NEW APPLICATION

0000012780

ORIGINAL

RECEIVED

2004 NOV 26 P 2: 19

AZ CORP COMMISSION
DOCUMENT CONTROL

Arizona Corporation Commission
DOCKETED
NOV 26 2004
DOCKETED BY [signature]

Richard L. Sallquist, Esq. (002677)
SALLQUIST & DRUMMOND, P.C.
4500 S. Lakeshore Drive, Suite 339
Tempe, Arizona 85282
Telephone: (480) 839-5202
Fax: (480) 345-0412
Attorneys for Valley Utilities Water Company, Inc.

BEFORE THE ARIZONA CORPORATION COMMISSION

IN THE MATTER OF THE APPLICATION OF VALLEY UTILITIES WATER COMPANY, INC. FOR AUTHORITY TO ISSUE PROMISSORY NOTE(S) AND OTHER EVIDENCES OF INDEBTEDNESS PAYABLE AT PERIODS OF MORE THAN TWELVE MONTHS AFTER THE DATE OF ISSUANCE.	DOCKET NO. W-01412A-04___ **APPLICATION** W-01412A-04-0849

Valley Utilities Water Company, Inc. ("Valley" or the "Company"), by and through undersigned counsel, respectfully states the following in support of this Application:

1. Valley is a corporation duly organized and existing under the laws of the State of Arizona. Its principal place of business is 12540 W. Bethany Home Rd., Litchfield Park, Arizona 85340.

2. Valley is a public service corporation primarily engaged in the business of providing water utility service in its certificated area in portions of Maricopa County, Arizona.

3. Valley seeks herein Commission approval for the issuance of promissory note(s) and other evidences of indebtedness in the original amount of up to $1,926,100.

4. Valley proposes to use the proceeds of the financing to purchase or construct certain plant and equipment necessary to treat and remove the arsenic from water produced by its existing wells. The details of the proposed construction projects are contained in the Narasimham Consulting Services, Inc.'s Arsenic Treatment Study, dated May 2004, attached hereto as **Attachment A** and are incorporated herein by this reference for all purposes.

93055.00000.138

5. The Company filed its application with Water Infrastructure Finance Authority of Arizona (WIFA) in the amount of $1,926,100 in the Fall of 2004, and the Company is on the WIFA 2005 Priority List. That loan will be utilized for the funding of the WIFA projects as described on **Attachment A**. The terms and conditions of that loan are expected to be a twenty year Promissory Note and Deed of Trust bearing an approximately 5.0% interest rate with monthly payments of $12, 711, and annual debt service of $152, 536. The Promissory Note and Deed of Trust are anticipated to be the standard WIFA documents and will be filed with the Commission upon issuance.

6. The Company has filed a permanent Rate Application, which increases will, among other things, support debt service for the WIFA loan as requested herein.

7. Additionally, the Company has filed an application for a Hook-Up Fee Tariff ("HUF"). All of the receipts from HUF's will be used to reduce the WIFA loan principal on the Arsenic Treatment System. It is estimated that approximately $550,000 will be recovered from the HUF's, which receipts are more fully set forth in **Attachment B** and incorporated herein by this reference for all purposes.

8. The Company will file a Motion to Consolidate and Rate Application with the Financing Application in a separate filing. The Company proposes to not consolidate the HUF Tariff Application with these matters, but to let the Tariff go into effect pursuant to A.R.S. § 40-367. This will permit the Company to collect the HUF's from the customer additions during the twelve-month pendency of the Rate Application.

9. Attached as **Attachment C** and incorporated herein by reference for all purposes are Valley's compiled financial statements as of December 31, 2003.

10. Attached hereto as **Attachment D**, and incorporated herein by this reference for all purposes, is a proforma capital structure before and after the financing.

11. Attached as **Attachment E** and incorporated herein for all purposes is a form of the Resolution of the Valley's Board of Directors authorizing this application and the issuance of the Promissory Note(s) and the evidences of indebtedness.

12. Valley will provide notice of the filing of this Application in conformity with A.R.S. § 40-302 in the form attached as **Attachment F** and incorporated herein by this reference, which exhibit contains the form of the Notice of Publication to be filed with the Commission, or in such other form as ordered by the Commission.

