SCOTTSDALE,AZ 85250

WERNER, JACK C & EVELYN M
6350 N 78TH ST #302
SCOTTSDALE, AZ 85250-4796

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

WESTENDORF, BERNELDA
7746 E ROVEY AVE
SCOTTSDALE, AZ 85253

WHITEMAN, JAMES V & L BETTY
6038 N 77TH PL
SCOTTSDALE, AZ 85253

WINDLE, ALISON K
5211 SAGAMORE RD
PUTNAM STATION, NY 12861

WONG, DONALD H
6720 N 78TH ST 321
SCOTTSDALE, AZ 85250

WOODROW, LESLIE
6350 N 78TH ST STE 303
SCOTTSDALE, AZ 85250

WRIGHT, HAMILTON & JANE P
6349 N 78TH ST, #72
SCOTTSDALE, AZ 85250

ZIMNY, CAROYLN J
7764 E VALLEY VISTA DR
SCOTTSDALE, AZ 85250

ZINK, ALEXANDER M
1561 W LAUREL AVE
GILBERT, AZ 85233

ZINK, ALEXANDER M
6246 N CATTLE TRACK RD
SCOTTSDALE, AZ 85250

ZRAKET, GEORGE A & CAROL W
7537 E BERRIDGE LN
SCOTTSDALE, AZ 85253

Organizations

7522 E. MCDONALD LLC
7522 E. MCDONALD
SCOTTSDALE, AZ 85250

ABC LIVING TRUST
3104 E CAMELBACK RD 263
PHOENIX, AZ 85016

ARROYO VERDE HOMEOWNERS ASSN
6450 N 77TH PLACE
SCOTTSDALE, AZ 85250-4740

B F E PROPERTIES
4480 W PEORIA NO 202
GLENDALE, AZ 85302

CABRILLO SQUARE, C/O EAGLE PROPERTY MANAGEMENT
CABRILLO SQUARE
P.O. BOX 16170
PHOENIX, AZ 85011-6170

CANAL AT CATTLE TRACK LLC
105 CATTLE TRACK
SCOTTSDALE, AZ 85250

FLOOD CONTROL DISTRICT
2801W DURANGO ST
PHOENIX, AZ 85009

KLM REALTY CORPORATION
318 6270 N 78TH ST
SCOTTSDALE, AZ 85250

PHOENIX TITLE & TR CO
P O BOX 158
SCOTTSDALE, AZ 85251

PLATEAU WINDS CORPORATION
523 N BEAVER ST
FLAGSTAFF, AZ 86001

S R P A I & P D
PO BOX 1980
PHOENIX, AZ 85001

PARADISE VALLEY ARSENIC TREATMENT PLANT - LETTER RECIPIENTS

SCOTTSDALE COLONY
HOMEOWNERS ASSN
PO BOX 1057
SCOTTSDALE, AZ 85252

SIEGEL CORPORATE VENTURES
1820 W MARYLAND AVE STE 5
PHOENIX, AZ 85015

SNAKE RIVER ASSOC
2701 ALCOTT
DENVER, CO 80211

STUDIO ON CATTLETRACK LTD
7550 E MCDONALD DR
SCOTTSDALE, AZ 85253

APPENDIX J

Arizona American Water

July 16, 2004

Re: Paradise Valley Removal Project
Pre-Application Case Number: 239-2004

Dear

For over 30 years, Arizona American Water and Paradise Valley Water Company have owned and operated the Miller Road Booster Station 6215 North Miller Road in your neighborhood. The facility supplies water to portions of the Town of Paradise Valley, City of Scottsdale, and unincorporated Maricopa County. Due to recent changes by the United States Environmental Protection Agency, Arizona American Water must make modifications to this current facility.

You may have read in a recent Arizona Republic article about new Environmental Protection Agency standards for arsenic levels that are impacting many public/private water systems in the Valley. Since much of our groundwater contains some arsenic by nature, additional treatment is now required. To meet these requirements work is required to be completed by January 23, 2006.

Damon S. Williams Associates and D.L. Norton General Contracting have been hired by Arizona American Water to design and build the new facilities at this site. Arizona American Water will be submitting a rezoning request and use permit to the City of Scottsdale in the near future for this project. Following is brief project overview.

> Rezoning parcels 174-13-934 and 174-13-935 back to R1-43 for construction of a new 19 mgd arsenic removal facility to remove naturally occurring arsenic from well water. Requires Rezoning Application and Use Permit (Parcels 174-13-930, 931, 931, 934, and 935) following rezoning approval.

Before we move further in the process, we would like to invite you to an Open House meeting that we have scheduled to discuss the project with neighbors and interested individuals. Representatives from Arizona American Water and the design/build team will be available at the Open House which is scheduled for:

Date: Thursday August 5, 2004
Time: 5:30 p.m.
Location: Hilton Scottsdale Resort & Villas
6333 North Scottsdale Road
Scottsdale, AZ 85250

RWE GROUP

Arizona American Water

If you can not attend but would like to understand the project, please call me at 623/445-2462. If you would like to contact the City of Scottsdale regarding this project, call Tim Curtis, Project Coordination Manager at 480/312-4210 or e-mail at tcurtis@scottsdaleAZ.Gov or visit the City's website http://www.scottsdaleAZ.Gov/projects/ProjectsInProcess. Your input and support are very important to the success of this project.

Sincerely,

James M. Campbell

Mr. Jim Campbell
Operations Superintendent
Paradise Valley District
Arizona American Water

RWE GROUP

APPENDIX K

AFFIDAVIT OF POSTING
PUBLIC HEARING NOTICE

CASE NUMBER: Pre- Application 239-2004

PROJECT NAME:

LOCATION: Hilton Scottsdale Resort + Villas

SITE POSTING DATE: 7-14-2004

APPLICANT NAME: Arizona American Water

SIGN COMPANY NAME: Scottsdale Sign A Rama LLC.

PHONE NUMBER: 480-994-4000.

I confirm that the site has been posted as indicated by the Project Manager for the case as listed. Picture\s of site posting\s have been submitted.

Scott Wakefield — 7-14-04

Applicant signature — Date

PATRICK BRYANT
Notary Public - Arizona
Maricopa County
My Comm. Expires May 5, 2008

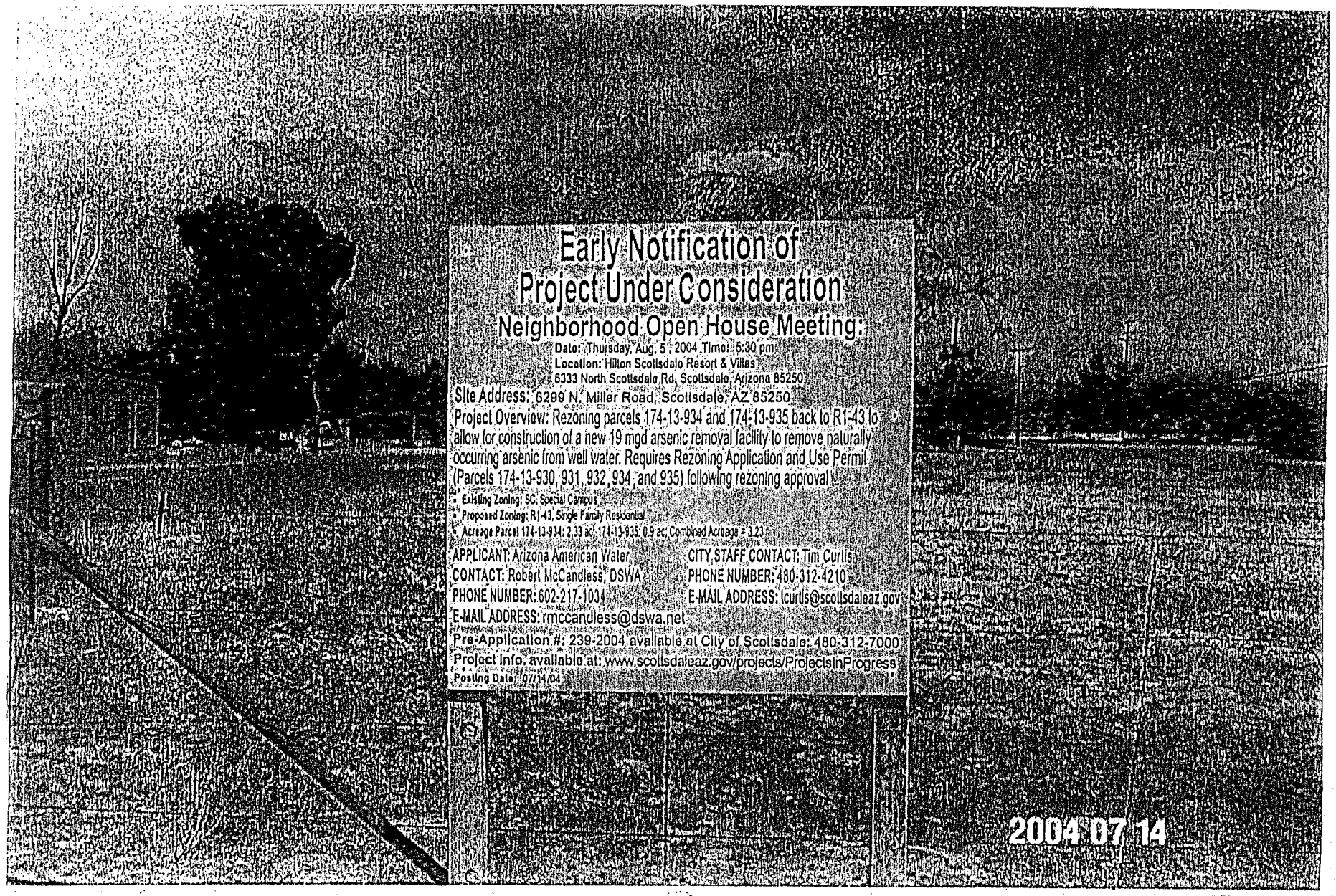
Notary Public

Acknowledged before me this 14 day of July 2004

My commission expires May 5, 2008

Return completed, notarized affidavit and pictures to Current Planning Services at least 20 days prior to Planning Commission hearing.

Current Planning Services
7447 E. Indian School Road, Suite 105
Scottsdale, AZ 85251
480-312-7000


Early Notification of
Project Under Consideration
Neighborhood Open House Meeting:
Date: Thursday, Aug. 5 , 2004 Time: 5:30 pm
Location: Hilton Scottsdale Resort & Villas
6333 North Scottsdale Rd, Scottsdale, Arizona 85250
Site Address: 6299 N. Miller Road, Scottsdale, AZ 85250
Project Overview: Rezoning parcels 174-13-934 and 174-13-935 back to R1-43 to allow for construction of a new 19 mgd arsenic removal facility to remove naturally occurring arsenic from well water. Requires Rezoning Application and Use Permit (Parcels 174-13-930, 931, 932, 934, and 935) following rezoning approval
• Existing Zoning: SC, Special Campus
• Proposed Zoning: R1-43, Single Family Residential
• Acreage Parcel 174-13-934: 2.33 ac; 174-13-935: 0.9 ac; Combined Acreage = 3.23
APPLICANT: Arizona American Water
CONTACT: Robert McCandless, DSWA
PHONE NUMBER: 602-217-1034
E-MAIL ADDRESS: rmccandless@dswa.net
CITY STAFF CONTACT: Tim Curtis
PHONE NUMBER: 480-312-4210
E-MAIL ADDRESS: tcurtis@scottsdaleaz.gov
Pre-Application #: 239-2004 available at City of Scottsdale: 480-312-7000
Project Info. available at: www.scottsdaleaz.gov/projects/ProjectsInProgress
Posting Date: 07/14/04
2004 07 14

AZAW000292

Approved in Resolution 6161, October 7, 2002

POLICY OF THE CITY OF SCOTTSDALE ON APPEALS OF DEDICATIONS, EXACTIONS, OR ZONING REGULATIONS

RIGHTS OF PROPERTY OWNER

In addition to other rights granted to you by the U.S. and Arizona Constitution, federal and state law and city ordinances or regulations, you are hereby notified of your right to appeal the following City actions relating to your property:

1) Any dedication or exaction which is required of you by an administrative agency or official of the city as a condition of granting approval of your request to use, improve or develop your real property. This appeal right does not apply to a dedication or exaction required as part of a city legislative act (for example a zoning ordinance) where an administrative agency or official has no discretion to determine the dedication or exaction.
2) The adoption or amendment of a zoning regulation that creates a taking of property in violation of Arizona and federal court decisions.

APPEAL PROCEDURE

The appeal must be in writing and specify the City action appealed and the date final action was taken, and it must be filed with or mailed to the hearing officer designated by the city within 30 days after the final action is taken. Address the appeal as follows:

Hearing Officer, C/O City Clerk
3939 Drinkwater Blvd.
Scottsdale, AZ 85251

- No fee will be charged for filing
- The City Attorney's Office will review the appeal for compliance with the above requirements, and will notify you if your appeal does not comply.
- Eligible appeals will be forwarded to the hearing officer, and a hearing will be scheduled within 30 days of receipt by the hearing officer of your request. Ten days notice will be given to you of the date, time and place of the hearing unless you indicate that less notice is acceptable to you.
- The city will submit a takings impact report to the hearing officer.
- In an appeal from a dedication or exaction, the City will bear the burden of proving that the dedication or exaction to be imposed on your property bears an essential nexus between the requirement and a legitimate governmental interest and that the proposed dedication or exaction is roughly proportional to the impact of the use, improvement or development you proposed.
- In an appeal from the adoption or amendment of a zoning regulation, the City will bear the burden of proving that any dedication or exaction requirement in the zoning regulation is roughly proportional to the impact of the proposed use, improvement, or development, and that the zoning regulation does not create a taking of property in violation of Arizona and federal court cases.
- The hearing officer must render his decision within five working days after the appeal is heard.
- The hearing officer can modify or delete a dedication or exaction or, in the case of an appeal from a zoning regulation, transmit a recommendation to the City Council.
- If you are dissatisfied with the decision of the hearing officer, you may file a complaint for a trial de novo with the Superior Court within 30 days of the hearing officer's decision.

If you have questions about this appeal process, you may contact:

City Manager's Office 3939 Drinkwater Blvd. Scottsdale, AZ 85251 (480) 312-2422	City Attorney's Office 3939 Drinkwater Blvd. Scottsdale, AZ 85251 (480) 312-2405

Please be aware that City staff cannot give you legal advice. You may wish, but are not required, to hire an attorney to represent you in an appeal.

Report # _____
Coordinator

APPLICATION FORM FOR CERTIFICATE OF NO EFFECT OR CERTIFICATE OF APPROVAL RE: ARCHAEOLOGICAL RESOURCES ORDINANCE

PRESERVATION DIVISION
CITY OF SCOTTSDALE

Quarter Section: _____

Book/Map/Parcel: ____-____-____

Street Address: _____

_____

APPLICANT NAME: DEI PROFESSIONAL SERVICES, LLC

ADDRESS: 6225 North 24th Street, Suite 200, Phoenix, AZ 85016

TELEPHONE #: 602-954-0038 FAX#: 602-944-8605 E-MAIL: jkack@deipro.com

OWNER NAME: Arizona American Water (Aaron Ashcroft)

ADDRESS 19820 N. 7th Street, Ste. 201
Phoenix, AZ 85024

TELEPHONE#: 623-445-2418 FAX# 623-445-2454 E-MAIL: aashcroft@amwater.com

NOTES:

DEVELOPMENT PROJECT APPLICATION

____ Rezoning	✓ Use Permit	____ General Plan
____ Preliminary Plat	____ Final Plat	____ Master Plan
____ Development Review Board		____ Lot Split
____ Building Permit	____ Grading Permit	____ Infrastructure Imp.
____ Native Plant		

ARCHAEOLOGICAL SURVEY & REPORT

☒ Archaeological Survey and Report Submitted Date: 9/14/04
Name of Report: A Cultural Resources Survey and Viewshed Reconnaissance
Prepared by: EcoPlan Associates

APPLICANTS/ARCHAEOLOGISTS STOP HERE

Report # _____
Coordinator _____

THIS SIDE OF FORM TO BE COMPLETED BY CITY

Accepted by _____ Date: _____
Complete/Approved: _____ Date: _____
(Historic Preservation Officer/City Archaeologist)

CERTIFICATE OF NO EFFECT

☐ Approved, in accordance with the following findings:

_____ No archaeological resources are located on the property

_____ No significant archaeological resources are impacted

_____ Significant archaeological resources are protected:
Type of permanent protection provided _____
Documentation of permanent protection provided and approved _____

☐ Denied, Certificate of Approval Required

Signature: _____ Date: _____
(Historic Preservation Officer/City Archaeologist)

CERTIFICATE OF APPROVAL

Dates:
_____ Submittal of Revised Archaeological Survey and Report
_____ Approved Revised Archaeological Survey and Report
_____ Submittal of Mitigation Plan
_____ Approved Mitigation Plan by HPO/Archaeologist: ____ OR
Historic Preservation Commission: ____
_____ Satisfactory Implementation of Mitigation Plan

☐ Denied: _____

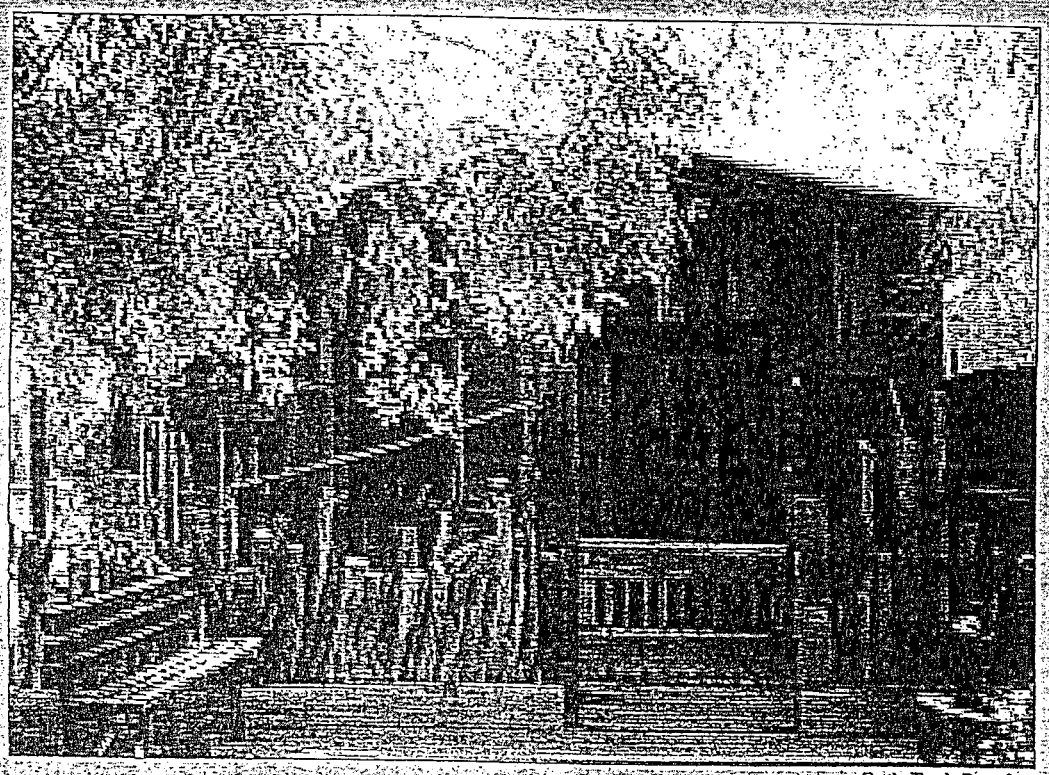
☐ Approved

Signature: _____ Date _____
(Historic Preservation Officer/City Archaeologist)

APPEALS

Certificate of No Effect	Certificate of Approval	Mitigation Plan
Appeal Date: _____	Appeal Date: _____	Appeal Date: _____
HPC Hearing: _____	HPC Hearing: _____	HPC Hearing: _____
HPC Decision: _____	HPC Decision: _____	HPC Decision: _____
CC Hearing: _____	CC Hearing: _____	CC Hearing: _____
CC Decision: _____	CC Decision: _____	CC Decision: _____

A Cultural Resource Survey and Viewshed Reconnaissance for an Arsenic Removal Facility in Scottsdale, Maricopa County, Arizona



Cattle Track Complex

Prepared by:
Jodi Strohmayer

Submitted by:
J. Simon Bruder

Prepared for:
Damon S. Williams Associates, LLC

EcoPlan Associates, Inc.
Environmental Science & Resource Economics
701 West Southern Avenue, Suite 203, Mesa, Arizona 85210

EcoPlan Cultural Resource Survey Report 04-700

August 2004

PRIVILEGED – DO NOT RELEASE

AZAW000296

A Cultural Resource Survey and Viewshed Reconnaissance for an Arsenic Removal Facility in Scottsdale, Maricopa County, Arizona

Prepared by:
Jodi Strohmayer

Submitted by:
J. Simon Bruder

Prepared for:
Damon S. Williams Associates, LLC
2355 East Camelback Road, Suite 700
Phoenix, Arizona 85016

For Submission to:
City of Scottsdale
Historic Preservation Division
7447 E. Indian School Road
Scottsdale, AZ 85251

EcoPlan Associates, Inc.
Environmental Science & Resource Economics
701 W. Southern Ave., Suite 203
Mesa, Arizona 85210

EcoPlan Cultural Resource Survey Report 04-700
August 2004

PRIVILEGED – DO NOT RELEASE
This document contains sensitive information about the location of cultural resources.
Such information is to be distributed only on an as-needed basis in order to protect these properties

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AZAW000300

ABSTRACT/MANAGEMENT SUMMARY

Report Title	A Cultural Resource Survey and Viewshed Reconnaissance for an Arsenic Removal Facility in Scottsdale, Maricopa County, Arizona.
Report Date	August 2004
EcoPlan Project No.	04-700
Permits	None were required because the survey was confined to private land.
Agencies and Sponsor	Damon S. Williams Associates, LLC (DSWA)
Project Description	A pedestrian survey and viewshed analysis for a proposed arsenic removal facility, in Scottsdale, Maricopa County, Arizona.
Project Location	The project area is located in the NW¼ SW¼ SE¼ and the SW¼ NW¼ SE¼ of Section 11, Township 2 North, Range 4 East, of the Gila and Salt River Base Line and Meridian, as depicted on the 1965 (photorevised 1982) Paradise Valley, Arizona 7.5-minute USGS quadrangle.
Area of Potential Effect	The area of potential effect (APE) for the current project consists of the facility location, which encompasses approximately 12.05 acres of private land, as well as a one-mile viewshed around the project area where historic properties could be impacted visually by the proposed facility.
Personnel and Dates of Fieldwork	The author conducted the survey and viewshed reconnaissance on 22 July 2004, expending one person-field day of effort.
Number of Properties	One: Site AZ U:5:283 (ASM), a historic artifact scatter.
Eligible or Contributing Elements of Properties	None
Ineligible and/or Non-Contributing Elements of Properties	One: Site AZ U:5:283 (ASM), a historic artifact scatter.
Effect Recommendation	Site AZ U:5:283 (ASM) is recommended as ineligible for listing in the National Register, and therefore it is recommended that no further treatment or avoidance measures are recommended. Research within the one-mile viewshed identified two cultural resources, the Cattle Track Complex and the Arizona Canal, which were evaluated for potential visual impacts that could result from the proposed installation of the arsenic removal facility. Provided the facility design is compatible with the adjacent historic properties, the Cattle Track Complex and the Arizona Canal will not be impacted visually by the proposed facility. As a result, we recommend that a "Certificate of No Effect" be issued for this project in accordance with the City of Scottsdale's "Archaeological Resource Protection Ordinance." If previously unidentified cultural resources should be discovered during construction, the City of Scottsdale Historic Preservation Division should be notified to make arrangements for the appropriate assessment and treatment of those resources.

INTRODUCTION AND BACKGROUND

On behalf of Arizona American Water Company (AZAWC), Damon S. Williams Associates, LLC (DSWA) is preparing a design for an arsenic removal facility in Scottsdale, Maricopa County, Arizona (Figure 1). This action is in response to the recent announcement by the U.S. Environmental Protection Agency (EPA), which requires public water systems to lower the maximum contaminant level (MCL) of arsenic in drinking water by 2006. In some cases, compliance with these new regulations will require the installation and operation of treatment facilities. Accordingly, AZAWC, assisted by DSWA, must consider the effects of the facility installation on historic properties and obtain approval from the City of Scottsdale Historic Preservation Division. As a result, DSWA contracted EcoPlan Associates, Inc. (EcoPlan) to conduct a cultural resource survey and viewshed reconnaissance in support of the proposed arsenic removal facility.

PROJECT LOCATION AND AREA OF POTENTIAL EFFECT

The project area is located in the NW¼ SW¼ SE¼ and the SW¼ NW¼ SE¼ of Section 11, Township 2 North, Range 4 East, Gila and Salt River Base Line and Meridian as depicted on the 1965 (photorevised 1982) Paradise Valley, Arizona 7.5-minute USGS topographic map (Figure 2).

The area of potential effect (APE) is described as the "footprint" where disturbance may occur as a result of the proposed installation of the arsenic removal facility. The APE for the current project consists of the facility location, which encompasses approximately 12.05 acres of private land, as well as a one-mile viewshed around the project area where historic properties could be impacted visually by the proposed facility.

STUDY GOALS AND REPORTING CONVENTIONS

The objective of this report is to provide documentation to assist AZAWC in obtaining approval from the City of Scottsdale Historic Preservation Division for the proposed installation of an arsenic removal facility in Scottsdale. More specifically, this report will provide documentation of, and when appropriate, National Register of Historic Places (National Register) eligibility assessments for all cultural resources identified within the APE.

Cultural resource specialists typically express measurements using the metric system when reporting on aboriginal archaeological sites, and English measurements when discussing non-aboriginal properties. Measurements derived from USGS maps, or from other sources in which English measurements are used, are given only in English dimensions. Thus, distances are given in miles and elevations are given in feet. The dimensions of surveyed areas are expressed in feet (or miles) and acres. If appropriate, metric-English conversions are provided for clarity.

INVENTORY METHODS

Prior to fieldwork, cultural resource records were consulted at the Arizona State Museum (ASM), the AZSITE on-line database, the Arizona State Historic Preservation Office (SHPO), Pueblo Grande Museum (PGM), the National Register of Historic Places (National Register) on-line database, the Scottsdale Historic Register (Scottsdale Register) on-line, and the General Land Office (GLO) plats on file at the Bureau of Land Management (BLM) to identify prior surveys and previously recorded cultural resources within one mile of the project area. Documentation collected during the record searches was

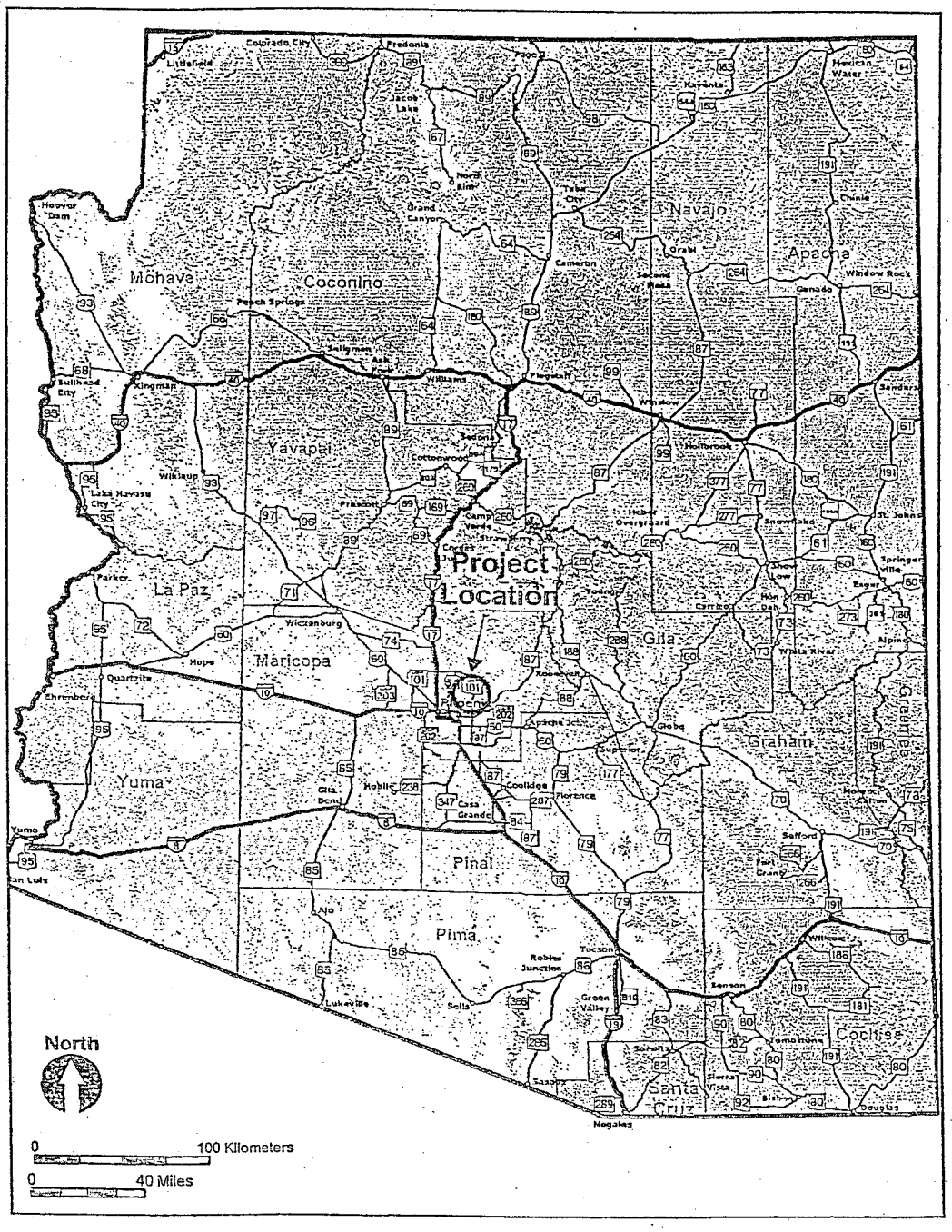


Figure 1. General Project Location.

AZAW000303

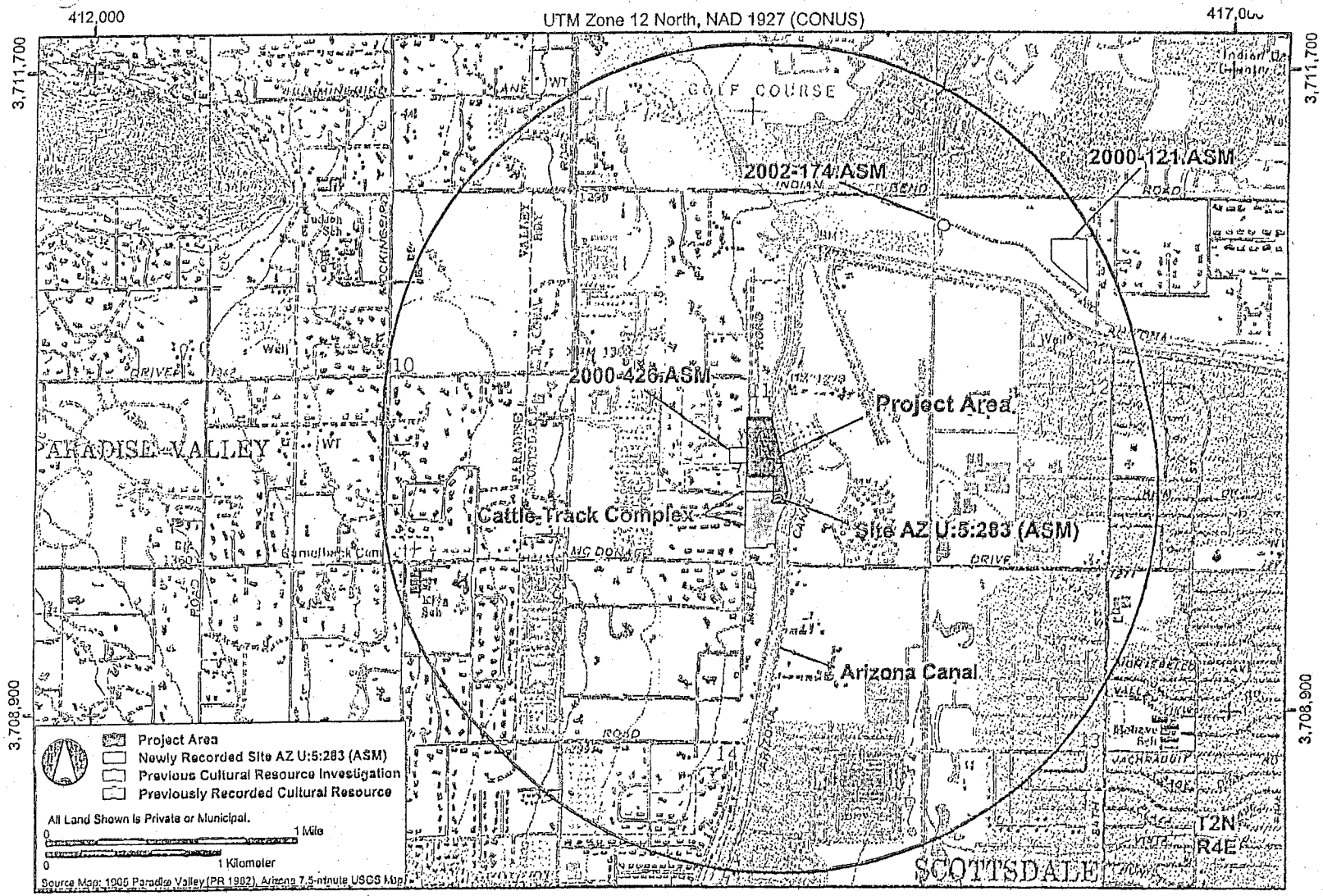


Figure 2. Project Vicinity Showing Land Status, Newly Recorded Site AZ U:5:283 (ASM), Previous Cultural Resources and Surveys (Scale 1:24,000).

plotted on maps along with the survey area. A review of available site cards for cultural resources in the vicinity provided information on the types and locations of cultural resources likely to be encountered during the survey.

The project area was identified using plans provided by DSWA. During the investigation, the author surveyed the parcel by walking parallel transects spaced less than 50 ft apart. The cultural resources searched for included archaeological sites, historic buildings and structures, and isolated occurrences (IOs). When encountered, the location and a general description of identified cultural resources were recorded. Each location was plotted by hand on survey area maps, which consisted of portions of USGS 7.5-minute topographic maps. Cultural resource locations were recorded using a Garmin Etrex handheld Global Positioning System (GPS), and photographed with a digital camera.

The distinction between IOs and archaeological sites is based on the general criteria outlined in the "Revised Site Definition Policy (Arizona State Lands)" (ASM 1995). Archaeological sites are generally defined and identified as areas of purposeful human activity that include artifact assemblages and/or features and structural remnants that reflect this activity. Generally, artifact assemblages at sites, in comparison to those at IOs, include several artifact classes (for example, chipped stone debitage, ceramic sherds, or glass bottles) and greater overall numbers of artifacts. IOs generally consist of only a single or possibly a few artifacts, of only one or two artifact classes, that do not reflect purposeful human activity. IOs are indicative of happenstance or fortuitous artifact deposition rather than a purposeful human undertaking. A few ceramic sherds representing an accidentally broken vessel or a single projectile point are examples of IOs. Simple, isolated features also can be identified as IOs.

When cultural remains were located during the pedestrian survey, the author walked close interval transects, approximately 10-13 ft apart, in the vicinity of the find to locate any additional artifacts, associated features, or structural remains. Based on the results of the close interval inspection, the cultural resources were determined to be either a site or an IO. The general criteria applied regarding the number of artifacts was 20 or fewer artifacts within a localized area, generally 50 ft in diameter, of only one or two artifact classes, were considered an IO. Larger concentrations of artifacts, and artifacts with associated features, were considered archaeological sites.

ENVIRONMENT

The project area is located within the Basin and Range physiographic province, and approximately 25 miles northeast of the confluence of the Gila and Salt Rivers. Elevations in the vicinity approach 1,300 feet above sea level. The underlying geology consists of surficial deposits, which accumulated throughout the Holocene to middle Pleistocene (Kamilli and Richard 1998). Surface sediments within the region belong to the Laveen-Rillito association, which are moderately coarse-textured limy soils that formed in old alluvium derived from limestone (Hendricks 1985). The surrounding vegetation is characteristic of the Lower Colorado River Valley subdivision of the Sonoran Desertscrub biotic community (Turner and Brown 1994). High temperatures and low precipitation support the growth of creosotebush, white bursage, ocotillo, and brittlebush. Areas near drainageways can often support western honey mesquite, ironwood, smoketree, and blue palo verde (Turner and Brown 1994). In terms of a built environment, the project area can be characterized as largely urbanized due to commercial and residential development.

CULTURE HISTORY

This section briefly summarizes the prehistory and history of the project vicinity. More detailed overviews of the regional culture history can be found in Crown and Judge (1991), Doyel (1987), Doyel, Fish, and Fish (2000), Gladwin and others (1938), Gumerman (1991), Haury (1945, 1976), and Wilcox

and others (1981). The cultural history of the project vicinity can be divided into five time periods that roughly correspond to major changes or adaptations in life patterns. These periods are the Paleoindian (about 10,000–8,500 B.C.), Archaic (8,500 B.C.–A.D. 0), Formative (A.D. 0–1500), Protohistoric (A.D. 1500–1800), and the Historic Period (A.D. 1800–1950). Table 1 summarizes the chronology used in this document.

Table 1. Cultural Chronology Used in This Document

2000 1950	Recent		
1800	Historic Native American and Euroamerican		
1500	Protohistoric O'odham (Pima and Papago)		
1350	Formative Hohokam[1]	Classic Period	Polvorón Phase (?)
			Civano Phase
1150			Soho Phase
		Sedentary Period	Santan Phase (?)
			Sacaton Phase
850		Colonial Period	Santa Cruz Phase
			Gila Butte Phase
700		Pioneer Period	Snaketown Phase
			Sweetwater Phase
500			Estrella Phase
			Vahki Phase
A.D. 0			Red Mountain Phase
B.C. 8500	Archaic		
	Paleoindian		

[1]Hohokam chronology adapted from Dean (1991)

Paleoindian and Archaic Periods

Populations during the Paleoindian period were small, mobile hunting and gathering groups. Paleoindian populations of the Clovis complex relied on large game animals, and produced large, finely made projectile points. The Paleoindian period is followed by the Archaic Period, and by a shift from hunting large game animals to a more varied hunting and gathering lifestyle and the beginnings of agricultural subsistence. This shift in lifestyle may be due to the extinction of large game species throughout the Southwest. Artifacts found at Archaic Period sites typically include a wide variety of chipped stone projectile points, tools, and materials. A variety of ground stone implements can be found at sites dating to the Late Archaic Period. No Paleoindian or Archaic Period sites are known to exist in the project

vicinity, although several early Holocene Archaic sites have been noted west of the Agua Fria/Gila River confluence (Mabry 1998).

The Formative Period

The Hohokam, who inhabited the Middle Gila, Middle Salt, and Santa Cruz River valleys during the Formative Period are one of the most widely investigated, archaeologically defined, cultural groups in North America. Researchers have divided the Hohokam cultural sequence into four periods that equate to changes in settlement and subsistence patterns. These periods are the Pioneer (A.D. 0–775), Colonial (A.D. 775–975), Sedentary (A.D. 975–1150), and Classic (A.D. 1150–1400). The chronological sequence for the four Hohokam periods (and the phases into which they are subdivided) used in this report follows Dean (1991) (refer to Table 1).

The Pioneer Period has been divided into five phases that correspond to changes in habitation and ceramic types: Red Mountain (A.D. 0–300), Vahki (A.D. 300–500), Estrella (A.D. 500–600), Sweetwater (A.D. 600–700), and Snaketown (A.D. 700–775). The introduction of ceramic technology, an increased dependence on agriculture, and the establishment of more sedentary villages are the factors that usher in the Formative Period, although preceramic agricultural sites of the Red Mountain Phase (A.D. 0–300) have been identified in the Phoenix Basin (Doyel and Fish 2000:9; Mabry 2000:55). This period is characterized by small groups of square- and ovoid-shaped pit houses arranged in clusters of 2–4 houses around a central courtyard and probably only seasonally occupied (Cordell 1997; Crown 1991; Doyel 1987). Several house groups may have formed a dispersed village, and would have been situated adjacent to a major waterway, such as the Salt River. Throughout most of the Pioneer Period, agriculture was primarily confined to the river floodplain, however, by the Snaketown Phase irrigation canals were being constructed and arable lands adjacent to rivers were being farmed. Crops included corn, beans, squash, cotton, and tobacco. The dispersed villages are often associated with distinct activity areas, trash mounds, and burial areas. Artifacts commonly observed at Pioneer Period sites include clay figurines, slate palettes, worked marine shell, plain and polished red ware ceramics, red-on-gray decorated ceramics in the Estrella Phase, and red-on-buff ceramics in the subsequent phases (Cordell 1997; Crown 1991).

The Colonial Period includes the Gila Butte (A.D. 775–850) and Santa Cruz (A.D. 850–975) Phases, and is interpreted as a period of Hohokam expansion and increased sedentism. Habitations during the Colonial Period were likely permanent, situated on terraces above the river floodplain, consisted of 2–4 rectangular pit houses arranged in clusters around courtyards, and commonly included associated extramural work areas, cremation areas, and trash mounds (Crown 1991; Hill and Bruder 2000). Several of these clusters make up larger villages, such as Snaketown, on the Gila River approximately 25 miles (40 km) southeast of the project area, which is dispersed over an area several hundred meters in diameter—maybe several kilometers (Haury 1976; Wilcox and others 1981). Monumental architecture appears in the Colonial Period in the form of caliche-capped trash mounds and what Hohokam researchers have termed ballcourts, signaling an increasing differentiation or increase in status of some sites in the Hohokam area (Crown 1991; Wilcox and Sternberg 1983). Irrigation agriculture increased during this period, although dry farming was still practiced. Artifacts typical of the Colonial Period include specialized craft items of marine shell and turquoise, slate palettes, and elaborate clay figurines. Decorated red-on-buff pottery is also common, and includes incised wares in the Gila Butte Phase, and non-incised wares with tightly packed, carefully executed decorations during the Santa Cruz Phase (Haury 1976).

During the Sedentary Period, the Hohokam culture area continued to grow, and reached its greatest extent. Large villages such as Snaketown also reached their greatest size and most complex arrangements (Doyel, Fish and Fish 2000; Haury 1976). The period consists of the Sacaton (and possibly the Santan) Phase (A.D. 975–1150), which is characterized by large villages of ellipsoidal and rectangular pit houses

on terraces above the river floodplain (Cordell 1997; Crown 1991). Construction of ballcourts continues and flourishes in the Sedentary, and a new form of monumental architecture, the platform mound, is introduced (Crown 1991; Wilcox and Sternberg 1983). During this period canal systems are further expanded, and the dead are cremated and buried in pottery vessels, although a few east facing, extended inhumations are known (Crown 1991). Craft items during this period become increasingly crude, and design elements on red-on-buff pottery are less carefully executed (Crown 1991). Red-ware pottery is reintroduced in this period.

At about A.D. 1000, near the end of the Sedentary Period, a dramatic shift can be seen in the settlement, architecture, burial practices, and material culture throughout the Hohokam culture area, and throughout the American Southwest. Researchers define three phases, the Soho (A.D. 1150–1300), Civano (A.D. 1300–1400), and Polvorón (1400–1500), for the Classic Period in the Phoenix basin (Doyel and Fish 2000:4–5). In the Classic Period, larger, aggregated, and permanent communities on the river floodplain with adobe, *jacal*, and masonry constructions replace pit house villages in most of the Hohokam area. Irrigation systems are expanded and upgraded. Larger villages become home to massive platform mounds, such as that seen at the Gatlin Site in Gila Bend, and are often enclosed within compound walls (Doyel 1991). Large adobe *great houses* were constructed at central sites such as Pueblo Grande, Mesa Grande, and Casa Grande. The majority of human burials in the Classic Period tend to be inhumations, although cremations still occur (Crown 1991). Red-on-buff ceramics are virtually replaced by Salado-style polychrome wares and highly polished red wares. Crown (1991:153) suggests that the Classic Period was a time of intensification and rapid change, departing from the patterns of earlier periods. By A.D. 1400, evidence points to a virtual Hohokam abandonment of the region, although some evidence exists for a possible small-scale occupation in the post-classic Polvorón Phase.

The Protohistoric and Historic Periods

After A.D. 1500, indigenous Pima and Papago groups (modern-day Akimel O'odham and Tohono O'odham) occupied the region surrounding the Phoenix basin. It is thought by most researchers that these groups are descendents of the prehistoric Hohokam (McGuire and Schiffer 1982), although Crown (1991:154) states that it is unclear whether the Phoenix basin was continuously occupied by indigenous populations up to the arrival of Europeans. Eusebio Kino, a Jesuit and Spanish explorer, explored much of the lower Gila River Valley and Papaguería in 1699, but never documented a visit to the Phoenix Basin. Modern researchers think that the Phoenix basin was either abandoned or only occupied infrequently on an opportunistic basis. At some point after the Spanish *Entrada*, Apache and Yavapai groups began to exploit the resources of the Salt and Gila River Valleys, and began to raid Papago villages along the Gila River to the south of the project area. Few Apache or Yavapai sites have been identified in the Phoenix area. Typically, Apache and Yavapai sites consist of small ephemeral settlements, wikieups, and agave roasting pits associated with chipped stone tools and crude plain ware ceramic artifacts (Gilpin and Phillips 1999).

The first Euroamericans came to the Phoenix basin in the mid-1800s, after the United States acquired what is now most of Arizona and New Mexico in the treaty of Guadalupe Hidalgo. Early settlers of the Phoenix basin were attracted by the fertile soils and the potential for agriculture. In some cases, the early settlers dug out the old Hohokam canals to increase arable lands, and the ancient irrigation network surely provided inspiration for a massive historic canal system (Trimble 1986). In 1902, Congress passed the Reclamation Act, which allowed the federal government to fund irrigation projects throughout the western US with monies acquired from the sale of public lands (United States Bureau of Reclamation 2004). Established as a result of the Reclamation Act, the Reclamation Service (renamed Bureau of Reclamation in 1923) selected the Salt River Valley as one of its first major projects. From this initiative stemmed Salt River Project (SRP), which now manages and operates the Valley's extensive canal system.

Scottsdale was named for Reverend Winfield Scott, who moved to the area in 1888 and acted as a local promoter for the community (Trimble 1986). With a population of only eight hundred, Scottsdale's growth was considerably stunted prior to World War II, but by 1965 the city boasted fifty-five thousand residents (Trimble 1986). Today, Scottsdale is a popular stop for tourists visiting the southwest.

PREVIOUS RESEARCH

The author consulted cultural resource records at ASM, the SHPO, PGM, and the AZSITE on-line database to identify prior surveys and previously recorded cultural resources within one mile of the proposed treatment facility. The records search identified three previous cultural resource surveys within one mile of the current project area. These surveys are summarized in Table 2 and depicted on Figure 2. None of the surveys were conducted within the current project area.

Table 2
Previous Cultural Resource Surveys within One Mile of the Project Area

	Project Number	Project Name	Reference
1	2000-121.ASM	Scottsdale Resort Condo Survey	Walsh 2000
2	2000-426.ASM	LVA II Archaeological Survey	Shaw 2000
3	2002-174.ASM	Intelligent Transportation Systems: Smart Corridors II	Winter and others 2002

The National Register on-line database, the Scottsdale Register on-line database, and the GLO plats were reviewed for further information on historic properties and possible historic locales. Review of the GLO plat for T2N R4E, dating to 1870, did not indicate any historic locales, buildings, or features within the project vicinity. Consultation of the National Register and Scottsdale Register, however, yielded one historic property: the Cattle Track Complex. The Cattle Track Complex is comprised of two adjacent parcels of land located in Scottsdale on Cattle Track Road (also known as Miller Road) between Lincoln Drive and McDonald Drive. The southern parcel belongs to the Ellis family and consists of one main building and eight ancillary structures. The northern parcel is currently owned by Fred Kueffner, and consists of one main building and two workshop studios. All of the buildings located within the Cattle Track Complex were built by engineer George L. Ellis, whose innovative designs played an integral role in the development of Scottsdale as an arts colony in the 1930s. The main building on the Ellis property, aptly named the George Ellis House, was constructed in 1937 from recycled materials. Today, most of the buildings serve as residences and work studios, but continue to convey their historic associations. The George Ellis House was added to the National Register in 1999 under Criteria B and C, for its association with the life of a significant person and for its distinctive design and construction. The Cattle Track Complex as a whole was zoned historic property in 1996 by the City of Scottsdale, and added to the Scottsdale Register following its establishment in 1999.

In addition to the Cattle Track Complex, another cultural resource, the Arizona Canal, is located immediately adjacent to the proposed location for the arsenic removal facility. The Arizona Canal was constructed between 1882 and 1885 by the Arizona Canal Company, and eventually integrated into the SRP system. A Programmatic Agreement (PA) has been developed among the Bureau of Reclamation, the Advisory Council on Historic Preservation, the Arizona SHPO, and SRP for the system of historic canals. The PA states that the Arizona Canal has been determined eligible for listing on the National Register under Criteria A and C.

SURVEY RESULTS

PEDESTRIAN SURVEY

The author conducted the survey on 22 July 2004, expending one person-field day of effort. Much of the project area has been disturbed as a result of previous construction (Figures 3 – 6). Ground visibility during the survey was excellent, with less than 15 percent of the ground surface obstructed by vegetation.

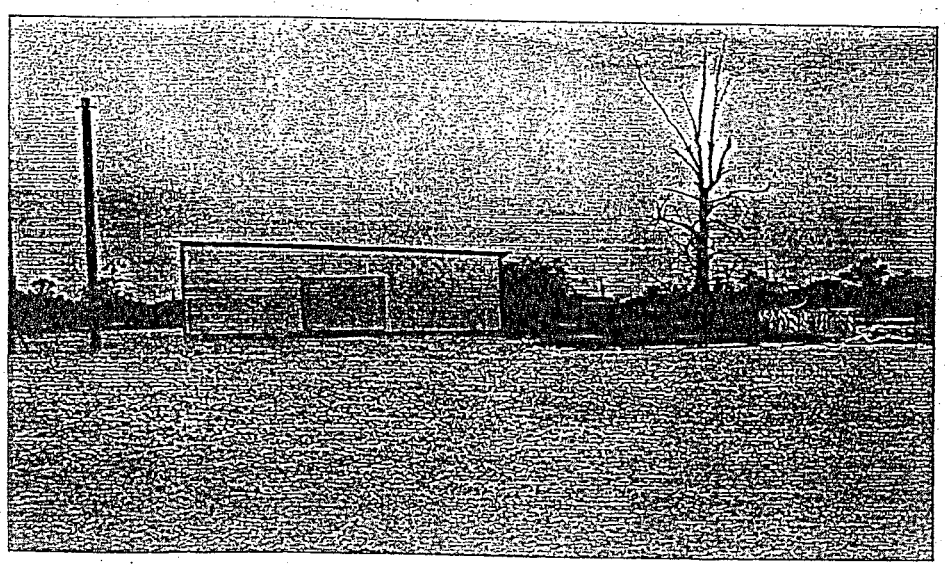


Figure 3. Photograph of Existing Storage Shed on Surveyed Parcel (view to north). Photograph by J. Strohmayer, 22 July 2004.

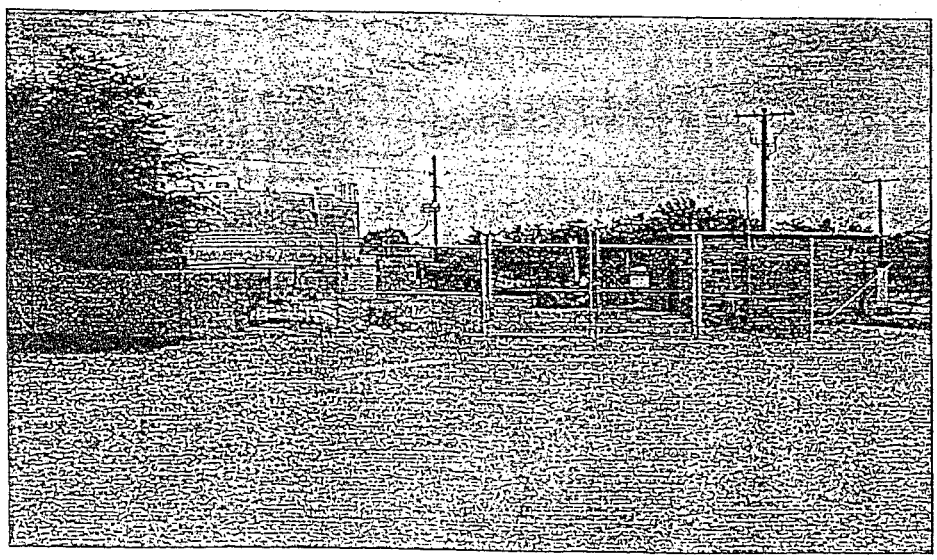


Figure 4. Photograph of Existing Paradise Valley Water Company Tank on Surveyed Parcel (view to east). Photograph by J. Strohmayer, 22 July 2004.

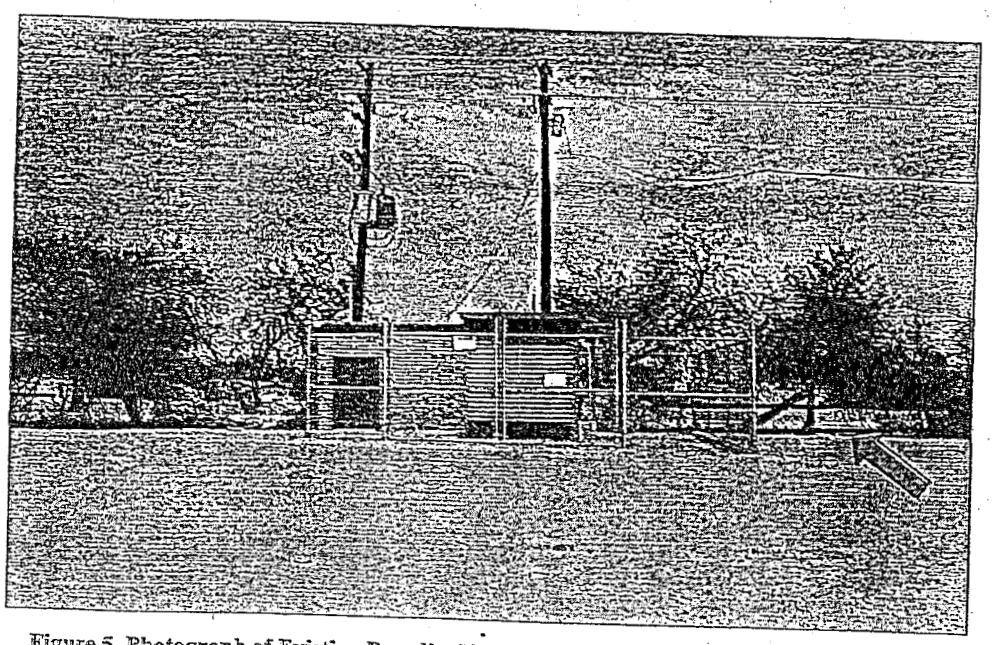


Figure 5. Photograph of Existing Paradise Valley Water Company Well #11 (view to east).
The Arrow Indicates the Arizona Canal.
Photograph by J. Strohmayer, 22 July 2004.

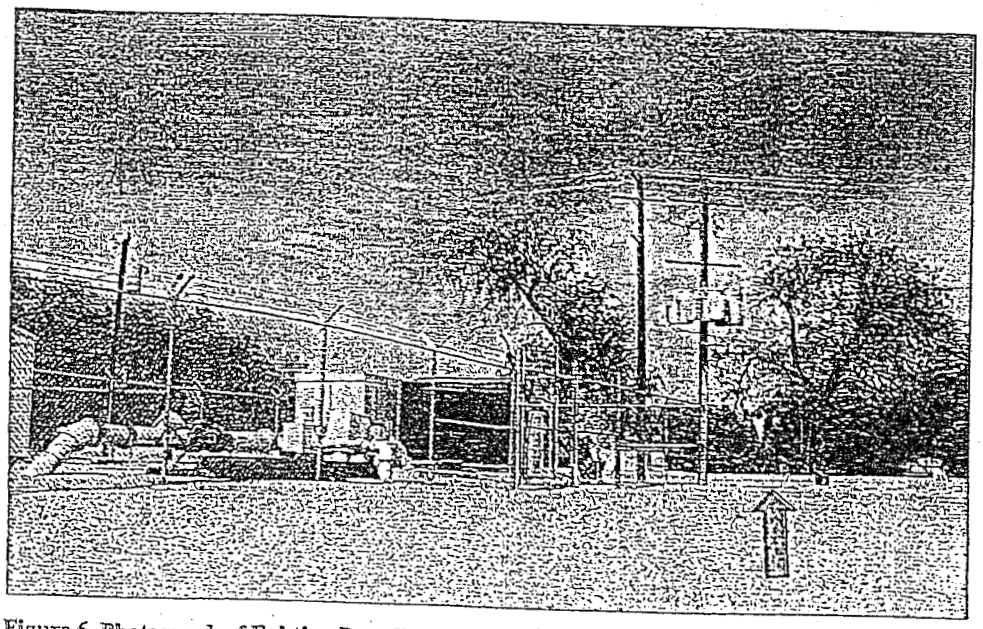


Figure 6. Photograph of Existing Paradise Valley Water Company Well #12 (view to northeast).
The Arrow Indicates the Arizona Canal.
Photograph by J. Strohmayer, 22 July 2004.

As a result of the field effort, a historic trash scatter, site AZ U:5:283 (ASM), was identified within the project APE. A description is provided below, along with a National Register eligibility assessment.

AZ U:5:283 (ASM)

Site Number	AZ U:5:283 (ASM)
Property Type	Historic Trash Scatter
Site Dimensions	140 x 115 ft
Location	East of Cattle Track Road (Miller Road) Between Lincoln Drive and McDonald Drive
Legal Location	NW¼ SW¼ SE¼ and the SW¼ NW¼ SE¼ of Section 11, T2N R4E, Gila and Salt River Base Line and Meridian
USGS Map Reference	1965 (Photorevised 1982) Paradise Valley, Arizona USGS 7.5' Quadrangle
UTM Coordinates	415020, 3709830 UTM Zone 12 North, NAD 1927 (Conus)
Elevation	1,290 ft above sea level
Land Status	Private
Cultural Association	Indeterminate Historic
Temporal Association	Historic Period (early 1920s)

Site Description

Site AZ U:5:283 (ASM) consists of a moderate density historic trash scatter situated east of Miller Road between Lincoln and McDonald Drives, and approximately 100 ft west of the Arizona Canal (refer to Figure 2). The site is situated at the southern extent of the survey parcel and bounded by the Cattle Track Complex to the south and west. The boundaries of the artifact scatter were marked with pin flags (later removed), and their locations were mapped using a GPS. The plan view map of site AZ U:5:283 (ASM) can be found in Figure 7.

The site is located within a well-developed residential area on a parcel of land that has been recently bladed. As a result, much of the natural environment no longer exists. There is no vegetation within the site boundary, which allowed for 100 percent ground visibility at the time of the survey (Figures 8 and 9). Dense vegetation, however, does surround the areas immediately adjacent to the survey parcel. Surface sediments consist of a loose sandy loam with few gravel inclusions.

The site measures 115 ft north to south and 145 ft east to west, and consists of a general scatter with a 10 x 20 ft artifact concentration situated roughly at the center of the site. All of the artifacts identified at site AZ U:5:283 (ASM) were inventoried and are presented below in Table 3. Approximately 142 artifacts were observed at the site, which is equal to 0.08 artifacts/y^2. More than half of the artifacts inventoried are glass. Glass types include clear, brown, selenium, cobalt, aqua, and sun-colored amethyst (SCA). Additional artifact types include metal, ceramics, shell casings, and a brick. SCA and aqua glass, such as the fragments observed at site AZ U:5:283 (ASM), were manufactured between 1880 – 1920, while selenium glass was only produced from 1915-1930 (Goodman 1998). In addition, a continuous thread top bottle fragment was observed at site AZ U:5:283 (ASM). Bottles and jars with continuous thread tops became widely used beginning in 1924 (Goodman 1998). In sum, the diagnostic artifacts identified at site AZ U:5:283 (ASM) suggest a temporal range between 1915 and the early 1920s, which indicates that it pre-dates the Cattle Track Complex.

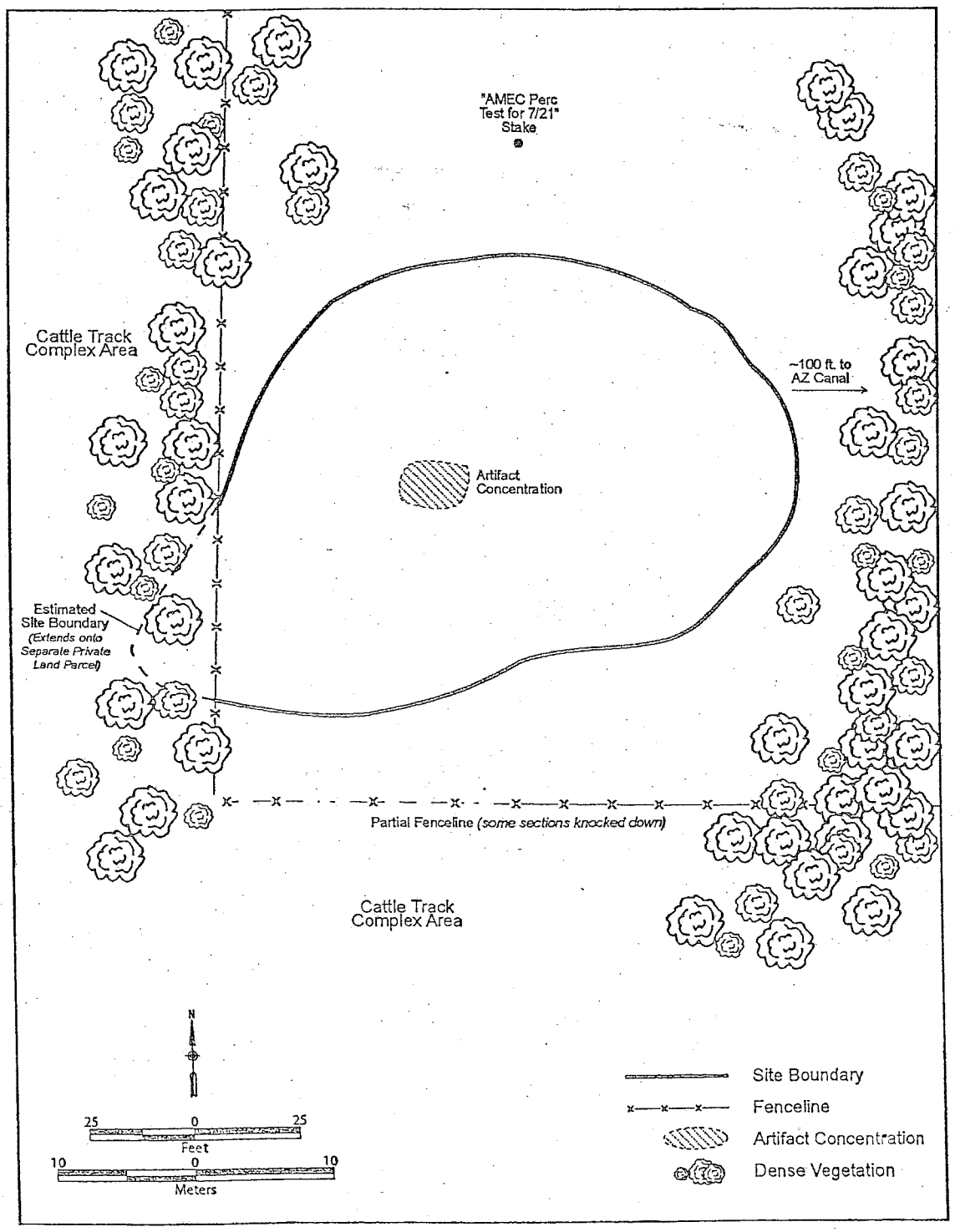


Figure 7. Plan View of Site AZ U:5:283 (ASM).

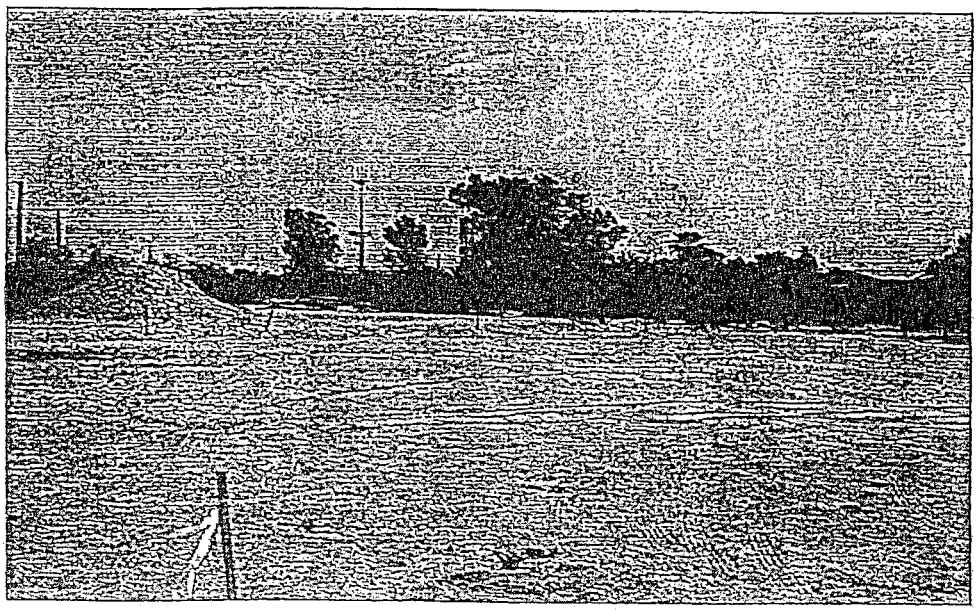


Figure 8. Photograph of Site AZ U:5:283 (ASM) (view to south-southwest).
Photograph by J. Strohmayer, 22 July 2004.

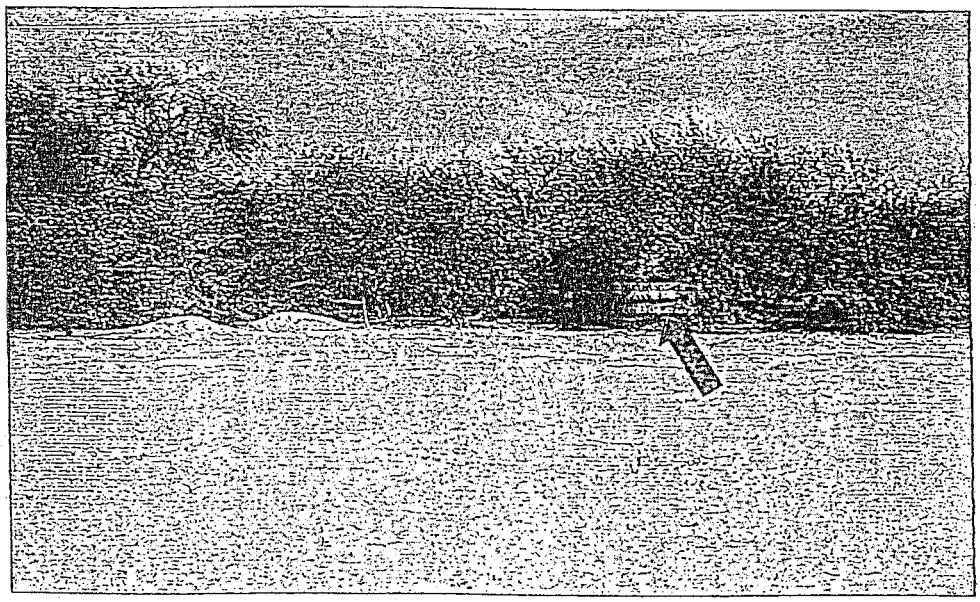


Figure 9. Photograph of the Eastern Extent of Site AZ U:5:283 (ASM) (view to east).
The Arrow Indicates the Arizona Canal.
Photograph by J. Strohmayer, 22 July 2004.

Table 3
Artifacts Inventoried at Site AZ U:5:283 (ASM)

Artifact Type	General Scatter	Concentration	Subtotals
Glass (Total)	50	35	85
Clear	26	17	43
Brown	8	0	9
Selenium	1	0	1
Cobalt	5	0	5
Aqua	10	8	6
SCA	0	10	10
Metal (Total)	18	3	21
Cans	14	0	14
Wire	4	3	7
Ceramics (Total)	15	17	32
Whiteware	11	15	26
Porcelain	4	2	6
Other (Total)	2	2	4
Shell Casing	2	1	3
Brick	0	1	1
Subtotals	85	57	
Total Number of Artifacts = 142			

Recommendation

It is evident from the temporally diagnostic artifacts that site AZ U:5:283 (ASM) is unrelated to the adjacent Cattle Track Complex, and therefore does not appear to be associated with an important event or person (refer to discussion below). Furthermore, site AZ U:5:283 (ASM) has no apparent architectural or engineering importance, and its information potential has been exhausted by this recording. We recommend, therefore, that the site be considered ineligible for listing in the National Register. Accordingly, no avoidance measures or further treatment of site AZ U:5:283 (ASM) is recommended.

VIEWSHED RECONNAISSANCE

The Cattle Track Complex is zoned "historic property," and therefore is protected under Article VI of the City of Scottsdale Historic Preservation Ordinance, which provides for the retention of the original appearance, setting and placement of the historic property. One specific building of the Cattle Track Complex, the George Ellis House, is listed on the National Register under Criteria B and C. In addition, the Arizona Canal has been determined eligible for the National Register under Criteria A and C. As a result, the Cattle Track Complex, specifically the George Ellis House, and the Arizona Canal have the potential to be impacted visually by the installation of the arsenic removal facility.

Accordingly, the author conducted a viewshed reconnaissance survey using pedestrian and vehicular transportation on 22 July 2004. Digital photographs were taken of the proposed facility location from various points within the Cattle Track Complex and from the Arizona Canal. Figure 10 depicts the locations of the photographs with respect to the surveyed parcel and the adjacent cultural resources, while Figures 11 – 17 illustrate aspects of the research. Results of the reconnaissance determined that, due to extensive tree coverage, the existing structures on the proposed arsenic removal facility parcel are not visible from either the National Register or Scottsdale Register properties. In addition, elements of the surrounding built environment, specifically existing power lines and a cellular tower (refer to Figure 8),

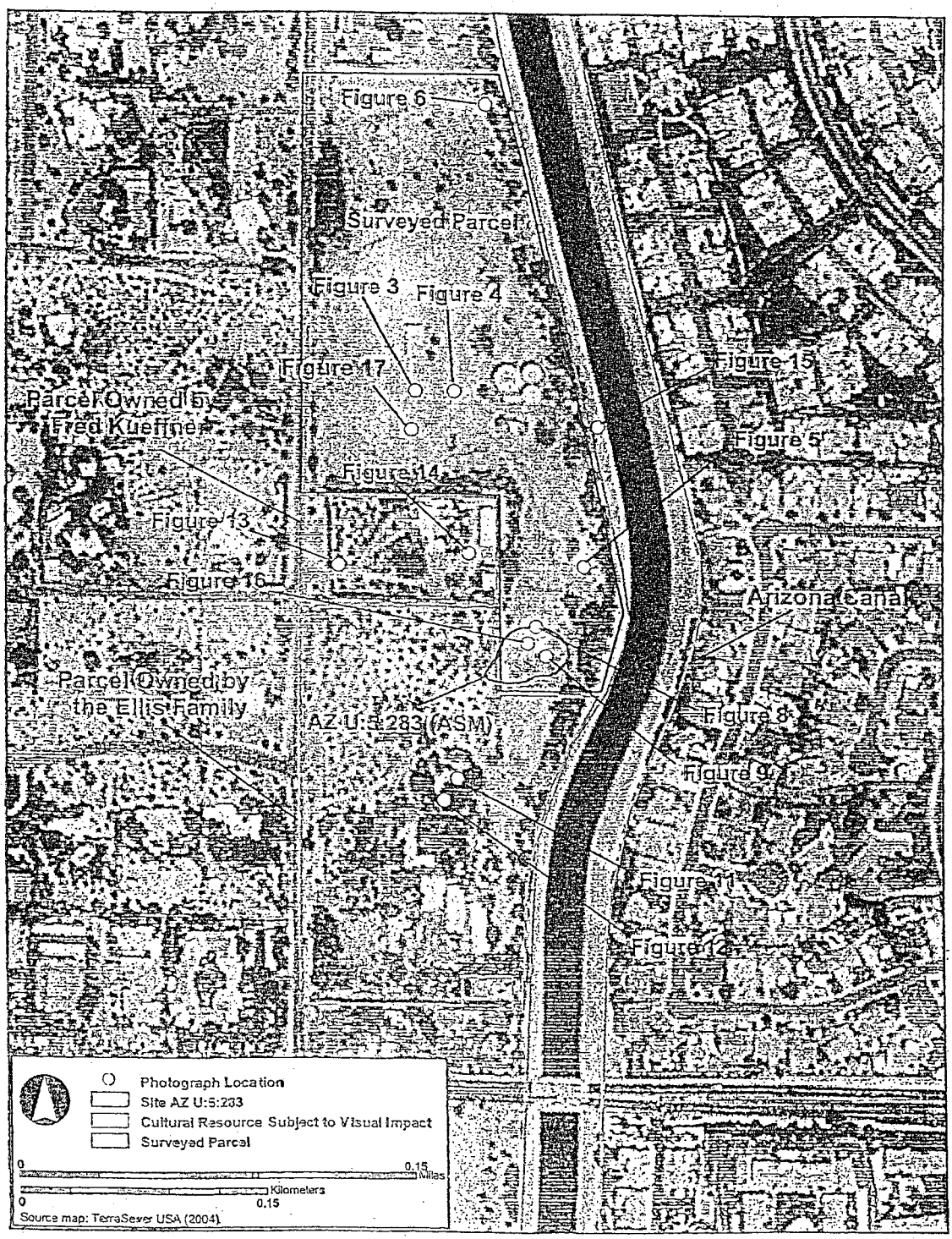


Figure 10. Project Vicinity Showing Photograph Locations.

are in the direct line of sight of both the Cattle Track Complex and the Arizona Canal. Because local views from these cultural resources have already been obstructed, the installation of the arsenic removal facility will not impose any additional adverse visual impact. Furthermore, provided the facility design is compatible with the adjacent historic properties, the Cattle Track Complex and the Arizona Canal will not be impacted visually by the proposed facility.

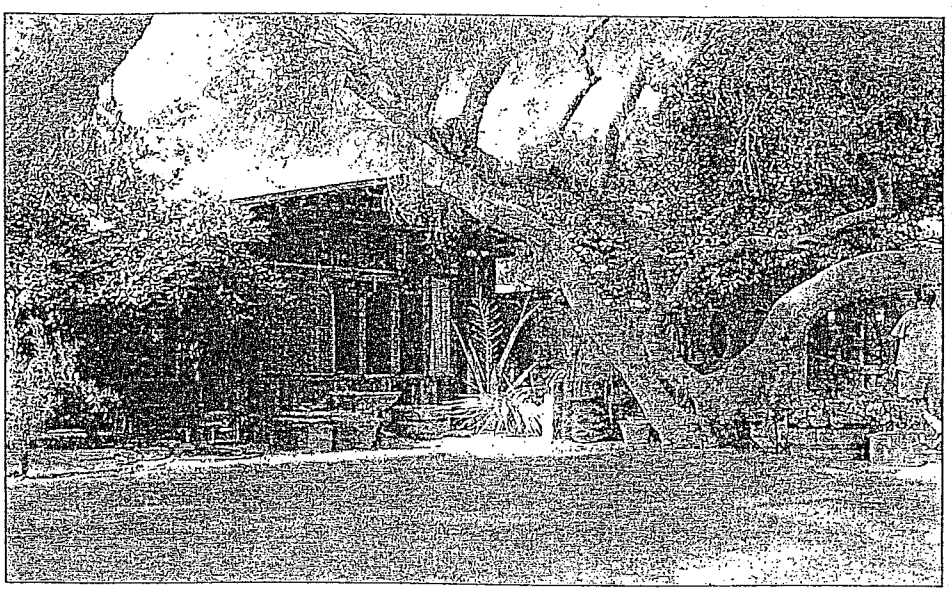


Figure 11. Photograph of the George Ellis House Facing the Proposed Facility (view to northeast). Photograph by J. Strohmayer, 22 July 2004.

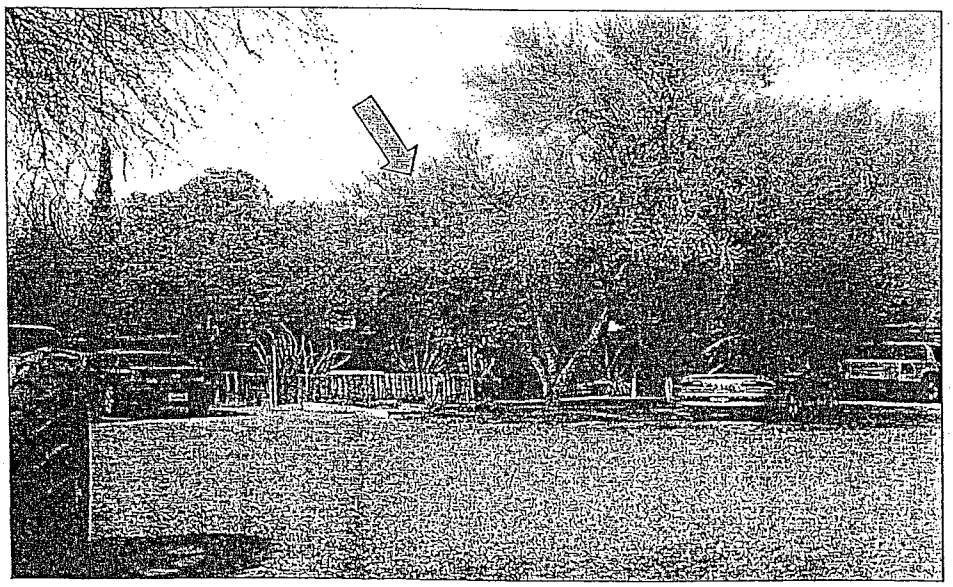


Figure 12. Photograph of the George Ellis House Indicating the Proposed Facility Location (view to northeast). Photography by J. Strohmayer, 22 July 2004.

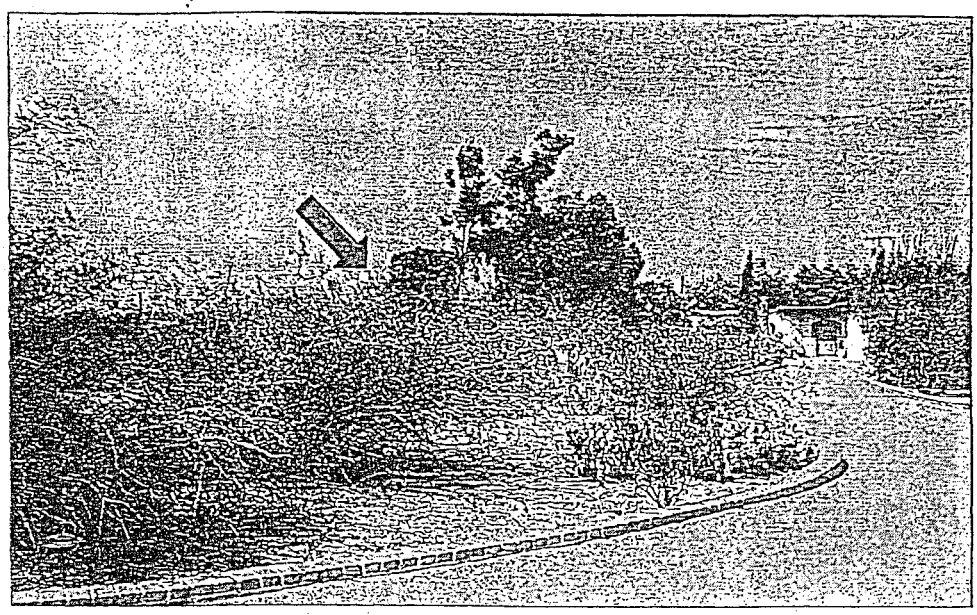


Figure 13. Photograph of the Fred Kueffner Homestead Indicating the Proposed Facility Location (view to northeast).
Photograph by J. Strohmayer, 22 July 2004.

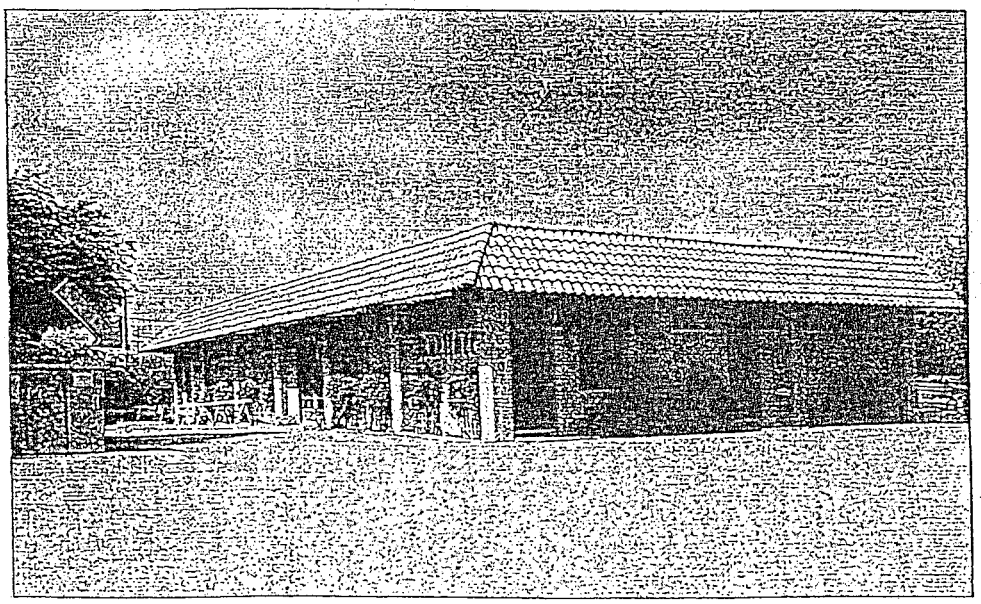


Figure 14. Photograph of the Fred Kueffner Homestead with an Existing Structure on the Surveyed Parcel in the Background (view to northeast).
Photograph by J. Strohmayer, 22 July 2004.

Figure 15. Photograph of the Arizona Canal. The Arrow Indicates the Location of an Existing Paradise Valley Water Company Tank (view to north).
Photograph by J. Strohmayer, 22 July 2004.

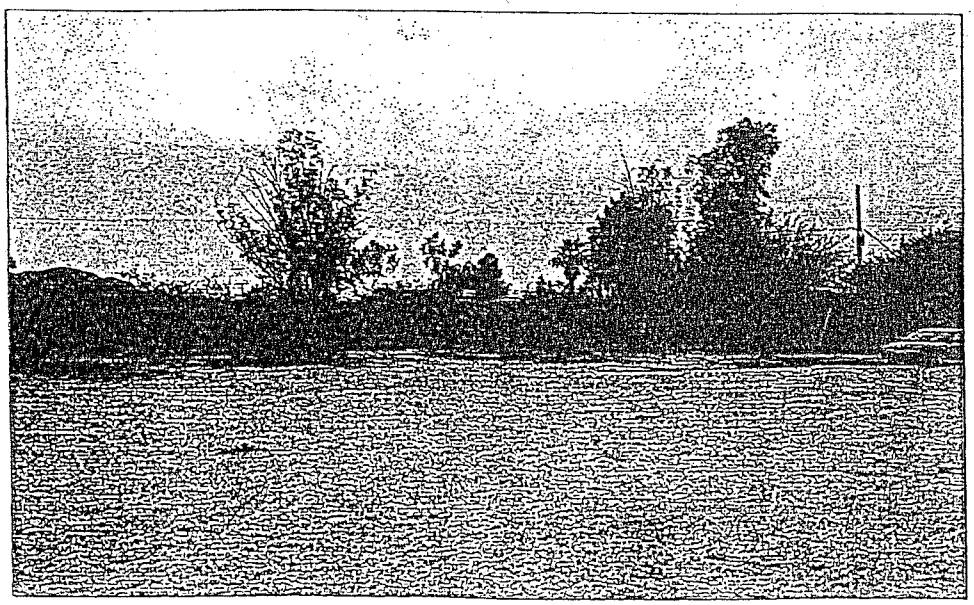


Figure 16. Photograph from Site AZ U:5:283 (ASM) Facing the Northern Extent of the Cattle Track Complex (view to west-northwest).
Photograph by J. Strohmayer, 22 July 2004.

Figure 17. Photograph from the Surveyed Parcel Facing the Northern Extent of the Cattle Track Complex (view to south).
Photograph by J. Strohmayer, 22 July 2004.

SUMMARY AND RECOMMENDATIONS

At the request of DSWA, EcoPlan conducted a cultural resource survey and viewshed reconnaissance in support of a proposed arsenic removal facility in Scottsdale, Maricopa County, Arizona. The area surveyed by EcoPlan amounts to 12.05 acres of private land. As a result of this investigation, the author identified one previously unrecorded site (AZ U:5:283 [ASM]), a historic trash scatter, within the APE. This site is recommended as ineligible for listing in the National Register, and therefore no further treatment or avoidance measures are necessary.

Research within the one-mile viewshed identified two cultural resources, the Cattle Track Complex and the Arizona Canal, which were evaluated for potential visual impacts resulting from the proposed installation of the arsenic removal facility. Provided the facility design is compatible with the adjacent historic properties, the Cattle Track Complex and the Arizona Canal will not be impacted visually by the installation of the arsenic removal facility. As a result, we recommend that a "Certificate of No Effect" be issued for this project in accordance with the City of Scottsdale's "Archaeological Resource Protection Ordinance."

If previously unidentified cultural resources should be discovered during construction, the City of Scottsdale Historic Preservation Division should be notified to make arrangements for the appropriate assessment and treatment of those resources.

REFERENCES CITED

ASM (Arizona State Museum)
1995 *Revised Site Definition Policy for Archaeologists Working on State Lands within Arizona.* Memorandum circulated August 21, 1995.

Cordell, Linda
1997 *Archaeology of the Southwest.* Second edition. Academic Press, San Diego.

Crown, Patricia L.
1991 The Hohokam: Current Views of Prehistory and the Regional System. In *Chaco and Hohokam: Prehistoric Regional Systems in the American Southwest.* Edited by P.L. Crown and W.J. Judge. School of American Research Press, Santa Fe, New Mexico.

Crown, Patricia L. and W. James Judge (editors)
1991 *Chaco and Hohokam: Prehistoric Regional Systems in the American Southwest.* School of American Research Press, Santa Fe, New Mexico.

Dean, Jeffery S.
1991 Thoughts on Hohokam Chronology. In *Exploring the Hohokam Prehistoric Peoples of the American Southwest.* Edited by G.J. Gumerman. University of New Mexico Press, Albuquerque, New Mexico.

Doyel, David E. , ed.
1987 *The Hohokam Village Site Structure and Organization.* Southwestern and Rocky Mountain Division of the American Association for the Advancement of Science, Glenwood Springs, Colorado.

Doyel, David E.
1991 Hohokam Cultural Evolution in the Phoenix Basin. In *Exploring the Hohokam Prehistoric Peoples of the American Southwest* edited by G. J. Gumerman. University of New Mexico Press, Albuquerque, New Mexico.

Doyel, David E., Suzanne K. Fish, and Paul R. Fish, eds.
2000 *The Hohokam Village Revisited.* Southwestern and Rocky Mountain Division of the American Association for the Advancement of Science, Glenwood Springs, Colorado.

Gilpin, Dennis, and David A. Phillips Jr.
1999 *The Prehistoric to Historic Transition Period in Arizona, Circa A.D. 1519 to 1692.* SWCA, Inc., Flagstaff, Arizona.

Gladwin, Harold S., Emil W. Haury, E. B. Sayles, and Nora Gladwin
1938 *Excavations at Snaketown: Material Culture.* Medallion Papers No. 25, Gila Pueblo, Globe, Arizona.

Goodman, John D.
1998 *Late Historic Artifacts Field Recording and Dating Guide.* Prepared for the Arizona Archaeological Council's 1998 Spring Meeting Workshop on historic artifacts held at the Pueblo Grande Museum, Phoenix, Arizona, 29 May 1998.

Gumerman, George J., ed.
1991 *Exploring the Hohokam Prehistoric Peoples of the American Southwest.* University of New Mexico Press, Albuquerque, New Mexico.

Haury, Emil W.
1945 *The Excavation of Los Muertos and Neighboring Ruins in the Salt River Valley, Southern Arizona.* Volume 24, No. 1. Peabody Museum of American Archaeology and Ethnology, Harvard University, Cambridge, Massachusetts.
1976 *The Hohokam: Desert Farmers and Craftsmen.* University of Arizona Press, Tucson, Arizona.

AFFIDAVIT OF POSTING
PUBLIC HEARING NOTICE

CASE NUMBER: Pre-Application 239-2004

PROJECT NAME:

LOCATION: Hilton Scottsdale Resort + Villas

SITE POSTING DATE: 7-14-2004

APPLICANT NAME: Arizona American Water

SIGN COMPANY NAME: Scottsdale Sign A Rama LLC.

PHONE NUMBER: 480-994-4000.

I confirm that the site has been posted as indicated by the Project Manager for the case as listed. Picture\s of site posting\s have been submitted.

Stephen Wakefield — 7-14-04

Applicant signature — Date

PATRICK BRYANT
Notary Public - Arizona
Maricopa County
My Comm. Expires May 5, 2008

Notary Public

Acknowledged before me this 14 day of July 2004

My commission expires May 5, 2008

Return completed, notarized affidavit and pictures to Current Planning Services at least 20 days prior to Planning Commission hearing.