13. In Valley's opinion the purpose to which proceeds of the issuance of the Promissory Note(s) and evidences of indebtedness will be applied as set forth above are lawful, and within its powers and are compatible with the public interest, with sound financial practices, and with the proper performance of the Company of service as a public service corporation and will not impair its ability to perform that service. The Company is further of the opinion that the issuance of the Promissory Note(s) and evidences of indebtedness as herein contemplated are reasonably necessary or appropriate for the aforementioned purposes. To the extent that such purposes may be considered reasonably chargeable to operating expenses or to income, the Company requests that they be permitted by the Commission in the order sought hereby.

WHEREFORE, Valley requests that the Commission make such inquiry or investigation that the Commission may deem necessary and appropriate; make the findings required by A.R.S. § 40-301 and § 40-302 relative to the purposes of issuing the Promissory Note(s) and evidences of indebtedness as herein stated; and thereafter make an immediately effective order (i) authorizing the Company to issue the Promissory Note(s) and entry into the proposed evidences of indebtedness, in the same manner and for the purposes herein contemplated, (ii) stating that the issuance of the Promissory Note(s) and evidences of indebtedness are reasonably necessary or appropriate for the purposes set forth above, (iii) stating that such purposes are within those permitted by A.R.S. § 40-301, and (iv) approving such purposes to the extent that they may be considered reasonably chargeable to operating expenses or income.

Respectfully submitted this 24th day of November , 2004.

SALLQUIST & DRUMMOND, P.C.

By_______________________
Richard L. Sallquist
4500 S. Lakeshore Drive, Suite 339
Tempe, Arizona 85282
Attorneys for Valley Utilities Water Company, Inc.

Original and ten copies of the
foregoing filed this 24th day
of November, 2004, with

Docket Control
Arizona Corporation Commission
1200 West Washington
Phoenix, Arizona 85007

93055.00000.138

Copies of the foregoing Hand Delivered this 29th day of November, 2004 to:

Hearing Division
Arizona Corporation Commission
1200 West Washington
Phoenix, Arizona 85007

Legal Division
Arizona Corporation Commission
1200 West Washington
Phoenix, Arizona 85007

Utilities Division
Arizona Corporation Commission
1200 West Washington
Phoenix, Arizona 85007

93055.00000.138

LIST OF EXHIBITS

ATTACHMENT	DESCRIPTION
A	FINANCING DETAILS
B	HUF COMPUTATION
C	FINANCIAL STATEMENTS
D	PRO FORMA CAPITAL STRUCTURE
E	BOARD OF DIRECTORS RESOLUTION
F	NOTICE OF PUBLICATION

VALLEY UTILITIES WATER COMPANY INC.

WATER INFRASTRUCTURE FINANCE AUTHORITY OF ARIZONA

WIFA

Water Infrastructure Finance Authority of Arizona

ARSENIC TREATMENT STUDY

FINAL REPORT

WIFA TASK ASSIGNMENT
TA DW 023-2003

May 2004

NCS

Narasimhan Consulting Services, Inc.
3150 N. 24th Street, Suite D-104
Phoenix, AZ 85016
(602) 629-0206

ATTACHMENT A

TABLE OF CONTENTS

Section No. & Title — Page #

1.0 BACKGROUND ... 1
1.1 Report Organization ... 1
1.2 Definitions of Terms Used in Treatment Processes ... 1

2.0 OBJECTIVES ... 2

3.0 GROUNDWATER QUALITY ... 2
3.1 Impact of Other Parameters ... 2
3.2 Valley Utilities Wells ... 3

4.0 TECHNOLOGY ASSESSMENT ... 4
4.1 Adsorption ... 4
4.1.1 Adsorption using Granular Iron Based Media ... 5
4.1.2 Iron modified Activated Alumina Adsorption Media ... 6
4.2 Partial Stream Treatment ... 6

5.0 SITE SPECIFIC IMPLEMENTATION ... 7

6.0 PILOT TEST RESULTS ... 8

7.0 PILOT TESTING CONCLUSIONS AND ANTICIPATED PROCESS PERFORMANCE ... 10

8.0 IMPLEMENTATION STRATEGY ... 11
8.1 Treatment Options ... 11
8.2 Non-Treatment (Blending) Option ... 17

9.0 RECOMMENDED ALTERNATIVE ... 18
9.1 Site Criteria and Piping ... 18
9.2 Pumping Requirements ... 19
9.3 Sanitary Sewer Connection ... 19

10.0 SUMMARY AND RECOMMENDATIONS ... 19

LIST OF TABLES

Table #	Title	Page #
1	Valley Utilities Wells Water Quality	3
2	Ground Water Quality During Pilot Testing	8
3	Design Criteria for Single Vessel Full Flow Arsenic Adsorption Facility for Valley Utilities Wells	12
4	Full Flow Single Vessel GIM Treatment Costs for Valley Utilities Wells	13
5	Design Criteria for Dual Vessel Partial Flow Arsenic Adsorption Facility for Valley Utilities Wells	15
6	Dual Vessel Partial Flow GIM Treatment Costs for Valley Utilities Wells	16
7	Design Criteria for Dual Vessel Partial Flow (with Two Parallel Trains) Arsenic Adsorption Facility for Valley Utilities Wells	17
8	Comparison of Valley Utilities Wells Arsenic Treatment Costs	18

LIST OF FIGURES

Figure No.	Title	Page #
1	Schematic of a Single Vessel GIM Treatment System	After Page 5
2	Schematic of a Dual Vessel GIM Treatment System	After Page 5
3	Arsenic Breakthrough in GFH Media	After Page 9
4	Fluoride Removal in GFH Media	After Page 9
5	Silica Removal in GFH Media	After Page 9
6	Iron Release in GFH Media	After Page 10
7	Layout of a Dual Vessel Facility at Reservoir Site	After Page 18

ARSENIC TREATMENT STUDY

Valley Utilities Water Company
WIFA TA DW 023-2003

1.0 BACKGROUND

The Valley Utilities currently depends solely on groundwater sources for its potable water needs. Based on the historical analytical data, three Valley Utilities wells contain elevated levels of arsenic. Valley Utilities has identified that Wells 4, 5 and 6 will likely require arsenic treatment to comply with the new arsenic MCL. Wells 4 and 5 constitute POE 002 and Well 6 constitutes POE 003. Currently, Wells 4 and 5 feed the onsite reservoir (Reservoir No. 1) and Well 6 feeds the reservoir (Reservoir No. 2) located at the northwest intersection of El Mirage Rd. and Maryland Ave. (approximately 0.5 miles southeast of the well site). All three wells are located at the Reservoir No.1 site. Valley Utilities is planning on constructing another reservoir in the service area.

1.1 Report Organization

This report includes an overview of the treatment technologies under consideration, pilot testing results and treatment recommendations. A detailed discussion of existing water quality is also presented. Section 8.0 of the report presents the implementation options for the Valley wells along with the recommended strategy. Preliminary facility layouts and design criteria are also presented.

1.2 Definitions of Terms Used in Treatment Processes

Adsorbate: The molecule or contaminant (arsenic, nitrate) that accumulates, or adsorbs, at the interface (solid and liquid or solid and gas) during adsorption processes is called the adsorbate.

Adsorbent: The solid on which adsorption occurs is called the adsorbent (adsorption media or IX).

Bed Volume (BV): The volume of media in an adsorption vessel (expressed as ft^3 or gallons).

Breakthrough: Breakthrough is the appearance of an unwanted contaminant at an unacceptable concentration in the effluent. The breakthrough for arsenic is defined at 8 ppb (80% of MCL) or some other target levels.

Backwash: Backwash is the process in which a countercurrent flow to fluidize the bed is passed through the media in order to remove accumulated particles (inert solids) from the media and to achieve bed expansion. During this process, the contaminants adsorbed on the media are not removed (as with regeneration).

Empty Bed Contact Time (EBCT): EBCT is the theoretical time the water is in contact with the adsorption media (computed as the BV divided by the flow rate through a vessel).

Exhaustion: Exhaustion is the depletion of the adsorptive capacity of the media in the service mode.

Run Length: Run length is the number of BVs of water treated to reach exhaustion, or a specified treatment objective.

2.0 OBJECTIVES

The specific objectives of the study were:

1. To perform a water quality and treatment evaluation of the Valley Utilities wells.
2. To design and conduct a pilot study to evaluate the most feasible treatment alternative available for arsenic removal.
3. To evaluate the results of the pilot study.
4. To identify implementation options, establish facility design criteria, and treatment costs for the most effective technology.