Current Planning Services
7447 E. Indian School Road, Suite 105
Scottsdale, AZ 85251
480-312-7000

Early Notification of Project Under Consideration

Neighborhood Open House Meeting:

Date: Thursday, Aug. 5, 2004 **Time:** 6:30 pm
Location: Hilton Scottsdale Resort & Villas
6333 North Scottsdale Rd, Scottsdale, Arizona 85250

Site Address: 6299 N. Miller Road, Scottsdale, AZ 85250

Project Overview: Rezoning parcels 174-13-934 and 174-13-935 back to R1-43 to allow for construction of a new 19 mgd arsenic removal facility to remove naturally occurring arsenic from well water. Requires Rezoning Application and Use Permit (Parcels 174-13-930, 931, 932, 934, and 935) following rezoning approval

- **Existing Zoning:** SC, Special Campus
- **Proposed Zoning:** R1-43, Single Family Residential
- **Acreage Parcel** 174-13-934: 2.33 ac, 174-13-935: 0.9 ac, Combined Acreage = 3.23

APPLICANT: Arizona American Water
CONTACT: Robert McCandless, DSWA
PHONE NUMBER: 602-217-1034
E-MAIL ADDRESS: rmccandless@dswa.net

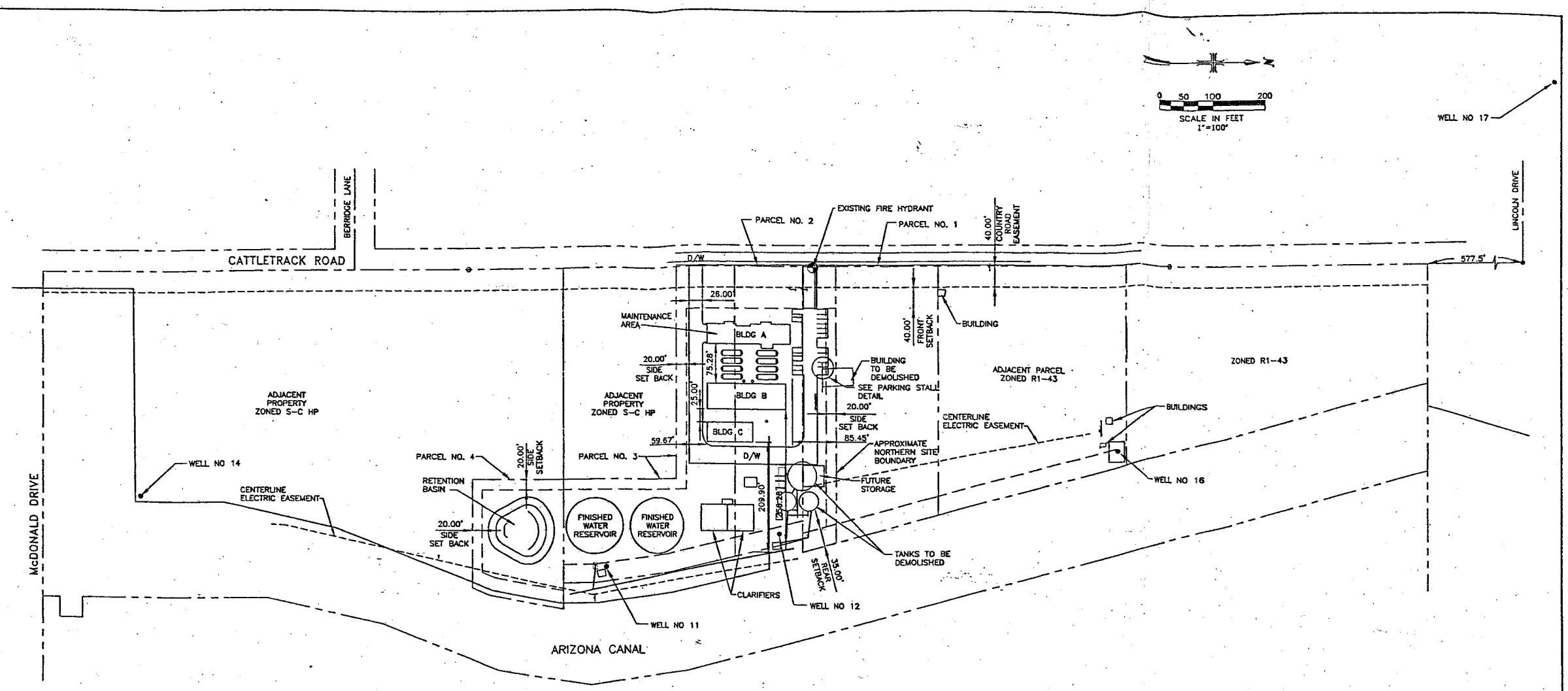
CITY STAFF CONTACT: Tim Curtis
PHONE NUMBER: 480-312-4210
E-MAIL ADDRESS: tcurtis@scottsdaleaz.gov

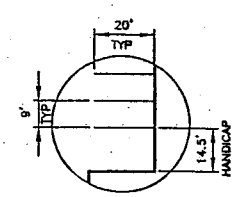
Pre-Application #: 239-2004 available at City of Scottsdale: 480-312-7000

Project Info. available at: www.scottsdaleaz.gov/projects/ProjectsInProgress

Posting Date: 07/14/04

2004 07 14





PARKING STALL DETAIL

PARCEL DATA

PARCEL NO.	APN	CURRENT ZONING	PROPOSED ZONING	ACREAGE
1	174-13-931	R1-43	NO CHANGE	3.099
2	174-13-932	R1-43	NO CHANGE	1.6
3	174-13-934	R1-43 HP	NO CHANGE	2.33
4	174-13-935	R1-43 HP	NO CHANGE	0.90

STRUCTURES

DESC	DIMENSION FT x FT	GROSS FLOOR AREA, SF	MAX. HEIGHT, FT	PROPOSED USE
BLDG A	160 x 35	5,600	18	ADMINISTRATION, CUSTOMER SERVICE, LAB
BLDG B	150 x 48	7,200	18	CHEMICAL STORAGE / FEED, PUMP ROOM
BLDG C	90 x 35	3,150	28	SOLIDS HANDLING, STANDBY POWER
BLDG TOTAL		15,950		
RESERVOIRS	107 FT DIA	17,984	28	WATER STORAGE
CLARIFIERS	55 FT DIA	4,752	4	SETTLING
PROCESS TOTAL		22,736		

PROJECT DATA

PREAPPLICATION NUMBER: 239-PA-2004

LOCATION:
6215 NORTH MILLER ROAD
SCOTTSDALE, ARIZONA

OWNER:
ARIZONA AMERICAN WATER
19820 NORTH 7th STREET
PHOENIX, ARIZONA 85024

ZONING:
CURRENT: R1-43 HP (PARCEL NOS. 3 & 4)

SITE AREA: (INCLUDES 0.86 AC OF PARCEL NO. 1)
GROSS: 247,856 SF
NET: 195,731 SF

PARKING SPACES
REQUIRED: 11, 2 (BLDG A ONLY)
PROVIDED: 17, 1 HANDICAP

OPEN SPACE
REQUIRED: 53,238.83 SF
PROVIDED: 129,095 SF

AZAW000325

LEGEND

- PROPERTY LINE
- CENTER LINE OF ROADWAY
- EASEMENT LINE
- SETBACK LINE

REVISIONS

PARADISE VALLEY ARSENIC REMOVAL FACILITY
CIVIL
SITE PLAN

ARIZONA AMERICAN WATER COMPANY
PARADISE VALLEY DISTRICT

DAMON S. WILLIAMS ASSOCIATES, LLC
2355 EAST CAMELBACK ROAD, SUITE 700
PHOENIX, ARIZONA 85016

DSWA

DRAWN BY SLB
PROJECT ENG'R CHC
APPROVED RRM

DATE SEPTEMBER 2004
PROJECT 23640003

USE DIMENSIONS ONLY
SCALE NA

USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES

2302-0001-SP01

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City of Scottsdale
Current Planning Services

PROJECT DATA SHEET
Residential/Commercial

Project Number: 239 -PA- 2004 Coordinator: Tim Curtis

Project Address: 6215 N. Miller Road, Scottsdale, AZ 85250 Date: September 3, 2004

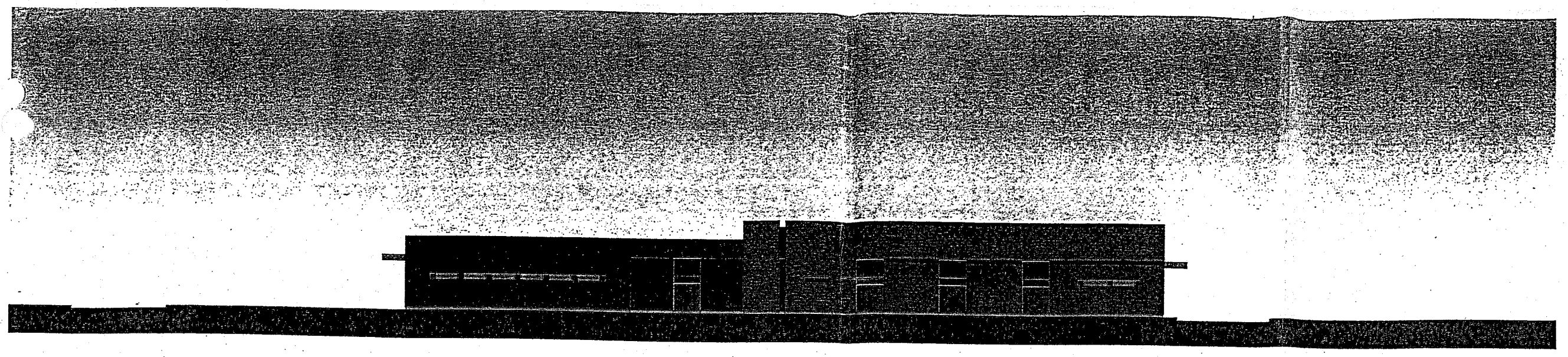
Proposed Use: Arsenic Removal Facility (Groundwater) Zoning District: R1-43

TO BE COMPLETED BY APPLICANT COMMERCIAL	RESIDENTIAL	CALCULATIONS	TO BE COMPLETED BY CITY
	195731	Net Lot Area	
X	247856	Gross Lot Area	
	X	Gross Floor Area Allowed	
	X	Gross Floor Area Provided	
	X	Building Volume Allowed	
	X	Building Volume Provided	
X	N/A	Number Of Units Or Lots	
X	N/A	Density Allowed	
X	N/A	Density Provided	
X	43,000	Minimum Lot Size Allowed	
X	247,856	Minimum Lot Size Provided	
	30	Building Height Allowed	
	28	Building Height Provided	
	15950	Net Floor Area	
	32	Parking Spaces Required	
	18	Parking Provided On-Site	
	0	Parking Provided Off-Site	
	18	Total Parking Provided	
	53,238.83	Open Space Required	
	129095	Open Space Provided	
	6000	Front Open Space Required	
	16800	Front Open Space Provided	
	540	Parking Lot Landscaping Required	
	1400	Parking Lot Landscaping Provided	

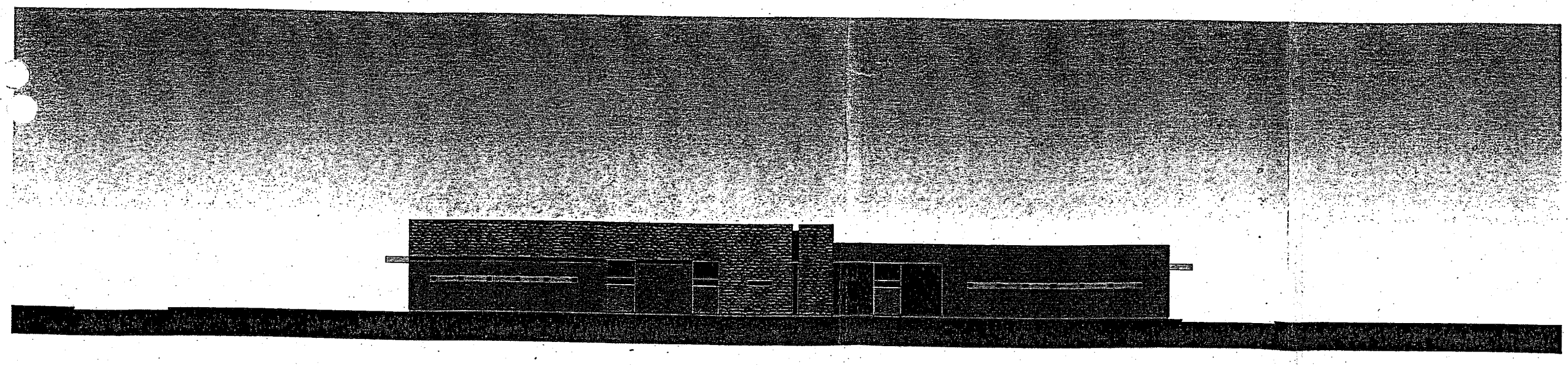
SET BACKS

REQUIRED	PROVIDED	CALCULATIONS	N, S, E, OR W	REQUIRED	PROVIDED
40	100	Front			
35	35	Rear			
20	50	Left Side			
20	90	Right Side			
10	15	Parking			

Planning and Development Services Department
7447 E Indian School Road, Suite 105, Scottsdale, AZ 85251 • Phone: 480-312-7000 • Fax: 480-312-7088



East Elevation of the Chemical Building



West Elevation of the Chemical Building

Arizona American Water Arsenic Removal Facilities Project

Arizona American Water

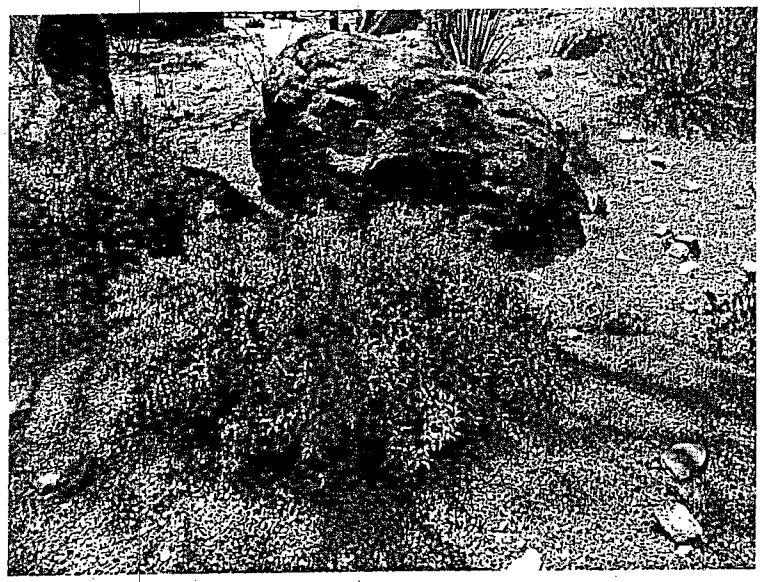
Damon S. Williams Associates

246 First Street
Suite 200
San Francisco, CA
94105

tel: (415) 957 2750
fax: (415) 957 2780

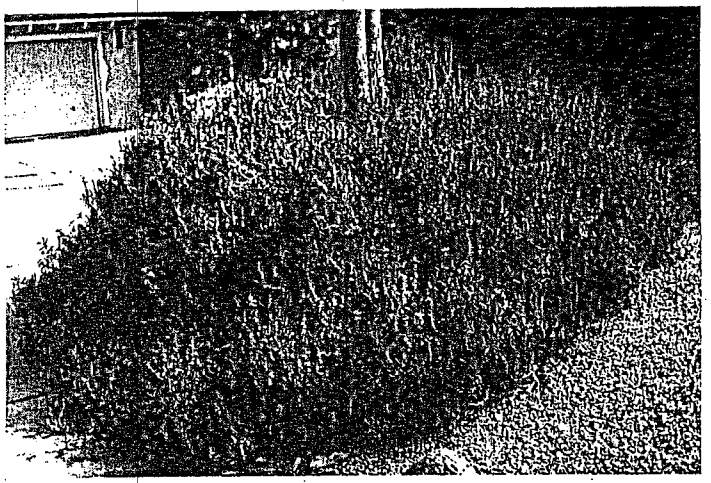
Michael Willis Architects

Landscaping Palette

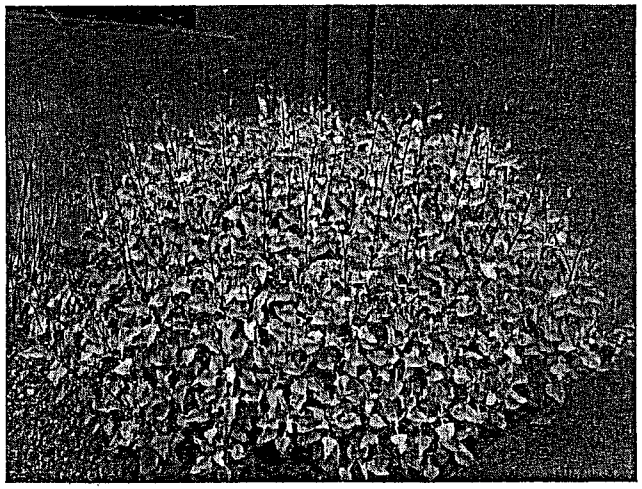


Ambrosia Deltoidia

Baileya Multiradiata



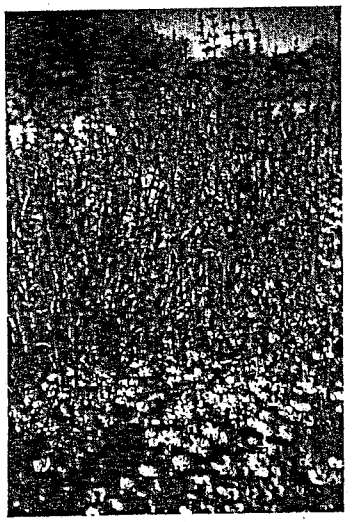
Justicia Californica



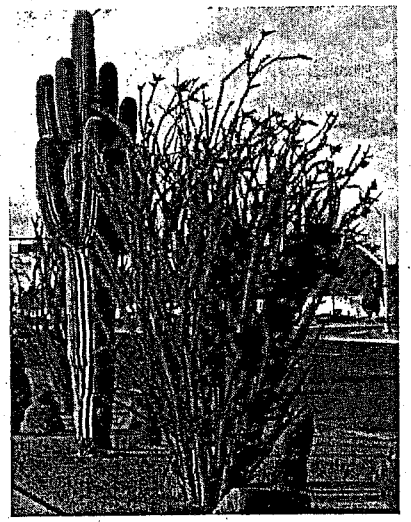
Encelia Farinosa

Larrea Tridentata

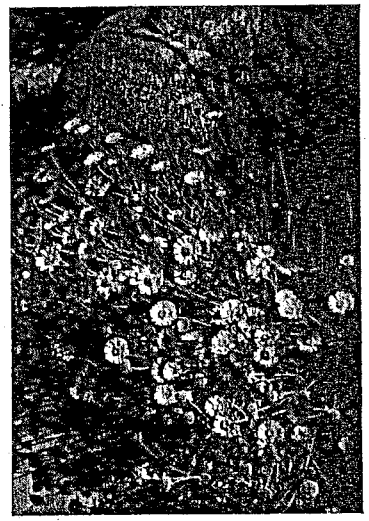
Opuntia Santa-Rita



Penstemon Parryi

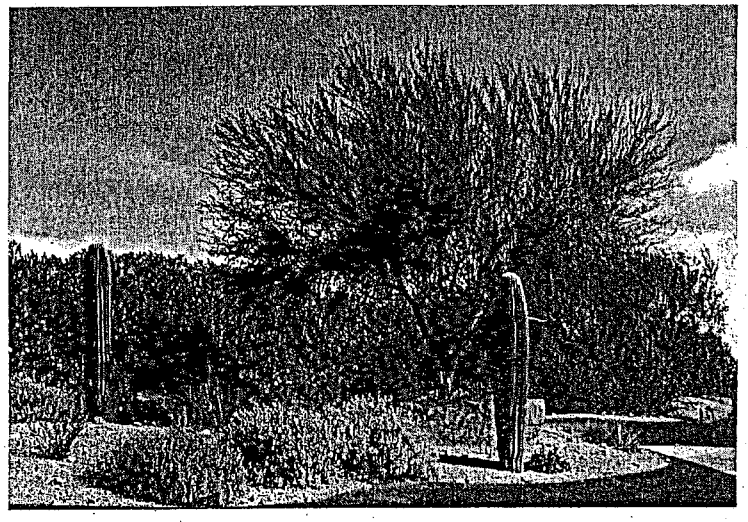


Saguaro and Ocotillo

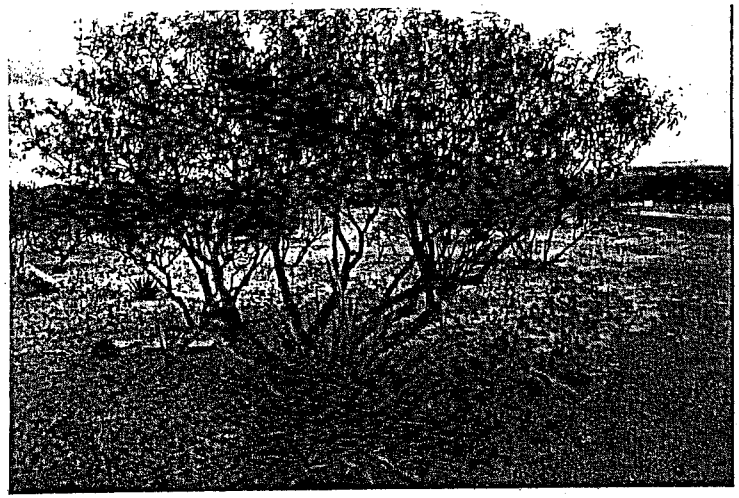


Baileya Multiradiata

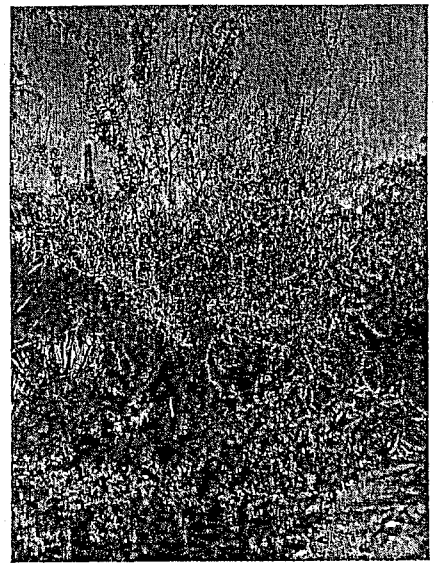
Parkinsonia Florida



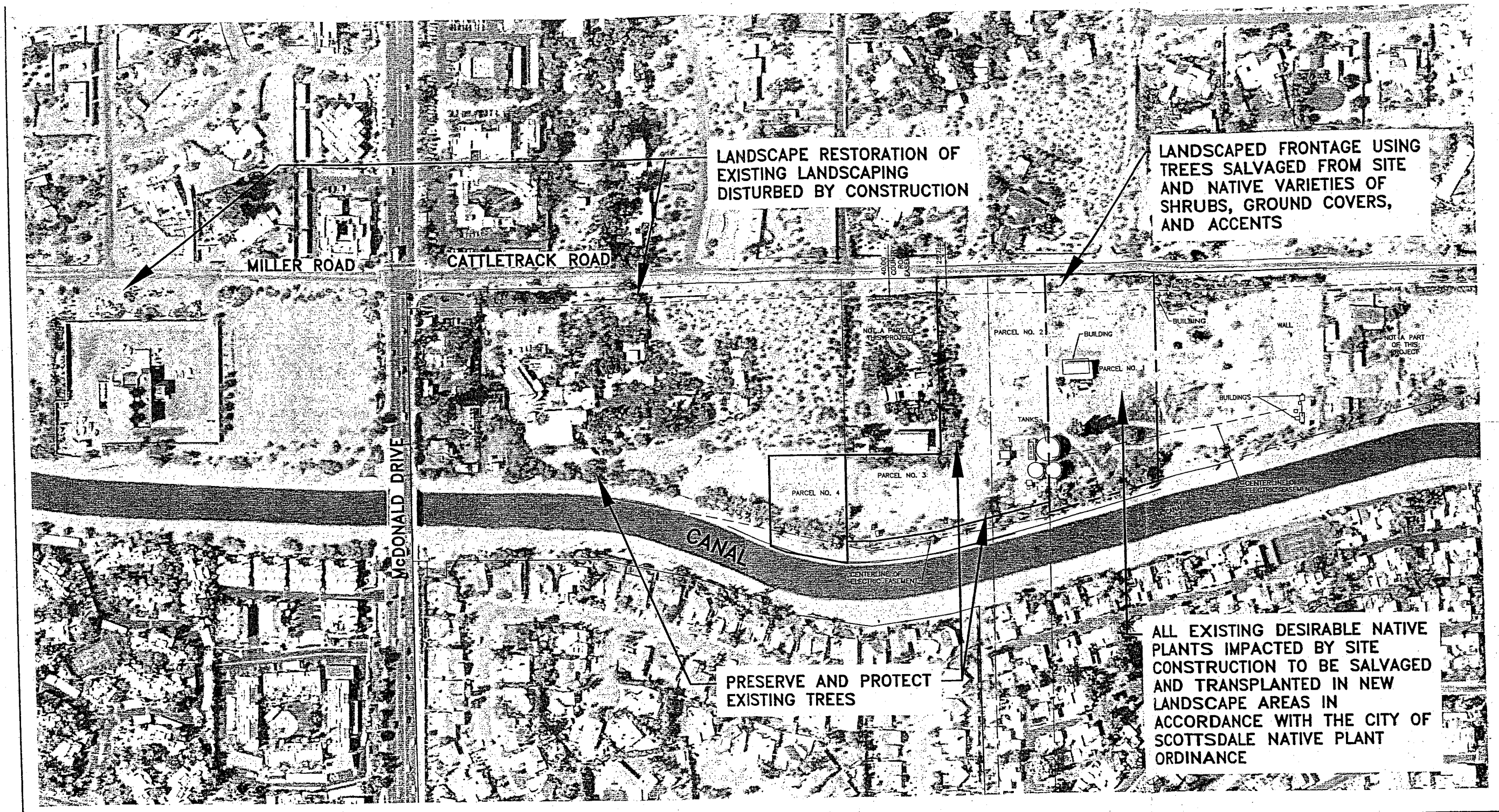
Parkinsonia Florida



Prosopia Juliflora



Zizyphus Obtusifolia



0 50 100 200
SCALE IN FEET
1"=100'

AZAW000332

McCloskey • Peltz, Inc.
LANDSCAPE ARCHITECTS
One West Elliot Road Suite 110 Tempe, Arizona 85284
Phone: (480) 838-4777 Fax: (480) 831-1774

REVISIONS

Paradise Valley Arsenic Removal Facility
LANDSCAPE
DESIGN APPROACH

ARIZONA AMERICAN
WATER CO. PARADISE VALLEY DISTRICT

DAMON S. WILLIAMS ASSOCIATES, LLC
2355 E. CAMELBACK ROAD, SUITE 700
PHOENIX, AZ 85016

DSWA

DRAWN BY HEO
PROJECT ENG'R DCM
APPROVED

DATE JULY 2004
PROJECT 040190

USE DIMENSIONS ONLY
SCALE 1" = 100'

USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES

2364-0003-L1

PRELIMINARY

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TRIP GENERATION COMPARISON

Cattletrack Road (Miller Road alignment) is classified as a minor collector between McDonald Drive and Lincoln Drive. It is not identified as a major street on the City's Streets Master Plan. Cattletrack consists of two lanes, one lane in each direction. The intersection of Cattletrack and McDonald Drive has a traffic signal.

A traffic study conducted by Scottsdale Engineering & Associates, Inc. indicated that the daily traffic volume along Cattletrack Road (Miller Road alignment) was 1,836 vehicles. The average speed of the vehicles measured was 33 miles per hour (mph); the 85th percentile speed was 40 mph. The study indicates that these volumes and speeds are consistent with a local collector street. Typically, minor collector streets are designed to accommodate traffic volumes of at least 5,000 vehicles per day. There are residential driveways along Cattletrack which are limited in number due to the large lot sizes present in this area.

The traffic volume due to the PVARF will show a modest increase over the current operations due to increased operator attendance at the site, bulk chemical deliveries, and liquid sludge hauling. The estimated traffic volume is shown in the following table:

Type	Trip Frequency	Days Per Week	Vehicle	Trips Per Month	Trips per Workday
Customer	3/day	5	Passenger	60.0	3.0
Employees	20/day	5	Passenger	400.0	20.0
Plant Operators	4/day	7	Passenger	112.0	4.0
Distribution Crews	4/day	5	Single Unit Truck	80.0	4.0
Solids Hauling	1/week		WB-50	4	0.14
Chemical Delivery Ferric	1/month		WB-50	1	0.04
Chemical Delivery Caustic	2/month		WB-50	2	0.07
Chemical Delivery Hypochlorite	3/month		WB-50	3	0.11
Chemical Delivery Polymer	1/month		Single Unit Truck	1	0.04
				Total	**31**

A WB-50 vehicle (large semi-trailer combination) will be used for the turning radii and geometric layout of plant drives. Plant drives will be 20 feet wide and paved with asphaltic concrete except in the chemical unloading area, which will be concrete. Turning radii will be a minimum of 25 feet on the inside.

DEI Professional Services, LLC

MILLER & MCDONALD RESIDENTS
"DOOR TO DOOR" REPORT
AS OF SEPTEMBER 29, 2004

NAME	OWNER ADDRESS	PARCEL #	LEFT BLUE DOOR HANGER	LEFT YELLOW DOOR HANGER & PROJECT INFORMATION SHEET	SIGNATURE OBTAINED / NOTES
Ross Betty Bocella	5713 N. Cattletrack	173-03-007-R	X		X
John & Mary Miller	5715 N.Miller Road	173-03-007-S	X	X	
Neil & Lauri Green	3240 W. Woodmen Road	173-03-008-F	X	X	UNDER CONSTRUCTION
Steven & Wendy Foss	7921 S. Dateland Drive	173-03-008-G			
Liscum & Lillian Diven	5821 Canal Bank Road	173-03-011-H			
Diven Liscum/Lillian O TR	5821 N. Canal Bank Road	173-03-011-H			
Rodrian James/Susan M TR/James Scott	2119 Swan Blvd	173-03-616-A			X
Resident	5998 N. 78th Street, #200	173-03-616-A			
Cheri Hoffman	5998 N. 78th Street, #101	173-03-617-A			X
Resident	5998 N. 78th Street, #201	173-03-617-A	X	X	
Resident	5998 N. 78th Street, #110	173-03-626-A	X	X	
Resident	5998 N. 78th Street, #210	173-03-626-A	X	X	
Conner William R/Renee R	105 N. Columbia Blvd	173-03-627-A	X	X	
Resident	5998 N. 78th Street, #211	173-03-627-A			STORAGE
Thomason Bill	5812 N. 12th Street, #7	173-03-640-A			STORAGE
R&G Ventures	8655 E. Via De Ventura Ste G-280	173-03-641-A			STORAGE
Carras Elias C	5210 Lake Washington Blvd	173-03-642-A			STORAGE
Villa Estados	7020 3rd Ave, Suite 7	-03-643-A			STORAGE

AZAW000334

Laugher Ron/Karin	5998 N. 78th Street, #215	173-03-644-A			STORAGE
HayesMarjorie S TR	5998 N. 78th Street, #220	173-03-646 A			STORAGE
Calka Curtis C	5998 N. 78th Street, #221	173-03-647-A			STORAGE
Richards Charles L II	5998 N. 78th Street, #208	173-03-650-A			STORAGE
Dohrmann Fred G & Lois F	PO Box 392	173-03-651-A			STORAGE
Macleod Mark A/Carla L	5998 N. 78th Street, #112	173-03-879	X	X	X
Shan She Holdings Inc.	60 Academy Park RDO Cir	173-03-880	X	X	
Greenslade Geoffrey J/reginald James/Grant W	895 3rd Street East	173-03-881	X	X	
Resident	5998 N. 78th Street, #214	173-03-881	X	X	
Wilkowich Kim R/Douglass Barbara	5998 N. 78th Street, #115	173-03-882	X	X	
Resident	5998 N. 78th Street, #215	173-03-882	X	X	
Good John Nicholas/Patricia Ann	6 Taggart Place	173-03-883	X	X	
Resident	5998 N. 78th Street, #216	173-03-883			X
Tulloch Neil	7701 E. McDonald Drive	173-03-884	X	X	
Resident	5998 N. 78th Street, #217	173-03-884	X	X	
Weissman Harold	5998 N. 78th Street, #118	173-03-885	X	X	
Resident	5998 N. 78th Street, #218	173-03-885	X	X	
Mulvihill Dennis P/Vicki	3714 Bryden Bay	173-03-886	X	X	
Resident	5998 N. 78th Street, #219	173-03-886	X	X	
Hicke William Lawrence /Lee Anne/ETAL	5998 N. 78th Street, #120	173-03-887	X	X	
Resident	5998 N. 78th Street, #220	173-03-887	X	X	
612468 Saskatchewan LTD	2 D Lakeview Place	173-03-888	X	X	
Resident	5998 N. 78th Street, #221	173-03-888	X	X	
Leier Dolores	5998 N. 78th Street, #122	173-03-889	X	X	
Resident	5998 N. 78th Street, #222	173-03-889	X	X	
McGee Glenn R/Patty A	1107 N. William Tell Cir	173-03-890	X	X	
Resident	5998 N. 78th Street, #223	173-03-890	X	X	
Wipperfurth Louann TR	7811 E. Via Del Futuro	173-03-891			X
Resident	5998 N. 78th Street, #124	173-03-891	X	X	

Nichol Ken/Judy	BOX 69	173-03-892	X	X	
Resident	5998 N. 78th Street, #225	173-03-892	X	X	
Vanwassenhove Reginald E/ Shauna L	14816 45th Ave	173-03-893	X	X	VACANT
Resident	5998 N. 78th Street, #226	173-03-893	X	X	
Weiss Gary Steven	5998 N. 78th Street, #127	173-03-894	X	X	
Resident	5998 N. 78th Street, #227	173-03-894			X
Topolski Raymond T & Patricia	5998 N. 78th Street, #113-Phase II	173-03-911			STORAGE
McLellan James W	5998 N. 78th Street, #223	173-03-912			STORAGE
Backus Janice L	5998 N. 78th Street, #212	173-03-913			STORAGE
Canus Realty Inc	5998 N. 78th Street, #222	173-03-914			STORAGE
Wolfe Rudolph Carl	60 Academy Park RDO Cir	173-03-915			STORAGE
Macleod Mark A/Carla L	5998 N. 78th Street, #112	173-03-916			STORAGE
Hayes Mary / Shawn	7675 E. McDonald Drive, #1	173-03-931	X		
Klopf Sue S.	2805 Sylvania Drive	173-03-932			
Bradley Frederick W	7675 E. McDonald Drive, #103	173-03-933	X	X	
Resident	7675 E. McDonald Drive, #206	173-03-933	X	X	
Resident	7675 E. McDonald Drive, #207	173-03-933	X	X	
Resident	7675 E. McDonald Drive, #104	173-03-933	X	X	
Resident	7675 E. McDonald Drive, #205	173-03-933	X	X	
Boyle William J	7675 E. McDonald Drive, #208	173-03-933	X	X	
Ternes William	7675 E. McDonald Drive, #104	173-03-934	X	X	
Nohava Barry L	7675 E. McDonald Drive, #105	173-03-935			
Valdez Delia	7676 E. McDonald Drive	173-03-936			
Giannini Robert	2376 Topsail Cir	173-03-937			
MC Kasy Daniel W/Gwendolyn TR	7676 E. McDonald Drive, #108	173-03-938			
Davis Nadine/Doonan Sinald R/Marianne	1201 Yale Place, #1207	173-03-939			
Carney Kevin E. / Karen J	PO Box 475412	173-03-940			
Resident	7675 E. McDonald Drive, #221	173-03-941			X
	7675 E. McDonald Drive, #111	173-03-941	X	X	

Resident	7675 E. McDonald Drive, #222	173-03-941	X	X	
Gladwin Lindsay/StephenM/Laura A	7675 E. McDonald Drive, #112	173-03-942	X	X	
Resident	7675 E. McDonald Drive, #223	173-03-942	X	X	
Resident	7675 E. McDonald Drive, #224	173-03-942	X	X	X
Anundson Larry Q/Winch-Anundson Nancy M	9620 Yukon Circle	173-03-943	X	X	
Resident	7675 E. McDonald Drive, #113	173-03-943	X	X	
Resident	7675 E. McDonald Drive, #226	173-03-943	X	X	
Resident	7675 E. McDonald Drive, #225	173-03-944	X	X	
Stevenson Diane M	7675 E. McDonald Drive, #114	173-03-944			X
Resident	7676 E. McDonald Drive, #227	173-03-944	X	X	
Resident	7677 E. McDonald Drive, #228	173-03-944	X	X	
Naismith James Robert/Audrey Marguerite TR	5703 N. Paradise View Street	173-04-002	X	X	
Naismith Audrey Marguerite TR	5703 N. Paradise View Street	173-04-008	X	X	
Alshar Dennis	5755 N. Paradise View	173-04-009	X	X	
Shadmohammadi Ghorbanali & Esmat Koukjeh	7501 E. Palo Verde Drive	173-04-010			X
Madia Leah F. ETAL	7505 E. Neale Drive	173-04-011-A	X	X	
Spring Park Ranch Limited Partnership	5256 Skalkaho Road	173-04-014			
7537 E. McDonald, LLC	7537 E. McDonald Drive	173-04-015			
Henry Aaron	5811 N. Sundown	173-04-016			SPOKE WITH. WOULD NOT SIGN
Wells Fargo Bank NA Tr	PO Box 810490	173-04-017			
Paulson Trust	5805 N. Sundown Drive	173-04-018			
Johnson Dale G/Gale L TR	5808 N. Sundown Drive	173-04-019			SPOKE WITH. WOULD NOT SIGN
Benz David	7517 E. Sundown Circle	173-04-020			X
Brown michael David TR	2164 E. Boradway 300	173-04-021	X	X	
Drexler William	7516 E. Sundown Circle	173-04-023	X	X	
Reds Moviola I LLC	7511 E. McDonald Drive	173-04-024			
Schulte Jenry J/Marjorie TR	7480 E. Solano Drive	173-04-028	X	X	
Wilson David H/Brooke M	5895 N. 75th Street	173-04-029	X	X	
Stark Gregory Patricia	5875 N. 75th Street	173-04-030			X

Clow Michael L/Kira D	5855 N. 75th Street	173-04-031			X
Hangaris Vivian TR	7519 E. San Miguel	173-15-011	X	X	
Yearnin	7515 E. San Miguel	173-15-012			X
Adami Robert W TR	7508 E. San Miguel Ave	173-15-016			X
Stewart Charles R & Patirica N	7514 E. San Miguel	173-15-017	X	X	
Pfeffer Steven	7520 E. San Miguel	173-15-018	X	X	
Silverman Carole B. TR	5638 N. 75th Place	173-15-019	X	X	
Kantor Marvin/Jane D TR	5644 N. 75th Place	173-15-020	X		SPOKE WITH. WOULD NOT SIGN
Rendon Humberto M/Marcela E.	7520 E. Montebello Ave	173-15-021	X		X
Current Resident	7526 E. Montebello Ave	173-15-022	X	X	
Boniface Dale	1650-1177 W. Hastings Street	173-15-023	X	X	
Kroiss Dolores C	15 Mid Oaks Ln	173-15-024	X	X	
Butler Jinx	5631 N. 75th Place	173-15-025			X
Resident	5625 N. 75th Place	173-15-026			X
Privado Village Homeowners Assoc. Inc.	PO Box 4484	173-15-062			
Van Stiphout Josette L	7744 E. Montebello	173-81-069			
Cord G Mark/Sylvia	7745 E. Solano Drive	173-81-070			
Monson Tamara	7749 E. Solano Drive	173-81-071			
Greenberg H David & Jacquelyne B	111 N. Washington	173-81-074			
Griegi Roxanne	7752 E. Solano Drive	173-81-075			
Marini Anthony M SR	10806 N. 71st Place Unit A	173-81-076			
Lee Thomas L/Colleen K	23960 Wildwood Canyon Road	173-81-077			
Bell Nada	5950 N. 78th Street 101	173-81-086			
Russell Richard J/Lynette J TR	4616 Jupiter Drive	173-81-087			
Hayer Joseph C/Frene	277 Denver Drive	173-81-088			
Limber Jamie A/Kimberly L	240 S. Presidio Drive	173-81-089			
Velasco Francisco	5950 N. 78th Street 105	173-81-090	X	X	
Cullen Irene M	5950 N. 78th Street No 106	173-81-091	X	X	
Gongora Rub[illegible]	11030 N. 37th Street	173-81-092	X	X	

Weir James O	5363 36th Ave CT	173-81-093	X	X	
Resident	5950 N. 78th Street, #208	173-81-093	X	X	
Weir Patricia	5363 36th Ave CT	173-81-094	X	X	
Resident	5950 N. 78th Street, #209	173-81-094			X
Richardson Darrell/Judith A	5950 N. 78th Street	173-81-095			X
Resident	5950 N. 78th Street, #210	173-81-095	X	X	
Velasco Raquel TR	8513 Citrus Way	173-81-096			X
Resident	5950 N. 78th Street, #211	173-81-096	X	X	
Guisinger Matthew	17319 NE 144th Street	173-81-097			X
Resident	5950 N. 78th Street, #212	173-81-097	X	X	
Hofmann, Anne	5950 N. 78th Street Unit 113	173-81-098			X
Resident	5950 N. 78th Street Unit 213	173-81-098	X	X	
Clutchall Cory C	5950 N. 78th Street Unit 114	173-81-099			X
Cronin Kevin/Susan	16615 W. 140th Street	173-81-100	X	X	
Resident	5950 N. 78th Street Unit 215	173-81-100	X	X	
Legate Terry Donna K	5950 N. 78th Street Unit 116	173-81-101			X
Resident	5950 N. 78th Street Unit 216	173-81-101	X	X	
Swiercz Bernard P/Connie S	606 37th Street	173-81-102	X	X	
Resident	5950 N. 78th Street Unit 217	173-81-102	X	X	
Connors Thomas J TR	11031 E. Mirassol Circle	173-81-103			X
Resident	5950 N. 78th Street Unit 218	173-81-103	X	X	
Gordon Joyce A TR	5950 N. 78th Street Unit 119	173-81-104			X
Resident	5950 N. 78th Street Unit 218	173-81-104	X	X	
Krska Clifford F/Shirley M	5950 N. 78th Street Unit 120	173-81-105			X
Resident	5950 N. 78th Street Unit 220	173-81-105	X	X	
Heerbrandt Michael A	5950 N. 78th Street Unit 121	173-81-106			X
Resident	5950 N. 78th Street Unit 221	173-81-106			X
Lovellette April	5950 N. 78th Street Unit 122	173-81-107	X	X	
Resident	5950 N. 78th Street Unit 222	173-81-107	X	X	

Stenholt Neil JR/Phyllis	1850 Burton Lane	173-81-108	X	X	
Resident	5950 N. 78th Street Unit 223	173-81-108			X
Boswell Marcia J	5950 N. 78th Street, #124	173-81-109			X
Resident	5950 N. 78th Street, #224	173-81-109	X	X	
Furda Larry W/Mary R	5950 N. 78th Street, #125	173-81-110	X	X	
Resident	5950 N. 78th Street, #225	173-81-110			X
Smith Michelle Rene	8621 N. Avenida Del Sol	173-81-111	X	X	
Resident	5950 N. 78th Street, #226	173-81-111	X	X	
Faehnrich Robert W/Connie M	5950 N. 78th Street, #127	173-81-112	X	X	
Resident	5950 N. 78th Street, #227	173-81-112	X	X	
Levy Gloria TR	5950 N. 78th Street Unit 128	173-81-113	X	X	
Resident	5950 N. 78th Street Unit 228	173-81-113	X	X	
Kaplan David L/Anita D TR	5950 N. 78th Street, #129	173-81-114			X
Resident	5950 N. 78th Street, #229	173-81-114	X	X	
KUX Erik Edgar/KUX Schlair Maria	5950 N. 78th Street, #130	173-81-115			X
Resident	5950 N. 78th Street, #230	173-81-115	X	X	
Myers Kevin L	5950 N. 78th Street, #131	173-81-116	X	X	
Resident	5950 N. 78th Street, #231	173-81-116	X	X	
Kennedy Janet	5950 N. 78th Street, #132	173-81-117	X	X	
Resident	5950 N. 78th Street, #232	173-81-117	X	X	
Rabin Zorack/Joan	5950 N. 78th Street, #133	173-81-118	X	X	
Resident	5950 N. 78th Street, #233	173-81-118	X	X	
Shepherd Joan L	5950 N. 78th Street, #134	173-81-119	X	X	
Resident	5950 N. 78th Street, #234	173-81-119	X	X	
Nelson Paul W/Barbara J	5950 N. 78th Street, #135	173-81-120	X	X	
Resident	5950 N. 78th Street, #235	173-81-120	X	X	
Little Harold E/Smith Eleanor Crane	5950 N. 78th Street, #136	173-81-121	X	X	
Simpson James H	5950 N. 78th Street, #137	173-81-122	X	X	
Resident	5950 N. 78th Street, #237	173-81-122	X	X	

Grdina John G/Massoli Jenna	6271 E. Horseshoe Rd	173-81-123			X
Kirwin Tom	5950 N. 78th Street Unit 139	173-81-124	X	X	
Resident	5950 N. 78th Street Unit 239	173-81-124	X	X	
Dees Alvin B/Virginia R	10210 Melody Ln SW	173-81-125	X	X	
Resident	5950 N. 78th Street, #240	173-81-125	X	X	
Huff Janet L TR	1425 Broaday	173-81-126	X	X	
Hummel Lionel D	5950 N. 78th Street, #142	173-81-127	X	X	
Resident	5950 N. 78th Street, #242	173-81-127	X	X	
Bradley Shannon N	5950 N. 78th Street, #143	173-81-128	X	X	
Resident	5950 N. 78th Street, #243	173-81-128			X
Wilkins Malcolm J/Nancy M	306 C. Hickory	173-81-129	X	X	
Resident	5950 N. 78th Street, #244	173-81-129	X	X	
Cramer Gary A/Jennifer M	2253 Gilman Drive #308	173-81-130	X	X	
Resident	5950 N. 78th Street, #245	173-81-130	X	X	
Holmes Carter	5950 N. 78th Street, #146	173-81-131	X	X	
Hansen Alfred/Lorraine/Darren F	8835 50th Ave	173-81-132	X	X	
Resident	5950 N. 78th Street, #247	173-81-132	X	X	
Kalkman Donald A	5950 N. 78th Street	173-81-133	X	X	
Resident	5950 N. 78th Street, #248	173-81-133	X	X	
Leinweber L Donald/Carolyn A	351 Paradise Road	173-81-134	X	X	
Resident	5950 N. 78th Street, #249	173-81-134	X	X	
Roseth Doug/Sara	16764 Farrago TRL	173-81-135	X	X	
Resident	5950 N. 78th Street, #250	173-81-135			X
Unruh Loren H/Gayle	5950 N. 78th Street Unit 151	173-81-136	X		X
Resident	5950 N. 78th Street Unit 251	173-81-136	X		
Maurer John W	5950 N. 78th Street Unit 152	173-81-137	X		
Hanson Gary R/Jean A	5950 N. 78th Street Unit 153	173-81-138	X		
Jeffrey Daniel R/Deborah J	6130 Calle Rosa	173-81-139	X		
Robinson Henrietta	5950 N. 78th Street Unit 155	173-81-140	X		

Sarrafzadeh Babak/Nasser	5950 N. 78th Street Unit 156	173-81-141	X		
Kavoussi Katayoon/Nazanin	5950 N. 78th Street Unit 157	173-81-142	X		
Dellas Margaret A TR	5950 N. 78th Street Unit 158	173-81-143	X		X
Standard Sandra	5950 N. 78th Street Unit 159	173-81-144	X		X
Bennett Julie	5950 N. 78th Street Unit 160	173-81-145	X		
Thomas Elmer/Ruth Ann	184 Strasburg Pike	173-81-146	X		
Walker Arthur E JR/Agnes M	5950 N. 78th Street Unit 162	173-81-147	X		
Knapp Shirley A TR	5950 N. 78th Street Unit 163	173-81-148	X		
Gruendler Kurt	5950 N. 78th Street Unit 163	173-81-149	X		X
Mirza Lila L	5950 N. 78th Street Unit 165	173-81-150	X		
Holeman Thomas/Sharon	5950 N. 78th Street Unit 166	173-81-151	X		X
Bowles Theresa A	5950 N. 78th Street Unit 167	173-81-152	X		
Morrison Jason L	5950 N. 78th Street Unit 168	173-81-153	X		
Murphy Patricia	5950 N. 78th Street Unit 169	173-81-154	X		X
Pavlock Tamara L	5950 N. 78th Street Unit 170	173-81-155	X		
Canal at Cattle Track, LLC	105 Cattle Track	174-13-004-F			
Plateau Winds Corp	523 N. Beaver Street	174-13-008-A			
SRPAI & PD	PO Box 1980	174-13-009			
Bruce J. Conway & Norma L Conway Trust	7761 E. Rovey Ave	174-13-471	X		
Gaughan Patrick J & Marlene M	7755 E. Rovey Ave	174-13-472			X
Watson Nancy M	7749 E. Rovey Ave	174-13-473	X		
Mac Rae Ian & Rita C	7743 E. Rovey Ave	174-13-474	X	X	
Chotin Morris TR	962 Wynhaven Ln	174-13-475			
Raczowski Donald James/Harkins Bernadette	7731 E. Rovey Ave	174-13-476	X		
Ross Lucy-Meao	7725 E. Rovey Ave	174-13-477	X		
Nathan Walter & Gloria B	7719 E. Rovey Ave	174-13-478	X		X
Grant Roger Lee & Stephanie Anne	6002 N. 77th Place	174-13-479	X	X	
Coyne Sandra Dee	6008 N. 77th Place	174-13-480	X	X	
Sandland Stev	6014 N. 77th Place	174-13-481			X

Jacques Wilfred G/Arlette A	6020 N. 77th Place	174-13-482			X
Brinton Michael John	6026 N. 77th Place	174-13-483	X	X	
Cooley Timothy F & Rose Marie	6032 N. 77th Place	174-13-484	X	X	
Whiteman James V/L Betty	6038 N. 77th Place	174-13-485	X	X	
Maluda Miroslav/Julia	6044 N. 77th Place	174-13-486			X
Rosenbaum Josephine TR	6041 N. 77th Place	174-13-516	X	X	
Peay Heidi R	6035 N. 77th Place	174-13-517			X
Clancy Micheal/Lenore R TR	7734 E. Berridge Ln	174-13-518	X	X	
Friedman Anne G	7740 E. Berridge Ln	174-13-519	X	X	
Stevenson Brian R/Marile C	7743 E. Berridge Ln	174-13-520	X	X	
Heltemes Leon T & Colleen	5201 E. Charter Oak Road	174-13-521	X	X	
Smith Scott Randolph	7731 E. Berridge Ln	174-13-522			X
Tempelman Emmanuel	7725 E. Berridge Ln	174-13-523			X
Nuernberg Mark Alan	7728 E. Rovery Ave	174-13-524			SPOKE WITH. WOULD NOT SIGN
Chalmers Karen	7734 E. Rovey Ave	174-13-525			SPOKE WITH. WOULD NOT SIGN
Caldwell Twila	7740 E. Rovey Ave	174-13-526	X	X	
Westendorf Bernelda	7746 E. Rovey Ave	174-13-527	X	X	
Levin Daniel W	7752 E. Rovey Ave	174-13-528			
7522 E. McDonald, LLC	7522 E. McDonald Drive	174-13-933			
The Studio on Cattle Track Ltd	7550 E. McDonald Drive	174-14-003			
Adams Charles P TR	7538 E. Berridge Ln	174-14-015			
Bernard Stephen Z/Elizabeth A	7501 E. Berridge Ln	174-14-024			SPOKE WITH. WOULD NOT SIGN
Andras James T/Christine E	7511 E. Berridge Ln	174-14-025			X
Kempner Sandra TR	7523 E. Berridge Ln	174-14-026			SPOKE WITH. WOULD NOT SIGN
Zraket George A & Carol W	7537 E. Berridge Ln	174-14-027	X	X	
Phoenix Title & Tr Co.	PO Box 158	174-14-033			
Trans City Life Insurance Company	6560 N. Scottsdale Road, Suite E201	174-14-037			
Cliff Ulman	4620 N. 16th Street	CONDO			
WMJ Boyle	7904 E. Chapparal Road STE A 110 PM	CONDO			
		totals	175	143	54

AZAW000343

% Caretaker, Inc.	PO Box 4171	CONDO			

VSA
and
Associates

Acoustics
Noise
Vibration
Consultants

Arizona American Water
Paradise Valley
Arsenic Removal Facility

30% Noise Control Design

Prepared For
Damon S. Williams Associates, LLC

By
VSA and Associates
September 15, 2004

12525 Lambert Road, Whittier, CA 90606 Phone (562) 698-2468 Fax (562) 698-2339 www.vsaassociates.com

Arizona American Water
Paradise Valley
Arsenic Removal Facility

30% Noise Control Design

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1. INTRODUCTION

1.1 Introduction and Project Description

In January 2000 the Environmental Protection Agency (EPA) lowered the drinking water Maximum Contaminant Level (MCL) for arsenic, the maximum level allowed to be served to the public, from 50 µg/L to 10 µg/L. Arsenic is naturally occurring in many of the soils that contact groundwater, particularly throughout the Southwestern U.S. All water systems serving the public are required to achieve compliance with the new arsenic MCL by January 23, 2006.

Arizona American Water (formerly Paradise Valley Water Company) owns and operates the water system serving portions of the Town of Paradise Valley and the City of Scottsdale (COS). Water is supplied from a total of seven wells located throughout the service area. Due to the wells' naturally occurring arsenic levels, treatment is required to ensure that arsenic concentrations in the finished water will be consistently below the pending MCL.

The PVARF will be constructed adjacent to the existing water storage and booster pumping facility on Cattletrack Road approximately 1200 feet north of MacDonald Drive. This facility will consolidate water from multiple well sources and treat the water using a coagulation-filtration process in a split stream mode of operation to produce a blended water quality containing not more than 8 µg/L of arsenic. The treatment process is very similar to that employed for removal of iron from groundwater, and has been demonstrated to effectively remove arsenic to levels well below the new standard.
In addition to the treatment process component, the project will include an administrative facility with a customer service area, finished water storage, backwash recovery facilities and an equipment storage area. New raw and finished water transmission mains will be constructed to convey water from the existing Miller Road Treatment Facility south of MacDonald Drive to/from the proposed PVARF.

The project consists of 3 new buildings:

- Building A: This building will house a lab, customer service and admin offices. There will be a garage with minor maintenance activities.
- Building B: This building will house several pumps, a blower and an electrical room.
- Building C: This building will house a sludge thickener, belt press, air compressor, generator and other miscellaneous equipment.

Aerial photo of the project and project layout are shown in Figure 1.1 and 1.2. The pumps will operate intermittently, and may operate at any time of the day or year. The areas surrounding the proposed project are visible from the aerial photograph, Figure 1.2, and are residents to the south and west and other plant areas to the north and east. The current predominant noise sources in this area are:

- Squaw Peak WTP
- Random aircraft flyby, gardening activities and dogs barking
- Vehicular traffic on adjacent and far streets

The impact from the project will be on the homes to south and west. This impact will decrease at distances further away from the plant because of sound attenuating factors, discussed in subsequent sections.

Figure 1.1 Project Area

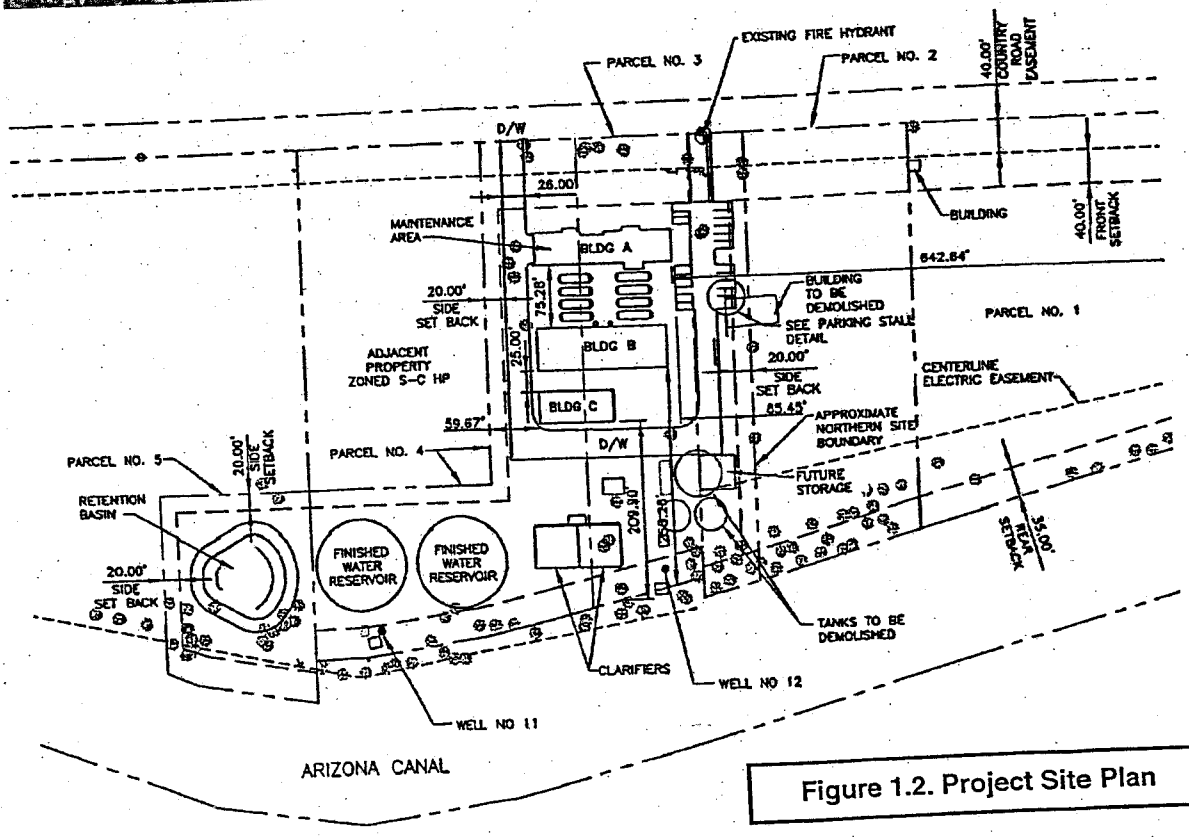


Figure 1.2. Project Site Plan

2. NOISE TERMINOLOGY

The following is a brief discussion of noise terminology used in this assessment.

- *Sound:* A vibratory disturbance created by a vibrating objects, which, when transmitted by pressure waves through a medium such as air, and is capable of being detected by a receiving mechanism, such as the human ear or a microphone.

- *Noise:* Sound that is loud, unpleasant, unexpected, or otherwise undesirable. Noise is unwanted sound. The judgement is subjective.

- *Sound Pressure Level - Decibel (dB):* Sound pressure is measured in units of micro Newton's per square meter (µN/m2) called micro Pascals (µPa). 1 µPa is approximately one-hundred billionth of the normal atmospheric pressure. The pressure of a very loud sound may be 200,000,000 µPa, or 10,000,000 times the pressure of the weakest audible sound (20 µPa). Expressing sound levels in terms of µPa would be very cumbersome because of this wide range. For this reason, sound pressure levels (SPL) are described in logarithmic units of ratios of actual sound pressures to a reference pressure squared. In its simplest form, sound pressure level in decibels is expressed by the term:

  $$\text{Sound Pressure Level (SPL)} = 10 \text{ Log10 } (P_1/P_0)^2$$

  Where: P_1 is sound pressure, P_0 is a reference pressure, standardized as 20 µPa

- *A-Weighted Decibel (dBA):* Not all sound pressures are equally loud. This is because the human ear does not respond equally to all frequencies. Human ear is much more sensitive to sounds in the frequency range about 1 kHz to 4 kHz than to very low or high frequency sounds. For this reason, a filter ("A weighting filter") whose response to frequency is more like that of the human ear is used to measure noise. The "A weighting filter" approximates the frequency response of the average young ear when listening to most ordinary everyday sounds. When people make relative judgements of the loudness or annoyance of a sound, their judgements correlate well with the "A weighting filter" sound levels of those sounds. The A-weighting is standardized per ANSI S1.4, 1983. The A-weighting filter is internationally recognized, and has been incorporated into the majority of environmental noise standards as the preferred weighting.

- *Equivalent Sound Level (Leq):* The equivalent steady state sound or vibration level, which in a stated period of time would contain the same acoustical or vibration energy.

- *Percentage Exceedance Level (L10%, L90%):* The number notes the percentage of time that the noise level was exceeded during the measurement period. Example L10% represents the noise level that is exceeded 10 percent of the time while L90% represents the noise level exceeded 90 percent of the time. The L90% represents the background noise level.

- *Ambient:* The total of all noise in the environment, other than the noise from the source of interest. This term is used interchangeably with background noise

- *Frequency:* The number of times per second that the sine wave of sound repeats itself, or that the sine wave of a vibrating object repeats itself. Expressed in hertz (Hz)

- *Adding Noise Levels:* Adding noise levels to determine the combined noise, if another source is added, is not a simple arithmetic addition. Since decibels are logarithmic units,

sound pressure levels cannot be added or subtracted by ordinary arithmetic means. For example, if one pump produces a SPL of 70 dB at a given receiver point, if another mump is located very close by the two pumps operating simultaneously would not produce 140 dB. In fact, they would combine to produce 73 dB. This can be shown mathematically by working through the SPL equation above. In general, when combining sound levels, the following table may be used as an approximation (+/- 1 dB).

When Two Decibel Values Differ By	Add This Amount to the Higher Value	Example
0 or 1 dB	3 dB	70 dB + 69 dB = 73 dB 70 dB + 70 dB = 73 dB 10 dB + 10 dB = 13 dB
2 or 3	2 dB	67 dB + 69 dB = 71 dB 66 dB + 69 dB = 71 dB 10 dB + 13 dB = 15 dB
4 to 9 dB	1 dB	67 dB + 63 dB = 68 dB 67 dB + 58 dB = 68 dB 10 dB + 2 dB = 11 dB
10 dB or More	0 dB	67 dB + 57 dB = 67 dB 67 dB + 42 dB = 67 dB 67 dB + 11 dB = 67 dB

3. NOISE SETTING

3.1 Typical Noise Levels

Noise is defined as unwanted sound. The method commonly used to quantify environmental noise is the A-weighted sound level measured in A-weighted decibels (dBA). In practice, environmental noise is conveniently measured using a sound level meter that includes an electronic filter corresponding to the A-weighted curve. Table 1.1 provides examples of typical A-weighted noise levels, their subjective loudness and effects.

Common Noise Source	A-Weighted Sound Level dBA	Subjective Loudness	Effects of Noise
Threshold of Pain	140		
Military Jet Takeoff at 50 feet	130		
Hard rock band in side a concert hall	120		
Automatic punch press at 5 feet	110		
Loud auto horn at 20 feet	100		
Power mower at 20 feet	90		
Garbage Disposal at 5 feet	80		
Commercial jet interior during flight	70	Loud	Speech Interference
Normal conversation at 5 – 10 feet	60		
Residential Air Conditioner at 50 feet	50		
Background Level within Residence		Moderate	Sleep Disturbance
Bird Calls at 20 feet Quite area background noise	40		
Whisper at 3 feet	30	Faint	No Effect
Interior of Recording Studio	20		
Rustling Leaves at 5 to 10 feet	10	Very Faint	
Threshold of Hearing	0		

Table 1.1 : Common Noise Levels, Loudness and Effects

To account for the fluctuation in noise levels over time, noise impacts are commonly evaluated using time-averaged noise levels. Time averages are typically expressed in terms of the Equivalent Level (Leq), a steady-state energy level equal to the energy content of the time varying period

3.2 Human Response to Noise

The human response to environmental noise is subjective and varies considerably from individual to individual. The effects of noise can range from interference with sleep, concentration, and communication, to the causation of physiological and psychological stress, and, at the highest intensity levels, hearing loss.

One way of estimating a person's subjective reaction to a new noise is to compare the new noise with the existing noise environment to which the person has become adapted; i.e., the increase over the so-called "ambient" noise level. Research in the area of perceived impacts of various degrees of increase in A-weighted noise levels, indicates the following:

- Except in carefully controlled laboratory experiments, a change of 1 dBA cannot be perceived.
- Outside of the laboratory, a 3-dBA change is considered a just-perceivable difference.
- A change in noise level of at least 5 dBA is required before any noticeable change in community response would be expected. A 5-dBA increase is often considered a significant impact.
- A 10-dBA increase is subjectively heard as approximately a doubling in loudness and almost always causes an adverse community response.

As indicated earlier sound levels are not added arithmetically:

- When two sounds of equal sound level are added; although the sound energy has doubled, the result is a sound level that is 3 dB higher. A three-dB increase in the noise level as indicated above is considered a just-perceivable difference.
- When ten sounds of equal sound level are added; although the sound energy has increased by 10 fold, the result is a sound level that is 10 dB higher. A 10 dB increase in the noise level as indicated above is considered as approximately a doubling in loudness.
- When one hundred sounds of equal sound level are added; although the sound energy has increased by 100 fold, the result is a sound level that is 20 dB higher. A 20 dB increase in the noise level as indicated above is considered as approximately a 4 times increase in loudness.

Therefore subjective response to increase in the noise level is considered in determining impact.

- 3-dBA increase is just-perceivable difference and no potential impact is considered.
- 5-dBA increase is a noticeable change and is often considered a significant impact.
- 10-dBA increase is approximately a doubling in loudness and almost always causes an adverse community response.

3.3 Sound Propagation

In assessing the impact of project noise on the surrounding environment several factors are taken into consideration:

- The characteristics of the noise source: This consideration takes into account the frequency content of the noise, the presence of pure tones. This is taken into consideration by using the equipment generated noise levels as part of the design analysis. Equipment generated noise levels used in the analysis are often provided by the manufacturer and form part of the specifications.
- The character of the impacted area, whether residential, commercial or industrial. Each impacted area has its own criteria. For example in a residential area the exterior noise

levels are considered for interference with leisure activities. In commercial and industrial settings the level of noise is considered for speech interference and hearing damage. This is taken into consideration by establishing the receivers that will be impacted. The impact is evaluated on the basis of established noise criterion. In the case of residential the criteria established by local ordinance, agreements or common practice are used. In the case of commercial facilities (office) criteria established by the American society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) is used. In industry settings the criteria for hearing damage established by OSHA is used.

- The sound transmission path. When sound propagates over a distance, it changes in both level and frequency content. The manner in which noise is reduced with distance depends on the following important factors:
  - *Geometric spreading.* Sound from a single point source radiates uniformly outward as it travels away from the source in a spherical pattern. The sound level attenuates (or drops off) at a rate of 6 dBA for each doubling of distance. The pump can be regarded as a stationary point source of sound. The attenuation of sound levels from the pumps will be 6 dBA (theoretically in practice its 5-6 dBA) per doubling of distance.
  - *Ground absorption.* The noise path between the pumps and the observer is very close to the ground. Noise attenuation from ground absorption and reflective wave canceling adds to the attenuation because of geometric spreading. For acoustically "hard" sites (i.e., sites with a reflective surface, such as dirt or a smooth body of water, between the source and the receiver), excess ground attenuation is minimal. For acoustically absorptive or "soft" sites (i.e., sites with an absorptive ground surface, such as soft dirt, grass, or scattered bushes and trees), the excess ground attenuation can be up to 1.5 dBA per doubling of distance.
  - *Atmospheric effects.* Atmospheric conditions can have an effect on noise levels. Wind has been shown to be the single most important meteorological factor within approximately 1500 feet, whereas vertical air temperature gradients are more important over longer distances. Other factors, such as humidity, and turbulence, also have an effect. Receivers located downwind from a source can be exposed to increased noise levels relative to calm conditions, whereas locations upwind can have lower noise levels. Increased sound levels can also occur because of temperature inversion conditions (i.e., increasing temperature with elevation).
  - *Shielding by natural or human-made features.* A large object or barrier in the path between a noise source and a receiver can substantially attenuate noise levels at the receiver. The amount of attenuation provided by this shielding depends on the size of the object and the frequency content of the noise source. Natural terrain features (such as hills and dense woods) and human-made features (such as buildings and walls) can substantially reduce noise levels. Walls are often constructed between a source and a receiver to specifically reduce noise. A continuous barrier that breaks the line of sight between a source and a receiver will typically result in at least 5 dB of noise reduction. A higher barrier may provide as much as 15 to 20 dB of noise reduction.

4. EXISTING CONDITIONS

To characterize the existing noise environment at the proposed project site, minimal ambient noise measurements were made in the surrounding community during the day. Long term (24 hour) measurements are planned but have not been completed as yet.

The measured noise levels in the afternoon in the adjacent residential areas are in the range 44 to 48 dBA.

AZAW000354

5. NOISE STANDARDS

5.1 Introduction

The project is located in the City of Paradise Valley. To the best of our knowledge there are no prevailing noise ordinances or guidelines that specify the maximum permitted noise levels from operation of equipment. In the absence of clear noise standards or guidelines the potential impact from the project can be evaluated one of several ways:

- On the basis of increase in the background noise levels
- On the basis of ordinances in other similar cities
- On the basis project specific conditions

5.2 Impact on the basis of increase in noise levels from current operations

The pumps will operate intermittently, and may operate at any time of the day or year. Therefore pump operation has to be assumed as 24-hour operation. For a 24 hour operation the standard industry practice and the practice in almost all noise ordinance is that impact must be evaluated on the basis of the lowest noise level during the period of operation. Therefore impact on the basis of increase in noise levels from current operations has to be based on the lowest noise level over a 24-hour period. The lowest measured Leq level is expected to be 40 to 45 dBA. Since, as mentioned earlier, a change in noise level of at least 5 dBA is required before any noticeable change in community response would be expected. A 5-dBA increase over the lowest noise levels would be acceptable as a criterion. Based on this approach a maximum noise level of 45 dBA would be acceptable.

The emergency generator testing will be another source of noise. Since this can be tested during the day the expected noise criteria for this is likely to 50 to 55 dBA.

5.3 Impact on the basis of Noise Ordinances of other cities

Most cities that typically have a noise ordinance require noise levels at the property line to be 55 dBA during the day and 45 dBA during the night.

5.4 Impact on the basis of Project Specific Conditions

There are no project specific requirements.

5.5 Project Design Criteria

The project criteria is still being developed and will be finalized upon completion of 24 hour noise levels. The expected criteria is like to be:

- Emergency Generator Testing: 55 dBA
- All other equipment: 40 to 45 dBA.

AZAW000355

6. NOISE CONTROL RECOMMENDATIONS

6.1 Noise Control Design

The noise control design will be based on selecting quite equipment and incorporation of readily available noise control elements:

6.1.1 Selecting Quiet Equipment

At this time the size of the equipment has not been finalized and therefore no equipment source noise levels available. We are assuming noise levels from our database based on currently available horsepower ratings. The source noise levels will be further refined as the project proceeds.

The acoustical design process begins with the noise levels of equipment obtained from the manufacturer. It is rare that equipment manufacturers will meet the noise levels we specify.

- As a first step we will request manufacturers to submit all or one of the following data along with how was the data obtained:
  - Octave Band Sound Power Levels, (63 Hz to 8,000 Hz)
  - Octave Band Sound Pressure Level at a given distance, (63 Hz to 8,000 Hz)
  - dBA levels at a given distance
  - How was the submitted data obtained: Calculations, Laboratory Testing, Field Testing, Testing Extrapolation, etc. Please provide details.
- Data from different manufacturers will be compared. Based on this comparison the final noise levels that will be used in the design process will be estimated. The final levels are estimated from this comparison to ensure that more than one manufacturer will meet the specifications.
- The final levels estimated become the basis of our design and part of the equipment specifications.
- The equipment manufacturer will be required to provide proof in the form of a test or other data as part of their submittal that they can meet the specified noise levels.

6.1.2 Design Characteristics

The following design characteristics will be used to reduce equipment noise levels to meet the project noise design criteria.

- Equipment Noise Specifications: Equipment specifications will stipulate the maximum noise emission from equipment. Specifications will be developed based on what the manufacture will submit as verified emission levels. Procedure for measuring the specified level will be developed. Manufacturer will be required to meet the emission noise levels specified.
- Sound Attenuating Enclosures: Equipment requiring extensive noise control may be installed in an acoustic enclosure. A well-designed enclosure will reduce the noise levels by 85 dBA or more. Acoustic enclosure is a room around the equipment. All penetrations (doors, windows, ventilation openings, piping penetrations, etc.) into the room have to be carefully designed so that these elements do not compromise the performance.

- Absorbing Materials: Sound absorbing materials are relatively lightweight porous materials with interconnecting passages. These materials dissipate acoustic energy through conversion to minute amounts of heat as the air expands and contracts in the interconnected passages. These are used to reduce noise within enclosures or in cavities. Most common types or absorbing materials are fiberglass.
- Mufflers/Sound traps: Mufflers and sound traps are commercial devices designed to attenuate sound propagating in a flowing media. Typical applications will include exhaust and intake systems and openings in enclosures and barriers. Several manufacturers manufacture a wide variety of these products.
- Acoustical Barriers: Acoustical barriers are basically nonporous walls of sufficient mass (minimum 4 lb./sq.ft.) that are constructed between the source and the receiver.
- Distance Spreading and Directing Sound Away From Potential Receivers: The sound level decreases with distance because of spreading of the sound waves. The reduction follows the "inverse square law." For small sources away from reflecting surfaces the decrease in the sound level is 6 dB per doubling of distance.

  Sound can also be directed in a particular direction (or away from a particular direction) by using stacks or shaped openings.

Acoustical design elements are passive elements and there are no mechanical (moving) parts. They require no maintenance.

6.2 Predicted Noise

The preliminary recommendations to meet the various criterions are:

Building	Noise Control Element
A	HVAC System may require noise control in the form of barriers, duct lining or sound traps. The size and location will determine the extent of the noise control elements.
B	• Acoustical panels on the walls and underside of the roof slab may be required. • STC rated Acoustical doors or sealed doors will be required. • All openings will require noise control.
C	• Acoustical panels on the walls and underside of the roof slab may be required. • STC rated Acoustical doors or sealed doors will be required. • All openings will require noise control.

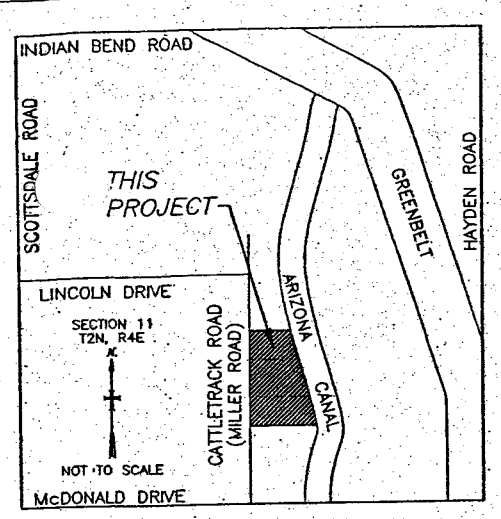
These recommendations will be reevaluated and refined as the project proceeds.

6.3 Summary

At this time we do not have any firm recommendations, as certain items need clarification. Some preliminary recommendations are presented in Section 6.2.

110

VICINITY MAP



: SITE ACRES: 3.78 AC
OPERTY ZONING: R1-43, S-C HP
E DRAWING C01 FOR DETAILS)
TE: SIGNAGE REQUIRES SEPARATE APPROVALS AND PERMITS

ENGINEER OF RECORD ON THESE PLANS HAS RECEIVED OPY OF THE APPROVED STIPULATIONS FOR THIS PROJECT HAS DESIGNED THESE PLANS IN CONFORMANCE WITH APPROVED STIPULATIONS.

"AS-BUILT" CERTIFICATION

EBY CERTIFY THAT THE "AS-BUILT" IMPROVEMENTS AS N HEREON ARE LOCATED AS NOTED, AND THE LOCATIONS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF.

REGISTERED ENGINEER — DATE

CITY OF SCOTTSDALE

REVIEWED AND RECOMMENDED APPROVAL BY:

IRE EPT.		GRADING & DRAINAGE	
SCAPE ANNING		WATER & SEWER	
AFFIC		PAVING	

APPROVED BY:

ENGINEERING COORDINATION MANAGER (OR DESIGNEE) — DATE

MARICOPA COUNTY DEPARTMENT OF ENVIRONMENTAL SERVICES

Ellen Kenney MCESD #20111117 6/13/05
DATE

ARIZONA AMERICAN WATER COMPANY

DATE

Two working days before you dig
CALL FOR THE BLUE STAKES
263-1100
Blue Stake Center
CALL COLLECT

LEGAL DESCRIPTION

PARCEL 1 - 174-13-932

A PARCEL OF LAND LOCATED IN THE SOUTHEAST QUARTER OF SECTION 11, TOWNSHIP 2 NORTH, RANGE 4 EAST, OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA, MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTER OF SECTION 11; BEING A BRASS CAP FLUSH, FROM WHICH THE SOUTH QUARTER CORNER OF SAID SECTION 11, BEING A BRASS CAP FLUSH BEARS SOUTH 00° 32' 11" EAST, A DISTANCE OF 2652.01 FEET;

THENCE SOUTH 00° 32' 11" EAST, ALONG THE NORTH-SOUTH MID-SECTION LINE OF SAID SECTION 11, A DISTANCE OF 577.81 FEET;

THENCE, DEPARTING SAID MID-SECTION LINE NORTH 89° 27' 49" EAST, A DISTANCE OF 30.00 FEET, TO THE PROPOSED EASTERLY RIGHT-OF-WAY LINE OF MILLER ROAD AND THE POINT OF BEGINNING OF THE PARCEL HEREON DESCRIBED;

THENCE DEPARTING SAID RIGHT-OF-WAY LINE AND ALONG A LINE COMMON WITH THE PROPERTY DESCRIBED IN A QUIT CLAIM DEED, RECORDING NUMBER 02-0398962, AS RECORDED IN THE OFFICE OF THE MARICOPA COUNTY RECORDER, SOUTH 89°53' 58" EAST, A DISTANCE OF 322.62 FEET TO THE WESTERLY RIGHT-OF-WAY LINE OF THE ARIZONA CANAL AS PER SALT RIVER PROJECT RIGHT-OF-WAY MAP, JOB NUMBER RAD-970-100 (6);

THENCE ALONG SAID RIGHT-OF-WAY LINE THE FOLLOWING COURSES, SOUTH 15°33'20" EAST, A DISTANCE OF 373.93 FEET;

THENCE SOUTH 16° 02' 44" EAST, A DISTANCE OF 181.02 FEET;

THENCE DEPARTING SAID RIGHT OF WAY LINE SOUTH 89° 29' 00" WEST, A DISTANCE OF 467.90 FEET, TO THE PROPOSED EASTERLY RIGHT-OF-WAY LINE OF MILLER ROAD;

THENCE NORTH 00°32'11" WEST, ALONG SAID RIGHT- OF- WAY LINE AND PARALLEL WITH THE NORTH-SOUTH MID-SECTION LINE OF SECTION 11, A DISTANCE OF 539.01 FEET TO THE POINT OF BEGINNING OF THE PARCEL HEREON DESCRIBED.

PARCEL 2 - 174-13-934

A PARCEL OF LAND LOCATED IN THE SOUTHEAST QUARTER OF SECTION 11, TOWNSHIP 2 NORTH, RANGE 4 EAST, OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA. MORE PARTICULARLY DESCRIBED AS FOLLOWS:

COMMENCING AT THE CENTER OF SECTION 11, BEING A BRASS CAP FLUSH, FROM WHICH THE SOUTH QUARTER CORNER OF SAID SECTION 11, BEING A BRASS CAP FLUSH BEARS SOUTH 00° 32' 11" EAST, A DISTANCE OF 2652.01 FEET;

THENCE SOUTH 00° 32' 11" EAST, ALONG THE NORTH-SOUTH MID-SECTION LINE OF SAID SECTION 11, A DISTANCE OF 1439.01 FEET;

THENCE NORTH 89° 27' 49" EAST, DEPARTING SAID MID-SECTION LINE, A DISTANCE OF 30.00 FEET TO THE PROPOSED EASTERLY RIGHT-OF-WAY LINE OF MILLER ROAD AND THE POINT OF BEGINNING OF THE PARCEL HEREON DESCRIBED;

THENCE NORTH 00° 32' 11" WEST, ALONG SAID EASTERLY RIGHT-OF-WAY LINE, A DISTANCE OF 322.19 FEET;

THENCE DEPARTING SAID EASTERLY RIGHT-OF-WAY LINE, NORTH 89° 29' 00" EAST, A DISTANCE OF 467.90 FEET TO THE WESTERLY RIGHT-OF-WAY LINE OF THE ARIZONA CANAL, PER SALT RIVER PROJECT RIGHT-OF-WAY MAP, JOB NUMBER RAD-970-100 (6);

THENCE ALONG SAID RIGHT-OF-WAY LINE THE FOLLOWING COURSES, SOUTH 16° 02' 44" EAST, A DISTANCE OF 88.15 FEET;

THENCE SOUTH 14° 14' 16" EAST, A DISTANCE OF 133.44 FEET;

THENCE SOUTH 13° 40' 38" EAST, A DISTANCE OF 128.31 FEET;

THENCE SOUTH 07° 51' 09" EAST, A DISTANCE OF 143.64 FEET;

THENCE SOUTH 00° 25' 26" EAST, A DISTANCE OF 57.02 FEET;

THENCE SOUTH 08° 50' 59" WEST, A DISTANCE OF 85.36 FEET;

THENCE SOUTH 18° 10' 54" WEST, A DISTANCE OF 96.90 FEET;

THENCE DEPARTING SAID RIGHT-OF-WAY LINE AND ALONG A LINE COMMON WITH THE PROPERTIES DESCRIBED IN A QUIT CLAIM DEED, RECORDING NUMBER 95-0259270 AND A SPECIAL WARRANTY DEED RECORDING NUMBER 02-1245532 AS RECORDED IN THE OFFICE OF THE MARICOPA COUNTY RECORDER, THE FOLLOWING COURSES, SOUTH 89? 27' 49" WEST, A DISTANCE OF 153.41 FEET;

THENCE NORTH 00° 32' 11" WEST, A DISTANCE OF 393.00 FEET;

THENCE SOUTH 89° 27' 49" WEST, A DISTANCE OF 372.00 FEET TO THE POINT OF BEGINNING OF THE PARCEL HEREON DESCRIBED.

Arizona American Water

PARADISE VALLEY ARSENIC REMOVAL FACILITY

6215 NORTH MILLER ROAD
SCOTTSDALE, ARIZONA 85250

JUNE 2005

	VOLUME REQD CU FT	VOLUME PROVIDED CU FT
DETENTION BASIN	36,745	42,075

COMMUNITY NUMBER	PANEL # PANEL DATE	SUFFIX	DATE OF FIRM (INDEX DATE)	FIRM ZONE	BASE FLOOD ELEVATION (IN AO ZONE, USE DEPTH)
045012	1695 JULY 19, 2001	G	JULY 19, 2001	A	NO BASE FLOOD ELEVATIONS DETERMINED

BENCHMARK

FOUND 3" BRASS CAP FLUSH AT INTERSECTION OF LINCOLN DRIVE AND CATTLETRACK (MILLER) ROAD ELEVATION 1284.51 (NAVD 88)

UTILITY	UTILITY COMPANY	NAME OF COMPANY REPRESENTATIVE	TELEPHONE NUMBER	DATE SIGNED
WATER	AAW	JOE GROSS	623-445-2401	6/10/05
SANITARY SEWER	CITY OF SCOTTSDALE	LARRY TRITZ	480-312-7887	6/9/05
ELECTRIC	APS	KATHY CUTHBERTSON	602-493-4433	3/3/05
TELEPHONE	QWEST	IAN HOLMES	602-630-0496	3/24/05
NATURAL GAS	SW GAS CORP	HENGAMAN NAJAFI	602-484-5294	3/24/05
CABLE TV	COX COMMUNICATIONS	ROB RUSSELL	623-328-3506	3/28/05

ENGINEER'S CERTIFICATION

I ROBERT R. McCANDLESS, BEING THE PERSON RESPONSIBLE FOR DESIGNING THE FACILITIES NECESSARY TO SERVE THIS DEVELOPMENT, HEREBY CERTIFY THAT ALL OF THE UTILITY COMPANIES LISTED ABOVE, HAVE REVIEWED THIS PROJECT PROPOSAL AND ALL CONFLICTS HAVE BEEN RESOLVED AT THIS POINT. 'NO CONFLICT' FORMS HAVE BEEN OBTAINED FROM EACH UTILITY COMPANY AND ARE INCLUDED IN THIS SUBMITTAL. I ALSO CERTIFY THAT ALL ONSITE TRANSFORMERS, CABLE BOXES AND ANY OTHER PUBLIC/PRIVATE APPURTENANCES ARE PLACED SUCH THAT THEY DO NOT NEGATIVELY IMPACT THE USE OR INTENDED USE OF ANY DEDICATED EASEMENTS OR FACILITIES DEVELOPED WITH THIS PROJECT INCLUDING BUT NOT LIMITED TO STORMWATER STORAGE BASINS, SIGHT DISTANCE EASEMENTS AND NAOS OR OTHER OPEN SPACE EASEMENTS.

SIGNATURE — 6-13-05 DATE

AZAW000442

Registered Professional Engineer (Civil) CERTIFICATE NO. 27301 ROBERT R. McCANDLESS Date Signed 6/13/05 Arizona U.S.A.

OWNER

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Fax 623.445.2454
Joe Gross, P.E.
JGross@AmWater.com

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Fax 480.998.3921
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ENGINEER

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Phone 602.265.5400 Fax 602.265.5632
Robert R. McCandless, P.E.
RMcCandless@DSWA.net

ARIZONA AMERICAN WATER
PARADISE VALLEY ARSENIC REMOVAL FACILITY
JUNE 2005

22-LD-2005	30-NP-2005	8-HP-2005	109-DR-2004	33-UP-2004	QS NO. 21-46	PLAN CHECK NO. 607-05

GOVERNING BUILDING CODES
ALL CONSTRUCTION SHALL COMPLY WITH THE FOLLOWING CODES AND AMENDMENTS PER THEIR ADOPTING ORDINANCES:
2003 INTERNATIONAL BUILDING CODE (ORD. #3505)
2003 INTERNATIONAL MECHANICAL CODE (ORD. #3506)
2003 INTERNATIONAL FIRE CODE (ORD. #3507)
1999 NATIONAL ELECTRICAL CODE (ORD. #3413)
1994 UNIFORM PLUMBING CODE (ORD. #2785) IAMPO EDITION

ALL CONSTRUCTION SHALL COMPLY WITH THE LATEST VERSION OF "UNIFORM STANDARD SPECIFICATIONS AND DETAILS FOR PUBLIC WORKS CONSTRUCTION", SPONSORED AND DISTRIBUTED BY MARICOPA ASSOCIATION OF GOVERNMENTS, AND AS AMENDED BY THE [illegible] VERSION OF THE CITY OF SCOTTSDALE SUPP[illegible]AL STANDARD SPECIFICATIONS AND DETAILS, UNLESS REFER[illegible] OTHERWISE ON THE DRAWINGS.

UNLESS DETAILED, SPECIFIED OR INDICATED OTHERWISE, CONSTRUCTION SHALL BE AS INDICATED IN THE APPLICABLE TYPICAL DETAILS AND GENERAL NOTES. TYPICAL DETAILS ARE MEANT TO APPLY EVEN THOUGH NOT REFERENCED AT SPECIFIC LOCATIONS OR IN SPECIFIC DRAWINGS.

WHERE CONSTRUCTION DETAILS ARE SHOWN OR NOTED FOR ANY PART OF THE WORK, DETAILS SHALL BE THE SAME AS FOR OTHER SIMILAR WORK.

THE ENGINEERING DESIGN ON THESE PLANS IS APPROVED BY THE CITY IN SCOPE AND NOT ON DETAIL. IF CONSTRUCTION QUANTITIES ARE SHOWN ON PLANS, THEY ARE NOT VERIFIED BY THE CITY.

APPROVAL OF THE PLANS BY THE CITY IS VALID FOR SIX (6) MONTHS. IF AN ENCROACHMENT PERMIT FOR THE CONSTRUCTION HAS NOT BEEN ISSUED WITHIN SIX MONTHS, THE PLANS SHALL BE RESUBMITTED TO THE CITY FOR RE-APPROVAL.

A PUBLIC WORKS INSPECTOR WILL INSPECT ALL WORK WITHIN THE CITY OF SCOTTSDALE RIGHTS-OF-WAY AND IN EASEMENTS. NOTIFY INSPECTION SERVICES 24 HOURS PRIOR TO STARTING OF CONSTRUCTION (TELEPHONE 480-312-5750).

CITY ENCROACHMENT PERMITS ARE REQUIRED FOR ALL WORK IN PUBLIC RIGHT-OF-WAY AND EASEMENTS GRANTED FOR PUBLIC PURPOSES. AN ENCROACHMENT PERMIT WILL BE ISSUED BY THE CITY UPON RECEIPT OF PAYMENT OF A BASE FEE PLUS A FEE FOR INSPECTION SERVICES TO BE PROVIDED BY THE CITY. COPIES OF ALL PERMITS SHALL BE RETAINED ON-SITE AND SHALL BE AVAILABLE FOR INSPECTION AT ALL TIMES. FAILURE TO PRODUCE THE REQUIRED PERMITS WILL RESULT IN IMMEDIATE WORK STOPPAGE UNTIL THE PROPER PERMIT DOCUMENTATION IS OBTAINED.

WHEREVER EXCAVATION IS DONE, CONTACT THE BLUE STAKE CENTER AT 602-263-1100 (CALL COLLECT IF NECESSARY) TWO WORKING DAYS PRIOR TO EXCAVATION. THE CENTER WILL IDENTIFY LOCATIONS OF UNDERGROUND UTILITY LINES FOR THE PROJECT.

ALL EXCAVATION AND GRADING NOT IN PUBLIC RIGHT-OF-WAY OR IN EASEMENTS GRANTED FOR PUBLIC PURPOSES MUST CONFORM TO CHAPTER 70, EXCAVATION AND GRADING, OF THE LATEST EDITION OF THE UNIFORM BUILDING CODE PREPARED BY THE INTERNATIONAL CONFERENCE OF BUILDING OFFICIALS. A PERMIT FOR THIS GRADING MUST BE SECURED FROM THE CITY.

ENGINEER OR OWNER SHALL NOT BE RESPONSIBLE FOR THE CONSTR[illegible]N METHODS OR TECHNIQUES, OR FOR THE EXCAV[illegible]F ANY PART OF WORK SHOWN ON THESE DRAWINGS.

COMPLY WITH ALL CONSTRUCTION PERMITS REQUIRED BY CITY OF SCOTTSDALE, AND COORDINATE ALL REQUIRED INSPECTIONS. OWNER WILL BE RESPONSIBLE FOR PAYMENT OF ALL PERMITTING FEES. FEE AMOUNTS ARE NOT TO BE INCLUDED IN THE CONTRACT PRICE.

CONTRACTOR TO MAINTAIN PLANT ROADWAY ACCESS TO ALL FACILITIES FOR MAINTAINING PLANT OPERATIONS DURING CONSTRUCTION. IF THE WORK REQUIRES INTERRUPTION OF EXISTING ACCESS TO PLANT FACILITIES THE CONTRACTOR SHALL PROVIDE TEMPORARY ACCESS (APPROVED BY THE OWNER) TO THESE FACILITIES.

NEITHER ENGINEER NOR OWNER IS RESPONSIBLE FOR THE ACTS OR OMISSIONS, OF THE CONTRACTOR, SUBCONTRACTOR, OR ANY PERSON PERFORMING THE WORK ON BEHALF OF THE CONTRACTOR, OR FOR THE FAILURE OF THE CONTRACTOR TO CARRY OUT THE WORK IN ACCORDANCE WITH THE CONTRACT DOCUMENTS.

CONTRACTOR IS RESPONSIBLE FOR SECURITY AND FOR THE SECURE STORAGE OF GOODS AND MATERIALS ONSITE.

NOT USED

EXISTING STRUCTURES AND FACILITIES WHICH ARE TO BE DEMOLISHED ARE SHOWN ON DEMOLITION SHEETS. SEE SPECIFICATION FOR SPECIFIC REQUIREMENTS REGARDING DEMOLITION OF EXISTING FACILITIES.

NOT USED

COORDINATE DEMOLITION AND PIPING INSTALLATION WITH OWNER'S OPERATIONS PER SPECIFICATIONS. REFER TO C DRAWINGS FOR DEMOLITION, AND C AND M DRAWINGS FOR NEW PIPING.

THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS BEFORE STARTING WORK AND SHALL IMMEDIATELY NOTIFY THE ENGINEER OF ANY DISCREPANCIES.

THE ELEVATIONS OF EXISTING TOPOGRAPHY SHOWN MAY VARY. CONTRACTOR TO FIELD VERIFY.

AN ASTERISK (*) SHOWN ON THE DRAWING REFERS TO A DIMENSION OR ELEVATION TO BE FIELD VERIFIED.

A DOUBLE-ASTERISK (**) SHOWN ON THE DRAWING REFERS TO A DIMENSION OR ELEVATION TO BE DETERMINED BASED ON EQUI[illegible]NT MANUFACTURER.

[illegible]TER[illegible] THE FIELD DIMENSIONS NOT SHOWN FOR LOCATION OF NEW [illegible]ING AS REQUIRED. NOTIFY ENGINEER IN INSTANCES WHERE REVISION TO DRAWING ARE REQUIRED.

25. LOCATIONS OF EXISTING STRUCTURES, EQUIPMENT AND UNDERGROUND PIPING AND UTILITIES SHOWN ON THE DRAWINGS ARE BASED ON BEST AVAILABLE INFORMATION. CONTRACTOR SHALL VERIFY ALL CRITICAL LOCATIONS AND ELEVATIONS BEFORE CONSTRUCTION PROCEEDS.

26. THE CONTRACTOR SHALL CONTACT THE APPROPRIATE UTILITY COMPANY OR AGENCY PRIOR TO PROCEEDING WITH WORK WHICH INVOLVES OR AFFECTS EXISTING FEATURES OR UTILITIES.

27. LOCATION OF UNDERGROUND UTILITIES SHOWN ON THESE DRAWINGS WERE OBTAINED FROM THE BEST AVAILABLE RECORDS. THE OWNER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR NOT IN THE LOCATION SHOWN. THE CONTRACTOR SHALL VERIFY ALL LOCATIONS OF EXISTING UTILITIES AND SHALL TAKE ALL PRECAUTIONARY MEASURES INCLUDING DEWATERING AS NECESSARY TO PROTECT EXISTING UNDERGROUND UTILITIES WHETHER OR NOT THEY ARE SHOWN.

28. ALL UTILITIES SHALL BE PROTECTED FROM DAMAGE AS A RESULT OF THE WORK. THE CONTRACTOR SHALL RELOCATE, REPAIR OR REPLACE ANY UTILITIES DAMAGED DURING THE WORK TO THE SATISFACTION OF THE RESPECTIVE UTILITY COMPANY OR AGENCY OR THE OWNER.

29. NOTIFY UTILITIES AT LEAST 48 HOURS IN ADVANCE OF ANY EXCAVATION, DISCONNECTION, CONNECTION, OR REMOVAL OF ANY PIPE OR CONDUIT UNDER THEIR AUTHORITY. VERIFY LOCATION OF ALL UTILITIES AND AVOID DAMAGE TO SAME. THE CONTRACTOR SHALL RELOCATE, REPAIR OR REPLACE ANY UTILITIES DAMAGED DURING THE WORK TO THE SATISFACTION OF THE RESPECTIVE UTILITY COMPANY OR AGENCY, OR THE OWNER.

30. ALL BURIED PIPING AND ELECTRICAL DUCT BANK SHALL BE BACKFILLED ACCORDING TO THE CONTRACT DOCUMENTS AND EXISTING PAVEMENT REPAIRED PER CITY OF SCOTTSDALE STANDARD DETAIL NO. 2200 'T' TOP.

31. MINIMUM COVER OVER ALL BURIED PIPING SHALL BE 4'-0" UNLESS OTHERWISE SHOWN OR APPROVED BY ENGINEER. PIPE WITH LESS THAN 4'-0" COVER SHALL BE CONCRETE ENCASED, PER TYPICAL DETAIL. NOTIFY ENGINEER TO RECTIFY CONFLICTS.

32. WHERE BURIED PIPING CROSSES EXISTING BURIED PIPING, CROSSINGS SHALL BE CONSTRUCTED PER MAG STANDARD DETAILS NO. 403, 404 AND 405.

33. FOR ALL BURIED VALVES, CONTRACTOR SHALL CONSTRUCT BLOCKING PER MAG STANDARD DETAIL NO. 301 AND PROVIDE A VALVE BOX PER MAG STANDARD DETAIL NO. 391, TYPE "A".

34. INSTALL AIR RELIEF ASSEMBLIES AT ALL HIGH POINTS ON THE PROCESS PIPING. ACTUAL LOCATIONS TO BE DETERMINED DURING CONSTRUCTION. SEE TYPICAL DETAILS.

35. PROVIDE TEMPORARY THRUST RESTRAINT AND PIPE SUPPORTS FOR EXISTING PIPING WHENEVER REQUIRED BY THE WORK. CONTRACTOR TO REPLACE OR RESTORE THE EXISTING RESTRAINT SYSTEM OR PIPE SUPPORT SYSTEMS TO LIKE-NEW CONDITION.

36. THRUST RESTRAINT, WHERE REQUIRED, SHALL BE PROVIDED USING MEGALUG MECHANICAL JOINT RESTRAINTS OR APPROVED EQUAL PER PROJECT TECHNICAL SPECIFICATIONS.

37. THE CONTRACTOR SHALL ADJUST ALL EXISTING MANHOLES, VALVE BOXES, CLEANOUTS AND FIRE HYDRANTS WITHIN WORK LIMITS REQUIRED TO MATCH PROPOSED FINAL GRADE ACCORDING TO MAG STANDARD DETAILS NO. 270, 360, 391, 422 AND 441.

38. PIPING, ELECTRICAL DUCTBANKS, INSTRUMENTATION AND OTHER FACILITIES TO BE CONTINUED BY OTHER CONSTRUCTION CONTRACTS SHALL:
(IF THE WORK BY OTHERS IS NOT IN PLACE) BE TERMINATED AT THE LIMITS SHOWN, TESTED AND CAPPED WITH AN APPROPRIATE TERMINATION FLANGE OR DEVICE PRIOR TO COMPLETION OF THE WORK. SITE FACILITIES SHALL BE LOCATED (SURVEYED) REFERENCING PLANT COORDINATES AND ELEVATIONS. MARKERS EXTENDING 4'-0" ABOVE FINISHED GRADE SHALL BE PROVIDED WITH THE ABOVE INFORMATION. PROVIDE THE OWNER WITH THE SURVEY NOTES UPON COMPLETION OF THE WORK; OR
(IF THE WORK BY OTHERS IS IN PLACE) BE TERMINATED AND TESTED TO THE LIMIT OF THE WORK. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY APPURTENANCES AND ACCESSORIES, NUTS, BOLTS, ETC REQUIRED TO COMPLETE THE CONNECTION TO THE WORK BY OTHERS.

39. REFER TO M DRAWINGS FOR CONTINUATION OF PIPING AT STRUCTURES.

40. WHEN SAWCUTTING ALONG EDGE OF EXISTING PAVEMENT, CUT MINIMUM 2 FEET FROM EDGE OF EXISTING.

41. THE CONTRACTOR SHALL BE RESPONSIBLE FOR REPLACING AND INSTALLING ANY EXISTING SURVEY MONUMENTS REMOVED OR DAMAGED DURING CONSTRUCTION.

42. THE CONTRACTOR IS RESPONSIBLE FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES IN ACCORDANCE WITH THE SPECIFICATIONS.

CONSTRUCTION NOTES

1. MATERIALS IN CONTACT WITH DRINKING WATER SHALL CONFORM TO NATIONAL SANITATION FOUNDATION STANDARDS 60 AND 61.
2. PROVIDE SEPARATION BETWEEN ADJACENT POTABLE WATER, SEWER AND RECLAIMED WATER PIPELINES IN ACCORDANCE WITH THE MOST RESTRICTIVE REQUIREMENT OF ARIZONA ADMINISTRATIVE CODE, TITLE 18, CHAPTER 4 AND 9 AND MAG STANDARD DETAIL 404.
3. INSTALL NEW PIPELINES AT UNIFORM SLOPE BETWEEN POINTS FOR WHICH ELEVATIONS ARE GIVEN.
4. DETERMINE IN THE FIELD, WITH THE ENGINEER'S APPROVAL, DIMENSIONS NOT SHOWN FOR THE LOCATION OF NEW PIPING.
5. PROVIDE ALL TEMPORARY PROCESS, POWER AND AUXILIARY BYPASSES AND TEMPORARY SERVICE CONNECTIONS REQUIRED TO SUSTAIN ONGOING TREATMENT PROCESSES AND OPERATIONS AT THE MILLER ROAD BOOSTER STATION THROUGHOUT THE COURSE OF THIS CONTRACT.