3.0 GROUNDWATER QUALITY

3.1 Impact of Other Parameters

This section provides an overview of the co-occurring constituents that impact arsenic removal and the levels at which these contaminants are of concern, particularly for adsorption processes. A summary of these key parameters is presented below:

- Silica is the most significant competing anion that interferes with arsenic removal in an arsenic removal system that utilizes adsorption. Silica (SiO_2), at levels above 30 mg/L, can cause an impact on adsorption processes.
- Trace levels of phosphorus (0.1-0.2 mg/L), reported as total phosphorus, can significantly impact adsorption using granular iron media. If phosphorus levels are greater than 0.2 mg/L, granular iron media will not be an acceptable treatment technology.
- Fluoride significantly impacts arsenic removal in iron modified activated alumina adsorption systems as it competes for the adsorption sites along with arsenic. Fluoride levels greater than 1.3 mg/L can impact arsenic adsorption systems.
- Alkalinity and pH can impact chemical feed parameters for technologies requiring pH adjustment. As pH levels rise above 8.0, the media loses its positive charge and more silicate ions are present, both significantly reducing adsorption capacity.
- Constituents such as chlorides, sulfates, and bicarbonates may not individually pose any significant impact to adsorption systems. However, when present in high concentrations (TDS >750 mg/L), they may be sorbed to the arsenic removal media due to the principles of mass action.
- High levels of iron (>0.5 mg/L) and manganese (>0.05 mg/L) may plug and foul the adsorption systems, particularly if sufficient oxidation occurs before the treatment system.
- Based on the observations from recent pilot studies, vanadium, if present in concentrations similar to arsenic in source water, may cause a reduction in the adsorption capacity.

3.2 Valley Utilities Wells

Historical water quality data (1988-to-date), with four data points, was provided by Valley Utility personnel. The statistical distribution of constituent levels was calculated and is presented below in Table 1.

Table 1: Valley Utilities Wells Water Quality

Constituent	Units	Concentration	No of samples
pH	-	7.8	3
Arsenic	ppb	14	4
TDS	mg/L	273	3
Alkalinity	mg/L	125	3
Fluoride	mg/L	1.1	3
Nitrate	mg/L	2.9	4
Calcium	mg/L	25	3
Chloride	mg/L	42	4
Hardness	mg/L	94	4
Iron	mg/L	0.10	3
Magnesium	mg/L	10	3
Manganese	mg/L	0.018	3
Sodium	mg/L	59	3
Sulfate	mg/L	44	3
Chromium	mg/L	0.015	2
Silica as SiO_2	mg/L	26	3

Note: Maximum concentrations reported for arsenic, nitrate, and chromium; average concentrations reported for other parameters

It is noted that the water quality data shown in Table 1 represents the blended water for the Wells 4, 5 and 6. The water quality in Wells 4, 5 and 6 is similar as they belong to the same aquifer. No significant variation in water quality exists except for pH. Based on four data points, the pH values in the well water ranged from 7.5 to 8.1 with an average of 7.8. The arsenic levels in the well water ranged from 12-14 ppb. In general, the groundwater is low in TDS (average 273 mg/L), hardness (94 mg/L), alkalinity (125 mg/L) and nitrate (2.9 mg/L). The average of three silica (as SiO_2) samples was 26 mg/L. No other significant interfering contaminants such as phosphate, chloride, or TDS are present at levels of concern and favorable water quality conditions for arsenic removal are anticipated. Historical data was not available for vanadium; therefore, vanadium levels in the well water were closely monitored during the pilot study. It was found that the vanadium levels were consistently below 10 ppb, not considered to be an impact on arsenic treatment.

Historically, there have been seasonal variations in the flow rates from the wells operated by the Valley Utilities. Typically, the well production is higher during the summer than in winter. Based on a conversation with Valley Utilities personnel, the range of flows for Wells No.4, 5 and 6 are 110-400 gpm, 300-500 gpm, and 350-600 gpm, respectively. The maximum combined flow from the three wells can be 1500 gpm (during peak demand scenarios). Therefore, the treatment system would be designed to treat 1500 gpm of total well flow.

4.0 TECHNOLOGY ASSESSMENT

Arsenic removal technologies under consideration include various adsorption media such as alumina, iron composite, and other metallic sorbents. A description of each treatment technology is included in the following sections. All of these technologies may be considered by Valley Utilities, though there are some significant differences in operational criteria such as the level of chemicals used, amount of flexibility provided for future changes in technology, waste streams that are generated, and simplicity of operation. Discussions regarding these operational issues are also presented in the following sections.

4.1 Adsorption

Adsorption refers to the accumulation of material at the interface between two phases (water and solid media). As water containing ionized arsenic passes through an adsorption column, arsenic sorbs to the solid media due to surface attractive forces. Adsorption media for arsenic removal are activated alumina and granular iron media. During adsorption, water is passed continuously through a column containing adsorption media. Over a period of time, the capacity of the adsorption media is exhausted, and it needs to be regenerated or replaced. Since media regeneration is tedious and generates hazardous wastes, regenerating adsorption media is not recommended. The alternative option is throw-away adsorption media, which eliminates the complexities associated with regeneration. The throw away media needs to be disposed of properly and should not leach arsenic beyond its regulatory limits.

Several types of adsorbents are either commercially available or are in research and development stages for potential arsenic removal. Established adsorption media include activated alumina, iron modified activated alumina (Fe-AA), granular iron media (GIM), and other composites using zinc, copper, and titanium. Of these products GIM and Fe-AA are the most proven, established, and commercially available. GIM has the added advantage of performing well at higher pH levels (7-8) and is a viable process without the use of pH reduction chemicals. It is anticipated that in coming years other media will become available with similar properties, but for the purposes of this evaluation, GIM will be used as the baseline adsorption technology. Based on experience, a system that is designed for GIM can be replaced with an alternate, more effective, media in the future without any major physical modifications. One significant advantage of the adsorption process is its flexibility (ability to accommodate more cost-effective adsorbents in the future).

4.1.1 Adsorption using Granular Iron Based Media

GIM such as granular ferric hydroxide (GFH) or Bayoxide E-33 are effective in removing arsenic utilizing a fixed bed adsorption process. Recent tests conducted in the Valley have shown that the adsorptive capacity of granular iron media is several magnitudes greater than the alumina based sorbents.

Results from pilot scale studies indicated that an EBCT of 2.5 minutes is required for effective arsenic removal. Previous testing conducted in Phoenix, Arizona on an influent with 10 ppb arsenic showed that with an EBCT of 2.5 minutes and without pH adjustment (ambient pH of 7.9), GFH treated approximately 89,000 BVs (155 continuous operational days) of water before arsenic breakthrough occurred (NCS, 2000). Similar tests conducted at Metro Water, Tucson, AZ on an influent with 11 ppb arsenic showed that with an EBCT of 2.5 minutes and no pH adjustment (ambient pH of 6.9), GFH treated > 45,000 BVs (78 continuous operational days) of water before arsenic breakthrough occurred (NCS, 2001). A full-scale GFH facility that treats 1.5 mgd of groundwater with 17 ppb arsenic and a pH of 7.7 (Well 280) was put into operation in June 2003 in the City of Phoenix. Other full scale facilities are planned in Phoenix, Scottsdale, and El Paso, Texas, using a similar design and media.

Phosphorus levels >0.2 mg/L and pH levels >8.0 can significantly impact the performance of iron based media. Silica also impacts performance, but not as significantly as it does for alumina based sorbents. The media can be used on a throw-away basis and hazardous wastes are not generated.

Various GIM treatment configuration options using a single vessel or two vessels in series are possible based on water quality, feasibility of partial stream treatment, and the level of redundancy required. These treatment configuration options are shown below.

1. For wells with influent arsenic levels ≥18 ppb and pH <8.0, single pass GIM treatment without pH adjustment with full-flow treatment is recommended. The column(s) are operated to 8-10 ppb arsenic breakthrough before the media is replaced. The schematic of a single pass GIM treatment system without pH adjustment is shown in Figure 1.

2. For wells with influent arsenic levels <18 ppb and pH ≤8.0, two vessels in a series GIM system without pH adjustment with partial stream treatment is recommended. The lead (first) column is operated to a breakthrough of 9-10 ppb at which time the effluent arsenic concentration is 3 ppb in the lag (second) column. The media in the lead column is then replaced. All of the water that needs to be treated is passed through the second column when the media is being replaced in the lead column. After media replacement, the lag column will become the lead column and vice versa. The schematic of a two vessel GIM treatment system without pH adjustment is shown in Figure 2. Based on pilot tests conducted at the Valley Utilities reservoir site, a two vessel system with 15 ppb influent arsenic would treat 180,000 BVs before media replacement (312 days of operation).