GENERAL

DWG NO	TITLE
G01	COVER SHEET AND VICINITY MAP
G02	GENERAL NOTES AND DRAWING INDEX
G03	ABBREVIATIONS
G04	LEGENDS AND SYMBOLS
G05	HYDRAULIC PROFILE
G06	FUNCTIONAL PROCESS FLOW SCHEMATIC

CIVIL

DWG NO	TITLE
C01	OVERALL SITE PLAN
C01A	OVERALL SITE PLAN
C01B	OPEN SPACE PLAN
C02	DEMOLITION PLAN 1
C03	DEMOLITION PLAN 2
C04	DEMOLITION PLAN 3
C05	GRADING, DRAINAGE AND PAVING PLAN 1
C06	GRADING, DRAINAGE AND PAVING PLAN 2
C07	GRADING, DRAINAGE AND PAVING PLAN 3
C08	YARD PIPING PLAN 1
C09	YARD PIPING PLAN 2
C10	YARD PIPING PLAN 3
C11	YARD PIPING – BACKWASH PLAN AND PROFILE
C12	YARD PIPING 18" STORMDRAIN PROFILE
C13	YARD PIPING 24" STORMDRAIN PROFILE
C14	VENTURI METER – PLAN AND SECTION VIEWS
C15	TYPICAL DETAILS 1
C16	CITY OF SCOTTSDALE STANDARD DETAILS 1

LANDSCAPE ARCHITECTURE

DWG NO	TITLE
L01	GENERAL NOTES AND LEGENDS
L02	OVERALL SITE PLAN
L03	PLANTING PLAN 1
L04	PLANTING PLAN 2
L05	PLANTING PLAN 3
L06	IRRIGATION PLAN 1
L07	IRRIGATION PLAN 2
L08	IRRIGATION PLAN 3
L09	DETAILS
L10	IRRIGATION DETAILS 1
L11	IRRIGATION DETAILS 2
NPI01	NATIVE PLANT INVENTORY – GENERAL NOTES
NPI02	NATIVE PLANT INVENTORY TABLE
NPI03	NATIVE PLANT INVENTORY PLAN 1
NPI04	NATIVE PLANT INVENTORY PLAN 2

ARCHITECTURAL

DWG NO	TITLE
A01	PROJECT INFORMATION
A02	BUILDING 'A' – FLOOR PLAN
A03	BUILDING 'A' – FLOOR PLAN MATCHLINE NORTH
A04	BUILDING 'A' – FLOOR PLAN MATCHLINE SOUTH
A05	BUILDING 'B' – FLOOR PLAN
A06	BUILDING 'C' – FLOOR PLAN
A07	CANOPY FLOOR PLAN
A08	BUILDING 'A' – ROOF PLAN
A09	BUILDING 'B' – ROOF PLAN
A10	BUILDING 'C' – ROOF PLAN
A11	CANOPY ROOF PLAN
A12	BUILDING 'A' – ELEVATIONS
A13	BUILDING 'B' – ELEVATIONS
A14	BUILDING 'C' – ELEVATIONS
A15	CANOPY ELEVATIONS
A16	BUILDING 'A' – SECTIONS
A17	BUILDING 'A' – SECTIONS
A18	BUILDING 'A' – SECTIONS
A19	BUILDING 'B' – SECTIONS
A20	BUILDING 'B' – SECTIONS
A21	BUILDING 'B' – SECTIONS
A22	BUILDING 'C' – SECTIONS
A23	BUILDING 'C' – SECTIONS
A24	CANOPY SECTIONS
A25	BUILDING 'A' – INTERIOR ELEVATIONS
A26	BUILDING 'A' – INTERIOR ELEVATIONS
A27	BUILDING 'A' – INTERIOR ELEVATIONS
A28	BUILDING 'C' – INTERIOR ELEVATIONS
A29	BUILDING 'A' REFLECTED CEILING PLAN
A30	BUILDING 'B' REFLECTED CEILING PLAN
A31	BUILDING 'C' REFLECTED CEILING PLAN
A32	CANOPY REFLECTED CEILING PLAN
A33	DOOR AND FRAME SCHEDULE
A34	WINDOW AND LOUVER SCHEDULE
A35	FINISH SCHEDULE
A36	BUILDING 'A', 'B' AND 'C' PARTITION TYPES
A37	BUILDING 'A' INTERIOR DETAILS
A38	BUILDING 'B' AND 'C' INTERIOR DETAILS
A39	BUILDING 'A' ROOF, WALL AND EXT DETAILS
A40	BUILDING 'A' ROOF, WALL AND EXT DETAILS
A41	BUILDING 'A' ROOF, WALL AND EXT DETAILS
A42	BUILDING 'B' AND 'C' ROOF, WALL AND EXT DETAILS
A43	BUILDING 'B' AND 'C' ROOF, WALL AND EXT DETAILS
A44	BUILDING 'B' AND 'C' ROOF, WALL AND EXT DETAILS
A45	BACKWASH CLARIFIER ELEVATIONS (WEST AND SOUTH)
A46	FINISH WATER RESEVOIR ELEVATION (TYPICAL)
A47	PERIMETER WALL SHEET 1 OF 2
A48	PERIMETER WALL SHEET 2 OF 2

STRUCTURAL

DWG NO	TITLE
S1	GENERAL NOTES I
S2	GENERAL NOTES II
S3	TYPICAL DETAILS I
S4	TYPICAL DETAILS II
S5	BUILDING A – FOUNDATION PLAN
S6	BUILDING A – LOWER ROOF PLAN
S7	BUILDING A – HIGH ROOF PLAN
S8	BUILDING A – SECTIONS
S9	BUILDING A – SECTIONS
S10	BUILDING A – DETAILS
S10A	BUILDING A – SECTIONS
S11	BUILDING A – SECTION
S12	BUILDING A – SECTION AND DETAIL
S13	BUILDING A – SECTION AND DETAIL
S14	BUILDING A – SECTION AND DETAIL
S15	BUILDING A – SECTIONS
S16	FILTERS – PLAN AND SECTION
S17	FILTER GALLERY – PLAN AND SECTIONS
S18	BUILDING B – FOUNDATION PLAN
S19	BUILDING B – ROOF PLAN
S20	BUILDING B – SECTIONS
S21	BUILDING B – SECTIONS
S22	BUILDING B – DETAILS
S23	BUILDING B – SECTIONS AND DETAILS
S24	BUILDING C – FOUNDATION PLAN
S25	BUILDING C – ROOF PLAN
S26	BUILDING C – SECTIONS
S27	BUILDING C – SECTIONS AND DETAILS
S28	BUILDING C – SECTIONS AND DETAILS
S28A	BUILDING C – SECTIONS AND DETAILS
S29	BACKWASH CLARIFIERS – PLAN
S30	BACKWASH CLARIFIERS – SECTIONS
S30A	BACKWASH CLARIFIERS – SECTIONS
S31	RECYCLE AND UNDERFLOW PUMP STATION PLANS AND SECTION
S32	FINISHED WATER RESERVOIR PLAN, SECTION AND DETAIL
S33	MISCELLANEOUS SITE STRUCTURES PLANS, SECTIONS AND DETAILS
S34	FILTER GALLERY – PLAN AND SECTIONS
S35	FILTER GALLERY – PLAN AND SECTIONS

CONSTRUCTION QUANTITIES IN CITY OF SCOTTSDALE RIGHT OF WAY AND PUBLIC UTILITY EASEMENTS

TRENCHING AND BACKFILL	23 CY
PAVING P.C. CONCRETE	100 SY
PAVING A.C.	5 SY
DECORATIVE PAVING OR SIDEWALK	6 SY
SIDEWALK AND BIKEPATH	4207 SQ FT
FIRE HYDRANTS	1 EA
FIRE LINES FROM EXISTING MAINS	138 LF
SANITARY SEWER TAPS AND SERVICE LINE	208 LF
SANITARY SEWER MANHOLES	1 EA
WATERLINE	129 LF

AZAW000443

MECHANICAL

DWG NO	TITLE
M01	PROCESS FLOW SCHEMATIC – WELLS AND MRTF
M02	PROCESS FLOW SCHEMATIC JET MIXING AND FILTRATION (FILTERS 1, 3 & 5)
M03	PROCESS FLOW SCHEMATIC FILTRATION (FILTERS 2, 4 & 6)
M04	PROCESS FLOW SCHEMATIC WASHWATER AND DISTRIBUTION PUMPS
M05	PROCESS FLOW SCHEMATIC CLARIFIERS AND SOLIDS HANDLING
M06	SODIUM HYDROXIDE STORAGE AND FEED SCHEMATIC
M07	FERRIC CHLORIDE STORAGE AND FEED SCHEMATIC
M08	SODIUM HYPOCHLORITE STORAGE AND FEED SCHEMATIC
M09	POLYMER STORAGE AND FEED SCHEMATIC
M10	FILTER GALLERY – OVERALL PLAN
M11	FILTER GALLERY – SECTION
M12	FILTER GALLERY – SECTION
M13	FILTER GALLERY – SECTIONS
M14	FILTER GALLERY – SECTIONS
M15	FILTER GALLERY – SECTIONS
M16	JET MIXER PLAN AND SECTION
M17	BUILDING B OVERALL PLAN
M18	SODIUM HYPOCHLORIDE STORAGE ROOM PARTIAL PLAN AND SECTION
M19	SODIUM HYDROXIDE STORAGE ROOM PUMP AND TANK DETAILS
M20	SODIUM HYDROXIDE STORAGE ROOM PARTIAL PLAN AND SECTION
M21	FERRIC CHLORIDE STORAGE STORAGE ROOM PUMP AND TANK DETAILS
M22	FERRIC CHLORIDE STORAGE STORAGE ROOM PARTIAL PLAN AND SECTION
M23	FERRIC CHLORIDE STORAGE STORAGE ROOM PUMP AND TANK DETAILS
M24	PUMP ROOM – PLAN
M25	PUMP ROOM SECTIONS AND DETAILS
M26	BUILDING B – POLYMER & BLOWER ROOMS PLANS AND SECTIONS
M27	BUILDING B DETAILS
M28	BUILDING C OVERALL PLAN
M29	THICKENER AND FILTER PRESS – SECTIONS
M30	BACKWASH CLARIFIER – PLAN
M31	BACKWASH CLARIFIER – SECTION
M32	RECYCLE AND UNDERFLOW PUMP STATION PLANS AND SECTION
M33	FINISHED WATER RESERVOIR – PLAN AND DETAIL
M34	FINISHED WATER RESERVOIR – SECTION
M35	FINISHED WATER RESERVOIR – DETAILS
M36	FINISHED WATER RESERVOIR SECTION AND DETAIL
M37	TYPICAL DETAILS 1
M38	TYPICAL DETAILS 2
M39	TYPICAL DETAILS 3
M40	TYPICAL DETAILS 4

HVAC

DWG NO	TITLE
H01	ABBREVIATIONS, SYMBOLS AND GENERAL NOTES
H02	SCHEDULES
H03	ADMINISTRATION BUILDING – PLAN AND SECTIONS
H04	BUILDING B – PLAN AND DETAIL
H05	BUILDING B – SECTIONS
H06	BUILDING C – PLAN AND SECTIONS
H07	TYPICAL DETAILS 1
H08	TYPICAL DETAILS 2

PLUMBING

DWG NO	TITLE
P01	BUILDING A – WATER PLAN & DIAGRAM
P02	BUILDING A – WASTE AND VENT PLAN AND DIAGRAM
P03	BUILDING B – WATER & WASTE AND VENT PLAN AND DIAGRAMS
P04	BUILDING C – WATER,WASTE AND VENT PLAN & DIAGRAM
P05	FILTER GALLERY – WASTE & VENT PLAN AND DIAGRAM
P06	TYPICAL DETAILS

ELECTRICAL

DWG NO	TITLE
E01	LEGEND
E02	SERVICE ENTRANCE SECTION SINGLE LINE DIAGRAM
E03	MCC-1 – SINGLE LINE DIAGRAM
E04	MCC-2 – SINGLE LINE DIAGRAM
E05	POWER DISTRIBUTION PANELS SINGLE LINE DIAGRAM
E06	PANELBOARD SCHEDULES
E07	PANELBOARD SCHEDULES
E08	AREA LIGHTING PHOTOMETRICS – CALCULATIONS
E09	SITE PLAN
E10	SITE LIGHTING PLAN
E11	BYPASS AREA – PLAN
E12	SERVICE ENTRANCE AREA – ELECTRICAL PLAN
E13	ADMINISTRATION BUILDING "A" – POWER PLAN
E14	ADMINISTRATION BUILDING – LIGHTING PLAN
E15	FILTER AREA – ELECTRICAL PLAN
E16	FILTER GALLERY – LIGHTING & RECEPTACLE PLAN
E17	PUMP AND CHEMICAL AREA – 480V POWER PLAN
E18	PUMP AND CHEMICAL AREA LOW VOLTAGE ELECTRICAL PLAN
E19	PUMP AND CHEMICAL AREA LIGHTING AND RECEPTACLE PLAN
E20	BUILDING C – ELECTRICAL PLAN
E21	BUILDING C – LIGHTING & RECEPTACLE PLAN
E22	CLARIFIER AREA – ELECTRICAL PLAN
E23	WELLS 11 AND 12 – ELECTRICAL PLANS
E24	INSTRUMENTATION CONDUIT DIAGRAMS PLC-1 PLANT INFLUENT
E25	INSTRUMENTATION CONDUIT DIAGRAMS FILTRATION AREA
E26	INSTRUMENTATION CONDUIT DIAGRAMS PLC-5 POLYMER AND FERRIC
E27	INSTRUMENTATION CONDUIT DIAGRAMS PLC-6 NaOH AND NaOCL
E28	INSTRUMENTATION CONDUIT DIAGRAMS PLANT EFFLUENT
E29	SCHEMATICS NO. 1
E30	SCHEMATICS NO. 2
E31	SCHEMATICS NO. 3
E32	SCHEMATICS NO. 4
E33	DETAILS
E34	DETAILS
E35	TELEPHONE RISER DIAGRAM
E36	DUCT BANK SECTIONS
E37	OUTDOOR LIGHT FIXTURE CUT SHEETS

INSTRUMENTATION

DWG NO	TITLE
I01	SYMBOLS AND LEGEND – P & ID
I02	SYSTEM ARCHITECTURE DIAGRAM
I03	WELLS 14, 15, AND PCX-1 – P & ID
I04	WELLS 11, 12, 16, AND 17 – P & ID
I05	MILLER ROAD TREATMENT FACILITY – P & ID
I06	RAW WATER MIXING – P & ID
I07	BYPASS BLENDING – P & ID
I08	PRESSURE FILTERS SHEET 1 – P & ID
I09	PRESSURE FILTERS SHEET 2 – P & ID
I10	FINISHED WATER RESERVOIR – P & ID
I11	DISTRIBUTION PUMP STATION SHT 1 – P & ID
I12	DISTRIBUTION PUMP STATION SHT 2 – P & ID
I13	WASHWATER PUMP STATION – P & ID
I14	CENTRIFUGAL BLOWER – P & ID
I15	FERRIC CHLORIDE FEED SYSTEM – P & ID
I16	*NOT USED*
I17	NaOH FEED SYSTEM – P & ID
I18, I19	*NOT USED*
I20	NaOCl FEED SYSTEM SHT 1 – P & ID
I21	NaOCl FEED SYSTEM SHT 2 – P & ID
I22, I23	*NOT USED*
I24	POLYMER FEED SYSTEM SHEET 1 – P & ID
I25	POLYMER FEED STYSTEM SHEET 2 – P & ID
I26	WASHWATER CLARIFIER 1 & 2 – P & ID
I27	*NOT USED*
I28	RECYCLE PUMP STATION – P & ID
I29	UNDERFLOW PUMP STATION – P & ID
I30	THICKENER & SLUDGE PUMP STATION – P & ID
I31	FILTER PRESS – P & ID
I32, I33	*NOT USED*
I34	THICKENED SLUDGE WETWELL – P & ID
I35	MISCELLANEOUS – P & ID
I36	TYPICAL DETAILS

REVISIONS

Registered Professional Engineer (Civil) CERTIFICATE NO. 27301 ROBERT R. McCANDLESS Date Signed

Paradise Valley Arsenic Removal Facility
GENERAL
GENERAL NOTES
AND DRAWING INDEX

ARIZONA AMERICAN WATER
PARADISE VALLEY DISTRICT

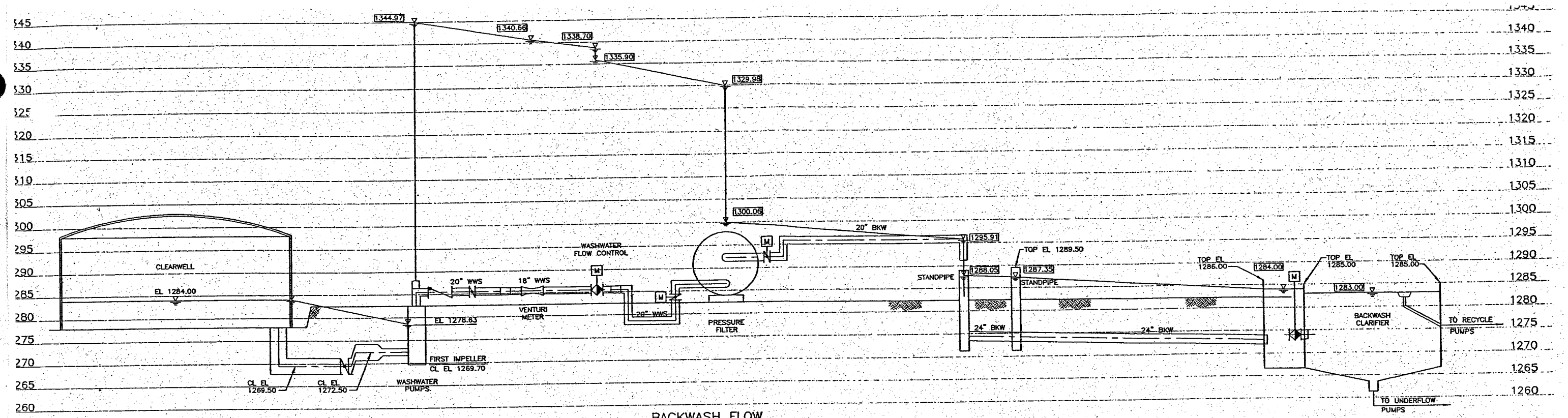
DAMON S. WILLIAMS ASSOCIATES, LLC
2355 E. CAMELBACK ROAD, SUITE 700
PHOENIX, AZ 85016

DSWA

DRAWN BY PGH, CDH
PROJECT ENG'R CHC
APPROVED RRM

DATE JUNE 2005
PROJECT 23020203

USE DIMENSIONS ONLY
SCALE NO SCALE



TREATMENT FLOW
TERMINAL HEADLOSS, DIRTY FILTER = 10 PSIG
TERMINAL HEADLOSS, CLEAN FILTER = 6 PSIG

LEGEND

1293.68	WATER SURFACE ELEVATION
1293.68	WATER SURFACE ELEV MAX RES, DIRTY FILTER
1271.85	WATER SURFACE ELEV MAX RES, CLEAN FILTER
1258.86	WATER SURFACE ELEV MIN RES, CLEAN FILTER

AZAW000444

Registered Professional Engineer (Civil) CERTIFICATE NO. 27301 ROBERT K. McCANDLESS

REVISIONS

Paradise Valley Arsenic Removal Facilit
GENERAL

HYDRAULIC PROFILE

ARIZONA AMERICAN WATER
PARADISE VALLEY DISTRICT

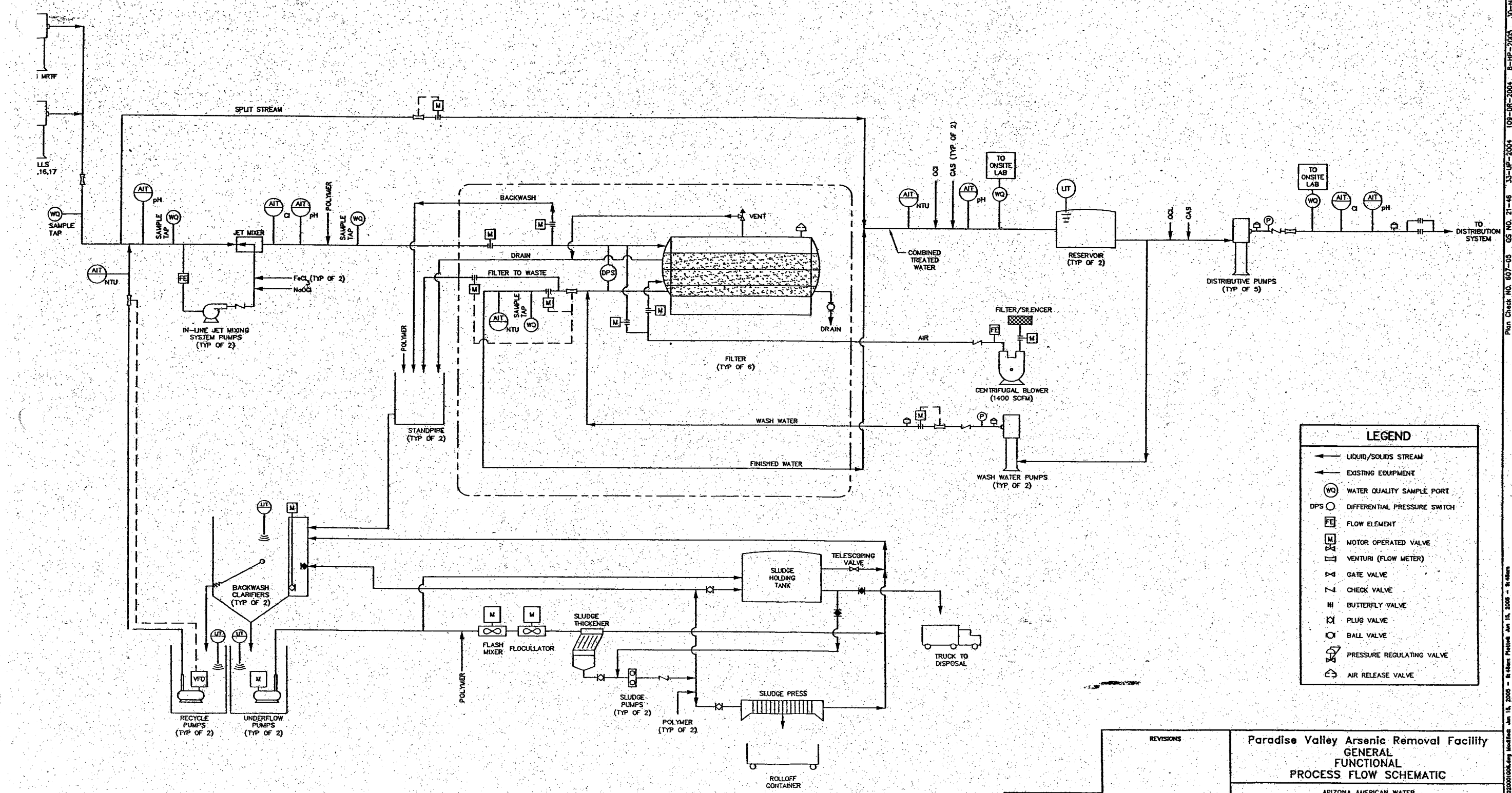
DAMON S. WILLIAMS ASSOCIATES, LLC
2355 E. CAMELBACK ROAD, SUITE 700
PHOENIX, AZ 85016

DSWA

DRAWN BY SLB, AA
PROJECT ENG'R RDB

DATE JUNE 2005

USE DIMENSIONS ONLY



REVISIONS

Registered Professional Engineer (Civil) CERTIFICATE NO. 27301 ROBERT R. McCANDLESS Date Signed 6-30-05 Arizona, U.S.A.

Paradise Valley Arsenic Removal Facility
GENERAL FUNCTIONAL PROCESS FLOW SCHEMATIC

ARIZONA AMERICAN WATER
PARADISE VALLEY DISTRICT

DAMON S. WILLIAMS ASSOCIATES, LLC
2355 E. CAMELBACK ROAD, SUITE 700
PHOENIX, AZ 85016

DSWA

DRAWN BY PGH, AA
PROJECT ENG'R CHC
APPROVED RRM

DATE JUNE 2005
PROJECT 23020203

USE DIMENSIONS ONLY
SCALE NOT TO SCALE

Plan Check NO. 607-05 GS NO. 21-46 33-UP-2004 109-DR-2004 8-HP-2005 30-HP-2005 27-10-905

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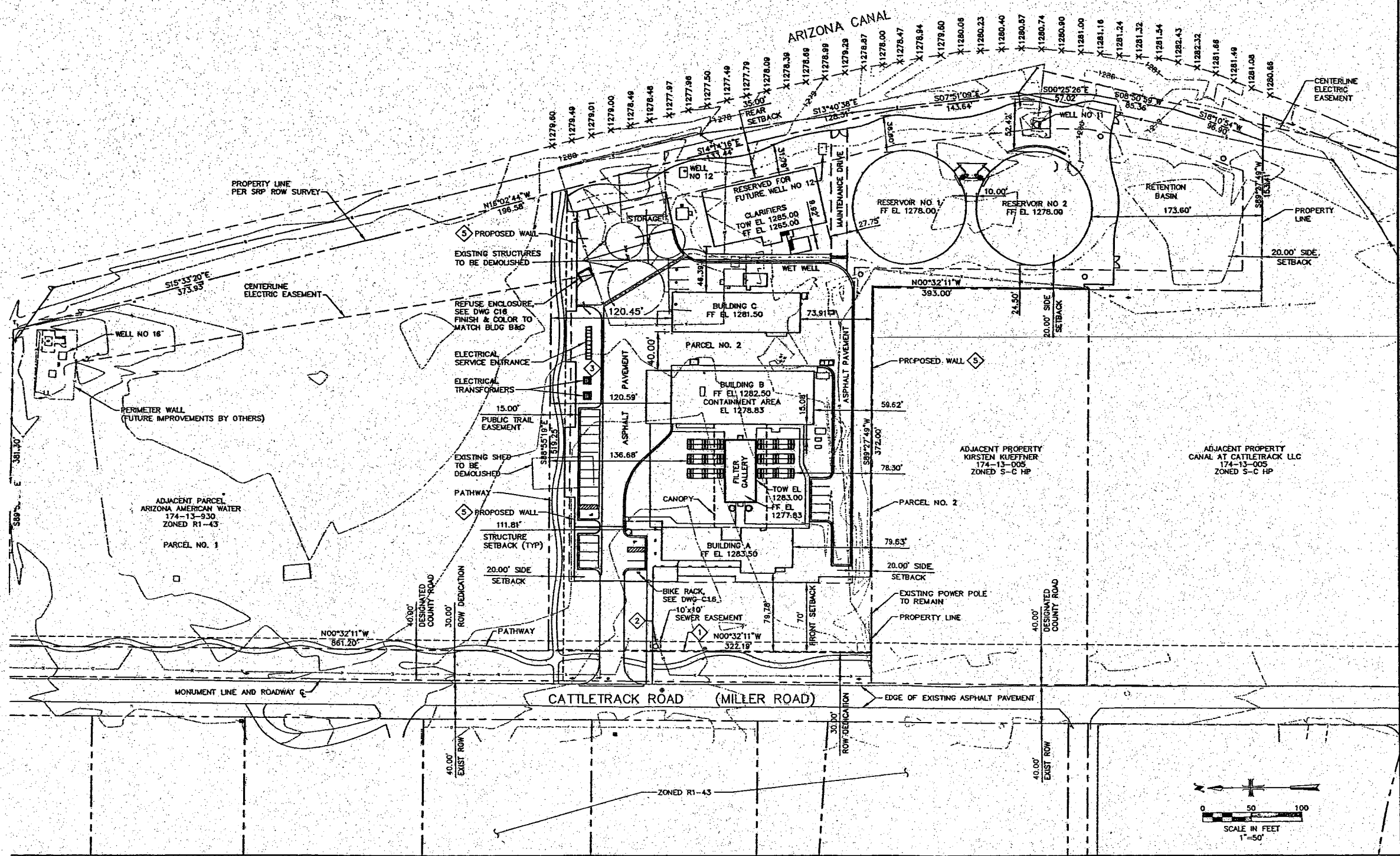
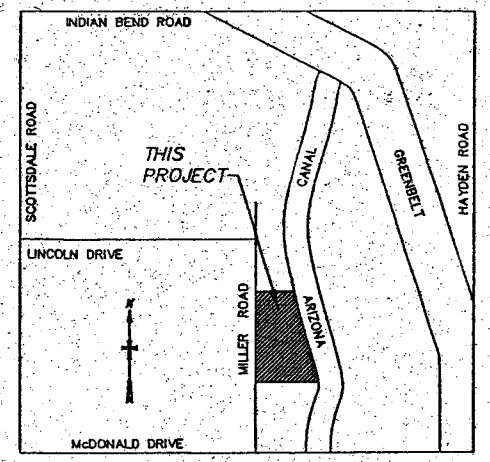
AZAW000445



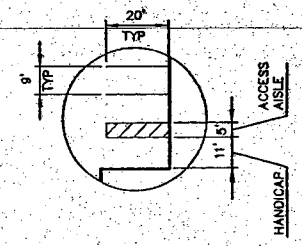
SE 1/4 SECTION 11; T2N R4E

6215 NORTH MILLER ROAD
SCOTTSDALE, ARIZONA 85250



VICINITY MAP

NOT TO SCALE



PARKING STALL DETAIL

PARKING SPACES REQUIRED (BASED ON BLDG A ONLY)
1 SPACE/500 SF GFA x 4415 SF = 9 SPACES

KEY NOTES

1. 1 FOOT VEHICULAR NON-ACCESS EASEMENT.
2. MONITORING MANHOLE. SEE DWG C08.
3. TOP OF SLAB ELEVATION: 1280.50
   HEIGHT OF SERVICE ENTRANCE: 7'-6"
   HEIGHT OF TRANSFORMER: 5'-0"
   TOP OF WALL ELEVATION: 1289.00
4. FOR PARCEL NO. 1 AND PARCEL NO. 2 LEGAL DESCRIPTIONS REFER TO COVER SHEET.
5. SEE DWGS A47 AND A48.

CALL TWO WORKING DAYS BEFORE YOU DIG 263-1100 BLUE STAKE CENTER

AZAW000446

STRUCTURES

DESC	DIMENSION (FT x FT)	GROSS FLOOR AREA (SF)	MAX HEIGHT (FT)	PROPOSED USE
BLDG A	130 x 46	4,415	18	ADMINISTRATION, CUSTOMER SERVICE, LAB
BLDG B	142 x 53	7,668	20	PROCESS
BLDG C	127 x 41	4,984	22	PROCESS/MAINTENANCE
BLDG TOTAL		17,067		
RESERVOIRS	117 FT DIA	10,751	20	WATER STORAGE
CLARIFIERS	55 x 55	4,752	5	WATER RECOVERY
PROCESS		15,503		

PARCEL DATA

APN	CURRENT ZONING	PROPOSED ZONING	NET ACREAGE
174-13-934	R1-43, S-C HP	NO CHANGE	3.78

NOTE: REFER TO 22-LD-2005 FOR ADDITIONAL INFORMATION

BUILDING CODE DATA

PROJECT DATA

PREAPPLICATION NO:
239-PA-2004

LOCATION:
6215 NORTH MILLER ROAD
SCOTTSDALE, ARIZONA 85250

PARKING SPACES (BLDG A ONLY)
REQUIRED: 11, 2
PROVIDED: 22, 2 HANDICAP
(VAN ACCESSIBLE)

SITE AREA:
GROSS: 236,601 SF
NET: 164,800 SF

OWNER:
ARIZONA AMERICAN WATER CO.
19820 NORTH 7th STREET
PHOENIX, ARIZONA 85024
CONTACT: JOE GROSS, P.E.
TEL: 623.445.2403, FAX: 623.445.2454
JGROSS@AMWATER.COM

ENGINEER:
DAMON S. WILLIAMS ASSOCIATES
2355 E. CAMELBACK RD. STE 700
PHOENIX, ARIZONA 85016
CONTACT: ROBERT R. McCANDLESS, P.E.
TEL: 602.265.5400, FAX: 602.265.5632
RMCCANDLESS@DSWA.NET

Registered Professional Engineer (Civil) CERTIFICATE NO. 27391 ROBERT R. McCANDLESS State Of Arizona

REVISIONS

Paradise Valley Arsenic Removal Facility
CIVIL

OVERALL SITE PLAN

ARIZONA AMERICAN WATER
PARADISE VALLEY DISTRICT

DAMON S. WILLIAMS ASSOCIATES, LLC
2355 E. CAMELBACK ROAD, SUITE 700
PHOENIX, AZ 85016

DSWA

DRAWN BY SLB, PGH
PROJECT ENG'R BIS
APPROVED RRM

DATE JUNE 2005
PROJECT 23020203

USE DIMENSIONS ONLY
SCALE 1"=50'

GENERAL STRUCTURAL NOTES:

THESE NOTES APPLY EXCEPT WHERE SPECIFICALLY NOTED OTHERWISE ON THE STRUCTURAL DRAWINGS.

CODE:

1. COMPLY WITH THE 2003 INTERNATIONAL BUILDING CODE.

DESIGN LOADS:

1. SUPERIMPOSED DEAD LOADS:
   ROOF (NON-OFFICE) ---------- 25 PSF
   ROOF (OFFICE) ---------- 0 PSF
   ELEVATED SLABS ---------- 50 PSF

2. LIVE LOADS:
   ROOF (REDUCIBLE) ---------- 20 PSF
   ELEVATED SLABS ---------- 300 PSF

3. WIND LOADS:
   90 MPH (3 SECOND GUST SPEED)
   EXPOSURE C
   Iw = 1.15

4. SEISMIC LOADS:
   SEISMIC SITE PROFILE CLASS D
   SEISMIC USE GROUP III (ACCORDING TO AMEC SOIL INVESTIGATIONS ADDENDUM DEC. 16, 2004)
   SEISMIC DESIGN CATEGORY C (BASED UPON SHORT PERIOD & 1-SECOND PERIOD RESPONSE ACCELERATIONS)
   Ie = 1.25

GENERAL:

1. THE STRUCTURAL DRAWINGS SHOW THE COMPLETED PROJECT. THEY DO NOT INCLUDE COMPONENTS THAT ARE NEEDED FOR CONSTRUCTION SAFETY. THE CONTRACTOR IS RESPONSIBLE FOR SAFETY IN AND AROUND THE JOB SITE DURING CONSTRUCTION.

2. STRUCTURES HAVE BEEN DESIGNED FOR OPERATIONAL LOADS ON THE COMPLETED STRUCTURES. THE CONTRACTOR SHALL PROVIDE ALL NECESSARY TEMPORARY BRACING, SHORING, GUYING OR OTHER MEANS TO AVOID EXCESSIVE STRESSES AND TO HOLD STRUCTURAL ELEMENTS IN PLACE DURING CONSTRUCTION.

3. VERIFY ALL DIMENSIONS OF EQUIPMENT, PIPING, ETC. PRIOR TO STARTING WORK. NOTIFY THE ENGINEER OF ANY DISCREPANCIES OR INCONSISTENCIES.

4. ESTABLISH AND VERIFY ALL OPENINGS AND INSERTS FOR MECHANICAL, ELECTRICAL, AND PLUMBING WITH APPROPRIATE TRADES AND DRAWINGS.

5. REFER TO THE CIVIL DRAWINGS FOR ALL ELEVATIONS AND SLOPES.

6. ANY ENGINEERING DESIGN PROVIDED BY OTHERS AND SUBMITTED FOR REVIEW SHALL BEAR THE SEAL AND SIGNATURE OF AN INSURED STRUCTURAL OR CIVIL ENGINEER REGISTERED IN ARIZONA.

7. THE COST OF DESIGN WORK RESULTING FROM ERRORS OR OMISSIONS IN CONSTRUCTION SHALL BE BORNE BY THE CONTRACTOR.

8. IN CASE OF CONFLICTS, MORE COSTLY REQUIREMENTS GOVERN FOR BIDDING. SUBMIT CLARIFICATION REQUEST PRIOR TO PROCEEDING WITH WORK.

FOUNDATIONS:

1. PERFORM ALL WORK IN ACCORDANCE WITH THE SOILS REPORT BY AMEC EARTH AND ENVIRONMENTAL, INC., JOB #4-117-001054; DATED AUGUST 17, 2004 AND ADDENDUM #1 DATED DECEMBER 16, 2004. REPORT IS AVAILABLE FOR REVIEW FROM OWNER.

2. FOUNDATION DESIGN IS BASED ON THE FOLLOWING SOIL BEARING CAPACITIES:
   BEARING AT GRADE LEVEL ---------- 3000 PSF
   BEARING A MINIMUM OF 17 FEET BELOW EXISTING FINISHED GRADE ---------- 5000 PSF

3. THE FOUNDATIONS FOR THE BACKWASH CLARIFIER AND THE RECYCLE AND UNDERFLOW PUMP STATION SHALL BEAR ON UNDISTURBED NATIVE SOILS. ALL OTHER STRUCTURES SHALL BEAR ON OVEREXCAVATED AND RECOMPACTED STRUCTURAL FILL PREPARED IN ACCORDANCE WITH THE SOILS REPORT. ALL FOUNDATIONS SHALL BEAR AT LEAST 2'-0" BELOW THE LOWEST ADJACENT FINISHED GRADE. VERIFY THE SUITABILITY OF THE BEARING MATERIAL WITH THE SOILS CONSULTANT BEFORE PLACING FOUNDATIONS.

4. BACKFILL SHALL NOT BE PLACED AGAINST RETAINING OR FOUNDATION WALLS UNTIL THE CONCRETE HAS REACHED 75% OF ITS DESIGN STRENGTH. BACKFILL SHALL NOT BE PLACED AGAINST BASEMENT WALLS UNLESS TOPS OF WALLS ARE ADEQUATELY BRACED OR UNTIL GROUND FLOOR STRUCTURE IS IN PLACE. HEAVY EQUIPMENT FOR SPREADING AND COMPACTION BACKFILL SHALL NOT BE OPERATED CLOSER TO FOUNDATION OR RETAINING WALLS THAN A DISTANCE EQUAL TO THE HEIGHT OF BACKFILL ABOVE THE TOP OF THE FOOTING. THE AREA REMAINING SHALL BE COMPACTED IN LAYERS NOT MORE THAN 6 INCHES IN COMPACTED THICKNESS WITH POWER-DRIVEN HAND TAMPERS SUITABLE FOR THE MATERIAL BEING COMPACTED. NOTE: IN NO CASE SHALL THE HAND TAMPER APPLY A LATERAL LOAD AGAINST THE WALL GREATER THAN THAT OF THE GIVEN LATERAL LOADS OF THE SOILS REPORT.

5. PLACE DOWELS AND ANCHOR BOLTS BEFORE POURING CONCRETE. USE TEMPLATES TO ENSURE PROPER PLACEMENT.

6. CENTER FOUNDATIONS UNDER COLUMNS AND WALLS UNLESS NOTED OTHERWISE.

CONCRETE:

1. CONCRETE QUALITY SHALL CONFORM TO THE LATEST EDITIONS OF ACI 117, ACI 315, ACI 301 AND ACI 318. FINISHES SHALL CONFORM TO ACI 301, PARAGRAPH 10.4. SURFACES NOT EXPOSED TO PUBLIC VIEW: ROUGH FORM SURFACES. SURFACES EXPOSED TO PUBLIC VIEW: SMOOTH FORM FINISH. GROUT CLEAN AND PATCH ALL HOLES AND BLEMISHES GREATER THAN 1/8". ALL EXPOSED SURFACES SHALL CONFORM TO ACI 117 CLASS A FORMWORK TOLERANCES.

2. CONCRETE SHALL BE REGULAR WEIGHT (144 PCF) UNLESS NOTED OTHERWISE. CEMENT SHALL BE TYPE II AND SHALL CONFORM TO ASTM C150. AGGREGATE SHALL CONFORM TO ASTM C33. WATER SHALL BE POTABLE. AGGREGATE FOR LIGHTWEIGHT CONCRETE SHALL CONFORM TO ASTM C3303. ALL CONCRETE SHALL HAVE A MINIMUM 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI.

3. SUBMIT MIX DESIGNS FOR REVIEW BEFORE PLACEMENT OF CONCRETE.

4. MAXIMUM AGGREGATE SIZE SHALL NOT EXCEED 1".

5. SLUMP OF CONCRETE SHALL NOT EXCEED 4". IF SUPERPLASTICIZERS ARE USED IN THE MIX DESIGN, THE MIX SHALL BE SLUMPED AT THE JOB SITE PRIOR TO ADDITION OF SUPERPLASTICIZER. PROVIDE COMPUTERIZED BATCH RECORDS WITH ALL LOADS.

6. FLY ASH MAY BE USED AND SHALL CONFORM TO THE FOLLOWING: FLY ASH MAY BE USED IN CONCRETE MIX PROVIDED THE RATIO (BY VOLUME) OF FLY ASH TO TOTAL OF FLY ASH AND CEMENT IS NO MORE THAN 20 PERCENT. FLY ASH SHALL CONFORM TO ASTM C-618, TYPE F. COMPLETE CHEMICAL AND PHYSICAL ANALYSES OF THE FLY ASH SHALL BE SUBMITTED WHEN REQUESTED BY THE ENGINEER. IF DURING THE COURSE OF CONSTRUCTION, CONCRETE USING FLY ASH IS DEEMED BY THE ENGINEER TO NOT BE IN COMPLIANCE WITH ALL REQUIREMENTS STATED IN THE CONTRACT DOCUMENTS THE USE OF FLY ASH SHALL BE DISCONTINUED. UNDER NO CONDITIONS SHALL THE WATER-CEMENT RATIO EXCEED 0.45 FOR CONCRETE CONTAINING FLY ASH. FLY ASH SHALL NOT BE USED IN CONCRETE MIX DESIGN.

7. ADMIXTURES OTHER THAN THE FOREGOING SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW. DO NOT USE ADMIXTURES CONTAINING CALCIUM CHLORIDE.

8. PLACING: CONFORM TO ACI 304 AND ACI 308. DO NOT PLACE CONCRETE IN CONTACT WITH ALUMINUM.

9. THE MAXIMUM FREE DROP OF ANY CONCRETE SHALL BE 6'-0", EXCEPT FOR CAISSONS WHICH SHALL HAVE A FREE, UNOBSTRUCTED FALL.

10. PROVIDE 3/4" x 3/4" CHAMFERS AT ALL EXPOSED CORNERS OF COLUMNS AND WALLS.

11. MECHANICALLY VIBRATE ALL CONCRETE, EXCEPT SLABS ON GRADE NEED ONLY BE VIBRATED AROUND UNDER-FLOOR DUCTS AND OTHER ITEMS EMBEDDED IN THE SLAB. REVIBRATE THE TOP 5 FEET OF WALLS (OVER 10 FEET IN HEIGHT), COLUMNS AND DRILLED PIERS.

12. THE USE OF WATER OR "SPRINKLING" AS AN AID TO FINISHING IS NOT ALLOWED.

13. CURING: CONFORM TO ACI 318.
   A. COLUMNS, WALLS AND FOUNDATIONS:
      PROVIDE MEMBRANE CURING COMPOUND. APPLY CURING COMPOUND IMMEDIATELY UPON THE REMOVAL OF FORMS OR THE COMPLETION OF FINISHING WORK.
   B. ALL SLABS AND CAST-IN-PLACE FINISHED CONCRETE:
      PROVIDE MEMBRANE CURING COMPOUND. APPLY CURING COMPOUND IMMEDIATELY UPON THE COMPLETION OF FINISHING WORK. ONCE THE CONCRETE IS SET ENOUGH TO WALK ON WITHOUT HARMING THE FINISH, APPLY A SECOND HEAVY COAT OF CURING COMPOUND USING A HIGH PRESSURE AIRLESS SPRAYER.

   * ALL CURING COMPOUND SHALL HAVE A FUGITIVE DIE. ALL CURING COMPOUND SHALL MEET THE MOISTURE RETENTION REQUIREMENTS OF ASTM C-309, TYPE 1-D AT COVERAGE RATE SPECIFIED, AND PASS VOC REQUIREMENTS. ALL CURING COMPOUNDS SHALL BE COMPATIBLE WITH FUTURE TOPPINGS, PAINT, WATERPROOFING AND FINISHES. CLEAN ALL NOZZLES AFTER EACH USE.

14. DO NOT CAST CONCRETE IN LENGTHS OVER 40'-0".

15. LOCATION OF ALL CONSTRUCTION JOINTS SHALL BE AS SHOWN ON THE DRAWINGS OR APPROVED BY THE ENGINEER. PLACE JOINTS IN SLABS ON GRADE AT 20'-0" MAXIMUM. PLACE SLABS AND BEAMS, INCLUDING UPSET BEAMS, AT THE SAME TIME.

16. WAIT 24 HOURS BETWEEN ADJACENT CONCRETE CASTINGS.

17. CONSTRUCTION JOINTS SHALL BE THOROUGHLY CLEANED FOR BOND. PROVIDE WATERSTOPS AT ALL CONSTRUCTION JOINTS IN WATERBEARING SLABS AND WALLS, EXCEPT THAT WATERSTOPS ARE NOT REQUIRED IN WALLS AND SLABS WHEN THERE IS WATER ON BOTH SIDES, U.N.O.

18. ALL CONCRETE REPAIRS SHALL BE CONSIDERED STRUCTURAL. SEE STRUCTURAL CONCRETE REPAIR SECTION FOR MORE INFORMATION.

WATERSTOPS AT CONSTRUCTION JOINTS:

1. PROVIDE WATERSTOPS WHERE SHOWN ON DRAWINGS AND AT ALL CONSTRUCTION JOINTS IN PARTIALLY AND FULLY UNDERGROUND STRUCTURES.

2. SEE TYPICAL DETAILS FOR CONSTRUCTION JOINTS IN NEW CONSTRUCTION AND BETWEEN EXISTING AND NEW CONSTRUCTION.

STRUCTURAL CONCRETE REPAIRS:

1. THE FOLLOWING NOTES ON STRUCTURAL CONCRETE REPAIRS ARE GENERAL AND APPLY TO THE ENTIRE PROJECT. HOWEVER, ALL REPAIRS TO STRUCTURAL CONCRETE SHOULD BE BROUGHT TO THE ATTENTION OF THE STRUCTURAL ENGINEER ON A CASE BY CASE BASIS BEFORE PROCEEDING WITH THE INTENDED REPAIR. PATCHING WITH SITE MIXED PORTLAND CEMENT, SAND AND WATER IS NOT CONSIDERED AN ACCEPTABLE STRUCTURAL REPAIR.

2. SURFACE DEFECTS THAT REQUIRE REPAIR INCLUDE CRACKS IN EXCESS OF 0.01" WIDE, CRACKS OF ANY WIDTH AND OTHER SURFACE DEFICIENCIES WHICH PENETRATE TO THE REINFORCEMENT OR COMPLETELY THROUGH NON-REINFORCED SECTIONS, HONEYCOMB, ROCK POCKETS, VOIDS, HOLES LEFT BY TIE RODS AND BOLTS, AND SPALLS EXCEPT MINOR BREAKAGE AT CORNERS.

3. CRACKS WHICH REQUIRE REPAIR SHALL BE PRESSURE GROUTED USING ONE OF THE FOLLOWING. APPLY IN ACCORDANCE WITH THE MANUFACTURER'S DIRECTIONS AND RECOMMENDATIONS.
   A. SIKADUR 31, HI-MOD-GEL AND SIKADUR 35, HI-MOD L.V. MANUFACTURED BY SIKA CORPORATION.
   B. SCB CONCRESIVE 1380 MANUFACTURED BY MASTER BUILDERS TECHNOLOGIES.
   C. OR APPROVED EQUAL.

4. OUTLINE HONEYCOMB, ROCK POCKETS, VOIDS OVER 1/2" DIAMETER, AND SPALLS WITH 3/4" DEEP SAW CUT MINIMUM (DO NOT CUT REINFORCING STEEL, SCAN/X-RAY AS REQUIRED) AND REMOVE SUCH CONCRETE DOWN TO SOUND CONCRETE. MAKE EDGES OF CUTS PERPENDICULAR TO THE CONCRETE SURFACE. EDGES SHOULD BE "SQUARED UP". WHEN CHIPPING IS NECESSARY, LEAVE CHIPPED EDGES PERPENDICULAR TO THE SURFACE OR SLIGHTLY UNDERCUT. DO NOT FEATHER EDGES. THOROUGHLY CLEAN AND DAMPEN THE SURFACE WITH WATER (PRESOAK 24 HOURS TO A SATURATED SURFACE DRY CONDITION). VIGOROUSLY WORK A SCRUB COAT INTO THE AREA TO BE PATCHED WITH A CLEAN, WET, STIFF BROOM OR BRUSH IMMEDIATELY AHEAD OF MORTAR PLACEMENT (SCRUB COAT SHALL CONSIST OF A SMALL AMOUNT OF EACH BATCH MIXED TO A SLIGHTLY WETTER CONSISTENCY). DO NOT APPLY MORE SCRUB COAT THAN CAN BE COVERED WITH MORTAR BEFORE THE SCRUB COAT DRIES OUT. PATCH REMOVED AREA USING ONE OF THE FOLLOWING. APPLY IN ACCORDANCE WITH THE MANUFACTURER'S DIRECTIONS AND RECOMMENDATIONS.
   A. SIKATOP 122 PLUS AS MANUFACTURED BY SIKA CORPORATION.
   B. EMACO S88 CI AS MANUFACTURED BY MASTER BUILDERS TECHNOLOGIES.
   C. OR APPROVED EQUAL.

5. IF THE EXPOSED REINFORCING STEEL IN A PATCH HAS CORRODED IT SHOULD BE CLEANED USING A SANDBLASTER/WATERBLASTER IN ACCORDANCE WITH THE COMMERCIAL BLAST CLEAN STANDARDS. IN CASES WHERE THE REBAR HAS LOST MORE THAN 25% OF ITS ORIGINAL CROSS SECTION, A NEW REBAR PIECE SHOULD BE SPLICED TO THE OLD IN ACCORDANCE WITH ACI 318-95. SIGNIFICANT DAMAGE TO REINFORCEMENT SHOULD BE REVIEWED BY THE STRUCTURAL ENGINEER BEFORE PATCHING.

6. FILL HOLES LEFT BY TIE RODS AND BOLTS BY MEANS OF A PLUNGER-TYPE GUN OR OTHER SUITABLE DEVICE FROM THE LEAST EXPOSED FACE, USING A FLUSH STOP HELD AT THE EXPOSED FACE TO ENSURE COMPLETE FILLING. USE THE SAME PRODUCTS LISTED TO FILL ROCK POCKETS AND VOIDS. APPLY IN ACCORDANCE WITH THE MANUFACTURER'S DIRECTIONS AND RECOMMENDATIONS.

7. FOR VERTICAL AND OVERHEAD PATCHES PROVIDE DRILLED-IN 1/8" DIA. STAINLESS STEEL HEADED PINS AT 6" O.C. EACH WAY WITH 12 GAGE STAINLESS STEEL WIRE BETWEEN THE PINS.

8. ALL PATCHES TO CONCRETE SHALL BE CONSIDERED STRUCTURAL REPAIRS. PATCHING WITH SITE MIXED PORTLAND CEMENT, SAND AND WATER IS NOT CONSIDERED AN ACCEPTABLE STRUCTURAL REPAIR. ALL PATCHING OF COLORED CONCRETE SHALL MEET ARCHITECTURAL APPROVAL.

9. THE STRUCTURAL ENGINEER SHALL PERFORM AN INSPECTION AFTER EACH OF THE FOLLOWING STAGES:
   A. SAW CUTTING EDGE OF PATCH.
   B. CHIPPING OF EDGES.
   C. DURING PRESOAKING OF SURFACE.
   D. AFTER PRESOAK AND DURING SCRUB COAT APPLICATION.
   E. DURING PLACEMENT OF THE PATCH.

REINFORCING STEEL:

1. ALL REINFORCING STEEL SHALL CONFORM TO ASTM A 615, GRADE 60. ALL REINFORCING BARS SHALL BE DEFORMED.

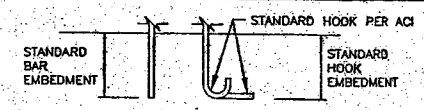
2. REFER TO MASONRY NOTES FOR FURTHER INFORMATION REGARDING REINFORCING STEEL IN MASONRY ELEMENTS.

3. CONCRETE COVERAGE FOR REINFORCING BARS (TO FACE OF BAR INCLUDING STIRRUPS, TIES AND SPIRALS) UNLESS NOTED OTHERWISE:
   CONCRETE CAST AGAINST AND PERMANENTLY EXPOSED TO EARTH ---------- 3"
   CONCRETE EXPOSED TO EARTH, WEATHER OR WATER ---------- 2"

4. SEE REINFORCEMENT LAP SPLICE AND EMBEDMENT LENGTH SCHEDULE FOR LAP SPLICE LENGTHS IN CONCRETE WHERE LAP LENGTHS ARE NOT SPECIFICALLY DESIGNATED ON THE STRUCTURAL PLANS.
   A. PROVIDE CLASS B SPLICES TYPICAL, UNLESS NOTED OTHERWISE.
   B. SPLICE REINFORCING ONLY AT APPROVED LOCATIONS. SPLICE BOTTOM BARS OVER SUPPORTS AND TOP BARS AT MID-SPAN ONLY, UNLESS NOTED OTHERWISE.
   C. TOP BARS ARE ALL HORIZONTAL BARS PLACED 58 12" OF CONCRETE IS CAST IN THE MEMBER BELOW THE BARS.

REINFORCEMENT LAP SPLICE AND EMBEDMENT LENGTH ($f'c \geq 4000$ PSI)

BAR SIZE NO.	BAR SPACING	MIN. LAP LENGTH (IN.) TOP BARS CLASS B	MIN. LAP LENGTH (IN.) OTHER BARS CLASS B	MIN. EMBEDMENT LGTH. (IN) STRAIGHT BARS TOP BARS	MIN. EMBEDMENT LGTH. (IN) STRAIGHT BARS OTHER BARS	MIN. EMBEDMENT LGTH. (IN) WITH STD. HOOK
REQUIREMENTS FOR SLABS & WALLS**						
#3	≥ 3db	24	19	19	15	7
#4		32	25	25	19	10
#5		40	31	31	24	12
#6		48	37	37	29	15
#7		70	54	54	42	17
#8		80	62	62	48	19
#9		91	70	70	54	22
#10		102	79	79	61	24
#11		113	87	87	67	27
REQUIREMENTS FOR BEAMS AND COLUMNS						
#3 THRU #7	≥ 2db	SAME AS SLABS AND WALLS ABOVE				
#8	2 dB OR LESS	121	93	93	71	19
#9		136	105	105	81	22
#10		153	118	118	91	24
#11		170	131	131	101	27



** FOR BAR CLEAR SPACING LESS THAN 3 BAR DIAMETER, ADD 50%

5. REINFORCING SPACING IS MAXIMUM ON CENTER. ALL REINFORCING IS TO BE CONTINUOUS UNLESS OTHERWISE NOTED.

6. ALL WALL REINFORCEMENT AT CORNERS OR JUNCTIONS OF WALLS SHALL BE CONTINUOUS, LAPPED OR TERMINATED IN A 90 DEGREE HOOK. ALL BARS SHALL BE DOWELED, UNLESS SHOWN OTHERWISE. ALL DOWELS SHALL BE SAME SIZE AND SPACING AS THE REINFORCEMENT TO BE SPLICED, UNLESS SHOWN OTHERWISE. CONFORM TO ACI DETAILING MANUAL SP-66. ALL RADIAL BARS SHALL HAVE STAGGERED SPLICES WITH NO MORE THAN 1/3 OF THE REINFORCING SPLICED AT ANY LOCATION.

7. DOWEL ALL VERTICAL REINFORCING TO FOUNDATIONS, UNLESS OTHERWISE NOTED ON DRAWINGS.

8. SECURELY TIE ALL REINFORCING AND EMBEDDED ITEMS IN POSITION BEFORE PLACING CONCRETE OR GROUT. DO NOT STAB OR SHOVE INTO FRESHLY PLACED CONCRETE.

9. SUBMIT PLACING DRAWINGS PER ACI DETAILING MANUAL, ACI SP-66. FABRICATE REINFORCING STEEL AFTER ENGINEER'S INCLUDE ELEVATIONS SHOWING REINFORCING AT ALL CONCRETE AND MASONRY WALLS, AND AT ALL FOUNDATIONS.

10. DO NOT WELD REINFORCING STEEL.

11. MECHANICAL BUTT SPLICES, FORM SAVERS, AND COUPLERS SHALL EXCEED THE REQUIREMENTS FOR BOTH TENSION AND COMPRESSION SPECIFIED BY ACI 318-95 AND THE UNIFORM BUILDING CODE. ALL CONNECTORS SHALL HAVE AN ICBO REPORT. TENSION SPLICE CAPACITY MUST EXCEED 125% Fy. INSTALL PER ICBO REPORT. SPECIAL INSPECTION WILL INCLUDE RANDOM TORQUEING OF COUPLERS BEFORE AND AFTER INSTALLATION IN FORMS. IF ANY COUPLER DOES NOT PASS THE TORQUE TEST ALL COUPLERS WILL BE TORQUED BY AN INDEPENDENT TESTING LAB AT THE CONTRACTORS EXPENSE.

12. TOLERANCES FOR FABRICATION, PLACEMENT, AND LAP SPLICES FOR REINFORCEMENT SHALL CONFORM TO SECTION 2 OF ACI 117.

13. REINFORCING BARS AND ACCESSORIES SHALL NOT BE IN CONTACT WITH ANY PIPE, PIPE FLANGE OR METAL PARTS EMBEDDED IN CONCRETE. A MINIMUM OF 1-1/2 INCHES CLEARANCE SHALL BE PROVIDED AT ALL TIMES U.N.O.

STRUCTURAL STEEL:

1. STEEL CONSTRUCTION SHALL CONFORM TO THE SPECIFICATIONS AND STANDARDS AS CONTAINED IN THE LATEST EDITION OF THE AISC STEEL CONSTRUCTION MANUAL, INCLUDING THE COMMENTARY AND SUPPLEMENTS THERETO, AS ISSUED.

2. MATERIALS SHALL CONFORM WITH THE FOLLOWING STANDARDS:
   W-SHAPES ---------- ASTM A992, FY = 50 KSI
   OTHER ROLLED SECTIONS (ANGLES, CHANNELS, PLATES, ETC.) UNLESS NOTED OTHERWISE ---------- ASTM A36, FY = 36 KSI
   STRUCTURAL PIPES ---------- ASTM A53, GR.B, FY = 35 KSI
   STRUCTURAL TUBES ---------- ASTM A500, GR.B, FY = 46 KSI
   STRUCTURAL BOLTS ---------- ASTM A325
   ANCHOR BOLTS ---------- ASTM A307 OR ASTM A36
   WELDING RODS ---------- E-70 SERIES LOW HYDROGEN

3. ALL WELDING SHALL CONFORM TO AWS D1.1.

4. ALL WELDERS SHALL HOLD VALID CERTIFICATES ISSUED BY AN ACCEPTED TESTING AGENCY WITHIN THE LAST 12 MONTHS. IF ANY CERTIFICATE IS MORE THAN 12 MONTHS OLD SUBMIT DETAILS OF COMPANY QUALITY CONTROL PROGRAM.

5. ALL WELDERS SHALL SUBMIT PREQUALIFIED WELDING AND WELDING PROCEDURES TO BE AVAILABLE ON PREMISES FOR REVIEW.

6. SUBMIT SHOP DRAWINGS FOR ENGINEER'S REVIEW. FABRICATE ONLY FROM REVIEWED DRAWINGS.

7. WHEN LONG SLOTTED HOLES ARE SPECIFIED BY DETAILS AND/OR NOTES ON DRAWINGS, THE CONTRACTOR SHALL SUPPLY PLATE WASHERS AS REQUIRED BY AISC CODE.

8. MINIMUM EMBEDMENT OF BOLTS IN MASONRY OR GROUT SHALL BE 8" WITH A HEAD AT THE EMBEDDED END OR 5" WITH A 3" HOOK AT THE EMBEDDED END.

9. HEADED ANCHOR STUDS (HAS ON DRAWINGS) SHALL BE NELSON HEADED STUDS OR APPROVED EQUAL. STUDS SHALL BE AUTOMATICALLY END WELDED WITH SUITABLE NELSON STUD WELDING EQUIPMENT. ALL WELDS SHALL BE MADE IN ACCORDANCE WITH RECOMMENDATIONS OF THE NELSON STUD WELDING COMPANY, LORAIN, OHIO. STUDS SHALL BE OF DIAMETER, LENGTH AND SPACING PER THE DRAWINGS.

10. GRIND SMOOTH ALL EXPOSED WELDS AND CUT EDGES. FINAL APPROVAL IS BY THE ENGINEER.

11. WHERE MASONRY ENCOMPASSES STEEL BEAMS PROVIDE DOVETAIL ANCHORS AT 16 INCHES O/C.

STAINLESS STEEL:

1. STAINLESS STEEL SHEETS AND PLATES SHALL CONFORM TO ASTM A-167. STAINLESS STEEL SECTIONS SHALL CONFORM TO ASTM A276. STAINLESS STEEL SHALL BE TYPE 316, U.N.O. FASTENERS AND FITTINGS SHALL CONFORM TO ASTM A-320.

ALUMINUM:

1. ALUMINUM CONSTRUCTION SHALL CONFORM TO THE LATEST EDITION OF THE ALUMINUM CONSTRUCTION MANUAL OF THE ALUMINUM ASSOCIATION.

2. UNLESS OTHERWISE INDICATED, STRUCTURAL ALUMINUM SHALL BE ALLOY 6061-T6 OR ALLOY 6063-T6 CONFORMING TO ASTM B-221. CHECKERED PLATE SHALL CONFORM TO ASTM B-209.

3. WHERE ALUMINUM IS IN CONTACT WITH CONCRETE OR MASONRY SURFACES, CONTACT SURFACES SHALL BE COATED WITH HEAVY ALKALI-RESISTANT BITUMINOUS PAINT.

AZAW000447

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Paradise Valley Arsenic Removal Facility
STRUCTURAL
GENERAL NOTES I

ARIZONA AMERICAN WATER
PARADISE VALLEY DISTRICT

DAMON S. WILLIAMS ASSOCIATES, LLC
2355 E. CAMELBACK ROAD, SUITE 700
PHOENIX, AZ 85016

DSWA

DRAWN BY DE
PROJECT ENG'R BSH
APPROVED

DATE JUNE 2005
PROJECT 23020203

USE DIMENSIONS ONLY
SCALE AS SHOWN

OF JOIST BEING USED. FABRICATION AND ERECTION SHALL BE IN ACCORDANCE WITH THE LATEST EDITION OF THE STEEL JOIST INSTITUTE SPECIFICATION. IN LIEU OF THE ABOVE REQUIREMENTS, THE FABRICATOR MAY PROVIDE A CURRENT ICBO RESEARCH RECOMMENDATION APPROVING THE TYPE OF JOIST BEING USED. CONCENTRATED LOADS WHERE SHOWN ON THE DRAWINGS SHALL BE CONSIDERED BY THE FABRICATOR IN THE DESIGN OF THE JOISTS.

2. BRIDGING SHALL CONFORM TO THE SJI SPECIFICATIONS. WHERE BRIDGING INTERFERES WITH MECHANICAL OR OTHER INSTALLATIONS, DESCRIPTIONS OF SUCH CONDITIONS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW BY THE STRUCTURAL ENGINEER. DO NOT REMOVE ANY BRIDGING UNTIL AFTER THE DECK IS IN PLACE.

3. CONNECTIONS AND BEARING MATERIAL REQUIRED BY THE SJI SPECIFICATIONS BUT NOT SHOWN ON THE DRAWINGS SHALL BE DESIGNED AND FURNISHED BY THE FABRICATOR. THE FABRICATOR SHALL VERIFY THAT CONNECTIONS TO JOISTS AND JOIST GIRDERS SHOWN ON THE STRUCTURAL DRAWINGS ARE COMPATIBLE WITH THE PROPOSED CHORD SIZES.

4. PROVIDE SPECIAL JOIST END SHOES ON ALL JOISTS WITH LESS THAN 4" OF BEARING. PROVIDE CALCULATIONS FOR THESE SPECIAL JOIST BEARINGS. SLOPE JOIST END SHOES TO MATCH ROOF SLOPE.

5. USE CARE TO AVOID DAMAGE TO JOIST FLANGES IN ALL FIELD WELDING. EXCEPT FOR DECK WELDING, DO NOT FIELD WELD TO COLD ROLLED FLANGES THINNER THAN 12 GAGE.

6. SEE MECHANICAL DRAWINGS FOR MECHANICAL EQUIPMENT SUPPORT FRAMING. LOCATE CONNECTIONS TO JOISTS 4" MAXIMUM FROM A PANEL POINT, OR PROVIDE AN ADDITIONAL 2 X 2 X 1/4 WEB ANGLE FROM THE POINT OF CONNECTION TO A PANEL POINT AT THE OPPOSITE CHORD.

7. ALL JOISTS SHALL BE ERECTED IN A VERTICAL POSITION PER SJI SPECIFICATIONS.

8. SUBMIT SHOP DRAWINGS FOR THE ENGINEER'S REVIEW. FABRICATE ONLY FROM REVIEWED DRAWINGS.

9. DESIGN ALL OPEN WEB STEEL JOISTS FOR AN ADDITIONAL 2000 LB LOAD AT THE MID SPAN. THE LOAD SHALL BE APPLIED TO THE BOTTOM CHORD OF THE JOIST AND IS IN ADDITION TO ALL OTHER LOADS.

3" TYPE PLN/N METAL ROOF DECK:

1. STEEL DECK INSTITUTE SPECIFICATIONS AND RECOMMENDATIONS APPLY EXCEPT AS NOTED OTHERWISE. DECK SHALL BE PAINTED OR GALVANIZED MINIMUM 20 GAGE 3" DEEP, WITH MINIMUM S = 0.508 INCH CUBED PER FOOT WIDTH. MAXIMUM FLUTE WIDTH SHALL BE 2-1/2 INCHES. DECK SHALL BE CONTINUOUS OVER THREE SPANS, EXCEPT THAT SIMPLE SPANS ARE REQUIRED WHERE DECK WARPS TO MEET ROOF SLOPES. USE NEXT HEAVIER GAGE FOR SIMPLE OR TWO SPAN CONTINUOUS CONDITIONS. PROVIDE A MINIMUM YIELD STRESS OF 33,000 PSI. CONFORM TO ICBO REPORT NUMBER 2078.

2. SUSPENDED CEILING SYSTEMS MAY BE SUPPORTED FROM THE DECK FLUTES. HOWEVER, DO NOT SUSPEND PLASTER CEILINGS FROM DECK. ALL MECHANICAL, ELECTRICAL AND PLUMBING SHALL BE SUPPORTED FROM THE STEEL STRUCTURE.

3. MINIMUM ALLOWABLE DIAPHRAGM SHEAR PER ICBO REPORT SHALL BE 713 POUNDS PER FOOT. PROVIDE ALL NECESSARY DETAILS SUCH AS EDGE FORM, SPLICE PLATES, PROFILE PLATES, ETC. ERECTION ACCORDANCE WITH THE REPORT TO MEET THE SHEAR REQUIREMENTS SPECIFIED ABOVE, EXCEPT THAT IN NO CASE SHALL CONNECTION TO STEEL MEMBERS BE LESS THAN NOTED BELOW. PUDDLE WELD TO STEEL, USING 1/2" DIAMETER FUSION AREA, 3/4" TO 1" WELD DIMENSION AT TOPS AS FOLLOWS:
   - A. TO ALL TRANSVERSE SUPPORTS (JOISTS, BEAMS, ANGLES, PLATES, ETC.) FOUR WELDS PER SHEET. WELD EACH SIDE OF SEAM AND AT TWO INTERMEDIATE FLUTES.
   - B. TO ALL STEEL PARALLEL TO FLUTES 18" O/C.
   - C. TO EACH FLUTE AND AT 6" ON CENTERS AT OPENINGS EDGES.
   - D. STANDING SEAM SIDE LAPS 1-1/2" LONG TOP SEAM WELD OR SIDELAP CONNECTION WITH VERCO PUNCHLOK TOOL AT 12" o/c.

4. ALL SHEETS TO BE 24" WIDE. NARROWER CLOSURE STRIPS SHALL NOT BE LESS THAN 1'-0" WIDE AND SHALL BE WELDED TO ADJACENT FULL SHEET WITH 1" LONG SEAM WELDS AT 12" O/C.

5. SHOP DRAWINGS SHALL SHOW THE ERECTION PROCEDURE AND DETAILS, THE ICBO REPORT NUMBER AND DIAPHRAGM SHEAR FURNISHED AND SHALL BE SUBMITTED FOR REVIEW PRIOR TO FABRICATION.

MASONRY:

1. MASONRY STRENGTH:
   - A. HOLLOW CONCRETE MASONRY UNITS: GRADE N, MEDIUM WEIGHT WITH A COMPRESSIVE STRENGTH OF 1900 PSI ON THE NET AREA. CONFORM TO ASTM C-90.
   - B. GROUT: 2000 PSI, MINIMUM 28 DAY COMPRESSIVE STRENGTH. MECHANICALLY VIBRATE GROUT IMMEDIATELY AFTER POURING AND AGAIN AFTER 5 MINUTES. GROUT SHALL CONFORM TO ASTM C476 AND ACI-530. MIX GROUT FOR AT LEAST FIVE MINUTES AND UNTIL MIX HAS BEEN ATTAINED. GROUT SHALL HAVE SUFFICIENT WATER ADDED TO PRODUCE A CONSISTENCY FOR POURING WITHOUT SEGREGATION. USE GROUT WITHIN 1.5 HOURS OF ADDITION OF MIXING WATER (NO WATER SHALL BE ADDED AT CONSTRUCTION SITE).
   - C. MORTAR: CEMENT-LIME TYPE S, 1900 PSI MINIMUM 28 DAY COMPRESSIVE STRENGTH. CONFORM TO ACI-530.
   - D. A SET OF FIVE MASONRY PRISMS SHALL BE BUILT AND TESTED IN ACCORDANCE WITH THE ASTM AND ACI STANDARDS PRIOR TO THE START OF CONSTRUCTION, UNDER THE OBSERVATION OF THE ENGINEER OR SPECIAL INSPECTOR OR AN APPROVED AGENCY AND TESTED BY AN APPROVED AGENCY.
   - E. A MINIMUM OF ONE SET OF THREE PRISMS SHALL BE CONSTRUCTED FOR EACH 5,000 SQUARE FEET OF WALL. THE PRISM TEST SHALL BE CONDUCTED IN ACCORDANCE WITH ASTM STANDARDS.
   - F. COMPRESSIVE STRENGTH OF MASONRY $Fm' = 1500$ PSI.

2. LAY UNITS IN RUNNING BOND. CORNERS SHALL HAVE A STANDARD BOND BY OVER-LAPPING UNITS.

3. MAXIMUM GROUT LIFT WITHOUT CLEAN-OUTS AND INSPECTION SHALL BE 4'-0".

4. TIE VERTICAL REINFORCING AT EACH END OF BAR AND AT 4'-0" MAXIMUM VERTICAL SPACING USING SINGLE WIRE LOOP TYPE TIES AS MANUFACTURED BY A.A. WIRE PRODUCTS COMPANY OR APPROVED ALTERNATE.

5. SEE ARCHITECTURAL DRAWINGS FOR LOCATIONS OF EXPANSION AND CONTROL JOINTS IN WALLS. MASONRY CONTROL JOINTS SHALL BE SPACED AT 24'-0" ON CENTER. LOCATE CONTROL JOINTS NO MORE THAN 16'-0" FROM THE CORNER OF A WALL. CONTROL JOINTS SHALL BE LOCATED AT ALL VERTICAL INTERFACES OF MAJOR CHANGES IN WALL HEIGHT AND WALL THICKNESS.

OPENING.

7. GROUT SOLID ALL WALLS IN CONTACT WITH EARTH, RETAINING WALLS, STEM WALLS AND AS NOTED ON DRAWINGS.

8. PRIOR TO GROUTING, THE GROUT SPACE SHALL BE CLEAN. SPACES TO BE FILLED WITH GROUT SHALL NOT CONTAIN MORTAR PROJECTIONS GREATER THAN 1/2 INCH, MORTAR DROPPINGS OR OTHER FOREIGN MATERIAL. ALL SPACES DESIGNATED TO BE GROUTED SHALL BE FILLED WITH GROUT AND THE GROUT SHALL BE CONFINED TO THOSE SPECIFIC SPACES. REMOVE ALL DEBRIS FROM BOTTOM OF MASONRY CELLS PRIOR TO GROUTING.

9. GROUT MATERIALS AND WATER CONTENT SHALL BE CONTROLLED TO PROVIDE ADEQUATE FLUIDITY FOR PLACEMENT, WITHOUT SEGREGATION OF THE CONSTITUENTS, AND SHALL BE MIXED THOROUGHLY.

10. THE GROUTING OF ANY SECTION OF WALL SHALL BE COMPLETED IN ONE DAY WITH NO INTERRUPTIONS GREATER THAN ONE HOUR.

11. BETWEEN GROUT POURS, A HORIZONTAL CONSTRUCTION JOINT SHALL BE FORMED BY STOPPING ALL WYTHES AT THE SAME ELEVATION AND WITH THE GROUT STOPPING A MINIMUM OF 1 1/2 INCHES BELOW A MORTAR JOINT, EXCEPT AT THE TOP OF THE WALL. WHERE BOND BEAMS OCCUR, THE GROUT POUR SHALL BE STOPPED A MINIMUM OF 1/2 INCH BELOW THE TOP OF THE MASONRY.

12. ALL CELLS AND SPACES CONTAINING REINFORCEMENT, ANCHOR BOLTS, OR HEADED ANCHOR STUDS (HAS) SHALL BE FILLED WITH GROUT. ALL EMBEDS SHALL BE TIED OR FIXED IN PLACE PRIOR TO GROUTING.

13. GROUT SHALL BE CONSOLIDATED BY MECHANICAL VIBRATION DURING PLACEMENT BEFORE LOSS OF PLASTICITY IN A MANNER TO FILL THE GROUT SPACE. GROUT POURS GREATER THAN 12 INCHES IN HEIGHT WILL BE RECONSOLIDATED BY MECHANICAL VIBRATION TO MINIMIZE VOIDS. GROUT POURS 12 INCHES OR LESS IN HEIGHT SHALL BE MECHANICALLY VIBRATED OR PUDDLED AND RODDED WITH SMOOTH BAR.

14. MINIMUM VERTICAL REINFORCING:
   PROVIDE CONTINUOUS FULL HEIGHT VERTICAL REINFORCING IN CENTER OF GROUTED VERTICAL CELLS AS SPECIFIED ON PLANS (48" O/C MINIMUM) AND AS FOLLOWS: 1 VERTICAL EACH SIDE OF EXPANSION JOINTS AND CONTROL JOINTS, 3 VERTICALS (1 PER CELL) AT CORNERS, INTERSECTIONS, WALL ENDS AND JAMBS, UNLESS OTHERWISE NOTED ON PLANS.

15. MINIMUM HORIZONTAL REINFORCING:
   - A. PROVIDE 2 #5 BARS AT MID HEIGHT BETWEEN FLOOR AND ROOF LINES AND AT ALL ROOF LINES AND 1 #5 AT TOP OF ALL PARAPETS IN CONTINUOUS GROUTED BOND BEAMS. EXTEND REINFORCING THROUGH EXPANSION AND CONTROL JOINTS, WRAPPING BARS WITH 1/8" THICK BOND BREAKING TAPE 2'-0" BOTH SIDES OF JOINT. DO NOT SPLICE BOND BEAM REINFORCING WITHIN 6'-0" OF AN EXPANSION OR CONTROL JOINT. PROVIDE BOND BEAM TYPE BLOCK FOR ALL HORIZONTAL REINFORCING.
   - B. PROVIDE LADDER TYPE #9 JOINT REINFORCING AT 16" VERTICAL SPACING IN WALLS (LAP LADDER JOINT REINF. 12" MINIMUM). DO NOT USE TRUSS TYPE JOINT REINFORCING.
   - C. AT PITCHED OR SLOPPING ROOF LINES, BOND BEAM SHALL BE STEPPED OR SLOPED TO MATCH THE WALL/ DIAPHRAGM JUNCTION.
   - D. 1 #5 BAR ABOVE AND BELOW ALL OPENINGS WITH ENDS EXTENDING 24" PAST THE OPENING.

16. SPLICES:
   - A. LAP REINFORCING BARS 48 BAR DIAMETERS AT SPLICES (#5 = 40" LAP).
   - B. LAP JOINT REINFORCING 12" MINIMUM AT SPLICES. SPLICES SHALL CONTAIN AT LEAST ONE CROSS WIRE OF EACH PIECE OF REINFORCEMENT IN THE LAPPED DISTANCE.

17. PROVIDE CONTINUOUS LATH GROUT BARRIERS BELOW BOND BEAMS.

18. ALL REINFORCING TO BE CLEAR OF MASONRY FACE SHELLS AND OTHER REINFORCING NOT SPLICED. 1/4" FOR FINE GROUT AND 1/2" FOR COARSE GROUT.

19. WHERE MASONRY ENCOMPASSES STEEL BEAMS PROVIDE DOVETAIL ANCHORS AT 16 INCHES O/C.

20. PROVIDE LINTEL TYPE BLOCKS AT THE BOTTOM OF ALL LINTELS. PROVIDE DOUBLE OPEN END HALF WEB HEIGHT BLOCK FOR REMAINDER OF LINTEL DEPTH. PLACE ALL BLOCKS OF LINTEL IN RUNNING BOND THROUGHOUT SPAN AND AT JAMBS.

21. ALL HOLES SHALL BE DRILLED. HOLES MADE BY CHIPPING WILL NOT BE ACCEPTED.

22. CONCRETE MASONRY UNITS SHALL NOT BE WETTED UNLESS OTHERWISE APPROVED.

23. MASONRY SHOP DRAWINGS SHALL INCLUDE THE FOLLOWING ITEMS:
   - A. COMPLETE LAYOUT OF ALL MASONRY WALLS SHOWING MODULAR PLANNING AND ALL SPECIAL SHAPES TO BE USED IN THE WORK. SHOW ALL DETAILS FOR EACH CONDITION ENCOUNTERED IN THE WORK. PROVIDE PLANS AND ELEVATIONS DRAWN AT 1/4-INCH SCALE AND DETAILS DRAWN AT 1-1/2-INCH SCALE. SHOW ALL ITEMS REQUIRED TO BE BUILT INTO UNIT MASONRY CONSTRUCTION WORK.
   - B. MASONRY CONTROL JOINT LOCATIONS AND DETAILS.
   - C. SHOW DRAWINGS SHOWING THE LOCATION, EXTENT AND ACCURATE CONFIGURATION AND PROFILE OF ALL ITEMS SHOWN, SPECIFIED AND REQUIRED BY THIS AND OTHER SECTIONS TO BE BUILT INTO THE UNIT MASONRY CONSTRUCTION WORK.
   - D. SHOP DRAWINGS FOR FABRICATION, BENDING AND PLACEMENT OF REINFORCING BARS. SHOW BAR SCHEDULES, DIAGRAMS OF BENT BARS, STIRRUP SPACING, LATERAL TIES AND OTHER ARRANGEMENTS AND ASSEMBLIES AS REQUIRED FOR FABRICATION AND PLACEMENT OF REINFORCING FOR UNIT MASONRY CONSTRUCTION WORK.

DEFERRED SUBMITTAL OF PREFABRICATED COMPONENTS:

1. THE CONTRACTOR SHALL INCLUDE IN HIS BID ALL TIME AND EFFORT REQUIRED TO OBTAIN A BUILDING DEPARTMENT REVIEW/PERMIT FOR THE FOLLOWING FACTORY FABRICATED STRUCTURAL COMPONENTS:
   - WOOD TRUSSES
   - OPEN WEB STEEL JOISTS
   - CANOPIES

2. IN ALL CASES THE COMPONENTS MUST BE DESIGNED AND MANUFACTURED BY AN APPROVED FABRICATOR. SUBMITTALS TO THE BUILDING DEPARTMENT SHALL PROCEED AFTER REVIEW BY THE GENERAL CONTRACTOR, THE ARCHITECT, AND THE STRUCTURAL ENGINEER. THE SUBMITTAL SHALL INCLUDE KEY PLAN, SECTIONS AND DETAILS SHOWING THE REQUIRED DETAILS FOR CONSTRUCTION.

SHOP DRAWINGS:

1. THE STRUCTURAL DRAWINGS ARE THE PROPERTY OF NABAR STANLEY BROWN, INC. AND SHALL NOT BE REPRODUCED AS SHOP DRAWINGS UNDER ANY CIRCUMSTANCE. ALL ELEMENTS REQUIRED TO BE SHOWN IN THE SHOP DRAWINGS SHALL BE REDRAWN BY THE PARTY PREPARING THE SHOP DRAWINGS. NABAR STANLEY BROWN, INC. WILL REJECT ANY SHOP DRAWINGS MERELY COPIED FROM THE STRUCTURAL DRAWINGS.

2. THE STRUCTURAL SHOP DRAWINGS WILL BE RETURNED FOR RESUBMITTAL IF A CURSORY REVIEW SHOWS MAJOR ERRORS WHICH SHOULD HAVE BEEN FOUND BY THE CONTRACTOR'S CHECKING. NABAR STANLEY BROWN, INC. SHALL RETURN WITHOUT COMMENT MATERIAL NOT CALLED FOR OR WHICH HAS NOT BEEN APPROVED BY THE CONTRACTOR AND BEAR HIS STAMP.

3. CONCRETE MIX DESIGNS: SUBMITTALS SHALL BE PREPARED OR CERTIFIED TO CONFORM TO ACI CODE BY AN INDEPENDENT TESTING LABORATORY PRIOR TO SUBMITTING TO ENGINEER. EACH SEPARATE MIX DESIGN SHALL BE INCLUDED WITH A COVER LETTER INDICATING ALL LOCATIONS ON THE PROJECT WHERE THE MIX WILL BE USED.

4. ANY RESUBMITTAL OF ANY DETAIL SHEET WITH ADDED INFORMATION SHALL BE ACCOMPANIED BY LOCATION PLAN IDENTIFYING THE MEMBERS INVOLVED AND CLOUDING AROUND ADDED INFORMATION.

5. ANY ENGINEERING SUBMITTED FOR REVIEW SHALL BE APPROPRIATELY SEALED. FULL RESPONSIBILITY OF SUCH ENGINEERING RESTS WITH THE PERSON SEALING THE DESIGN.

6. SEE EACH PREVIOUS SECTION OF THE GENERAL STRUCTURAL NOTES FOR ADDITIONAL REQUIREMENTS THAT SHALL BE INCLUDED ON EACH TRADE'S SHOP DRAWINGS.

STRUCTURAL INSPECTION:

1. THE OWNER OR THE ENGINEER OR ARCHITECT OF RECORD ACTING AS THE OWNER'S AGENT SHALL EMPLOY ONE OR MORE SPECIAL STRUCTURAL INSPECTORS IN ACCORDANCE THE BUILDING CODE.

2. THE CONTRACTOR SHALL INSPECT ALL STRUCTURAL WORK FOR CONFORMANCE WITH THE CONTRACT DOCUMENTS. ANY STRUCTURAL INSPECTION PROVIDED BY OTHERS DOES NOT RELIEVE HIM OF HIS RESPONSIBILITY. ANY STRUCTURAL DEVIATIONS FROM THE CONTRACT DOCUMENTS FOUND AT A LATER DATE AND DECLARED TO BE SIGNIFICANT BY THE STRUCTURAL ENGINEER SHALL BE CORRECTED BY THE CONTRACTOR WITH ALL DISPATCH. THE STRUCTURAL INSPECTOR IS NOT AUTHORIZED TO DIRECT OR APPROVE ANY CHANGES FROM THE CONTRACT DOCUMENTS. IF THE CONTRACTOR WISHES TO QUESTION THE STRUCTURAL INSPECTOR'S INTERPRETATION OF THE CONTRACT DOCUMENTS, HE MAY DO SO DIRECTLY WITH THE ENGINEER.

3. THE STRUCTURAL INSPECTOR IS NOT AUTHORIZED TO STOP OR DELAY THE WORK. IF THE CONTRACTOR ELECTS TO CONTINUE WITH CERTAIN WORK AFTER NOTIFICATION OF UNACCEPTABILITY BY THE STRUCTURAL INSPECTOR, HE DOES SO AT HIS OWN RESPONSIBILITY AND RISKS CORRECTING THE WORK AT A LESS OPPORTUNE TIME.

4. THE STRUCTURAL INSPECTOR IS NOT INSPECTING FOR ANY OSHA COMPLIANCE OR FOR ANY TEMPORARY CONSTRUCTION, SUCH AS BRACING.

5. THE CONTRACTOR IS RESPONSIBLE FOR PROVIDING ADEQUATE FACILITIES FOR THE STRUCTURAL INSPECTOR TO INSPECT THE WORK SAFELY AND EFFICIENTLY.

6. A MINIMUM 24 HOUR NOTICE IS REQUIRED FOR INSPECTION.

7. WORK MUST BE COMPLETED AT TIME OF INSPECTION.

8. CONTRACTOR SHALL BEAR THE EXPENSE OF ANY ADDITIONAL INSPECTION DUE TO INCOMPLETE OR INCORRECT WORK.

9. THE FOLLOWING ITEMS REQUIRE SPECIAL STRUCTURAL INSPECTION IN ACCORDANCE WITH THE BUILDING CODE:
   - A. CONCRETE
   - B. BOLTS INSTALLED IN CONCRETE
   - C. REINFORCING STEEL
   - D. STRUCTURAL WELDING
   - E. STRUCTURAL MASONRY
   - F. ADHESIVE ANCHOR PREPARATION AND INSTALLATION
   - G. EARTH WORK (BY OTHERS)

AZAW000448

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21887 SATEESH NABAR 6/14/05 ARIZONA, U.S.A.

REVISIONS

Paradise Valley Arsenic Removal Facility
STRUCTURAL
GENERAL NOTES II

ARIZONA AMERICAN WATER
PARADISE VALLEY DISTRICT

DAMON S. WILLIAMS ASSOCIATES, LLC
2355 E. CAMELBACK ROAD, SUITE 700
PHOENIX, AZ 85016

DSWA

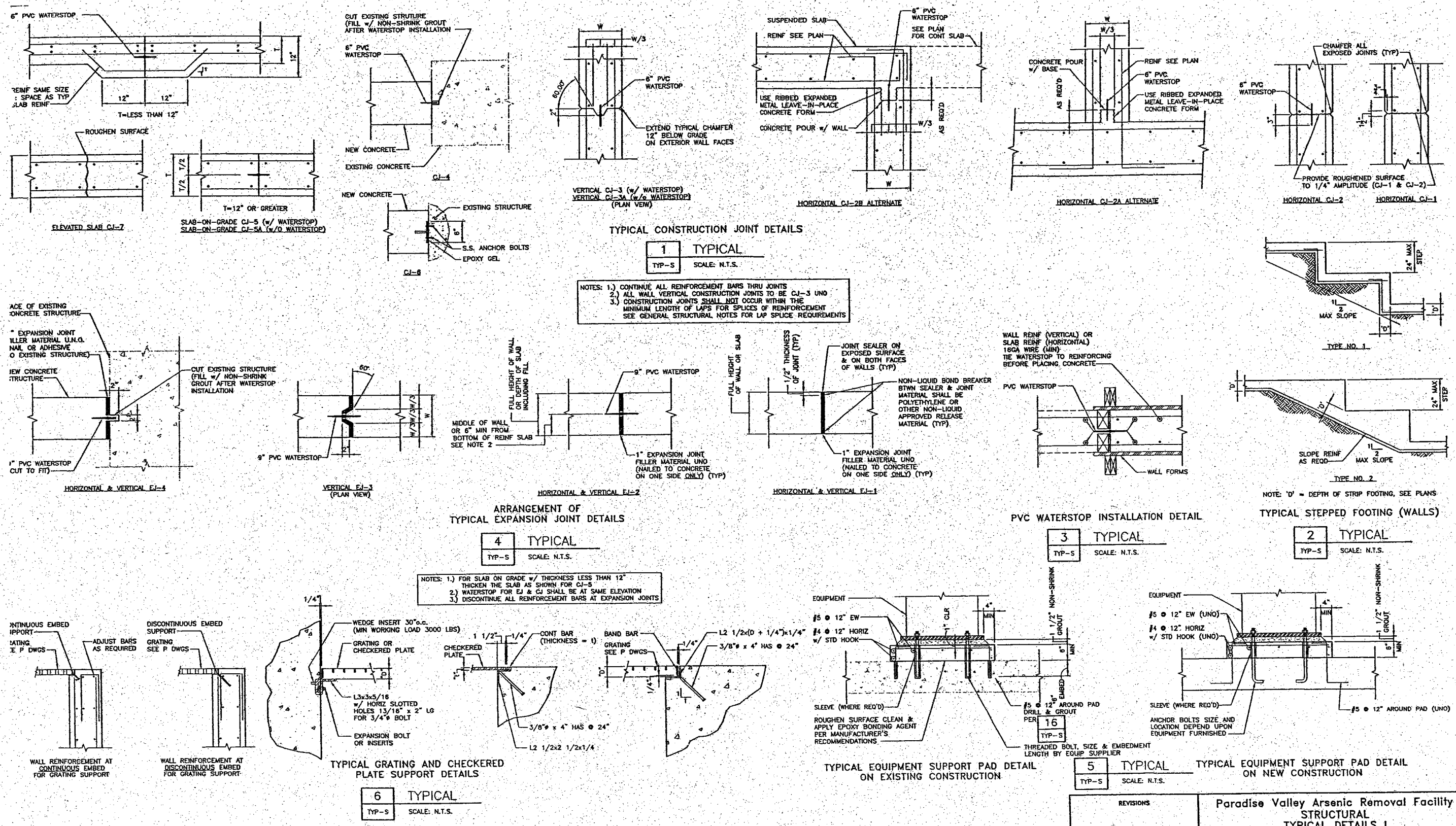
DRAWN BY DE
PROJECT ENG'R BSH
APPROVED

DATE JUNE 2005
PROJECT 23020203

USE DIMENSIONS ONLY
SCALE AS SHOWN

USE APPROVED DRAWINGS ONLY FOR CONSTRUCTION PURPOSES

2302-0001-S2



REVISIONS

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2150 East Highland Avenue, Suite #204
Phoenix, Arizona 85016-4721

21687 SATEESH NABAR

Paradise Valley Arsenic Removal Facility
STRUCTURAL
TYPICAL DETAILS I

ARIZONA AMERICAN WATER
PARADISE VALLEY DISTRICT

DAMON S. WILLIAMS ASSOCIATES, LLC
2355 E. CAMELBACK ROAD, SUITE 700
PHOENIX, AZ 85016

DSWA

DRAWN BY DE
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PROJECT 25020203

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SCALE AS SHOWN

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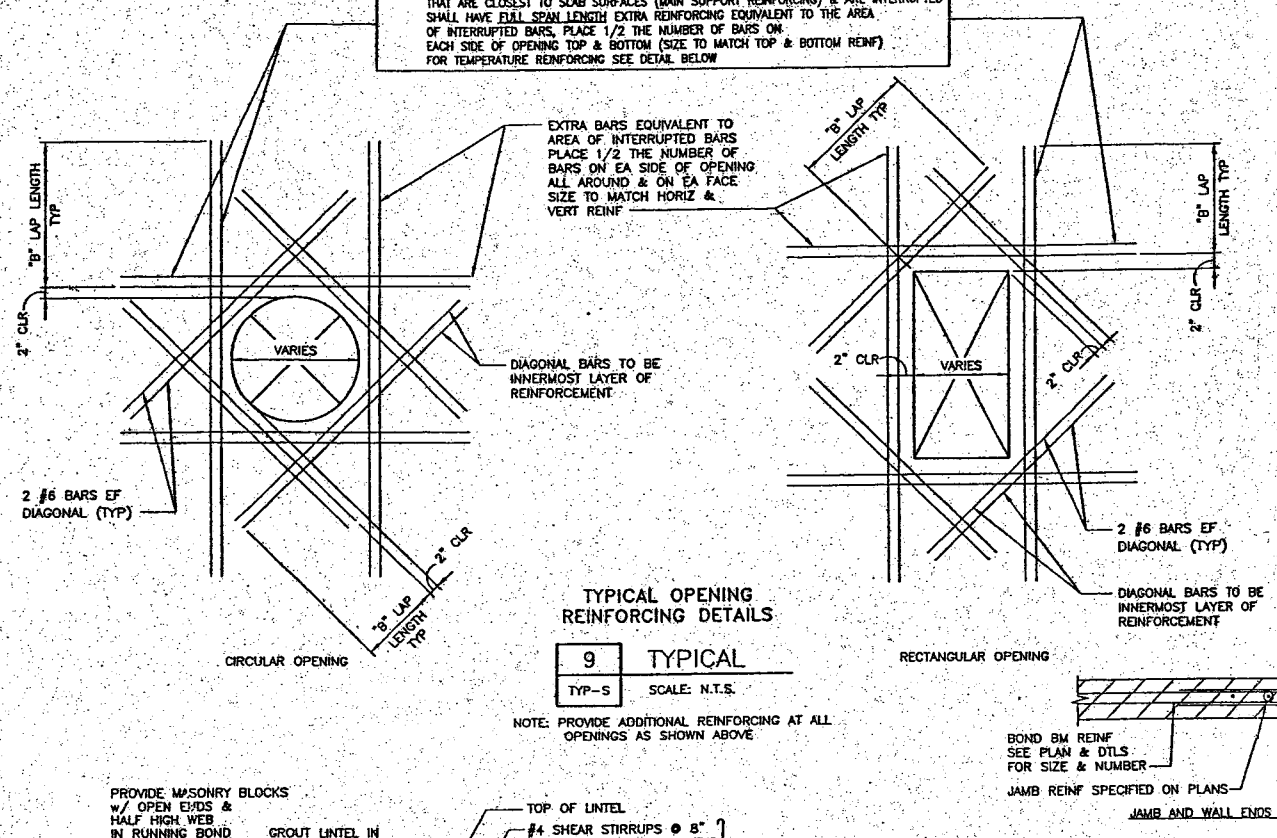
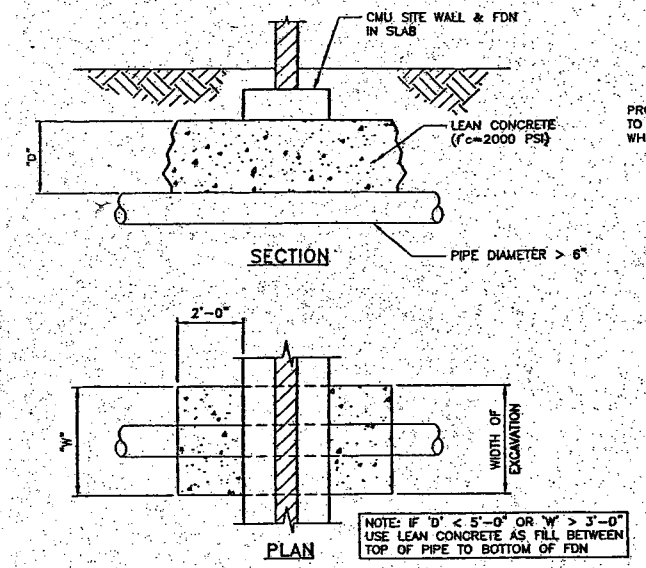
NOTE: REINFORCING BARS IN SLAB-ON-GRADE & SUSPENDED SLABS THAT ARE CLOSEST TO SLAB SURFACES (MAIN SUPPORT REINFORCING) & ARE INTERRUPTED SHALL HAVE FULL SPAN LENGTH EXTRA REINFORCING EQUIVALENT TO THE AREA OF INTERRUPTED BARS. PLACE 1/2 THE NUMBER OF BARS ON EACH SIDE OF OPENING TOP & BOTTOM (SIZE TO MATCH TOP & BOTTOM REINF) FOR TEMPERATURE REINFORCING SEE DETAIL BELOW



TYPICAL OPENING REINFORCING DETAILS

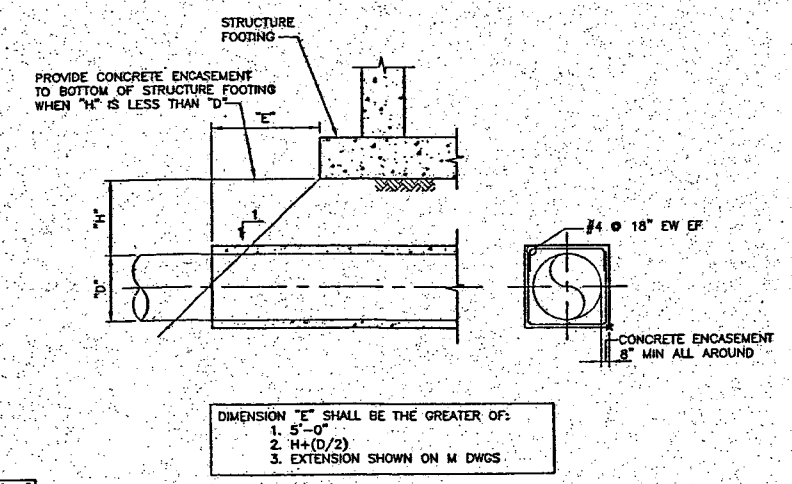
9	TYPICAL
TYP-S	SCALE: N.T.S.

NOTE: PROVIDE ADDITIONAL REINFORCING AT ALL OPENINGS AS SHOWN ABOVE



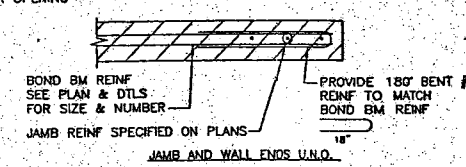
TYPICAL PIPE UNDER FOOTING

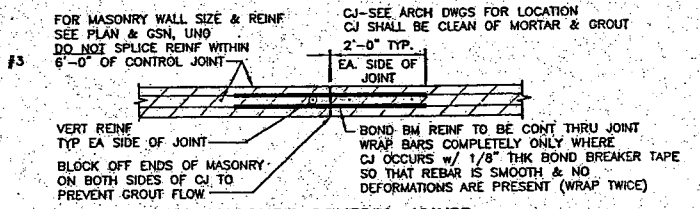
8	TYPICAL
TYP-S	SCALE: N.T.S.



CONCRETE PIPE ENCASEMENT UNDER STRUCTURES

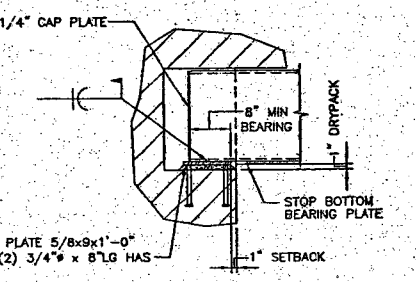
7	TYPICAL
TYP-S	SCALE: N.T.S.

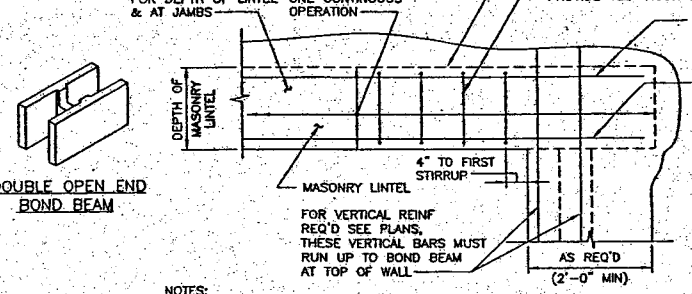




MASONRY CONTROL JOINTS (PLAN VIEW)

11	TYPICAL
TYP-S	SCALE: N.T.S.

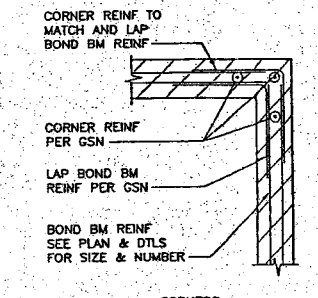




NOTES:
1.) SEE GENERAL STRUCTURAL NOTES FOR ADDITIONAL INFORMATION
2.) PROVIDE LINTEL TYPE BLOCKS AT BOTTOM COURSE OF LINTELS (TYP)
3.) NO VERTICAL JOINTS ARE ALLOWED WITHIN 2'-0" OF JAMB EDGE

MASONRY LINTELS

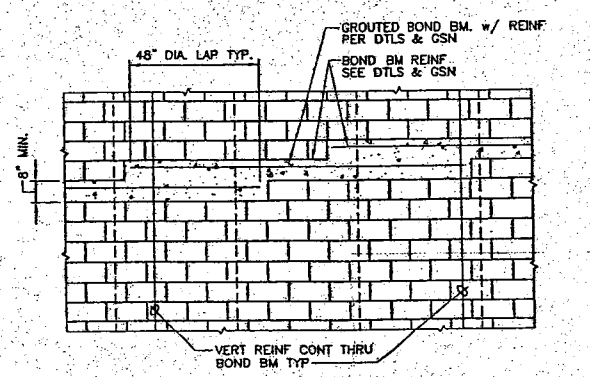
14	TYPICAL
TYP-S	SCALE: N.T.S.



CORNERS

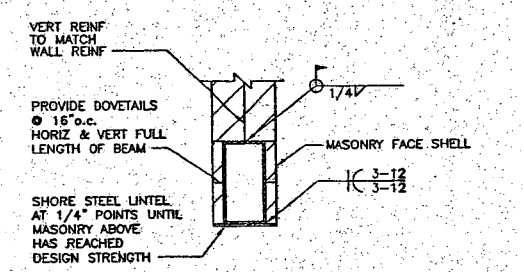
BOND BEAM REINFORCING (PLAN VIEW)

13	TYPICAL
TYP-S	SCALE: N.T.S.



STEPPED BOND BEAM

12	TYPICAL
TYP-S	SCALE: N.T.S.

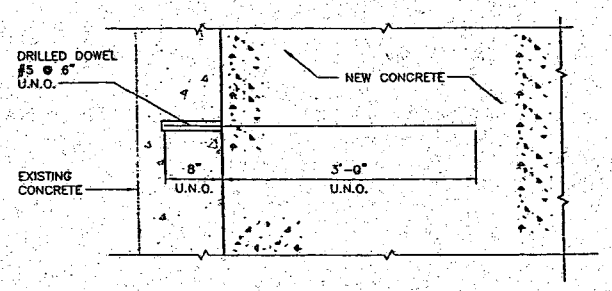


1. LOCATION OF ALL MECH OPENINGS NOT SHOWN ON STRUCT DRWGS IS SUBJECT TO APPROVAL OF THE STRUCTURAL ENGINEER THROUGH THE ARCHITECT.
2. ALL VERT REINF TO BE WELDED TO BE A706 REBAR

STEEL LINTEL SCHEDULE		
OPENING WIDTH	BEAM	BEARING EA END
10'-1" TO 18'-0"	TS 16x8x1/2 w/ 1/2" PLATE	12"

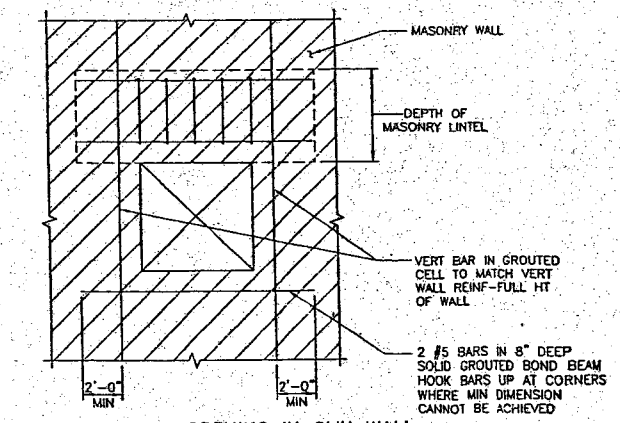
TYPICAL STEEL LINTELS AT CMU WALLS

10	TYPICAL
TYP-S	SCALE: N.T.S.



DRILLED DOWEL NOTES:
1. USE ROTARY PERCUSSION DRILL TO AVOID CUTTING EXISTING REINFORCING BARS. DO NOT USE CORE DRILL.
2. USE HOLE DIAMETER 1/4" LARGER THAN BAR DIAMETER.
3. THOROUGHLY CLEAN HOLE AND INSTALL DOWELS PER GROUT GROUT MANUFACTURER'S INSTRUCTIONS.
4. GROUT SHALL BE A TWO-COMPONENT GROUT RESIN SUITABLE FOR USE IN INSTALLING DOWELS, (USE HILTI HY-150 (ICBO #5193) OR APPROVED EQUAL)

DRILLED-IN-DOWEL



OPENING IN CMU WALL

REVISIONS

NSB Nabar Stanley Brown, Inc.
Consulting Structural Engineers

21887 SATEESH J. NABAR

Paradise Valley Arsenic Removal Facility
STRUCTURAL
TYPICAL DETAILS II

ARIZONA AMERICAN WATER
PARADISE VALLEY DISTRICT

DAMON S. WILLIAMS ASSOCIATES, LLC
2355 E. CAMELBACK ROAD, SUITE 700
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DSWA

DRAWN BY DE

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606-05 QS NO. 21-46 33-UP-2004 10B-DR-2004 8-HP-2005 30-HP-2005

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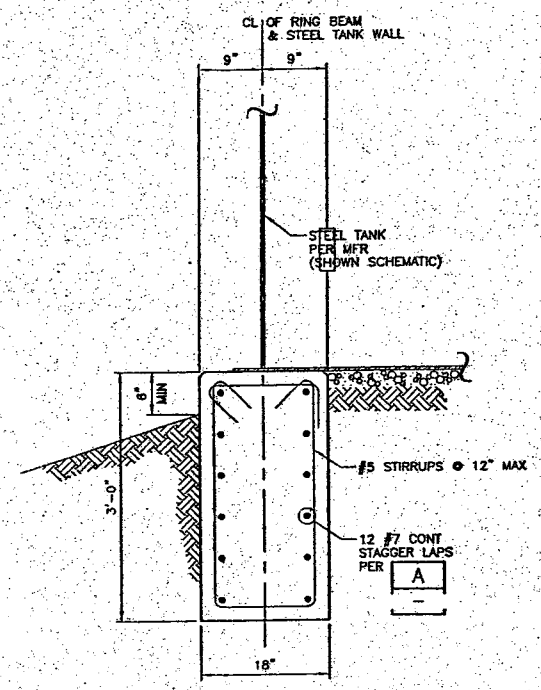
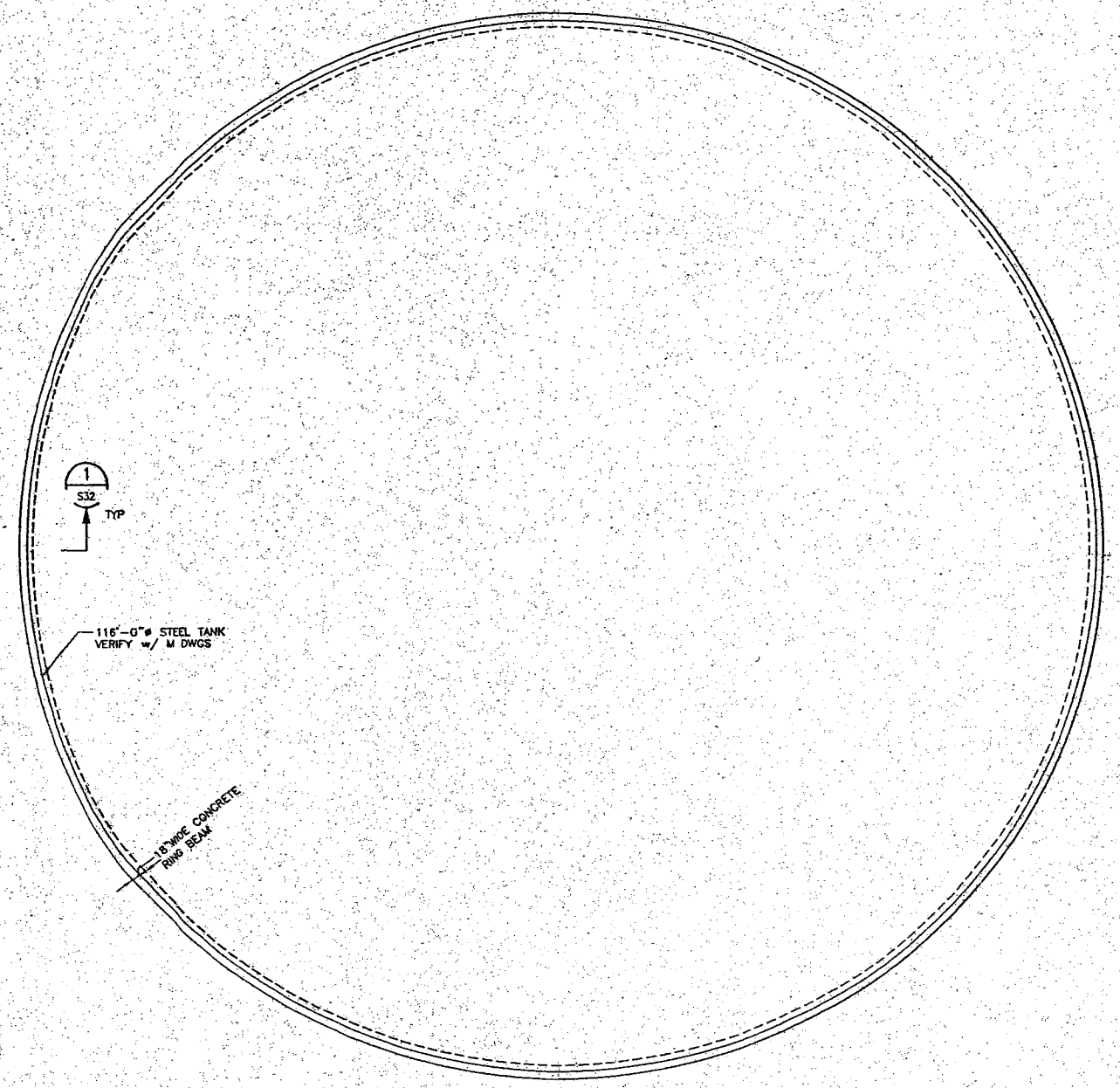
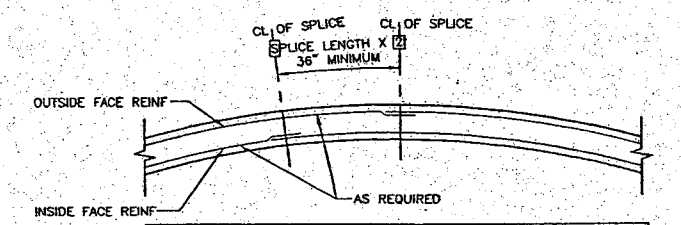


1 SECTION
S32 SCALE: 1"=1'-0"

0 1 2
SCALE IN FEET
1"=1'-0"

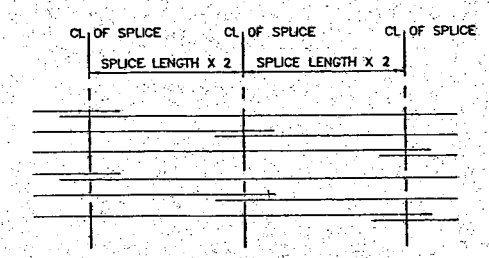




NOTES: 1.) SPLICES OF REINFORCEMENT SHALL BE STAGGERED SO THAT LESS THAN HALF OF REINFORCEMENT IS SPLICED WITHIN A LENGTH OF 48 BAR DIAMETERS

2.) MINIMUM LENGTH OF LAPS FOR SPLICES SHALL BE AS GIVEN IN THE TABLE FOR CLASS 'B' LAPS – SEE GSN

PLAN VIEW



ELEVATION OF
INSIDE & OUTSIDE FACE REINF

TYPICAL RING BEAM REINFORCEMENT
SPLICE LOCATIONS STAGGERED

A DETAIL
S32 SCALE: N.T.S.

A PLAN
S32 SCALE: 1/8"=1'-0"

0 4 8 16
SCALE IN FEET
1/8"=1'-0"

REVISIONS

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21887
SATESH J.
NABAR
6/16/05
ARIZONA, U.S.A.

Paradise Valley Arsenic Removal Facility
STRUCTURAL
FINISHED WATER RESERVOIR
PLAN, SECTION AND DETAIL

ARIZONA AMERICAN WATER
PARADISE VALLEY DISTRICT

DAMON S. WILLIAMS ASSOCIATES, LLC
2355 E. CAMELBACK ROAD, SUITE 700
PHOENIX, AZ 85016

DSWA

DRAWN BY DMS
PROJECT ENG'R BSH
APPROVED

DATE JUNE 2005
PROJECT 23020203

USE DIMENSIONS ONLY
SCALE AS SHOWN

606-05 CS NO. 21-46 33-UP-2004 109-DR-2004 6-HP-2005 30-HP-7

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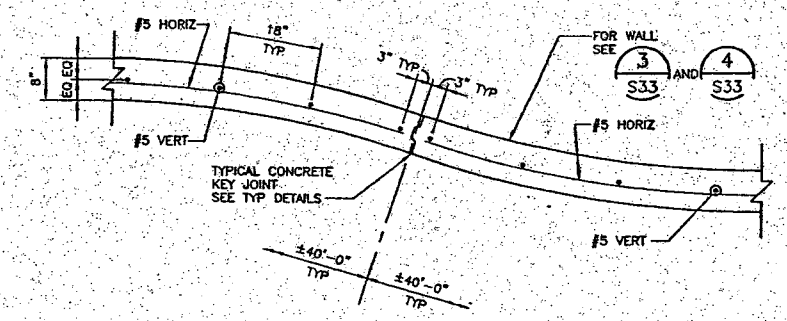
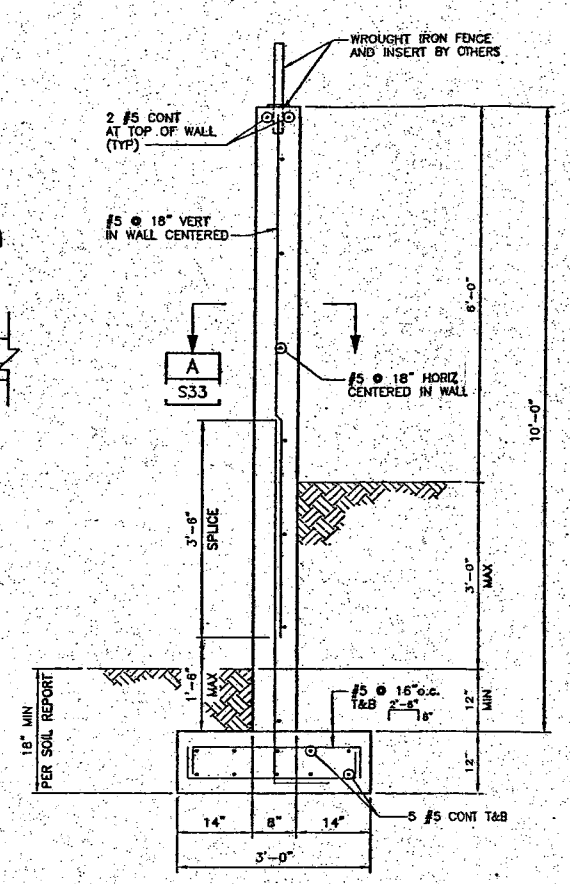


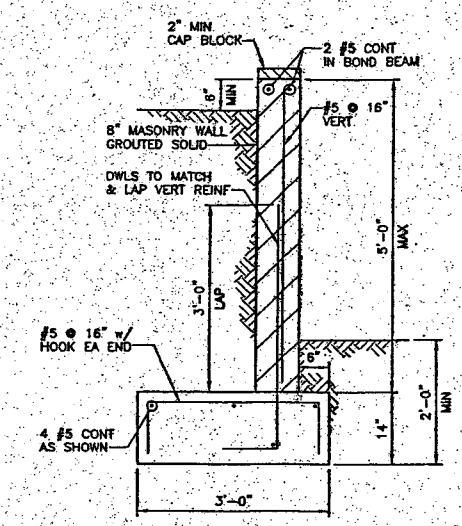
(PLAN VIEW)

A S33 DETAIL
SCALE: 3/4=1'-0"



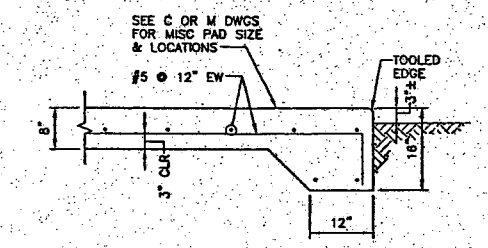
CAST IN PLACE
CONCRETE SITE/RETAINING WALL

3 S33 SECTION
SCALE: 3/4"=1'-0"



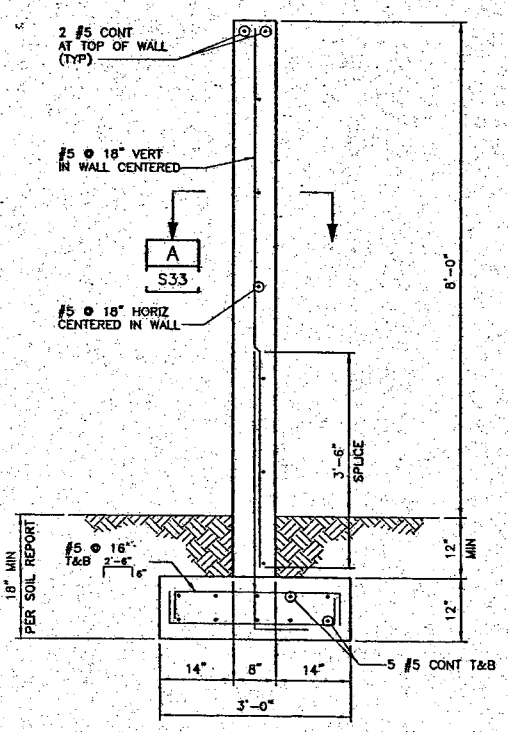
MASONRY RETAINING WALL

2 S33 SECTION
SCALE: 3/4"=1'-0"



MISCELLANEOUS PAD

1 S33 SECTION
SCALE: 3/4"=1'-0"



CAST IN PLACE
CONCRETE FENCE WALL

4 S33 SECTION
SCALE: 3/4"=1'-0"

AZAW000452

REVISIONS

NSB Nabar Stenley Brown, Inc.
Consulting Structural Engineers
2130 East Highland Avenue, Suite #204
Phoenix, Arizona 85016-4721
tel (602)912-9191 fax (602)912-9696

REGISTERED PROFESSIONAL ENGINEER
CERTIFICATE NO. 23667
SATEESH J. NABAR
Date 6/16/05
Expires 6/30/06
ARIZONA U.S.A.

Paradise Valley Arsenic Removal Facility
STRUCTURAL
MISCELLANEOUS SITE STRUCTURES
PLANS, SECTIONS & DETAILS

ARIZONA AMERICAN WATER
PARADISE VALLEY DISTRICT

DAMON S. WILLIAMS ASSOCIATES, LLC
2355 E. CAMELBACK ROAD, SUITE 700
PHOENIX, AZ 85016

DSWA

DRAWN BY DE
PROJECT ENG'R BSH
APPROVED

DATE JUNE 2005
PROJECT 23020203

USE DIMENSIONS ONLY
SCALE AS SHOWN

606-05 GS NO. 21-46 33-UP-2004 109-HR-2004 R-HP-2004 V1-HP-2004

T:\2182\Final_Submittal\23020203S33.dwg Modified: Jun 15, 2005 5:43pm

111

28
22 ft.
10ft.
JAN 19 2005

112

Taebel, Danielle

From:	Lewis, Natalie N.
Sent:	Monday, February 14, 2005 6:33 PM
To:	'ericnesvig@aol.com'; 'suefischer@earthlink.net'; 'rcproc8@aol.com'; 'azdrpaint@aol.com'; 'jb@berrydamore.com'
Cc:	Gawf, Ed; Dolan, Jan; Shearer, Neal; Bronski, Donna; Grant, Randy; Curtis, Tim; Jones, Kurt A.; Robberson, Deborah; Drake, Betty; Ecton, Wayne; Lane, Jim; Littlefield, Robert; Manross, Mary; McCullagh, Ron; Osterman, Kevin; Blyler, Lisa; Harper, LaTricia; Olson, Steve; Stockwell, Brent; Zaplatosch, Rose
Subject:	PV Water Tanks

Dear Concerned Citizens,

The Mayor and City Council have continued receiving letters, e-mails and calls from citizens regarding the heights of the water tanks for the Paradise Valley Arsenic Removal Facility near Miller and Cattletrack roads. The consistent request in these correspondences has been to ask the City Council to intervene and to stop the tanks from being built and/or to require the tanks be partially buried.

Because there has been several contacts from neighbors and because the City Council wants to make sure that we have looked at all possible alternatives, the Council asked me to double and triple check with our legal and planning staff on process-related options. This is what I have learned and confirmed.

- **As it relates to the tank heights or an ability to require the tanks be buried – the decision is final and may not be appealed.**

  Background: The tank heights were confirmed during the Conditional Use Permit public hearing process. Based on resident concerns voiced after the January 11th meeting, the Council met on January 25th and discussed whether to reconsider this for discussion/action at a future City Council meeting. Per city code, Council may only move to reconsider an action at the very next regularly scheduled meeting – which in this case was Jan. 25. At that time, there was not sufficient support on the Council to take formal action on the reconsideration. Thus, the original tank height allowances as approved at the January 11th City Council Meeting remained in place.

  However, at this meeting, the developer did offer to use five-foot shorter/wider tanks. Because that commitment didn't get confirmed on the record at the Jan. 25th City Council meeting, the City's legal and planning staff ensured it was part of the case record at the Jan. 27th Development Review Board public hearing.

- **The Scottsdale Development Review Board (DRB) does not have jurisdiction to require a property owner to build structures lower than the height approved in the zoning process.**

  Background: The DRB consists of citizens and design professionals who are appointed by the City Council to review and approve architectural designs, site and landscaping plans, and color palettes for proposed developments. While the DRB does not have jurisdiction to require lowering the tank heights that were approved during the zoning process, the City's legal dept. was able to document and confirm for the public record the developer's commitment at the Jan. 25 City Council meeting to install tanks that are five feet shorter (but somewhat wider) on the site. Other than this administrative clarification from the Council meeting, the DRB does not have jurisdiction over the zoning and height allowances. As such and in response to resident concerns, the DRB required the property owner to develop a camouflage painting treatment for the tanks, to add larger trees next to the tanks within the landscaping plan, and to move the tanks as far back from the property line as possible.

- **The ONLY process-related action the City Council could have pursued would have been to reconsider the DRB decision. But because the Council would have been acting in the capacity of DRB, they (like DRB) could not influence the tank height issue anyway.**

  Background: Per city code, the Council has the ability to reconsider the DRB actions within 20 calendar days. However, the DRB does not have jurisdiction over the heights of the tanks or an ability to require the water company to bury them. So even if the Council had decided to reconsider the DRB action within the required 20 days, they would have been acting as the DRB, and likewise would not have jurisdiction over the tank heights matter.

- **The decision-making authority in the water tank height matter rests with the property owner, the Paradise**

COS0292

Valley Water Company.

Background: The Council will continue forwarding your comments to the PV Water Company in hopes that they can find additional ways to address your concerns. But any decision to impact heights of the tanks now rests with them.

I know this has been a lot of detail -- but it is factual. The City Council works hard to be open and responsive to residents within allowed process and procedures. In this case, all appropriate processes have been completed and any decisions about the tank heights are out of the City Council's power to influence.

Respectfully,

Natalie N. Lewis
Asst. to the Mayor and Council
480-312-7806
NLewis@ScottsdaleAZ.gov

Note: This e-mail has been sent to citizens who have contacted the City via e-mail regarding this issue. Other citizens who have submitted letters will receive this same message via regular mail.

COS0293

113

Taebel, Danielle

From: Hink, John [jhink@rcalaw.com]
Sent: Tuesday, September 07, 2004 7:09 PM
To: Christine Close
Cc: Curtis, Tim; Manross, Mary
Subject: RE: Paradise Valley Arsenic Removal Facility - Open House Meeting

I am not sure that really answers the question. I'm not sure you have to have an office building on the site. Also the setback requirements at the SEC on McDonald and Cattletrack probably require less property. These are questions I am getting from my neighbors.

Tim – what is the status on the condo/office rezone?

John A. Hink, Esq.
Ryley Carlock & Applewhite, P.A.
One North Central Avenue
Suite 1200
Phoenix, Arizona 85004-4417
(602) 258-7701/ Fax (602) 257-9582
direct fax (602) 257-6935

-----Original Message-----
From: Christine Close [mailto:CClose@dswa.net]
Sent: Wednesday, August 25, 2004 7:51 PM
To: Hink, John
Subject: RE: Paradise Valley Arsenic Removal Facility - Open House Meeting

Hi John,

Sorry for taking so long to get back to you. I need to gather some information to answer your question.

Arizona American did consider this property, but determined that there was not enough square footage to accommodate the facility. We will need approximately 5.75 acres, and the property available to the south is only 3 acres. In addition, since several of the wells being treated are located on or close to the selected site, there is a cost savings with respect to the piping to and from the facility.

Hopefully, this answers your question. If you require further detail, please do not hesitate to get in touch with us.

Regards,
Christine

-----Original Message-----
From: Hink, John [mailto:jhink@rcalaw.com]
Sent: Wednesday, August 18, 2004 11:38 AM
To: Christine Close
Subject: RE: Paradise Valley Arsenic Removal Facility - Open House Meeting

Thanks for the information.

I thought more about this and I don't understand why the arsenic facility can't be built next to the existing facility.

Can you explain?

John A. Hink, Esq.
Ryley Carlock & Applewhite, P.A.
One North Central Avenue

COS0493

Suite 1200
Phoenix, Arizona 85004-4417
(602) 258-7701/ Fax (602) 257-9582
direct fax (602) 257-6935

-----Original Message-----
From: Christine Close [mailto:CClose@dswa.net]
Sent: Tuesday, August 17, 2004 2:21 PM
To: Hink, John
Cc: peggypsainc@cox.net
Subject: Paradise Valley Arsenic Removal Facility - Open House Meeting

Hi John,

Thank for attending the open house on August 5, 2004. It was very helpful for us to obtain your opinions concerning the proposed facility.

During the meeting, you asked for the height of the Miller Road Treatment Facility which is located south of McDonald. The total building height is approximately 45 feet above finished grade. This height is measured to the top of the air stripper enclosures.

Please let me know if you need any additional information. I can be reached at 602.217.1031

Thanks again for attending,
Christine

114

Joseph R. Bertoldo
Scottsdale City Attorney's Office

3939 N. Drinkwater Blvd.
Scottsdale, AZ 85251

PHONE 480-312-2405
FAX 480-312-2548

COPY

AUG 05
RECEIVED
GALLAGHER & KENNEDY

July 28, 2005

VIA FACSIMILE (602) 522-2349 and Mail

Jim Palecek, Esq.
HUNSAKER & PALECEK, P.L.L.C.
5050 East Thomas Road
Phoenix, Arizona 85018

M

RE: Kueffners, et al v. City of Scottsdale, et al CV2005-051304

Dear Jim:

In confirming our conversation of July 28, 2005, I would like to provide you with written confirmation of the City's position regarding the zoning of the property in question. Please be advised that the property is zoned R1-43 with a Special Campus, ("SC") overlay and an HP designation. R1-43 provides that "public utility buildings, structures or appurtenances thereto for public service uses" is permitted provided a conditional use permit has been obtained. The HP designation and the SC overlay designation does not contradict this. In fact, Section 6.804 (f), provides that "[t]o the extent that the adoption of a Special Campus overlay district shall conflict with the regulations, requirements, stipulations or standards of other provisions within the zoning ordinance, the more permissive shall apply, unless otherwise specified herein." Therefore, the R1-43 use allowing public utility buildings, structures or appurtenances thereto is allowed.

It is the City's position that while Arizona-American Water Company was operating a non-conforming use on the property before receiving its conditional use permit, once the conditional use permit was received, the use became conforming and now complies with the zoning ordinance.

Although the City will be answering your discovery and submitting its Disclosure Statement in due course, I wanted to provide you with this explanation of the City's position as soon as possible.

Thank you for your attention to this matter.

Very truly yours,

Sherry R. Scott
Senior Assistant City Attorney

SRS:lch

115

D.L. Norton General Contracting

Arizona American Water Company
Paradise Valley Arsenic Removal Facilities

PHASE 1 SCHEDULE OF PAYMENTS

	Lump Sum Design	Cost of the Work	Supervision	Contractor's Fee	Bond	Total	
May, 2004	$20,000					$20,000.00	
June	$131,928	$24,500				$156,428.00	
July	$151,928	-$24,500				$127,428.00	
August	$200,453	$7,980				$208,433.00	
September	$127,821					$127,821.00	Subtotal
October	$127,821					$127,821.00	For
November	$127,821					$127,821.00	2004
December	$127,821					$127,821.00	
January, 2005	$127,821					$127,821.00	$1,023,573
February	$127,821	$50,000	$5,250	$3,361		$186,431.50	
March	$127,824	$50,000	$5,250	$3,361		$186,434.50	
April	$132,027	$50,000	$13,750	$3,361		$199,137.50	
May	$18,231	$50,000	$21,500	$3,361	$117,773	$210,864.50	
June	$18,231	$784,000	$41,500	$52,693		$896,423.64	
July	$18,231	$1,100,000	$41,500	$73,931		$1,233,662.00	
August	$18,231	$1,300,000	$41,500	$87,373		$1,447,104.00	
September	$18,231	$1,310,000	$41,500	$88,045		$1,457,776.10	Subtotal
October	$18,231	$1,310,000	$41,500	$88,045		$1,457,776.10	For
November	$18,231	$1,510,000	$41,500	$101,487		$1,671,218.10	2005
December	$18,231	$1,510,000	$41,500	$101,487		$1,671,218.10	
January, 2006	$18,231	$1,510,000	$45,000	$101,487		$1,674,718.10	$10,745,867
February	$18,231	$1,510,000	$41,500	$101,487		$1,671,218.10	
March	$18,231	$1,310,000	$41,500	$88,045		$1,457,776.10	Subtotal
April	$18,231	$943,000	$41,500	$63,379		$1,066,110.03	For
May	$18,231	$300,000	$41,500	$20,163		$379,894.00	2006
June	$18,231	$200,000	$12,000	$13,442		$243,673.00	
July	$18,231	$99,704	$12,000	$6,701		$136,636.11	
August		$0	$12,000	$0		$12,000.00	
September		$0	$5,250	$0		$5,250.00	
October		$784,457	$5,250	$52,723		$842,430.35	$7,489,705.79
Phase 1 Total	**$ 1,804,551**	**$ 15,689,141**	**$ 593,750**	**$ 1,053,931**	**$ 117,773**	**$ 19,259,146**	

EXHIBIT #8
WITNESS D. NORTON
DATE 8-25-05
BARBARA ROSADO/RPR

116

7730 E. EVANS ROAD
SCOTTSDALE, AX 85260-3410
480-998-3913 OFFICE
480-998-3921 FAX

D. L. NORTON GENERAL CONTRACTING

Fax

To: Bob Brown/ Brown Tank	From: Chip Norton
Fax: 602 268-6576	Pages: Cover
Phone:	Date: 1/28/05
Re: Arizona-American ARF	CC:

Urgent ☐ **For Review** ☐ **Please Comment** ☐ **Please Reply**

Bob

The tank dimensions at Paradise Valley were revised at a Development Review Board meeting yesterday afternoon. We now have two tanks at 116' diameter with a 20' sidewall height and a 1:48 slope on the roof from sidewall to center Omega vent. Please revise your proposal to reflect these changes. Thank you for dealing with this revision on very short notice.

Chip Norton

~~1,173,740.00~~
~~(181,118.00)~~
~~992,622.00~~
~~÷ 2~~
~~496,311.00 EACH~~

~~w/ Bond~~
~~+ 48,000~~

UPDATED PRICE
ONE TANK
NO MIXING

528,850.00
10,000.00 CATH
538,850.00
5400.00 BOND
544,250.00

EXHIBIT #9
WITNESS D. Norton
DATE 8-25-05
BARBARA ROSADO/RPR

117

DSWA

DAMON S. WILLIAMS ASSOCIATES, LLC
2355 East Camelback Road, Suite 700 ▪ Phoenix, Arizona 85016-3458
Phone: 602-265-5400 ▪ Fax: 602-265-5632
www.dswa.net

TELEPHONE MEMORANDUM

Date: August 5, 2005 **Time:** 1:30 pm

To/From: Erik Skulstad (AMEC) **Phone #:** (602) 989-1740
Chip Norton (DL Norton) (480) 998-3913

By: Rob McCandless

Subject: Project 040190 – PVARF: Reservoir Foundation Recommendations

File I.D.: 040190/03Corresp/Subs/AMEC/050805.tel

Copies To: Participants
Ed Radwanski
Christine Close

Message:

I had returned Erik's call regarding the subgrade preparation and foundation design recommendations for the reservoirs at the Paradise Valley site.

Chip provided an overview of the subgrade preparation for the reservoir. The original grade in the vicinity of the reservoirs varied between 1279.0 and 1280.0. The top of the foundation is to be 1278.0 and the ring wall is 3.0 feet tall. Therefore the bottom of the foundation is 1275.0. DL Norton overexcavated the entire area under and around the reservoirs to elevation 1274.0. In addition, a 10 foot wide strip under the ring wall foundation was overexcavated to elevation 1272.0. The subgrade was scarified and recompacted, and the overexcavation was backfilled with structural fill.

Erik indicated that this subgrade preparation should adequately conform to the recommendations of Addendum No. 2 of the geotechnical report.

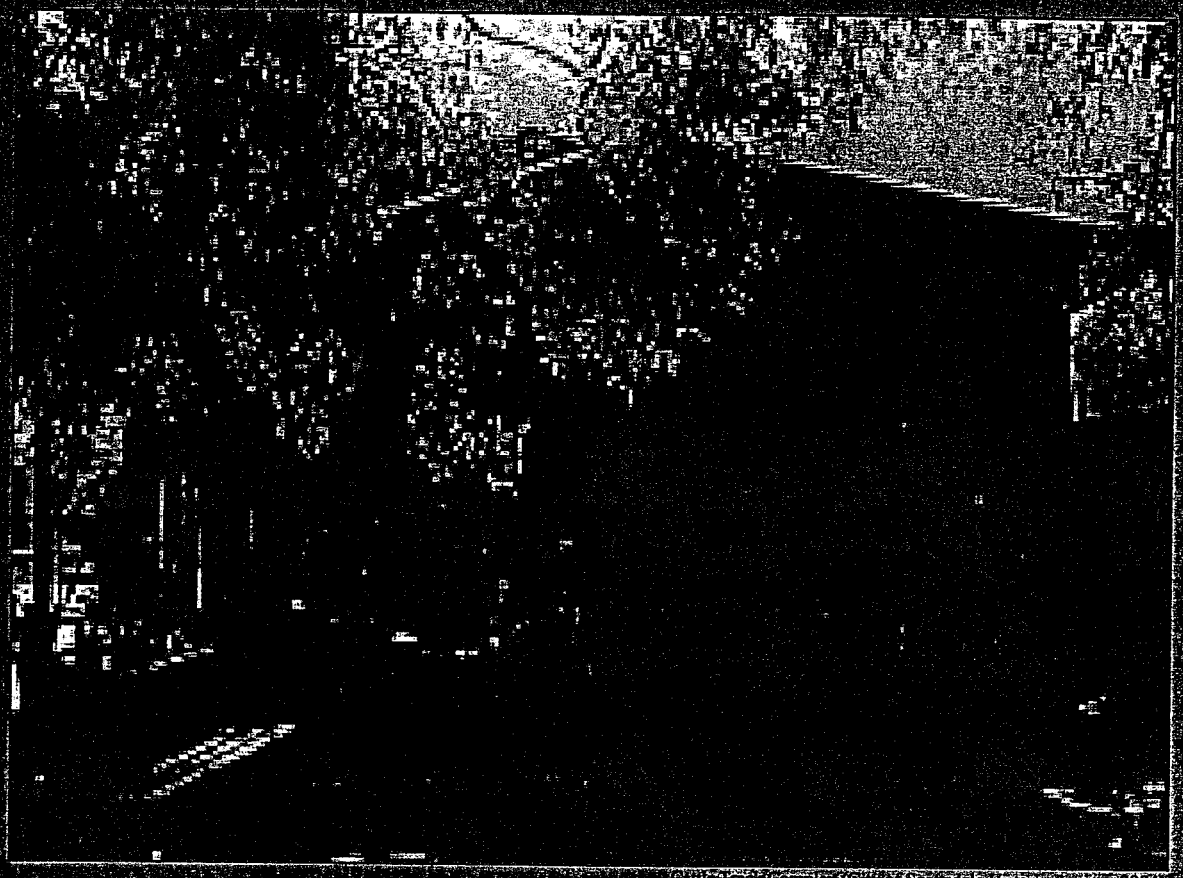
EXHIBIT #13
WITNESS D. Norton
DATE 8-25-05
BARBARA ROSADO/RPR

"Caring professionals engineering real solutions to our world's environmental challenges"

118

A Cultural Resource Survey of 2,205 Acres and a Cultural Resource Survey of Fence Removal

Within Scottsdale, Maricopa County, Arizona



Cattle Track Complex (City of Scottsdale Historic Register 2004)

Prepared by:
Jodi Strohmayer

Submitted by:
F. Simon Bender

Prepared for:
Damon S. Williams Associates, LLC

McCandless
EXHIBIT NO. 39
8-30-05
D. ~~LaVine~~ Cleary

Eco Plan Associates, Inc.
Environmental Science & Resource Economics
704 West Southern Avenue, Suite 201, Mesa, Arizona 85210

EcoPlan Cultural Resource Survey Report 04-700

August 2004 (Revised December 2004)

PRIVILEGED – DO NOT RELEASE

A Cultural Resource Survey of 12.05 Acres and Viewshed Reconnaissance for an Arsenic Removal Facility in Scottsdale, Maricopa County, Arizona

Prepared by:
Jodi Strohmayer

Submitted by:
J. Simon Bruder

Prepared for:
Damon S. Williams Associates, LLC
2355 East Camelback Road, Suite 700
Phoenix, Arizona 85016

For Submission to:
City of Scottsdale
Historic Preservation Division
7447 E. Indian School Road
Scottsdale, AZ 85251

EcoPlan Associates, Inc.
Environmental Science & Resource Economics
701 W. Southern Ave., Suite 203
Mesa, Arizona 85210

EcoPlan Cultural Resource Survey Report 04-700
August 2004 (Revised December 2004)

PRIVILEGED – DO NOT RELEASE
This document contains sensitive information about the location of cultural resources.
Such information is to be distributed only on an as-needed basis in order to protect these properties

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ABSTRACT/MANAGEMENT SUMMARY

Report Title	A Cultural Resource Survey of 12.05 Acres and Viewshed Reconnaissance for an Arsenic Removal Facility in Scottsdale, Maricopa County, Arizona.
Report Date	August 2004 (Revised December 2004)
EcoPlan Project No.	04-700
Permits	None were required because the survey was confined to private land.
Agencies and Sponsor	Damon S. Williams Associates, LLC (DSWA)
Project Description	A pedestrian survey and viewshed analysis for a proposed arsenic removal facility, in Scottsdale, Maricopa County, Arizona.
Project Location	The project area is located in the NW¼ SW¼ SE¼ and the SW¼ NW¼ SE¼ of Section 11, Township 2 North, Range 4 East, of the Gila and Salt River Base Line and Meridian, as depicted on the 1965 (photorevised 1982) Paradise Valley, Arizona 7.5-minute USGS quadrangle.
Area of Potential Effect	The area of potential effect (APE) for the current project consists of the facility location, which encompasses approximately 12.05 acres of private land, as well as a one-mile viewshed around the project area where known cultural resources could be impacted visually by the proposed facility.
Personnel and Dates of Fieldwork	The author conducted the survey and viewshed reconnaissance on 22 July 2004, expending one person-field day of effort.
Number of Properties	One: Site AZ U:5:283 (ASM), a historic artifact scatter.
Eligible or Contributing Elements of Properties	None
Ineligible and/or Non-Contributing Elements of Properties	One: Site AZ U:5:283 (ASM), a historic artifact scatter.
Effect Recommendation	Site AZ U:5:283 (ASM) is recommended as ineligible for listing in the National Register of Historic Places (NRHP), the Arizona Register of Historic Places (ARHP), and the Scottsdale Register, and therefore it is recommended that no further treatment or avoidance measures are necessary. Research within the one-mile viewshed identified two cultural resources, the Cattle Track Complex and the Arizona Canal, which were evaluated for potential visual intrusions that could result from the installation of the arsenic removal facility. Our research suggests that construction of the arsenic removal facility will not introduce any visual intrusions to either of the Register-listed cultural resources, and thus we recommend that a "Certificate of Appropriateness" be issued for this project in accordance with the City of Scottsdale's "Archaeological Resource Protection Ordinance." Because a portion of the current project area is zoned Special Campus – Historic Property (SC-HP), however, the facility design must be compatible with the City of Scottsdale's approved HP Plan, which includes design guidelines for new construction. It is our understanding that the Historic Preservation Commission (HPC), in conjunction with the Development Review Board (DRB) will review the facility design and evaluate

any visual impacts through a public hearing, and ultimately make the determination for a "Certificate of Appropriateness" for the arsenic removal facility.

If previously unidentified cultural resources are discovered during construction, the City of Scottsdale Historic Preservation Division must be notified to make arrangements for the appropriate assessment and treatment of those resources.

INTRODUCTION AND BACKGROUND

On behalf of Arizona American Water Company (AZAWC), Damon S. Williams Associates, LLC (DSWA) is preparing a design for an arsenic removal facility in Scottsdale, Maricopa County, Arizona (Figure 1). This action is in response to the recent announcement by the U.S. Environmental Protection Agency (EPA), which requires public water systems to lower the maximum contaminant level (MCL) of arsenic in drinking water by 2006. In some cases, compliance with these new regulations will require the installation and operation of treatment facilities. Accordingly, AZAWC, assisted by DSWA, must consider the effects of the facility installation on historic properties and obtain approval from the City of Scottsdale Historic Preservation Division. As a result, DSWA contracted EcoPlan Associates, Inc. (EcoPlan) to conduct a cultural resource survey of 12.05 acres and viewshed reconnaissance in support of the proposed arsenic removal facility. The author conducted the fieldwork on 22 July 2004.

PROJECT LOCATION AND AREA OF POTENTIAL EFFECT

The project area is located in the NW¼ SW¼ SE¼ and the SW¼ NW¼ SE¼ of Section 11, Township 2 North, Range 4 East, Gila and Salt River Base Line and Meridian as depicted on the 1965 (photorevised 1982) Paradise Valley, Arizona 7.5-minute USGS topographic map (Figure 2).

The area of potential effect (APE) is described as the "footprint" where disturbance may occur as a result of the proposed installation of the arsenic removal facility. The APE for the current project consists of the facility location, which encompasses approximately 12.05 acres of private land, as well as a one-mile viewshed around the project area where known cultural resources could be impacted visually by the proposed facility.

STUDY GOALS AND REPORTING CONVENTIONS

The objective of this report is to provide documentation to assist AZAWC in obtaining approval from the City of Scottsdale Historic Preservation Division for the proposed installation of an arsenic removal facility in Scottsdale. More specifically, this report will provide documentation of, and when appropriate, National Register of Historic Places (NRHP), Arizona Register of Historic Places (ARHP), and Scottsdale Register eligibility assessments for all cultural resources identified within the APE.

Cultural resource specialists typically express measurements using the metric system when reporting on aboriginal archaeological sites, and English measurements when discussing non-aboriginal properties. Measurements derived from USGS maps, or from other sources in which English measurements are used, are given only in English dimensions. Thus, distances are given in miles and elevations are given in feet. The dimensions of surveyed areas are expressed in feet (or miles) and acres. If appropriate, metric-English conversions are provided for clarity.

INVENTORY METHODS

Prior to fieldwork, cultural resource records were consulted at the Arizona State Museum (ASM), the AZSITE on-line database, the Arizona State Historic Preservation Office (SHPO), Pueblo Grande Museum (PGM), the NRHP on-line database, the Scottsdale Register on-line, and the General Land Office (GLO) plats on file at the Bureau of Land Management (BLM) to identify prior surveys and previously recorded cultural resources within one mile of the project area. Documentation collected

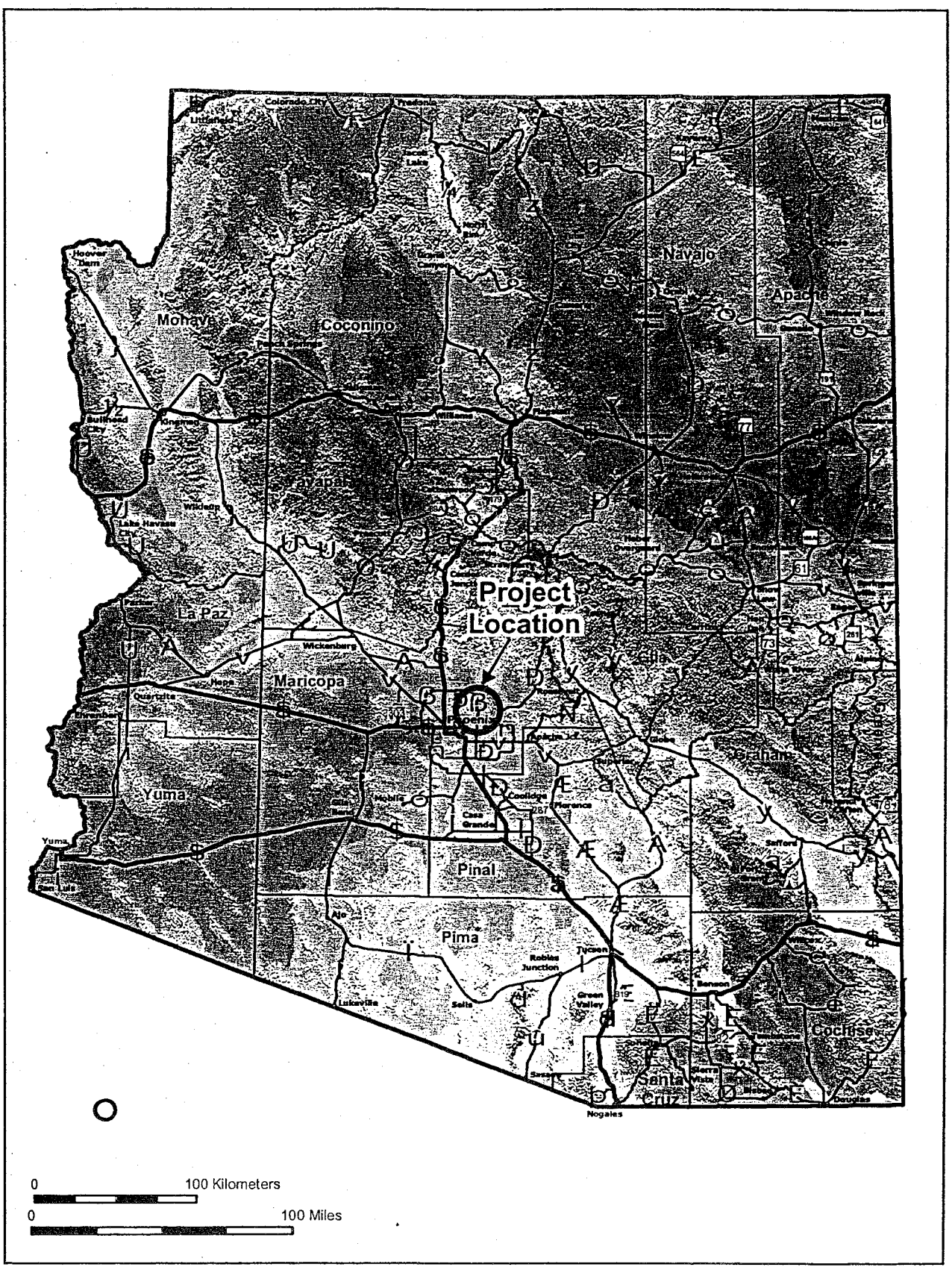

Figure 1. General Project Location.

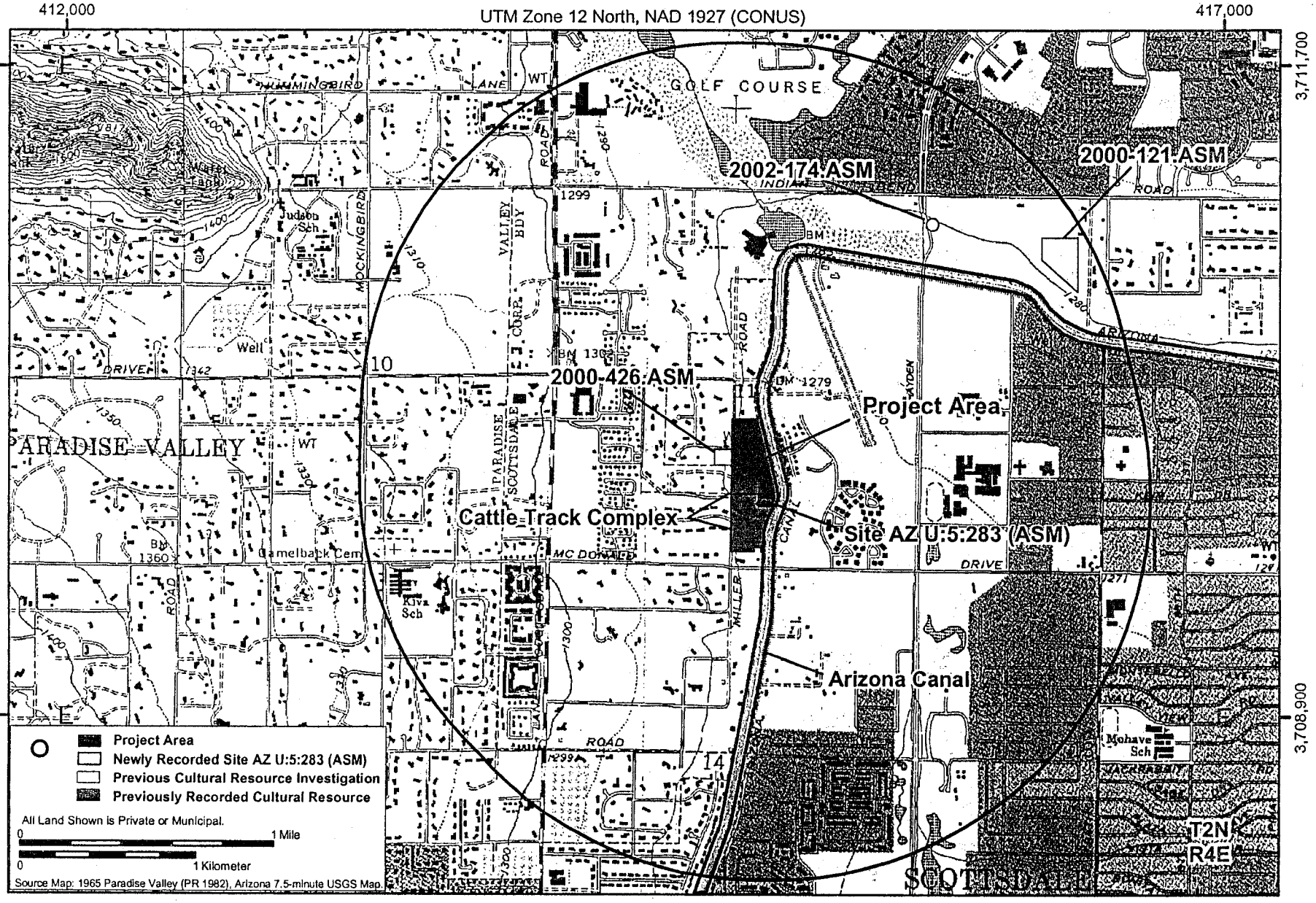

Figure 2. Project Vicinity Showing Land Status, Newly Recorded Site AZ U:5:283 (ASM), Previous Cultural Resources and Surveys (Scale 1:24,000).

during the record searches was plotted on maps along with the survey area. A review of available site cards for cultural resources in the vicinity provided information on the types and locations of cultural resources likely to be encountered during the survey.

The project area was identified using plans provided by DSWA. During the investigation, the author surveyed the parcel by walking parallel transects spaced less than 50 ft apart. The cultural resources searched for included archaeological sites, historic buildings and structures, and isolated occurrences (IOs). When encountered, the location and a general description of identified cultural resources were recorded. Each location was plotted by hand on survey area maps, which consisted of portions of USGS 7.5-minute topographic maps. Cultural resource locations were recorded using a Garmin Etrex handheld Global Positioning System (GPS), and photographed with a digital camera.

The distinction between IOs and archaeological sites is based on the general criteria outlined in the "Revised Site Definition Policy (Arizona State Lands)" (ASM 1995). Archaeological sites are generally defined and identified as areas of purposeful human activity that include artifact assemblages and/or features and structural remnants that reflect this activity. Generally, artifact assemblages at sites, in comparison to those at IOs, include several artifact classes (for example, chipped stone debitage, ceramic sherds, or glass bottles) and greater overall numbers of artifacts. IOs generally consist of only a single or possibly a few artifacts, of only one or two artifact classes, that do not reflect purposeful human activity. IOs are indicative of happenstance or fortuitous artifact deposition rather than a purposeful human undertaking. A few ceramic sherds representing an accidentally broken vessel or a single projectile point are examples of IOs. Simple, isolated features also can be identified as IOs.

When cultural remains were located during the pedestrian survey, the author walked close interval transects, approximately 10-13 ft apart, in the vicinity of the find to locate any additional artifacts, associated features, or structural remains. Based on the results of the close interval inspection, the cultural resources were determined to be either a site or an IO. The general criteria applied regarding the number of artifacts was 20 or fewer artifacts within a localized area, generally 50 ft in diameter, of only one or two artifact classes, were considered an IO. Larger concentrations of artifacts, and artifacts with associated features, were considered archaeological sites.

ENVIRONMENT

The project area is located within the Basin and Range physiographic province, and approximately 25 miles northeast of the confluence of the Gila and Salt Rivers. Elevations in the vicinity approach 1,300 feet above sea level. The underlying geology consists of surficial deposits, which accumulated throughout the Holocene to middle Pleistocene (Kamilli and Richard 1998). Surface sediments within the region belong to the Laveen-Rillito association, which are moderately coarse-textured limy soils that formed in old alluvium derived from limestone (Hendricks 1985). The surrounding vegetation is characteristic of the Lower Colorado River Valley subdivision of the Sonoran Desertscrub biotic community (Turner and Brown 1994). High temperatures and low precipitation support the growth of creosotebush, white bursage, ocotillo, and brittlebush. Areas near drainageways can often support western honey mesquite, ironwood, smoketree, and blue palo verde (Turner and Brown 1994). Vegetation within the project area was limited to the perimeter of the surveyed parcel, and consisted predominantly of native mesquite and various shrubs and grasses. In terms of a built environment, the project area can be characterized as largely urbanized due to commercial and residential development.

CULTURE HISTORY

This section briefly summarizes the prehistory and history of the project vicinity. More detailed overviews of the regional culture history can be found in Crown and Judge (1991), Doyel (1987), Doyel, Fish, and Fish (2000), Gladwin and others (1938), Gumerman (1991), Haury (1945, 1976), and Wilcox and others (1981). The cultural history of the project vicinity can be divided into five time periods that roughly correspond to major changes or adaptations in life patterns. These periods are the Paleoindian (about 10,000–8,500 B.C.), Archaic (8,500 B.C.–A.D. 0), Formative (A.D. 0–1500), Protohistoric (A.D. 1500–1800), and the Historic Period (A.D. 1800–1950). Table 1 summarizes the chronology used in this document.

Table 1. Cultural Chronology Used in This Document

2000 1950	Recent		
1800	Historic Native American and Euroamerican		
1500	Protohistoric O'odham (Pima and Papago)		
1350	Formative Hohokam[1]	Classic Period	Polvorón Phase (?)
			Civano Phase
1150			Soho Phase
		Sedentary Period	Santan Phase (?)
			Sacaton Phase
850		Colonial Period	Santa Cruz Phase
			Gila Butte Phase
700		Pioneer Period	Snaketown Phase
			Sweetwater Phase
500			Estrella Phase
			Vahki Phase
A.D. 0			Red Mountain Phase
B.C. 8500	Archaic		
	Paleoindian		

[1]Hohokam chronology adapted from Dean (1991)

Paleoindian and Archaic Periods

Populations during the Paleoindian period were small, mobile hunting and gathering groups. Paleoindian populations of the Clovis complex relied on large game animals, and produced large, finely made projectile points. The Paleoindian period is followed by the Archaic Period, and by a shift from hunting large game animals to a more varied hunting and gathering lifestyle and the beginnings of agricultural subsistence. This shift in lifestyle may be due to the extinction of large game species throughout the Southwest. Artifacts found at Archaic Period sites typically include a wide variety of chipped stone projectile points, tools, and materials. A variety of ground stone implements can be found at sites dating to the Late Archaic Period. No Paleoindian or Archaic Period sites are known to exist in the project vicinity, although several early Holocene Archaic sites have been noted west of the Agua Fria/Gila River confluence (Mabry 1998).

The Formative Period

The Hohokam, who inhabited the Middle Gila, Middle Salt, and Santa Cruz River valleys during the Formative Period are one of the most widely investigated, archaeologically defined, cultural groups in North America. Researchers have divided the Hohokam cultural sequence into four periods that equate to changes in settlement and subsistence patterns. These periods are the Pioneer (A.D. 0–775), Colonial (A.D. 775–975), Sedentary (A.D. 975–1150), and Classic (A.D. 1150–1400). The chronological sequence for the four Hohokam periods (and the phases into which they are subdivided) used in this report follows Dean (1991) (refer to Table 1).

The Pioneer Period has been divided into five phases that correspond to changes in habitation and ceramic types: Red Mountain (A.D. 0–300), Vahki (A.D. 300–500), Estrella (A.D. 500–600), Sweetwater (A.D. 600–700), and Snaketown (A.D. 700–775). The introduction of ceramic technology, an increased dependence on agriculture, and the establishment of more sedentary villages are the factors that usher in the Formative Period, although preceramic agricultural sites of the Red Mountain Phase (A.D. 0–300) have been identified in the Phoenix Basin (Doyel and Fish 2000:9; Mabry 2000:55). This period is characterized by small groups of square- and ovoid-shaped pit houses arranged in clusters of 2–4 houses around a central courtyard and probably only seasonally occupied (Cordell 1997; Crown 1991; Doyel 1987). Several house groups may have formed a dispersed village, and would have been situated adjacent to a major waterway, such as the Salt River. Throughout most of the Pioneer Period, agriculture was primarily confined to the river floodplain, however, by the Snaketown Phase irrigation canals were being constructed and arable lands adjacent to rivers were being farmed. Crops included corn, beans, squash, cotton, and tobacco. The dispersed villages are often associated with distinct activity areas, trash mounds, and burial areas. Artifacts commonly observed at Pioneer Period sites include clay figurines, slate palettes, worked marine shell, plain and polished red ware ceramics, red-on-gray decorated ceramics in the Estrella Phase, and red-on-buff ceramics in the subsequent phases (Cordell 1997; Crown 1991).

The Colonial Period includes the Gila Butte (A.D. 775–850) and Santa Cruz (A.D. 850–975) Phases, and is interpreted as a period of Hohokam expansion and increased sedentism. Habitations during the Colonial Period were likely permanent, situated on terraces above the river floodplain, consisted of 2–4 rectangular pit houses arranged in clusters around courtyards, and commonly included associated extramural work areas, cremation areas, and trash mounds (Crown 1991; Hill and Bruder 2000). Several of these clusters make up larger villages, such as Snaketown, on the Gila River approximately 25 miles (40 km) southeast of the project area, which is dispersed over an area several hundred meters in diameter—maybe several kilometers (Haury 1976; Wilcox and others 1981). Monumental architecture appears in the Colonial Period in the form of caliche-capped trash mounds and what Hohokam researchers have termed ballcourts, signaling an increasing differentiation or increase in status of some sites in the Hohokam area

(Crown 1991; Wilcox and Sternberg 1983). Irrigation agriculture increased during this period, although dry farming was still practiced. Artifacts typical of the Colonial Period include specialized craft items of marine shell and turquoise, slate palettes, and elaborate clay figurines. Decorated red-on-buff pottery is also common, and includes incised wares in the Gila Butte Phase, and non-incised wares with tightly packed, carefully executed decorations during the Santa Cruz Phase (Haury 1976).

During the Sedentary Period, the Hohokam culture area continued to grow, and reached its greatest extent. Large villages such as Snaketown also reached their greatest size and most complex arrangements (Doyel, Fish and Fish 2000; Haury 1976). The period consists of the Sacaton (and possibly the Santan) Phase (A.D. 975–1150), which is characterized by large villages of ellipsoidal and rectangular pit houses on terraces above the river floodplain (Cordell 1997; Crown 1991). Construction of ballcourts continues and flourishes in the Sedentary, and a new form of monumental architecture, the platform mound, is introduced (Crown 1991; Wilcox and Sternberg 1983). During this period canal systems are further expanded, and the dead are cremated and buried in pottery vessels, although a few east facing, extended inhumations are known (Crown 1991). Craft items during this period become increasingly crude, and design elements on red-on-buff pottery are less carefully executed (Crown 1991). Red-ware pottery is reintroduced in this period.

At about A.D. 1000, near the end of the Sedentary Period, a dramatic shift can be seen in the settlement, architecture, burial practices, and material culture throughout the Hohokam culture area, and throughout the American Southwest. Researchers define three phases, the Soho (A.D. 1150–1300), Civano (A.D. 1300–1400), and Polvorón (1400–1500), for the Classic Period in the Phoenix basin (Doyel and Fish 2000:4–5). In the Classic Period, larger, aggregated, and permanent communities on the river floodplain with adobe, *jacal*, and masonry constructions replace pit house villages in most of the Hohokam area. Irrigation systems are expanded and upgraded. Larger villages become home to massive platform mounds, such as that seen at the Gatlin Site in Gila Bend, and are often enclosed within compound walls (Doyel 1991). Large adobe *great houses* were constructed at central sites such as Pueblo Grande, Mesa Grande, and Casa Grande. The majority of human burials in the Classic Period tend to be inhumations, although cremations still occur (Crown 1991). Red-on-buff ceramics are virtually replaced by Salado-style polychrome wares and highly polished red wares. Crown (1991:153) suggests that the Classic Period was a time of intensification and rapid change, departing from the patterns of earlier periods. By A.D. 1400, evidence points to a virtual Hohokam abandonment of the region, although some evidence exists for a possible small-scale occupation in the post-classic Polvorón Phase.

The Protohistoric and Historic Periods

After A.D. 1500, indigenous Pima and Papago groups (modern-day Akimel O'odham and Tohono O'odham) occupied the region surrounding the Phoenix basin. It is thought by most researchers that these groups are descendents of the prehistoric Hohokam (McGuire and Schiffer 1982), although Crown (1991:154) states that it is unclear whether the Phoenix basin was continuously occupied by indigenous populations up to the arrival of Europeans. Eusebio Kino, a Jesuit and Spanish explorer, explored much of the lower Gila River Valley and Papaguería in 1699, but never documented a visit to the Phoenix Basin. Modern researchers think that the Phoenix basin was either abandoned or only occupied infrequently on an opportunistic basis. At some point after the Spanish *Entrada*, Apache and Yavapai groups began to exploit the resources of the Salt and Gila River Valleys, and began to raid Papago villages along the Gila River to the south of the project area. Few Apache or Yavapai sites have been identified in the Phoenix area. Typically, Apache and Yavapai sites consist of small ephemeral settlements, wikieups, and agave roasting pits associated with chipped stone tools and crude plain ware ceramic artifacts (Gilpin and Phillips 1999).

The first Euroamericans came to the Phoenix basin in the mid-1800s, after the United States acquired what is now most of Arizona and New Mexico in the treaty of Guadalupe Hidalgo. Early settlers of the Phoenix basin were attracted by the fertile soils and the potential for agriculture. In some cases, the early settlers dug out the old Hohokam canals to increase arable lands, and the ancient irrigation network surely provided inspiration for a massive historic canal system (Trimble 1986). In 1902, Congress passed the Reclamation Act, which allowed the federal government to fund irrigation projects throughout the western US with monies acquired from the sale of public lands (United States Bureau of Reclamation 2004). Established as a result of the Reclamation Act, the Reclamation Service (renamed Bureau of Reclamation in 1923) selected the Salt River Valley as one of its first major projects. From this initiative stemmed Salt River Project (SRP), which now manages and operates the Valley's extensive canal system. Scottsdale was named for Reverend Winfield Scott, who moved to the area in 1888 and acted as a local promoter for the community (Trimble 1986). With a population of only eight hundred, Scottsdale's growth was considerably stunted prior to World War II, but by 1965 the city boasted fifty-five thousand residents (Trimble 1986). Today, Scottsdale is a popular stop for tourists visiting the southwest.

PREVIOUS RESEARCH

The author consulted cultural resource records at ASM, the SHPO, PGM, and the AZSITE on-line database to identify prior surveys and previously recorded cultural resources within one mile of the proposed facility. The records search identified three previous cultural resource surveys within one mile of the current project area. These surveys are summarized in Table 2 and depicted on Figure 2. None of the surveys were conducted within the current project area.

Table 2
Previous Cultural Resource Surveys within One Mile of the Project Area

	Project Number	Project Name	Reference	Sites Identified within One-Mile of the Project Area
1	2000-121.ASM	Scottsdale Resort Condo Survey	Walsh 2000	None
2	2000-426.ASM	LVA II Archaeological Survey	Shaw 2000	None
3	2002-174.ASM	Intelligent Transportation Systems: Smart Corridors II	Winter and others 2002	None

The NRHP on-line database, the Scottsdale Register on-line database, and the GLO plats were reviewed for further information on cultural resources and possible historic locales. Review of the GLO plat for T2N R4E, dating to 1870, did not indicate any historic locales, buildings, or features within the project vicinity. Consultation of the NRHP and Scottsdale Register, however, yielded one cultural resource: the Cattle Track Complex. The Cattle Track Complex is comprised of two adjacent parcels of land located in Scottsdale on Cattle Track Road (also known as Miller Road) between Lincoln Drive and McDonald Drive. The southern parcel belongs to the Ellis family and consists of one main building and eight ancillary structures. The northern parcel is currently owned by Fred Kueffner, and consists of one main building and two workshop studios. All of the buildings located within the Cattle Track Complex were built by engineer George L. Ellis, whose innovative designs played an integral role in the development of Scottsdale as an arts colony in the 1930s. The main building on the Ellis property, aptly named the George Ellis House, was constructed in 1937 from recycled materials. Today, most of the buildings serve as residences and work studios, but continue to convey their historic associations. The George Ellis House was added to the NRHP in 1999 under Criteria B and C, for its association with the life of a significant

person and for its distinctive design and construction. The Cattle Track Complex as a whole was zoned historic property in 1996 by the City of Scottsdale, and added to the Scottsdale Register following its establishment in 1999.

In addition to the Cattle Track Complex, another cultural resource, the Arizona Canal, is located immediately adjacent to the proposed location for the arsenic removal facility. The Arizona Canal was constructed between 1882 and 1885 by the Arizona Canal Company, and eventually integrated into the SRP system. A Programmatic Agreement (PA) has been developed among the Bureau of Reclamation, the Advisory Council on Historic Preservation, the Arizona SHPO, and SRP for the system of historic canals. The PA states that the Arizona Canal has been determined eligible for listing on the NRHP under Criteria A and C.

SURVEY RESULTS

PEDESTRIAN SURVEY

The author conducted the survey on 22 July 2004, expending one person-field day of effort. Much of the project area has been disturbed as a result of previous construction (Figures 3 – 6). Ground visibility during the survey was excellent, with less than 15 percent of the ground surface obstructed by vegetation.

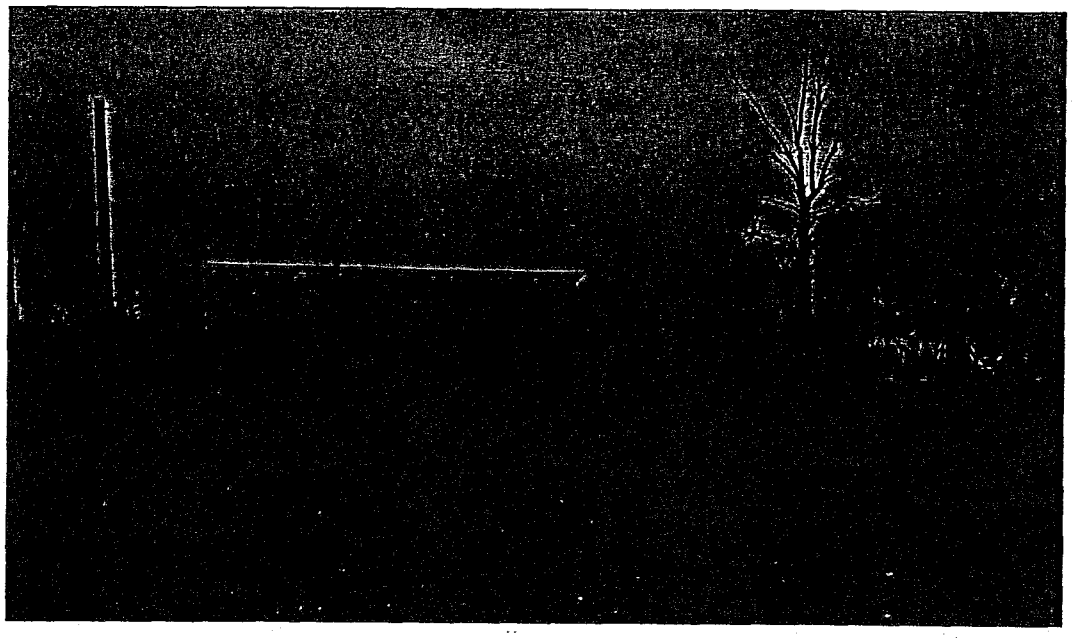

Figure 3. Photograph of Existing Storage Shed on Surveyed Parcel (view to north). Photograph by J. Strohmayer, 22 July 2004.

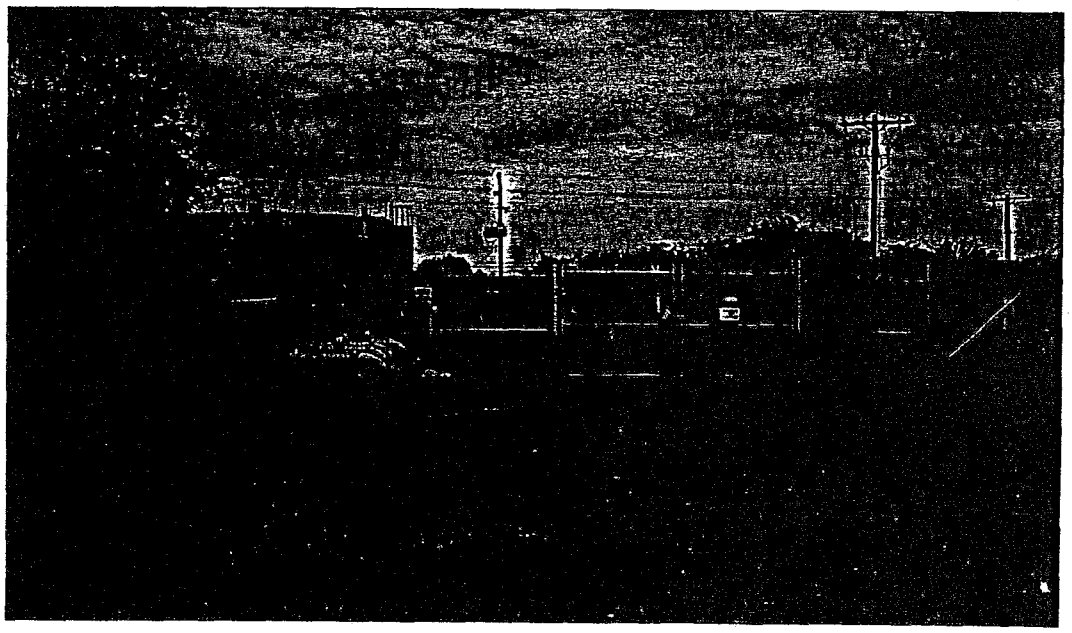

Figure 4. Photograph of Existing Paradise Valley Water Company Tank on Surveyed Parcel (view to east). Photograph by J. Strohmayer, 22 July 2004.

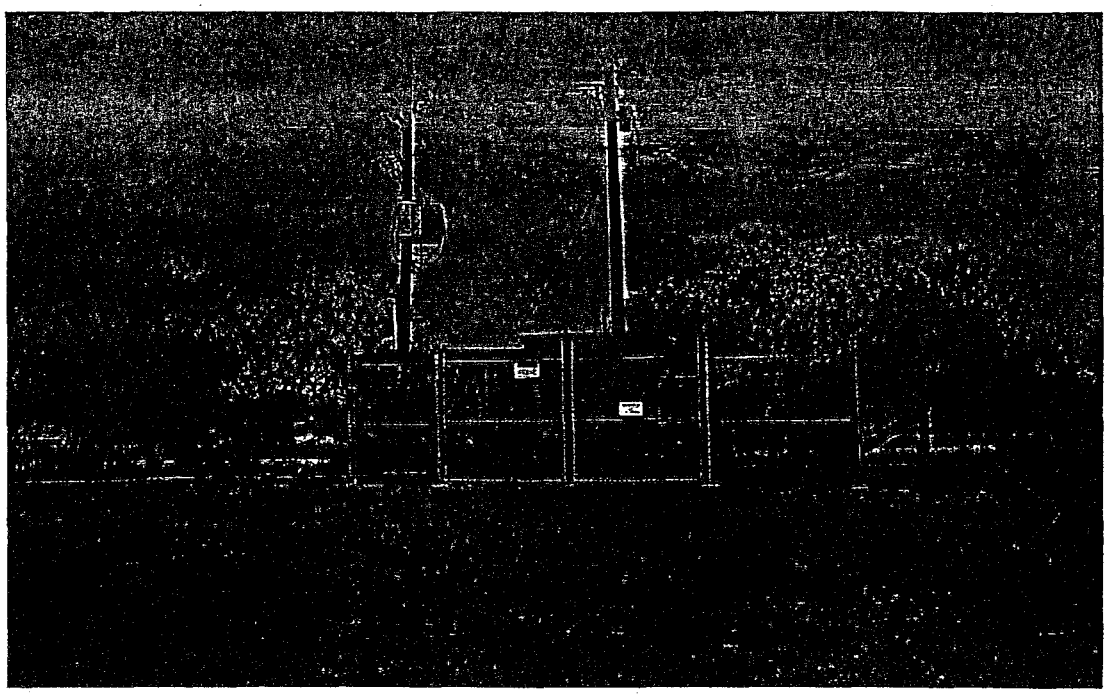

Figure 5. Photograph of Existing Paradise Valley Water Company Well #11 (view to east). The Arrow Indicates the Arizona Canal. Photograph by J. Strohmayer, 22 July 2004.

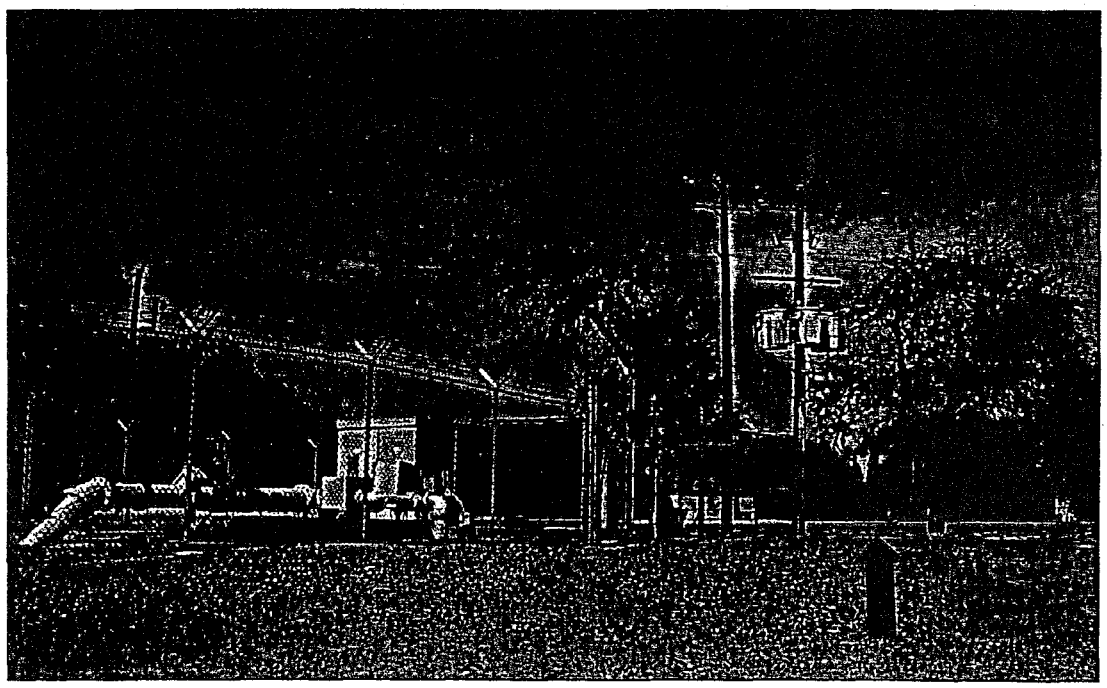

Figure 6. Photograph of Existing Paradise Valley Water Company Well #12 (view to northeast). The Arrow Indicates the Arizona Canal. Photograph by J. Strohmayer, 22 July 2004.

As a result of the field effort, a historic trash scatter, site AZ U:5:283 (ASM), was identified within the project APE. A description is provided below, along with NRHP, ARHP, and Scottsdale Register eligibility assessments.

AZ U:5:283 (ASM)

Site Number	AZ U:5:283 (ASM)
Property Type	Historic Trash Scatter
Site Dimensions	140 x 115 ft
Location	East of Cattle Track Road (Miller Road) Between Lincoln and McDonald Drives
Legal Location	NW¼ SW¼ SE¼ and the SW¼ NW¼ SE¼ of Section 11, T2N R4E, Gila and Salt River Base Line and Meridian
USGS Map Reference	1965 (Photorevised 1982) Paradise Valley, Arizona USGS 7.5' Quadrangle
UTM Coordinates	415020, 3709830 UTM Zone 12 North, NAD 1927 (Conus)
Elevation	1,290 ft above sea level
Land Status	Private
Cultural Association	Indeterminate Historic
Temporal Association	Historic Period (early 1920s)

Site Description

Site AZ U:5:283 (ASM) consists of a moderate density historic trash scatter situated east of Miller Road between Lincoln and McDonald Drives, and approximately 100 ft west of the Arizona Canal (refer to Figure 2). The site is situated at the southern extent of the survey parcel and bounded by the Cattle Track Complex to the south and west. The boundaries of the artifact scatter were marked with pin flags (later removed), and their locations were mapped using a GPS. The plan view map of site AZ U:5:283 (ASM) can be found in Figure 7.

The site is located within a well-developed residential area on a parcel of land that has been recently bladed. As a result, much of the natural environment no longer exists. There is no vegetation within the site boundary, which allowed for 100 percent ground visibility at the time of the survey (Figures 8 and 9). Dense vegetation, however, does surround the areas immediately adjacent to the survey parcel. Surface sediments consist of a loose sandy loam with few gravel inclusions.

The site measures 115 ft north to south and 145 ft east to west, and consists of a general scatter with a 10 x 20 ft artifact concentration situated roughly at the center of the site. All of the artifacts identified at site AZ U:5:283 (ASM) were inventoried and are presented below in Table 3. Approximately 142 artifacts were observed at the site, which is equal to 0.08 artifacts/y^2. More than half of the artifacts inventoried are glass. Glass types include clear, brown, selenium, cobalt, aqua, and sun-colored amethyst (SCA). Additional artifact types include metal, ceramics, shell casings, and a brick. SCA and aqua glass, such as the fragments observed at site AZ U:5:283 (ASM), were manufactured between 1880 – 1920, while selenium glass was only produced from 1915-1930 (Goodman 1998). In addition, a continuous thread top bottle fragment was observed at site AZ U:5:283 (ASM). Bottles and jars with continuous thread tops became widely used beginning in 1924 (Goodman 1998). In sum, the diagnostic artifacts identified at site AZ U:5:283 (ASM) suggest a temporal range between 1915 and the early 1920s, which indicates that it pre-dates the Cattle Track Complex.

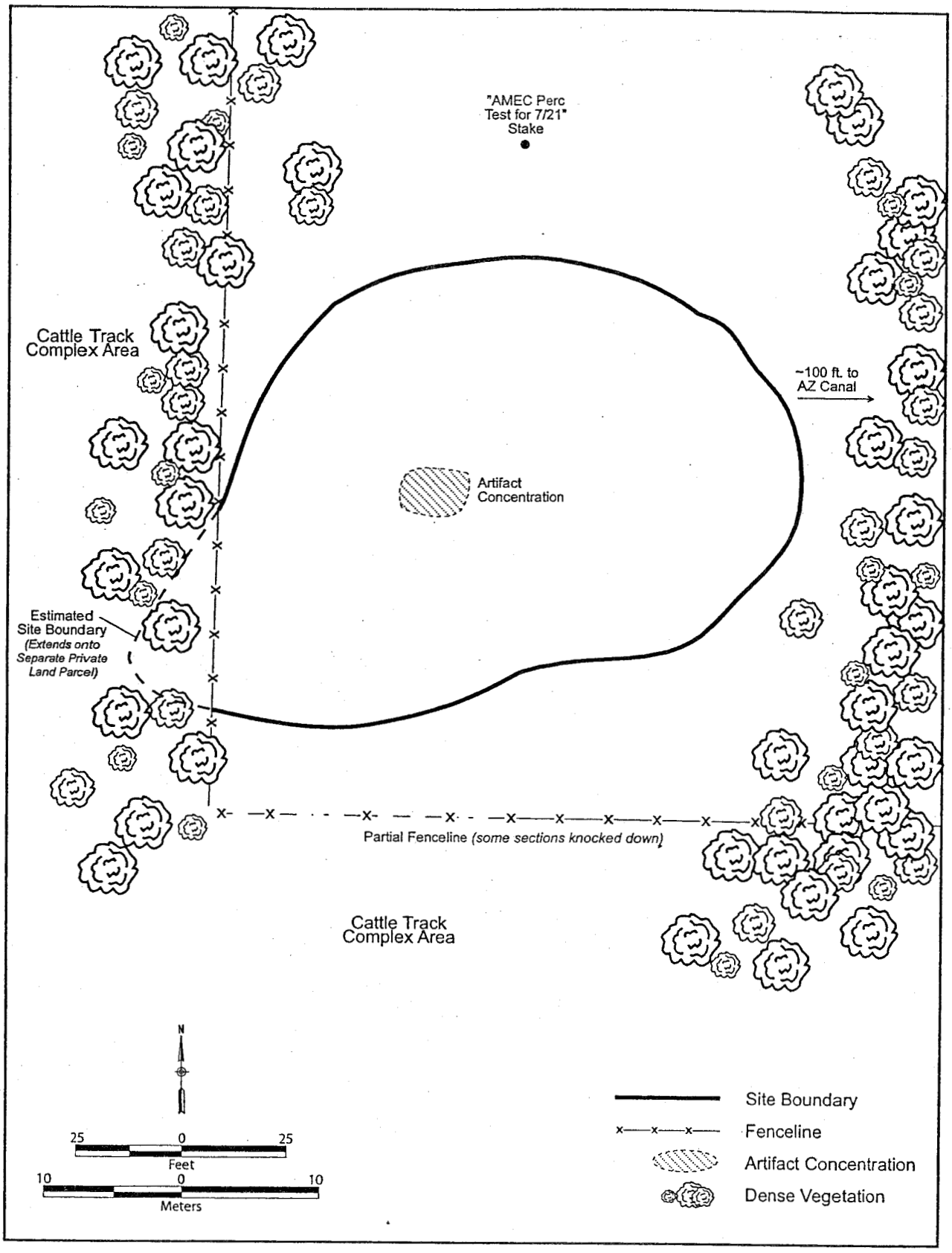

Figure 7. Plan View of Site AZ U:5:283 (ASM).

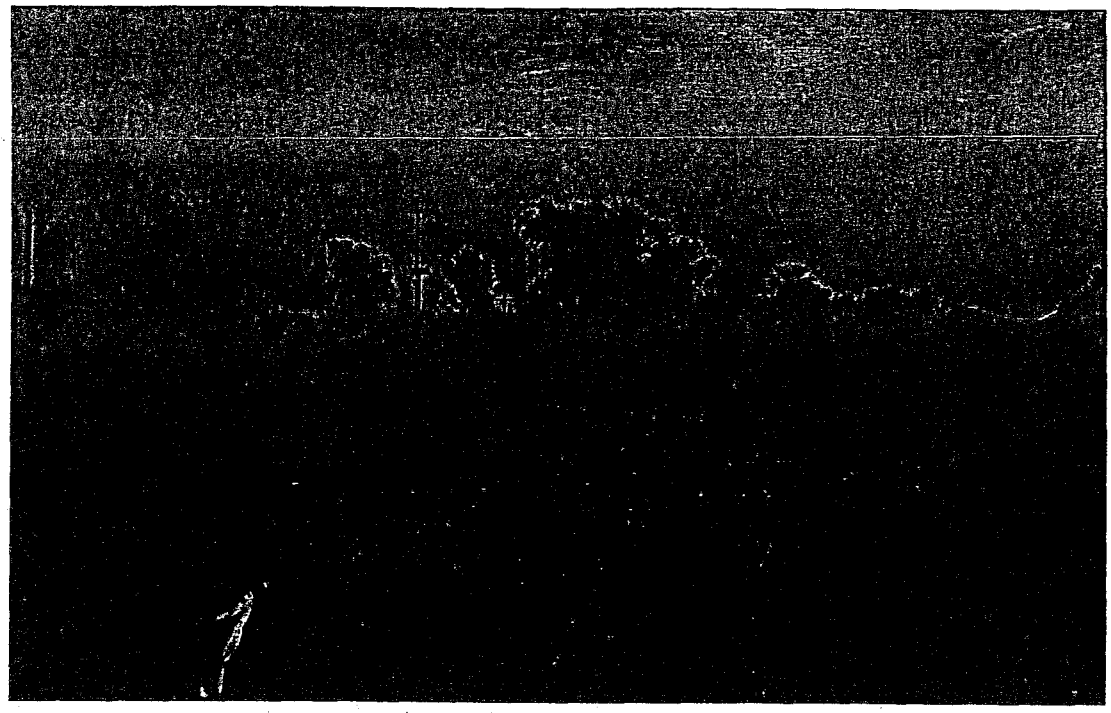

Figure 8. Photograph of Site AZ U:5:283 (ASM) (view to south-southwest). Photograph by J. Strohmayer, 22 July 2004.

Figure 9. Photograph of the Eastern Extent of Site AZ U:5:283 (ASM) (view to east). The Arrow Indicates the Arizona Canal. Photograph by J. Strohmayer, 22 July 2004.

Table 3
Artifacts Inventoried at Site AZ U:5:283 (ASM)

Artifact Type	General Scatter	Concentration	Subtotals
Glass (Total)	**50**	**35**	**85**
Clear	26	17	43
Brown	8	0	9
Selenium	1	0	1
Cobalt	5	0	5
Aqua	10	8	6
SCA	0	10	10
Metal (Total)	**18**	**3**	**21**
Cans	14	0	14
Wire	4	3	7
Ceramics (Total)	**15**	**17**	**32**
Whiteware	11	15	26
Porcelain	4	2	6
Other (Total)	**2**	**2**	**4**
Shell Casing	2	1	3
Brick	0	1	1
Subtotals	**85**	**57**	
Total Number of Artifacts = 142			

Recommendation

It is evident from the temporally diagnostic artifacts that site AZ U:5:283 (ASM) is unrelated to the adjacent Cattle Track Complex, and therefore does not appear to be associated with an important event or person (refer to discussion below). Furthermore, site AZ U:5:283 (ASM) has no apparent architectural or engineering importance, and its information potential has been exhausted by this recording. We recommend, therefore, that the site is ineligible for listing in the NRHP, ARHP, and the Scottsdale Register. Accordingly, it is recommended that no further treatment or avoidance measures are necessary for site AZ U:5:283 (ASM).

VIEWSHED RECONNAISSANCE

The Cattle Track Complex is zoned historic property (HP), and therefore is protected under Article VI of the City of Scottsdale Historic Preservation Ordinance, which provides for the retention of the original appearance, setting and placement of the historic property. One specific building of the Cattle Track Complex, the George Ellis House, is listed on the NRHP under Criteria B and C. In addition, the Arizona Canal has been determined eligible for the NRHP under Criteria A and C. As a result, the Cattle Track Complex, specifically the George Ellis House, and the Arizona Canal have the potential to be impacted visually by the installation of the arsenic removal facility.

Accordingly, the author conducted a viewshed reconnaissance survey using pedestrian and vehicular transportation on 22 July 2004. Digital photographs were taken of the proposed facility location from various points within the Cattle Track Complex and from the Arizona Canal. Figure 10 depicts the locations of the photographs with respect to the surveyed parcel and the adjacent cultural resources, while Figures 11 – 17 illustrate aspects of the research. Results of the reconnaissance determined that, due to extensive tree coverage, the existing structures on the proposed arsenic removal facility parcel are not

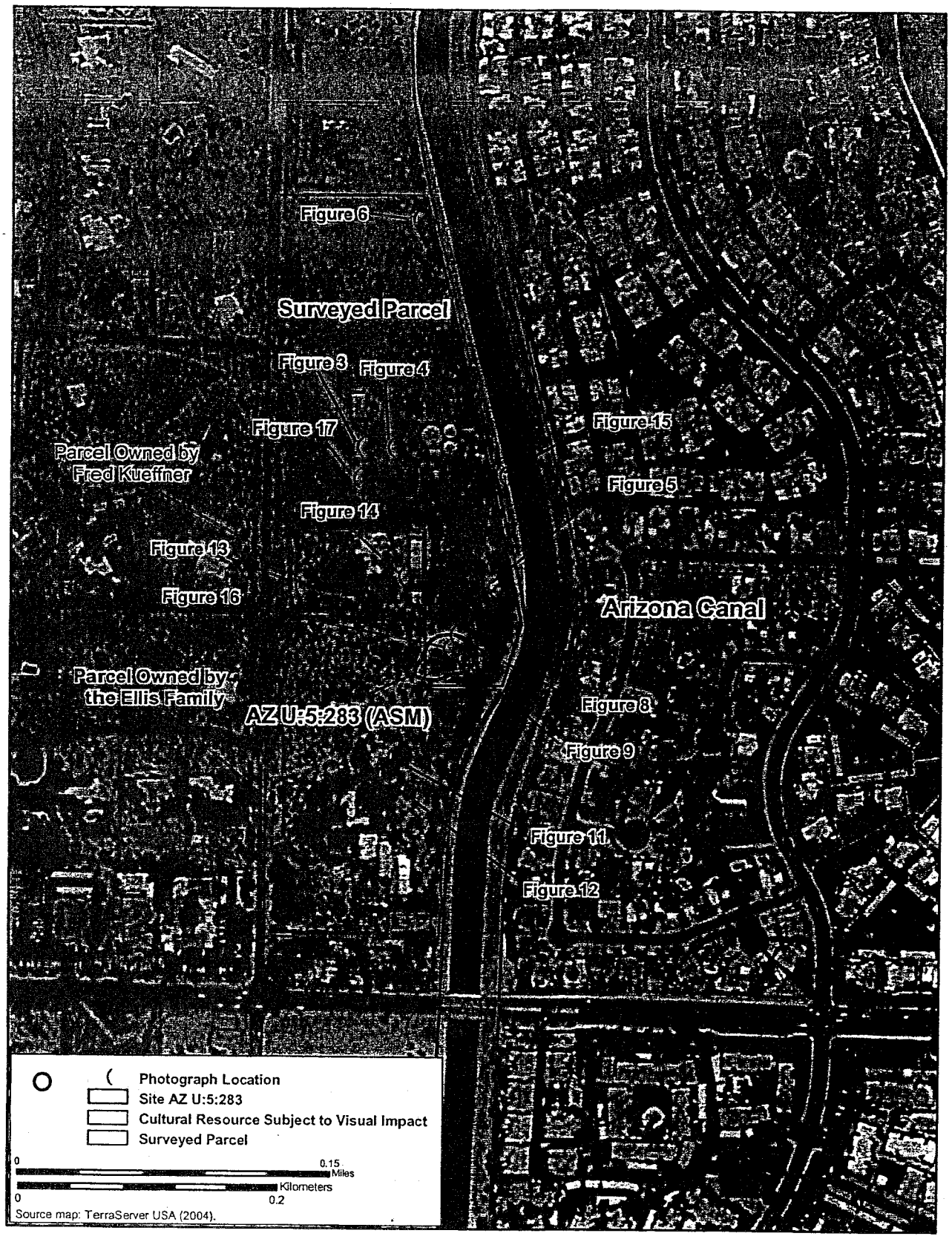

Figure 10. Project Vicinity Showing Photograph Locations.

visible from either of the Register-listed properties. In addition, elements of the surrounding built environment, specifically existing power lines and a cellular tower (refer to Figure 8), are in the direct line of sight of both the Cattle Track Complex and the Arizona Canal. Because local views from these cultural resources have already been obstructed, the installation of the arsenic removal facility will not introduce any additional visual intrusions.

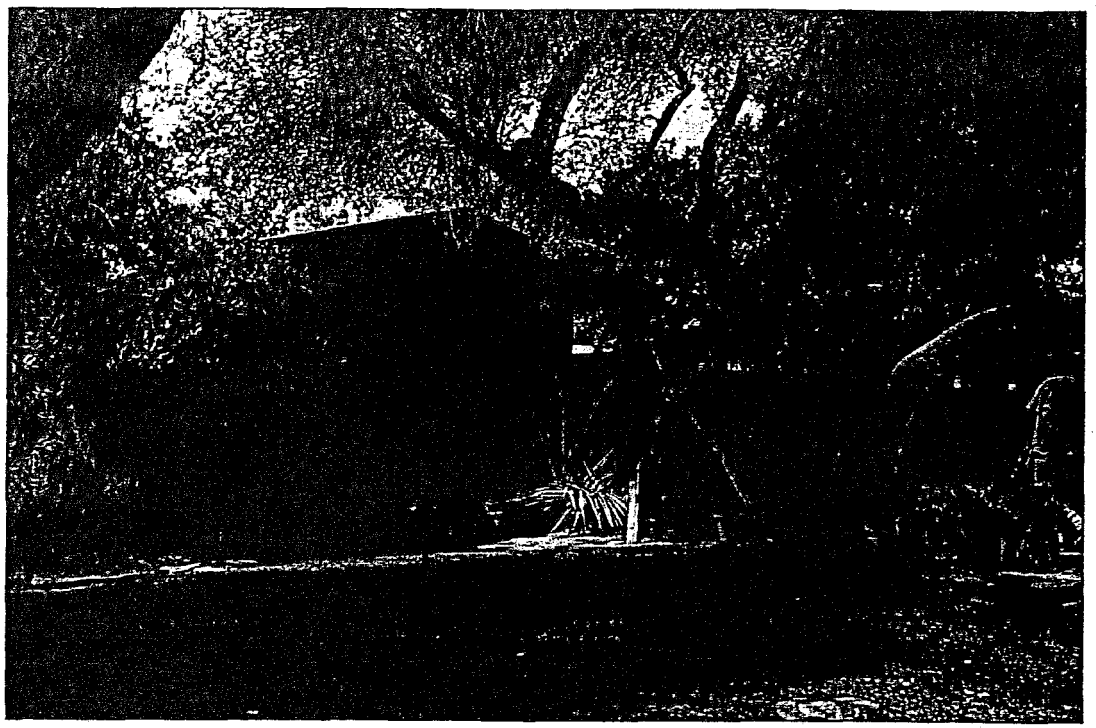

Figure 11. Photograph of the George Ellis House Facing the Proposed Facility (view to northeast). Photograph by J. Strohmayer, 22 July 2004.

Figure 12. Photograph of the George Ellis House Indicating the Proposed Facility Location (view to northeast). Photography by J. Strohmayer, 22 July 2004.

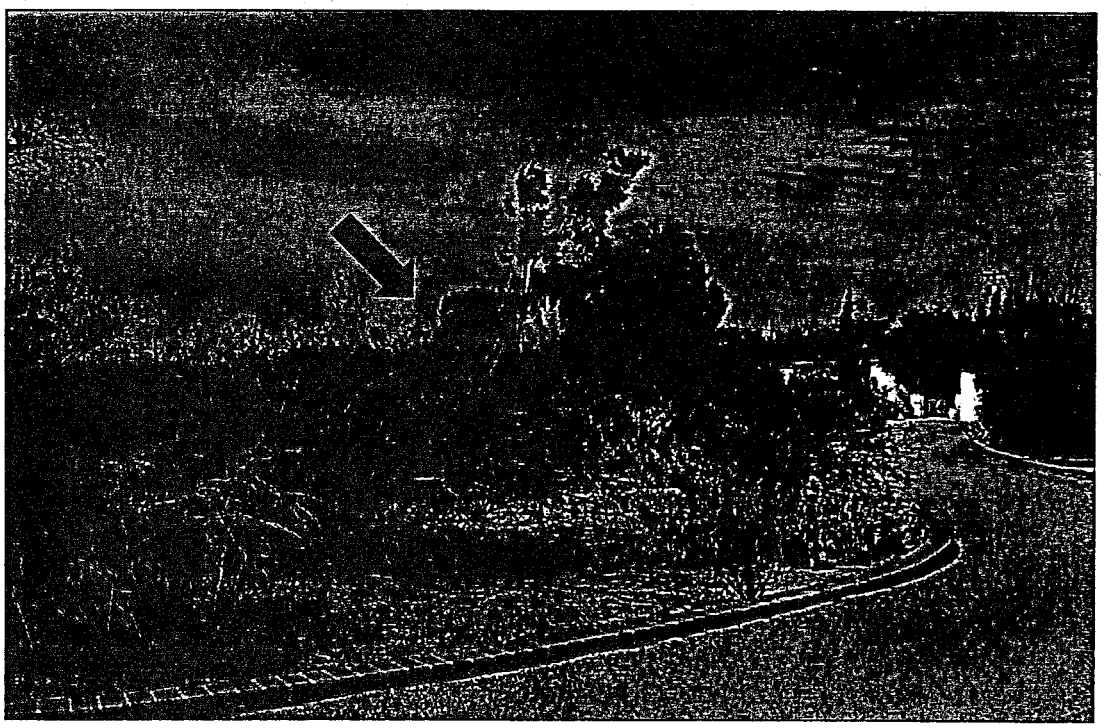

Figure 13. Photograph of the Fred Kueffner Homestead Indicating the Proposed Facility Location (view to northeast). Photograph by J. Strohmayer, 22 July 2004.

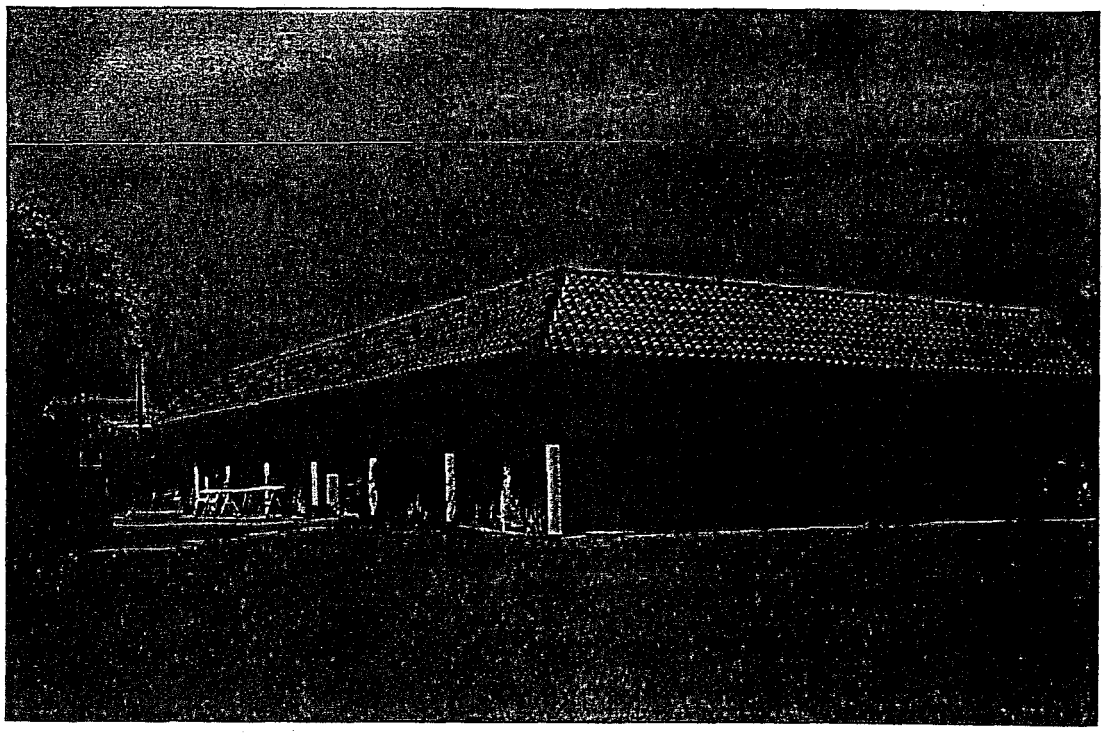

Figure 14. Photograph of the Fred Kueffner Homestead with an Existing Structure on the Surveyed Parcel in the Background (view to northeast). Photograph by J. Strohmayer, 22 July 2004.

Figure 15. Photograph of the Arizona Canal. The Arrow Indicates the Location of an Existing Paradise Valley Water Company Tank (view to north). Photograph by J. Strohmayer, 22 July 2004.

Figure 16. Photograph from Site AZ U:5:283 (ASM) Facing the Northern Extent of the Cattle Track Complex (view to west-northwest). Photograph by J. Strohmayer, 22 July 2004.

Figure 17. Photograph from the Surveyed Parcel Facing the Northern Extent of the Cattle Track Complex (view to south). Photograph by J. Strohmayer, 22 July 2004.

SUMMARY AND RECOMMENDATIONS

At the request of DSWA, EcoPlan conducted a cultural resource survey and viewshed reconnaissance in support of a proposed arsenic removal facility in Scottsdale, Maricopa County, Arizona. The area surveyed by EcoPlan amounts to 12.05 acres of private land. As a result of this investigation, the author identified one previously unrecorded site (AZ U:5:283 [ASM]), a historic trash scatter, within the APE. This site is recommended as ineligible for listing in the NRHP, ARHP, and Scottsdale Register, and therefore it is recommended that no further treatment or avoidance measures are necessary.

Research within the one-mile viewshed identified two cultural resources, the Cattle Track Complex and the Arizona Canal, which were evaluated for potential visual intrusions that could result from the installation of the arsenic removal facility. Our research suggests that construction of the arsenic removal facility will not introduce any additional visual intrusions to either of the Register-listed cultural resources, and thus we recommend that a "Certificate of Appropriateness" be issued for this project in accordance with the City of Scottsdale's "Archaeological Resource Protection Ordinance." Because a portion of the current project area is zoned Special Campus – Historic Property (SC-HP), however, the facility design must be compatible with the City of Scottsdale's approved HP Plan, which includes design guidelines for new construction. It is our understanding that the Historic Preservation Commission (HPC), in conjunction with the Development Review Board (DRB) will review the facility design and evaluate any visual impacts through a public hearing, and ultimately make the determination for a "Certificate of Appropriateness" for the arsenic removal facility.

If previously unidentified cultural resources are discovered during construction, the City of Scottsdale Historic Preservation Division must be notified to make arrangements for the appropriate assessment and treatment of those resources.

REFERENCES CITED

ASM (Arizona State Museum)
1995 *Revised Site Definition Policy for Archaeologists Working on State Lands within Arizona.* Memorandum circulated August 21, 1995.

Cordell, Linda
1997 *Archaeology of the Southwest.* Second edition. Academic Press, San Diego.

Crown, Patricia L.
1991 The Hohokam: Current Views of Prehistory and the Regional System. In *Chaco and Hohokam: Prehistoric Regional Systems in the American Southwest.* Edited by P.L. Crown and W.J. Judge. School of American Research Press, Santa Fe, New Mexico.

Crown, Patricia L. and W. James Judge (editors)
1991 *Chaco and Hohokam: Prehistoric Regional Systems in the American Southwest.* School of American Research Press, Santa Fe, New Mexico.

Dean, Jeffery S.
1991 Thoughts on Hohokam Chronology. In *Exploring the Hohokam Prehistoric Peoples of the American Southwest.* Edited by G.J. Gumerman. University of New Mexico Press, Albuquerque, New Mexico.

Doyel, David E. , ed.
1987 *The Hohokam Village Site Structure and Organization.* Southwestern and Rocky Mountain Division of the American Association for the Advancement of Science, Glenwood Springs, Colorado.