Figure 1: Schematic of a Single Vessel GIM Treatment System

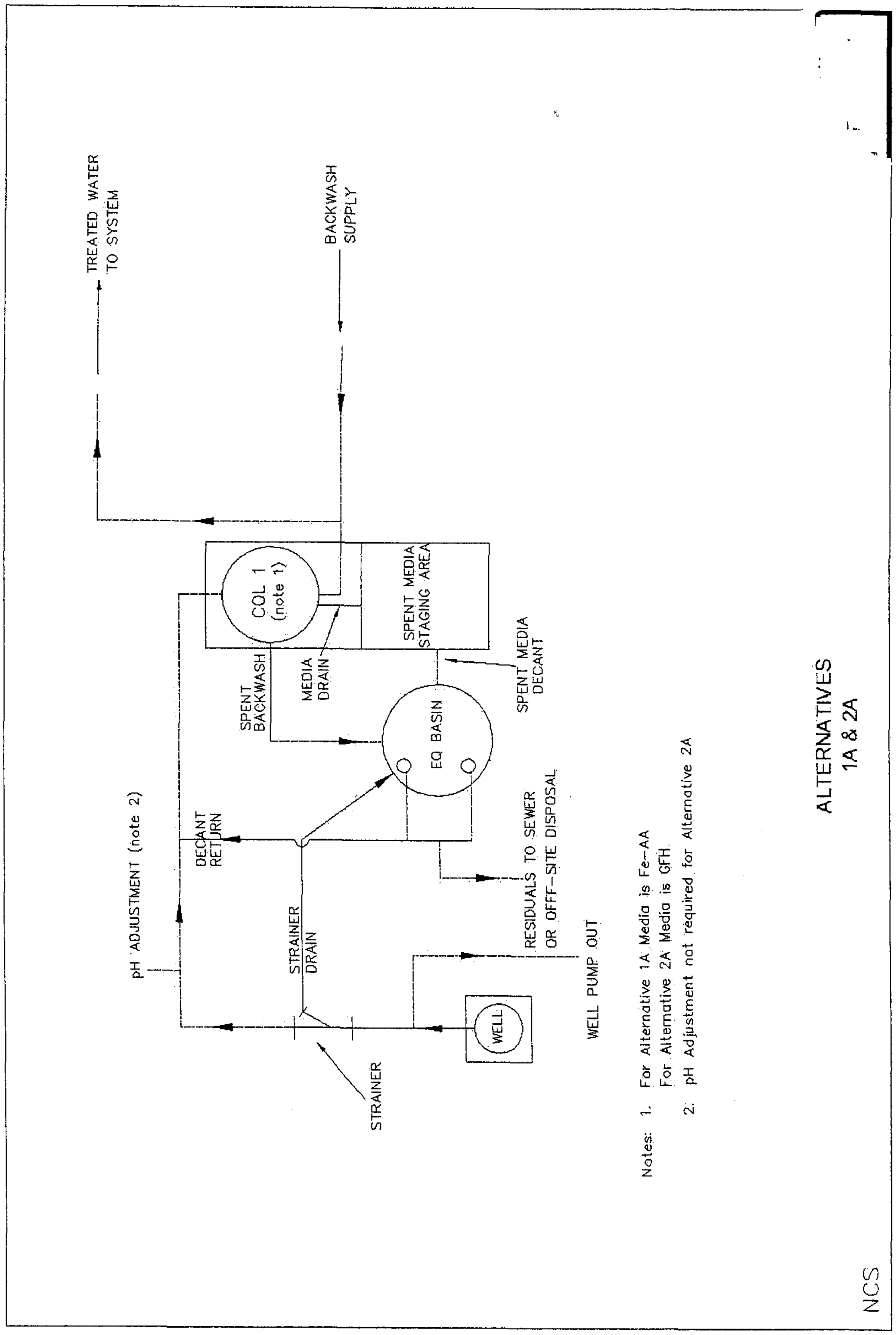
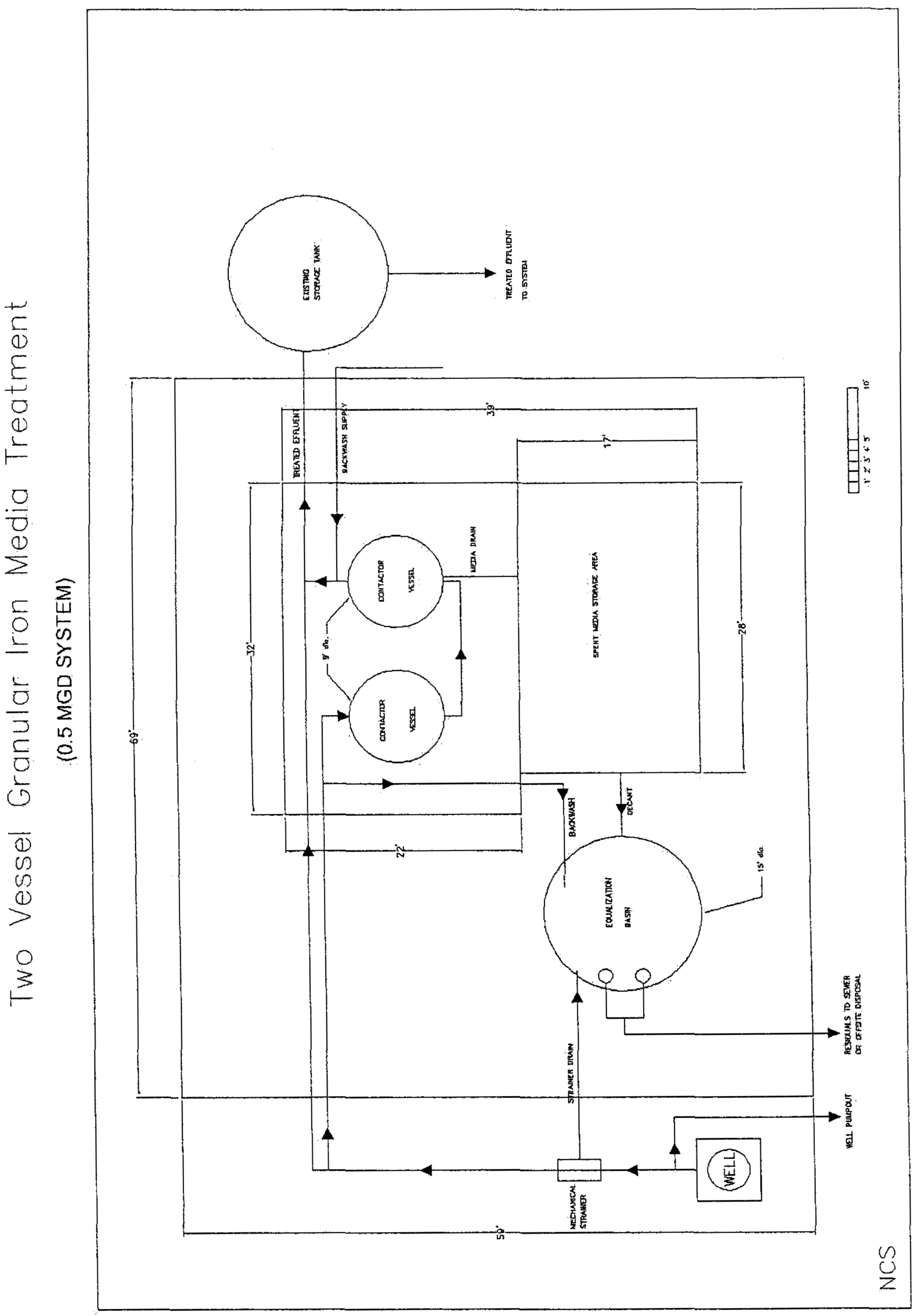