Doyel, David E.
1991 Hohokam Cultural Evolution in the Phoenix Basin. In *Exploring the Hohokam Prehistoric Peoples of the American Southwest* edited by G. J. Gumerman. University of New Mexico Press, Albuquerque, New Mexico.

Doyel, David E., Suzanne K. Fish, and Paul R. Fish, eds.
2000 *The Hohokam Village Revisited.* Southwestern and Rocky Mountain Division of the American Association for the Advancement of Science, Glenwood Springs, Colorado.

Gilpin, Dennis, and David A. Phillips Jr.
1999 *The Prehistoric to Historic Transition Period in Arizona, Circa A.D. 1519 to 1692.* SWCA, Inc., Flagstaff, Arizona.

Gladwin, Harold S., Emil W. Haury, E. B. Sayles, and Nora Gladwin
1938 *Excavations at Snaketown: Material Culture.* Medallion Papers No. 25, Gila Pueblo, Globe, Arizona.

Goodman, John D.
1998 *Late Historic Artifacts Field Recording and Dating Guide.* Prepared for the Arizona Archaeological Council's 1998 Spring Meeting Workshop on historic artifacts held at the Pueblo Grande Museum, Phoenix, Arizona, 29 May 1998.

Gumerman, George J., ed.
1991 *Exploring the Hohokam Prehistoric Peoples of the American Southwest.* University of New Mexico Press, Albuquerque, New Mexico.

Haury, Emil W.
1945 *The Excavation of Los Muertos and Neighboring Ruins in the Salt River Valley, Southern Arizona.* Volume 24, No. 1. Peabody Museum of American Archaeology and Ethnology, Harvard University, Cambridge, Massachusetts.
1976 *The Hohokam: Desert Farmers and Craftsmen.* University of Arizona Press, Tucson, Arizona.

Hendicks, David M.
1985 *Arizona Soils*. College of Agriculture, University of Arizona Press, Tucson.

Hill, Matthew E., Jr., and J. Simon Bruder
2000 *Farmers and Foragers or Cultivators and Collectors?: Opportunistic Occupation of the Interior Desert of the Western Papaguería.* Cultural Resources Services Research Paper No. 57, Dames & Moore, Phoenix, Arizona.

Kamilli, R.J. and S.M. Richard
1998 *Geologic Highway Map of Arizona.* Arizona Geological Society and Arizona Geological Survey, Tucson.

Mabry, Jonathan B.
1998 *Paleoindian and Archaic Sites in Arizona.* Center for Desert Archaeology, Tucson, Arizona.

2000 The Red Mountain Phase and the Origins of Hohokam Villages. In *The Hohokam Village Revisited.* Edited by D. E. Doyel, S. K. Fish, and P. R. Fish. Southwestern and Rocky Mountain Division of the American Association for the Advancement of Science, Glenwood Springs, Colorado.

McGuire, Randall H, and Michael B. Schiffer, eds.
1982 *Hohokam and Patayan: Prehistory of Southwestern Arizona.* Academic Press, New York, New York.

Shaw, Chester W., Ph.D.
2000 *A Cultural Resources Survey of 2.11 Acres Located at the Southwest Corner of 76th Street and Edward Lane, Scottsdale, Maricopa County, Arizona.* Logan Simpson Design, Inc., Tempe.

Trimble, Marshall
1986 *Roadside History of Arizona.* Mountain Press Publishing Company, Missoula, Montana.

Turner, Raymond M. and David E. Brown
1994 Sonoran Desertscrub. In *Biotic Communities: Southwestern Unites States and Northwestern Mexico*. Edited by D.E. Brown. University of Utah Press. Salt Lake City, Utah.

United States Bureau of Reclamation
2004 The Bureau of Reclamation. Electronic document on file at http://www.usbr.gov, accessed 20 July 2004.

Walsh, Mary-Ellen
2000 *A Class I Literature Review for a 1 Acre Property and a Cultural Resource Survey of a Separate 5.7 Acre Parcel, Both Located Near the Southeast Corner of Indian Bend Road and Hayden Road in Scottsdale, Maricopa County, Arizona.* Entranco, Inc., Phoenix.

Wilcox, David R., Thomas R. McGuire, and Charles Sternberg
1981 *Snaketown Revisited: A Partial Cultural Resource Survey, Analysis of Site Structure and an Ethnohistoric Study of the Proposed Hohokam-Pima National Monument.* Archaeological Series No. 155, Cultural Resource Management Division, Arizona State Museum, University of Arizona, Tucson, Arizona.

Wilcox, David R. and Charles Sternberg
1983 *Hohokam Ballcourts and their Interpretation.* Archaeological Series No. 160, Cultural Resource Management Division, Arizona State Museum, University of Arizona, Tucson, Arizona.

Winter, Kirsten, Kimberley A. Ryan, J. Grace Ellis, A.E. (Gene) Rogge, and Amanda Van Gorder
2002 *Cultural Resources Assessment for the Intelligent Transportation Systems Projects, Smart Corridors II, Maricopa County, Arizona.* URS Corporation, Phoenix.

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ARIZONA -AMERICAN WATER

PARADISE VALLEY WATER SYSTEM

FIRE FLOW CAPACITY ASSESSMENT

MARCH 2004

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ARIZONA -AMERICAN WATER

PARADISE VALLEY WATER SYSTEM

FIRE FLOW CAPACITY ASSESSMENT

MARCH 2004

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ARIZONA AMERICAN WATER COMPANY
PARADISE VALLEY WATER SYSTEM
FIRE FLOW CAPACITY ASSESSMENT

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ARIZONA AMERICAN WATER COMPANY
PARADISE VALLEY WATER SYSTEM
FIRE FLOW CAPACITY ASSESSMENT

EXECUTIVE SUMMARY

The Arizona-American Water Company (AAWC) Paradise Valley Fire Flow Capacity Assessment presents the requirements to upgrade the existing water system to enable it to provide 1,500 gallons per minute fire flow at a minimum 20 pounds per square inch pressure at all locations. The fire flow criteria was provided by the Town of Paradise Valley to all three of its water providers, including AAWC. The AAWC system was not originally designed to provide fire flow and as a result many of the waterlines are inadequately sized for fire protection.

The AAWC system source water is located at the far east end of a system that is longer from east to west than it is from north to south. The source water is provided from seven groundwater wells located on Miller Road. All water is delivered to the system through two facilities: the Miller Road Treatment Facility and the Miller Road Booster Station. The system is operated in ten pressure zones. The Main Zone serves 78 percent of customers, and three zones (Main Zone, Country Club Zone, and Clearwater Hills Zone) together serve approximately 96 percent of customers.

The analysis of system adequacy to meet fire flow requirements was performed using an existing WaterCAD model. Brown and Caldwell updated the model, verified pump curves and elevations, met extensively with Operations staff, and reviewed as-builts and water system block maps to verify the physical improvements included in the model.

The model was calibrated based on field test data. Fire flow tests were performed at 22 locations throughout the system. Pressure and flows from these tests were compared to model results, and pipe friction factors were adjusted in the vicinity of each flow test to achieve results as close as possible to the field test results.

The calibrated model was used to predict the available fire flow under current day conditions. The system deficiencies are caused by dramatic changes in elevation, long lengths of 4-inch and 6-inch pipe, and a single source of water located at one end of the system.

A comprehensive list of improvements was developed that, once completed, will allow the system to deliver the required fire flow to all customers. This list was prioritized by a citizen group organized by AAWC called the Water Users Group. Over the course of four meetings, the group reviewed the system deficiencies, the recommended improvements and their associated costs, developed a weighted list of evaluation criteria, and endorsed the final proposed schedule.

The recommended improvements have been phased over a 6-year period. The improvements scheduled for the first year (2004) consist of a new 12-inch water main in Jackrabbit and Invergordon and the installation of a number of fire hydrants in areas where the system is currently able to provide fire flow, but hydrants are not provided.

The total estimated cost of improvements is $15.6 million. This includes two projects, Projects 20 and 21, that should be re-evaluated in the future. Projects 20 and 21 address fire flow capacity for the High Cliff and Clearwater Hills III zones, which serve only 8 homes. The estimated cost of these projects is $963,700 for Project 20 and $394,335 for Project 21. These costs should be weighed against the cost of other options such as house sprinklers. The phasing plan presented in this report does not include Projects 20 and 21.

ARIZONA AMERICAN WATER COMPANY
PARADISE VALLEY WATER SYSTEM
FIRE FLOW CAPACITY ASSESSMENT

PROJECT OBJECTIVE AND SCOPE

Brown and Caldwell was contracted by the Arizona-American Water Company (AAWC) to conduct the Paradise Valley Fire Flow Capacity Assessment. The purpose of this investigation was to identify system improvements needed to provide reliable fire flow to all customers within the service area.

The scope of work for the project included:

- Collect and update the existing AAWC WaterCAD computer model of the Paradise Valley system.
- Calibrate the model.
- Model maximum day demand with 1500 gallons per minute (gpm) fire flow.
- Identify necessary system improvements.
- Work in conjunction with AAWC and the Paradise Valley Water Users Group to prioritize improvements and develop a Capital Improvement Program.

SYSTEM OVERVIEW

The service area for the AAWC water system is approximately 4 ½ miles wide from east to west, and 3 miles long from north to south. The service area includes portions of the Town of Paradise Valley, the City of Scottsdale, the City of Phoenix, and unincorporated Maricopa County.

The AAWC Paradise Valley Water System is operated in ten zones. The pressure zones are shown on Figure 1. The sources of water for the system are seven wells located at the eastern boundary of the service area near Miller Road. All of the water is conveyed to either the Miller Road Treatment Facility or the Miller Road Booster Pump Station, with the exception of Well No. 16, which discharges directly to the distribution system. Water is then supplied from these two facilities to the distribution system.

Table 1 displays the number of water users (accounts) in each zone. Approximately 96 percent of the total demand is in three zones: Main Zone, Country Club Zone and Clearwater Hills Zone. The Main Zone represents approximately 78 percent of total system peak demand, the Country Club Zone demand comprises approximately 12 percent of peak demand, and the Clearwater Hills Zone comprises approximately 6 percent of the total peak demand.

TABLE 1 - NUMBER OF WATER USERS BY ZONE

ZONE NAME	NUMBER OF USERS
Main	3600
Country Club	550
Clearwater Hills I and II	275
Stone Canyon	58
Racquet Club	25
Club Estates	15
Clearwater Hills III	4
High Cliff	4
Glenn Drive	4
Las Brisas	30
TOTAL	*4,565*
Source: Paradise Valley Water Company Comprehensive Planning Study, 1999	

DATA COLLECTION

Brown and Caldwell collected system information for this project including the water system maps, topography, pump curves, and storage volumes. A summary of the pumping and storage facilities by zone is presented in Table 2. The pump curves collected are included in Appendix A.

The system information collected by Brown and Caldwell is listed below:

- Water system block maps.
- Topography and aerial photography.
- Pump curves for Miller Road facilities and booster pump stations.
- Storage tank dimensions and control levels.
- Demand data for the following subdivisions/areas: Judson, Mummy Mountain, selected locations at Starlight and Cameldale, top ten water users.

- 2002 water production data.
- Water usage by account for all accounts for summer 2002.
- County assessor parcel information for the Judson subdivision, and Mummy Mountain.
- As-builts for the following: Country Club tanks inlet piping, Judson subdivision, 8-inch mains in Cameldale and Yucca.

TABLE 2 - AAWC PARADISE VALLEY WATER SYSTEM
SUMMARY OF STORAGE AND PUMPING CAPACITY BY ZONE

ZONE NAME	STORAGE FACILITY (GALLONS OF STORAGE)	PUMPS	RATED CAPACITY (GALLONS PER MINUTE)	TOTAL DYNAMIC HEAD (FEET)
Main	60th Street Tank (203,407)	MRBS #1	800	335
	Miller Road #1 (151,524)	MRBS #2	800	335
	Miller Road #2 (358,837)	MRBS #3	2800	335
	MRTF (485,000)	MRBS #4	1200	335
	Miller Road Sand Trap (192,228)	MRTF #1	3300	360
		MRTF #2	3300	360
		MRTF #3	3300	360
Country Club	Country Club #1 (508,800)	No. 1	900	100
	Country Club #2 (360,880)	No. 2	900	100
		No. 3	900	100
		No. 4	900	100
Clearwater Hills I and II	Clearwater Hills I (102,787)	No. 1	825	175
	Clearwater Hills II (103,249)	No. 2	825	175
		No. 3	825	175
Stone Canyon	Stone Canyon (94,476)	No. 1	250	250
		No. 2	350	250
Racquet Club	Racquet Club Tank (102,313)	-	-	-
Club Estates	Club Estates Standpipe (31,600)	No. 1	150	150
		No. 2	150	150
Clearwater Hills III	Clearwater Hills III (22,148)	No. 1	70	160
		No. 2	70	160
High Cliff	-	No. 1	70	410
		No. 2	70	410
Glenn Drive	-	No. 1	25	180
		No. 2	25	180
		No. 3	25	180
Las Brisas	-	No. 1	100	170
		No. 2	100	170
		No. 3	500	170

COMPUTER MODEL UPDATE

Brown and Caldwell updated the Paradise Valley Water System WaterCAD model created by AAWC in 1997. Specific steps completed during the model update are presented below:

- Updated model from WaterCAD version 5.1 to 6.5.
- Spot checked node elevations using topographic data dated 1986 provided by AAWC.
- The demand allocations for each zone were not verified by Brown and Caldwell against actual usage data. The total model demand was compared to the 2002 water production data.
- Removed pipe configuration in the model to the west of 40th Street as per discussion with AAWC operations.
- Verified and updated, as necessary, pump curves for all pumping facilities.
- Verified system operating setpoints through discussion with AAWC Operations.
- Updated pipe sizes in Starlight, Yucca and Cameldale based on discussion with AAWC operations.
- Modified zone boundary between Racquet Club and Main Zone at Yucca and Cameldale to reflect actual operating conditions, per discussion with AAWC operations.
- Removed cross connections between zones as per discussions with AAWC operations.
- Verified cross connection between Zone 1 and Zone 2 at Hillside Drive. This connection is currently open. Future improvements were modeled without this connection.
- Verified that the physical connection between Zone 2 and Zone 3 is not open at Foothill Drive, in cooperation with AAWC operations, by verifying static pressure on both sides of Tatum Boulevard in the far north part of the the service area.
- Corrected pump intake elevations at Country Club Booster Station.
- Corrected suction and discharge elevations at Miller Road Booster Pump Station.

- Verified demands and demand locations in the Cameldale, Starlight, and Yucca area for large residential users from billing records.
- Added waterline and demands for Sanctuary subdivision.
- Added waterline and demands for Judson subdivision.
- Added Mummy Mountain subdivision and demands.
- Added Las Brisas pressure zone to the model including pump curve and demands.
- Verified demand data for the top ten commercial users from billing records.
- Created average day, maximum day, maximum day with fire flow, and peak hour modeling scenarios from the existing demand data in the model and the water production data for the year 2002.
- Removed Well No. 17 from the model as per discussions with AAWC operations.

WATER MODEL CALIBRATION

Model calibration was conducted by comparing field test results to model results at selected locations. The field test data used were hydrant flows and pressure readings both before and during hydrant tests. The specific procedures for conducting those tests and for calibrating the model from those tests are outlined below:

- Hydrant flow tests were conducted at 22 locations throughout the system on June 11 and August 1, 2003 as shown on Figure 2. Water tank levels and status of pumps were recorded at the time of the hydrant flow tests.
- The model was calibrated using the demand scenario (average day, maximum day, or peak hour) that most closely reflected the system conditions during the fire flow testing.
- Fire demand equal to the flow recorded at the flow hydrant was applied to each node.
- Static and residual pressures at the pressure hydrant were compared to the model results.
- Pipe friction factors were adjusted in the vicinity of the test to achieve results as close as possible to the field test results.

The field test results and model results after calibration are summarized in Table 3. Location, zone and time of test are shown in the table for each flow test. Model results and the demand scenario used for calibration are also shown.

Table 4 presents the modeled pressure ranges for each zone, hydraulic grade line elevations and ground elevations by zone.

ARIZONA AMERICAN W[illegible]ER COMPANY
PARADISE VALLEY W[illegible]ER SYSTEM
FIRE FLOW CAPACITY ASSESSMENT

TABLE 3

LOCATION NUMBER	LOCATION	ZONE	TIME	HYDRANT TESTING				APPROXIMATE MODEL DEMAND	MODEL RESULTS	
				PRESSURE HYDRANT		FLOWING HYDRANT				
				STATIC PRESSURE (psi)	RESIDUAL PRESSURE (psi)	FLOW (gpm)	PRESSURE (psi)		STATIC PRESSURE	RESIDUAL PRESSURE
1	62nd Street between Cactus Wren and Indian Bend	1	6:45 a.m.	37	32	750	20	Peak Hour	37	33 w/ fire at Cactus Wren
2	61st Place and Naumann Drive	1	7:15 a.m.	62	56	1090	42	Peak Hour	61	56
3	Saguaro and McDonald	1	7:35 a.m.	69	64	1140	46	Peak Hour	71	67
4	Saguaro and Palo Verde	1	8:00 a.m.	62	44	480	8	Peak Hour	62	47
5	Horseshoe Lane	1	8:15 a.m.	97	74	1010	36	Peak Hour	102	74
5A	67th Place and Cactus Wren	1	8:30 a.m.	95	78	1320	62	Peak Hour	93	82
6	Scottsdale House	1	9:00 a.m.	92	60	1060	40	Peak Hour	91	60
7	Jackrabbit and Scottsdale Roads	1	9:20 a.m.	76	24	580	12	Peak Hour	102[1]	89[1]
8	Scottsdale Road and McDonald	1	9:40 a.m.	102	90	1405	70	Maximum Hour	106	92
9	N. 73rd Place and East. Ralls Street.	1	10:50 a.m.	120	110	1575	88	Peak Hour	120	109
10	44th Street and Valley Vista Lane	1	11:20 a.m.	59	40	1010	36	Average Day	65	31
11	Lincoln Drive and Hillside Drive	2	11:45 a.m.	62	46	750	20	Maximum Day	60	43
12	Clearwater Parkway and Tatum Blvd	2&3	12:00	42	40	1060	40	Average Day	43*, 37*	N/A

TABLE 3
WATER MODEL CALIBRATION RESULTS (Continued)

LOCATION NUMBER	LOCATION	ZONE	TIME	HYDRANT TESTING				APPROXIMATE MODEL DEMAND	MODEL RESULTS	
				PRESSURE HYDRANT		FLOWING HYDRANT				
				STATIC PRESSURE (psi)	RESIDUAL PRESSURE (psi)	FLOW (gpm)	PRESSURE (psi)		STATIC PRESSURE	RESIDUAL PRESSURE
13	Eliminated – COP system	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14	Lincoln Drive and 52nd Place	1	12:30 p.m.	64	60	1060	40	Average Day	66	60
15	Cactus Wren and Lost Dutchman	1	12:45 p.m.	56	50	340	4	Average Day	55	52
16	Superstition Lane below Racquet Tank	5	1:05 p.m.	8	4	340	4	Average Day	8	7
17	Foothill Drive and Desert Park Place	3	1:30 p.m.	76	26	500	9	Average Day	77	27
18	Moonlight Way and Lakeside Lane	3	7:30 a.m.	82	53	839	11	Peak Hour	87	59
19	Clearway Parkway and Lakeside Lane	3	8:00 a.m.	75	56	1160	48	Peak Hour	75	55
20	46th Place and Indian Bend	2	8:30 a.m.	44	26	500	9	Peak Hour	47	31
21	Lincoln Drive and Hillside Drive[2]	2	9:00 a.m.	60	38	790	22	Peak Hour	60	43
22	McDonald Drive and Yucca Way[3]	1	9:15 a.m.	46	38	790	22	Peak Hour	46	40

*Static pressures at flowing hydrant and pressure hydrant. One of the hydrants selected by Brown and Caldwell for this fire flow test was inoperable. Another adjacent hydrant was selected by the field operations, resulting in the flow and pressure hydrants being located in different zones. For this reason, static pressures only were used in the calibration process for this test.
[1]Several broken valves were subsequently repaired in this area.
[2]Same location as Flow Test 11.
[3]Reflects conversion of Cameldale area to Main Zone from Racquet Club Zone.

Table 4 - Pressure Ranges by Zone

ZONE	ZONE NAME	HGL	MODEL NODE ELEVATION RANGE	MODEL PRESSURE RANGE AVERAGE DAY	MODEL PRESSURE RANGE PEAK HOUR
1	Main Zone	1527.1 maximum (60th Street tank overflow)	1275 to 1450 feet	34 to 167 psi	19 to 163 psi
2	Country Club Zone	1600 maximum (set by CC booster pumps)	1360 to 1510 feet	42 to 109 psi	18 to 83 psi
3	Clearwater Hills Zone	1731.6 maximum (Clearwater Hills Tanks 1 and 2 overflow)	1360 to 1710 feet	11 to 170 psi	13 to 153 psi
4	Stone Canyon Zone	1694.0 maximum (Stone Canyon Tank overflow)	1410 to 1670 feet	10 to 140 psi	13 to 140 psi
5	Racquet Club Zone	1555.0 maximum (Racquet Club tank overflow)	1400 to 1535 feet	9 to 81 psi	2 to 48 psi
6	Club Estates Zone	1661.9 maximum (Club Estates standpipe)	1430 to 1650 feet	45 to 142 psi	46 to 101 psi
7	Clearwater Hills III Zone	1760.5 maximum (Clearwater Hills III tank overflow)	1700 to 1720 feet	24 to 40 psi	25 to 48 psi
8	Highcliff Zone	2070 to 2115 (set by pumps located)	1690 to 1900 feet	74 to 165 psi	74 to 165 psi
9	Glenn Drive Zone	1800 to 1900 (set by pumps located at Club Estates tank)	1655 to 1700 feet	43 to 63 psi	43 to 63 psi
10	Las Brisas Zone	1440 to 1610 (set by Las Brisas pumps)	1450 to 1550 feet	60 to 101 psi	24 to 65 psi

Note: Pressure ranges shown are from the model for 2003 demand scenario.

Several adjustments were required to the model to satisfactorily calibrate Zones 2 and 3. Those adjustments are described. In these locations, the model could initially not deliver the flow produced during the flow test and adjustments to the model were made to produce results that reflect the actual system performance.

- Flow Test No. 7 (Jackrabbit and Scottsdale Roads) – The model predicted greater flow capabilities than were being experienced in the field. Upon investigation by AAWC operations, there were several broken valves that were only partially opened. The valves were replaced which immediately improved the field measured flow and pressure in this area.

- Flow Test No. 10 (44th Street and Valley Vista Lane) – The model predicted lower static pressure and more headloss than experienced during the flow test. An 8-inch water main was added to the model from the Maderos Del Quenta Drive to 44th Street. It appears that, as modeled for calibration, there is a looped waterline bringing water to the area that is not reflected on the system maps. Recommendations for future improvements were made based on modeling that did not include the 8-inch main described above.

- Flow Test Nos. 11 and 21 (Hillside and Lincoln Drives) – The model could not deliver the 750 gpm test pressure that was recorded during the flow test. In the model the pipe connecting the Main Zone and Country Club zones was closed. Based on Brown and Caldwell's recommendation, AAWC Operations conducted a field investigation and found that this connection was actually open. Opening this connection in the model resulted in calibration of this area with the flow tests. This pipe was modeled as closed for subsequent modeling efforts.

- Flow Test Nos. 17 and 18 (Foothill Drive/Desert Park Place, and Moonlight Way/Lakeside Lane) – The model could not deliver the 500 gpm flow recorded for Test No.17 or 839 gpm recorded during Test No. 18. In order to calibrate these areas, the 4-inch discharge piping from Clearwater Hills Booster Pump Station was changed to 6-inch pipe. AAWC potholed the discharge piping on Moonlight Way and found it to be 4 inch as shown on the block maps. Pipe sizes at other locations may be incorrect or there may be another waterline not shown on the maps providing additional water to the north part of the Clearwater Hills Zones. The recommended improvements were based on 4-inch piping as shown on AAWC block maps. This was discussed with AAWC during a progress meeting with the understanding that there is considerable uncertainty in this area of the system, but that improvements based on the model would result in conservative recommendations.

- Flow Test No. 20 (46th Place and Indian Bend Road) – The model could not deliver the 500 gpm flow recorded during the test. This location could be calibrated when the interconnection between Zone 1 and Zone 2 was opened as described above with the discussion on Flow Test Nos. 11 and 21.

During the flow testing, discharge pressures and discharge rates were recorded for the Country Club Booster Pump Station. It became apparent that this booster pump station is operating significantly under rated capacity. This is thought by AAWC operations to be due to damaged impellers. AAWC proposed to replace the impellers on the four pumps at this Booster Pump Station in 2004.

FIRE FLOW ANALYSIS

The fire flow analysis was conducted using the automated WaterCAD software fire flow analysis under maximum day demand conditions and assuming that each storage tank was 10 feet below the top of the tank, and with all pumps running. Fire flows are computed by iteratively assigning demands and computing system pressure. The model assigns the fire flow demand to a node and checks the model, checking to see if all pressure constraints are met at that demand. The model will assign a new demand and re-check the system if a constraint is violated. The WaterCAD fire flow routine runs as follows:

- The fire flow demand (1500 gpm) is added to the modeled domestic demand at a node.
- The model calculates system pressures for all nodes, checking that the constraint (20 pounds per square inch) (psi) is met at all locations.
- The fire flow demand is added to the domestic demand at the next node, and the calculations are repeated for all nodes selected for analysis.
- The model output provides a status (pass/fail) for each node, fire flow available at each node, and the minimum zone pressure for a fire at each node.

MODEL RESULTS

Figure 2 displays the results of the fire flow analysis under existing conditions with the addition of a 12-inch water main programmed for 2004 in Jackrabbit from Scottsdale Road to Invergordon, and in Invergordon from Jackrabbit to McDonald. This 12-inch main will replace existing 4- and 6-inch pipes in those roads. The water model represented on Figure 2 also includes a 12-inch main in Starlight (P-324) which will be built by the homeowner per an

agreement with the water company. Appendix B contains the model results corresponding to Figure 2. The results of the Fire Flow Analysis under Maximum Day 2003 conditions were that more than 40 percent of the nodes in the model could not deliver a fire flow of 1,500 gpm with a minimum system residual pressure of 20 psi.

In general, the system is limited by dramatic changes in elevation, long lengths of 4- and 6-inch pipe, and a single source of water located at the east end of the system. In addition, there is very little storage capacity. The system is operated in ten zones, some of which are very small, and have little or no storage.

The water model does not include the majority of 4-inch pipe that exists. The headlosses of 1500 gpm flow through a 4-inch pipe prevents the delivery of that volume of water for fire control. Therefore, all 4-inch mains that serve fire hydrants need to be replaced.

Main Zone

The Main Zone provides the required fire flow to the majority of users with the exception of the southwest portion of zone. This area is the farthest from the pumping source and has more elevation variation than most of the Main Zone. The existing 6-inch pipe is not sufficiently sized to overcome these physical constraints.

Country Club and Clearwater Hills Zones

Both the Country Club and Clearwater Hills zones experience very limited available fire flows. Generally, long lengths of undersized pipes result in excessive losses.

The areas with fire flows available under 500 gpm in these zones include property west of Tatum Boulevard and north of Lincoln, and the far north part of the system on both side of Tatum Boulevard.

The entire Clearwater Hills Zone is limited in the ability to provide fire flow by over 7,000 feet of 4-inch diameter main serving as discharge piping from the Clearwater Hills Booster Pump Station and 4-inch mains leaving the Clearwater Hills Tanks.

Tatum Canyon forms the far northwest portion of the water system service area. Inadequate flows and pressures in this area are due to a combination of factors. The terrain is mountainous with dramatic elevation differences and the mains are 4- and 6-inch in size.

Smaller Zones

The smaller zones serve between 4 and 30 customers. These seven zones are:

- Stone Canyon

- Racquet Club
- Club Estates
- Glenn Drive
- Highcliff
- Clearwater Hills III
- Las Brisas

These zones have limited pumping capacity and storage in these zones varies from no storage to 100,000 gallons. Using an estimated duration of a fire of 2 hours, a total of 180,000 gallons of storage would be required to provide 1500 gpm.

Many homes in the higher elevations in the Clearwater Hills, Clearwater Hills III, Country Club, and High Cliff zones have individual pumps and hydropneumatic tanks to provide domestic water service. These individual pumps cannot provide enough water for fire flow, and the homes are located at significantly higher elevations than the roadways, where hydrants would be located. These homes must be considered on an individual basis for improvements to provide fire protection.

Stone Canyon Zone. Stone Canyon Zone is equipped with a booster pump station with two 350 gpm pumps and a 100,000 gallon tank. Water from the Stone Canyon Zone feeds the Racquet Tank Zone through a pressure reducing valve. The capacity of the Racquet Club Tank is approximately 100,000 gallons.

Racquet Club Zone. The Racquet Tank Zone includes Cameldale, Starlight and Yucca Streets. The Racquet Club Tank is not at a high enough elevation to pressurize all homes within the zone. Recently, an 8-inch line was installed along Yucca Road and Cameldale Way and looped to the 24-inch line along McDonald Drive. When this portion of the Racquet Club Zone is operated within the main zone, flows improve, but not enough to achieve the required 1500 gpm at 20 psi.

Club Estates and Glenn Drive Zones. The Club Estates Booster Pump Station pumps from the main zone through 6-inch mains to serve approximately 15 customers along Indian Bend Road, 47th Place, Glenn Drive and Arroyo Road. The only storage for this zone is a standpipe with a capacity of approximately 32,000 gallons. A small pump and hydropneumatic tank are located along Glenn Drive and pumps to four customers located at higher elevations along Glenn Drive. Club Estates is provided with two 100 gpm pumps. Glenn Drive is provided with three 25 gpm pumps. These systems provide neither pumping capacity nor storage to provide the desired 1500 gpm fire flow.

Las Brisas Zone. The Las Brisas subdivision has no storage. This subdivision consists of 30 lots. Their booster pump station is equipped with two 100 gpm pumps and a 500 gpm pump. Therefore, the Las Brisas Booster Pump Station cannot provide 1500 gpm for fire protection.

Highcliff Zone. Highcliff Zone is equipped with two 60 gpm pumps and no storage. This zone serves four customers.

Clearwater Hills III Zone. Two 70 gpm pumps located at the Clearwater Hill Tank 1 site, pump water up to the Clearwater Hills Zone. The four residents served by the Clearwater Hills Zone each own their own pump-to-pump water from the Clearwater Hills III tank to their residences which are located at higher elevations than the tank. There are a number of empty lots in this zone.

RECOMMENDATIONS

Brown and Caldwell used the WaterCAD model to develop and measure the affects of system improvements to provide the required fire flow to all nodes in the model. The recommendations are based on the system as reflected on the system maps, with no cross connections between zones. The recommendations were modeled with 2017 estimated demands.

The 2017 demands were calculated based on the updated 2003 demands generated with this project. The 2003 demands were multiplied by a factor of 1.125 to generate a total system demand of 19.40 million gallons per day, as predicted in the 1999 Water Master Plan report. The 2017 demand scenario represents build out of the service area.

Figure 3 presents the model results after all of the recommended improvements are made. The model reports corresponding to Figure 3 are included in Appendix C.

Figure 4 displays the location and short description of the recommended projects. Each project is described in more detail below.

The recommended projects were presented to the AAWC Paradise Valley Water Users Group for discussion. The group was provided with a map showing the fire flows available for different areas of the system, the locations of the projects, an estimated cost for each project, the number of users benefiting, and the cost per user benefits. The Water Users Group defined evaluation criteria and assigned a weight for each criterion. The projects were prioritized based on this criteria and information presented. The most important criteria were the criticality of the area (those areas with the lowest available fire flows were given highest priority) and the cost effectiveness (most users benefited per dollar).

The initial priority list of projects was reviewed by AAWC, and some modifications were made based on engineering and construction considerations. For example, two projects in Tatum Boulevard were scheduled for the same year to minimize impact to residents. The revised list of projects was then presented to the Water Users Group and endorsed by that group for presentation to the Town of Paradise Valley and incorporation into the AAWC Capital Improvements Program.

The project numbers contained in this report correspond to the priority placed on the project by that group. Recommendations A through E were not considered for prioritization by the Water Users Group because they have already been programmed by AAWC.

Recommendation A – Valve Study

The Valve Study will ensure that valves are exercised, verify the locations of valves, determine whether valves are fully opened or closed, and verify their condition. Several broken valves were found to be obstructing the flow and there was uncertainly as to whether physical connections between zones were opened or closed.

The Valve Study could be phased over a period of years, with priority on areas that are the most critical for system operation, or areas where information is most needed, such as the Clearwater Hills Zone in the vicinity of the booster station.

Recommendation B – Fire Hydrant Installation

The fire hydrant coverage within Paradise Valley is sparse. The Town of Paradise Valley is now conducting a study to identify where hydrants are needed, and the recommended spacing of hydrants. Hydrant coverage for the system within the City of Scottsdale is adequate. There is no requirement for hydrant spacing for areas in unincorporated Maricopa County.

For the purposes of cost estimating, Brown and Caldwell estimated that 200 fire hydrants would be required to provide hydrants at a spacing of 300 to 500 feet throughout the system. It is recommended that where 4-inch mains are replaced with 6- or 8-inch mains (See Recommendation C below) fire hydrants are installed at that time. As applicable, the cost of hydrants is included with the cost of recommended replacement projects in the cost tables in this report. Figure 5 shows the location of existing and future fire hydrants and proposed phasing.

Recommendation C – Replace 4-inch Water Mains Within a Minimum 6-Inch Size

Headlosses through a 4-inch size main line are so great that they prevent fire flows of 1500 gpm from being delivered at 20 psi residual pressure. Brown and Caldwell estimated from the system maps that approximately 80,000 lineal feet of 4-inch water mains will remain after the system improvements enumerated below are constructed. A minimum of 6-inch diameter pipe is recommended for service to fire hydrants.

As a general recommendation, water mains should be looped whenever possible. This will increase available fire flow, reduce pressure losses and provide increased reliability.

Figure 5 displays the location of 4-inch mains as shown on the AAWC system maps.

Recommendation D – Replace Impellers at the Country Club Booster Pump Station

At the time that data was collected for this report, the Country Club Booster Pump Station was equipped with four pumps rated at 900 gpm capacity each. Each of these pumps was operating at approximately half the rated capacity. AAWC operations reported that this was due to damaged impellers. The impellers were replaced in December 2003 and found to be highly deteriorated.

Any improvement to the pumping capacity at the Country Club Booster Pump Station will improve the available fire flows, not only in the Country Club Zone, but in the Clearwater Hills Zone as well. The Clearwater Hills Booster Pump Station receives water from the Country Club Zone.

Recommendation E – Jackrabbit/Invergordon Main Replacement

The existing mains in Jackrabbit and Invergordon are 4- and 6-inch in diameter. A 12-inch main is recommended from Scottsdale Road west in Jackrabbit to Invergordon, and north in Invergordon to McDonald, to provide necessary fire flow. The 4-inch mains north of Jackrabbit must be upsized to 6-inch to provide fire flows to residences in this area. The installation of 6-inch mains should include installation of fire hydrants.

Project No. 1 – 16-inch Main in Lincoln Drive, 500 gpm Pump Station Serving Country Club Zone. Pipe in the long lengths of pipe from the Country Club Booster Pump Station prevent delivery of adequate water to meet fire flows. The recommended improvements will provide water into the zone from a second location and direction. The proposed improvements will deliver more water to the western part of the Main Zone, and provide water for a proposed new booster pump station on Lincoln Drive at Hillside Drive.

There exist 16- and 24-inch mains in Lincoln Drive from the Miller Road source to roughly 750 feet east of Tatum Boulevard. The recommended project would extend a 16-inch water main 4500 feet to the west in Lincoln Drive, from 32nd Place to west of 43rd Place.

Project No. 2 – 500 GPM Booster Pump Station Serving Clearwater Hills Zone. The Clearwater Hills Zone experiences similar problems to the Country Club Zone in that those areas in the zone furthest from the pumping source experience inadequate fire flows. The 16-inch main constructed with Project 1 will also provide water for the suction side of the proposed Clearwater Hills Booster Pump Station on Lincoln, west of 43rd Place.

Project No. 3 – 6-inch Water Main in Tatum Boulevard, North. The existing waterline in Tatum Boulevard is the main source of water for the north part of the Country Club Zone. The existing main is undersized for the length required, resulting in excessive headlosses. A new 16-inch main in Tatum Boulevard is recommended from Indian Bend Road to the north

boundary of the service area at Desert Jewel Drive. This approximately 5,200 lineal feet of new main will provide fire protection to the north and south ends of the Country Club Zone.

Project No. 4 – 8-inch Water Mains in Southern Part of the Country Club Zone, West of Tatum. The improvements produce localized benefits by providing a loop and upsizing the existing water mains. This project includes 2,500 lineal feet of water main in 48th Street and Joshua Tree Lane, 600 lineal feet of 8-inch water main in Clearwater Parkway and Quartz Mountain Drive, and 75 lineal feet of 8-inch water main from the suction side of the Clearwater Hills Booster Pump Station to Hillside Drive. These improvements will reduce headlosses and help deliver more water at a higher head.

Project No. 5 – Upsize Discharge Piping from Clearwater Hills Booster Pump Station. The existing discharge piping is undersized resulting in excessive headlosses at a critical location in the system. Moreover, there are significant variations in elevation in the Clearwater Hills Zone, aggravating the affect of the piping deficiencies.

The existing piping in Moonlight Way, Clearwater Parkway, Sparkling Lane, Brookview Way, and Crystal Lane is 4 inches in diameter and should be upsized to 8 inches. The existing 6 inches in Moonlight Way should be replaced with 12 inches. This recommendation will significantly improve flows to all of the Clearwater Hills Zone.

Project No. 6 – Combine Stone Canyon and Racquet Club Zones. The existing Racquet Club Tank is not high enough to provide adequate fire flow to the homes in the area. The Racquet Club Tank overflow elevation is 1555 feet above sea level, while the 60th Street Tank overflow is 1527 feet above sea level. The Stone Canyon Tank overflow is at 1694 feet above sea level.

Combining the two zones will make the storage from Stone Canyon available to both zones, and will make the pumping capacity from a new booster pump station available to homes in both the Racquet Club and Stone Canyon zones.

A booster pump station is required to provide fire flow to homes located along Starlight Way. We recommend that a new 12-inch main be constructed for the discharge from this new booster pump station, and that this 12-inch main be connected to the Stone Canyon system in the vicinity of the Racquet Club Tank.

As the Racquet Club Tank is ineffective in its current location and elevation, it would be better utilized in the Main Zone. Main Zone storage is located at Miller Road and at the 60th Street Tank. The Racquet Club Tank can be used to boost pressures in the immediate surrounding Main Zone. A control valve would be required to close the water line to the Main Zone when the tank is filling from the new booster pump station, and to open the line to the Main Zone when the pump is off. The pump and valve should be controlled by high and low water level setpoints. The

existing valve located in a vault directly in front of the Racquet Club tank can be used for this purpose.

Another benefit of operating the system as described above is that the new 1500 gpm fire pump will cycle on and off, rather than lie dormant until a fire event occurs.

Connection of the Racquet Club Tank to the Main Zone will require constructing 1000 linear feet of new 8-inch water main along Superstition Lane to McDonald.

A pressure reducing valve should be provided between the existing 4-inch main in Starlight and the new 12-inch main. In this way, water can be delivered from the 12 inch to the 4 inch in the event of a pressure drop under fire demand.

The pressures in the lower elevations of Stone Canyon Zone appear to be over 100 psi under current day conditions due to the elevation of the Stone Canyon Tank. The tank overflow elevation is 1694 feet above sea level while the homes nearest McDonald are at an elevation of approximately 1420 feet. This elevation difference equates to 119 psi. The connection of the two zones will raise the pressures to approximately 155 psi under maximum day demand conditions, somewhat. If individual residences in the lower elevations are not already equipped with pressure reducing valves on their service lines, these should be installed prior to executing this conversion.

Project No. 7 – Install 8-inch Water Main in Clearwater Parkway. In order to deliver the required fire flow to the highest lots on Clearwater Parkway, the existing 6-inch water main in Clearwater Parkway from Mountain View to Red Ledge Drive must be upsized to 8 inch.

Project No. 8 – Install 16-inch Water Main in McDonald and 44th Street. Approximately 8,400 linear feet of 16-inch diameter pipe should be installed in McDonald and 44th Streets. This pipe will increase the amount of water to the southwest part of the Main Zone, furthest from the pumping source, and will benefit Main Zone, Country Club and Clearwater Hills Zones, in conjunction with Project Nos. 1 and 2.

Project No. 9 – Install 1800 Linear Feet of 8-inch Water Main in Tatum. This improvement would replace an existing 4-inch water main serving lots adjacent to Tatum, just north of Lincoln, within the Main Zone. The existing 4-inch main is undersized to provide fire flows to this immediate area.

Project No. 10 – Replace existing 6-inch in the Far North of the Country Club Zone. This project would upsize 4850 linear feet to 8-inch size in Desert Jewel Drive and Foothill Drive, and 2100 linear feet to 12 inch in 54th Street and Roadrunner. These larger water mains will deliver water from the 16-inch water main constructed as Project No. 3 in Tatum to neighborhoods in this north part of the service area.

Project No. 11 – Las Brisas Zone Improvements. Customers in the Las Brisas Zone are served by a booster pump station pumping from the Country Club Zone. The zone will ultimately serve 30 customers. A 500 gpm fire pump is provided. There is no storage in this system. The recommended improvement included replacing the existing 500 gpm pump with a 1500 gpm fire pump and replace 750 linear feet of the existing 6-inch discharge piping with 8-inch diameter piping.

Project No. 12 – Tatum Canyon Improvements. Two alternatives (Projects 12A and 12B) are presented on Figure 4 for this area. Tatum Canyon, located in the far northwest part of the service area, is limited for fire flow by the high elevation and length of 4-inch and 6-inch pipe from the discharge of Clearwater Hills Booster Pump Station. Improvement No. 5, the upsize of the discharge piping for Clearwater Hills Booster Pump Station should radically improve fire flows in this area.

The improvement shown as No. 12A consists of replacing approximately 8000 linear feet of 6-inch piping from the Clearwater Hills Booster Pump Station all the way around the loop formed by Desert Park Place and Foothill Drive. We recommend that this 8000 linear feet be constructed in two phases, the first phase being the 3000 linear feet from Moonlight Way to Desert Park Place. This phase may be adequate to provide the required fire flows. The remaining 5000 linear feet comprises the loop around Desert Park Place and Foothill Drive.

Alternative No. 12B is that of providing a booster pump station at Foothill Drive, west of Tatum to introduce water from the Country Club Zone into the Clearwater Hills Zone at the far north end. Project No. 12A is preferred because of the lower ongoing maintenance and replacement costs of a water line versus a pump station.

Also included in Project Nos. 12A and 12B is installation of 300 lineal feet of 8-inch water main from Moonlight Way to Sparkling Way to provide additional looping in this part of the Clearwater Hills Zone.

Project No. 13 – Loop Mummy Mountain Area. The Mummy Mountain area, formerly served by the Mummy Mountain Water Company, is located north of Lincoln Drive and east of Invergordon. The area requires looping to achieve fire flow. The recommended improvements are 150 lineal feet of 8-inch water main connecting the 8-inch line in 65th Place to the 8-inch line in Cactus Wren and 500 lineal feet of 6-inch main connecting the existing 6-inch main in Sierra Vista Road to the existing main in Lincoln.

Project No. 14 – 8-inch Main in Invergordon, North of Chaparral. To improve fire flows in the southeastern part of the Main Zone, 1700 lineal feet of 8-inch water main should be installed in Invergordon, north of Chaparral. This will replace the existing 4-inch at that location.

Project No. 15 – 8-inch Main in Chaparral Road Approximately 2700 linear feet of 4-inch main that exists in Chaparral Road between Scottsdale Road and 68th Street should be replaced with 8 inch in Chaparral, between Scottsdale Road and 68th Street.

Project No. 16 – Water Main Replacements in North Central Part of Country Club Zone. The existing 6-inch water mains in Lost Dutchman, Indian Bend Road, 56th Place, Joshua Tree Lane and 62nd Street should be replaced with 8 inch. In addition, 900 lineal feet of 4 inch in Joshua Tree Lane, 63rd Place and Invergordon should be replaced with 8 inch.

Project No. 17 – Water Main Replacement in Southwest Portion of Main Zone. Figure 3 displays two alternatives for Project No. 17. The existing system needs to be looped in this area. This can be done as shown in Project No. 17A by installing 1300 lineal feet of 6-inch water main from Hogan Circle to Claremont Avenue and from Hogan to 42nd Street, and 1420 linear feet of 8-inch water main in Keim Drive.

If it is not possible to obtain easements for the 6-inch water mains, the same improvement in fire flows requires replacing all of the existing 6-inch piping in Keim Drive, 41st Street and Bethany Home Road with 8200 lineal feet of 8-inch water main.

Project No. 18 – Club Estates/Glenn Drive Improvements. In order to achieve fire flow for Club Estates Zone, we recommend the installation of a 1500 gpm fire pump at the existing Club Estates Booster Pump Station on 59th Place. In addition, 2300 linear feet of 12-inch water main must be installed in 59th Place and Glenn Drive.

Project No. 19 – Stone Canyon 4-Inch Main Replacements. Approximately 300 lineal feet of 4-inch water main should be replaced with 8 inch in 52nd Place, San Miguel Avenue, Solano Drive, and 54th Street to provide fire flow to approximately 18 lots within the Stone Canyon Zone.

Project No. 20 – Highcliff Zone Improvements. A 1500 gpm fire pump and 1600 lineal feet of 8-inch fire line must be installed to provide fire protection to four lots comprising the Highcliff Zone. A less costly solution may be retrofitting the existing homes with sprinklers. The feasibility of using hydrants located in the adjacent Clearwater Hills Zone should also be examined for each of the lots in this zone.

Project No. 21 – Clearwater Hills III Zone Improvements. A simple solution is not available for the Clearwater Hills III. Water is pumped from a booster station located at the Clearwater Hills I Tank, through approximately 500 feet of 4-inch water main to the Clearwater Hills III Tank, an elevation difference of approximately 30 feet. The overflow elevation of Clearwater Hills III Tank is 1760.5 feet above sea level. The terrain in this area is extremely mountainous and the surrounding lots range in elevation from 1700 to 1950 feet above sea level. The four lots that have been developed use individual booster pump stations to provide water for domestic service.

The recommended project would install a 1500 gpm fire pump at the Clearwater Hills Tank No. 2 and an 8-inch fire line up to the end of the existing access road and to connect a fire hydrant to that new 8-inch line.

Another solution would be to construct a tank at the highest elevation possible on one of the lots on Silvercrest Way. A pump from the Clearwater Hills Zone and an 8-inch water main from the pump to the new tank would be necessary.

Any of the above solutions represents a very high cost to the four homeowners affected. There appear to be three additional lots that remain undeveloped in this area.

A less costly solution may be retrofitting the existing homes with sprinklers, and requiring any new homes in the area to be equipped with sprinkler.

Model Improvements. In addition to the system improvements described above, Brown and Caldwell recommends that the water model be improved and used as a tool to periodically review system adequacy and analyze proposed improvements. In order to improve the model and make it more reliable the following should be accomplished:

- Perform a valve study (See Recommendation A above)
- Update system maps to include new waterlines and verify pipe sizes.
- Determine the typical diurnal demand pattern for each zone.
- Examine storage needs. The existing system has deficient storage capacity. The model, once updated, should be run in extended period simulation to determine optimum storage required. An increase in storage capacity will help maintain uniform water pressures, increase system reliability and equalize demands to allow a more uniform rate of pumping and to allow pumping during off peak power rates.

Model Limitations. Based on the project scope, this Fire Flow Capacity Assessment was based on steady state modeling. Steady state modeling presents a snapshot of the system under certain boundary conditions. In contrast, extended period simulation provides information on how the system behaves over a range of boundary conditions. It was outside the scope of this project to conduct extended period simulation.

This model does not take into certain system operational features such as the connection between Country Club Tanks to the Main Zone. The way the system is operated, the 60th Street Tank in the Main Zone is emptying during peak demand conditions. When the tank level reaches less

than 12 feet, the tank is filled from the Country Club Zone. The demand from the Main Zone on the Country Club Zone is not metered, and is not modeled.

A similar situation exists between the Stone Canyon and Racquet Club Tanks. Water is pumped from the Main Zone into the Stone Canyon Tank. The Racquet Club Tank is filled from the Stone Canyon system, controlled by an altitude valve.

Steady state modeling will not reveal water storage deficiencies. Brown and Caldwell examined storage capacity by zone and included this consideration in development of recommended improvements. However, a comprehensive study of storage capacity could optimize system performance.

IMPLEMENTATION PLAN

Planning level costs for the improvements described above are presented in Tables 5 and 6. Table 5, Cost Estimate for Recommended Improvements, presents the costs for each project in the priority order established during the Water Users Group meetings. Table 6 presents the Proposed Project Phasing with the 4-inch mains replacements and fire hydrant installations grouped with the recommended main line replacements. The total cost of recommended projects presented in Table 5 is $15.5 million. Table 7 presents a timeline for the recommended improvements with design and construction costs color coded.

Under Year 2008 in Table 6, a re-evaluation of the system is included. This re-evaluation would include an update of the water model and flow tests to verify system conditions and calibrate the model. This project revealed some uncertainties in the system configuration and improvements in certain areas, especially in the upper elevations of the Clearwater Hills Zone.

The proposed phasing plan includes all projects except Nos. 20 and 21. These projects consist of improvements to two of the smaller zones serving four customers each. AAWC represented at the Water Users Group meeting that they would continue to look at options for providing fire flow to all users, and that there may be alternatives to the recommended projects presented.

ARIZONA -AMERICAN WATER

PARADISE VALLEY WATER SYSTEM

FIRE FLOW CAPACITY ASSESSMENT

MARCH 2004

BROWN AND CALDWELL

Environmental Engineers & Consultants

ARIZONA AMERICAN WATER COMPANY
PARADISE VALLEY WATER SYSTEM
FIRE FLOW CAPACITY ASSESSMENT

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CERTIFICATE NO. 27807
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ARIZONA, U.S.A.

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FIGURE 3 MAXIMUM DAY DEMAND ANALYSIS WITH PROPOSED IMPROVEMENTS
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APPENDICES

APPENDIX A PUMP CURVES
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ARIZONA AMERICAN WATER COMPANY
PARADISE VALLEY WATER SYSTEM
FIRE FLOW CAPACITY ASSESSMENT

EXECUTIVE SUMMARY

The Arizona-American Water Company (AAWC) Paradise Valley Fire Flow Capacity Assessment presents the requirements to upgrade the existing water system to enable it to provide 1,500 gallons per minute fire flow at a minimum 20 pounds per square inch pressure at all locations. The fire flow criteria was provided by the Town of Paradise Valley to all three of its water providers, including AAWC. The AAWC system was not originally designed to provide fire flow and as a result many of the waterlines are inadequately sized for fire protection.

The AAWC system source water is located at the far east end of a system that is longer from east to west than it is from north to south. The source water is provided from seven groundwater wells located on Miller Road. All water is delivered to the system through two facilities: the Miller Road Treatment Facility and the Miller Road Booster Station. The system is operated in ten pressure zones. The Main Zone serves 78 percent of customers, and three zones (Main Zone, Country Club Zone, and Clearwater Hills Zone) together serve approximately 96 percent of customers.

The analysis of system adequacy to meet fire flow requirements was performed using an existing WaterCAD model. Brown and Caldwell updated the model, verified pump curves and elevations, met extensively with Operations staff, and reviewed as-builts and water system block maps to verify the physical improvements included in the model.

The model was calibrated based on field test data. Fire flow tests were performed at 22 locations throughout the system. Pressure and flows from these tests were compared to model results, and pipe friction factors were adjusted in the vicinity of each flow test to achieve results as close as possible to the field test results.

The calibrated model was used to predict the available fire flow under current day conditions. The system deficiencies are caused by dramatic changes in elevation, long lengths of 4-inch and 6-inch pipe, and a single source of water located at one end of the system.

A comprehensive list of improvements was developed that, once completed, will allow the system to deliver the required fire flow to all customers. This list was prioritized by a citizen group organized by AAWC called the Water Users Group. Over the course of four meetings, the group reviewed the system deficiencies, the recommended improvements and their associated costs, developed a weighted list of evaluation criteria, and endorsed the final proposed schedule.

The recommended improvements have been phased over a 6-year period. The improvements scheduled for the first year (2004) consist of a new 12-inch water main in Jackrabbit and Invergordon and the installation of a number of fire hydrants in areas where the system is currently able to provide fire flow, but hydrants are not provided.

The total estimated cost of improvements is $15.6 million. This includes two projects, Projects 20 and 21, that should be re-evaluated in the future. Projects 20 and 21 address fire flow capacity for the High Cliff and Clearwater Hills III zones, which serve only 8 homes. The estimated cost of these projects is $963,700 for Project 20 and $394,335 for Project 21. These costs should be weighed against the cost of other options such as house sprinklers. The phasing plan presented in this report does not include Projects 20 and 21.

ARIZONA AMERICAN WATER COMPANY
PARADISE VALLEY WATER SYSTEM
FIRE FLOW CAPACITY ASSESSMENT

PROJECT OBJECTIVE AND SCOPE

Brown and Caldwell was contracted by the Arizona-American Water Company (AAWC) to conduct the Paradise Valley Fire Flow Capacity Assessment. The purpose of this investigation was to identify system improvements needed to provide reliable fire flow to all customers within the service area.

The scope of work for the project included:

- Collect and update the existing AAWC WaterCAD computer model of the Paradise Valley system.
- Calibrate the model.
- Model maximum day demand with 1500 gallons per minute (gpm) fire flow.
- Identify necessary system improvements.
- Work in conjunction with AAWC and the Paradise Valley Water Users Group to prioritize improvements and develop a Capital Improvement Program.

SYSTEM OVERVIEW

The service area for the AAWC water system is approximately 4 ½ miles wide from east to west, and 3 miles long from north to south. The service area includes portions of the Town of Paradise Valley, the City of Scottsdale, the City of Phoenix, and unincorporated Maricopa County.

The AAWC Paradise Valley Water System is operated in ten zones. The pressure zones are shown on Figure 1. The sources of water for the system are seven wells located at the eastern boundary of the service area near Miller Road. All of the water is conveyed to either the Miller Road Treatment Facility or the Miller Road Booster Pump Station, with the exception of Well No. 16, which discharges directly to the distribution system. Water is then supplied from these two facilities to the distribution system.

Table 1 displays the number of water users (accounts) in each zone. Approximately 96 percent of the total demand is in three zones: Main Zone, Country Club Zone and Clearwater Hills Zone. The Main Zone represents approximately 78 percent of total system peak demand, the Country Club Zone demand comprises approximately 12 percent of peak demand, and the Clearwater Hills Zone comprises approximately 6 percent of the total peak demand.

TABLE 1 - NUMBER OF WATER USERS BY ZONE

ZONE NAME	NUMBER OF USERS
Main	3600
Country Club	550
Clearwater Hills I and II	275
Stone Canyon	58
Racquet Club	25
Club Estates	15
Clearwater Hills III	4
High Cliff	4
Glenn Drive	4
Las Brisas	30
TOTAL	***4,565***
Source: Paradise Valley Water Company Comprehensive Planning Study, 1999	

DATA COLLECTION

Brown and Caldwell collected system information for this project including the water system maps, topography, pump curves, and storage volumes. A summary of the pumping and storage facilities by zone is presented in Table 2. The pump curves collected are included in Appendix A.

The system information collected by Brown and Caldwell is listed below:

- Water system block maps.
- Topography and aerial photography.
- Pump curves for Miller Road facilities and booster pump stations.
- Storage tank dimensions and control levels.
- Demand data for the following subdivisions/areas: Judson, Mummy Mountain, selected locations at Starlight and Cameldale, top ten water users.

- 2002 water production data.
- Water usage by account for all accounts for summer 2002.
- County assessor parcel information for the Judson subdivision, and Mummy Mountain.
- As-builts for the following: Country Club tanks inlet piping, Judson subdivision, 8-inch mains in Cameldale and Yucca.

TABLE 2 - AAWC PARADISE VALLEY WATER SYSTEM
SUMMARY OF STORAGE AND PUMPING CAPACITY BY ZONE

ZONE NAME	STORAGE FACILITY (GALLONS OF STORAGE)	PUMPS	RATED CAPACITY (GALLONS PER MINUTE)	TOTAL DYNAMIC HEAD (FEET)
Main	60th Street Tank (203,407)	MRBS #1	800	335
	Miller Road #1 (151,524)	MRBS #2	800	335
	Miller Road #2 (358,837)	MRBS #3	2800	335
	MRTF (485,000)	MRBS #4	1200	335
	Miller Road Sand Trap (192,228)	MRTF #1	3300	360
		MRTF #2	3300	360
		MRTF #3	3300	360
Country Club	Country Club #1 (508,800)	No. 1	900	100
	Country Club #2 (360,880)	No. 2	900	100
		No. 3	900	100
		No. 4	900	100
Clearwater Hills I and II	Clearwater Hills I (102,787)	No. 1	825	175
	Clearwater Hills II (103,249)	No. 2	825	175
		No. 3	825	175
Stone Canyon	Stone Canyon (94,476)	No. 1	250	250
		No. 2	350	250
Racquet Club	Racquet Club Tank (102,313)	-	-	-
Club Estates	Club Estates Standpipe (31,600)	No. 1	150	150
		No. 2	150	150
Clearwater Hills III	Clearwater Hills III (22,148)	No. 1	70	160
		No. 2	70	160
High Cliff	-	No. 1	70	410
		No. 2	70	410
Glenn Drive	-	No. 1	25	180
		No. 2	25	180
		No. 3	25	180
Las Brisas	-	No. 1	100	170
		No. 2	100	170
		No. 3	500	170

COMPUTER MODEL UPDATE

Brown and Caldwell updated the Paradise Valley Water System WaterCAD model created by AAWC in 1997. Specific steps completed during the model update are presented below:

- Updated model from WaterCAD version 5.1 to 6.5.
- Spot checked node elevations using topographic data dated 1986 provided by AAWC.
- The demand allocations for each zone were not verified by Brown and Caldwell against actual usage data. The total model demand was compared to the 2002 water production data.
- Removed pipe configuration in the model to the west of 40th Street as per discussion with AAWC operations.
- Verified and updated, as necessary, pump curves for all pumping facilities.
- Verified system operating setpoints through discussion with AAWC Operations.
- Updated pipe sizes in Starlight, Yucca and Cameldale based on discussion with AAWC operations.
- Modified zone boundary between Racquet Club and Main Zone at Yucca and Cameldale to reflect actual operating conditions, per discussion with AAWC operations.
- Removed cross connections between zones as per discussions with AAWC operations.
- Verified cross connection between Zone 1 and Zone 2 at Hillside Drive. This connection is currently open. Future improvements were modeled without this connection.
- Verified that the physical connection between Zone 2 and Zone 3 is not open at Foothill Drive, in cooperation with AAWC operations, by verifying static pressure on both sides of Tatum Boulevard in the far north part of the the service area.
- Corrected pump intake elevations at Country Club Booster Station.
- Corrected suction and discharge elevations at Miller Road Booster Pump Station.

- Verified demands and demand locations in the Cameldale, Starlight, and Yucca area for large residential users from billing records.
- Added waterline and demands for Sanctuary subdivision.
- Added waterline and demands for Judson subdivision.
- Added Mummy Mountain subdivision and demands.
- Added Las Brisas pressure zone to the model including pump curve and demands.
- Verified demand data for the top ten commercial users from billing records.
- Created average day, maximum day, maximum day with fire flow, and peak hour modeling scenarios from the existing demand data in the model and the water production data for the year 2002.
- Removed Well No. 17 from the model as per discussions with AAWC operations.

WATER MODEL CALIBRATION

Model calibration was conducted by comparing field test results to model results at selected locations. The field test data used were hydrant flows and pressure readings both before and during hydrant tests. The specific procedures for conducting those tests and for calibrating the model from those tests are outlined below:

- Hydrant flow tests were conducted at 22 locations throughout the system on June 11 and August 1, 2003 as shown on Figure 2. Water tank levels and status of pumps were recorded at the time of the hydrant flow tests.
- The model was calibrated using the demand scenario (average day, maximum day, or peak hour) that most closely reflected the system conditions during the fire flow testing.
- Fire demand equal to the flow recorded at the flow hydrant was applied to each node.
- Static and residual pressures at the pressure hydrant were compared to the model results.
- Pipe friction factors were adjusted in the vicinity of the test to achieve results as close as possible to the field test results.

The field test results and model results after calibration are summarized in Table 3. Location, zone and time of test are shown in the table for each flow test. Model results and the demand scenario used for calibration are also shown.

Table 4 presents the modeled pressure ranges for each zone, hydraulic grade line elevations and ground elevations by zone.

ARIZONA AME. .AN WATER COMPANY
PARADISE VALLEY WATER SYSTEM
FIRE FLOW CAPACITY ASSESSMENT

TABLE 3`

LOCATION NUMBER	LOCATION	ZONE	TIME	HYDRANT TESTING				APPROXIMATE MODEL DEMAND	MODEL RESULTS	
				PRESSURE HYDRANT		FLOWING HYDRANT				
				STATIC PRESSURE (psi)	RESIDUAL PRESSURE (psi)	FLOW (gpm)	PRESSURE (psi)		STATIC PRESSURE	RESIDUAL PRESSURE
1	62nd Street between Cactus Wren and Indian Bend	1	6:45 a.m.	37	32	750	20	Peak Hour	37	33 w/ fire at Cactus Wren
2	61st Place and Naumann Drive	1	7:15 a.m.	62	56	1090	42	Peak Hour	61	56
3	Saguaro and McDonald	1	7:35 a.m.	69	64	1140	46	Peak Hour	71	67
4	Saguaro and Palo Verde	1	8:00 a.m.	62	44	480	8	Peak Hour	62	47
5	Horseshoe Lane	1	8:15 a.m.	97	74	1010	36	Peak Hour	102	74
5A	67th Place and Cactus Wren	1	8:30 a.m.	95	78	1320	62	Peak Hour	93	82
6	Scottsdale House	1	9:00 a.m.	92	60	1060	40	Peak Hour	91	60
7	Jackrabbit and Scottsdale Roads	1	9:20 a.m.	76	24	580	12	Peak Hour	102[1]	89[1]
8	Scottsdale Road and McDonald	1	9:40 a.m.	102	90	1405	70	Maximum Hour	106	92
9	N. 73rd Place and East. Ralls Street.	1	10:50 a.m.	120	110	1575	88	Peak Hour	120	109
10	44th Street and Valley Vista Lane	1	11:20 a.m.	59	40	1010	36	Average Day	65	31
11	Lincoln Drive and Hillside Drive	2	11:45 a.m.	62	46	750	20	Maximum Day	60	43
12	Clearwater Parkway and Tatum Blvd	2&3	12:00	42	40	1060	40	Average Day	43*, 37*	N/A

TABLE 3
WATER MODEL CALIBRATION RESULTS (Continued)

LOCATION NUMBER	LOCATION	ZONE	TIME	HYDRANT TESTING				APPROXIMATE MODEL DEMAND	MODEL RESULTS	
				PRESSURE HYDRANT		FLOWING HYDRANT				
				STATIC PRESSURE (psi)	RESIDUAL PRESSURE (psi)	FLOW (gpm)	PRESSURE (psi)		STATIC PRESSURE	RESIDUAL PRESSURE
13	Eliminated – COP system	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
14	Lincoln Drive and 52nd Place	1	12:30 p.m.	64	60	1060	40	Average Day	66	60
15	Cactus Wren and Lost Dutchman	1	12:45 p.m.	56	50	340	4	Average Day	55	52
16	Superstition Lane below Racquet Tank	5	1:05 p.m.	8	4	340	4	Average Day	8	7
17	Foothill Drive and Desert Park Place	3	1:30 p.m.	76	26	500	9	Average Day	77	27
18	Moonlight Way and Lakeside Lane	3	7:30 a.m.	82	53	839	11	Peak Hour	87	59
19	Clearway Parkway and Lakeside Lane	3	8:00 a.m.	75	56	1160	48	Peak Hour	75	55
20	46th Place and Indian Bend	2	8:30 a.m.	44	26	500	9	Peak Hour	47	31
21	Lincoln Drive and Hillside Drive[2]	2	9:00 a.m.	60	38	790	22	Peak Hour	60	43
22	McDonald Drive and Yucca Way[3]	1	9:15 a.m.	46	38	790	22	Peak Hour	46	40

*Static pressures at flowing hydrant and pressure hydrant. One of the hydrants selected by Brown and Caldwell for this fire flow test was inoperable. Another adjacent hydrant was selected by the field operations, resulting in the flow and pressure hydrants being located in different zones. For this reason, static pressures only were used in the calibration process for this test.
[1]Several broken valves were subsequently repaired in this area.
[2]Same location as Flow Test 11.
[3]Reflects conversion of Cameldale area to Main Zone from Racquet Club Zone.

Table 4 - Pressure Ranges by Zone

ZONE	ZONE NAME	HGL	MODEL NODE ELEVATION RANGE	MODEL PRESSURE RANGE AVERAGE DAY	MODEL PRESSURE RANGE PEAK HOUR
1	Main Zone	1527.1 maximum (60th Street tank overflow)	1275 to 1450 feet	34 to 167 psi	19 to 163 psi
2	Country Club Zone	1600 maximum (set by CC booster pumps)	1360 to 1510 feet	42 to 109 psi	18 to 83 psi
3	Clearwater Hills Zone	1731.6 maximum (Clearwater Hills Tanks 1 and 2 overflow)	1360 to 1710 feet	11 to 170 psi	13 to 153 psi
4	Stone Canyon Zone	1694.0 maximum (Stone Canyon Tank overflow)	1410 to 1670 feet	10 to 140 psi	13 to 140 psi
5	Racquet Club Zone	1555.0 maximum (Racquet Club tank overflow)	1400 to 1535 feet	9 to 81 psi	2 to 48 psi
6	Club Estates Zone	1661.9 maximum (Club Estates standpipe)	1430 to 1650 feet	45 to 142 psi	46 to 101 psi
7	Clearwater Hills III Zone	1760.5 maximum (Clearwater Hills III tank overflow)	1700 to 1720 feet	24 to 40 psi	25 to 48 psi
8	Highcliff Zone	2070 to 2115 (set by pumps located)	1690 to 1900 feet	74 to 165 psi	74 to 165 psi
9	Glenn Drive Zone	1800 to 1900 (set by pumps located at Club Estates tank)	1655 to 1700 feet	43 to 63 psi	43 to 63 psi
10	Las Brisas Zone	1440 to 1610 (set by Las Brisas pumps)	1450 to 1550 feet	60 to 101 psi	24 to 65 psi

Note: Pressure ranges shown are from the model for 2003 demand scenario.

Several adjustments were required to the model to satisfactorily calibrate Zones 2 and 3. Those adjustments are described. In these locations, the model could initially not deliver the flow produced during the flow test and adjustments to the model were made to produce results that reflect the actual system performance.

- Flow Test No. 7 (Jackrabbit and Scottsdale Roads) – The model predicted greater flow capabilities than were being experienced in the field. Upon investigation by AAWC operations, there were several broken valves that were only partially opened. The valves were replaced which immediately improved the field measured flow and pressure in this area.

- Flow Test No. 10 (44th Street and Valley Vista Lane) – The model predicted lower static pressure and more headloss than experienced during the flow test. An 8-inch water main was added to the model from the Maderos Del Quenta Drive to 44th Street. It appears that, as modeled for calibration, there is a looped waterline bringing water to the area that is not reflected on the system maps. Recommendations for future improvements were made based on modeling that did not include the 8-inch main described above.

- Flow Test Nos. 11 and 21 (Hillside and Lincoln Drives) – The model could not deliver the 750 gpm test pressure that was recorded during the flow test. In the model the pipe connecting the Main Zone and Country Club zones was closed. Based on Brown and Caldwell's recommendation, AAWC Operations conducted a field investigation and found that this connection was actually open. Opening this connection in the model resulted in calibration of this area with the flow tests. This pipe was modeled as closed for subsequent modeling efforts.

- Flow Test Nos. 17 and 18 (Foothill Drive/Desert Park Place, and Moonlight Way/Lakeside Lane) – The model could not deliver the 500 gpm flow recorded for Test No.17 or 839 gpm recorded during Test No. 18. In order to calibrate these areas, the 4-inch discharge piping from Clearwater Hills Booster Pump Station was changed to 6-inch pipe. AAWC potholed the discharge piping on Moonlight Way and found it to be 4 inch as shown on the block maps. Pipe sizes at other locations may be incorrect or there may be another waterline not shown on the maps providing additional water to the north part of the Clearwater Hills Zones. The recommended improvements were based on 4-inch piping as shown on AAWC block maps. This was discussed with AAWC during a progress meeting with the understanding that there is considerable uncertainty in this area of the system, but that improvements based on the model would result in conservative recommendations.

- Flow Test No. 20 (46th Place and Indian Bend Road) – The model could not deliver the 500 gpm flow recorded during the test. This location could be calibrated when the interconnection between Zone 1 and Zone 2 was opened as described above with the discussion on Flow Test Nos. 11 and 21.

During the flow testing, discharge pressures and discharge rates were recorded for the Country Club Booster Pump Station. It became apparent that this booster pump station is operating significantly under rated capacity. This is thought by AAWC operations to be due to damaged impellers. AAWC proposed to replace the impellers on the four pumps at this Booster Pump Station in 2004.

FIRE FLOW ANALYSIS

The fire flow analysis was conducted using the automated WaterCAD software fire flow analysis under maximum day demand conditions and assuming that each storage tank was 10 feet below the top of the tank, and with all pumps running. Fire flows are computed by iteratively assigning demands and computing system pressure. The model assigns the fire flow demand to a node and checks the model, checking to see if all pressure constraints are met at that demand. The model will assign a new demand and re-check the system if a constraint is violated. The WaterCAD fire flow routine runs as follows:

- The fire flow demand (1500 gpm) is added to the modeled domestic demand at a node.
- The model calculates system pressures for all nodes, checking that the constraint (20 pounds per square inch) (psi) is met at all locations.
- The fire flow demand is added to the domestic demand at the next node, and the calculations are repeated for all nodes selected for analysis.
- The model output provides a status (pass/fail) for each node, fire flow available at each node, and the minimum zone pressure for a fire at each node.

MODEL RESULTS

Figure 2 displays the results of the fire flow analysis under existing conditions with the addition of a 12-inch water main programmed for 2004 in Jackrabbit from Scottsdale Road to Invergordon, and in Invergordon from Jackrabbit to McDonald. This 12-inch main will replace existing 4- and 6-inch pipes in those roads. The water model represented on Figure 2 also includes a 12-inch main in Starlight (P-324) which will be built by the homeowner per an

agreement with the water company. Appendix B contains the model results corresponding to Figure 2. The results of the Fire Flow Analysis under Maximum Day 2003 conditions were that more than 40 percent of the nodes in the model could not deliver a fire flow of 1,500 gpm with a minimum system residual pressure of 20 psi.

In general, the system is limited by dramatic changes in elevation, long lengths of 4- and 6-inch pipe, and a single source of water located at the east end of the system. In addition, there is very little storage capacity. The system is operated in ten zones, some of which are very small, and have little or no storage.

The water model does not include the majority of 4-inch pipe that exists. The headlosses of 1500 gpm flow through a 4-inch pipe prevents the delivery of that volume of water for fire control. Therefore, all 4-inch mains that serve fire hydrants need to be replaced.

Main Zone

The Main Zone provides the required fire flow to the majority of users with the exception of the southwest portion of zone. This area is the farthest from the pumping source and has more elevation variation than most of the Main Zone. The existing 6-inch pipe is not sufficiently sized to overcome these physical constraints.

Country Club and Clearwater Hills Zones

Both the Country Club and Clearwater Hills zones experience very limited available fire flows. Generally, long lengths of undersized pipes result in excessive losses.

The areas with fire flows available under 500 gpm in these zones include property west of Tatum Boulevard and north of Lincoln, and the far north part of the system on both side of Tatum Boulevard.

The entire Clearwater Hills Zone is limited in the ability to provide fire flow by over 7,000 feet of 4-inch diameter main serving as discharge piping from the Clearwater Hills Booster Pump Station and 4-inch mains leaving the Clearwater Hills Tanks.

Tatum Canyon forms the far northwest portion of the water system service area. Inadequate flows and pressures in this area are due to a combination of factors. The terrain is mountainous with dramatic elevation differences and the mains are 4- and 6-inch in size.

Smaller Zones

The smaller zones serve between 4 and 30 customers. These seven zones are:

- Stone Canyon

- Racquet Club
- Club Estates
- Glenn Drive
- Highcliff
- Clearwater Hills III
- Las Brisas

These zones have limited pumping capacity and storage in these zones varies from no storage to 100,000 gallons. Using an estimated duration of a fire of 2 hours, a total of 180,000 gallons of storage would be required to provide 1500 gpm.

Many homes in the higher elevations in the Clearwater Hills, Clearwater Hills III, Country Club, and High Cliff zones have individual pumps and hydropneumatic tanks to provide domestic water service. These individual pumps cannot provide enough water for fire flow, and the homes are located at significantly higher elevations than the roadways, where hydrants would be located. These homes must be considered on an individual basis for improvements to provide fire protection.

Stone Canyon Zone. Stone Canyon Zone is equipped with a booster pump station with two 350 gpm pumps and a 100,000 gallon tank. Water from the Stone Canyon Zone feeds the Racquet Tank Zone through a pressure reducing valve. The capacity of the Racquet Club Tank is approximately 100,000 gallons.

Racquet Club Zone. The Racquet Tank Zone includes Cameldale, Starlight and Yucca Streets. The Racquet Club Tank is not at a high enough elevation to pressurize all homes within the zone. Recently, an 8-inch line was installed along Yucca Road and Cameldale Way and looped to the 24-inch line along McDonald Drive. When this portion of the Racquet Club Zone is operated within the main zone, flows improve, but not enough to achieve the required 1500 gpm at 20 psi.

Club Estates and Glenn Drive Zones. The Club Estates Booster Pump Station pumps from the main zone through 6-inch mains to serve approximately 15 customers along Indian Bend Road, 47th Place, Glenn Drive and Arroyo Road. The only storage for this zone is a standpipe with a capacity of approximately 32,000 gallons. A small pump and hydropneumatic tank are located along Glenn Drive and pumps to four customers located at higher elevations along Glenn Drive. Club Estates is provided with two 100 gpm pumps. Glenn Drive is provided with three 25 gpm pumps. These systems provide neither pumping capacity nor storage to provide the desired 1500 gpm fire flow.

Las Brisas Zone. The Las Brisas subdivision has no storage. This subdivision consists of 30 lots. Their booster pump station is equipped with two 100 gpm pumps and a 500 gpm pump. Therefore, the Las Brisas Booster Pump Station cannot provide 1500 gpm for fire protection.

Highcliff Zone. Highcliff Zone is equipped with two 60 gpm pumps and no storage. This zone serves four customers.

Clearwater Hills III Zone. Two 70 gpm pumps located at the Clearwater Hill Tank 1 site, pump water up to the Clearwater Hills Zone. The four residents served by the Clearwater Hills Zone each own their own pump-to-pump water from the Clearwater Hills III tank to their residences which are located at higher elevations than the tank. There are a number of empty lots in this zone.

RECOMMENDATIONS

Brown and Caldwell used the WaterCAD model to develop and measure the affects of system improvements to provide the required fire flow to all nodes in the model. The recommendations are based on the system as reflected on the system maps, with no cross connections between zones. The recommendations were modeled with 2017 estimated demands.

The 2017 demands were calculated based on the updated 2003 demands generated with this project. The 2003 demands were multiplied by a factor of 1.125 to generate a total system demand of 19.40 million gallons per day, as predicted in the 1999 Water Master Plan report. The 2017 demand scenario represents build out of the service area.

Figure 3 presents the model results after all of the recommended improvements are made. The model reports corresponding to Figure 3 are included in Appendix C.

Figure 4 displays the location and short description of the recommended projects. Each project is described in more detail below.

The recommended projects were presented to the AAWC Paradise Valley Water Users Group for discussion. The group was provided with a map showing the fire flows available for different areas of the system, the locations of the projects, an estimated cost for each project, the number of users benefiting, and the cost per user benefits. The Water Users Group defined evaluation criteria and assigned a weight for each criterion. The projects were prioritized based on this criteria and information presented. The most important criteria were the criticality of the area (those areas with the lowest available fire flows were given highest priority) and the cost effectiveness (most users benefited per dollar).

The initial priority list of projects was reviewed by AAWC, and some modifications were made based on engineering and construction considerations. For example, two projects in Tatum Boulevard were scheduled for the same year to minimize impact to residents. The revised list of projects was then presented to the Water Users Group and endorsed by that group for presentation to the Town of Paradise Valley and incorporation into the AAWC Capital Improvements Program.

The project numbers contained in this report correspond to the priority placed on the project by that group. Recommendations A through E were not considered for prioritization by the Water Users Group because they have already been programmed by AAWC.

Recommendation A – Valve Study

The Valve Study will ensure that valves are exercised, verify the locations of valves, determine whether valves are fully opened or closed, and verify their condition. Several broken valves were found to be obstructing the flow and there was uncertainly as to whether physical connections between zones were opened or closed.

The Valve Study could be phased over a period of years, with priority on areas that are the most critical for system operation, or areas where information is most needed, such as the Clearwater Hills Zone in the vicinity of the booster station.

Recommendation B – Fire Hydrant Installation

The fire hydrant coverage within Paradise Valley is sparse. The Town of Paradise Valley is now conducting a study to identify where hydrants are needed, and the recommended spacing of hydrants. Hydrant coverage for the system within the City of Scottsdale is adequate. There is no requirement for hydrant spacing for areas in unincorporated Maricopa County.

For the purposes of cost estimating, Brown and Caldwell estimated that 200 fire hydrants would be required to provide hydrants at a spacing of 300 to 500 feet throughout the system. It is recommended that where 4-inch mains are replaced with 6- or 8-inch mains (See Recommendation C below) fire hydrants are installed at that time. As applicable, the cost of hydrants is included with the cost of recommended replacement projects in the cost tables in this report. Figure 5 shows the location of existing and future frie ydrants and proposed phasing.

Recommendation C – Replace 4-inch Water Mains Within a Minimum 6-Inch Size

Headlosses through a 4-inch size main line are so great that they prevent fire flows of 1500 gpm from being delivered at 20 psi residual pressure. Brown and Caldwell estimated from the system maps that approximately 80,000 lineal feet of 4-inch water mains will remain after the system improvements enumerated below are constructed. A minimum of 6-inch diameter pipe is recommended for service to fire hydrants.

As a general recommendation, water mains should be looped whenever possible. This will increase available fire flow, reduce pressure losses and provide increased reliability.

Figure 5 displays the location of 4-inch mains as shown on the AAWC system maps.

Recommendation D – Replace Impellers at the Country Club Booster Pump Station

At the time that data was collected for this report, the Country Club Booster Pump Station was equipped with four pumps rated at 900 gpm capacity each. Each of these pumps was operating at approximately half the rated capacity. AAWC operations reported that this was due to damaged impellers. The impellers were replaced in December 2003 and found to be highly deteriorated.

Any improvement to the pumping capacity at the Country Club Booster Pump Station will improve the available fire flows, not only in the Country Club Zone, but in the Clearwater Hills Zone as well. The Clearwater Hills Booster Pump Station receives water from the Country Club Zone.

Recommendation E – Jackrabbit/Invergordon Main Replacement

The existing mains in Jackrabbit and Invergordon are 4- and 6-inch in diameter. A 12-inch main is recommended from Scottsdale Road west in Jackrabbit to Invergordon, and north in Invergordon to McDonald, to provide necessary fire flow. The 4-inch mains north of Jackrabbit must be upsized to 6-inch to provide fire flows to residences in this area. The installation of 6-inch mains should include installation of fire hydrants.

2 **Project No. 1 – 16-inch Main in Lincoln Drive, 500 gpm Pump Station Serving Country Club Zone.** Pipe in the long lengths of pipe from the Country Club Booster Pump Station prevent delivery of adequate water to meet fire flows. The recommended improvements will provide water into the zone from a second location and direction. The proposed improvements will deliver more water to the western part of the Main Zone, and provide water for a proposed new booster pump station on Lincoln Drive at Hillside Drive.

There exist 16- and 24-inch mains in Lincoln Drive from the Miller Road source to roughly 750 feet east of Tatum Boulevard. The recommended project would extend a 16-inch water main 4500 feet to the west in Lincoln Drive, from 32nd Place to west of 43rd Place.

6 **Project No. 2 – 500 GPM Booster Pump Station Serving Clearwater Hills Zone.** The Clearwater Hills Zone experiences similar problems to the Country Club Zone in that those areas in the zone furthest from the pumping source experience inadequate fire flows. The 16-inch main constructed with Project 1 will also provide water for the suction side of the proposed Clearwater Hills Booster Pump Station on Lincoln, west of 43rd Place.

3 **Project No. 3 – 6-inch Water Main in Tatum Boulevard, North.** The existing waterline in Tatum Boulevard is the main source of water for the north part of the Country Club Zone. The existing main is undersized for the length required, resulting in excessive headlosses. A new 16-inch main in Tatum Boulevard is recommended from Indian Bend Road to the north

boundary of the service area at Desert Jewel Drive. This approximately 5,200 lineal feet of new main will provide fire protection to the north and south ends of the Country Club Zone.

Project No. 4 – 8-inch Water Mains in Southern Part of the Country Club Zone, West of Tatum. The improvements produce localized benefits by providing a loop and upsizing the existing water mains. This project includes 2,500 lineal feet of water main in 48th Street and Joshua Tree Lane, 600 lineal feet of 8-inch water main in Clearwater Parkway and Quartz Mountain Drive, and 75 lineal feet of 8-inch water main from the suction side of the Clearwater Hills Booster Pump Station to Hillside Drive. These improvements will reduce headlosses and help deliver more water at a higher head.

Project No. 5 – Upsize Discharge Piping from Clearwater Hills Booster Pump Station. The existing discharge piping is undersized resulting in excessive headlosses at a critical location in the system. Moreover, there are significant variations in elevation in the Clearwater Hills Zone, aggravating the affect of the piping deficiencies.

The existing piping in Moonlight Way, Clearwater Parkway, Sparkling Lane, Brookview Way, and Crystal Lane is 4 inches in diameter and should be upsized to 8 inches. The existing 6 inches in Moonlight Way should be replaced with 12 inches. This recommendation will significantly improve flows to all of the Clearwater Hills Zone.

Project No. 6 – Combine Stone Canyon and Racquet Club Zones. The existing Racquet Club Tank is not high enough to provide adequate fire flow to the homes in the area. The Racquet Club Tank overflow elevation is 1555 feet above sea level, while the 60th Street Tank overflow is 1527 feet above sea level. The Stone Canyon Tank overflow is at 1694 feet above sea level.

Combining the two zones will make the storage from Stone Canyon available to both zones, and will make the pumping capacity from a new booster pump station available to homes in both the Racquet Club and Stone Canyon zones.

A booster pump station is required to provide fire flow to homes located along Starlight Way. We recommend that a new 12-inch main be constructed for the discharge from this new booster pump station, and that this 12-inch main be connected to the Stone Canyon system in the vicinity of the Racquet Club Tank.

As the Racquet Club Tank is ineffective in its current location and elevation, it would be better utilized in the Main Zone. Main Zone storage is located at Miller Road and at the 60th Street Tank. The Racquet Club Tank can be used to boost pressures in the immediate surrounding Main Zone. A control valve would be required to close the water line to the Main Zone when the tank is filling from the new booster pump station, and to open the line to the Main Zone when the pump is off. The pump and valve should be controlled by high and low water level setpoints. The

existing valve located in a vault directly in front of the Racquet Club tank can be used for this purpose.

Another benefit of operating the system as described above is that the new 1500 gpm fire pump will cycle on and off, rather than lie dormant until a fire event occurs.

Connection of the Racquet Club Tank to the Main Zone will require constructing 1000 linear feet of new 8-inch water main along Superstition Lane to McDonald.

A pressure reducing valve should be provided between the existing 4-inch main in Starlight and the new 12-inch main. In this way, water can be delivered from the 12 inch to the 4 inch in the event of a pressure drop under fire demand.

The pressures in the lower elevations of Stone Canyon Zone appear to be over 100 psi under current day conditions due to the elevation of the Stone Canyon Tank. The tank overflow elevation is 1694 feet above sea level while the homes nearest McDonald are at an elevation of approximately 1420 feet. This elevation difference equates to 119 psi. The connection of the two zones will raise the pressures to approximately 155 psi under maximum day demand conditions, somewhat. If individual residences in the lower elevations are not already equipped with pressure reducing valves on their service lines, these should be installed prior to executing this conversion.

Project No. 7 – Install 8-inch Water Main in Clearwater Parkway. In order to deliver the required fire flow to the highest lots on Clearwater Parkway, the existing 6-inch water main in Clearwater Parkway from Mountain View to Red Ledge Drive must be upsized to 8 inch.

Project No. 8 – Install 16-inch Water Main in McDonald and 44th Street. Approximately 8,400 linear feet of 16-inch diameter pipe should be installed in McDonald and 44th Streets. This pipe will increase the amount of water to the southwest part of the Main Zone, furthest from the pumping source, and will benefit Main Zone, Country Club and Clearwater Hills Zones, in conjunction with Project Nos. 1 and 2.

Project No. 9 – Install 1800 Linear Feet of 8-inch Water Main in Tatum. This improvement would replace an existing 4-inch water main serving lots adjacent to Tatum, just north of Lincoln, within the Main Zone. The existing 4-inch main is undersized to provide fire flows to this immediate area.

Project No. 10 – Replace existing 6-inch in the Far North of the Country Club Zone. This project would upsize 4850 linear feet to 8-inch size in Desert Jewel Drive and Foothill Drive, and 2100 linear feet to 12 inch in 54th Street and Roadrunner. These larger water mains will deliver water from the 16-inch water main constructed as Project No. 3 in Tatum to neighborhoods in this north part of the service area.

Project No. 11 – Las Brisas Zone Improvements. Customers in the Las Brisas Zone are served by a booster pump station pumping from the Country Club Zone. The zone will ultimately serve 30 customers. A 500 gpm fire pump is provided. There is no storage in this system. The recommended improvement included replacing the existing 500 gpm pump with a 1500 gpm fire pump and replace 750 linear feet of the existing 6-inch discharge piping with 8-inch diameter piping.

Project No. 12 – Tatum Canyon Improvements. Two alternatives (Projects 12A and 12B) are presented on Figure 4 for this area. Tatum Canyon, located in the far northwest part of the service area, is limited for fire flow by the high elevation and length of 4-inch and 6-inch pipe from the discharge of Clearwater Hills Booster Pump Station. Improvement No. 5, the upsize of the discharge piping for Clearwater Hills Booster Pump Station should radically improve fire flows in this area.

The improvement shown as No. 12A consists of replacing approximately 8000 linear feet of 6-inch piping from the Clearwater Hills Booster Pump Station all the way around the loop formed by Desert Park Place and Foothill Drive. We recommend that this 8000 linear feet be constructed in two phases, the first phase being the 3000 linear feet from Moonlight Way to Desert Park Place. This phase may be adequate to provide the required fire flows. The remaining 5000 linear feet comprises the loop around Desert Park Place and Foothill Drive.

Alternative No. 12B is that of providing a booster pump station at Foothill Drive, west of Tatum to introduce water from the Country Club Zone into the Clearwater Hills Zone at the far north end. Project No. 12A is preferred because of the lower ongoing maintenance and replacement costs of a water line versus a pump station.

Also included in Project Nos. 12A and 12B is installation of 300 lineal feet of 8-inch water main from Moonlight Way to Sparkling Way to provide additional looping in this part of the Clearwater Hills Zone.

Project No. 13 – Loop Mummy Mountain Area. The Mummy Mountain area, formerly served by the Mummy Mountain Water Company, is located north of Lincoln Drive and east of Invergordon. The area requires looping to achieve fire flow. The recommended improvements are 150 lineal feet of 8-inch water main connecting the 8-inch line in 65th Place to the 8-inch line in Cactus Wren and 500 lineal feet of 6-inch main connecting the existing 6-inch main in Sierra Vista Road to the existing main in Lincoln.

Project No. 14 – 8-inch Main in Invergordon, North of Chaparral. To improve fire flows in the southeastern part of the Main Zone, 1700 lineal feet of 8-inch water main should be installed in Invergordon, north of Chaparral. This will replace the existing 4-inch at that location.

Project No. 15 – 8-inch Main in Chaparral Road Approximately 2700 linear feet of 4-inch main that exists in Chaparral Road between Scottsdale Road and 68th Street should be replaced with 8 inch in Chaparral, between Scottsdale Road and 68th Street.

Project No. 16 – Water Main Replacements in North Central Part of Country Club Zone. The existing 6-inch water mains in Lost Dutchman, Indian Bend Road, 56th Place, Joshua Tree Lane and 62nd Street should be replaced with 8 inch. In addition, 900 lineal feet of 4 inch in Joshua Tree Lane, 63rd Place and Invergordon should be replaced with 8 inch.

Project No. 17 – Water Main Replacement in Southwest Portion of Main Zone. Figure 3 displays two alternatives for Project No. 17. The existing system needs to be looped in this area. This can be done as shown in Project No. 17A by installing 1300 lineal feet of 6-inch water main from Hogan Circle to Claremont Avenue and from Hogan to 42nd Street, and 1420 linear feet of 8-inch water main in Keim Drive.

If it is not possible to obtain easements for the 6-inch water mains, the same improvement in fire flows requires replacing all of the existing 6-inch piping in Keim Drive, 41st Street and Bethany Home Road with 8200 lineal feet of 8-inch water main.

Project No. 18 – Club Estates/Glenn Drive Improvements. In order to achieve fire flow for Club Estates Zone, we recommend the installation of a 1500 gpm fire pump at the existing Club Estates Booster Pump Station on 59th Place. In addition, 2300 linear feet of 12-inch water main must be installed in 59th Place and Glenn Drive.

Project No. 19 – Stone Canyon 4-Inch Main Replacements. Approximately 300 lineal feet of 4-inch water main should be replaced with 8 inch in 52nd Place, San Miguel Avenue, Solano Drive, and 54th Street to provide fire flow to approximately 18 lots within the Stone Canyon Zone.

Project No. 20 – Highcliff Zone Improvements. A 1500 gpm fire pump and 1600 lineal feet of 8-inch fire line must be installed to provide fire protection to four lots comprising the Highcliff Zone. A less costly solution may be retrofitting the existing homes with sprinklers. The feasibility of using hydrants located in the adjacent Clearwater Hills Zone should also be examined for each of the lots in this zone.

Project No. 21 – Clearwater Hills III Zone Improvements. A simple solution is not available for the Clearwater Hills III. Water is pumped from a booster station located at the Clearwater Hills I Tank, through approximately 500 feet of 4-inch water main to the Clearwater Hills III Tank, an elevation difference of approximately 30 feet. The overflow elevation of Clearwater Hills III Tank is 1760.5 feet above sea level. The terrain in this area is extremely mountainous and the surrounding lots range in elevation from 1700 to 1950 feet above sea level. The four lots that have been developed use individual booster pump stations to provide water for domestic service.

The recommended project would install a 1500 gpm fire pump at the Clearwater Hills Tank No. 2 and an 8-inch fire line up to the end of the existing access road and to connect a fire hydrant to that new 8-inch line.

Another solution would be to construct a tank at the highest elevation possible on one of the lots on Silvercrest Way. A pump from the Clearwater Hills Zone and an 8-inch water main from the pump to the new tank would be necessary.

Any of the above solutions represents a very high cost to the four homeowners affected. There appear to be three additional lots that remain undeveloped in this area.

A less costly solution may be retrofitting the existing homes with sprinklers, and requiring any new homes in the area to be equipped with sprinkler.

Model Improvements. In addition to the system improvements described above, Brown and Caldwell recommends that the water model be improved and used as a tool to periodically review system adequacy and analyze proposed improvements. In order to improve the model and make it more reliable the following should be accomplished:

- Perform a valve study (See Recommendation A above)
- Update system maps to include new waterlines and verify pipe sizes.
- Determine the typical diurnal demand pattern for each zone.
- Examine storage needs. The existing system has deficient storage capacity. The model, once updated, should be run in extended period simulation to determine optimum storage required. An increase in storage capacity will help maintain uniform water pressures, increase system reliability and equalize demands to allow a more uniform rate of pumping and to allow pumping during off peak power rates.

Model Limitations. Based on the project scope, this Fire Flow Capacity Assessment was based on steady state modeling. Steady state modeling presents a snapshot of the system under certain boundary conditions. In contrast, extended period simulation provides information on how the system behaves over a range of boundary conditions. It was outside the scope of this project to conduct extended period simulation.

This model does not take into certain system operational features such as the connection between Country Club Tanks to the Main Zone. The way the system is operated, the 60th Street Tank in the Main Zone is emptying during peak demand conditions. When the tank level reaches less

than 12 feet, the tank is filled from the Country Club Zone. The demand from the Main Zone on the Country Club Zone is not metered, and is not modeled.

A similar situation exists between the Stone Canyon and Racquet Club Tanks. Water is pumped from the Main Zone into the Stone Canyon Tank. The Racquet Club Tank is filled from the Stone Canyon system, controlled by an altitude valve.

Steady state modeling will not reveal water storage deficiencies. Brown and Caldwell examined storage capacity by zone and included this consideration in development of recommended improvements. However, a comprehensive study of storage capacity could optimize system performance.

IMPLEMENTATION PLAN

Planning level costs for the improvements described above are presented in Tables 5 and 6. Table 5, Cost Estimate for Recommended Improvements, presents the costs for each project in the priority order established during the Water Users Group meetings. Table 6 presents the Proposed Project Phasing with the 4-inch mains replacements and fire hydrant installations grouped with the recommended main line replacements. The total cost of recommended projects presented in Table 5 is $15.5 million. Table 7 presents a timeline for the recommended improvements with design and construction costs color coded.

Under Year 2008 in Table 6, a re-evaluation of the system is included. This re-evaluation would include an update of the water model and flow tests to verify system conditions and calibrate the model. This project revealed some uncertainties in the system configuration and improvements in certain areas, especially in the upper elevations of the Clearwater Hills Zone.

The proposed phasing plan includes all projects except Nos. 20 and 21. These projects consist of improvements to two of the smaller zones serving four customers each. AAWC represented at the Water Users Group meeting that they would continue to look at options for providing fire flow to all users, and that there may be alternatives to the recommended projects presented.

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TABLE 5 - COST ESTIMATE FOR RECOMMENDED IMPROVEMENTS

NO.	ITEM	QUANTITY	UNIT	UNIT COST	COST	ENGINEERING	TOTAL COST
A	Comprehensive Valve Study	75	DAYS	$ 1,600	$ 120,000		$ 120,000
B	Install Fire Hydrants	220	EA	$ 5,000	$ 1,100,000		$ 1,100,000
C	Replace 4" Water Main with 6" Water Mains	80,000	LF	$ 45	$ 3,600,000		$ 3,600,000
D	Replace Impellers Country Club BPS	4	EA	$ 3,000	$ 12,000		$ 12,000
E	Jackrabbit/Invergordon 12" Water Main	8,000	LF	$ 75	$ 600,000	$ 90,000	$ 690,000
Subtotal					**$ 5,432,000**	$ 90,000	**$ 5,522,000**
Project No.							
1	16" Water Main Lincoln	6,900	LF	$ 122	$ 841,800	$ 126,270	$ 968,070
	BPS (500 gpm @ 100 ft)	1	EA	$ 250,000	$ 250,000	$ 37,500	$ 287,500
					$ 1,091,800	$ 163,770	**$ 1,255,570**
2	CC BPS (500 gpm @ 150 ft) Lincoln & 43rd Place	1	LS	$ 250,000	$ 250,000	$ 37,500	$ 287,500
	8" Water Main Highland Drive	1,500	LF	$ 55	$ 82,500	$ 12,375	$ 94,875
					$ 332,500	$ 49,875	**$ 382,375**
3	16" Water Main Tatum	5,200	LF	$ 122	$ 634,400	$ 95,160	$ 729,560
4	8" Water Main 48th Street and Joshua Tree Lane	2,500	LF	$ 55	$ 137,500	$ 20,625	$ 158,125
	8" Water MainClearwater/Quartz Mountain	600	LF	$ 55	$ 33,000	$ 4,950	$ 37,950
	8" Water MainCWH suction to Hillside	75	LF	$ 55	$ 4,125	$ 619	$ 4,744
					$ 174,625	$ 26,194	**$ 200,819**
5	8" Water Main replace existing 4" Water Main discharge	6,200	LF	$ 55	$ 341,000	$ 51,150	$ 392,150
	12" Water Main replace existing 6" from Clear Water Hills Tanks	1,100	LF	$ 75	$ 82,500	$ 12,375	$ 94,875
					$ 423,500	$ 63,525	**$ 487,025**
Combine Stone Canyon and Racquet Club Zones							
6	8" Water Main Starlight	2,100	LF	$ 55	$ 115,500	$ 17,325	$ 132,825
	BPS (800 gpm @ 225 ft)	1	LS	$ 300,000	$ 300,000	$ 45,000	$ 345,000
	8" Water MainStarlight to McDonald	1,000	LF	$ 82	$ 82,000	$ 12,300	$ 94,300
	PRV	1	EA	$ 5,000	$ 5,000	$ 750	$ 5,750
					$ 502,500	$ 75,375	**$ 577,875**
7	8" Water Main in Clearwater Parkway	900	LF	$ 55	$ 49,500	$ 7,425	$ 56,925
8	16" Water Main McDonald and 44th Street	8,400	LF	$ 122	$ 1,024,800	$ 153,720	$ 1,178,520
9	8" Water Main in Tatum	1,800	LF	$ 55	$ 99,000	$ 14,850	$ 113,850
10	8" Water Main Desert Jewel/Crestview/Ridgeview	4,200	LF	$ 55	$ 231,000	$ 34,650	$ 265,650
	12" Water Main Roadrunner/54th Street	2,100	LF	$ 75	$ 157,500	$ 23,625	$ 181,125
	8" Water Main Foothill Drive	650	LF	$ 55	$ 35,750	$ 5,363	$ 41,113
					$ 424,250	$ 63,638	**$ 487,888**
Las Brisas Zone Improvements							
11	Add 1500 gpm fire pump	1	LS	$ 300,000	$ 300,000	$ 45,000	$ 345,000
	8" Water Main in Las Brisas	750	LF	$ 55	$ 41,250	$ 6,188	$ 47,438
					$ 341,250	$ 51,188	**$ 392,438**
12A	8" Water Main Moonlight to Sparkling Lane	300	LF	55	$ 30,600	$ 4,590	$ 35,190
	12" Water Main CWHPS to Desert Park Place	3,000	LF	$ 102	$ 306,000	$ 45,900	$ 351,900
	12" Water Main Foothill/Desert Park	5,000	LF	$ 102	$ 510,000	$ 76,500	$ 586,500
					$ 846,600	$ 126,990	**$ 973,590**
12B	Pump Station at Foothill Drive	1	LS	$ 500,000	$ 500,000	$ 75,000	$ 575,000
13	8"Water Main Cactus Wren/Casablanca	150	LF	$ 55	$ 8,250	$ 1,238	$ 9,488
	6" Water Main Sierra Vista to Lincoln	500	LF	$ 45	$ 22,500	$ 3,375	$ 25,875
					$ 30,750	$ 4,613	**$ 35,363**
14	8" Water Main Invergordon	1,700	LF	$ 55	$ 93,500	$ 14,025	$ 107,525
15	8" Water Main Chaparral	2,700	LF	$ 55	$ 148,500	$ 22,275	$ 170,775

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TABLE 5 - COST ESTIMATE FOR RECOMMENDED IMPROVEMENTS (Continued)

NO.	ITEM	QUANTITY	UNIT	UNIT COST	COST	ENGINEERING	TOTAL COST
16	8" Water Main Lost Dutchman/Joshua Tree/Indian Bend	4,500	LF	$ 55	$ 247,500	$ 37,125	$ 284,625
	8" Water Main Invergordon/Joshua Tree/63rd Place/Cactus Wren	900	LF	$ 55	$ 49,500	$ 7,425	$ 56,925
					$ 297,000	$ 44,550	$ 341,550
17A	8" Water Main in Keim/Bethany Home	8,200	LF	$ 55	$ 451,000	$ 67,650	$ 518,650
17B	6" loop	1,300	LF	$ 45	$ 58,500	$ 8,775	$ 67,275
	8" Water Main	1,420	LF	$ 55	$ 78,100	$ 11,715	$ 89,815
					$ 136,600	$ 20,490	$ 157,090
Club Estates and Glenn Drive Zones							
18	Add 1500 gpm fire pump	1	LS	$ 300,000	$ 300,000	$ 45,000	$ 345,000
	12" fire line	2,300	LF	$ 102	$ 234,600	$ 35,190	$ 269,790
					$ 534,600	$ 80,190	$ 614,790
19	8" Water Main Solano/San Miguel (Stone Canyon)	3,225	LF	$ 55	$ 177,375	$ 26,606	$ 203,981
Highcliff Zone							
20	Add 1500 gpm fire pump (410' TDH)	1	LS	$ 750,000	$ 750,000	$ 112,500	$ 862,500
	8" fire line	1,600	LF	$ 55	$ 88,000	$ 13,200	$ 101,200
					$ 838,000	$ 125,700	$ 963,700
Clearwater Hills III							
21	Add 1500 gpm fire pump	1	LS	$ 300,000	$ 300,000	$ 45,000	$ 345,000
	8" fire line	780	LF	$ 55	$ 42,900	$ 6,435	$ 49,335
					$ 342,900	$ 51,435	$ 394,335
	Total with 12A & 17A				**$ 14,290,350**	**$ 1,418,753**	**$ 15,709,103**
	Total With 12A & 17A Less A-E				**$ 8,858,350**	**$ 1,328,753**	**$ 10,187,103**
	Total with 12B & 17B				**$ 13,629,350**	**$ 1,319,603**	**$ 14,948,953**
	Total with 12B & 17 B Less A-E				**$ 8,197,350**	**$ 1,229,603**	**$ 9,426,953**

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TABLE 6 - PROPOSED PROJECT PHASING

2004 IMPROVEMENTS							
Project No.	Description	# Fire Hydrants (Note 1)	Fire Hydrant Cost	LF of 4" Water Main	4" Water Main Replacement Cost		Total
	Fire Hydrants	40	$ 200,000			$	200,000
	Jackrabbit/Invergordon 12" Main	20	$ 100,000	10,000	$ 517,500	$	1,425,000
Total 2004 Improvements		60		10,000		$	1,625,000
2005 Improvements							
Project No.	Description	# Fire Hydrants	Fire Hydrant Cost	LF of 4" Water Main	4" Water Main Replacement Cost		Total
1	16" Water Main Lincoln/New CCBPS					$	1,255,570
3	16" Water Main Tatum	6	$ 30,000	3,400	$ 175,950	$	729,560
9	8" Water MainTatum					$	113,850
	Contingency (10%)					$	209,898
2005 Total		6		3,400		$	2,308,878
2006 Improvements							
Project No.	Description	# Fire Hydrants	Fire Hydrant Cost	LF of 4" Water Main	4" Water Main Replacement Cost		Total
2	BPS CWH/8" Water Main Highland Drive					$	382,375
4	8" Water Main - S. CC zone	5	$ 25,000	1,950	$ 100,913	$	326,731
5	Replace 4" Water Main/CWSHBPS	5	$ 25,000	2,450	$ 126,788	$	638,813
6	Stone Canyon/Racquet Club					$	577,875
10	8" Water Main - N. CC Zone					$	306,763
	Contingency (10%)					$	223,256
2006 Total		10		4,400		$	2,455,812
2007 Improvements							
Project No.	Description	# Fire Hydrants	Fire Hydrant Cost	LF of 4" Water Main	4" Water Main Replacement Cost		Total
7	8" Water Main Clearwater Parkway					$	56,925
8	16" Water Main McDonald & 44th Street	40	$ 200,000			$	1,378,520
10	12" Water Main N. CC Zone	5	$ 25,000			$	206,125
11	Las Brisas fire Pump and 8" Water Main	5	$ 25,000			$	417,438
12A	12" and 8" Water Main serving Tatum Canyon					$	387,090
	Contingency (10%)					$	244,610
2007 Total		50		-		$	2,690,707
2008 Improvements							
ProjectNo.	Description	# Fire Hydrants	Fire Hydrant Cost	LF of 4" Water Main	4" Water Main Replacement Cost		Total
	Reevaluation					$	100,000
	4" Main Replacements	50	$ 250,000	27,000	$ 1,536,975	$	1,786,975
16	8" Water Main Main Zone North					$	341,550
	Valve Study					$	120,000
	Contingency (10%)					$	234,853
2008 Total		50		27,000		$	2,583,378

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TABLE 6 - PROPOSED PROJECT PHASING (Continued)

2009 Improvements								
Project No.	Description	# Fire Hydrants	Fire Hydrant Cost	LF of 4" Water Main	4" Water Main Replacement Cost		Total
13	8"/6" Cactus Wren/Sierra Vista			6,260	$	323,955	$ 359,318
14	8" Water Main Invergordon			8,320	$	430,560	$ 538,085
15	8" Water Main Chaparral	14	$ 70,000	4,700	$	243,225	$ 484,000
17B	8"/6" Keim/Bethany Home area	2	$ 10,000	1,000	$	51,750	$ 218,840
18	Club Estates/Glen Drive Fire Pump						$ 614,790
19	Stone Canyon 4" Water Main replacements	8	$ 40,000	3,700	$	191,475	$ 435,456
	4" Main Replacements	20	$ 100,000	11,220	$	638,699	$ 738,699
	Contingency (10%)						$ 338,919
2009 Total		44		35,200			$ 3,728,106
TOTAL ALL PHASES		220		80,000			$ 15,391,881
Note 1	Number of Fire Hydrants approximate and will be adjusted to meet Town spacing requirements						

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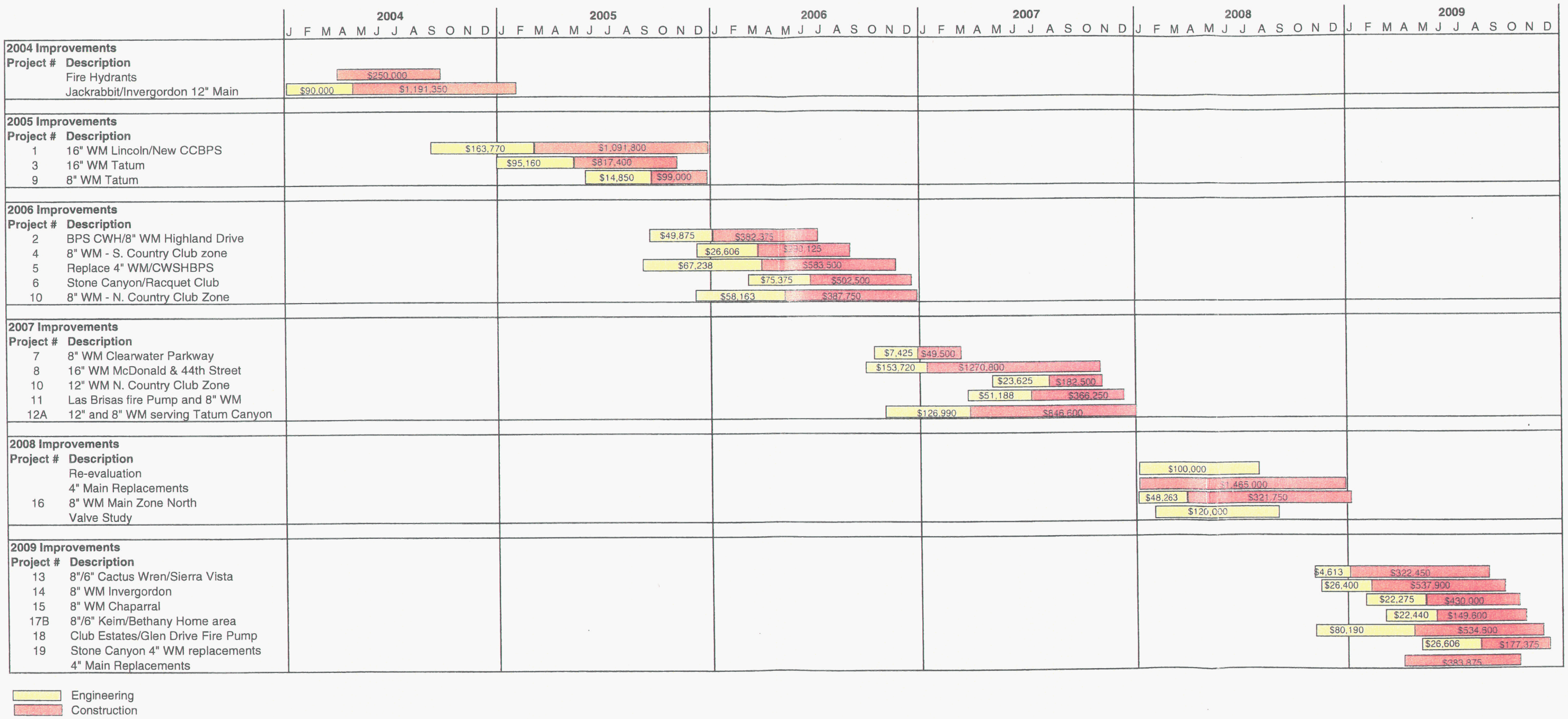
TABLE 7 - TIMELINE FOR PHASED IMPROVEMENTS



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APPENDIX A

PUMP CURVES

Alpha Southwest Inc.
Project: PV Water Booster Pumps
by: John Coughlan

MRBS
#142

PUMP-FLO ver: 5.0
File: (untitled)
Feb 5, 1998

PUMP DATA SHEET
Peerless Pump

CURVE: 3132010

Catalog: PRLESS60 v. 1

TYPE - SPEED: AE - 3600

PUMP Size: 4AE10

Speed: 3550 rpm
Imp dia: 9.625 in

Max Temperature: - °F
Max Pressure: - psi_g

Max Sphere Size: - in

Specific Speed Ns: -
Suction Nss: -

Suction size: 5 in
Discharge size: 4 in

FLUID Water tmp: 60 °F
den: 62.37 lb/ft³
vsc: 1.122 cP
vapor: 0.2568 psi
atm: 14.7 psi

NPSHa: - ft

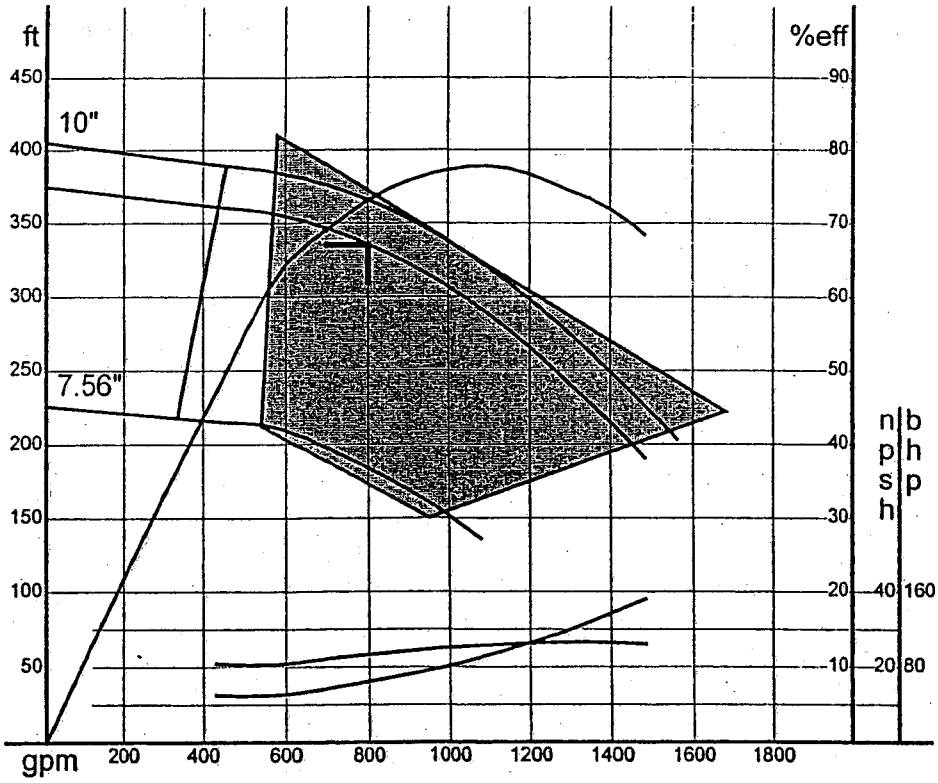
PIPING Pressure: - psi
Suction elev: - ft
size: - in
Discharge size: - in

DESIGN POINT
Flow: 800 gpm
Head: 335 ft

DATA POINT
Flow: 800 gpm
Head: 335 ft
Eff: 73 %
Power: 92.8 bhp
NPSHr: 16.1 ft

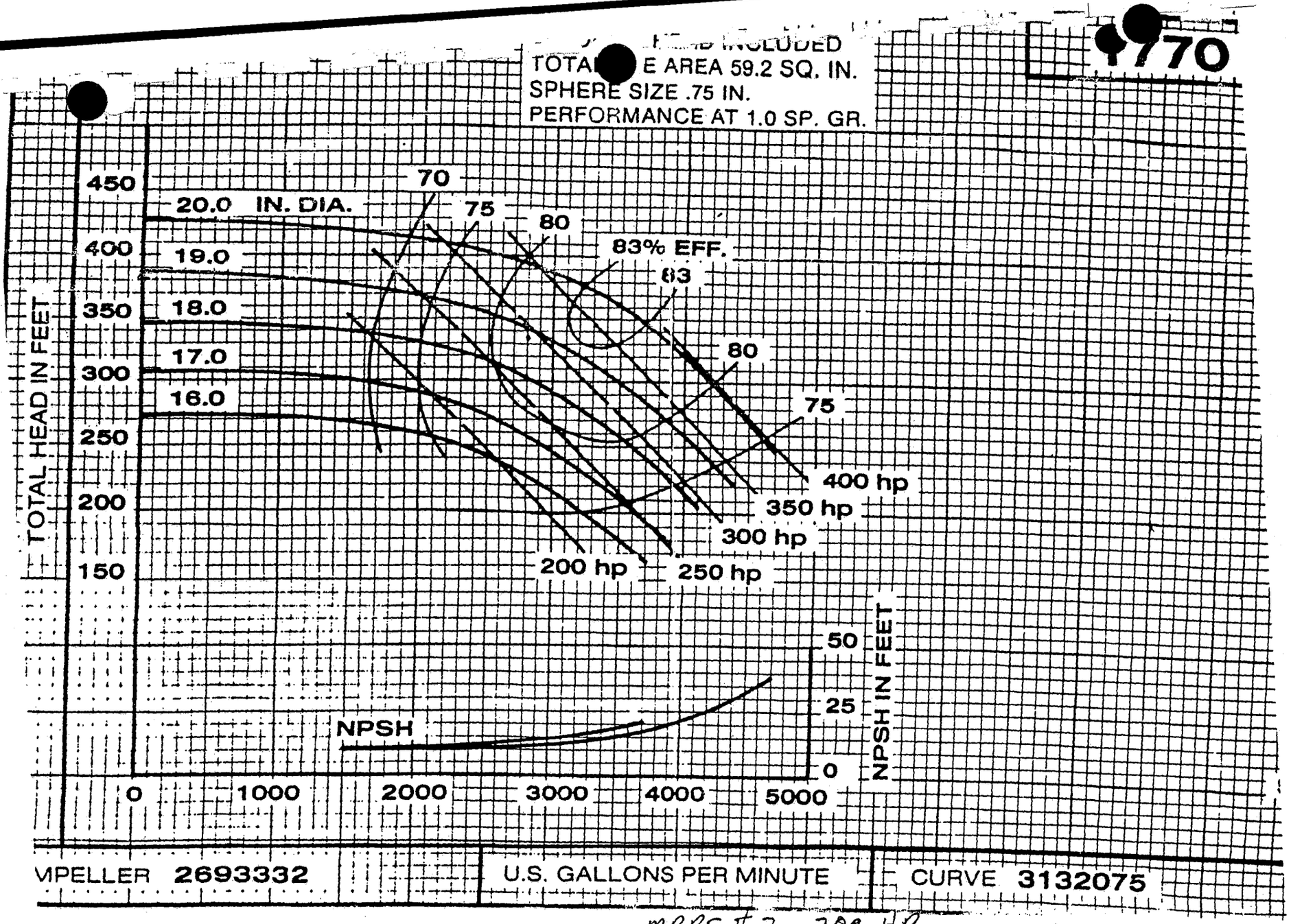
DESIGN CURVE
Shutoff Head: 375 ft
Pressure: 162 psi_g
Min Flow: 432 gpm
BEP: 78 %eff @ 1080
Max: 107 bhp @ 1300

MAX DIAMETER
Max: 117 bhp @ 1356



PERFORMANCE EVALUATION

Flow gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Power kW	Hrs/yr	Cost
960	3550	313	77	98.6	19.3				
[illegible]00	3550	335	73	92.8	16.1				
[illegible]0	3550	351	66	85.9	13.5				
[illegible]0	3550	360	52	83.8	12.5				
320	Flow Rate is Out of Range for this Pump								

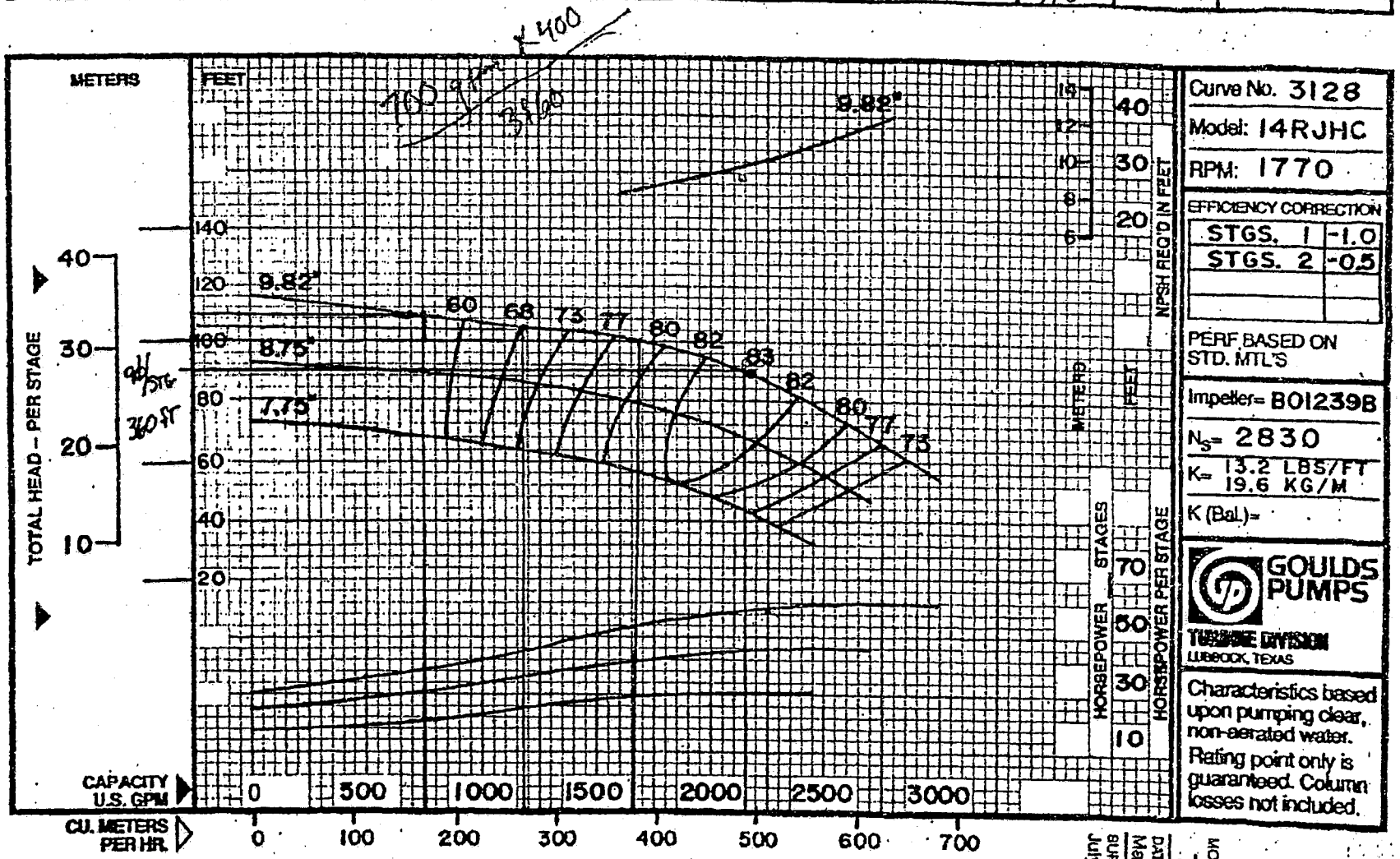

TOTAL HEAD INCLUDED
TOTAL FREE AREA 59.2 SQ. IN.
SPHERE SIZE .75 IN.
PERFORMANCE AT 1.0 SP. GR.
70
450
20.0 IN. DIA.
75
80
400
19.0
83% EFF.
83
350
18.0
80
17.0
300
16.0
75
250
400 hp
200
350 hp
300 hp
150
200 hp
250 hp
TOTAL HEAD IN FEET
50
25
NPSH
0
NPSH IN FEET
0
1000
2000
3000
4000
5000
IMPELLER 2693332
U.S. GALLONS PER MINUTE
CURVE 3132075

MRBS #3 300 HP

410 PWL 392 WELL #12

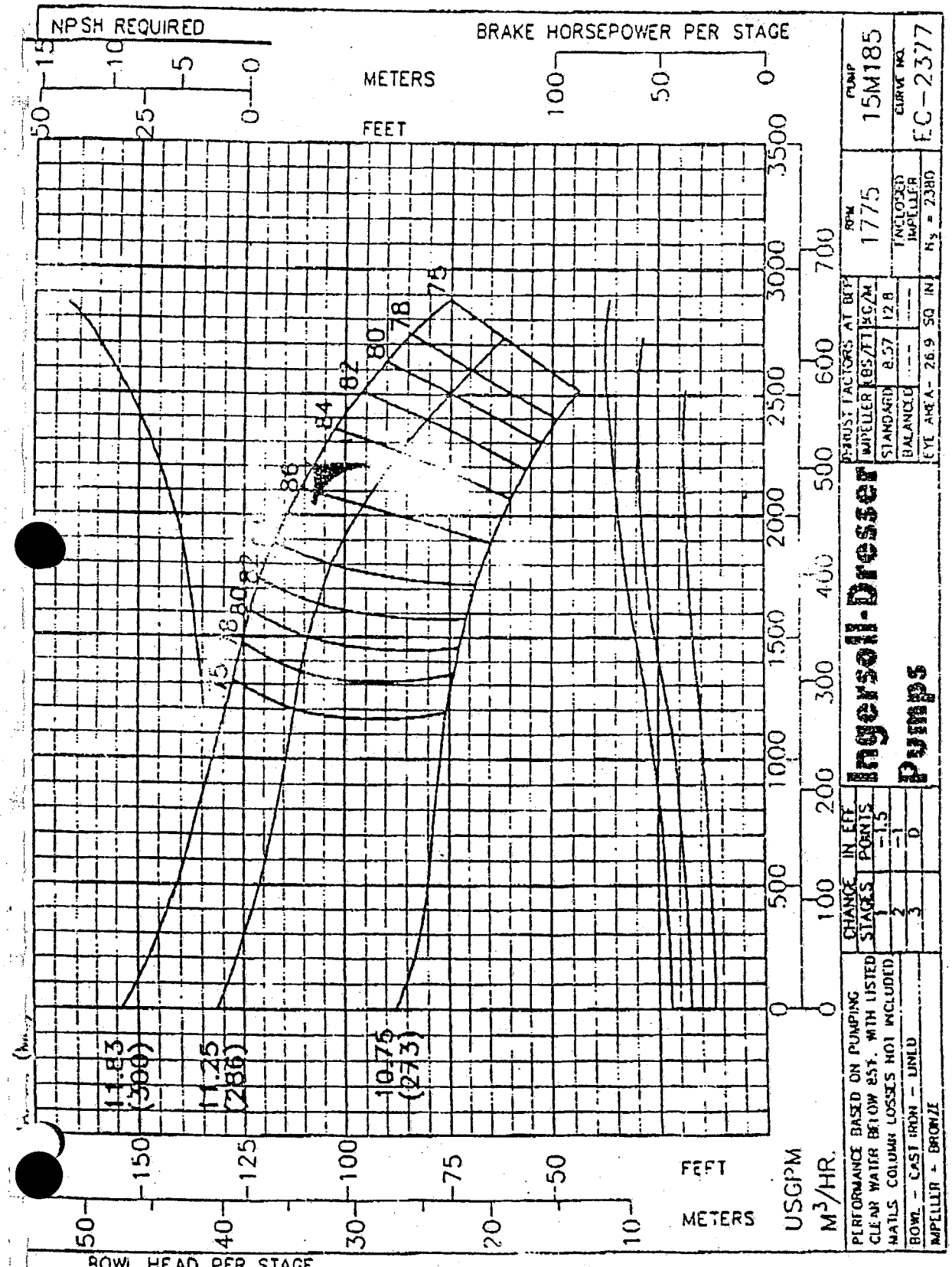
GOULDS PROPOSAL NO.	GOULDS S.O. NO.	INQUIRY NO.	CUSTOMER P.O. NO.	P.O. DATE	ITEM NO.	CUSTOMER

PROJECT	SERVICE	GPM CAPACITY	F.T. TDH	% EFFICIENCY	RPM.
			410		



WELL #11

Ingersoll-Dresser Pumps



Harold Thomas
713-884

Customer : Arizona - American Water Compny MRBS #4

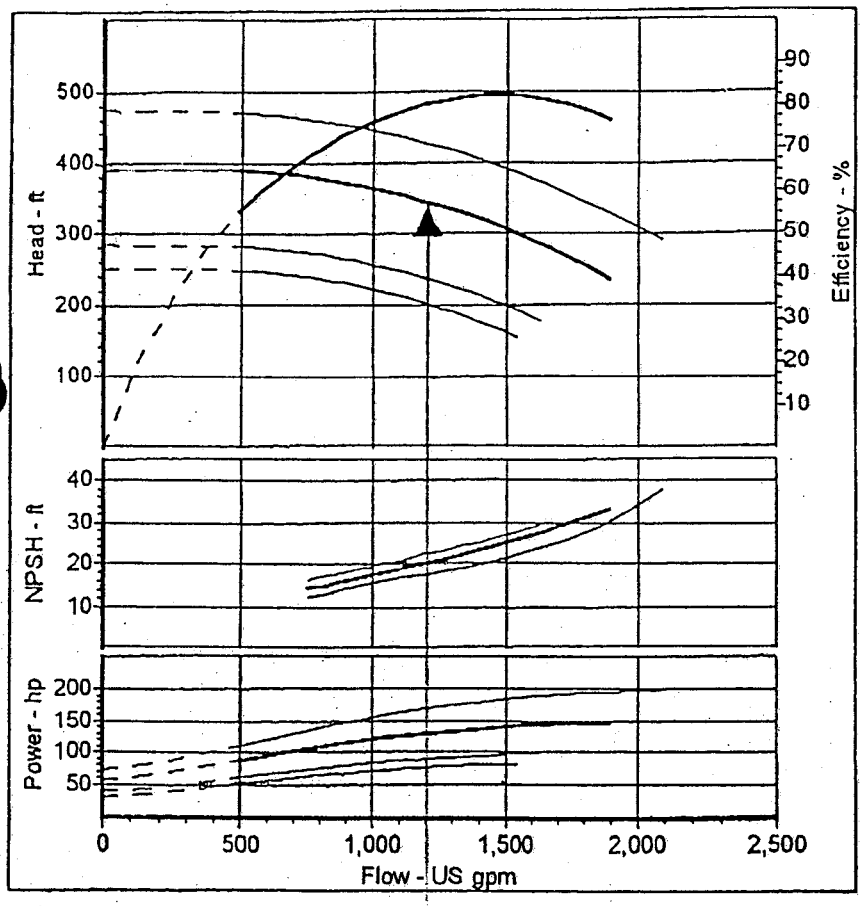
Alpha Southwest, Inc
1971 E. 5th St. Tempe, AZ 85281
Dave Bowen
Phone : 480 921 9789
Fax : 480 921 9861

Contact : Keith McKinney
Phone : Fax :

Project : Arizona - American Water Co.
Quote No. : US-2974-93-AZ- AWC 5AE11 Page No : 3
Date : Friday, April 20, 2001

Type: AE - Horizontal Split Case Single Stage
Pump Model: Peerless - 5AE11
Nom. Speed: 3565 RPM, 60 Hz Electric
Impeller Dia.: 9.50 Inch
Curve No.: 3132050
Market : Water

Item : 1
Impeller No.: 3132050
Fluid: Water
Temperature: 69.5 °F
Viscosity: 0.988 cSt
Sp. Gravity: 0.998
Your Ref. : Booster 5AE11



Duty Flow	1200	US gpm
Duty Head	335	ft
Imp. Dia.	9.5	inch
Power Required	130.14	hp
NPSH Required	19.986	ft
Efficiency	80.3	%
Peak Power	146.81	hp
Closed Valve Head	389.094	ft
Tolerance	Hyd Inst-Peerless Std	

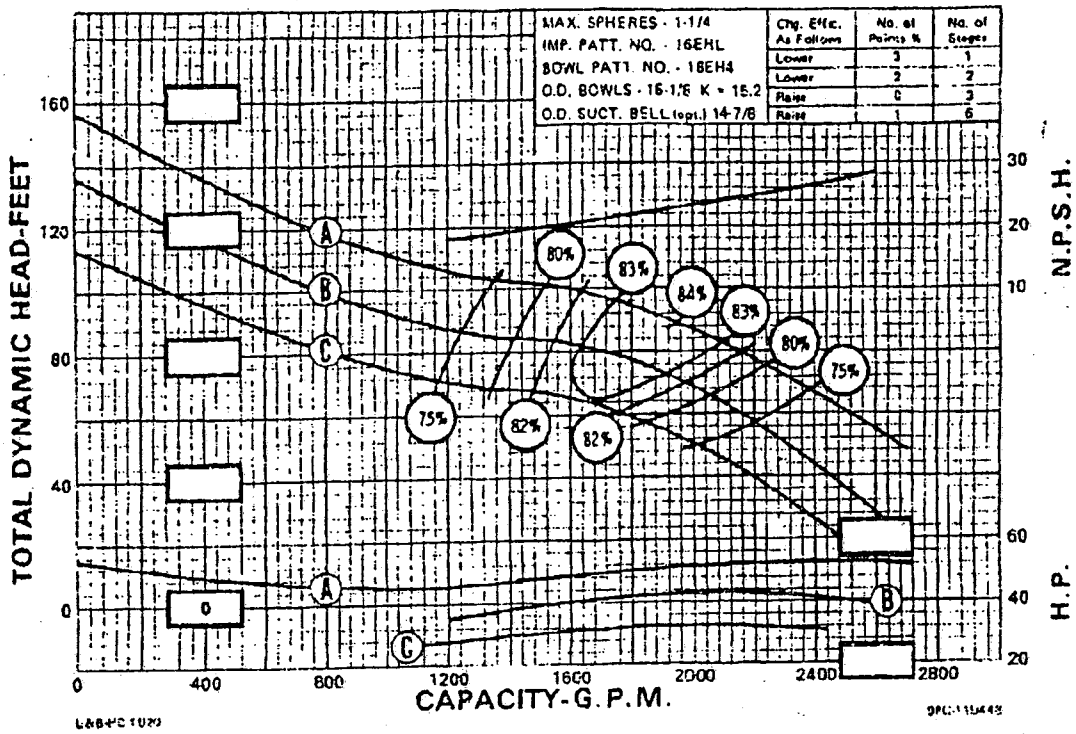
Comments

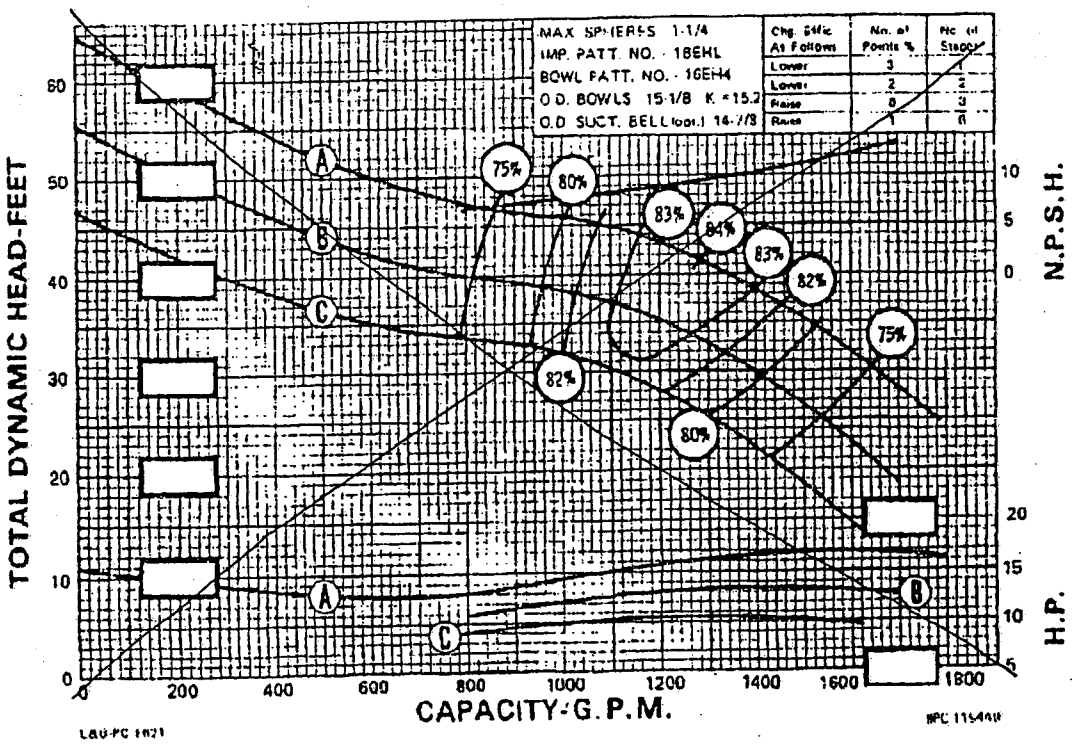
Performance curve represents typical performance. See Standard Hydraulic Performance document in the selective printing area of RAPID for testing tolerances & contractual guarantees.

Flow (US gpm)	Head (ft)	Pump Efficiency (%)	Power Required (hp)	NPSH Required (ft)
0.0	389.09	0.0	56.58	
497.4	389.13	55.4	88.14	
696.1	383.53	65.8	102.45	
894.9	372.54	73.2	115.05	15.63
1093.7	356.07	78.4	125.46	18.42
1292.5	334.22	81.6	133.74	21.45
1491.2	307.00	82.5	140.10	24.90
1690.0	274.30	81.0	144.61	28.78
1888.8	236.24	76.8	146.81	33.09

16EHL SERIES 1110

Verti-Line PUMP





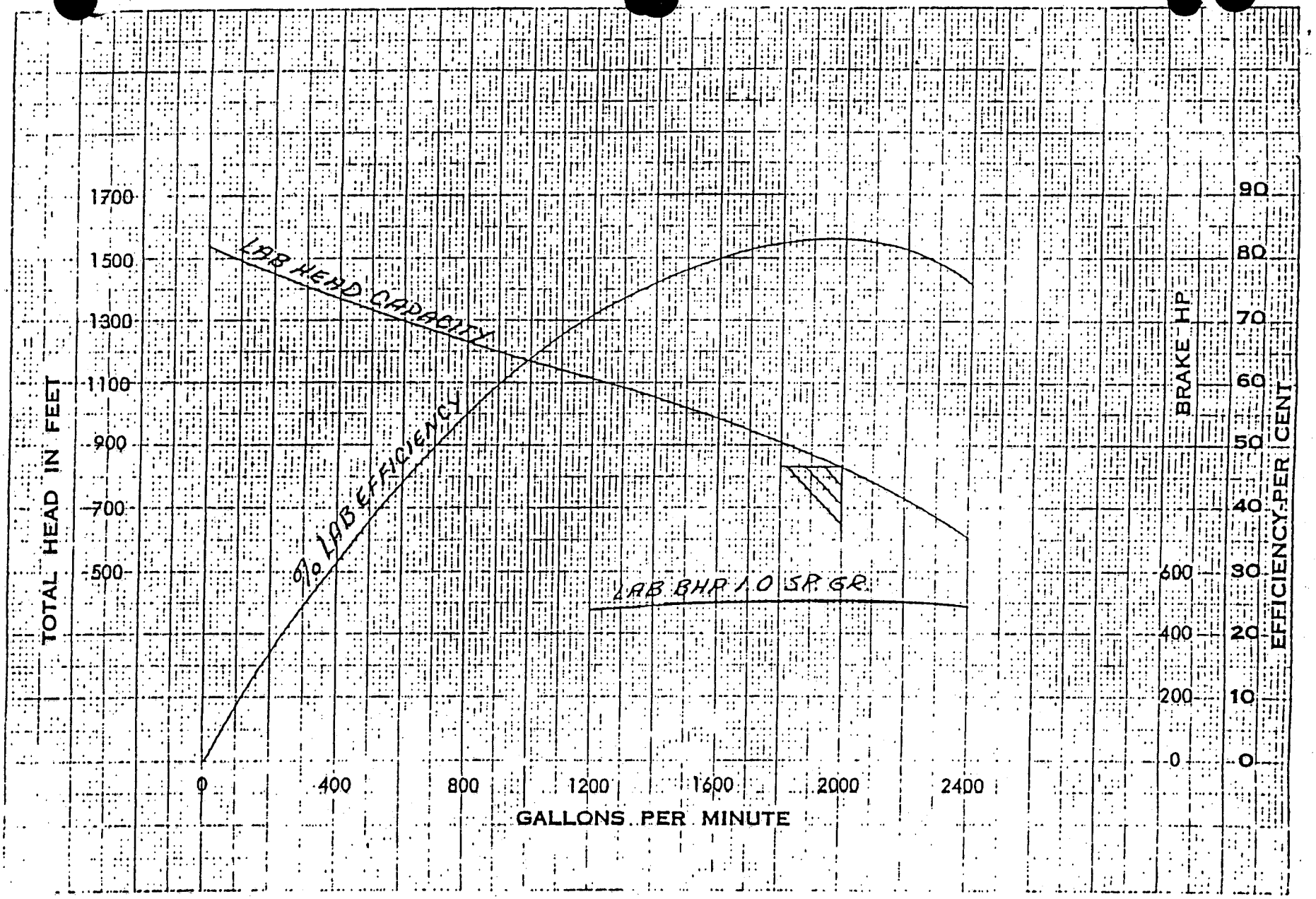
AURORA PUMP
A UNIT OF GENERAL [illegible]

(A) 11.609
(B) 10./50
(C) 9.8/5

NUMBER OF STAGES REQUIRED FOR APPLICATION
STANDARD CURVE ILLUSTRATES SINGLE STAGE PERFORMANCE ONLY

P300R

BYRON JACKSON



PUMP SIZE AND TYPE	RPM	CUSTOMER NO.	IMPELLER NO.	BASED ON	DATE	BYRON JACKSON NUMBER
15MQI C-10 STAGE DWT	1770		267954	3527	4-11-80	PC P-2098-1-ES
			BRANCH NO.	DATA BY	DRAWN BY DT	

SYS[illegible] PERFORMANCE WARRANTY
GUA[illegible] AT DESIGNATED POINT
ONLY AND IS CONTINGENT ON:
1. PROPER NPSH OR SUBMERGENCE AVAILABLE.
2. PROPER AND ADEQUATE FLOW TO PUMP SUCTION.
3. FLUID FREE OF GAS, AIR AND ABRASIVE MATTER.
4. IMPELLER WITH PROPER LATERIAL ADJUSTMENT (VERT. PUMP ONLY).

Peerless Pum[illegible]mpany

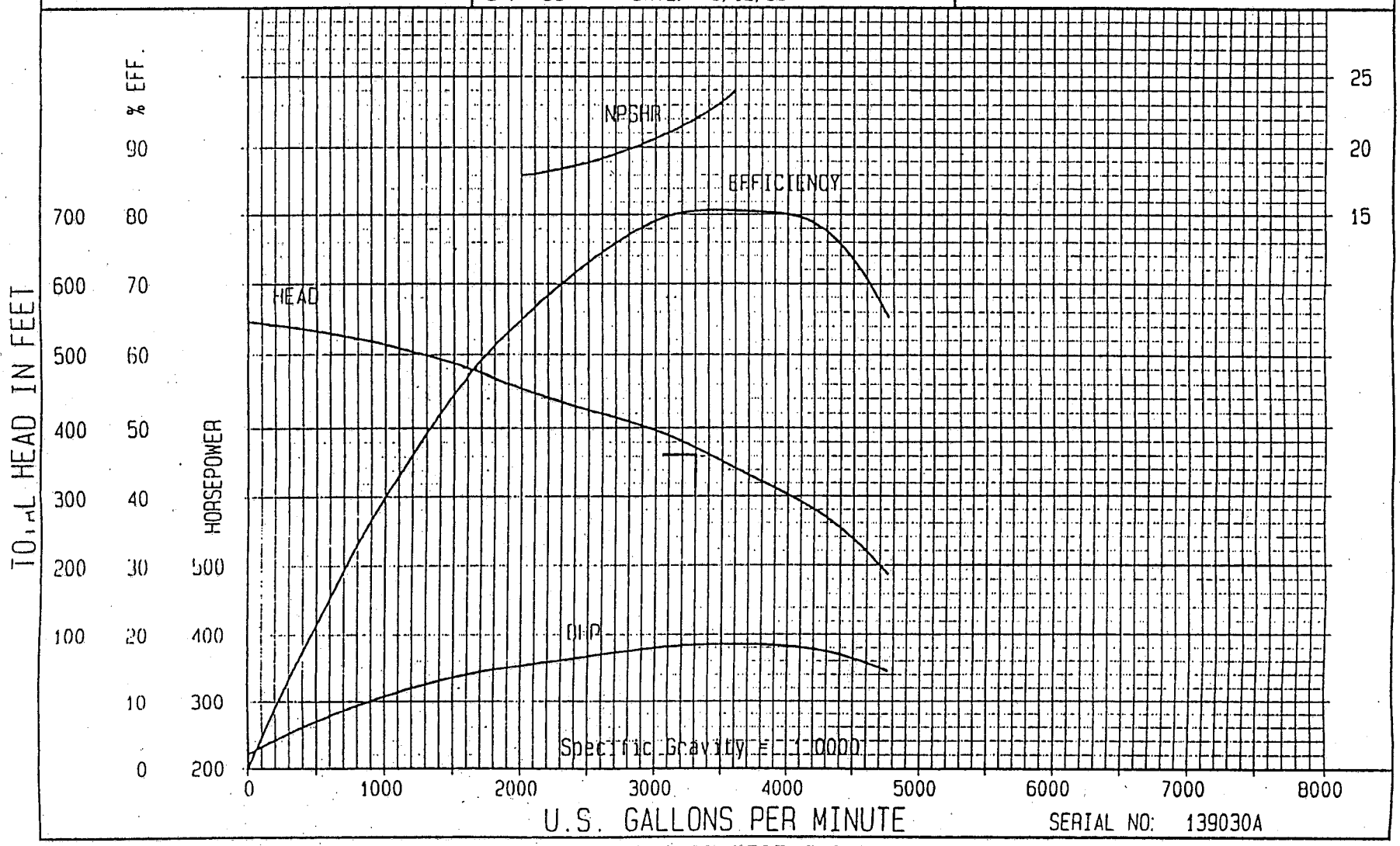
Indianapolis, IN 46207-7026

SERIAL NUMBER 139030A

FIELD PERFORMANCE
BY: DS DATE: 6/12/96

CURVE NO: C193387 Revision [illegible]
PUMP MODEL: 16HXB
TEST NO: 193387
SHOP ORDER: 9711MR2
STAGES: 4 RPM: 1775
IMPELLER: 2617216
IMP. DIA: 11.28x11.88

PMP-4560



CERTIFIED SHOP TEST CURVE

HYU[illegible] ERFORMANCE WARRANTY
GUAR[illegible] AT DESIGNATED POINT
ONLY AND IS CONTINGENT ON:
1. PROPER NPSH OR SUBMERGENCE AVAILABLE.
2. PROPER AND ADEQUATE FLOW TO PUMP SUCTION.
3. FLUID FREE OF GAS, AIR AND ABRASIVE MATTER.
4. IMPELLER WITH PROPER LATERIAL ADJUSTMENT (VERT. PUMP ONLY).

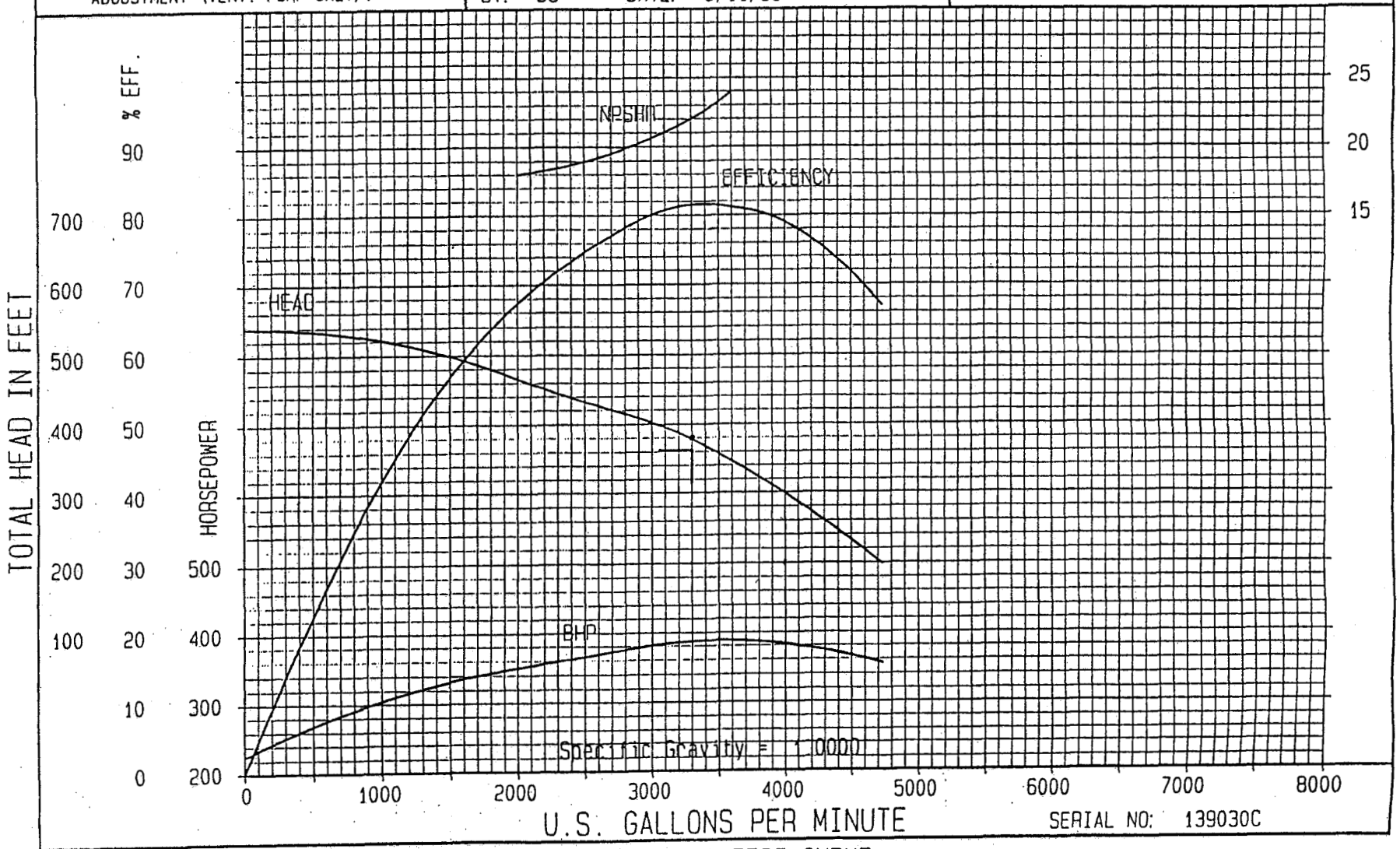
Peerless Pump [illegible]mpany
Indianapolis, IN 46207-7026

SERIAL NUMBER 139030C

FIELD PERFORMANCE
BY: DS DATE: 6/11/96

CURVE NO: C193381
PUMP MODEL: 16HX8
TEST NO: 193381
SHOP ORDER: 9711MR2
STAGES: 4 RPM: 1775
IMPELLER: 2617216
IMP. DIA: 11.28X11.88

PMP-4570



CERTIFIED SHOP TEST CURVE

GUA[illegible] AT DESIGNATED POINT ONLY AND IS CONTINGENT ON:
1. PROPER NPSH OR SUBMERGENCE AVAILABLE.
2. PROPER AND ADEQUATE FLOW TO PUMP SUCTION.
3. FLUID FREE OF GAS, AIR AND ABRASIVE MATTER.
4. IMPELLER WITH PROPER LATERIAL ADJUSTMENT (VERT. PUMP ONLY).

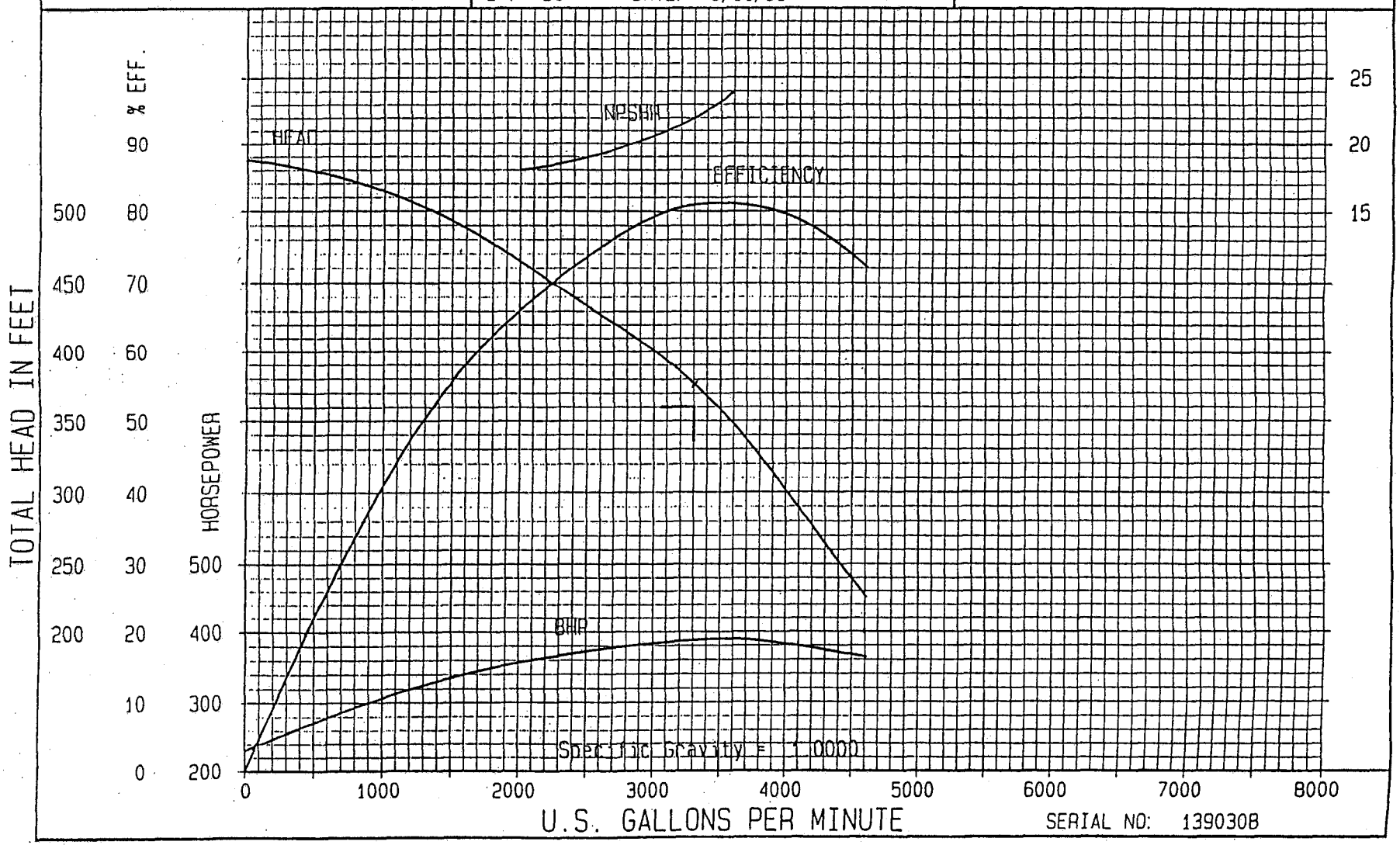
Peerless Pump Company
Indianapolis, IN 46207-7026

SERIAL NUMBER 139030B

FIELD PERFORMANCE
BY: OS DATE: 6/11/96

CURVE NO: C193376
PUMP MODEL: 16HXB
TEST NO: 193376
SHOP ORDER: 9711MR2
STAGES: 4 RPM: 1775
IMPELLER: 2617216
IMP. DIA: 11.28X11.88

PMP-4580



SERIAL NO: 139030B

CERTIFIED SHOP TEST CURVE

DES 134-30,30C

APRIL 1985

134-29

MODEL 2 1/2 YHB PUMP

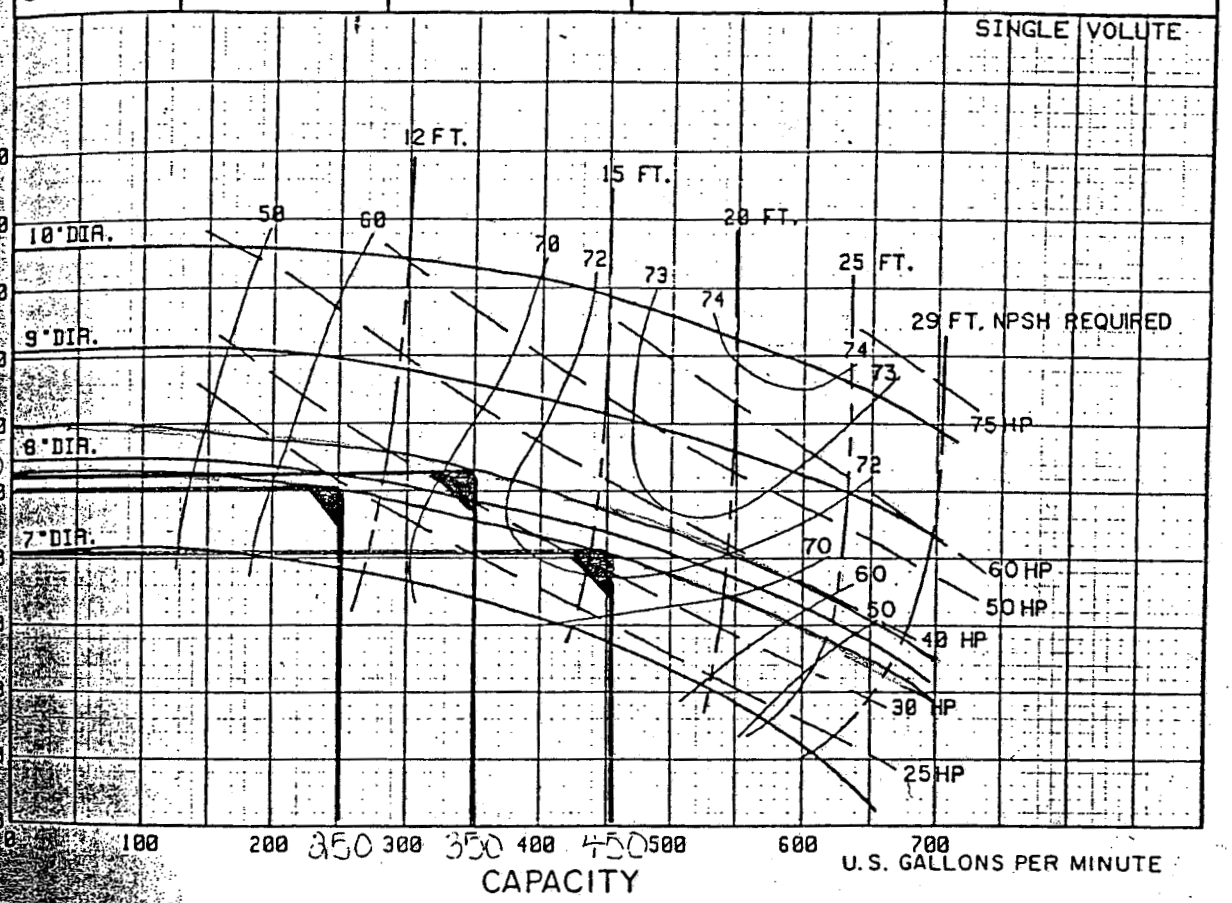
SPEED - 3600 RPM

Stone Canyon Booster Station

CLOSED IMPELLER

60 HERTZ

IMP. DIA. VARIOUS	N_S = 1060	MAX. DIA. SOLIDS .44"	SPEED: 3560 RPM	MODEL: 2-1/2YHB



HP	MAXIMUM IMPELLER DIAMETER: FOR FULL MOTOR LOAD	MAXIMUM IMPELLER DIAMETER: FOR FULL MOTOR LOAD + 15% S.F.
75	A(10.00")	
60	B(9.06")	B+(9.94")
50	C(8.69")	C+(8.94")
40	D(8.12")	D+(8.56")
30	E(7.69")	E+(7.88")
25	F(7.12")	F+(7.44")

FT. x (.305) = METERS

GPM x (.227) = CUBIC METERS PER HOUR

PARADISE VALLEY, AZ
JOB REFERENCE NO. 86083

CONDITIONS:

POINT 1 - 250 G.P.M. @ 250 T.D.H.

POINT 2 - 350 G.P.M. @ 260 T.D.H.

POINT 3 - 450 G.P.M. @ 205 T.D.H.

40 H.P., 3600 R.P.M.

Performances shown are for close-coupled electric configuration with packing. Other mounting styles may require horsepower and/or performance adjustments.

CORNELL PUMP CO. — PORTLAND, OREGON

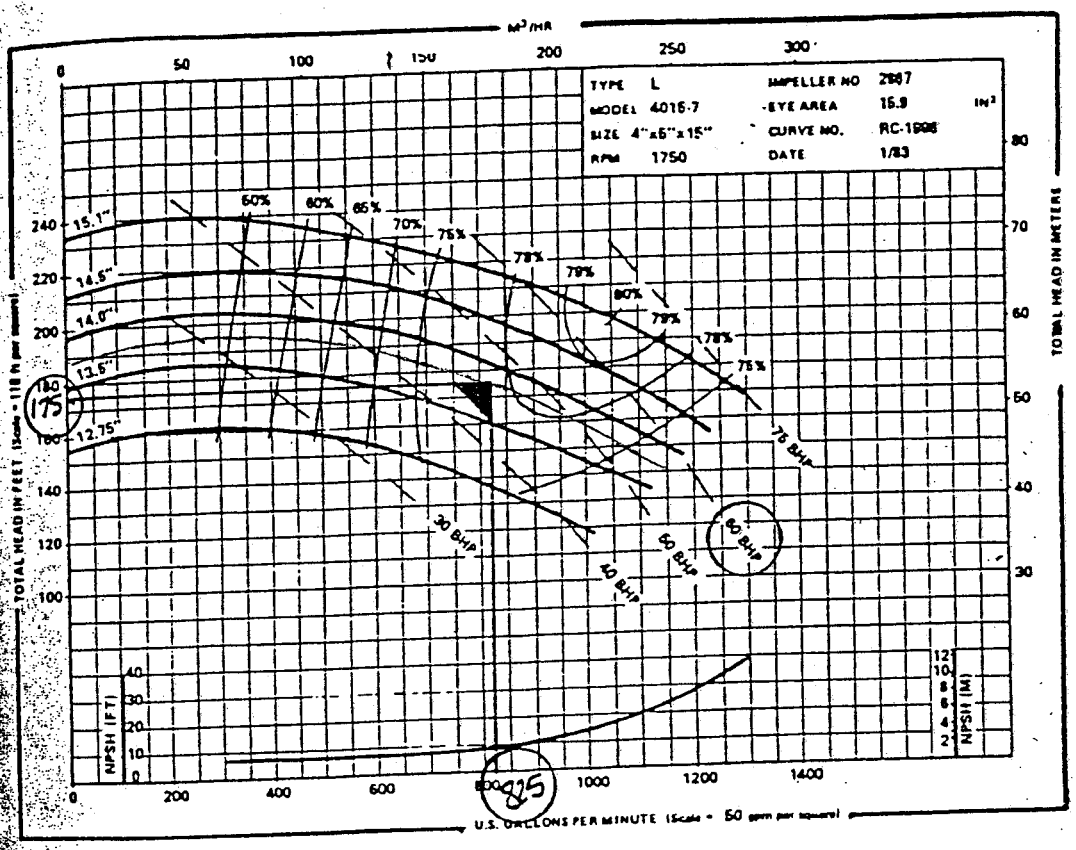
Clearwater Hills B.D.
3 pumps

A1b

END SUCTION CENTRIFUGAL PUMPS

Type L

PERFORMANCE CURVES — 1750 RPM



PARADISE VALLEY, ARIZONIA
JOB REFERENCE NO. 85172

CONDITIONS:

825 G.PM. @ 175' T.D.H.
60 H.P., 1750 R.P.M.

5095-5, 1750 RPM

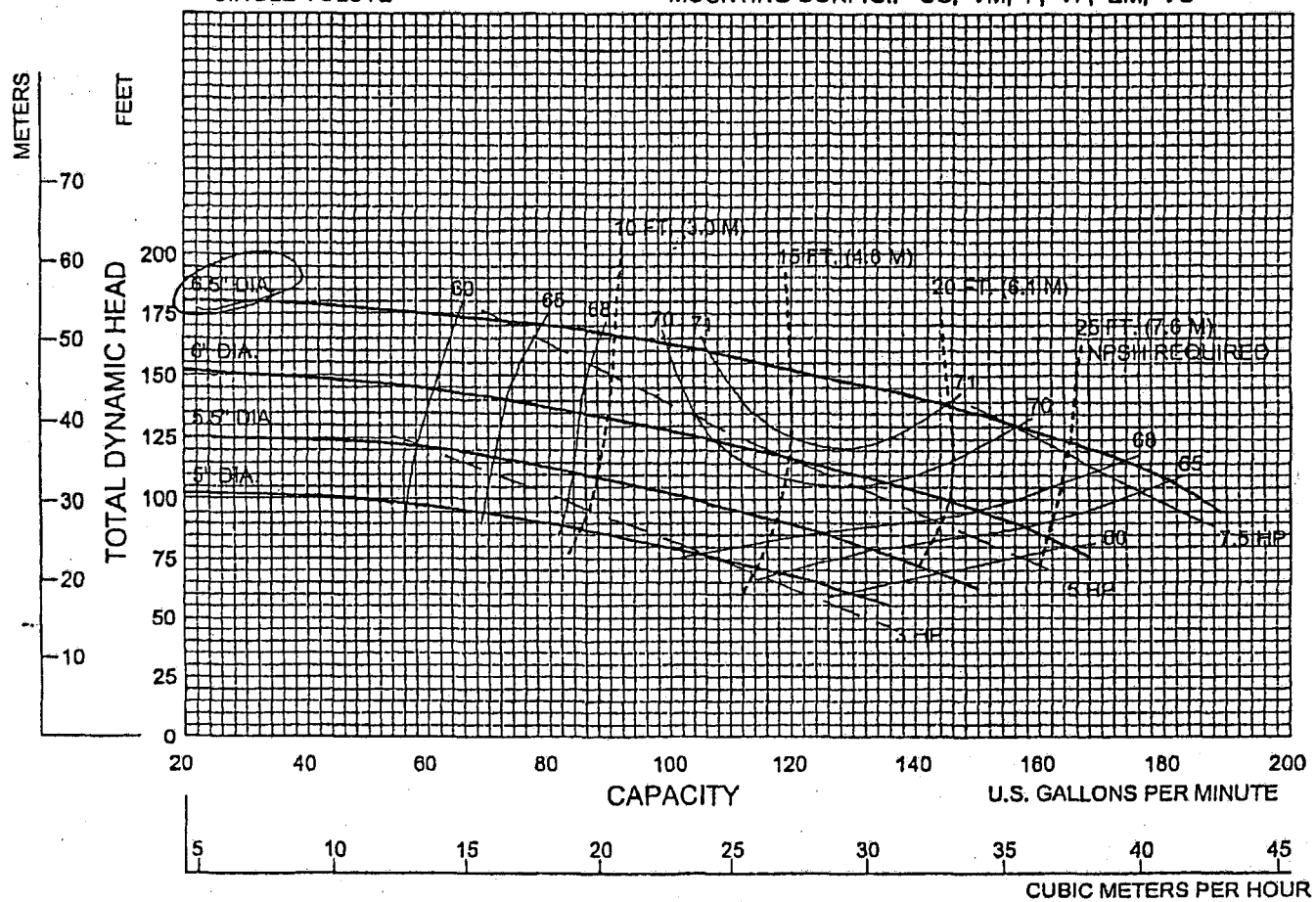
REFER TO FACTORY

Feet x .305 = Meters
Inches x 25.4 = Millimeters
GPM x .227 = Cubic Meters/Hour
GPM x 3.785 = Liters/Minute
HP x .746 = KW

Speed	Impeller Dia.	Style	Solids Dia.	N_S	Suction	Discharge	No. vanes
3520	VARIOUS	ENCLOSED	.25"	899	1.5"	1.25"	6

SINGLE VOLUTE

MOUNTING CONFIG.: CC, VM, F, VF, EM, VC



Your trim is 6.5"

Performances shown are for cool water, close-coupled electric configuration with packing. Other mounting styles or liquids may require horsepower and/or performance adjustments.

10/20/00

SUPERSEDES 8/11/00

125W36

CORNELL

Cornell Pump Company • Portland, Oregon

1.25W - 3600 RPM

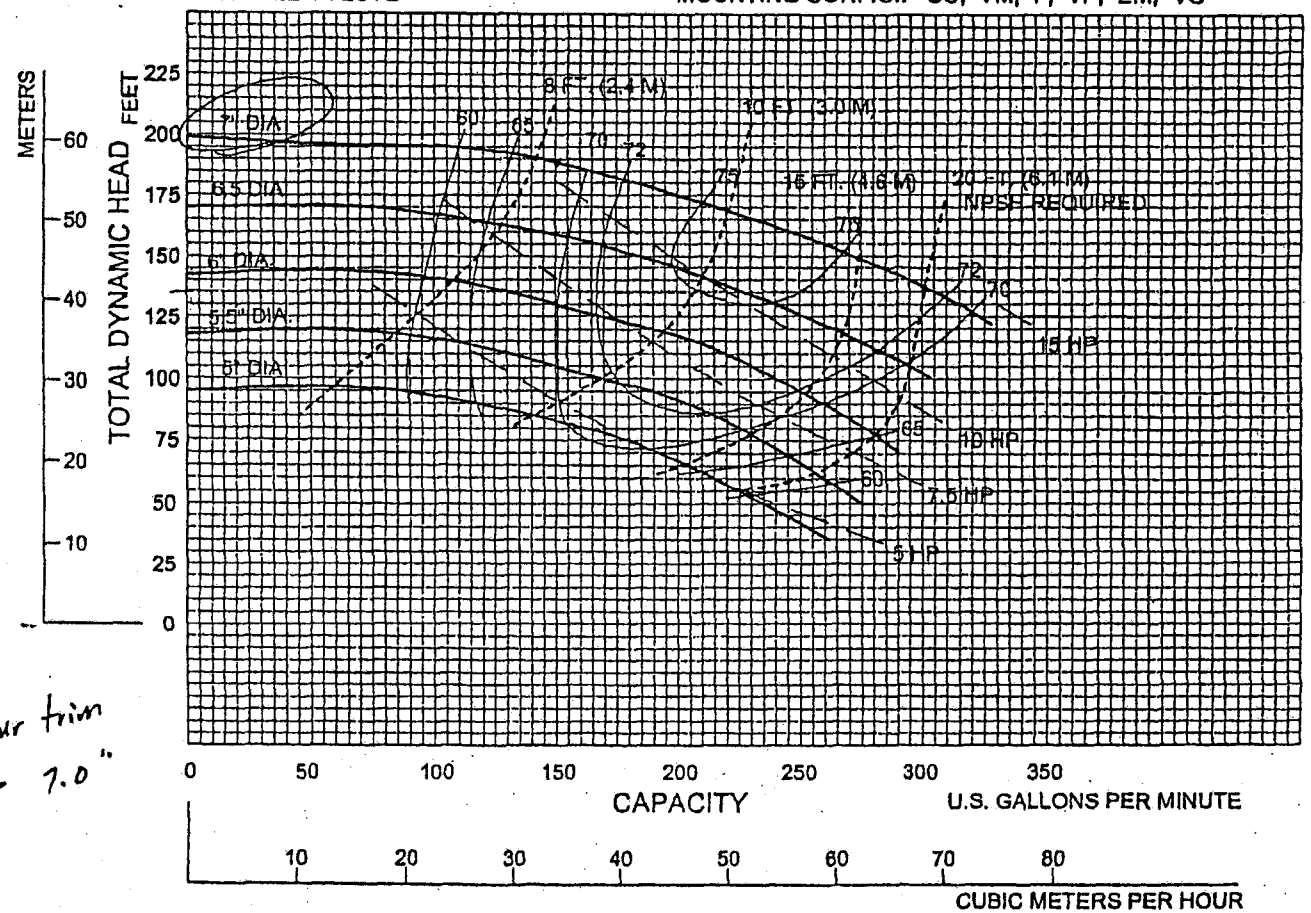
for Bruce
7.5 HP

Feet x .305 = Meters
Inches x 25.4 = Millimeters
GPM x .227 = Cubic Meters/Hour
GPM x 3.785 = Liters/Minute
HP x .746 = KW

Speed	Impeller Dia.	Style	Solids Dia.	N_S	Suction	Discharge	No. vanes
3530	VARIOUS	ENCLOSED	.34"	1119	2.5"	2"	5

SINGLE VOLUTE

MOUNTING CONFIG.: CC, VM, F, VF, EM, VC



Your trim is 7.0"

Performances shown are for cool water, close-coupled electric configuration with packing. Other mounting styles or liquids may require horsepower and/or performance adjustments.

8/21/00

CORNELL
Efficient by Design

Cornell Pump Company • Portland, Oregon

2W - 3600 RPM

NEW PAGE

2W36

LAS BRISAS 15HP

...S.
...ISAS
...ster Station
...o Fire flow
Pump

APRIL 1985

132-34

MODEL ~~3W~~ PUMP

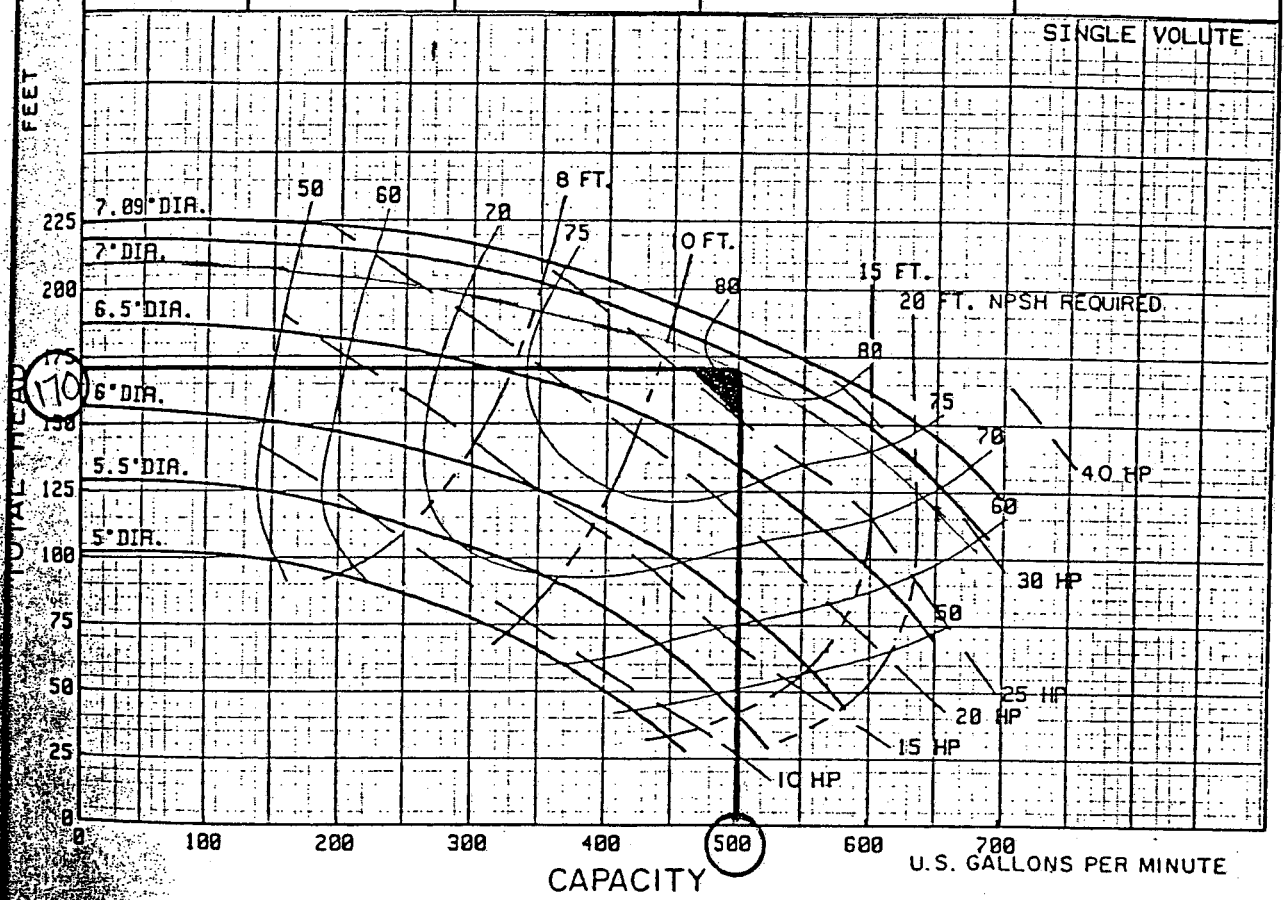
3WB
per Cornell
2/12/98

SPEED - 3600 RPM

CLOSED IMPELLER

60 HERTZ

IMP. DIA.: VARIOUS	N_S = 1633	MAX. DIA. SOLIDS: .50"	SPEED: 3550 RPM	MODEL: 3W



HP	MAXIMUM IMPELLER DIAMETER: FOR FULL MOTOR LOAD	MAXIMUM IMPELLER DIAMETER: FOR FULL MOTOR LOAD + 15% S.F.
40	A(7.09")	
30	B(6.94")	B+(7.09")
25	C(6.62")	C+(6.81")
20	D(6.25")	D+(6.5")
15	E(5.81")	E+(6.19")
10	F(5.06")	F+(5.62")

FT. x (.305) = METERS

GPM x (.227) = CUBIC METERS PER HOUR

PARADISE VALLEY, ARIZONA
JOB REFERENCE NO. 86308

CONDITIONS:

500 G.P.M. @ 170' T.D.H.

30 H.P., 3600 R.P.M.

Performances shown are for close-coupled electric configuration with packing. Other mounting styles may require horsepower and/or performance adjustments.

CORNELL PUMP CO. — PORTLAND, OREGON

thwest Inc. 4 Pumps
PV Water/Country Club Station
n Coughlan

PUMP-FLO ver: 5.0
File: (untitled)
Mar 20, 1997

PUMP DATA SHEET
Peerless Pump

Catalog: PRLESS60 v. 1

RVE: 3115024

YPE - SPEED: F/C - 1800

PUMP Size: 1240A

Speed: 1750 rpm
Imp dia: 11.375 in

Max Temperature: - °F
Max Pressure: - psi_g

Max Sphere Size: - in

Specific Speed Ns: -
Suction Nss: -

Suction size: 5 in
Discharge size: 4 in

FLUID Water tmp: 60 °F
den: 62.37 lb/ft³
vsc: 1.122 cP
vapor: 0.2568 psi
atm: 14.7 psi

NPSHa: - ft

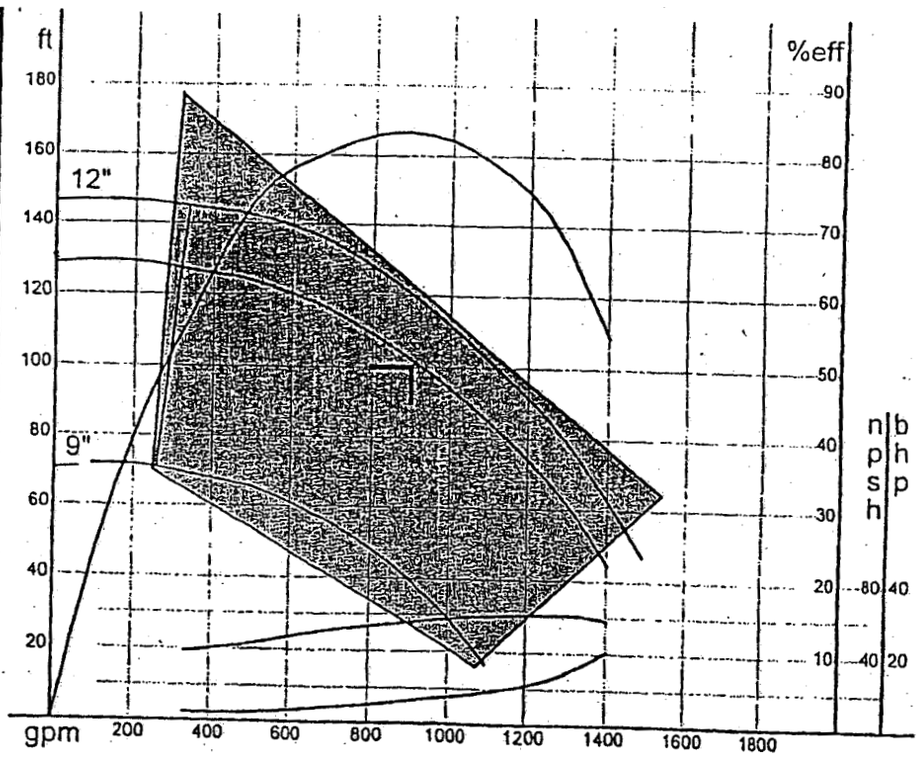
PIPING Pressure: - psi
Suction elev: - ft
size: - in
Discharge size: - in

DESIGN POINT
Flow: 900 gpm
Head: 100 ft

DATA POINT
Flow: 900 gpm
Head: 102 ft
Eff: 83 %
Power: 28.0 bhp
NPSHr: 12.8 ft

DESIGN CURVE
Shutoff Head: 129 ft
Pressure: 55.7 psi_g
Min Flow: 337 gpm
BEP: 83 %eff @ 910
Max: 30.5 bhp @ 1260

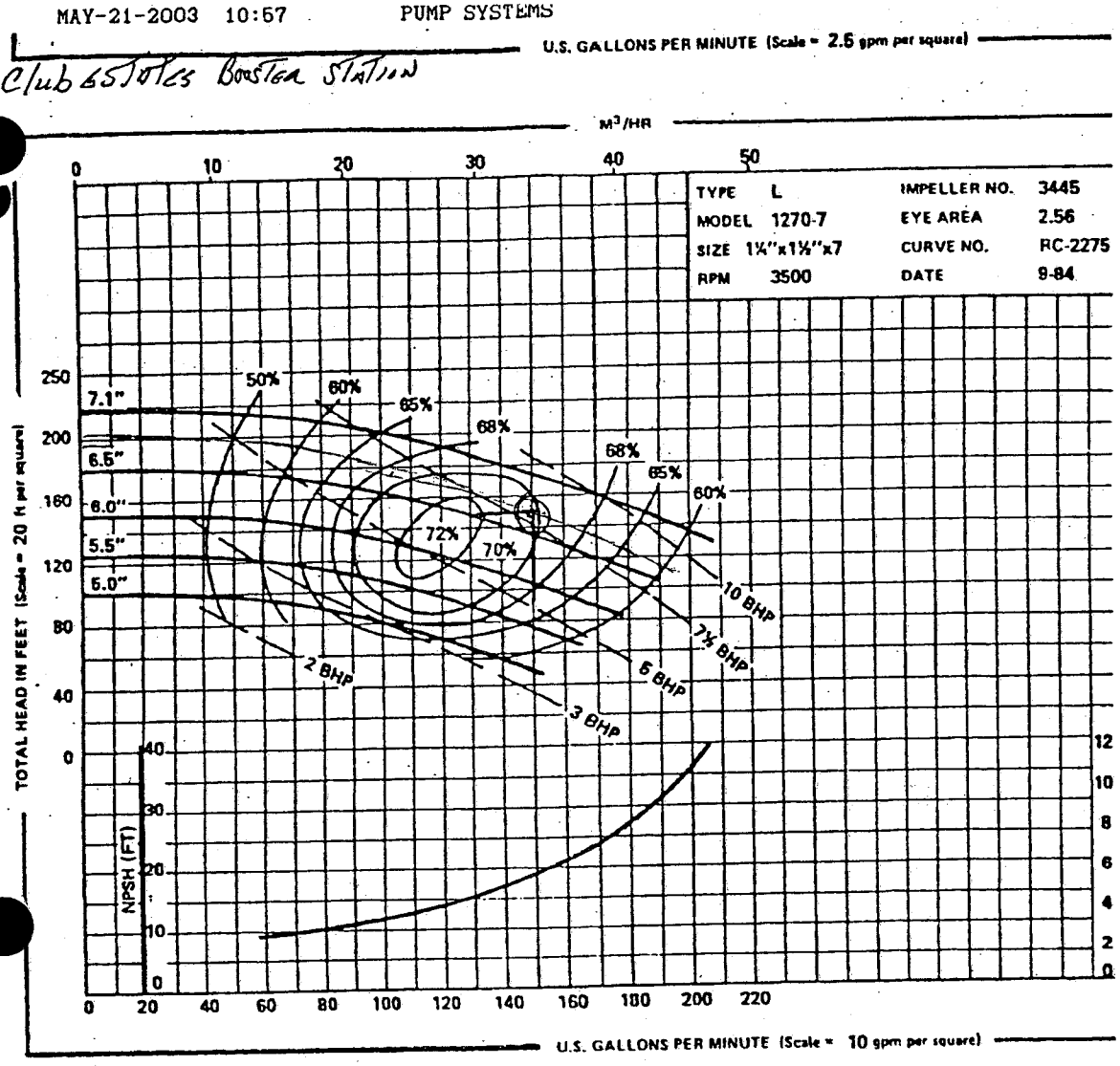
MAX DIAMETER
Max: 35.6 bhp @ 1340



PERFORMANCE EVALUATION

Flow gpm	Speed rpm	Head ft	Pump %eff	Power bhp	NPSHr ft	Motor %eff	Power kW	Hrs/yr	Cost
1080	1750	86.7	80	29.5	17.5				
900	1750	102	83	28.0	12.8				
720	1750	114	81	25.7	8.9				
540	1750	122	74	22.5	5.8				
[illegible]	1750	127	59	19.5	5.0				

Club estates Booster station



4

150 TDH

150 gpm

6-75 impeller

APPENDIX B

WATER MODEL RESULTS
FIRE FLOW AVAILABLE 2004

Calculation Results Summary

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004
[Analysis Started]
[Fire Flow]
Failed to Converge 0
Satisfied Constraints 347
Failed Constraints 241
Total Nodes Computed 588
[Steady State]
[Analysis Ended]

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004

Fire Flow Analysis

Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
Disch CC (J-2850)	22	1,500.00	0.00	N/A	92.77	N/A	N/A	N/A	false
Disch CWH I (J-1530	33	1,500.00	0.00	N/A	120.18	N/A	N/A	N/A	false
Disch MRBS (J-6000	11	1,500.00	0.00	N/A	140.71	N/A	N/A	N/A	false
Disch MRTF (J-6095)	11	1,500.00	0.00	N/A	137.94	N/A	N/A	N/A	false
Disch SC (J-2827)	44	1,500.00	0.00	N/A	141.00	N/A	N/A	N/A	false
Disch W16 (J-6060)	1	1,500.00	0.00	N/A	141.68	N/A	N/A	N/A	false
FH1	1	1,500.00	10.11	944.64	42.27	20.00	10.35	J-2135	false
FH1F	1	1,500.00	0.00	815.64	55.62	20.00	10.35	J-2135	false
FH2	1	1,500.00	0.00	3,000.00	69.87	39.09	10.33	J-2135	true
FH2F	1	1,500.00	0.00	3,000.00	71.94	54.03	10.33	J-2135	true
FH3	1	1,500.00	0.00	3,000.00	73.71	59.69	10.33	J-2135	true
FH3F	1	1,500.00	0.00	3,000.00	70.64	55.26	10.33	J-2135	true
FH4	1	1,500.00	0.00	1,280.32	65.26	20.00	10.35	J-2135	false
FH4F	1	1,500.00	0.00	1,032.44	61.31	20.00	10.35	J-2135	false
FH5	1	1,500.00	0.00	940.32	100.25	20.00	10.36	J-2135	false
FH5A	1	1,500.00	0.00	3,000.00	96.82	49.07	10.33	J-2135	true
FH5AF	1	1,500.00	0.00	3,000.00	95.52	61.21	10.33	J-2135	true
FH5F	1	1,500.00	33.25	740.11	95.11	20.00	10.36	J-2135	false
FH6	1	1,500.00	0.00	2,088.78	103.52	20.00	10.34	J-2135	true
FH6F	1	1,500.00	0.00	2,265.47	99.61	20.00	10.34	J-2135	true
FH8	1	1,500.00	0.00	3,000.00	114.55	65.06	10.34	J-2135	true
FH8F	1	1,500.00	0.00	3,000.00	114.17	63.28	10.34	J-2135	true
FH9	1	1,500.00	0.00	3,000.00	119.16	74.85	10.34	J-2135	true
FH9F	1	1,500.00	0.00	3,000.00	119.92	94.62	10.34	J-2135	true
FH10	1	1,500.00	0.00	732.33	44.74	20.00	10.36	J-2135	false
FH10F	1	1,500.00	0.00	1,329.44	62.98	20.00	0.93	J-1	false
FH11	2	1,500.00	0.00	158.20	57.27	52.80	-2.54	J-2736	false
FH11F	2	1,500.00	0.00	111.15	58.25	54.16	-2.54	J-2736	false
FH12	2	1,500.00	0.00	686.28	52.84	44.80	-2.54	J-2736	false
FH12F	3	1,500.00	0.00	919.01	98.28	20.00	10.62	J-2600	false
FH14	1	1,500.00	0.00	3,000.00	61.10	32.91	10.34	J-2135	true
FH14F	1	1,500.00	0.00	3,000.00	56.99	29.50	10.34	J-2135	true
FH15	1	1,500.00	0.00	1,285.22	52.63	20.00	10.35	J-2135	false
FH15F	1	1,500.00	0.00	329.48	52.63	20.00	10.36	J-2135	false
FH16	5	1,500.00	0.00	0.00	12.42	12.42	8.05	J-33	false
FH16F	5	1,500.00	0.00	0.00	8.05	8.05	8.05	J-33	false
FH17	3	1,500.00	0.00	439.48	75.15	20.00	10.62	J-2600	false
FH17F	3	1,500.00	0.00	381.73	64.37	20.00	10.62	J-2600	false
FH18	3	1,500.00	0.00	1,271.94	101.47	29.72	-2.54	FH17F	false
FH18F	3	1,500.00	0.00	631.48	68.63	20.00	10.62	J-2600	false
FH19	3	1,500.00	0.00	1,631.47	72.01	28.18	-2.54	J-2610	true
FH19F	3	1,500.00	0.00	1,609.95	88.73	20.00	-2.33	J-2610	true
FH20	2	1,500.00	0.00	72.69	38.08	34.25	-2.54	J-2736	false
FH20F	2	1,500.00	0.00	72.78	25.56	21.67	-2.54	J-2736	false
FH22	1	1,500.00	0.00	1,224.61	50.07	20.00	10.35	J-2135	false
FH22F	5	1,500.00	18.08	44.11	30.96	20.00	4.34	J-5145	false
J-1	1	1,500.00	0.00	355.04	42.99	20.00	10.36	J-2135	false
J-2	1	1,500.00	0.00	1,676.88	117.78	20.00	10.35	J-2135	true
J-4	5	1,500.00	0.00	0.00	14.14	14.14	8.05	J-33	false
J-4 s	5	1,500.00	0.00	0.00	16.39	16.39	8.05	J-33	false

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-5	1	1,500.00	0.00	3,000.00	49.79	34.83	10.33	J-2135	true
J-6	1	1,500.00	0.00	N/A	69.87	N/A	N/A	N/A	false
J-7 Sussman	5	1,500.00	0.00	36.19	25.94	20.00	5.25	J-5145	false
J-8	1	1,500.00	0.00	1,083.25	49.63	20.00	10.35	J-2135	false
J-9	1	1,500.00	0.00	3,000.00	56.19	41.61	10.33	J-2135	true
J-10	5	1,500.00	0.00	76.69	40.90	20.00	0.36	J-5145	false
J-11	1	1,500.00	0.00	3,000.00	56.19	32.05	10.33	J-2135	true
J-12	1	1,500.00	0.00	1,289.98	45.35	20.00	10.35	J-2135	false
J-16	99	1,500.00	0.00	N/A	9.40	N/A	N/A	N/A	false
J-17	11	1,500.00	0.00	N/A	140.71	N/A	N/A	N/A	false
J-18	1	1,500.00	0.00	N/A	62.93	N/A	N/A	N/A	false
J-19	1	1,500.00	0.00	3,000.00	73.78	45.50	10.32	J-2135	true
J-20	1	1,500.00	0.00	758.24	44.74	20.00	10.36	J-2135	false
J-21	1	1,500.00	0.00	1,503.75	56.35	20.00	10.34	J-2135	true
J-22	2	1,500.00	0.00	N/A	57.27	N/A	N/A	N/A	false
J-23	1	1,500.00	0.00	3,000.00	75.74	59.83	10.32	J-2135	true
J-24	2	1,500.00	0.00	N/A	58.25	N/A	N/A	N/A	false
J-26	2	1,500.00	0.00	686.28	52.84	44.90	-2.54	J-2736	false
J-27	1	1,500.00	0.00	3,000.00	119.92	98.91	10.34	J-2135	true
J-28	3	1,500.00	0.00	N/A	98.28	N/A	N/A	N/A	false
J-30	77	1,500.00	0.00	N/A	48.81	N/A	N/A	N/A	false
J-31	5	1,500.00	0.00	0.00	12.42	12.42	8.05	J-33	false
J-33	5	1,500.00	0.00	0.00	8.05	8.05	8.05	FH16F	false
J-35	1	1,500.00	0.00	N/A	70.64	N/A	N/A	N/A	false
J-36	1	1,500.00	0.00	3,000.00	119.16	79.14	10.34	J-2135	true
J-37	1	1,500.00	0.00	N/A	73.71	N/A	N/A	N/A	false
J-38	1	1,500.00	0.00	N/A	52.63	N/A	N/A	N/A	false
J-39	1	1,500.00	0.00	1,281.19	65.26	20.00	10.35	J-2135	false
J-40	37	1,500.00	0.00	N/A	22.41	N/A	N/A	N/A	false
J-42	1	1,500.00	0.00	1,033.17	61.31	20.00	10.35	J-2135	false
J-44	1	1,500.00	0.00	N/A	100.25	N/A	N/A	N/A	false
J-45	1	1,500.00	0.00	N/A	52.63	N/A	N/A	N/A	false
J-46	1	1,500.00	0.00	1,045.53	60.98	20.00	10.35	J-2135	false
J-47	1	1,500.00	0.00	N/A	103.52	N/A	N/A	N/A	false
J-48	1	1,500.00	0.00	3,000.00	91.16	63.77	10.33	J-2135	true
J-49	1	1,500.00	0.00	N/A	114.55	N/A	N/A	N/A	false
J-50	7	1,500.00	0.00	759.52	40.14	20.00	14.33	J-1975	false
J-51	1	1,500.00	0.00	3,000.00	96.87	50.90	10.33	J-2135	true
J-52	1	1,500.00	0.00	N/A	114.17	N/A	N/A	N/A	false
J-53	1	1,500.00	0.39	3,000.00	93.33	63.05	10.33	J-2135	true
J-54	1	1,500.00	0.00	3,000.00	96.82	61.44	10.33	J-2135	true
J-55	3	1,500.00	0.00	382.14	64.37	20.00	10.62	J-2600	false
J-56	1	1,500.00	0.18	3,000.00	94.64	24.36	10.33	J-2135	true
J-57	1	1,500.00	0.00	N/A	62.40	N/A	N/A	N/A	false
J-58	1	1,500.00	7.43	3,000.00	96.81	33.76	10.33	J-2135	true
J-59	1	1,500.00	0.00	N/A	56.99	N/A	N/A	N/A	false
J-60	66	1,500.00	0.00	N/A	117.89	N/A	N/A	N/A	false
J-61	1	1,500.00	0.00	3,000.00	97.68	25.35	10.33	J-2135	true
J-62	1	1,500.00	2.95	3,000.00	93.34	33.33	10.33	J-2135	true
J-63	1	1,500.00	0.00	3,000.00	96.83	59.62	10.33	J-2135	true

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-64	1	1,500.00	32.46	826.22	78.15	20.00	10.35	J-2135	false
J-65	1	1,500.00	15.30	741.71	80.20	20.00	10.35	J-2135	false
J-67	1	1,500.00	40.19	691.98	80.12	20.00	10.36	J-2135	false
J-68	1	1,500.00	20.51	738.01	80.19	20.00	10.35	J-2135	false
J-69	1	1,500.00	0.00	1,118.73	78.71	20.00	10.35	J-2135	false
J-70	16	1,500.00	0.00	N/A	41.26	N/A	N/A	N/A	false
J-71	1	1,500.00	21.43	697.13	80.13	20.00	10.36	J-2135	false
J-72	10	1,500.00	48.03	446.69	42.17	20.00	38.98	J-82	false
J-74	10	1,500.00	0.00	N/A	52.48	N/A	N/A	N/A	false
J-75	10	1,500.00	0.00	N/A	52.48	N/A	N/A	N/A	false
J-76	10	1,500.00	0.00	N/A	52.48	N/A	N/A	N/A	false
J-77	10	1,500.00	0.00	N/A	137.45	N/A	N/A	N/A	false
J-78	10	1,500.00	0.00	N/A	137.45	N/A	N/A	N/A	false
J-79	10	1,500.00	0.00	N/A	137.45	N/A	N/A	N/A	false
J-80	90	1,500.00	0.00	N/A	62.90	N/A	N/A	N/A	false
J-81	10	1,500.00	0.00	504.46	96.27	20.00	32.95	J-72	false
J-82	10	1,500.00	0.00	892.46	48.67	20.00	16.81	J-72	false
J-83	1	1,500.00	27.68	1,068.60	78.70	20.00	10.35	J-2135	false
J-84	1	1,500.00	23.39	1,100.56	80.86	20.00	10.35	J-2135	false
J-90	69	1,500.00	0.00	N/A	18.41	N/A	N/A	N/A	false
J-93	99	1,500.00	0.00	N/A	8.46	N/A	N/A	N/A	false
J-94	1	1,500.00	0.00	1,217.56	82.72	36.67	-2.54	J-1890	false
J-95	1	1,500.00	10.20	855.56	51.29	20.00	10.36	J-2135	false
J-96	1	1,500.00	20.40	1,120.33	64.26	20.00	-0.95	J-1890	false
J-100	1	1,500.00	15.21	3,000.00	139.21	120.64	10.34	J-2135	true
J-105	1	1,500.00	15.21	3,000.00	140.65	123.88	10.34	J-2135	true
J-110	1	1,500.00	15.21	3,000.00	140.18	119.87	10.34	J-2135	true
J-115	1	1,500.00	15.21	2,980.00	137.57	20.00	10.34	J-2135	true
J-120	1	1,500.00	15.21	3,000.00	139.75	122.96	10.34	J-2135	true
J-125	1	1,500.00	27.20	3,000.00	139.72	122.93	10.34	J-2135	true
J-130	1	1,500.00	11.99	3,000.00	136.54	113.13	10.34	J-2135	true
J-135	1	1,500.00	11.99	3,000.00	135.48	111.05	10.34	J-2135	true
J-140	1	1,500.00	11.99	3,000.00	134.63	109.36	10.34	J-2135	true
J-145	1	1,500.00	11.99	3,000.00	133.20	103.23	10.34	J-2135	true
J-150	1	1,500.00	11.99	3,000.00	134.71	108.57	10.34	J-2135	true
J-155	1	1,500.00	11.99	3,000.00	134.06	107.87	10.34	J-2135	true
J-160	1	1,500.00	13.00	3,000.00	126.91	100.77	10.34	J-2135	true
J-165	1	1,500.00	13.00	1,062.63	122.97	20.00	10.35	J-2135	false
J-170	1	1,500.00	13.00	3,000.00	126.86	94.15	10.34	J-2135	true
J-175	1	1,500.00	13.00	3,000.00	127.10	100.73	10.34	J-2135	true
J-180	1	1,500.00	13.00	3,000.00	128.26	101.05	10.34	J-2135	true
J-185	1	1,500.00	13.00	3,000.00	128.26	85.81	10.34	J-2135	true
J-190	1	1,500.00	11.99	3,000.00	130.85	106.80	10.34	J-2135	true
J-195	1	1,500.00	28.85	3,000.00	134.96	117.87	10.34	J-2135	true
J-200	1	1,500.00	11.99	3,000.00	126.57	97.33	10.34	J-2135	true
J-205	1	1,500.00	11.99	3,000.00	136.43	102.86	10.34	J-2135	true
J-210	9	1,500.00	0.00	3,000.00	62.86	62.86	43.35	J-330	true
J-220	1	1,500.00	11.99	3,000.00	126.25	108.19	10.34	J-2135	true
J-225	1	1,500.00	28.85	3,000.00	133.33	115.60	10.34	J-2135	true
J-230	1	1,500.00	16.87	3,000.00	124.99	99.87	10.34	J-2135	true

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004

Fire Flow Analysis

Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-235	1	1,500.00	16.87	3,000.00	124.81	97.45	10.34	J-2135	true
J-240	1	1,500.00	30.83	3,000.00	123.20	96.03	10.34	J-2135	true
J-245	1	1,500.00	22.50	3,000.00	118.55	100.63	10.34	J-2135	true
J-246	1	1,500.00	40.97	3,000.00	118.31	100.35	10.34	J-2135	true
J-247	1	1,500.00	28.99	3,000.00	117.61	99.61	10.34	J-2135	true
J-248	1	1,500.00	42.95	3,000.00	117.87	100.11	10.34	J-2135	true
J-250	1	1,500.00	18.48	3,000.00	114.95	81.52	10.34	J-2135	true
J-255	1	1,500.00	24.99	3,000.00	114.71	86.72	10.34	J-2135	true
J-260	1	1,500.00	24.99	3,000.00	115.11	91.04	10.34	J-2135	true
J-265	1	1,500.00	13.00	3,000.00	115.97	92.22	10.34	J-2135	true
J-270	1	1,500.00	18.27	3,000.00	115.00	91.42	10.34	J-2135	true
J-275	1	1,500.00	13.00	3,000.00	114.65	86.25	10.34	J-2135	true
J-280	1	1,500.00	5.26	2,844.91	111.29	20.00	10.34	J-2135	true
J-285	1	1,500.00	5.26	3,000.00	111.42	60.51	10.34	J-2135	true
J-290	1	1,500.00	5.26	3,000.00	110.85	87.68	10.34	J-2135	true
J-295	1	1,500.00	24.99	3,000.00	115.84	88.43	10.34	J-2135	true
J-300	1	1,500.00	13.00	3,000.00	124.85	98.36	10.34	J-2135	true
J-305	1	1,500.00	13.00	3,000.00	124.72	96.62	10.34	J-2135	true
J-310	1	1,500.00	13.00	3,000.00	121.31	96.39	10.34	J-2135	true
J-315	1	1,500.00	13.00	3,000.00	114.32	26.87	10.34	J-2135	true
J-320	1	1,500.00	13.00	2,695.68	112.13	20.00	10.34	J-2135	true
J-330	9	1,500.00	0.00	979.34	43.35	20.00	62.86	J-210	false
J-340	1	1,500.00	11.99	3,000.00	135.13	117.83	10.34	J-2135	true
J-345	1	1,500.00	36.98	3,000.00	124.51	46.87	10.34	J-2135	true
J-350	1	1,500.00	20.11	2,706.16	123.21	20.00	10.34	J-2135	true
J-355	1	1,500.00	20.11	2,590.99	124.60	20.00	10.34	J-2135	true
J-360	1	1,500.00	20.11	3,000.00	123.38	34.94	10.34	J-2135	true
J-365	1	1,500.00	20.11	3,000.00	123.32	53.83	10.34	J-2135	true
J-370	1	1,500.00	20.11	3,000.00	121.57	60.33	10.34	J-2135	true
J-375	1	1,500.00	30.42	3,000.00	121.53	87.21	10.34	J-2135	true
J-380	1	1,500.00	18.48	3,000.00	115.19	62.96	10.34	J-2135	true
J-385	1	1,500.00	13.97	3,000.00	119.69	81.24	10.34	J-2135	true
J-390	1	1,500.00	13.97	3,000.00	120.63	93.65	10.34	J-2135	true
J-395	1	1,500.00	42.95	3,000.00	117.49	86.88	10.34	J-2135	true
J-400	6	1,500.00	0.00	2.74	20.62	20.00	20.01	J-1290	false
J-405	1	1,500.00	22.14	3,000.00	114.05	84.99	10.34	J-2135	true
J-410	1	1,500.00	10.51	3,000.00	115.01	25.23	10.34	J-2135	true
J-415	1	1,500.00	10.51	3,000.00	114.39	83.77	10.34	J-2135	true
J-420	1	1,500.00	10.51	3,000.00	117.76	93.17	10.34	J-2135	true
J-425	1	1,500.00	42.95	3,000.00	117.01	99.37	10.34	J-2135	true
J-430	88	1,500.00	0.00	3,000.00	160.40	160.40	160.40	J-430	true
J-440	1	1,500.00	18.48	3,000.00	107.53	88.56	10.34	J-2135	true
J-445	1	1,500.00	18.48	3,000.00	108.41	89.46	10.34	J-2135	true
J-450	38	1,500.00	0.00	N/A	14.47	N/A	N/A	N/A	false
J-455	1	1,500.00	63.61	3,000.00	116.27	98.45	10.34	J-2135	true
J-460	1	1,500.00	31.89	3,000.00	124.29	105.27	10.34	J-2135	true
J-465	1	1,500.00	15.21	3,000.00	126.24	106.74	10.34	J-2135	true
J-470	1	1,500.00	18.48	3,000.00	109.39	64.34	10.34	J-2135	true
J-475	1	1,500.00	31.89	3,000.00	121.28	102.77	10.34	J-2135	true
J-480	1	1,500.00	30.42	3,000.00	122.86	88.96	10.34	J-2135	true

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004

Fire Flow Analysis

Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-490	1	1,500.00	28.45	3,000.00	133.31	98.11	10.34	J-2135	true
J-495	1	1,500.00	28.45	3,000.00	133.30	50.99	10.34	J-2135	true
J-500	1	1,500.00	28.45	1,222.96	65.28	20.00	10.35	J-2135	false
J-505	1	1,500.00	16.68	3,000.00	117.44	72.65	10.34	J-2135	true
J-510	1	1,500.00	16.68	3,000.00	122.93	76.47	10.34	J-2135	true
J-515	1	1,500.00	28.45	2,588.33	117.83	20.00	10.34	J-2135	true
J-520	1	1,500.00	16.68	3,000.00	120.15	71.68	10.34	J-2135	true
J-525	1	1,500.00	46.93	3,000.00	114.94	96.35	10.34	J-2135	true
J-545	1	1,500.00	13.00	2,510.28	100.52	20.00	10.34	J-2135	true
J-550	1	1,500.00	10.33	1,646.80	109.69	20.00	10.35	J-2135	true
J-560	1	1,500.00	30.47	1,291.21	111.75	20.00	10.35	J-2135	false
J-565	1	1,500.00	15.34	2,467.71	107.71	20.00	10.34	J-2135	true
J-570	1	1,500.00	15.34	2,254.90	106.34	20.00	10.34	J-2135	true
J-575	1	1,500.00	25.67	2,254.67	102.49	20.00	10.34	J-2135	true
J-580	1	1,500.00	17.47	1,510.21	109.57	20.00	10.35	J-2135	true
J-585	1	1,500.00	17.47	993.03	109.56	20.00	10.36	J-2135	false
J-590	1	1,500.00	10.33	932.56	111.76	20.00	10.36	J-2135	false
J-595	1	1,500.00	17.47	1,071.17	104.44	20.00	10.35	J-2135	false
J-600	1	1,500.00	27.84	2,163.57	98.90	20.00	10.34	J-2135	true
J-605	1	1,500.00	27.84	3,000.00	99.82	60.00	10.34	J-2135	true
J-610	1	1,500.00	14.30	3,000.00	92.41	74.83	10.34	J-2135	true
J-615	1	1,500.00	29.64	3,000.00	94.97	76.36	10.34	J-2135	true
J-620	1	1,500.00	15.34	1,170.46	97.11	20.00	10.35	J-2135	false
J-625	1	1,500.00	15.34	1,497.34	99.73	20.00	10.35	J-2135	false
J-630	1	1,500.00	14.30	2,433.75	94.88	20.00	10.34	J-2135	true
J-635	1	1,500.00	29.64	3,000.00	98.18	78.87	10.34	J-2135	true
J-640	1	1,500.00	14.30	2,649.63	95.75	20.00	10.34	J-2135	true
J-645	1	1,500.00	14.30	3,000.00	91.34	72.59	10.33	J-2135	true
J-650	1	1,500.00	14.30	1,800.66	101.14	20.00	10.35	J-2135	true
J-655	1	1,500.00	14.30	3,000.00	101.33	81.12	10.34	J-2135	true
J-660	1	1,500.00	24.80	2,135.70	103.12	20.00	10.34	J-2135	true
J-665	1	1,500.00	24.80	1,515.38	103.65	20.00	10.35	J-2135	true
J-670	1	1,500.00	21.44	3,000.00	104.74	83.47	10.34	J-2135	true
J-675	1	1,500.00	10.51	3,000.00	104.54	44.61	10.34	J-2135	true
J-680	1	1,500.00	10.51	3,000.00	105.21	70.52	10.34	J-2135	true
J-685	1	1,500.00	10.51	3,000.00	104.98	69.76	10.34	J-2135	true
J-690	1	1,500.00	11.63	3,000.00	105.29	87.88	10.34	J-2135	true
J-695	1	1,500.00	29.64	3,000.00	102.71	82.20	10.34	J-2135	true
J-700	1	1,500.00	15.34	2,496.92	102.88	20.00	10.34	J-2135	true
J-705	1	1,500.00	36.44	3,000.00	93.33	78.92	10.33	J-2135	true
J-710	1	1,500.00	36.44	3,000.00	93.37	78.61	10.33	J-2135	true
J-715	1	1,500.00	14.30	3,000.00	93.42	75.06	10.33	J-2135	true
J-720	1	1,500.00	14.30	2,559.72	85.87	20.00	10.34	J-2135	true
J-735	1	1,500.00	44.88	3,000.00	100.85	83.25	10.33	J-2135	true
J-740	1	1,500.00	11.63	3,000.00	96.82	78.22	10.33	J-2135	true
J-745	1	1,500.00	46.53	3,000.00	92.14	74.05	10.33	J-2135	true
J-750	1	1,500.00	0.00	3,000.00	132.15	112.07	10.34	J-2135	true
J-755	1	1,500.00	11.63	3,000.00	94.55	76.57	10.33	J-2135	true
J-760	1	1,500.00	33.25	2,696.46	101.32	20.00	10.34	J-2135	true
J-775	1	1,500.00	33.25	2,583.25	95.86	20.00	10.34	J-2135	true

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004

Fire Flow Analysis

Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-780	1	1,500.00	33.25	2,875.76	94.26	20.00	10.34	J-2135	true
J-790	1	1,500.00	44.88	3,000.00	92.42	76.43	10.33	J-2135	true
J-795	1	1,500.00	11.63	3,000.00	91.07	74.09	10.33	J-2135	true
J-800	1	1,500.00	11.63	2,612.00	89.15	20.00	10.34	J-2135	true
J-810	1	1,500.00	11.63	1,393.34	86.79	20.00	10.35	J-2135	false
J-815	1	1,500.00	25.93	3,000.00	85.69	71.56	10.33	J-2135	true
J-820	1	1,500.00	14.30	3,000.00	89.90	33.59	10.33	J-2135	true
J-825	1	1,500.00	14.30	1,640.53	85.28	20.00	10.35	J-2135	true
J-830	1	1,500.00	34.99	3,000.00	83.69	64.73	10.33	J-2135	true
J-835	1	1,500.00	20.70	2,240.57	85.47	20.00	10.34	J-2135	true
J-840	1	1,500.00	20.70	1,886.26	91.07	20.00	10.35	J-2135	true
J-845	1	1,500.00	27.84	2,846.65	97.14	20.00	10.34	J-2135	true
J-850	1	1,500.00	27.84	3,000.00	96.28	40.48	10.34	J-2135	true
J-855	1	1,500.00	27.84	3,000.00	96.14	34.89	10.34	J-2135	true
J-865	1	1,500.00	7.14	2,179.78	103.52	20.00	10.34	J-2135	true
J-870	1	1,500.00	7.14	2,235.81	101.36	20.00	10.34	J-2135	true
J-885	1	1,500.00	7.14	2,346.68	99.61	20.00	10.34	J-2135	true
J-890	1	1,500.00	7.14	2,057.83	97.82	20.00	10.34	J-2135	true
J-900	1	1,500.00	7.14	2,342.01	100.04	20.00	10.34	J-2135	true
J-905	1	1,500.00	7.14	2,063.78	103.51	20.00	10.34	J-2135	true
J-910	1	1,500.00	20.70	1,611.42	99.03	20.00	10.35	J-2135	true
J-915	1	1,500.00	20.70	1,300.41	102.05	20.00	10.35	J-2135	false
J-920	1	1,500.00	20.70	1,405.70	95.95	20.00	10.35	J-2135	false
J-925	1	1,500.00	7.14	2,071.79	106.55	20.00	10.34	J-2135	true
J-930	1	1,500.00	20.70	1,758.50	89.11	20.00	10.35	J-2135	true
J-935	1	1,500.00	20.70	2,016.91	86.08	20.00	10.35	J-2135	true
J-940	1	1,500.00	20.70	3,000.00	81.42	43.96	10.33	J-2135	true
J-945	1	1,500.00	20.70	1,050.57	72.33	20.00	10.35	J-2135	false
J-950	1	1,500.00	20.70	3,000.00	77.12	57.73	10.33	J-2135	true
J-955	1	1,500.00	20.70	3,000.00	69.78	48.68	10.33	J-2135	true
J-960	1	1,500.00	14.30	3,000.00	69.17	50.08	10.33	J-2135	true
J-965	1	1,500.00	14.30	563.37	77.98	20.00	10.36	J-2135	false
J-970	1	1,500.00	35.09	3,000.00	75.93	62.18	10.33	J-2135	true
J-975	1	1,500.00	25.93	3,000.00	83.65	69.62	10.33	J-2135	true
J-980	1	1,500.00	20.80	3,000.00	77.11	62.92	10.33	J-2135	true
J-990	1	1,500.00	11.63	3,000.00	82.75	68.30	10.33	J-2135	true
J-995	1	1,500.00	43.56	3,000.00	82.34	58.46	10.33	J-2135	true
J-1010	1	1,500.00	10.11	3,000.00	83.65	37.09	10.33	J-2135	true
J-1030	1	1,500.00	10.11	3,000.00	73.79	58.59	10.32	J-2135	true
J-1045	1	1,500.00	10.11	1,109.62	42.10	20.00	10.35	J-2135	false
J-1050	1	1,500.00	10.11	3,000.00	44.19	38.76	10.31	J-2135	true
J-1055	1	1,500.00	30.52	3,000.00	68.04	56.25	10.32	J-2135	true
J-1060	1	1,500.00	10.11	1,039.40	83.34	20.00	10.35	J-2135	false
J-1070	1	1,500.00	10.11	2,129.52	68.02	20.00	10.34	J-2135	true
J-1075	1	1,500.00	10.11	3,000.00	77.86	60.45	10.33	J-2135	true
J-1080	1	1,500.00	31.92	3,000.00	72.77	54.97	10.33	J-2135	true
J-1085	1	1,500.00	31.92	3,000.00	69.87	52.40	10.33	J-2135	true
J-1090	1	1,500.00	31.92	3,000.00	68.69	52.01	10.33	J-2135	true
J-1095	1	1,500.00	31.92	3,000.00	67.10	51.47	10.33	J-2135	true
J-1100	1	1,500.00	31.92	3,000.00	61.39	46.16	10.33	J-2135	true

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-1105	1	1,500.00	41.09	3,000.00	61.38	47.25	10.33	J-2135	true
J-1115	1	1,500.00	9.16	3,000.00	69.14	55.19	10.33	J-2135	true
J-1120	1	1,500.00	82.18	3,000.00	56.33	41.83	10.33	J-2135	true
J-1125	1	1,500.00	31.92	3,000.00	73.14	29.95	10.33	J-2135	true
J-1130	1	1,500.00	42.03	3,000.00	73.46	53.72	10.33	J-2135	true
J-1135	1	1,500.00	52.63	2,283.69	68.80	20.00	10.34	J-2135	true
J-1140	5	1,500.00	18.08	67.15	37.53	20.00	1.57	J-5145	false
J-1150	1	1,500.00	18.08	1,452.85	65.67	20.00	10.35	J-2135	false
J-1160	1	1,500.00	18.08	3,000.00	69.14	55.19	10.33	J-2135	true
J-1165	5	1,500.00	18.08	0.00	13.75	13.75	8.05	J-33	false
J-1170	1	1,500.00	0.00	1,351.50	56.33	20.00	10.35	J-2135	false
J-1175	1	1,500.00	0.00	430.71	48.96	20.00	10.36	J-2135	false
J-1180	1	1,500.00	29.87	3,000.00	48.16	32.85	10.34	J-2135	true
J-1185	1	1,500.00	20.71	1,422.64	56.77	20.00	10.35	J-2135	false
J-1190	1	1,500.00	20.71	467.38	57.39	20.00	10.36	J-2135	false
J-1195	1	1,500.00	38.32	1,637.60	61.56	20.00	10.35	J-2135	true
J-1200	1	1,500.00	38.32	1,333.19	60.07	20.00	10.35	J-2135	false
J-1205	1	1,500.00	17.62	2,221.25	65.13	20.00	10.34	J-2135	true
J-1210	1	1,500.00	38.32	1,389.22	62.63	20.00	10.35	J-2135	false
J-1215	1	1,500.00	20.71	1,022.28	59.54	20.00	10.35	J-2135	false
J-1220	1	1,500.00	24.48	3,000.00	65.42	44.54	10.34	J-2135	true
J-1225	1	1,500.00	29.86	2,262.45	66.01	20.00	10.34	J-2135	true
J-1230	1	1,500.00	32.65	3,000.00	54.57	20.43	2.91	J-1305	true
J-1235	1	1,500.00	32.65	3,000.00	56.56	21.45	10.33	J-2135	true
J-1250	1	1,500.00	20.41	1,043.88	46.67	20.00	10.35	J-2135	false
J-1255	1	1,500.00	20.41	1,118.59	52.58	20.00	10.35	J-2135	false
J-1260	1	1,500.00	20.41	2,899.66	61.81	20.00	10.33	J-2135	true
J-1265	1	1,500.00	30.52	810.06	32.67	20.00	10.35	J-2135	false
J-1270	1	1,500.00	10.11	2,897.83	45.10	20.00	10.16	J-1265	true
J-1275	1	1,500.00	10.11	1,146.97	41.44	20.00	10.35	J-2135	false
J-1280	6	1,500.00	10.11	1,019.65	117.71	20.00	4.41	J-1290	false
J-1285	6	1,500.00	10.11	894.01	64.55	20.00	4.49	J-1290	false
J-1290	6	1,500.00	10.11	2.79	20.63	20.00	19.99	J-400	false
J-1305	1	1,500.00	12.24	1,085.63	34.17	20.00	10.35	J-2135	false
J-1310	1	1,500.00	0.00	3,000.00	57.43	56.90	10.36	J-2135	true
J-1320	2	1,500.00	8.06	780.76	85.15	78.28	-2.54	J-2736	false
J-1325	1	1,500.00	8.45	3,000.00	70.61	36.53	10.34	J-2135	true
J-1330	1	1,500.00	8.45	3,000.00	70.76	51.96	10.34	J-2135	true
J-1335	1	1,500.00	12.24	3,000.00	68.81	48.69	10.34	J-2135	true
J-1340	1	1,500.00	32.95	3,000.00	67.40	47.41	10.34	J-2135	true
J-1345	2	1,500.00	8.06	1,400.39	72.32	61.53	-2.54	J-2736	false
J-1350	2	1,500.00	8.06	933.11	81.50	74.73	-2.54	J-2736	false
J-1355	2	1,500.00	8.06	723.63	66.95	59.51	-2.54	J-2736	false
J-1360	2	1,500.00	8.06	934.57	81.50	74.73	-2.54	J-2736	false
J-1375	2	1,500.00	8.06	720.70	68.36	61.00	-2.54	J-2736	false
J-1380	2	1,500.00	56.09	726.56	57.09	49.59	-2.54	J-2736	false
J-1385	2	1,500.00	48.03	722.17	58.56	52.48	-2.54	J-2736	false
J-1390	33	1,500.00	0.00	N/A	120.19	N/A	N/A	N/A	false
J-1395	2	1,500.00	19.71	699.46	64.62	58.57	-2.54	J-2736	false
J-1400	2	1,500.00	48.03	719.24	49.01	34.82	-2.54	J-2736	false

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004

Fire Flow Analysis

Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-1405	2	1,500.00	48.03	708.34	49.34	20.00	-2.50	J-2736	false
J-1410	2	1,500.00	48.03	717.77	57.44	24.17	-2.54	J-2736	false
J-1415	2	1,500.00	0.00	446.96	42.17	20.00	-1.39	J-2736	false
J-1420	2	1,500.00	48.03	401.09	53.64	20.00	-1.18	J-2736	false
J-1425	2	1,500.00	48.03	717.77	64.29	44.16	-2.54	J-2736	false
J-1430	2	1,500.00	48.03	714.84	63.97	33.14	-2.54	J-2736	false
J-1435	2	1,500.00	48.03	713.38	59.52	22.32	-2.54	J-2736	false
J-1440	2	1,500.00	48.03	237.72	47.53	20.00	-0.46	J-2736	false
J-1445	2	1,500.00	48.03	225.36	50.44	20.00	-0.40	J-2736	false
J-1450	2	1,500.00	48.03	282.97	65.48	20.00	-0.67	J-2736	false
J-1455	2	1,500.00	19.71	711.91	63.10	26.91	-2.54	J-2736	false
J-1460	2	1,500.00	19.71	708.98	62.91	33.03	-2.54	J-2736	false
J-1465	2	1,500.00	20.49	605.71	63.93	57.64	-2.54	J-2736	false
J-1470	2	1,500.00	14.93	605.71	63.93	55.68	-2.54	J-2736	false
J-1475	2	1,500.00	14.93	329.96	72.91	66.47	-2.54	J-2736	false
J-1480	2	1,500.00	14.93	596.92	74.70	64.68	-2.54	J-2736	false
J-1485	2	1,500.00	14.93	316.04	73.57	67.21	-2.54	J-2736	false
J-1490	23	1,500.00	0.00	N/A	39.10	N/A	N/A	N/A	false
J-1495	1	1,500.00	15.28	92.53	43.76	20.00	10.36	J-2135	false
J-1500	1	1,500.00	15.28	1,950.07	71.70	25.40	-2.54	J-1495	true
J-1510	33	1,500.00	0.00	N/A	120.19	N/A	N/A	N/A	false
J-1515	1	1,500.00	8.45	1,738.68	70.10	20.00	10.35	J-2135	true
J-1520	23	1,500.00	0.00	N/A	39.10	N/A	N/A	N/A	false
J-1545	1	1,500.00	8.45	2,520.45	73.39	20.00	-1.52	J-1495	true
J-1550	1	1,500.00	30.21	1,873.81	65.82	20.00	10.35	J-2135	true
J-1555	1	1,500.00	34.82	1,911.44	77.63	20.00	-0.28	J-1890	true
J-1560	1	1,500.00	34.82	1,919.49	79.65	21.62	-2.54	J-1890	true
J-1565	1	1,500.00	14.97	1,631.84	68.28	20.00	10.35	J-2135	true
J-1570	1	1,500.00	14.97	1,888.00	66.07	20.00	3.12	J-1890	true
J-1580	1	1,500.00	9.16	696.90	61.90	20.00	10.36	J-2135	false
J-1585	1	1,500.00	24.14	1,048.46	61.90	20.00	10.35	J-2135	false
J-1590	1	1,500.00	17.61	1,074.19	50.53	20.00	10.35	J-2135	false
J-1595	1	1,500.00	0.00	661.06	49.93	20.00	10.36	J-2135	false
J-1600	1	1,500.00	17.61	3,000.00	49.10	33.05	10.34	J-2135	true
J-1605	1	1,500.00	29.87	3,000.00	48.62	33.11	10.34	J-2135	true
J-1620	1	1,500.00	0.00	569.23	49.93	20.00	10.36	J-2135	false
J-1625	4	1,500.00	9.16	1,443.60	131.19	20.00	9.94	J-1650	false
J-1630	4	1,500.00	9.16	1,299.73	103.77	20.00	10.13	J-1650	false
J-1635	4	1,500.00	9.16	1,357.91	76.38	20.00	6.50	J-1650	false
J-1640	4	1,500.00	9.16	1,033.54	67.54	20.00	9.65	J-1645	false
J-1645	4	1,500.00	9.16	0.00	10.38	10.38	16.26	J-2645	false
J-1650	4	1,500.00	9.16	0.00	16.34	16.34	10.38	J-1645	false
J-1670	1	1,500.00	19.84	1,758.91	83.89	33.86	-2.54	J-1890	true
J-1675	1	1,500.00	19.84	1,684.94	83.35	38.03	-2.54	J-1890	true
J-1680	1	1,500.00	4.42	1,602.26	83.69	37.36	-2.54	J-1890	true
J-1730	1	1,500.00	18.87	755.04	51.22	20.00	9.34	J-1890	false
J-1735	1	1,500.00	14.46	1,282.01	64.23	20.00	1.31	J-1890	false
J-1740	1	1,500.00	58.94	1,063.66	59.53	20.00	4.87	J-1	false
J-1745	1	1,500.00	74.22	1,045.07	59.87	20.00	10.36	J-2135	false
J-1750	3	1,500.00	0.00	3,000.00	118.43	87.48	4.17	J-2610	true

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004

Fire Flow Analysis

Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-1755	1	1,500.00	19.84	1,280.64	60.81	20.00	3.04	J-1	false
J-1760	1	1,500.00	19.84	1,694.82	73.27	20.00	-2.35	J-1890	true
J-1765	1	1,500.00	19.84	1,726.27	78.73	20.00	1.21	J-1890	true
J-1770	1	1,500.00	19.84	1,754.15	77.84	26.49	-2.54	J-1890	true
J-1775	1	1,500.00	19.84	1,751.59	83.30	36.29	-2.54	J-1890	true
J-1780	2	1,500.00	34.54	90.00	50.12	46.31	-2.54	J-2736	false
J-1785	2	1,500.00	15.28	73.88	44.88	41.39	-2.54	J-2736	false
J-1790	2	1,500.00	15.28	69.67	48.69	44.97	-2.54	J-2736	false
J-1795	2	1,500.00	15.28	66.93	42.26	38.79	-2.54	J-2736	false
J-1800	2	1,500.00	15.28	64.09	31.93	28.63	-2.54	J-2736	false
J-1805	2	1,500.00	15.28	58.41	26.67	23.47	-2.54	J-2736	false
J-1810	2	1,500.00	15.28	67.47	38.73	35.23	-2.54	J-2736	false
J-1815	2	1,500.00	15.28	70.31	35.06	30.92	-2.54	J-2736	false
J-1820	3	1,500.00	15.28	3,000.00	104.80	43.91	2.06	J-2610	true
J-1825	3	1,500.00	26.40	2,246.98	85.56	20.00	5.99	J-2610	true
J-1830	3	1,500.00	11.12	2,388.43	91.19	28.56	-2.54	J-2610	true
J-1835	3	1,500.00	11.12	1,305.82	62.56	20.00	10.35	J-2610	false
J-1840	3	1,500.00	19.26	1,195.82	95.06	20.00	8.80	J-2610	false
J-1845	3	1,500.00	19.26	1,291.03	105.71	20.00	7.22	J-2610	false
J-1850	3	1,500.00	19.26	1,415.04	116.53	20.00	4.83	J-2610	false
J-1855	3	1,500.00	19.26	1,502.52	92.97	20.00	0.78	J-2610	true
J-1860	3	1,500.00	39.10	1,296.89	145.72	20.00	6.82	J-2610	false
J-1865	3	1,500.00	39.10	1,281.33	145.28	20.00	7.06	J-2610	false
J-1870	1	1,500.00	39.10	724.55	46.46	20.00	10.36	J-2135	false
J-1875	1	1,500.00	39.10	899.73	58.17	20.00	10.36	J-2135	false
J-1880	3	1,500.00	19.26	1,258.58	133.63	20.00	7.44	J-2610	false
J-1885	3	1,500.00	19.26	1,333.42	133.71	20.00	6.45	J-2610	false
J-1890	1	1,500.00	14.46	364.20	40.13	20.00	10.36	J-2135	false
J-1895	1	1,500.00	14.46	552.11	60.45	20.00	7.26	J-1890	false
J-1900	1	1,500.00	14.46	677.40	82.13	26.90	-2.54	J-1890	false
J-1905	3	1,500.00	11.12	1,524.72	73.72	35.15	-2.54	J-2610	true
J-1910	3	1,500.00	11.12	2,296.51	95.28	54.59	-2.54	J-2610	true
J-1915	3	1,500.00	11.12	475.71	25.43	20.00	10.62	J-2600	false
J-1920	8	1,500.00	11.12	630.66	73.67	20.00	164.74	J-2615	false
J-1925	3	1,500.00	11.12	2,026.25	36.27	20.00	3.44	J-2610	true
J-1930	3	1,500.00	11.12	1,400.02	43.58	20.00	10.62	J-2600	false
J-1935	3	1,500.00	11.12	2,383.21	61.50	20.00	10.62	J-2600	true
J-1940	3	1,500.00	11.12	3,000.00	111.93	65.14	1.94	J-2610	true
J-1945	3	1,500.00	9.37	2,913.21	72.09	20.00	0.48	J-1995	true
J-1950	3	1,500.00	9.37	2,665.10	62.61	20.50	-2.54	J-1995	true
J-1955	3	1,500.00	9.37	1,934.33	62.61	21.49	-2.54	J-1995	true
J-1960	3	1,500.00	9.37	2,667.94	80.99	20.00	3.88	J-1995	true
J-1965	3	1,500.00	9.37	1,372.60	69.65	20.00	10.62	J-2600	false
J-1970	3	1,500.00	9.37	0.00	13.74	13.74	10.62	J-2600	false
J-1975	7	1,500.00	9.37	89.45	23.92	20.00	37.69	J-50	false
J-1980	3	1,500.00	9.37	3,000.00	118.36	55.31	5.26	J-1995	true
J-1985	3	1,500.00	9.37	1,288.01	101.57	29.16	-2.54	FH17F	false
J-1990	3	1,500.00	29.07	1,083.94	79.07	20.00	5.30	FH17F	false
J-1995	3	1,500.00	9.37	590.42	36.22	20.00	10.62	J-2600	false
J-2000	2	1,500.00	79.23	142.82	37.54	20.00	-0.02	J-2736	false

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-2005	3	1,500.00	31.20	546.48	113.36	43.76	-2.54	FH17F	false
J-2010	3	1,500.00	31.20	562.71	106.55	39.65	-2.54	FH17F	false
J-2015	3	1,500.00	19.71	583.53	92.84	25.93	-2.54	J-55	false
J-2020	3	1,500.00	19.71	637.39	106.27	39.37	-2.54	FH17F	false
J-2025	2	1,500.00	19.71	650.02	58.56	20.00	-2.29	J-2736	false
J-2030	3	1,500.00	19.71	637.39	126.11	38.88	-2.54	J-55	false
J-2035	3	1,500.00	19.71	552.39	114.79	20.00	10.14	J-55	false
J-2040	2	1,500.00	14.93	79.83	46.94	42.73	-2.54	J-2736	false
J-2045	1	1,500.00	14.93	520.04	61.45	20.00	10.36	J-2135	false
J-2050	2	1,500.00	14.93	74.89	43.14	39.19	-2.54	J-2736	false
J-2055	2	1,500.00	30.21	70.31	39.49	35.80	-2.54	J-2736	false
J-2060	1	1,500.00	15.21	3,000.00	130.80	110.70	10.34	J-2135	true
J-2070	1	1,500.00	31.89	3,000.00	121.16	102.50	10.34	J-2135	true
J-2085	1	1,500.00	16.68	3,000.00	119.92	101.59	10.34	J-2135	true
J-2090	1	1,500.00	0.00	3,000.00	140.74	123.91	10.34	J-2135	true
J-2100	1	1,500.00	9.16	3,000.00	47.78	32.69	10.33	J-2135	true
J-2110	1	1,500.00	0.00	3,000.00	141.60	120.35	10.34	J-2135	true
J-2130	3	1,500.00	0.00	1,530.03	119.28	40.25	-2.54	FH17F	true
J-2135	1	1,500.00	10.11	0.00	10.36	10.36	29.48	PVCC Lak	false
J-2140	1	1,500.00	9.16	3,000.00	72.53	56.19	10.33	J-2135	true
J-2145	1	1,500.00	9.16	3,000.00	73.74	57.13	10.33	J-2135	true
J-2150	1	1,500.00	8.06	3,000.00	52.88	33.43	10.03	PVCC Lak	true
J-2155	2	1,500.00	8.06	799.80	92.13	86.26	-2.54	J-2736	false
J-2156	1	1,500.00	16.12	3,000.00	53.16	33.64	10.20	PVCC Lak	true
J-2160	1	1,500.00	0.00	3,000.00	107.83	62.49	10.36	J-2135	true
J-2165	1	1,500.00	8.06	2,433.11	50.71	20.00	10.35	J-2135	true
J-2170	1	1,500.00	14.30	3,000.00	93.46	74.85	10.33	J-2135	true
J-2180	1	1,500.00	0.00	3,000.00	64.35	26.18	10.36	J-2135	true
J-2181	1	1,500.00	0.00	3,000.00	141.14	124.06	10.34	J-2135	true
J-2185	1	1,500.00	28.45	3,000.00	133.28	89.10	10.34	J-2135	true
J-2190	1	1,500.00	0.00	3,000.00	142.47	115.49	10.34	J-2135	true
J-2195	1	1,500.00	0.00	3,000.00	142.47	111.26	10.34	J-2135	true
J-2200	22	1,500.00	8.06	N/A	11.84	N/A	N/A	N/A	false
J-2201	22	1,500.00	0.00	N/A	11.84	N/A	N/A	N/A	false
J-2202	22	1,500.00	0.00	N/A	10.36	N/A	N/A	N/A	false
J-2205	22	1,500.00	8.06	N/A	10.36	N/A	N/A	N/A	false
J-2210	1	1,500.00	0.00	884.86	62.91	20.00	10.36	J-2135	false
J-2220	3	1,500.00	0.00	637.41	126.11	39.79	-2.54	J-55	false
J-2225	1	1,500.00	8.06	3,000.00	50.71	24.67	10.03	PVCC Lak	true
J-2226	1	1,500.00	0.00	3,000.00	50.71	30.93	10.03	PVCC Lak	true
J-2235	1	1,500.00	28.45	3,000.00	133.27	49.32	10.34	J-2135	true
J-2240	1	1,500.00	11.99	3,000.00	120.77	94.52	10.34	J-2135	true
J-2245	1	1,500.00	11.99	3,000.00	130.01	102.34	10.34	J-2135	true
J-2250	1	1,500.00	13.00	3,000.00	112.90	25.49	10.34	J-2135	true
J-2255	1	1,500.00	27.84	3,000.00	92.15	23.76	10.34	J-2135	true
J-2260	1	1,500.00	27.84	3,000.00	92.15	25.01	10.34	J-2135	true
J-2270	1	1,500.00	19.84	1,661.22	78.70	20.00	1.03	J-1890	true
J-2275	2	1,500.00	14.93	72.78	29.46	25.58	-2.54	J-2736	false
J-2280	2	1,500.00	14.93	72.69	43.28	39.45	-2.54	J-2736	false
J-2285	2	1,500.00	14.93	73.79	42.78	38.87	-2.54	J-2736	false

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004

Fire Flow Analysis

Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-2290	1	1,500.00	0.00	3,000.00	115.80	78.51	10.34	J-2135	true
J-2295	1	1,500.00	31.92	3,000.00	82.11	52.36	10.33	J-2135	true
J-2300	1	1,500.00	0.00	3,000.00	131.04	102.31	10.34	J-2135	true
J-2310	1	1,500.00	14.30	2,795.47	95.69	20.00	10.34	J-2135	true
J-2315	1	1,500.00	11.63	3,000.00	85.63	26.38	10.33	J-2135	true
J-2320	1	1,500.00	76.80	3,000.00	83.18	69.40	10.33	J-2135	true
J-2325	1	1,500.00	31.92	3,000.00	83.03	68.57	10.33	J-2135	true
J-2330	1	1,500.00	76.80	3,000.00	83.57	68.83	10.33	J-2135	true
J-2335	2	1,500.00	9.37	740.48	47.52	40.93	-2.54	J-2736	false
J-2340	2	1,500.00	11.12	740.48	40.57	23.61	-2.54	J-2736	false
J-2355	1	1,500.00	4.42	969.13	82.12	34.07	-2.54	J-1890	false
J-2375	3	1,500.00	31.20	532.65	92.49	21.40	-2.54	FH17F	false
J-2380	3	1,500.00	31.20	440.78	75.15	20.00	10.62	J-2600	false
J-2385	2	1,500.00	14.93	76.72	50.27	46.21	-2.54	J-2736	false
J-2405	1	1,500.00	10.11	1,529.75	81.85	20.00	10.35	J-2135	true
J-2410	1	1,500.00	10.11	3,000.00	82.28	64.61	10.33	J-2135	true
J-2415	1	1,500.00	45.13	3,000.00	116.31	80.73	10.34	J-2135	true
J-2420	1	1,500.00	18.08	1,105.13	60.69	20.00	10.35	J-2135	false
J-2425	1	1,500.00	20.70	3,000.00	70.18	50.88	10.33	J-2135	true
J-2430	1	1,500.00	20.70	3,000.00	70.20	50.90	10.33	J-2135	true
J-2435	1	1,500.00	20.70	3,000.00	70.22	50.91	10.33	J-2135	true
J-2440	1	1,500.00	28.45	1,911.85	117.81	20.00	10.35	J-2135	true
J-2445	1	1,500.00	16.68	3,000.00	119.88	72.42	10.34	J-2135	true
J-2450	1	1,500.00	15.21	2,807.10	125.30	20.00	10.34	J-2135	true
J-2455	1	1,500.00	20.11	3,000.00	122.86	85.46	10.34	J-2135	true
J-2460	1	1,500.00	20.11	3,000.00	122.86	71.76	10.34	J-2135	true
J-2465	1	1,500.00	13.00	3,000.00	126.54	94.66	10.34	J-2135	true
J-2470	1	1,500.00	11.99	3,000.00	135.30	109.48	10.34	J-2135	true
J-2475	1	1,500.00	5.26	2,868.16	111.86	20.00	10.34	J-2135	true
J-2480	1	1,500.00	5.26	3,000.00	113.07	60.02	10.34	J-2135	true
J-2490	1	1,500.00	20.11	2,636.03	123.27	20.00	10.34	J-2135	true
J-2495	1	1,500.00	20.11	2,522.92	123.54	20.00	10.34	J-2135	true
J-2500	1	1,500.00	20.70	2,003.72	87.18	20.00	10.35	J-2135	true
J-2505	1	1,500.00	20.70	1,160.16	63.66	20.00	10.35	J-2135	false
J-2510	1	1,500.00	14.30	1,292.04	76.54	20.00	10.35	J-2135	false
J-2515	1	1,500.00	20.70	1,454.32	104.22	20.00	10.35	J-2135	false
J-2525	1	1,500.00	34.30	1,102.94	60.40	20.00	2.65	J-1	false
J-2530	1	1,500.00	19.84	1,044.89	63.81	20.00	2.73	J-1	false
J-2535	1	1,500.00	19.84	965.79	59.47	20.00	6.47	J-1	false
J-2540	1	1,500.00	19.84	1,048.55	59.50	20.00	3.60	J-1	false
J-2545	1	1,500.00	19.84	956.63	57.30	20.00	5.82	J-1	false
J-2550	1	1,500.00	38.32	1,169.40	60.42	20.00	10.35	J-2135	false
J-2555	1	1,500.00	13.00	3,000.00	115.58	33.40	10.34	J-2135	true
J-2580	1	1,500.00	20.41	698.00	59.05	20.00	10.36	J-2135	false
J-2585	1	1,500.00	32.04	738.92	55.23	20.00	10.36	J-2135	false
J-2590	3	1,500.00	11.12	3,000.00	118.54	75.10	4.94	J-2610	true
J-2591	3	1,500.00	0.00	3,000.00	118.37	87.35	4.15	J-2610	true
J-2592	3	1,500.00	0.00	3,000.00	118.39	87.39	4.15	J-2610	true
J-2595	3	1,500.00	11.12	3,000.00	118.54	46.82	4.94	J-2610	true
J-2596	3	1,500.00	0.00	3,000.00	109.69	74.91	3.67	J-2610	true

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004

Fire Flow Analysis

Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-2600	3	1,500.00	11.12	0.00	10.62	10.62	13.74	J-1970	false
J-2605	3	1,500.00	11.12	1,887.08	36.48	20.00	6.09	J-2610	true
J-2610	3	1,500.00	11.12	0.00	18.80	18.80	10.62	J-2600	false
J-2615	8	1,500.00	11.12	3,000.00	164.74	164.74	73.67	J-1920	true
J-2620	1	1,500.00	50.05	1,114.11	58.70	20.00	10.35	J-2135	false
J-2630	1	1,500.00	18.87	953.93	82.07	34.92	-2.54	J-1890	false
J-2635	1	1,500.00	9.16	2,055.27	71.62	20.00	10.34	J-2135	true
J-2640	4	1,500.00	9.16	1,460.88	139.59	20.00	10.20	J-1645	false
J-2645	4	1,500.00	9.16	0.00	16.26	16.26	10.38	J-1645	false
J-2646	55	1,500.00	0.00	N/A	10.40	N/A	N/A	N/A	false
J-2647	55	1,500.00	0.00	N/A	11.81	N/A	N/A	N/A	false
J-2650	5	1,500.00	18.08	0.00	8.66	8.66	8.05	J-33	false
J-2665	1	1,500.00	14.30	795.11	85.65	20.00	10.36	J-2135	false
J-2670	1	1,500.00	10.33	1,014.15	107.83	20.00	10.35	J-2135	false
J-2675	1	1,500.00	12.24	3,000.00	60.45	22.31	10.33	J-2135	true
J-2680	1	1,500.00	12.24	3,000.00	63.04	22.21	10.33	J-2135	true
J-2685	1	1,500.00	17.62	2,901.67	66.05	20.00	10.33	J-2135	true
J-2690	1	1,500.00	20.71	1,066.04	60.41	20.00	10.35	J-2135	false
J-2695	1	1,500.00	20.71	1,115.02	59.55	20.00	10.35	J-2135	false
J-2700	5	1,500.00	18.08	284.45	56.82	20.00	8.05	J-33	false
J-2705	1	1,500.00	18.08	1,508.42	55.70	20.00	10.35	J-2135	true
J-2710	3	1,500.00	9.37	1,060.07	98.28	20.00	10.62	J-2600	false
J-2715	3	1,500.00	9.37	1,765.14	110.89	28.92	-2.54	J-55	true
J-2720	3	1,500.00	9.37	2,757.20	109.23	41.85	-2.54	J-1995	true
J-2725	3	1,500.00	9.37	2,721.04	96.11	20.00	0.58	J-1995	true
J-2730	2	1,500.00	15.28	0.00	8.94	8.94	0.66	J-2736	false
J-2735	2	1,500.00	15.28	0.00	8.91	8.91	0.66	J-2736	false
J-2736	2	1,500.00	0.00	0.00	0.66	0.66	8.91	J-2735	false
J-2755	1	1,500.00	14.46	621.60	74.74	20.00	1.56	J-1890	false
J-2760	1	1,500.00	14.46	668.34	87.75	25.19	-2.54	J-1890	false
J-2765	2	1,500.00	8.06	868.65	89.78	83.33	-2.54	J-2736	false
J-2770	2	1,500.00	8.06	824.71	90.46	84.50	-2.54	J-2736	false
J-2775	1	1,500.00	20.70	1,535.25	97.73	20.00	10.35	J-2135	true
J-2785	2	1,500.00	11.12	740.48	40.57	24.25	-2.54	J-2736	false
J-2791	3	1,500.00	0.00	3,000.00	120.12	87.54	4.15	J-2610	true
J-2792	2	1,500.00	11.12	782.23	40.06	33.17	-2.54	J-2736	false
J-2795	2	1,500.00	11.12	742.68	47.52	40.98	-2.54	J-2736	false
J-2800	2	1,500.00	20.49	704.59	64.92	58.79	-2.54	J-2736	false
J-2805	1	1,500.00	23.73	3,000.00	62.96	44.76	10.34	J-2135	true
J-2810	1	1,500.00	8.45	3,000.00	68.89	50.43	10.34	J-2135	true
J-2815	1	1,500.00	8.45	3,000.00	64.34	45.95	10.34	J-2135	true
J-2820	1	1,500.00	8.45	3,000.00	49.11	33.05	10.34	J-2135	true
J-2825	1	1,500.00	35.22	3,000.00	49.38	33.52	10.34	J-2135	true
J-2830	1	1,500.00	53.55	3,000.00	51.72	35.98	10.34	J-2135	true
J-2835	1	1,500.00	35.12	968.22	59.01	20.00	10.36	J-2135	false
J-2840	1	1,500.00	16.12	1,138.37	36.33	20.00	10.35	J-2135	false
J-2845	2	1,500.00	8.06	814.45	92.77	86.95	-2.54	J-2736	false
J-2846	22	1,500.00	0.00	N/A	94.03	N/A	N/A	N/A	false
J-2847	22	1,500.00	0.00	N/A	94.18	N/A	N/A	N/A	false
J-2848	22	1,500.00	0.00	N/A	94.25	N/A	N/A	N/A	false

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004

Fire Flow Analysis

Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-2849	22	1,500.00	0.00	N/A	94.27	N/A	N/A	N/A	false
J-2856	12	1,500.00	0.00	N/A	52.02	N/A	N/A	N/A	false
J-2857	12	1,500.00	0.00	N/A	52.04	N/A	N/A	N/A	false
J-2858	12	1,500.00	0.00	N/A	52.11	N/A	N/A	N/A	false
J-2859	12	1,500.00	0.00	N/A	52.25	N/A	N/A	N/A	false
J-2890	1	1,500.00	0.00	3,000.00	76.42	60.01	10.32	J-2135	true
J-5000	1	1,500.00	69.01	3,000.00	71.15	57.25	10.33	J-2135	true
J-5005	1	1,500.00	37.33	1,923.89	57.01	20.00	10.35	J-2135	true
J-5010	5	1,500.00	43.37	76.66	40.90	20.00	0.37	J-5145	false
J-5015	1	1,500.00	20.89	3,000.00	48.77	33.74	10.33	J-2135	true
J-5020	5	1,500.00	20.48	77.98	40.99	20.00	0.20	J-5145	false
J-5030	1	1,500.00	14.24	832.56	83.26	20.00	10.36	J-2135	false
J-5035	1	1,500.00	13.58	3,000.00	81.76	62.55	10.33	J-2135	true
J-5040	1	1,500.00	30.99	1,270.39	59.63	20.00	10.35	J-2135	false
J-5045	1	1,500.00	46.83	2,802.25	73.45	20.00	-1.16	J-1890	true
J-5050	1	1,500.00	46.83	3,000.00	73.88	36.13	10.25	J-1890	true
J-5055	1	1,500.00	62.10	3,000.00	73.21	42.16	10.34	J-2135	true
J-5060	1	1,500.00	62.10	3,000.00	73.28	44.48	10.34	J-2135	true
J-5065	1	1,500.00	46.83	3,000.00	73.02	31.03	10.34	J-2135	true
J-5070	1	1,500.00	46.83	2,140.87	70.78	20.00	10.35	J-2135	true
J-5075	1	1,500.00	46.83	2,089.32	73.81	20.00	10.35	J-2135	true
J-5080	22	1,500.00	50.37	N/A	11.88	N/A	N/A	N/A	false
J-5085	1	1,500.00	54.47	2,047.90	87.97	20.00	10.35	J-2135	true
J-5090	1	1,500.00	54.47	2,369.48	95.73	20.00	10.34	J-2135	true
J-5095	1	1,500.00	66.70	2,317.06	95.71	20.00	10.34	J-2135	true
J-5100	1	1,500.00	175.71	196.50	45.71	20.00	10.36	J-2135	false
J-5105	1	1,500.00	101.92	3,000.00	77.14	60.77	10.33	J-2135	true
J-5110	1	1,500.00	64.21	2,701.08	114.13	20.00	10.34	J-2135	true
J-5115	1	1,500.00	77.22	3,000.00	114.73	35.72	10.34	J-2135	true
J-5120	1	1,500.00	94.14	3,000.00	117.91	99.24	10.34	J-2135	true
J-5125	1	1,500.00	94.14	3,000.00	117.72	98.83	10.34	J-2135	true
J-5130	1	1,500.00	87.65	3,000.00	133.22	44.48	10.34	J-2135	true
J-5135	1	1,500.00	81.16	1,375.99	110.99	20.00	10.35	J-2135	false
J-5140	1	1,500.00	81.16	1,335.43	111.76	20.00	10.35	J-2135	false
J-5145	5	1,500.00	124.00	0.00	9.12	9.12	8.05	J-33	false
J-5150	1	1,500.00	353.73	1,407.35	59.61	20.00	10.35	J-2135	false
J-5155	1	1,500.00	96.22	2,515.87	51.24	20.00	10.34	J-2135	true
J-5160	2	1,500.00	30.37	91.00	59.99	55.32	-2.54	J-2736	false
J-5165	2	1,500.00	28.49	366.58	83.80	75.06	-2.54	J-2736	false
J-5170	2	1,500.00	8.19	753.66	79.99	72.64	-2.54	J-2736	false
J-5175	2	1,500.00	21.81	706.05	67.37	59.71	-2.54	J-2736	false
J-5185	2	1,500.00	58.43	3,000.00	66.09	51.14	0.56	J-2736	true
J-5190	1	1,500.00	62.61	1,489.01	40.67	20.00	10.35	J-2135	false
J-5195	1	1,500.00	50.37	2,039.98	49.35	20.00	4.82	J-1305	true
J-6005	99	1,500.00	0.00	N/A	9.40	N/A	N/A	N/A	false
J-6010	99	1,500.00	0.00	N/A	9.40	N/A	N/A	N/A	false
J-6015	11	1,500.00	0.00	N/A	140.71	N/A	N/A	N/A	false
J-6020	99	1,500.00	0.00	N/A	8.45	N/A	N/A	N/A	false
J-6025	99	1,500.00	0.00	N/A	9.40	N/A	N/A	N/A	false
J-6030	11	1,500.00	0.00	N/A	140.72	N/A	N/A	N/A	false

Scenario: MAX DAY FIRE FLOW W/JACKRABBIT & INVERGORDON IMPROVEMENTS-2004

Fire Flow Analysis

Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-6035	11	1,500.00	0.00	N/A	140.71	N/A	N/A	N/A	false
J-6040	99	1,500.00	0.00	N/A	8.79	N/A	N/A	N/A	false
J-6065	11	1,500.00	0.00	N/A	-2.49	N/A	N/A	N/A	false
J-6070	11	1,500.00	0.00	N/A	137.94	N/A	N/A	N/A	false
J-6075	11	1,500.00	0.00	N/A	137.94	N/A	N/A	N/A	false
J-6080	11	1,500.00	0.00	N/A	137.94	N/A	N/A	N/A	false
J-6085	11	1,500.00	0.00	N/A	137.98	N/A	N/A	N/A	false
J-6090	11	1,500.00	0.00	N/A	137.98	N/A	N/A	N/A	false
PVCC Lake (J-5180)	1	1,500.00	300.00	N/A	29.48	N/A	N/A	N/A	false
SRP W22.6 (J-2120)	1	1,500.00	0.00	N/A	140.18	N/A	N/A	N/A	false
Suction CC (J-2860)	12	1,500.00	8.06	N/A	52.88	N/A	N/A	N/A	false
Suction CWH I (J-279	23	1,500.00	0.00	N/A	39.10	N/A	N/A	N/A	false
Suction SC (J-2826)	14	1,500.00	0.00	N/A	47.19	N/A	N/A	N/A	false

APPENDIX C

WATER MODEL RESULTS
FIRE FLOW AVAILABLE 2017 AFTER IMPROVEMENTS

Calculation Results Summary

Scenario: MAX DAY-2017 W/FIRE FLOW
[Analysis Started]
[Fire Flow]
Failed to Converge 0
Satisfied Constraints 625
Failed Constraints 15
Total Nodes Computed 640
[Steady State]
[Analysis Ended]

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
Disch CC (J-2850)	22	1,500.00	0.00	N/A	89.05	N/A	N/A	N/A	false
Disch CWH I (J-1530	33	1,500.00	0.00	N/A	117.60	N/A	N/A	N/A	false
Disch MRBS (J-6000	11	1,500.00	0.00	N/A	160.07	N/A	N/A	N/A	false
Disch MRTF (J-6095)	11	1,500.00	0.00	N/A	157.26	N/A	N/A	N/A	false
Disch SC (J-2827)	44	1,500.00	0.00	N/A	155.64	N/A	N/A	N/A	false
Disch W16 (J-6060)	1	1,500.00	0.00	N/A	158.25	N/A	N/A	N/A	false
FH1	1	1,500.00	11.37	2,635.62	37.79	20.00	4.74	J-2135	true
FH1F	1	1,500.00	0.00	3,000.00	51.52	32.09	4.74	J-2135	true
FH2	1	1,500.00	0.00	3,000.00	66.31	39.46	4.75	J-2135	true
FH2F	1	1,500.00	0.00	3,000.00	68.41	54.47	4.75	J-2135	true
FH3	1	1,500.00	0.00	3,000.00	70.74	60.60	4.75	J-2135	true
FH3F	1	1,500.00	0.00	3,000.00	67.41	55.85	4.75	J-2135	true
FH4	1	1,500.00	0.00	1,850.37	62.00	20.00	4.76	J-2135	true
FH4F	1	1,500.00	0.00	1,926.45	59.69	20.00	4.76	J-2135	true
FH5	1	1,500.00	0.00	3,000.00	98.70	20.33	4.75	J-2135	true
FH5A	1	1,500.00	0.00	3,000.00	94.52	56.17	4.75	J-2135	true
FH5AF	1	1,500.00	0.00	3,000.00	93.21	68.31	4.75	J-2135	true
FH5F	1	1,500.00	37.41	2,909.09	93.56	20.00	4.75	J-2135	true
FH6	1	1,500.00	0.00	2,340.32	101.85	20.00	4.76	J-2135	true
FH6F	1	1,500.00	0.00	2,626.46	97.93	20.00	4.76	J-2135	true
FH8	1	1,500.00	0.00	3,000.00	117.61	70.79	4.76	J-2135	true
FH8F	1	1,500.00	0.00	3,000.00	117.00	69.06	4.76	J-2135	true
FH9	1	1,500.00	0.00	3,000.00	125.27	84.40	4.76	J-2135	true
FH9F	1	1,500.00	0.00	3,000.00	126.59	104.27	4.76	J-2135	true
FH10	1	1,500.00	0.00	2,823.67	52.12	20.00	4.76	J-2135	true
FH10F	1	1,500.00	0.00	3,000.00	63.57	33.67	4.76	J-2135	true
FH11	2	1,500.00	0.00	1,890.98	108.23	20.00	12.64	J-2736	true
FH11F	2	1,500.00	0.00	1,955.38	99.87	20.00	11.89	J-2736	true
FH12	2	1,500.00	0.00	2,490.23	50.19	20.00	8.77	J-2736	true
FH12F	3	1,500.00	0.00	3,000.00	97.96	59.90	6.24	J-1995	true
FH14	1	1,500.00	0.00	3,000.00	56.96	32.07	4.76	J-2135	true
FH14F	1	1,500.00	0.00	3,000.00	52.28	28.00	4.76	J-2135	true
FH15	1	1,500.00	0.00	2,408.75	49.12	20.00	4.76	J-2135	true
FH15F	1	1,500.00	0.00	3,000.00	49.21	25.28	4.75	J-2135	true
FH16	5	1,500.00	0.00	2,597.26	113.72	20.00	23.75	J-33	true
FH16F	5	1,500.00	0.00	2,558.26	108.13	20.00	20.92	J-33	true
FH17	3	1,500.00	0.00	2,266.20	79.65	20.00	6.29	J-2600	true
FH17F	3	1,500.00	0.00	2,080.99	68.81	20.00	6.29	J-2600	true
FH18	3	1,500.00	0.00	3,000.00	101.74	41.53	3.36	J-1995	true
FH18F	3	1,500.00	0.00	2,502.32	71.05	20.00	6.29	J-2600	true
FH19	3	1,500.00	0.00	1,505.13	68.27	34.25	-2.54	J-2610	true
FH19F	3	1,500.00	0.00	1,569.21	84.85	32.05	-2.54	J-2610	true
FH20	2	1,500.00	0.00	2,620.61	59.40	20.00	7.77	J-2736	true
FH20F	2	1,500.00	0.00	1,679.63	46.79	20.00	12.31	J-2736	true
FH22	1	1,500.00	0.00	1,532.41	46.37	20.00	4.77	J-2135	true
FH22F	5	1,500.00	20.34	2,623.03	153.50	20.00	29.95	J-5010	true
J-1	1	1,500.00	0.00	N/A	43.82	N/A	N/A	N/A	false
J-2	1	1,500.00	0.00	3,000.00	129.23	25.18	4.76	J-2135	true
J-4	5	1,500.00	0.00	2,810.49	121.28	20.00	17.39	FH16	true
J-4 s	5	1,500.00	0.00	3,000.00	133.47	22.44	13.78	FH16	true

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-5	1	1,500.00	0.00	3,000.00	45.19	33.84	4.75	J-2135	true
J-6	1	1,500.00	0.00	3,000.00	66.31	50.04	4.75	J-2135	true
J-7 Sussman	5	1,500.00	0.00	3,000.00	144.46	33.63	14.33	FH16	true
J-8	1	1,500.00	0.00	N/A	45.94	N/A	N/A	N/A	false
J-9	1	1,500.00	0.00	3,000.00	51.83	40.94	4.75	J-2135	true
J-10	5	1,500.00	0.00	2,318.02	163.44	20.00	20.00	J-5010	true
J-11	1	1,500.00	0.00	3,000.00	51.29	32.39	4.75	J-2135	true
J-12	1	1,500.00	0.00	N/A	35.62	N/A	N/A	N/A	false
J-15	Zone-1	1,500.00	0.00	N/A	-643.78	N/A	N/A	N/A	false
J-16	99	1,500.00	0.00	N/A	5.02	N/A	N/A	N/A	false
J-17	11	1,500.00	0.00	N/A	160.09	N/A	N/A	N/A	false
J-18	1	1,500.00	0.00	3,000.00	63.57	44.06	4.76	J-2135	true
J-19	1	1,500.00	0.00	3,000.00	69.66	59.32	4.74	J-2135	true
J-20	1	1,500.00	0.00	3,000.00	52.12	32.72	4.76	J-2135	true
J-21	1	1,500.00	0.00	3,000.00	52.24	36.61	4.74	J-2135	true
J-22	2	1,500.00	0.00	1,897.11	108.23	20.00	12.61	J-2736	true
J-23	1	1,500.00	0.00	3,000.00	71.96	62.36	4.74	J-2135	true
J-24	2	1,500.00	0.00	1,960.88	99.87	20.00	11.87	J-2736	true
J-26	2	1,500.00	0.00	2,560.73	50.19	20.00	8.40	J-2736	true
J-27	1	1,500.00	0.00	3,000.00	126.59	108.56	4.76	J-2135	true
J-28	3	1,500.00	0.00	3,000.00	97.96	61.57	6.24	J-1995	true
J-30	77	1,500.00	0.00	3,000.00	49.76	20.63	20.63	J-30	true
J-31	5	1,500.00	0.00	2,671.05	113.72	20.00	20.00	FH16	true
J-33	5	1,500.00	0.00	2,575.65	108.13	20.00	20.00	FH16F	true
J-35	1	1,500.00	0.00	3,000.00	67.41	57.33	4.75	J-2135	true
J-36	1	1,500.00	0.00	3,000.00	125.27	88.68	4.76	J-2135	true
J-37	1	1,500.00	0.00	3,000.00	70.74	60.84	4.75	J-2135	true
J-38	1	1,500.00	0.00	3,000.00	49.10	24.84	4.75	J-2135	true
J-39	1	1,500.00	0.00	1,852.94	62.00	20.00	4.76	J-2135	true
J-40	37	1,500.00	0.00	N/A	18.08	N/A	N/A	N/A	false
J-42	1	1,500.00	0.00	2,176.76	59.69	20.00	4.76	J-2135	true
J-44	1	1,500.00	0.00	3,000.00	98.70	27.52	4.75	J-2135	true
J-45	1	1,500.00	0.00	2,062.32	49.17	20.00	4.76	J-2135	true
J-46	1	1,500.00	0.00	2,298.16	59.31	20.00	4.76	J-2135	true
J-47	1	1,500.00	0.00	2,424.68	101.85	20.00	4.76	J-2135	true
J-48	1	1,500.00	0.00	3,000.00	88.84	70.97	4.75	J-2135	true
J-49	1	1,500.00	0.00	3,000.00	117.61	87.88	4.76	J-2135	true
J-50	7	1,500.00	0.00	994.63	41.09	20.00	11.49	J-1975	false
J-51	1	1,500.00	0.00	3,000.00	94.61	58.42	4.75	J-2135	true
J-52	1	1,500.00	0.00	3,000.00	117.00	89.45	4.76	J-2135	true
J-53	1	1,500.00	0.44	3,000.00	91.02	70.17	4.75	J-2135	true
J-54	1	1,500.00	0.00	3,000.00	94.52	68.56	4.75	J-2135	true
J-55	3	1,500.00	0.00	2,120.82	68.81	20.00	6.29	J-2600	true
J-56	1	1,500.00	0.20	3,000.00	92.33	31.45	4.75	J-2135	true
J-57	1	1,500.00	0.00	3,000.00	58.26	43.21	4.76	J-2135	true
J-58	1	1,500.00	8.36	3,000.00	94.51	40.84	4.75	J-2135	true
J-59	1	1,500.00	0.00	3,000.00	52.28	37.84	4.76	J-2135	true
J-60	66	1,500.00	0.00	3,000.00	96.52	75.06	75.06	J-60	true
J-61	1	1,500.00	0.00	3,000.00	95.37	32.43	4.75	J-2135	true
J-62	1	1,500.00	3.32	3,000.00	91.03	40.43	4.75	J-2135	true

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-63	1	1,500.00	0.00	3,000.00	94.54	66.78	4.75	J-2135	true
J-64	1	1,500.00	36.52	3,000.00	83.68	31.64	4.75	J-2135	true
J-65	1	1,500.00	17.22	2,343.84	85.84	20.00	4.76	J-2135	true
J-67	1	1,500.00	45.22	3,000.00	85.97	72.96	4.75	J-2135	true
J-68	1	1,500.00	23.08	2,636.44	85.86	20.00	4.76	J-2135	true
J-69	1	1,500.00	0.00	3,000.00	83.68	60.88	4.75	J-2135	true
J-70	16	1,500.00	0.00	1,954.47	35.58	20.00	20.00	J-70	true
J-71	1	1,500.00	24.11	2,331.57	85.87	20.00	4.76	J-2135	true
J-72	10	1,500.00	54.04	1,678.16	55.39	20.00	24.99	J-74	true
J-74	10	1,500.00	0.00	N/A	44.30	N/A	N/A	N/A	false
J-75	10	1,500.00	0.00	N/A	44.38	N/A	N/A	N/A	false
J-76	10	1,500.00	0.00	N/A	44.46	N/A	N/A	N/A	false
J-77	10	1,500.00	0.00	2,524.11	179.52	56.82	-2.54	J-74	true
J-78	10	1,500.00	0.00	2,523.74	179.54	56.89	-2.54	J-74	true
J-79	10	1,500.00	0.00	2,523.56	179.56	56.94	-2.54	J-74	true
J-80	90	1,500.00	0.00	3,000.00	62.86	60.71	60.71	J-80	true
J-81	10	1,500.00	0.00	1,889.37	138.38	20.00	10.87	J-74	true
J-82	10	1,500.00	0.00	2,543.70	176.48	50.70	-2.54	J-74	true
J-83	1	1,500.00	31.14	3,000.00	84.17	49.17	4.75	J-2135	true
J-84	1	1,500.00	26.32	3,000.00	86.67	68.77	4.75	J-2135	true
J-90	69	1,500.00	0.00	N/A	-1.35	N/A	N/A	N/A	false
J-93	99	1,500.00	0.00	N/A	4.11	N/A	N/A	N/A	false
J-94	1	1,500.00	0.00	3,000.00	83.72	65.01	4.76	J-2135	true
J-95	1	1,500.00	0.00	2,158.45	52.20	20.00	4.76	J-2135	true
J-96	1	1,500.00	0.00	3,000.00	65.15	31.33	4.76	J-2135	true
J-98	1	1,500.00	0.00	1,682.37	43.16	20.00	4.77	J-2135	true
J-99	1	1,500.00	0.00	2,328.19	51.66	20.00	4.76	J-2135	true
J-100	1	1,500.00	17.11	3,000.00	155.98	141.95	4.77	J-2135	true
J-102	1	1,500.00	0.00	1,602.36	42.99	20.00	4.77	J-2135	true
J-103	2	1,500.00	0.00	1,949.16	117.61	20.00	12.83	J-2736	true
J-104	3	1,500.00	0.00	2,124.62	156.55	20.00	5.48	J-2610	true
J-105	1	1,500.00	17.11	3,000.00	159.73	148.77	4.77	J-2135	true
J-107	2	1,500.00	0.00	2,794.19	76.79	20.00	7.74	J-2736	true
J-108	1	1,500.00	0.00	2,723.14	69.95	20.00	4.76	J-2135	true
J-109	1	1,500.00	0.00	1,513.09	64.34	20.00	4.77	J-2135	true
J-110	1	1,500.00	17.11	3,000.00	159.21	144.38	4.77	J-2135	true
J-111	3	1,500.00	0.00	2,546.36	71.06	20.00	6.29	J-2600	true
J-112	3	1,500.00	0.00	3,000.00	118.75	51.24	1.36	J-55	true
J-113	2	1,500.00	0.00	3,000.00	57.41	33.21	6.95	J-2736	true
J-114	1	1,500.00	0.00	3,000.00	89.44	76.65	4.75	J-2135	true
J-115	1	1,500.00	17.11	3,000.00	154.36	50.06	4.76	J-2135	true
J-116	2	1,500.00	0.00	2,008.12	50.68	20.00	11.02	J-2736	true
J-118	1	1,500.00	0.00	3,000.00	59.43	43.14	4.76	J-2135	true
J-119	4	1,500.00	0.00	3,000.00	144.83	31.86	5.65	J-1645	true
J-120	1	1,500.00	17.11	3,000.00	158.86	147.57	4.77	J-2135	true
J-121	4	1,500.00	0.00	3,000.00	127.80	32.52	5.70	J-1645	true
J-122	4	1,500.00	0.00	3,000.00	112.66	21.30	5.70	J-1645	true
J-123	5	1,500.00	0.00	3,000.00	144.88	34.62	15.86	J-31	true
J-124	2	1,500.00	0.00	N/A	30.40	N/A	N/A	N/A	false
J-125	1	1,500.00	30.60	3,000.00	158.86	147.54	4.77	J-2135	true

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-126	1	1,500.00	0.00	2,579.77	60.23	20.00	4.76	J-2135	true
J-127	1	1,500.00	0.00	2,665.10	62.40	20.00	4.76	J-2135	true
J-128	2	1,500.00	0.00	2,133.54	48.43	20.00	10.58	J-2736	true
J-129	2	1,500.00	0.00	3,000.00	57.08	23.12	6.30	J-2736	true
J-130	1	1,500.00	13.49	3,000.00	151.61	130.87	4.76	J-2135	true
J-131	3	1,500.00	0.00	1,682.78	106.28	20.00	3.86	J-2610	true
J-132	3	1,500.00	0.00	1,802.40	127.96	20.00	0.25	J-1840	true
J-133	3	1,500.00	0.00	1,793.61	138.79	20.00	0.99	J-1840	true
J-134	3	1,500.00	0.00	1,948.47	131.84	20.00	3.34	J-2610	true
J-135	1	1,500.00	13.49	3,000.00	148.98	126.50	4.76	J-2135	true
J-136	3	1,500.00	0.00	1,995.39	144.85	20.00	5.08	J-2610	true
J-140	1	1,500.00	13.49	3,000.00	144.27	120.72	4.76	J-2135	true
J-145	1	1,500.00	13.49	3,000.00	140.65	113.51	4.76	J-2135	true
J-150	1	1,500.00	13.49	3,000.00	142.54	118.55	4.76	J-2135	true
J-155	1	1,500.00	13.49	3,000.00	140.94	117.33	4.76	J-2135	true
J-160	1	1,500.00	14.63	3,000.00	132.49	109.60	4.76	J-2135	true
J-165	1	1,500.00	14.63	3,000.00	140.78	111.35	4.76	J-2135	true
J-170	1	1,500.00	14.63	3,000.00	131.62	105.75	4.76	J-2135	true
J-175	1	1,500.00	14.63	3,000.00	131.97	109.19	4.76	J-2135	true
J-180	1	1,500.00	14.63	3,000.00	132.39	107.18	4.76	J-2135	true
J-185	1	1,500.00	14.63	3,000.00	132.39	91.93	4.76	J-2135	true
J-190	1	1,500.00	13.49	3,000.00	134.58	113.53	4.76	J-2135	true
J-195	1	1,500.00	32.46	3,000.00	138.80	123.45	4.76	J-2135	true
J-200	1	1,500.00	13.49	3,000.00	130.12	104.54	4.76	J-2135	true
J-205	1	1,500.00	13.49	3,000.00	143.48	111.84	4.76	J-2135	true
J-210	9	1,500.00	0.00	3,000.00	62.86	62.86	43.35	J-330	true
J-220	1	1,500.00	13.49	3,000.00	129.66	114.65	4.76	J-2135	true
J-225	1	1,500.00	32.46	3,000.00	137.05	121.55	4.76	J-2135	true
J-230	1	1,500.00	18.98	3,000.00	128.61	107.07	4.76	J-2135	true
J-235	1	1,500.00	18.98	3,000.00	128.61	104.98	4.76	J-2135	true
J-240	1	1,500.00	34.69	3,000.00	127.30	104.04	4.76	J-2135	true
J-245	1	1,500.00	25.31	3,000.00	121.27	106.68	4.76	J-2135	true
J-246	1	1,500.00	46.10	3,000.00	121.00	106.37	4.76	J-2135	true
J-247	1	1,500.00	32.61	3,000.00	120.22	105.52	4.76	J-2135	true
J-248	1	1,500.00	48.33	3,000.00	120.25	105.67	4.76	J-2135	true
J-250	1	1,500.00	20.79	3,000.00	118.18	88.86	4.76	J-2135	true
J-255	1	1,500.00	28.12	3,000.00	117.95	93.45	4.76	J-2135	true
J-260	1	1,500.00	28.12	3,000.00	118.24	97.49	4.76	J-2135	true
J-265	1	1,500.00	14.63	3,000.00	119.10	98.76	4.76	J-2135	true
J-270	1	1,500.00	20.55	3,000.00	117.42	97.30	4.76	J-2135	true
J-275	1	1,500.00	14.63	3,000.00	117.21	92.58	4.76	J-2135	true
J-280	1	1,500.00	5.92	3,000.00	113.30	25.44	4.76	J-2135	true
J-285	1	1,500.00	5.92	3,000.00	113.28	69.05	4.76	J-2135	true
J-290	1	1,500.00	5.92	3,000.00	112.43	92.54	4.76	J-2135	true
J-295	1	1,500.00	28.12	3,000.00	119.19	95.29	4.76	J-2135	true
J-300	1	1,500.00	14.63	3,000.00	129.19	105.91	4.76	J-2135	true
J-305	1	1,500.00	14.63	3,000.00	129.10	104.16	4.76	J-2135	true
J-310	1	1,500.00	14.63	3,000.00	125.64	103.71	4.76	J-2135	true
J-315	1	1,500.00	14.63	3,000.00	118.64	58.85	4.76	J-2135	true
J-320	1	1,500.00	14.63	2,955.78	116.04	20.00	4.76	J-2135	true

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-330	9	1,500.00	0.00	3,000.00	43.35	40.14	62.86	J-210	true
J-340	1	1,500.00	13.49	3,000.00	142.18	126.83	4.76	J-2135	true
J-345	1	1,500.00	41.61	3,000.00	129.35	63.79	4.76	J-2135	true
J-350	1	1,500.00	22.63	3,000.00	128.21	20.88	4.76	J-2135	true
J-355	1	1,500.00	22.63	2,874.76	129.68	20.00	4.76	J-2135	true
J-360	1	1,500.00	22.63	3,000.00	128.83	47.38	4.76	J-2135	true
J-365	1	1,500.00	22.63	3,000.00	128.79	65.46	4.76	J-2135	true
J-370	1	1,500.00	22.63	3,000.00	127.05	71.16	4.76	J-2135	true
J-375	1	1,500.00	34.23	3,000.00	126.99	97.40	4.76	J-2135	true
J-380	1	1,500.00	20.79	3,000.00	118.27	72.99	4.76	J-2135	true
J-385	1	1,500.00	15.72	3,000.00	123.37	89.88	4.76	J-2135	true
J-390	1	1,500.00	15.72	3,000.00	124.30	100.84	4.76	J-2135	true
J-395	1	1,500.00	48.33	3,000.00	120.75	93.92	4.76	J-2135	true
J-400	6	1,500.00	0.00	0.00	0.82	0.82	0.90	J-1290	false
J-405	1	1,500.00	24.91	3,000.00	116.83	91.10	4.76	J-2135	true
J-410	1	1,500.00	11.82	3,000.00	117.80	52.28	4.76	J-2135	true
J-415	1	1,500.00	11.82	3,000.00	117.18	90.22	4.76	J-2135	true
J-420	1	1,500.00	11.82	3,000.00	120.57	100.55	4.76	J-2135	true
J-425	1	1,500.00	48.33	3,000.00	119.34	104.85	4.76	J-2135	true
J-430	88	1,500.00	0.00	3,000.00	160.40	160.40	160.40	J-430	true
J-440	1	1,500.00	20.79	3,000.00	111.30	95.85	4.76	J-2135	true
J-445	1	1,500.00	20.79	3,000.00	112.33	96.96	4.76	J-2135	true
J-450	38	1,500.00	0.00	N/A	10.27	N/A	N/A	N/A	false
J-455	1	1,500.00	71.57	3,000.00	120.67	106.60	4.76	J-2135	true
J-460	1	1,500.00	35.88	3,000.00	131.00	115.21	4.76	J-2135	true
J-465	1	1,500.00	17.11	3,000.00	134.15	117.85	4.76	J-2135	true
J-470	1	1,500.00	20.79	3,000.00	114.37	74.81	4.76	J-2135	true
J-475	1	1,500.00	35.88	3,000.00	126.94	111.86	4.76	J-2135	true
J-480	1	1,500.00	34.23	3,000.00	128.35	98.83	4.76	J-2135	true
J-490	1	1,500.00	32.01	3,000.00	144.47	112.21	4.76	J-2135	true
J-495	1	1,500.00	32.01	3,000.00	144.46	64.99	4.76	J-2135	true
J-500	1	1,500.00	32.01	1,701.05	62.14	20.00	4.76	J-2135	true
J-505	1	1,500.00	18.77	3,000.00	122.22	81.55	4.76	J-2135	true
J-510	1	1,500.00	18.77	3,000.00	128.61	85.82	4.76	J-2135	true
J-515	1	1,500.00	32.01	2,708.50	122.59	20.00	4.76	J-2135	true
J-520	1	1,500.00	18.77	3,000.00	125.35	80.83	4.76	J-2135	true
J-525	1	1,500.00	52.80	3,000.00	118.59	103.20	4.76	J-2135	true
J-545	1	1,500.00	14.63	3,000.00	100.03	38.96	4.76	J-2135	true
J-550	1	1,500.00	11.62	2,854.80	106.67	20.00	4.76	J-2135	true
J-560	1	1,500.00	34.28	2,787.73	108.15	20.00	4.76	J-2135	true
J-565	1	1,500.00	17.26	3,000.00	107.09	28.76	4.76	J-2135	true
J-570	1	1,500.00	17.26	2,737.52	105.27	20.00	4.76	J-2135	true
J-575	1	1,500.00	28.88	3,000.00	100.54	30.42	4.76	J-2135	true
J-580	1	1,500.00	19.65	3,000.00	105.86	34.60	4.76	J-2135	true
J-585	1	1,500.00	19.65	2,887.94	105.97	20.00	4.76	J-2135	true
J-590	1	1,500.00	11.62	2,754.82	108.22	20.00	4.76	J-2135	true
J-595	1	1,500.00	19.65	3,000.00	101.40	29.92	4.76	J-2135	true
J-600	1	1,500.00	31.32	3,000.00	98.17	30.72	4.75	J-2135	true
J-605	1	1,500.00	31.32	3,000.00	98.29	69.29	4.75	J-2135	true
J-610	1	1,500.00	16.08	3,000.00	90.87	77.42	4.75	J-2135	true

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-615	1	1,500.00	33.35	3,000.00	93.67	79.15	4.75	J-2135	true
J-620	1	1,500.00	17.26	3,000.00	95.65	40.11	4.75	J-2135	true
J-625	1	1,500.00	17.26	2,570.98	97.57	20.00	4.76	J-2135	true
J-630	1	1,500.00	16.08	3,000.00	94.59	59.00	4.75	J-2135	true
J-635	1	1,500.00	33.35	3,000.00	96.99	81.80	4.75	J-2135	true
J-640	1	1,500.00	16.08	3,000.00	95.50	63.06	4.75	J-2135	true
J-645	1	1,500.00	16.08	3,000.00	89.72	75.19	4.75	J-2135	true
J-650	1	1,500.00	16.08	3,000.00	99.33	53.39	4.76	J-2135	true
J-655	1	1,500.00	16.08	3,000.00	100.55	84.26	4.76	J-2135	true
J-660	1	1,500.00	27.91	3,000.00	102.90	48.17	4.76	J-2135	true
J-665	1	1,500.00	27.91	3,000.00	103.33	43.01	4.76	J-2135	true
J-670	1	1,500.00	24.12	3,000.00	104.69	87.09	4.76	J-2135	true
J-675	1	1,500.00	11.82	3,000.00	104.69	61.44	4.76	J-2135	true
J-680	1	1,500.00	11.82	3,000.00	105.53	78.20	4.76	J-2135	true
J-685	1	1,500.00	11.82	3,000.00	105.22	77.08	4.76	J-2135	true
J-690	1	1,500.00	13.09	3,000.00	105.53	91.20	4.76	J-2135	true
J-695	1	1,500.00	33.35	3,000.00	102.14	85.46	4.76	J-2135	true
J-700	1	1,500.00	17.26	3,000.00	101.40	33.31	4.76	J-2135	true
J-705	1	1,500.00	41.00	3,000.00	91.42	80.74	4.75	J-2135	true
J-710	1	1,500.00	41.00	3,000.00	91.49	80.51	4.75	J-2135	true
J-715	1	1,500.00	16.08	3,000.00	91.64	77.70	4.75	J-2135	true
J-720	1	1,500.00	16.08	3,000.00	83.51	43.75	4.75	J-2135	true
J-735	1	1,500.00	50.50	3,000.00	100.62	86.31	4.75	J-2135	true
J-740	1	1,500.00	13.09	3,000.00	95.12	80.74	4.75	J-2135	true
J-745	1	1,500.00	52.36	3,000.00	90.41	76.68	4.75	J-2135	true
J-750	1	1,500.00	0.00	3,000.00	144.64	127.89	4.76	J-2135	true
J-755	1	1,500.00	13.09	3,000.00	92.73	78.73	4.75	J-2135	true
J-760	1	1,500.00	37.41	3,000.00	99.76	47.88	4.75	J-2135	true
J-775	1	1,500.00	37.41	3,000.00	93.85	53.70	4.75	J-2135	true
J-780	1	1,500.00	37.41	3,000.00	92.48	53.82	4.75	J-2135	true
J-790	1	1,500.00	50.50	3,000.00	90.49	78.40	4.75	J-2135	true
J-795	1	1,500.00	13.09	3,000.00	89.23	75.91	4.75	J-2135	true
J-800	1	1,500.00	13.09	3,000.00	86.50	35.27	4.75	J-2135	true
J-810	1	1,500.00	13.09	3,000.00	84.56	23.53	4.75	J-2135	true
J-815	1	1,500.00	29.17	3,000.00	83.27	72.95	4.75	J-2135	true
J-820	1	1,500.00	16.08	3,000.00	88.02	35.44	4.75	J-2135	true
J-825	1	1,500.00	16.08	3,000.00	83.26	31.41	4.75	J-2135	true
J-830	1	1,500.00	39.37	3,000.00	81.83	67.84	4.75	J-2135	true
J-835	1	1,500.00	23.29	2,388.79	83.87	20.00	4.76	J-2135	true
J-840	1	1,500.00	23.29	1,993.93	89.52	20.00	4.76	J-2135	true
J-845	1	1,500.00	31.32	3,000.00	95.84	46.28	4.75	J-2135	true
J-850	1	1,500.00	31.32	3,000.00	94.77	60.17	4.75	J-2135	true
J-855	1	1,500.00	31.32	3,000.00	94.51	56.24	4.75	J-2135	true
J-865	1	1,500.00	8.04	2,479.61	101.85	20.00	4.76	J-2135	true
J-870	1	1,500.00	8.04	2,547.41	99.68	20.00	4.76	J-2135	true
J-885	1	1,500.00	8.04	2,753.54	97.93	20.00	4.76	J-2135	true
J-890	1	1,500.00	8.04	2,508.54	96.14	20.00	4.76	J-2135	true
J-900	1	1,500.00	8.04	2,746.95	98.36	20.00	4.76	J-2135	true
J-905	1	1,500.00	8.04	2,387.24	101.83	20.00	4.76	J-2135	true
J-910	1	1,500.00	23.29	2,034.85	97.37	20.00	4.76	J-2135	true

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-915	1	1,500.00	23.29	1,799.79	100.41	20.00	4.76	J-2135	true
J-920	1	1,500.00	23.29	1,831.33	94.04	20.00	4.76	J-2135	true
J-925	1	1,500.00	8.04	2,385.59	104.87	20.00	4.76	J-2135	true
J-930	1	1,500.00	23.29	2,886.20	87.25	20.00	4.76	J-2135	true
J-935	1	1,500.00	23.29	3,000.00	84.21	29.28	4.75	J-2135	true
J-940	1	1,500.00	23.29	2,683.87	79.02	20.00	4.76	J-2135	true
J-945	1	1,500.00	23.29	2,720.86	70.29	20.00	4.76	J-2135	true
J-950	1	1,500.00	23.29	3,000.00	75.06	60.84	4.75	J-2135	true
J-955	1	1,500.00	23.29	3,000.00	67.52	50.07	4.75	J-2135	true
J-960	1	1,500.00	16.08	3,000.00	66.81	52.86	4.75	J-2135	true
J-965	1	1,500.00	16.08	1,997.04	76.05	20.00	4.76	J-2135	true
J-970	1	1,500.00	39.48	3,000.00	73.00	63.13	4.75	J-2135	true
J-975	1	1,500.00	29.17	3,000.00	81.09	70.88	4.75	J-2135	true
J-980	1	1,500.00	23.40	3,000.00	74.14	63.86	4.75	J-2135	true
J-990	1	1,500.00	13.09	3,000.00	79.78	69.39	4.75	J-2135	true
J-995	1	1,500.00	49.01	3,000.00	79.38	59.82	4.75	J-2135	true
J-1010	1	1,500.00	11.37	3,000.00	80.45	54.84	4.75	J-2135	true
J-1030	1	1,500.00	11.37	3,000.00	69.66	60.34	4.74	J-2135	true
J-1045	1	1,500.00	11.37	2,786.13	37.11	20.00	4.74	J-2135	true
J-1050	1	1,500.00	11.37	3,000.00	38.74	34.82	4.73	J-2135	true
J-1055	1	1,500.00	34.34	3,000.00	63.19	55.21	4.74	J-2135	true
J-1060	1	1,500.00	11.37	3,000.00	80.22	40.76	4.75	J-2135	true
J-1070	1	1,500.00	11.37	2,932.43	64.04	20.00	4.74	J-2135	true
J-1075	1	1,500.00	11.37	3,000.00	74.38	61.08	4.75	J-2135	true
J-1080	1	1,500.00	35.92	3,000.00	69.25	55.45	4.75	J-2135	true
J-1085	1	1,500.00	35.92	3,000.00	66.31	52.77	4.75	J-2135	true
J-1090	1	1,500.00	35.92	3,000.00	65.09	52.32	4.75	J-2135	true
J-1095	1	1,500.00	35.92	3,000.00	63.51	51.76	4.75	J-2135	true
J-1100	1	1,500.00	35.92	3,000.00	57.69	46.26	4.75	J-2135	true
J-1105	1	1,500.00	46.23	3,000.00	57.62	47.25	4.75	J-2135	true
J-1115	1	1,500.00	10.31	3,000.00	65.80	55.65	4.75	J-2135	true
J-1120	1	1,500.00	92.46	3,000.00	52.08	41.28	4.75	J-2135	true
J-1125	1	1,500.00	35.92	3,000.00	69.50	38.31	4.75	J-2135	true
J-1130	1	1,500.00	47.29	3,000.00	69.84	54.81	4.75	J-2135	true
J-1135	1	1,500.00	59.21	2,756.65	65.18	20.00	4.75	J-2135	true
J-1140	5	1,500.00	20.34	3,000.00	160.05	49.68	15.86	FH16	true
J-1150	1	1,500.00	20.34	2,331.85	62.24	20.00	4.76	J-2135	true
J-1160	1	1,500.00	20.34	3,000.00	65.80	55.65	4.75	J-2135	true
J-1165	5	1,500.00	20.34	2,815.80	121.47	20.00	18.04	J-31	true
J-1170	1	1,500.00	0.00	1,555.30	52.08	20.00	4.77	J-2135	true
J-1175	1	1,500.00	0.00	N/A	44.71	N/A	N/A	N/A	false
J-1180	1	1,500.00	33.61	3,000.00	43.33	31.57	4.75	J-2135	true
J-1185	1	1,500.00	23.30	1,963.07	53.52	20.00	4.76	J-2135	true
J-1190	1	1,500.00	23.30	1,692.54	53.98	20.00	4.76	J-2135	true
J-1195	1	1,500.00	43.12	2,142.15	58.66	20.00	4.76	J-2135	true
J-1200	1	1,500.00	43.12	1,959.23	57.29	20.00	4.76	J-2135	true
J-1205	1	1,500.00	19.82	2,626.83	62.01	20.00	4.76	J-2135	true
J-1210	1	1,500.00	43.12	2,249.27	59.90	20.00	4.76	J-2135	true
J-1215	1	1,500.00	23.30	1,509.43	56.87	20.00	4.76	J-2135	true
J-1220	1	1,500.00	27.54	3,000.00	62.03	45.47	4.75	J-2135	true

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-1225	1	1,500.00	33.59	2,609.62	62.91	20.00	4.76	J-2135	true
J-1230	1	1,500.00	36.73	3,000.00	51.16	29.21	4.75	J-2135	true
J-1235	1	1,500.00	36.73	3,000.00	52.68	28.91	4.75	J-2135	true
J-1250	1	1,500.00	22.96	2,471.19	42.78	20.00	4.75	J-2135	true
J-1255	1	1,500.00	22.96	2,772.77	48.18	20.00	3.57	J-1265	true
J-1260	1	1,500.00	22.96	3,000.00	57.36	31.26	4.75	J-2135	true
J-1265	1	1,500.00	34.34	972.29	26.76	20.00	4.77	J-2135	false
J-1270	1	1,500.00	11.37	3,000.00	39.24	21.73	4.74	J-2135	true
J-1275	1	1,500.00	11.37	2,207.89	35.66	20.00	4.75	J-2135	true
J-1280	6	1,500.00	11.37	2,310.06	96.45	85.86	-2.54	J-1290	true
J-1285	6	1,500.00	11.37	2,274.90	44.31	38.13	-2.54	J-1290	true
J-1290	6	1,500.00	11.37	0.00	0.90	0.90	0.82	J-400	false
J-1305	1	1,500.00	13.77	1,130.13	30.92	20.00	4.77	J-2135	false
J-1310	1	1,500.00	0.00	3,000.00	53.12	52.62	4.77	J-2135	true
J-1320	2	1,500.00	9.07	3,000.00	81.38	62.06	12.14	J-2736	true
J-1325	1	1,500.00	9.50	3,000.00	67.66	39.87	4.76	J-2135	true
J-1330	1	1,500.00	9.50	3,000.00	67.72	52.40	4.76	J-2135	true
J-1335	1	1,500.00	13.77	3,000.00	65.62	49.47	4.75	J-2135	true
J-1340	1	1,500.00	37.07	3,000.00	64.13	48.24	4.75	J-2135	true
J-1345	2	1,500.00	9.07	3,000.00	68.43	51.58	17.24	J-2736	true
J-1350	2	1,500.00	9.07	3,000.00	77.59	64.91	15.68	J-2736	true
J-1355	2	1,500.00	9.07	3,000.00	63.41	38.61	11.02	J-2736	true
J-1360	2	1,500.00	9.07	3,000.00	77.59	64.96	15.67	J-2736	true
J-1375	2	1,500.00	9.07	3,000.00	64.82	41.20	11.13	J-2736	true
J-1380	2	1,500.00	63.11	3,000.00	53.56	25.06	10.65	J-2736	true
J-1385	2	1,500.00	54.04	3,000.00	55.21	37.61	8.15	J-2736	true
J-1390	33	1,500.00	0.00	3,000.00	117.61	96.16	96.19	J-1510	true
J-1395	2	1,500.00	22.17	3,000.00	61.76	43.72	6.91	J-2736	true
J-1400	2	1,500.00	54.04	N/A	42.09	N/A	N/A	N/A	false
J-1405	2	1,500.00	54.04	2,675.81	164.63	20.00	-0.20	J-1400	true
J-1410	2	1,500.00	54.04	2,327.64	67.84	20.00	6.86	J-1415	true
J-1415	2	1,500.00	0.00	1,677.25	54.49	20.00	13.05	J-2736	true
J-1420	2	1,500.00	54.04	1,988.89	66.19	20.00	11.90	J-2736	true
J-1425	2	1,500.00	54.04	2,774.41	68.03	20.00	4.07	J-1400	true
J-1430	2	1,500.00	54.04	2,783.20	67.95	20.00	8.51	J-2736	true
J-1435	2	1,500.00	54.04	3,000.00	61.77	40.70	6.95	J-2736	true
J-1440	2	1,500.00	54.04	3,000.00	56.11	32.30	6.95	J-2736	true
J-1445	2	1,500.00	54.04	2,659.79	59.53	20.00	8.69	J-2736	true
J-1450	2	1,500.00	54.04	2,408.29	74.69	20.00	9.84	J-2736	true
J-1455	2	1,500.00	22.17	3,000.00	64.80	44.23	6.95	J-2736	true
J-1460	2	1,500.00	22.17	3,000.00	63.06	43.59	6.93	J-2736	true
J-1465	2	1,500.00	23.05	3,000.00	61.76	43.43	6.91	J-2736	true
J-1470	2	1,500.00	16.80	2,744.02	61.76	20.00	8.23	J-2736	true
J-1475	2	1,500.00	16.80	3,000.00	72.60	52.84	6.95	J-2736	true
J-1480	2	1,500.00	16.80	2,889.59	71.40	20.00	10.66	J-2736	true
J-1485	2	1,500.00	16.80	3,000.00	73.46	53.55	6.96	J-2736	true
J-1490	23	1,500.00	0.00	2,567.87	35.96	20.00	20.00	J-1520	true
J-1495	1	1,500.00	17.19	2,276.09	72.46	20.00	4.77	J-2135	true
J-1500	1	1,500.00	17.19	3,000.00	69.95	50.91	4.76	J-2135	true
J-1510	33	1,500.00	0.00	3,000.00	117.61	96.18	96.19	J-1390	true

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-1515	1	1,500.00	9.50	2,248.08	67.70	20.00	4.76	J-2135	true
J-1520	23	1,500.00	0.00	2,560.40	35.96	20.00	20.04	J-1490	true
J-1545	1	1,500.00	9.50	3,000.00	71.70	40.99	4.76	J-2135	true
J-1550	1	1,500.00	33.99	3,000.00	64.34	45.16	4.76	J-2135	true
J-1555	1	1,500.00	39.17	2,960.27	76.88	20.00	4.76	J-2135	true
J-1560	1	1,500.00	39.17	3,000.00	79.36	26.68	4.76	J-2135	true
J-1565	1	1,500.00	16.85	2,696.04	67.15	20.00	4.76	J-2135	true
J-1570	1	1,500.00	16.85	3,000.00	65.01	48.02	4.76	J-2135	true
J-1580	1	1,500.00	10.31	3,000.00	59.43	42.92	4.76	J-2135	true
J-1585	1	1,500.00	27.16	2,315.46	59.22	20.00	4.76	J-2135	true
J-1590	1	1,500.00	19.81	1,717.53	46.27	20.00	4.76	J-2135	true
J-1595	1	1,500.00	0.00	N/A	44.95	N/A	N/A	N/A	false
J-1600	1	1,500.00	19.81	3,000.00	43.79	31.14	4.75	J-2135	true
J-1605	1	1,500.00	33.61	3,000.00	43.65	31.65	4.75	J-2135	true
J-1620	1	1,500.00	0.00	N/A	44.95	N/A	N/A	N/A	false
J-1625	4	1,500.00	10.31	3,000.00	153.94	67.74	5.69	J-1645	true
J-1630	4	1,500.00	10.31	3,000.00	130.16	48.15	5.37	J-1645	true
J-1635	4	1,500.00	10.31	3,000.00	130.13	47.89	5.36	J-1645	true
J-1640	4	1,500.00	10.31	2,875.03	93.51	20.00	5.35	J-1645	true
J-1645	4	1,500.00	10.31	0.00	6.59	6.59	93.51	J-1640	false
J-1650	4	1,500.00	10.31	2,614.56	109.61	20.00	6.00	J-1645	true
J-1670	1	1,500.00	22.32	3,000.00	83.92	65.83	4.76	J-2135	true
J-1675	1	1,500.00	22.32	3,000.00	83.62	65.36	4.76	J-2135	true
J-1680	1	1,500.00	4.97	3,000.00	83.97	65.56	4.76	J-2135	true
J-1730	1	1,500.00	21.24	3,000.00	52.23	32.91	4.76	J-2135	true
J-1735	1	1,500.00	16.27	3,000.00	65.00	45.54	4.76	J-2135	true
J-1740	1	1,500.00	66.32	3,000.00	60.18	40.63	4.76	J-2135	true
J-1745	1	1,500.00	83.51	3,000.00	60.07	40.52	4.76	J-2135	true
J-1750	3	1,500.00	0.00	3,000.00	115.84	94.43	4.33	J-2610	true
J-1755	1	1,500.00	22.32	1,702.06	61.38	20.00	4.76	J-2135	true
J-1760	1	1,500.00	22.32	2,628.20	73.01	20.00	4.76	J-2135	true
J-1765	1	1,500.00	22.32	2,569.89	78.21	20.00	4.76	J-2135	true
J-1770	1	1,500.00	22.32	3,000.00	77.56	26.78	4.76	J-2135	true
J-1775	1	1,500.00	22.32	3,000.00	83.26	50.15	4.76	J-2135	true
J-1780	2	1,500.00	38.86	1,949.89	85.36	20.00	11.59	J-2736	true
J-1785	2	1,500.00	17.19	2,080.72	74.58	20.00	10.67	J-2736	true
J-1790	2	1,500.00	17.19	1,824.92	75.56	20.00	11.55	J-2736	true
J-1795	2	1,500.00	17.19	2,093.08	67.81	20.00	10.24	J-2736	true
J-1800	2	1,500.00	17.19	1,866.76	58.08	20.00	11.29	J-2736	true
J-1805	2	1,500.00	17.19	1,780.52	51.24	20.00	11.45	J-2736	true
J-1810	2	1,500.00	17.19	2,521.36	61.94	20.00	7.96	J-2736	true
J-1815	2	1,500.00	17.19	1,841.49	56.98	20.00	11.15	J-2736	true
J-1820	3	1,500.00	17.19	3,000.00	102.11	50.65	2.79	J-2610	true
J-1825	3	1,500.00	29.70	2,289.18	82.60	20.00	4.25	J-2610	true
J-1830	3	1,500.00	12.51	2,450.32	87.80	33.03	-2.54	J-2610	true
J-1835	3	1,500.00	12.51	1,356.90	59.08	20.00	6.29	J-2600	false
J-1840	3	1,500.00	21.67	1,554.29	91.11	20.00	4.99	J-2610	true
J-1845	3	1,500.00	21.67	1,792.42	101.71	20.00	2.66	J-2610	true
J-1850	3	1,500.00	21.67	1,868.04	112.54	20.00	0.33	J-2610	true
J-1855	3	1,500.00	21.67	1,661.50	89.05	22.36	-2.54	J-2610	true

Scenario: MAX DAY-2017 W/FIRE FLOW
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Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-1860	3	1,500.00	43.99	1,613.18	141.66	20.00	4.08	J-2610	true
J-1865	3	1,500.00	43.99	1,616.41	141.21	20.00	4.26	J-2610	true
J-1870	1	1,500.00	43.99	2,156.25	47.23	20.00	4.76	J-2135	true
J-1875	1	1,500.00	43.99	3,000.00	58.88	38.87	4.76	J-2135	true
J-1880	3	1,500.00	21.67	1,708.01	129.58	20.00	3.79	J-2610	true
J-1885	3	1,500.00	21.67	2,040.89	129.67	20.00	1.25	J-2610	true
J-1890	1	1,500.00	16.27	1,885.25	41.25	20.00	4.76	J-2135	true
J-1895	1	1,500.00	16.27	2,448.12	61.65	20.00	4.76	J-2135	true
J-1900	1	1,500.00	16.27	3,000.00	83.36	24.15	4.76	J-2135	true
J-1905	3	1,500.00	12.51	1,397.09	69.88	40.83	-2.54	J-2610	false
J-1910	3	1,500.00	12.51	2,257.69	91.89	58.27	-2.54	J-2610	true
J-1915	3	1,500.00	12.51	130.37	21.49	20.00	6.29	J-2600	false
J-1920	8	1,500.00	12.51	2,182.53	73.69	20.00	164.74	J-2615	true
J-1925	3	1,500.00	12.51	1,771.00	32.47	20.00	2.48	J-2610	true
J-1930	3	1,500.00	12.51	1,743.16	39.96	20.00	5.46	J-2610	true
J-1935	3	1,500.00	12.51	2,623.26	59.66	20.00	5.02	J-2610	true
J-1940	3	1,500.00	12.51	3,000.00	109.25	69.47	1.28	J-2610	true
J-1945	3	1,500.00	10.54	3,000.00	70.58	32.03	6.29	J-2600	true
J-1950	3	1,500.00	10.54	3,000.00	61.51	26.53	6.29	J-2600	true
J-1955	3	1,500.00	10.54	3,000.00	62.43	26.13	0.29	J-1995	true
J-1960	3	1,500.00	10.54	3,000.00	79.91	41.90	6.29	J-2600	true
J-1965	3	1,500.00	10.54	3,000.00	69.10	34.34	3.58	J-1995	true
J-1970	3	1,500.00	10.54	0.00	9.41	9.41	6.29	J-2600	false
J-1975	7	1,500.00	10.54	232.54	30.30	20.00	32.49	J-50	false
J-1980	3	1,500.00	10.54	3,000.00	116.66	89.99	5.23	J-2610	true
J-1985	3	1,500.00	10.54	3,000.00	101.78	42.21	3.50	J-1995	true
J-1990	3	1,500.00	32.71	2,903.23	79.77	20.00	4.19	J-1995	true
J-1995	3	1,500.00	10.54	1,756.16	36.42	20.00	6.29	J-2600	true
J-2000	2	1,500.00	89.14	1,683.47	46.52	20.00	12.83	J-2736	true
J-2005	3	1,500.00	35.10	2,724.79	117.80	45.36	-2.54	J-55	true
J-2010	3	1,500.00	35.10	2,745.30	110.87	39.52	-2.54	FH17F	true
J-2015	3	1,500.00	22.17	2,885.74	97.02	25.67	-2.54	FH17F	true
J-2020	3	1,500.00	22.17	2,950.38	110.03	38.68	-2.54	FH17F	true
J-2025	2	1,500.00	22.17	2,253.48	130.83	20.00	15.67	J-2736	true
J-2030	3	1,500.00	22.17	2,775.74	129.97	20.00	6.29	J-2600	true
J-2035	3	1,500.00	22.17	2,136.93	118.70	20.00	6.29	J-2600	true
J-2040	2	1,500.00	16.80	2,689.82	65.95	20.00	8.24	J-2736	true
J-2045	1	1,500.00	16.80	2,130.25	89.79	20.00	4.77	J-2135	true
J-2050	2	1,500.00	16.80	2,645.87	63.74	20.00	7.96	J-2736	true
J-2055	2	1,500.00	33.99	2,741.64	61.63	20.00	6.42	J-2730	true
J-2060	1	1,500.00	17.11	3,000.00	141.98	125.02	4.76	J-2135	true
J-2070	1	1,500.00	35.88	3,000.00	127.07	111.78	4.76	J-2135	true
J-2085	1	1,500.00	18.77	3,000.00	125.18	110.35	4.76	J-2135	true
J-2090	1	1,500.00	0.00	3,000.00	159.87	148.90	4.77	J-2135	true
J-2100	1	1,500.00	10.31	3,000.00	43.09	31.59	4.75	J-2135	true
J-2110	1	1,500.00	0.00	3,000.00	158.18	141.54	4.77	J-2135	true
J-2130	3	1,500.00	0.00	3,000.00	118.74	70.71	5.43	J-1995	true
J-2135	1	1,500.00	11.37	0.00	4.77	4.77	26.24	PVCC Lak	false
J-2140	1	1,500.00	10.31	3,000.00	69.04	56.58	4.75	J-2135	true
J-2145	1	1,500.00	10.31	3,000.00	70.41	57.67	4.75	J-2135	true

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-2150	1	1,500.00	9.07	3,000.00	49.74	32.81	4.76	J-2135	true
J-2155	2	1,500.00	9.07	3,000.00	88.42	74.48	13.14	J-2736	true
J-2156	1	1,500.00	18.13	3,000.00	50.02	33.08	4.76	J-2135	true
J-2160	1	1,500.00	0.00	3,000.00	105.11	87.00	4.77	J-2135	true
J-2165	1	1,500.00	9.07	2,571.53	47.57	20.00	4.76	J-2135	true
J-2170	1	1,500.00	16.08	3,000.00	91.73	77.46	4.75	J-2135	true
J-2180	1	1,500.00	0.00	3,000.00	62.16	38.90	4.77	J-2135	true
J-2181	1	1,500.00	0.00	3,000.00	160.50	149.47	4.77	J-2135	true
J-2185	1	1,500.00	32.01	3,000.00	144.43	103.11	4.76	J-2135	true
J-2190	1	1,500.00	0.00	3,000.00	159.05	136.68	4.77	J-2135	true
J-2195	1	1,500.00	0.00	3,000.00	159.05	133.40	4.77	J-2135	true
J-2200	22	1,500.00	9.07	N/A	7.51	N/A	N/A	N/A	false
J-2201	22	1,500.00	0.00	N/A	7.50	N/A	N/A	N/A	false
J-2202	22	1,500.00	0.00	N/A	6.03	N/A	N/A	N/A	false
J-2205	22	1,500.00	9.07	N/A	6.03	N/A	N/A	N/A	false
J-2210	1	1,500.00	0.00	3,000.00	63.06	28.39	4.77	J-2135	true
J-2220	3	1,500.00	0.00	2,747.77	129.97	20.00	6.29	J-2600	true
J-2225	1	1,500.00	9.07	3,000.00	47.57	25.31	4.76	J-2135	true
J-2226	1	1,500.00	0.00	3,000.00	47.57	30.32	4.76	J-2135	true
J-2235	1	1,500.00	32.01	3,000.00	144.42	63.24	4.76	J-2135	true
J-2240	1	1,500.00	13.49	3,000.00	124.25	101.51	4.76	J-2135	true
J-2245	1	1,500.00	13.49	3,000.00	137.28	112.19	4.76	J-2135	true
J-2250	1	1,500.00	14.63	3,000.00	114.29	57.27	4.76	J-2135	true
J-2255	1	1,500.00	31.32	3,000.00	90.37	49.40	4.75	J-2135	true
J-2260	1	1,500.00	31.32	3,000.00	90.39	49.59	4.75	J-2135	true
J-2270	1	1,500.00	22.32	2,401.98	78.34	20.00	4.76	J-2135	true
J-2275	2	1,500.00	16.80	1,855.96	50.70	20.00	11.62	J-2736	true
J-2280	2	1,500.00	16.80	2,908.81	64.61	20.00	6.10	J-2736	true
J-2285	2	1,500.00	16.80	2,711.79	63.74	20.00	7.36	J-2736	true
J-2290	1	1,500.00	0.00	3,000.00	119.04	85.74	4.76	J-2135	true
J-2295	1	1,500.00	35.92	3,000.00	79.03	59.16	4.75	J-2135	true
J-2300	1	1,500.00	0.00	3,000.00	138.49	112.72	4.76	J-2135	true
J-2310	1	1,500.00	16.08	3,000.00	95.10	57.72	4.75	J-2135	true
J-2315	1	1,500.00	13.09	3,000.00	82.69	36.74	4.75	J-2135	true
J-2320	1	1,500.00	86.41	3,000.00	80.22	70.74	4.75	J-2135	true
J-2325	1	1,500.00	35.92	3,000.00	80.03	69.78	4.75	J-2135	true
J-2330	1	1,500.00	86.41	3,000.00	80.59	69.99	4.75	J-2135	true
J-2335	2	1,500.00	10.54	3,000.00	44.51	25.09	5.22	J-2736	true
J-2340	2	1,500.00	12.51	2,701.17	37.03	20.00	6.30	J-2736	true
J-2355	1	1,500.00	4.97	3,000.00	83.30	64.17	4.76	J-2135	true
J-2375	3	1,500.00	35.10	2,702.54	96.99	23.95	-2.54	FH17F	true
J-2380	3	1,500.00	35.10	2,384.12	79.65	20.00	6.29	J-2600	true
J-2385	2	1,500.00	16.80	2,672.06	70.25	20.00	8.08	J-2736	true
J-2405	1	1,500.00	11.37	1,574.71	78.57	20.00	4.76	J-2135	true
J-2410	1	1,500.00	11.37	3,000.00	79.00	65.29	4.75	J-2135	true
J-2415	1	1,500.00	50.78	3,000.00	120.81	89.49	4.76	J-2135	true
J-2420	1	1,500.00	20.34	2,314.82	58.89	20.00	4.76	J-2135	true
J-2425	1	1,500.00	23.29	3,000.00	67.92	53.87	4.75	J-2135	true
J-2430	1	1,500.00	23.29	3,000.00	67.96	53.92	4.75	J-2135	true
J-2435	1	1,500.00	23.29	3,000.00	67.98	53.94	4.75	J-2135	true

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-2440	1	1,500.00	32.01	2,027.57	122.57	20.00	4.77	J-2135	true
J-2445	1	1,500.00	18.77	3,000.00	124.88	81.45	4.76	J-2135	true
J-2450	1	1,500.00	17.11	3,000.00	132.18	38.71	4.76	J-2135	true
J-2455	1	1,500.00	22.63	3,000.00	128.35	95.94	4.76	J-2135	true
J-2460	1	1,500.00	22.63	3,000.00	128.35	82.40	4.76	J-2135	true
J-2465	1	1,500.00	14.63	3,000.00	130.94	102.43	4.76	J-2135	true
J-2470	1	1,500.00	13.49	3,000.00	144.00	120.09	4.76	J-2135	true
J-2475	1	1,500.00	5.92	3,000.00	113.94	26.67	4.76	J-2135	true
J-2480	1	1,500.00	5.92	3,000.00	115.30	69.04	4.76	J-2135	true
J-2490	1	1,500.00	22.63	2,895.26	128.59	20.00	4.76	J-2135	true
J-2495	1	1,500.00	22.63	2,782.33	128.78	20.00	4.76	J-2135	true
J-2500	1	1,500.00	23.29	2,119.26	85.61	20.00	4.76	J-2135	true
J-2505	1	1,500.00	23.29	2,282.14	61.61	20.00	4.76	J-2135	true
J-2510	1	1,500.00	16.08	1,898.07	74.36	20.00	4.76	J-2135	true
J-2515	1	1,500.00	23.29	1,920.23	102.57	20.00	4.76	J-2135	true
J-2525	1	1,500.00	38.59	3,000.00	61.15	41.61	4.76	J-2135	true
J-2530	1	1,500.00	22.32	2,949.10	64.61	20.00	4.76	J-2135	true
J-2535	1	1,500.00	22.32	2,973.63	60.28	20.00	4.76	J-2135	true
J-2540	1	1,500.00	22.32	3,000.00	60.27	32.53	4.76	J-2135	true
J-2545	1	1,500.00	22.32	2,964.66	58.09	20.00	4.76	J-2135	true
J-2550	1	1,500.00	43.12	2,112.85	57.73	20.00	4.76	J-2135	true
J-2555	1	1,500.00	14.63	3,000.00	118.81	57.60	4.76	J-2135	true
J-2580	1	1,500.00	22.96	2,480.16	54.70	20.00	4.75	J-2135	true
J-2585	1	1,500.00	36.05	2,287.35	50.36	20.00	4.76	J-2135	true
J-2590	3	1,500.00	12.51	3,000.00	116.19	92.83	4.67	J-2610	true
J-2591	3	1,500.00	0.00	3,000.00	115.73	94.24	4.32	J-2610	true
J-2592	3	1,500.00	0.00	3,000.00	115.76	94.29	4.32	J-2610	true
J-2595	3	1,500.00	12.51	3,000.00	116.19	64.52	4.67	J-2610	true
J-2596	3	1,500.00	0.00	3,000.00	107.09	81.57	4.05	J-2610	true
J-2600	3	1,500.00	12.51	0.00	6.29	6.29	9.41	J-1970	false
J-2605	3	1,500.00	12.51	1,683.47	32.94	20.00	4.34	J-2610	true
J-2610	3	1,500.00	12.51	0.00	14.60	14.60	6.29	J-2600	false
J-2615	8	1,500.00	12.51	3,000.00	164.74	164.74	73.69	J-1920	true
J-2620	1	1,500.00	56.31	3,000.00	58.74	39.37	4.76	J-2135	true
J-2630	1	1,500.00	21.24	3,000.00	83.26	64.12	4.76	J-2135	true
J-2635	1	1,500.00	10.31	2,402.34	68.28	20.00	4.76	J-2135	true
J-2640	4	1,500.00	10.31	3,000.00	157.69	56.91	5.91	J-1645	true
J-2645	4	1,500.00	10.31	2,614.38	109.66	20.00	6.00	J-1645	true
J-2646	55	1,500.00	0.00	2,606.51	109.57	20.00	20.36	J-2647	true
J-2647	55	1,500.00	0.00	2,606.32	109.48	20.00	20.54	J-2646	true
J-2650	5	1,500.00	20.34	2,573.91	107.84	20.00	21.72	FH16F	true
J-2665	1	1,500.00	16.08	2,866.06	83.51	20.00	4.76	J-2135	true
J-2670	1	1,500.00	11.62	3,000.00	104.22	22.11	4.76	J-2135	true
J-2675	1	1,500.00	13.77	3,000.00	56.57	29.03	4.75	J-2135	true
J-2680	1	1,500.00	13.77	3,000.00	59.16	28.36	4.75	J-2135	true
J-2685	1	1,500.00	19.82	3,000.00	62.18	22.50	4.75	J-2135	true
J-2690	1	1,500.00	23.30	1,942.93	57.78	20.00	4.76	J-2135	true
J-2695	1	1,500.00	23.30	1,787.57	56.86	20.00	4.76	J-2135	true
J-2700	5	1,500.00	20.34	N/A	53.07	N/A	N/A	N/A	false
J-2705	1	1,500.00	20.34	2,027.53	52.01	20.00	4.76	J-2135	true

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-2710	3	1,500.00	10.54	3,000.00	97.92	62.14	6.14	J-1995	true
J-2715	3	1,500.00	10.54	3,000.00	109.92	73.76	6.29	J-2600	true
J-2720	3	1,500.00	10.54	3,000.00	108.67	78.13	6.04	J-2610	true
J-2725	3	1,500.00	10.54	3,000.00	94.96	53.48	6.29	J-2600	true
J-2730	2	1,500.00	17.19	995.73	30.40	20.00	15.40	J-2736	false
J-2735	2	1,500.00	17.19	N/A	29.73	N/A	N/A	N/A	false
J-2736	2	1,500.00	0.00	N/A	23.23	N/A	N/A	N/A	false
J-2755	1	1,500.00	16.27	2,589.02	75.96	20.00	4.76	J-2135	true
J-2760	1	1,500.00	16.27	2,879.79	88.98	20.00	4.76	J-2135	true
J-2765	2	1,500.00	9.07	3,000.00	86.05	72.74	14.83	J-2736	true
J-2770	2	1,500.00	9.07	3,000.00	86.71	73.49	14.14	J-2736	true
J-2775	1	1,500.00	23.29	1,916.75	96.07	20.00	4.76	J-2135	true
J-2785	2	1,500.00	12.51	2,306.40	37.06	20.00	8.84	J-2736	true
J-2791	3	1,500.00	0.00	3,000.00	117.49	94.45	4.32	J-2610	true
J-2792	2	1,500.00	12.51	2,735.60	37.02	20.00	6.32	J-2736	true
J-2795	2	1,500.00	12.51	3,000.00	44.51	25.84	5.20	J-2736	true
J-2800	2	1,500.00	23.05	3,000.00	62.04	43.82	6.62	J-2736	true
J-2805	1	1,500.00	26.69	3,000.00	59.92	45.24	4.76	J-2135	true
J-2810	1	1,500.00	9.50	3,000.00	65.38	50.37	4.76	J-2135	true
J-2815	1	1,500.00	9.50	3,000.00	60.27	45.19	4.76	J-2135	true
J-2820	1	1,500.00	9.50	3,000.00	43.79	31.14	4.75	J-2135	true
J-2825	1	1,500.00	39.63	3,000.00	44.20	31.79	4.75	J-2135	true
J-2830	1	1,500.00	60.25	3,000.00	46.61	34.33	4.75	J-2135	true
J-2835	1	1,500.00	39.52	3,000.00	59.19	39.70	4.76	J-2135	true
J-2840	1	1,500.00	18.13	N/A	33.09	N/A	N/A	N/A	false
J-2845	2	1,500.00	9.07	3,000.00	89.05	75.92	13.86	J-2736	true
J-2846	22	1,500.00	0.00	3,000.00	90.34	76.35	6.03	J-2202	true
J-2847	22	1,500.00	0.00	3,000.00	90.49	76.37	6.03	J-2202	true
J-2848	22	1,500.00	0.00	3,000.00	90.56	76.37	6.03	J-2202	true
J-2849	22	1,500.00	0.00	3,000.00	90.58	76.30	6.03	J-2202	true
J-2856	12	1,500.00	0.00	3,000.00	48.85	31.01	31.26	J-2857	true
J-2857	12	1,500.00	0.00	3,000.00	48.87	31.23	31.22	J-2856	true
J-2858	12	1,500.00	0.00	3,000.00	48.94	31.50	31.45	J-2856	true
J-2859	12	1,500.00	0.00	3,000.00	49.09	31.82	31.69	J-2856	true
J-2890	1	1,500.00	0.00	3,000.00	73.30	63.05	4.74	J-2135	true
J-5000	1	1,500.00	77.64	3,000.00	67.96	57.89	4.75	J-2135	true
J-5005	1	1,500.00	41.99	2,744.57	53.31	20.00	4.76	J-2135	true
J-5010	5	1,500.00	48.80	2,308.32	163.44	20.00	20.93	J-10	true
J-5015	1	1,500.00	23.51	3,000.00	44.12	32.69	4.75	J-2135	true
J-5020	5	1,500.00	23.04	3,000.00	163.52	49.67	15.86	FH16	true
J-5030	1	1,500.00	16.03	2,228.12	81.18	20.00	4.76	J-2135	true
J-5035	1	1,500.00	15.28	3,000.00	79.83	65.65	4.75	J-2135	true
J-5040	1	1,500.00	34.87	2,701.72	57.72	20.00	4.76	J-2135	true
J-5045	1	1,500.00	52.68	3,000.00	71.70	39.67	4.76	J-2135	true
J-5050	1	1,500.00	52.68	3,000.00	71.63	45.65	4.76	J-2135	true
J-5055	1	1,500.00	69.87	3,000.00	70.80	51.93	4.76	J-2135	true
J-5060	1	1,500.00	69.87	3,000.00	70.77	52.18	4.76	J-2135	true
J-5065	1	1,500.00	52.68	3,000.00	70.73	39.66	4.76	J-2135	true
J-5070	1	1,500.00	52.68	2,279.85	68.48	20.00	4.76	J-2135	true
J-5075	1	1,500.00	52.68	2,208.53	71.51	20.00	4.76	J-2135	true

Scenario: MAX DAY-2017 W/FIRE FLOW
Fire Flow Analysis
Fire Flow Report

Label	Zone	Needed Fire Flow (gpm)	Base Flow (gpm)	Available Fire Flow (gpm)	Pressure (psi)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction	Satisfies Fire Flow Constraints?
J-5080	22	1,500.00	56.67	N/A	7.56	N/A	N/A	N/A	false
J-5085	1	1,500.00	61.28	2,315.37	86.32	20.00	4.76	J-2135	true
J-5090	1	1,500.00	61.28	2,768.74	94.04	20.00	4.76	J-2135	true
J-5095	1	1,500.00	75.05	2,722.05	94.00	20.00	4.76	J-2135	true
J-5100	1	1,500.00	197.69	3,000.00	50.87	24.35	4.74	J-2135	true
J-5105	1	1,500.00	114.67	3,000.00	74.43	64.10	4.74	J-2135	true
J-5110	1	1,500.00	72.24	2,977.57	115.85	20.00	4.76	J-2135	true
J-5115	1	1,500.00	86.87	3,000.00	118.65	50.80	4.76	J-2135	true
J-5120	1	1,500.00	105.92	3,000.00	121.47	106.18	4.76	J-2135	true
J-5125	1	1,500.00	105.92	3,000.00	120.82	105.32	4.76	J-2135	true
J-5130	1	1,500.00	98.62	3,000.00	144.35	58.19	4.76	J-2135	true
J-5135	1	1,500.00	91.32	2,549.19	107.50	20.00	4.76	J-2135	true
J-5140	1	1,500.00	91.32	2,605.41	108.19	20.00	4.76	J-2135	true
J-5145	5	1,500.00	139.51	2,887.44	124.64	20.00	19.02	FH16	true
J-5150	1	1,500.00	397.98	1,694.64	56.28	20.00	4.76	J-2135	true
J-5155	1	1,500.00	108.25	2,655.40	46.38	20.00	4.76	J-2135	true
J-5160	2	1,500.00	34.17	3,000.00	76.06	54.91	6.94	J-2736	true
J-5165	2	1,500.00	32.05	2,214.20	82.31	20.00	11.76	J-2736	true
J-5170	2	1,500.00	9.21	3,000.00	76.29	54.69	11.65	J-2736	true
J-5175	2	1,500.00	24.53	3,000.00	64.28	26.70	7.70	J-2736	true
J-5185	2	1,500.00	65.74	3,000.00	61.78	49.58	23.09	J-2736	true
J-5190	1	1,500.00	70.44	1,668.09	37.42	20.00	4.76	J-2135	true
J-5195	1	1,500.00	56.67	2,392.27	46.10	20.00	4.76	J-2135	true
J-6005	99	1,500.00	0.00	N/A	5.02	N/A	N/A	N/A	false
J-6010	99	1,500.00	0.00	N/A	5.04	N/A	N/A	N/A	false
J-6015	11	1,500.00	0.00	N/A	160.07	N/A	N/A	N/A	false
J-6020	99	1,500.00	0.00	N/A	4.09	N/A	N/A	N/A	false
J-6025	99	1,500.00	0.00	N/A	5.05	N/A	N/A	N/A	false
J-6030	11	1,500.00	0.00	N/A	160.07	N/A	N/A	N/A	false
J-6035	11	1,500.00	0.00	N/A	160.09	N/A	N/A	N/A	false
J-6040	99	1,500.00	0.00	N/A	4.44	N/A	N/A	N/A	false
J-6065	11	1,500.00	0.00	N/A	-2.49	N/A	N/A	N/A	false
J-6070	11	1,500.00	0.00	N/A	157.26	N/A	N/A	N/A	false
J-6075	11	1,500.00	0.00	N/A	157.27	N/A	N/A	N/A	false
J-6080	11	1,500.00	0.00	N/A	157.30	N/A	N/A	N/A	false
J-6085	11	1,500.00	0.00	N/A	157.30	N/A	N/A	N/A	false
J-6090	11	1,500.00	0.00	N/A	157.29	N/A	N/A	N/A	false
PVCC Lake (J-5180)	1	1,500.00	337.53	N/A	26.24	N/A	N/A	N/A	false
SRP W22.6 (J-2120)	1	1,500.00	0.00	N/A	159.29	N/A	N/A	N/A	false
Suction CC (J-2860)	12	1,500.00	9.07	N/A	49.74	N/A	N/A	N/A	false
Suction CWH I (J-279	23	1,500.00	0.00	N/A	35.97	N/A	N/A	N/A	false
Suction SC (J-2826)	14	1,500.00	0.00	N/A	42.02	N/A	N/A	N/A	false

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RECEIVED
AUG 15 2005
By

TOWN OF
PARADISE VALLEY

OFFICE OF: TOWN MANAGER

6401 EAST LINCOLN DRIVE
TOWN OF PARADISE VALLEY, ARIZONA 85253-4399

PHONE: (480) 948-7411
FAX: (480) 951-3715
TDD: (480) 483-1811

August 10, 2005

Brian K. Biesemeyer, P.E.
Operations Manager, Arizona-American Water Company
15626 North Del Webb Blvd.
Sun City, AZ 85351

Re: Water System Improvements

Dear Mr. Biesemeyer:

Over the past several years, the Town, your company and our other two water providers completed an interesting, productive and highly successful planning process relating to fire flow capabilities needed to ensure the safety of Town residents. The Town has been pleased with the public dialogue relating to the need to make substantial water system improvements for fire protection.

Since completing the planning process, the Town's three water providers have begun implementing a fire flow improvement program through their capital budgets. Arizona-American Water has been especially proactive in addressing these immediate needs, by stepping forward, prior to a rate adjustment, and completing the Jackrabbit-Invergorden Main Replacement and the Tatum-McDonald Realignment.

As the original requestor of these water system improvements, the Town understands that there is likely to be a substantial impact to our constituents', (your customers') rates. Your success at the Corporation Commission will ultimately dictate whether the fire flow improvements are included in your capital budget. It is important to note that, without these improvements, the risk to life and property would continue into the distant future, which is an unacceptable long-term risk to the Town. The sooner the improvement program can get underway the better; Town residents' safety and the protection of their property is highly dependent on this program.

As I have stated in the past we have enjoyed Arizona-American's proactive efforts and cooperation, and we know this will continue into the future. If we can be of any assistance as Arizona-American moves forward with the improvement program, please do

not hesitate to call on us for support. Thank you again, and we look forward to your continued service to our community and its residents.

Sincerely,

Thomas M. Martinsen

Thomas M. Martinsen
Town Manager

TMM/nm

121

"Robert R. McCandless" <RMcCandless@dswa.net>

01/25/2005 11:36 AM

To: <TFriday@amwater.com>, <pkeenan@amwater.com>, <Joe.Gross@amwater.com>, "delbert norton" <cnorton@dlnorton.com>
cc: "Dale Jensen" <dale@jensenengineering.com>
Subject: Impact of depressed reservoirs on electrical design

Dale and I spoke about this. By adding another 16-20 feet of lift to the washwater supply and distribution pumps, we will need to increase the motor horspowers of all by 50 hp (rounded to nearest motor size) for a total of 350 hp. We're pretty well loaded on two 3000 amp services using 480V now, and may need to go to 4160V service at least for the larger motor loads. The problem is, APS won't provide 4160V primary power, so we would need to get 12.47kV power to the site. APS will provide transformers for 12.47kV::480V, but not 12.47kV::4160V. We would have to provide and maintain our own transformers. If we use 4160V power, our electrical room will get larger in order to meet code requirements. The end result is that we could be into this for an additional $500,000 worth of electrical components.

I'm not sure APS had 12.47KV lines near our site. My recollection is that the service is 480V. Dale, would this be possible?

On the operations and maintenance side, special certification will be required for working on the 4160V equipment.

122

From: Robert R. McCandless <RMcCandless@dswa.net>
Sent: Thursday, January 27, 2005 7:23 AM
To: <pkeenan@amwater.com>
Cc: delbert norton <cnorton@dlnorton.com>; Dale Jensen <dale@jensenengineering.com>; <Joe.Gross@amwater.com>; <TFriday@amwater.com>
Subject: RE: Impact of depressed reservoirs on electrical design

---

Right now I am proceeding with revised steel reservoir dimensions of a 116 ft diameter and 20 ft side wall height. I am using a very flat slope on the roof of 1V to 48H, consistent with the Anthem Water Campus reservoirs. With the Omega Vent, the overall structure height is just under 24 feet. With the floor of the reservoirs depressed 2 feet below the adjacent canal bank, the overall height will appear to be 22 feet.

Lowering the max water level by 4 feet won't sustantially affect our pump hydraulics.

-----Original Message-----
From: pkeenan@amwater.com [mailto:pkeenan@amwater.com]
Sent: Thursday, January 27, 2005 7:04 AM
To: Robert R. McCandless
Cc: delbert norton; Dale Jensen; Joe.Gross@amwater.com; TFriday@amwater.com
Subject: Re: Impact of depressed reservoirs on electrical design

This certainly sounds like a major impact. Where do we stand on buried reservoirs versus the original steel design?

Peter Keenan
American Water
213 Carriage Lane
Delran, NJ 08075
Tel: 856-824-2583
Mob: 609-364-5937
Fax: 856-764-4331

"Robert R. McCandless" <RMcCandless@dswa.net> 01/25/2005 01:36 PM

To: <TFriday@amwater.com>, <pkeenan@amwater.com>, <Joe.Gross@amwater.com>, "delbert norton" <cnorton@dlnorton.com>

cc: "Dale Jensen" <dale@jensenengineering.com>

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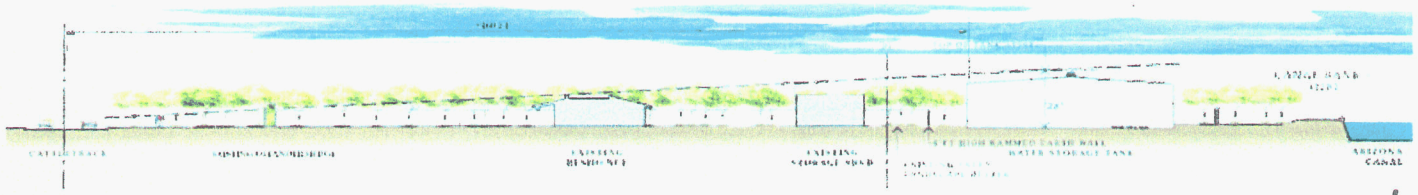
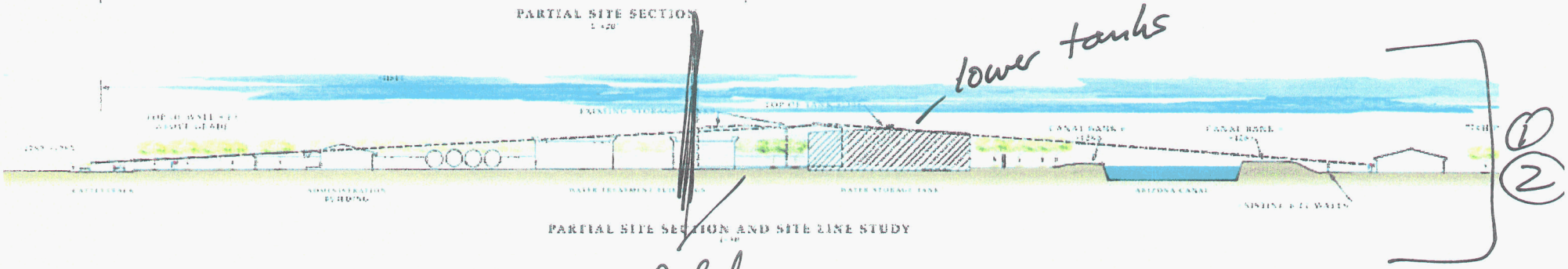
123

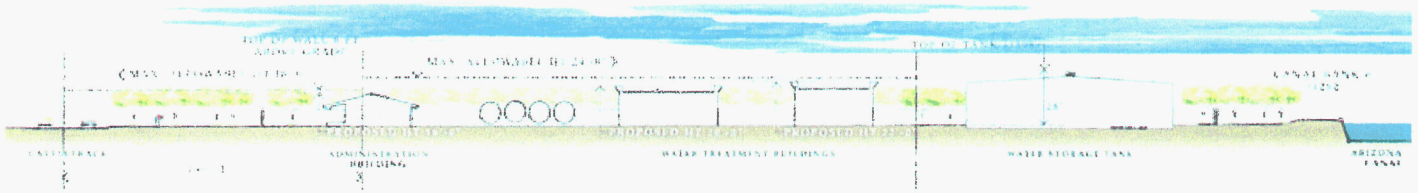


PARTIAL SITE SECTION



PARTIAL SITE SECTION AND SITE LINE STUDY

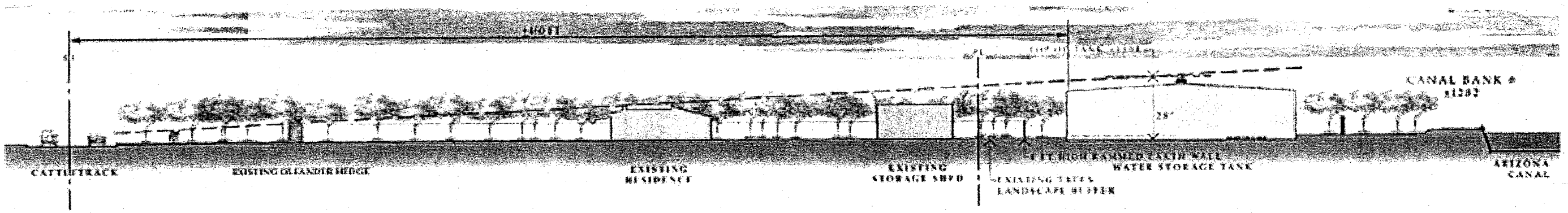
delete



PARTIAL SITE SECTION

lower tank.

PARTIAL SITE SECTION



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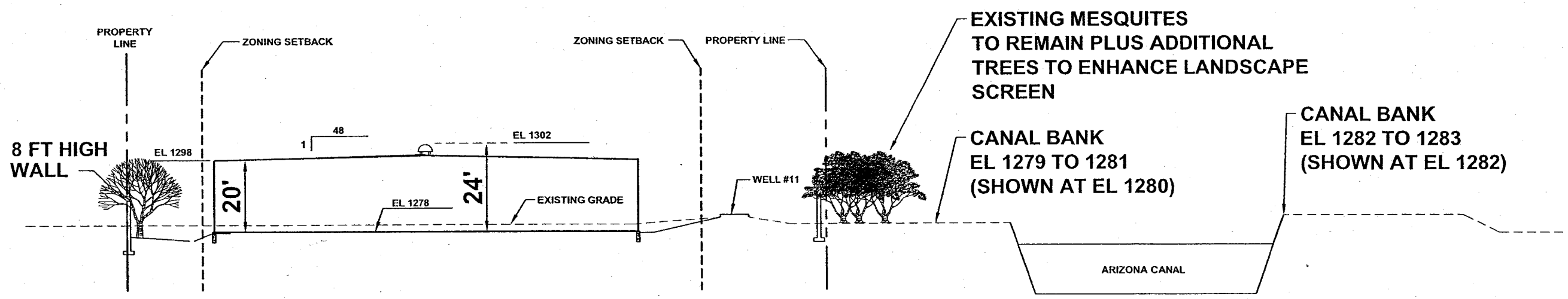
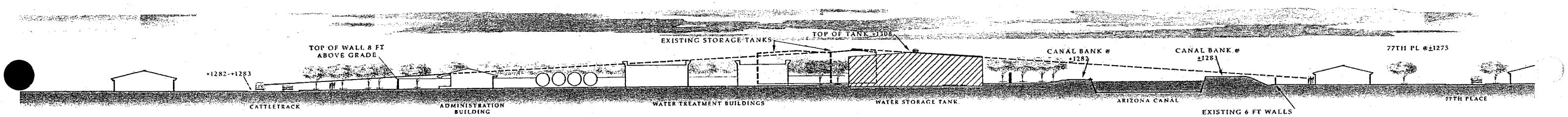
1"=20'



PROPOSED SHORTER RESERVOIRS



PARTIAL SITE SECTION AND SITE LINE STUDY
1=30

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ON CUE WITH DEQ DRINKING WATER

By Jeff Stuck, Manager, Drinking Water Section
Arizona Department of Environmental Quality, WQD

ADEQ Arizona Department of Environmental Quality
Janet Napolitano, Governor
Stephen A. Owens, ADEQ Director

MONITORING REQUIREMENTS FOR THE NEW ARSENIC STANDARD

Mandatory Compliance • Exemptions • Standardized Monitoring Framework

All community and non transient, community water systems (including new systems) will be required to meet the new compliance and monitoring requirements for the revised arsenic standard by January 23, 2006.

The standard lowers the MCL from 50 parts-per-billion (ppb) to 10 ppb, and more than 300 of Arizona's public water systems are challenged to comply.

Systems needing guidance should refer to ADEQ's Arsenic Master Plan (AMP) for cost-effective treatment options and other technical assistance. This comprehensive guide is located at www.azdeq.gov/environ/water/dw/arsenic.html.

EXEMPTIONS

By law, ADEQ will undertake enforcement action against public water systems in violation of the new arsenic standard. It will apply the rules for exemptions under AZ Administrative Code R18-4-111.

- A water system must effectively demonstrate that all necessary steps to meet compliance requirements are well in progress.
- In determining whether a public water system is unable to comply with the new standard, the Department will consider whether:
- The necessary treatment techniques and capital improvements have been identified and can be completed in a well defined schedule;
- If the public water system needs financial assistance for necessary capital improvements, the system has entered into an agreement to obtain the financial assistance;
- The system has entered into an enforceable agreement to become part of a regional public water system; and
- Necessary management or restructuring changes resulting in compliance are being implemented.
- In the interest of public health and safety, ADEQ will exercise its option to require an interim alternative treatment mode, such as bottled water, until water quality can be improved.

STANDARDIZED MONITORING FRAMEWORK

- Systems can begin sampling in 2005 to satisfy monitoring requirements for compliance.
- Data gathered between January 1, 2005 and January 23, 2006 may be used for compliance purposes if it is consistent with the analytical methodology approved for use by the January 22, 2001 Final Rule at 40 CFR 141.23(k)(l).
- Ground water systems must take one initial sampl between 2005 and 2007. Surface water systems must tak annual samples.
- Arsenic sampling for community water systems (CWSs will be covered by the MAP Program. CWSs will b notified of their initial monitoring status and acceptabl data can be grandfathered with ADEQ approval.
- For CWSs not covered by the MAP Program, all sample must be collected at each entry point of the distributio system, unless otherwise specified by ADEQ.
- Compliance will be based on a running annual average a each sampling point.
- Systems will not be in violation of the new MCL until year of quarterly samples have been collected (unles fewer samples would cause the running annual average t be exceeded.)
- If a system does not collect all required sample: compliance will be based on the running annual average c the samples collected.

REDUCED MONITORING

- Monitoring relief is geared toward those systems that hav results with arsenic levels below the new standard of 1 ppb.
- If the initial monitoring result for arsenic is less than th new MCL of 10 ppb, then ground water systems mus collect one sample every three years, while surface wate systems must collect annual samples.
- ADEQ will reduce monitoring frequency to once ever nine years if warranted by sampling results.

INCREASED MONITORING

- A system with a sampling point result above the MCL o 10 ppb must collect quarterly samples at that samplin point, until the system is reliably and consistently belov the MCL.
- In such circumstances, enforcement actions will be taken

FOR FURTHER INFORMATION

Arsenic Master Plan Quick Link --
www.azdeq.gov/environ/water/dw/arsenic.html
ADEQ, WQD, Drinking Water Section (602) 771 – 4644
www.epa.gov/safewater/ars/
www.epa.gov/safewater/ars/implement.html
EPA Safe Drinking Water Hotline – (800) 426-4791

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ARIZONA AMERICAN WATER
PARADISE VALLEY ARSENIC REMOVAL FACILITY
TANK LOCATION RATIONALE

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AESTHETICS

- Current location has the least impact – virtually hidden from view from Cattletrack.

- The current location allows for the lowest possible elevation for the steel tanks on the site. To relocate the tanks to the north would require that the tanks be constructed at a higher elevation and more visible from offsite.

- The best site lines for both the Kueffner's and others, results from locating the reservoirs behind their sheds/workshops and the existing tree line. The Kueffners will have an open site line across the clarifiers towards the northeast between Building C and their rear shed structure.

- The site is laid out to minimize the amount of vehicle traffic and maintenance activities in close proximity to the Kueffner's property. The reservoirs require the least frequent access for operations and maintenance, which we believe will minimize potential disturbances to the Kueffners.

- Due to the location of Well 11 and the size of the reservoir footprint, more land would be required for relocated reservoirs, resulting in a larger visual impact on all neighbors.

- Placement of Building C in the current location of the reservoirs would reduce opportunities for landscape buffering due to the need for full pavement for vehicle circulation. Building C is 20 feet high.

PROCESS

- Logical location in process flow.

- It is essential to keep the residuals handling facilities in close proximity. Therefore, we would need to move the dewatering building Building C along with the clarifiers. Besides the difficulty of accessing the building, the 20-foot height of Building C would also represent a site line obstruction.

- Security – Following 9/11, we look for opportunities to make our finished water storage facilities less accessible, which the design accomplishes.

SITE CONSTRAINTS

- Building C can't be moved to the location of the proposed tanks because of traffic flow (need to maneuver roll off in and out of building) and process piping

- The steel tanks cannot be depressed further due to drainage limitations.

- Deep excavation for buried tanks would require the old growth mesquites along the Arizona Canal to be removed

- Cannot excavate near existing Well No. 12

- Existing reservoirs must remain in service until new tanks are constructed. This precludes moving the steel tanks as designed to the current location of the clarifiers and existing steel reservoirs.

- Proximity to the Arizona Canal precludes constructing buried concrete tanks in lieu of on-ground steel tanks; significant risk of undermining the canal. Other constraints on constructing buried concrete tanks:
    - Construction of DYK-type concrete tanks require a 20' horizontal overexcavation to allow for the winding machine. This would encroach on the Kueffner property and Well 11.
    - To construct even one tank at the location of the clarifiers would encroach on Well 11.

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Cost of Buried Reservoir

Added Cost of Buried Concrete Reservoir	$1,250,000
Relocate Well	$1,000,000
Deeper buried piping	$ 55,000
Deeper, larger pumps	$ 55,000
Electrical service improvements	$ 500,000
Design and Permitting Fees	$ 290,000
Total Cost	$3,150,000

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A. Undergrounding either fully or partially, the water tanks would result in a minimum 20 month delay in meeting the January 23, 2006 EPA mandated requirements.

B. We have a Development Review Board hearing this Thursday, the day after tomorrow. With this schedule, we will be able to operate the removal facility on January 23rd to meet the EPA requirement, but the plant will not yet be completely finished.

C. The following delays result from any effort to materially alter the site plan.

1. At least two months to re-engineer the facility;
2. Return to Planning Commission;
3. Return to City Council;
4. Return to Historic Preservation Commission;
6. DRB hearing;
7. Approximately five months longer to construct the re-engineered tanks versus the currently engineered tanks.

D. Running parallel with this timeframe is a requirement to relocate Well No. 11 on site necessitating approvals from the Arizona Department of Water Resources, relocating and drilling a new well (which cannot be done during the summer time in order to meet the water demand).

E. Who will be impacted by the delay?

1. 1,891 households and businesses in Scottsdale south of Indian Bend Road;
2. 2,627 households in Paradise Valley;
3. 152 households in the County Island of Clearwater Hills;

   4,680 Total

F. Ramifications of delay.

These 4,680 impacted households and businesses will be receiving water that does not meet the EPA mandated requirement. This will result in the following:

1. Notice of violation issued by the EPA and/or Arizona Department of Environmental Quality;
2. Mailed notice to all 4,680 customers;
3. A request for extension of timeframe with the Arizona Department of Environmental Quality;
4. A public hearing must be held regarding the extension demonstrating "compelling factors" for an extension of the timeline;

5. Notice of public hearing must be given to impacted customers. The hearing must be held and the time extension granted. Current requirements are that American Water must mitigate the failed standard in providing water to their customers;

6. Approximate cost for this is $2.75 million. That does not include lost "goodwill" with American Water's customers.

G. Why can't the tanks be moved to the location of the existing tanks?

The existing three tanks on site must remain in operation until the new tanks are ready. There must be a place for water to be stored at all times.

H. Other factors to consider:

1. Pursuant to the existing zoning, according to the City Council Action Report for the use permit, the permitted height for occupied buildings in the Special Campus District (where the tanks are located) is 38 feet. A single family home would be permitted two stories 30 feet in height. The two tanks are approximately 8,000 square feet each and are unoccupied structures that generate no noise.

2. The cost of these delays and the uncertainty associated with them would be passed onto the 1,891 households and businesses in the City of Scottsdale, the 2,627 households in Paradise Valley, and the 152 households in the County Island of Clearwater Hills.

3. How will the Town of Paradise Valley Town Council, and its impacted citizens, react to this delay and additional cost?

4. American Water has tried to be a good neighbor. Beginning with Technical Solutions and John Berry's involvement a few short months ago, substantial changes have been made to the site plan in order to maintain the rural character of the area. At the request of the neighbors after open houses and door-to-door outreach efforts, the following substantial changes were made to the original site plan.

   a. A new architect was hired, Taliesan trained Larry Heiny of H&S Architects;

   b. The administration building was redesigned as a rustic looking single family ranch house;

   c. Extensive landscaping was added;

   d. Minimum 100 foot building setback from Cattle Track Road;

   e. A pedestrian path for access to the canal;

f. Non-asphalt parking lot for employees;

g. Rammed earth wall with wrought iron accents;

h. Soundproofing pumps on site.

I. In a continuing attempt to be a good neighbor, American Water has analyzed the engineering possibilities of the following and have agreed to make these changes at the Development Review Board hearing the day after tomorrow.

1. Reduce the height of the tanks from a maximum of 28 feet to a maximum of 23 feet (the 28 feet is a small vent at the top of the tank and actual edge of the tank is approximately four feet less than the top of the vent) Thus, the existing proposed 28 foot tank, in actuality, is approximately 24 feet to the top of the edge while the revised height of the tank would be 23 feet to the top of the vent and approximately 19 feet to the top of the edge of the tank. This will result in the width of the tank being increased by approximately 9 feet.

We can make these changes and still meet the EPA mandated deadline of January 23, 2005.

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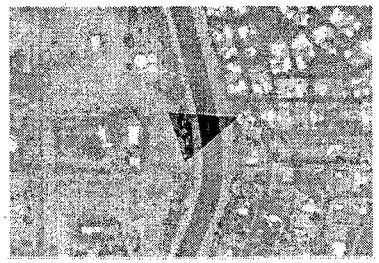
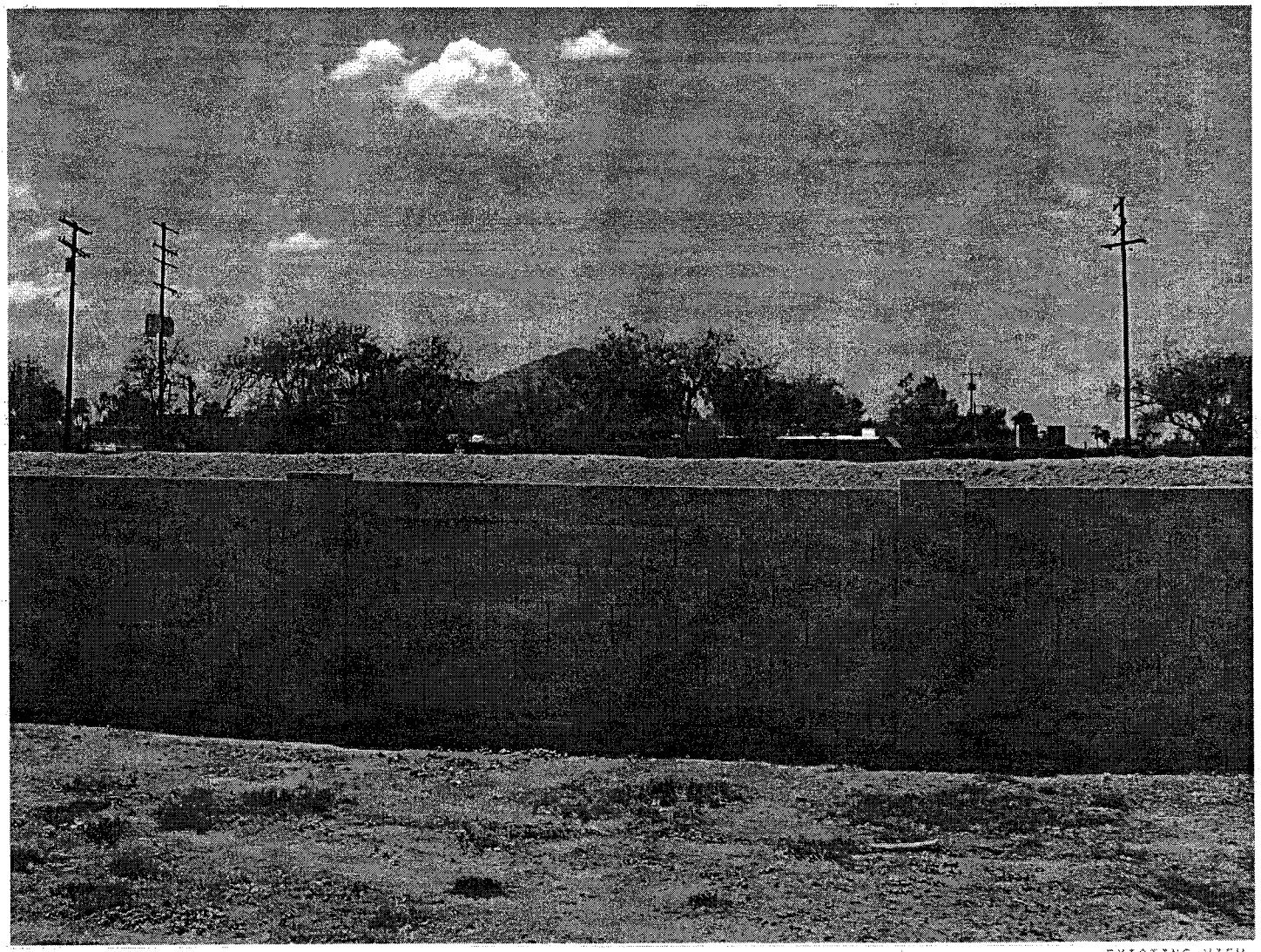
№ VP 1

VANTAGE POINT ONE (VP1)



VP1
33°31.642N
111°54.873W
1263ft



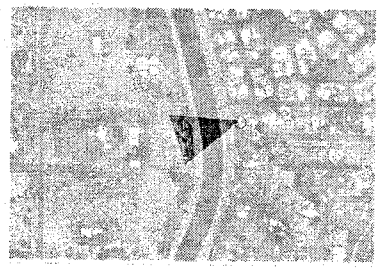
EXISTING VIEW

129

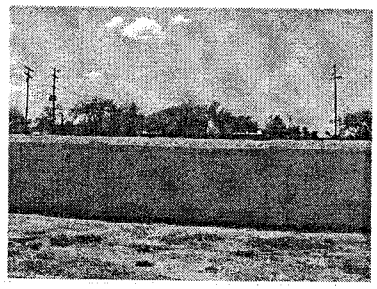
PROJ.# 05029-az american H2O / litigation visuals
CLIENT: H&S International, G&K

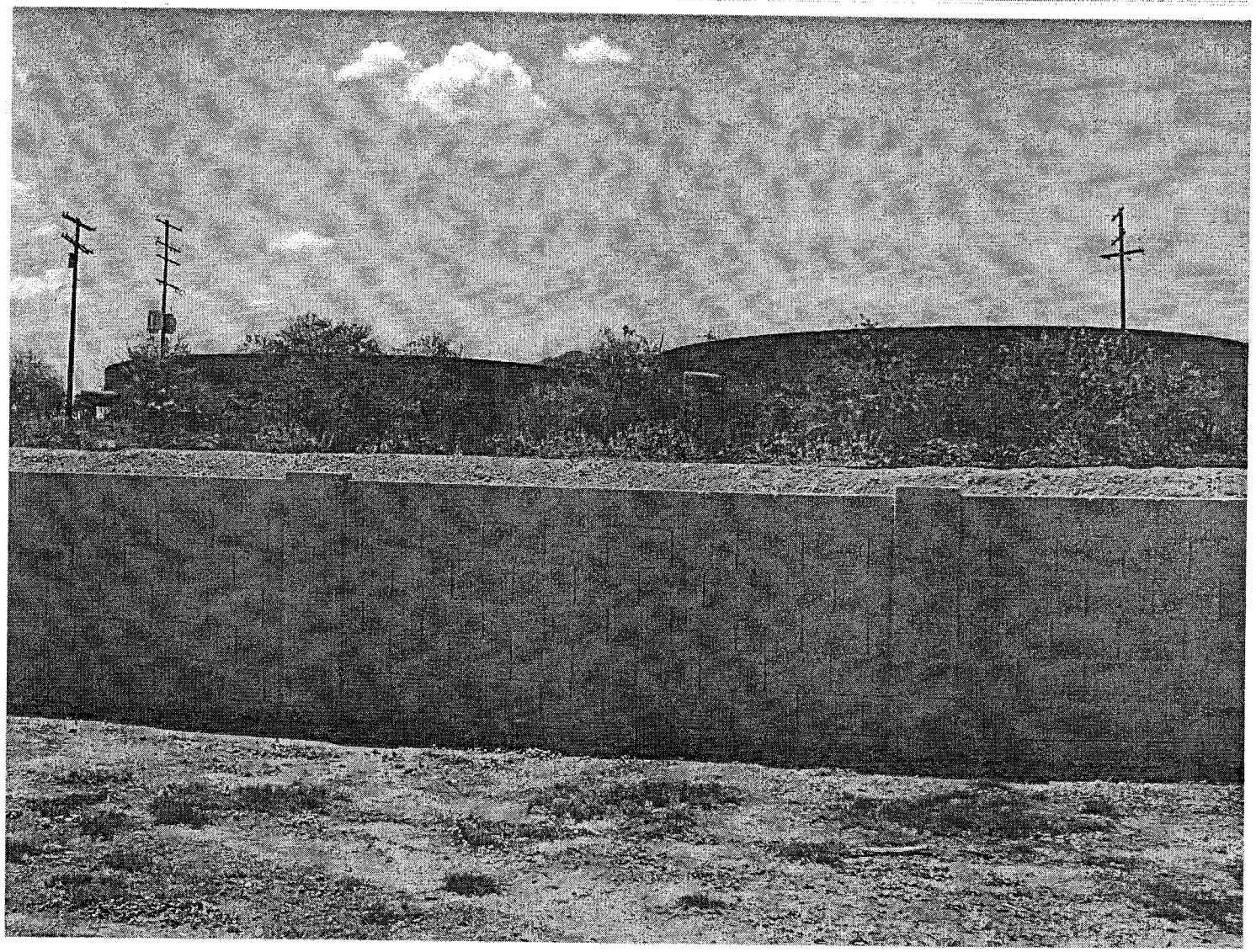
№ VP 1

VANTAGE POINT ONE (VP1)



VP1
33°31.642N
111°54.873W
1263ft





CONCEPTUAL VIEW OF PROPOSED TANKS

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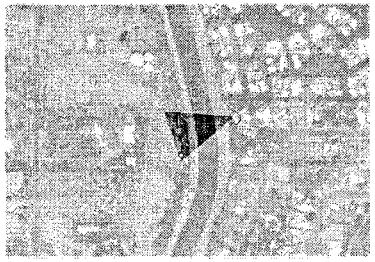
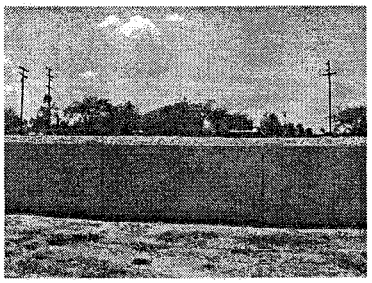
4

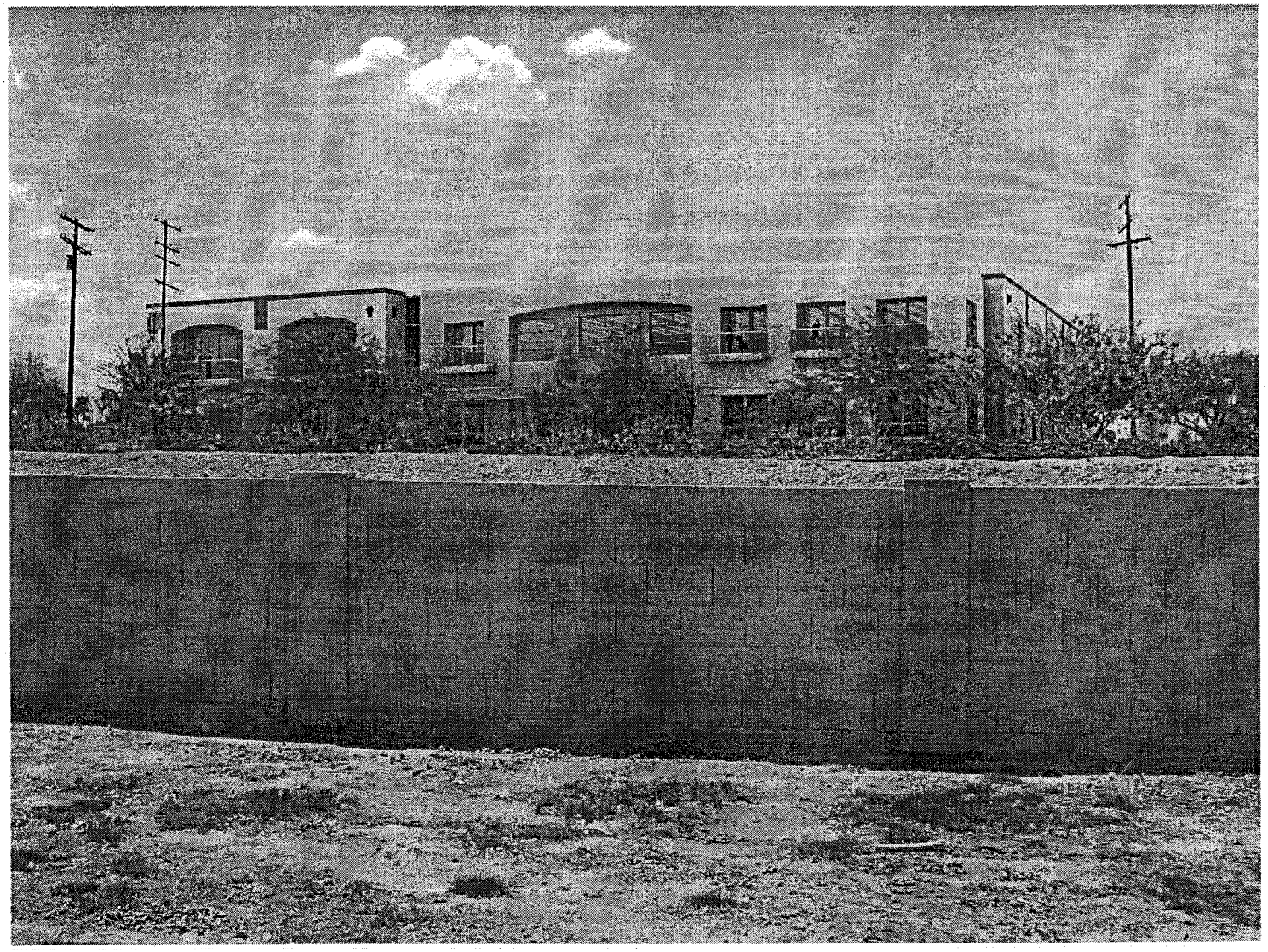
N° VP 1

VANTAGE POINT ONE (VP1)



VP1
33°31.642N
111°54.873W
1263ft





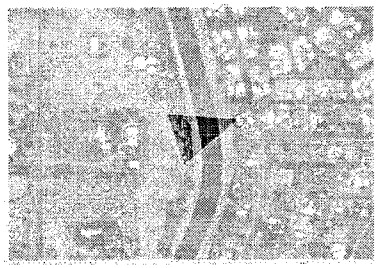
CONCEPTUAL VIEW OF OFFICE BUILDING WITHIN PROPOSED TANK ENVELOP

131

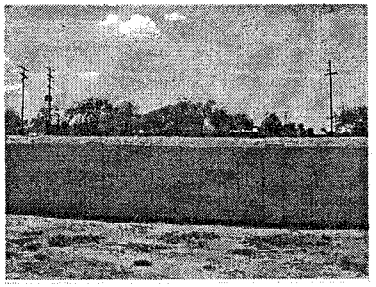
PROJ # 05029-az american H20 / litigation visuals
CLIENT: HRS International, GSK

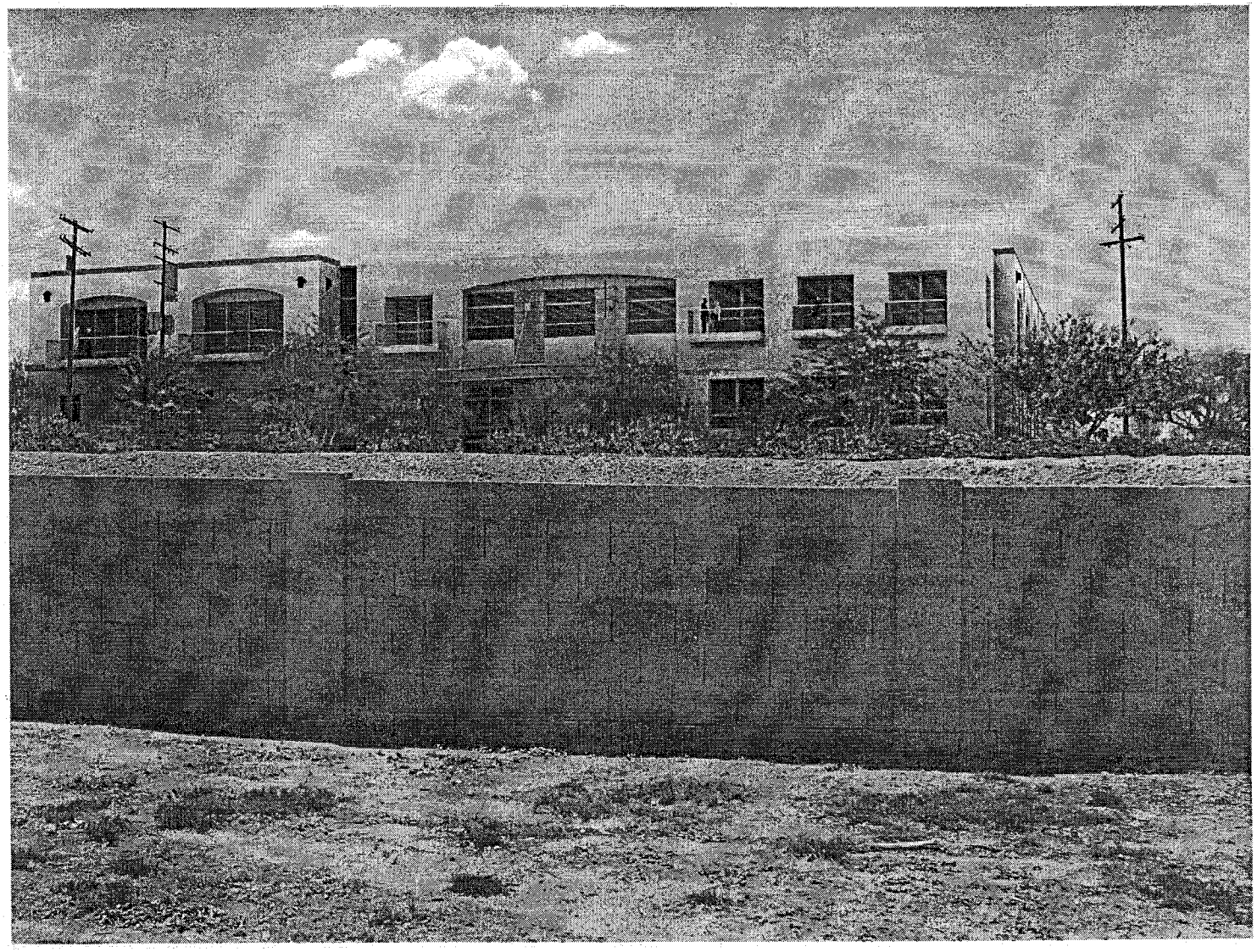
№ VP 1

VANTAGE POINT ONE (VP1)



VP1
33°31.642N
111°54.873W
1263ft





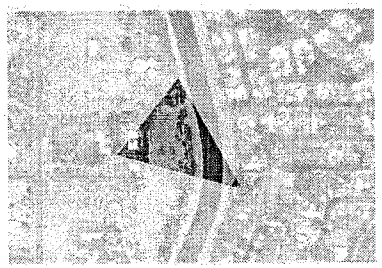
CONCEPTUAL VIEW OF OFFICE BUILDING WITH MINIMAL SETBACK REQUIREMENT

132

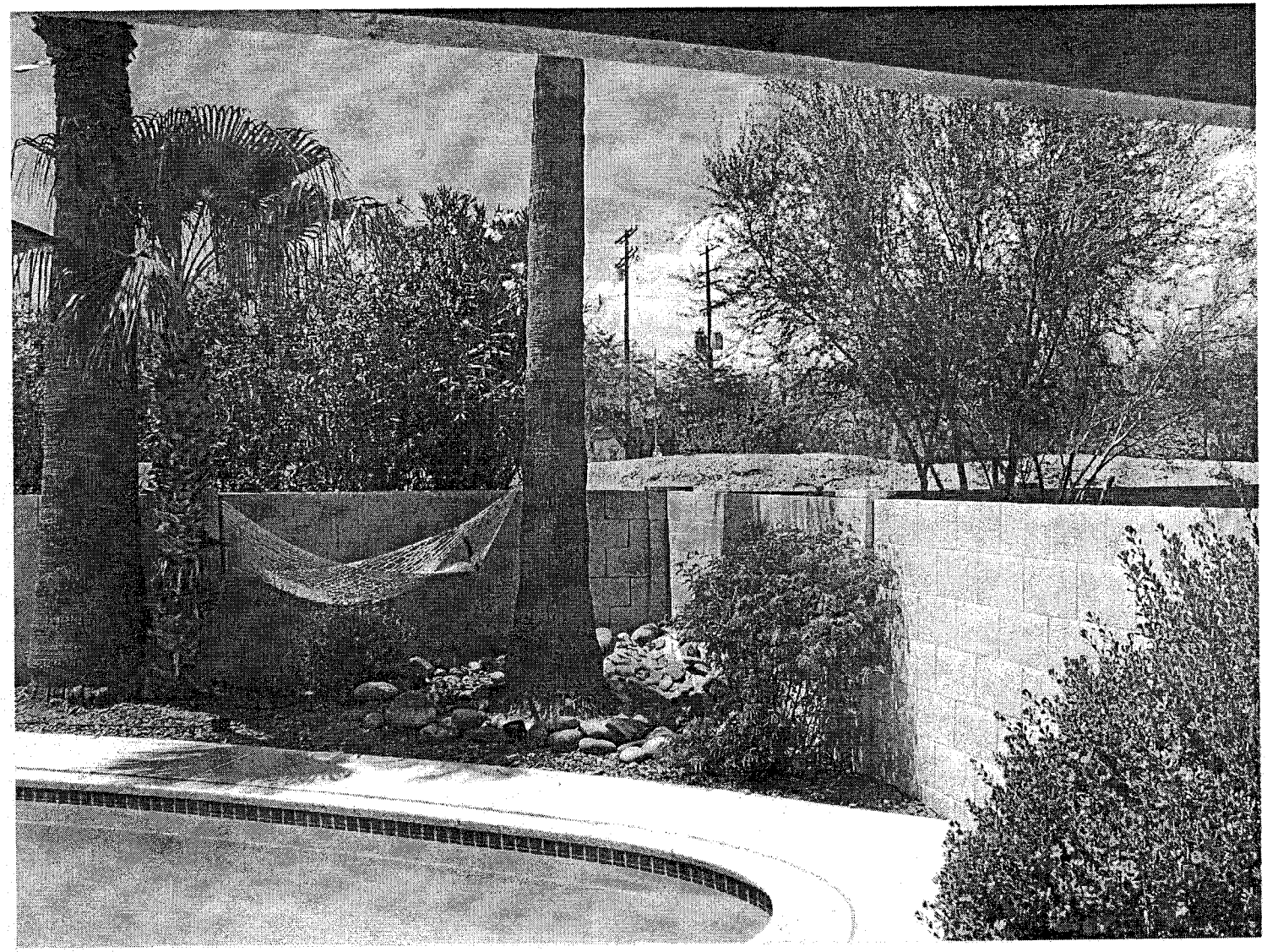
PROJ # 050294 arrellian H2O / Irrigation stands
[illegible] H&S Interpretive, GSK

№ VP 2

VANTAGE POINT TWO (VP2)



VP2
33°31.598N
111°54.878W
1276ft



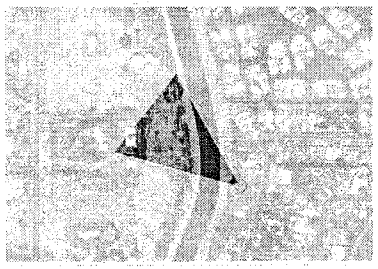
EXISTING VIEW

133

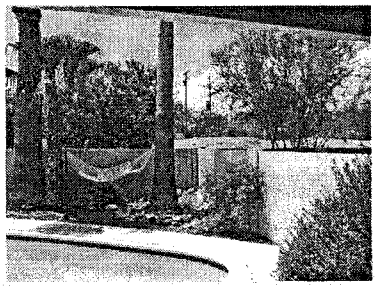
PROJ # 06029-az american H2O / litigation visuals
Client: H&S International, S&K

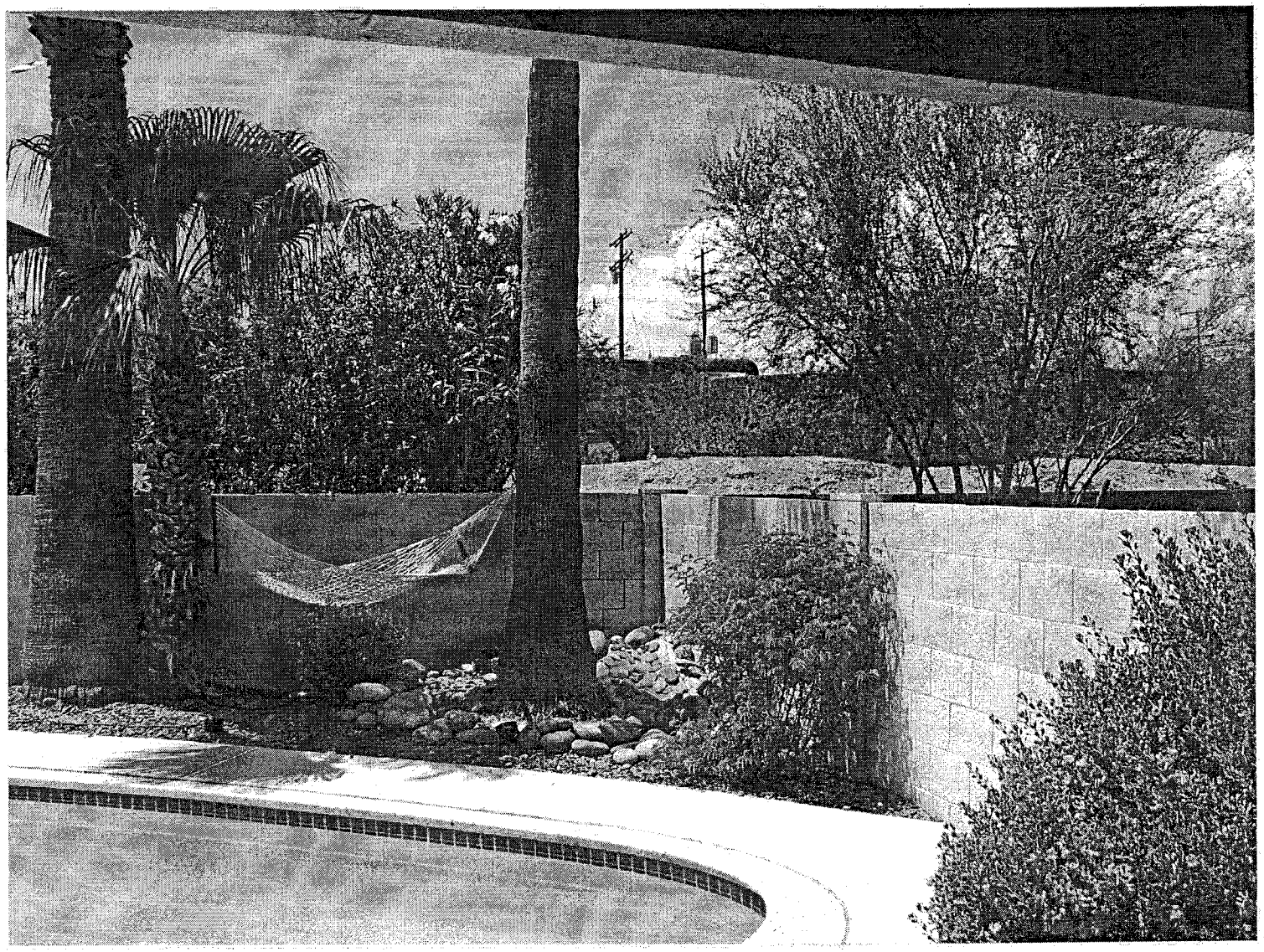
№ VP 2

VANTAGE POINT TWO (VP2)



VP2
33°31.598N
111°54.878W
1276ft



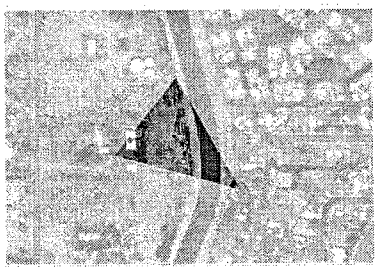


CONCEPTUAL VIEW OF PROPOSED TANKS

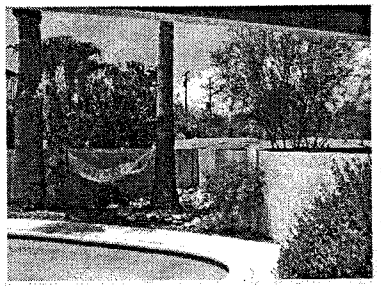
134

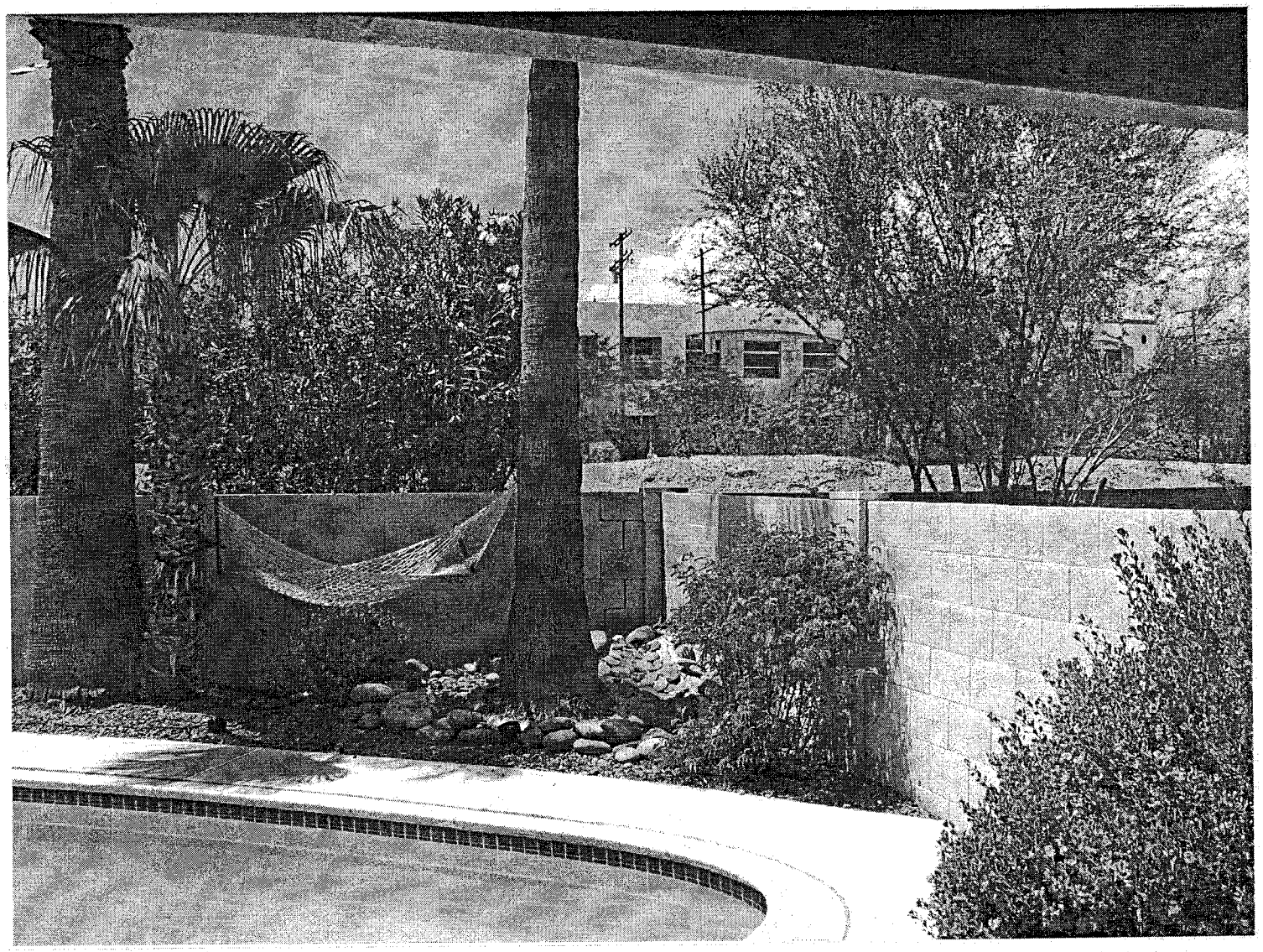
№ VP 2

VANTAGE POINT TWO (VP2)



VP2
33°31.598N
111°54.878W
1276ft



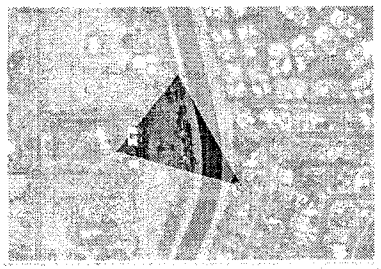


CONCEPTUAL VIEW OF OFFICE BUILDING WITHIN PROPOSED TANK ENVELOP

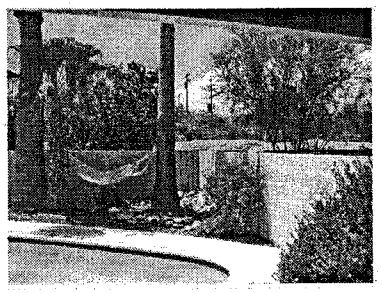
135

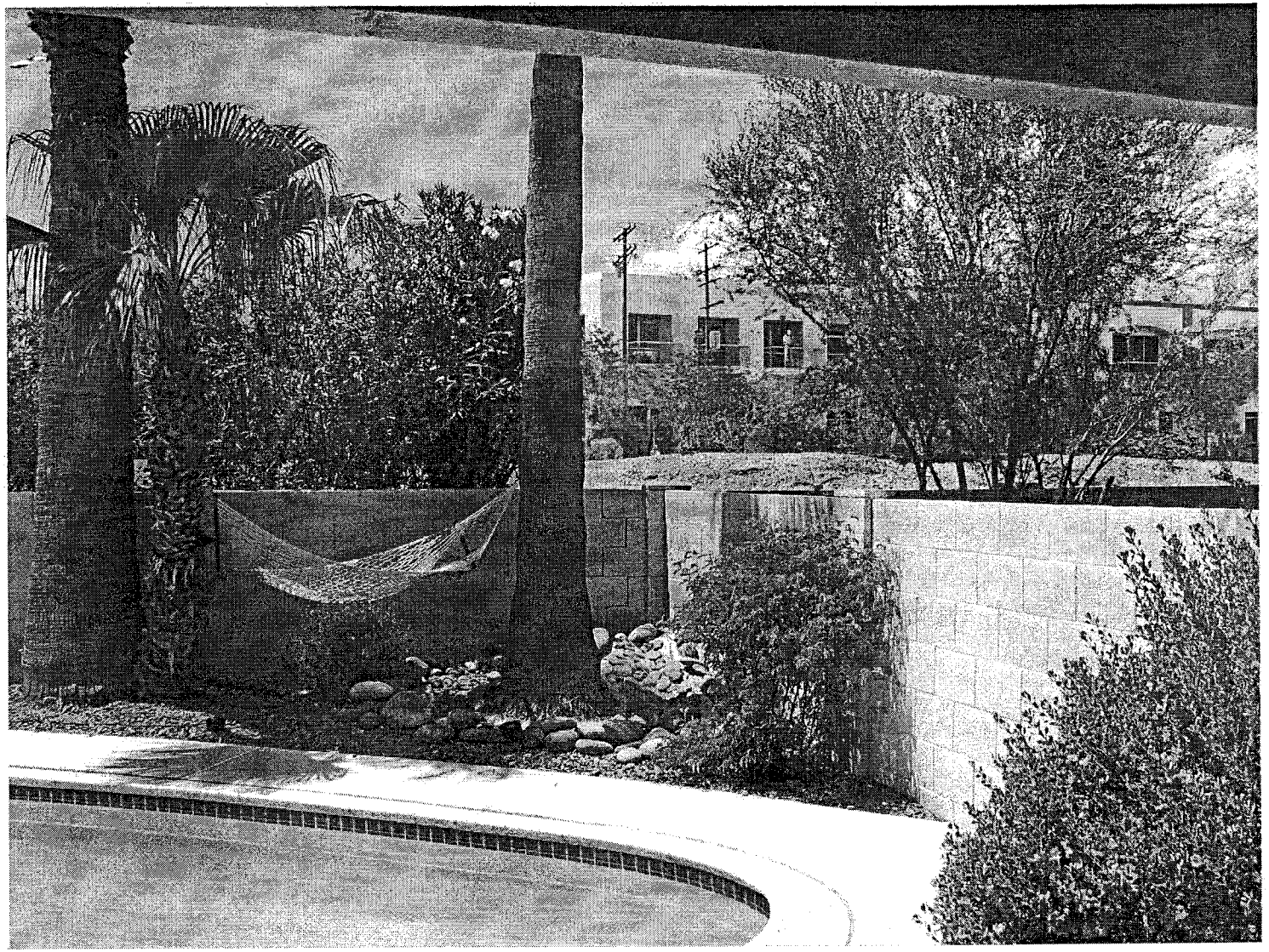
Nº VP 2

VANTAGE POINT TWO (VP2)



VP2
33°31.598N
111°54.878W
1276ft





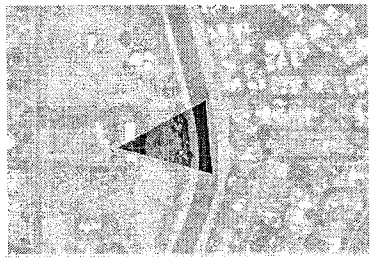
CONCEPTUAL VIEW OF OFFICE BUILDING WITH MINIMAL SETBACK REQUIREMENT

136

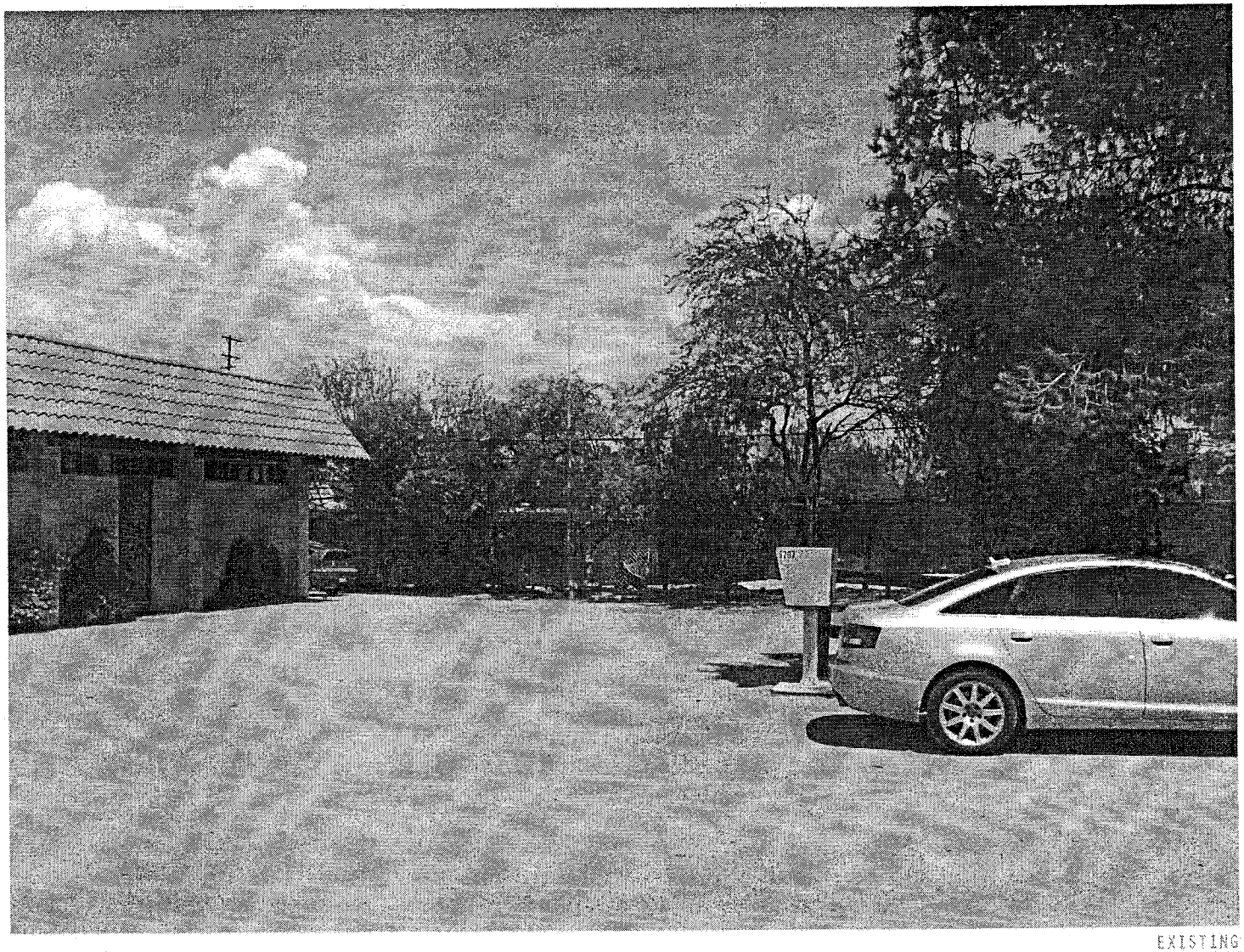
PROJ # 05029-az american H20 / litigation visuals
client: JMS international G&K

№ VP 3

VANTAGE POINT THREE (VP3)



VP3
33°31.619N
111°54.978W
1279ft



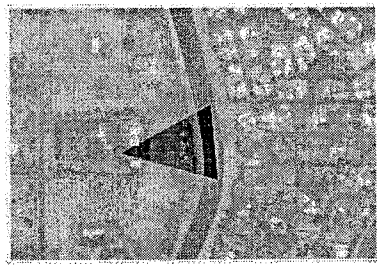
EXISTING

137

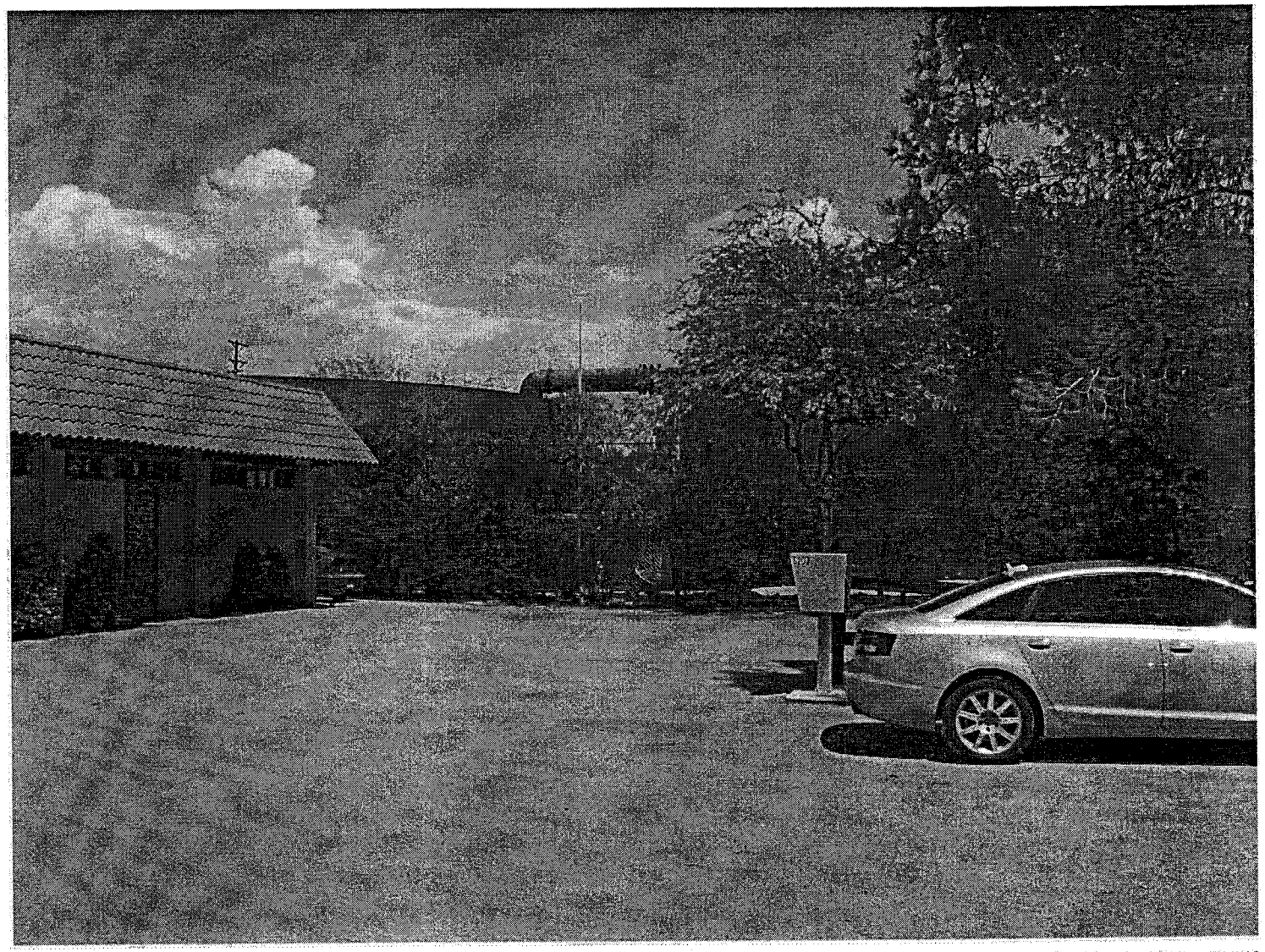
PROJ # 05029-az american H2O / litigation visuals
TEAM: H&S International, G&K

№ VP 3

VANTAGE POINT THREE (VP3)



VP3
33°31.619N
111°54.978W
1279ft

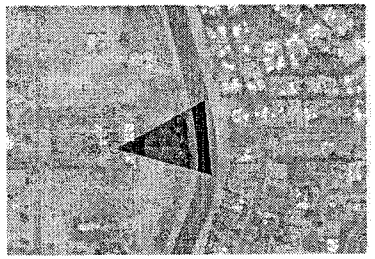


CONCEPTUAL VIEW OF PROPOSED TANKS

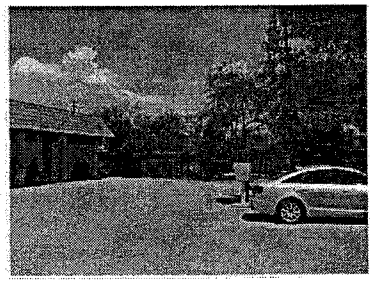
138

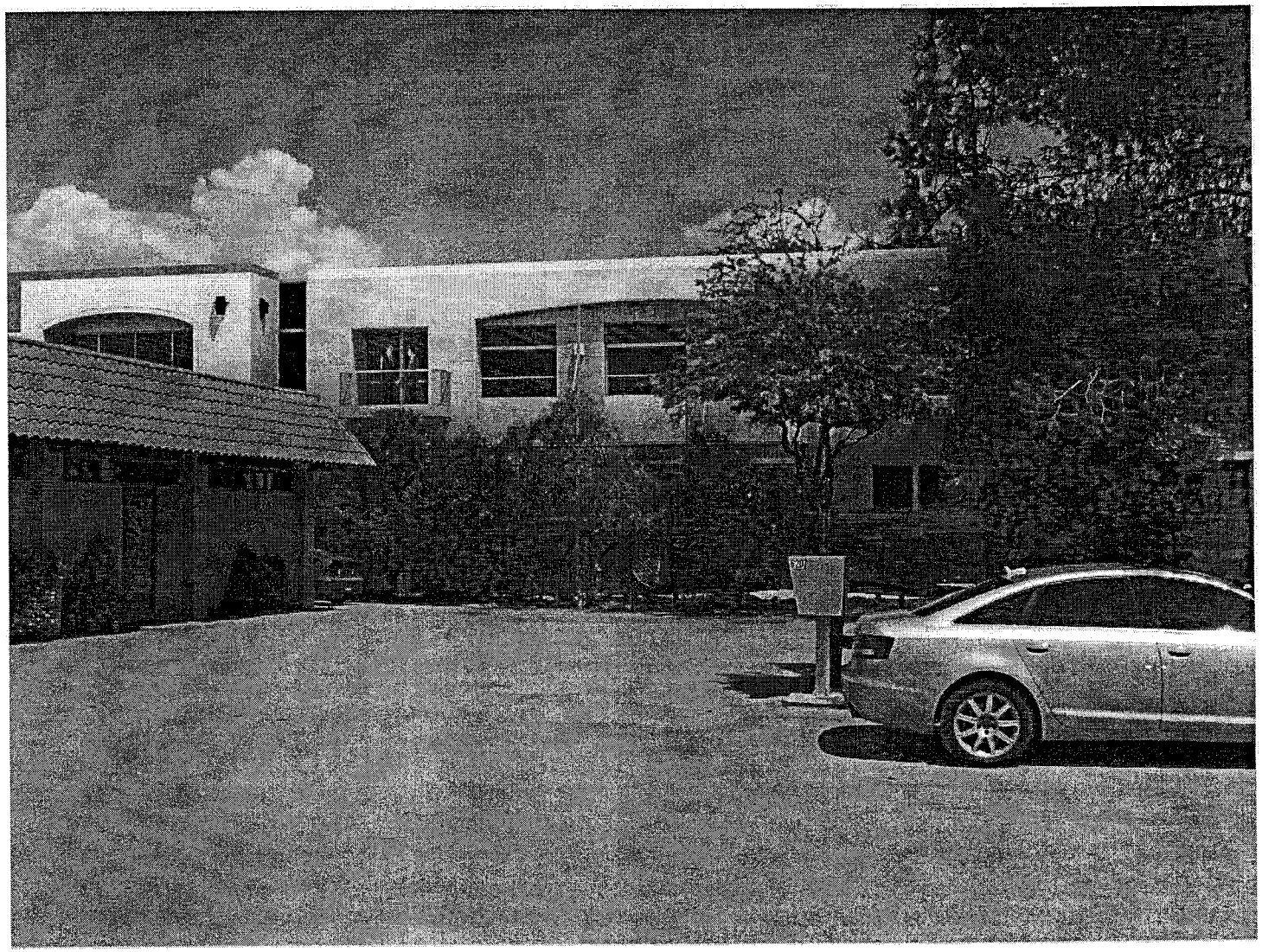
№ VP 3

VANTAGE POINT THREE (VP3)



VP3
33°31.619N
111°54.978W
1279ft



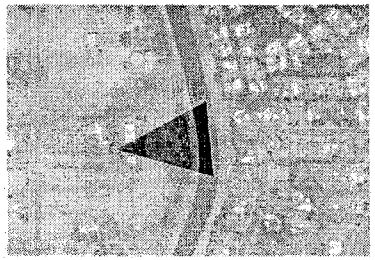


CONCEPTUAL VIEW OF OFFICE BUILDING WITHIN PROPOSED TANK ENVELOPE

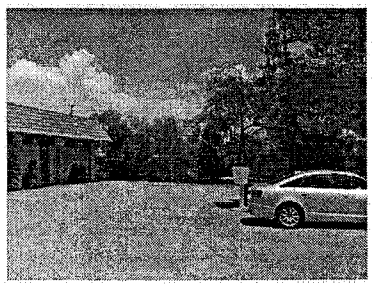
139

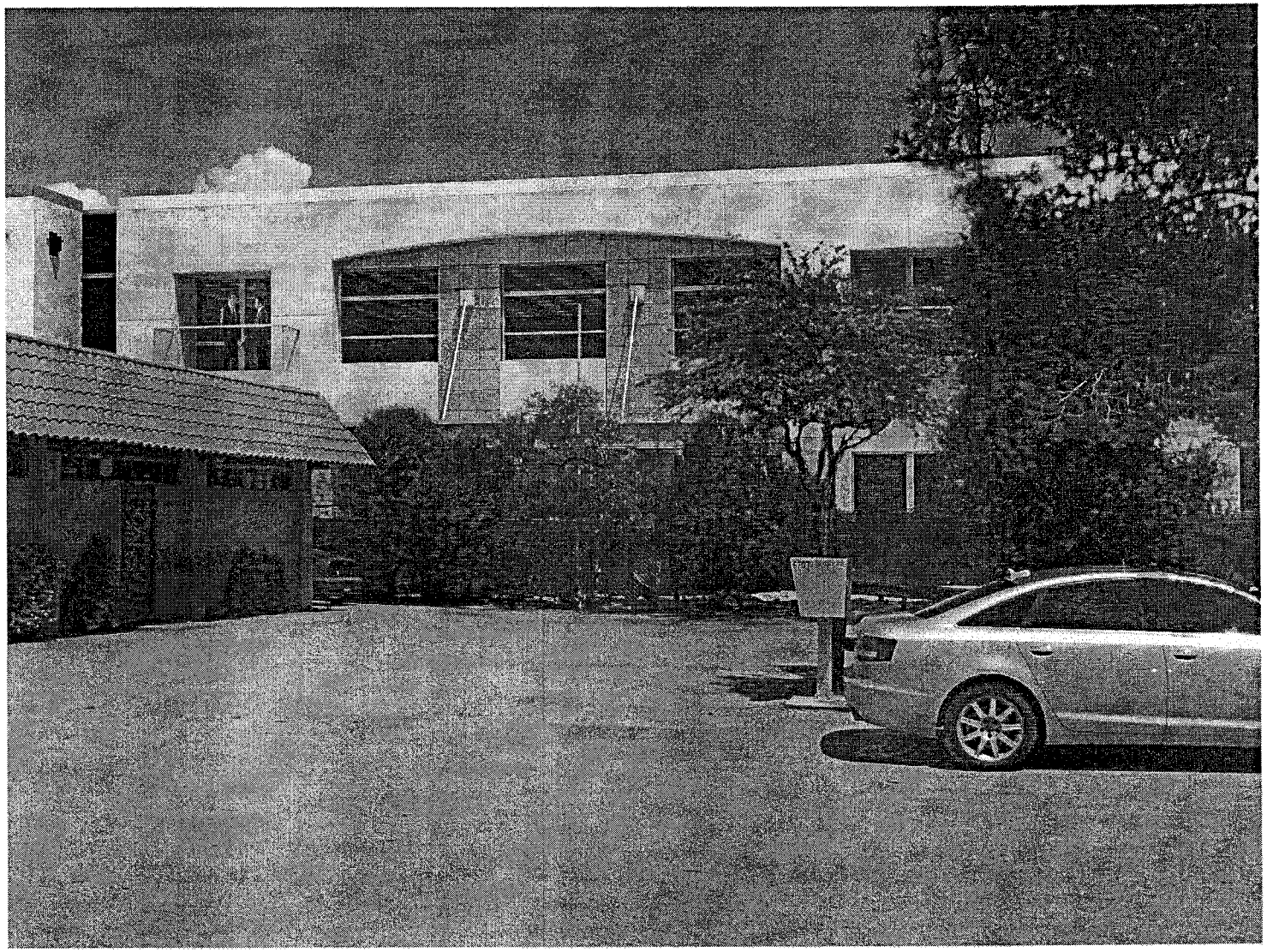
№ VP 3

VANTAGE POINT THREE (VP3)



VP3
33°31.619N
111°54.978W
1279ft





CONCEPTUAL VIEW OF OFFICE BUILDING WITH MINIMAL SETBACK REQUIREMENT

PART 2 OF 2

W-01303A-05-0405
W-01303A-05-0910

BAR CODE # 0000048817

To review Part 1 see:

BAR CODE #0000046181