Figure 2: Schematic of a Dual Vessel GIM Treatment System



4.1.2 Iron modified Activated Alumina Adsorption Media

Iron-enhanced activated alumina (Fe-AA) media has run lengths significantly greater than those for conventional AA. pH adjustment to approximately 6.8 is necessary. Field scale tests have shown that effective removal rates and long column run lengths can be achieved in local groundwater supplies, as discussed below.

Previous testing conducted in Phoenix, Arizona on an influent with 14 ppb arsenic demonstrated that with an EBCT of 5 minutes and with pH adjustment to less than 7.0, Fe-AA treated approximately 18,500 BVs (64 continuous days of operation) of water before arsenic breakthrough occurred (NCS, 2000). Similar tests conducted at Metro Water, Tucson, AZ on an influent with 23 ppb arsenic showed that with an EBCT of 5.0 minutes and without pH adjustment (ambient pH of 6.9), Fe-AA treated approximately 26,000 BVs (90 continuous days of operation) of water treatment before arsenic breakthrough occurred (NCS, 2001). Lower silica levels were present at the Tucson site, which resulted in longer filter runs.

Fe-AA can also be used on a throw-away basis once the adsorptive capacity is exhausted. The media would be replaced periodically. Residuals handling for throw-away Fe-AA requires a small concrete staging area to stockpile the media prior to its landfill disposal.

Various Fe-AA treatment configuration options using a single vessel or two vessels in series are possible, similar to the GIM systems discussed above.

4.2 Partial Stream Treatment

The concept of partial stream treatment can be used to meet the target treated water arsenic value of 8 ppb. This can save costs in comparison to treating the whole flow, particularly when the well water arsenic level is only slightly above the current MCL. Under this scenario, a portion of the flow is treated while the remaining flow is bypassed and blended back with the treated flow. This is generally economical up to a partial treatment flow equal to approximately 75% of the total well capacity. After this point, the costs of media consumption, controls, piping, meters, and control valves will offset the reduced costs of partial treatment. A sample calculation to determine treated water flow based on well water arsenic concentration is presented below for a well with an influent arsenic level of 15 ppb and a flow of 1 MGD (the target arsenic level after partial stream treatment and blending would be 8 ppb).

$$\text{Treatment Plant Flow (mgd)} = \frac{(As_{well} \times Q_{well} - Q_{well} \times As_{POE})}{As_{well} - As_{effluent}} \qquad \text{(Equation 1)}$$

$$= \frac{(15 \times 1 - 1 \times 8)}{15 - 3}$$

$$= 0.58 \text{ MGD}$$

Where:

Treatment Plant Flow (MGD) = size of the partial stream arsenic treatment facility

As_{well}	=	arsenic level in well to be treated (ppb)
Q_{well}	=	well flow rate (MGD)
As_{POE}	=	target arsenic level at point of entry in blended effluent (generally 80% of MCL)
$As_{effluent}$	=	effluent arsenic level in WTP (3 ppb - this is for this example only)

The advantages of partial stream treatment include lower pressure ratings for the treatment system, lower treatment costs, smaller facilities, and reduced O&M costs. Partial stream treatment can be used for any type of adsorption media. Depending on the groundwater arsenic level, a portion of the flow is treated in the series configuration. Partial stream treatment may be considered for GIM processes using a target arsenic level in treated water of 3 ppb. For CF technology, partial stream treatment can be considered using a treated water effluent level of 5 ppb.

5.0 SITE SPECIFIC IMPLEMENTATION

In general, adsorption processes are more economical for treatment systems less than 2 MGD with moderate arsenic concentrations (arsenic < 18 ppb), particularly where pH adjustment is not required. Also, a partial flow treatment concept is applicable to wells with arsenic levels less than 18 ppb. Based on this premise, the following mitigation strategies were evaluated for the Valley Utilities wells:

A. Treatment Options

1. Single vessel full flow adsorption treatment for the arsenic-impacted Valley Utilities wells (Well No. 4, 5 and 6). The combined facility would be located at Reservoir No. 1. Existing pipelines would be utilized to deliver flows from the treatment facility to Reservoir No. 1 and 2.
2. Dual vessel partial flow adsorption treatment for the arsenic-impacted Valley Utilities Wells (Well No. 4, 5 and 6). The combined facility would be located at Reservoir No. 1. Existing pipelines would be utilized to deliver flows from the treatment facility to Reservoir No. 1 and 2.

B. Non-Treatment (Blending) Option

1. Blend with water from the Airline Well Field owned by the Litchfield Park Service Company (LPSCO) at their new reservoir to be located 0.5 miles east of the Valley Utilities Reservoir No. 1. Dedicated pipelines would be required to deliver the water to the Airline Well Field Reservoir and back to the Valley Utilities reservoirs (Reservoir No. 1 and 2). Additional pumping costs would be incurred and LPSCO would charge for the O&M of the facility at dollars per every 1000 gallons delivered basis.

To assist in developing and evaluating the implementation alternatives listed above, pilot testing was conducted to develop design and operating criteria specific to Valley Utilities. Pilot tests were conducted at the Reservoir No. 1 site between March and September 2003. The findings from these tests have been utilized for developing full scale design criteria for the Valley Utilities arsenic-impacted wells. A discussion of these pilot testing activities is presented below.

6.0 PILOT TEST RESULTS

Pilot testing of adsorption media was conducted at the Valley Utilities Reservoir No. 1 site. A GIM adsorption product, GFH, was tested at the site to verify the media performance, develop design criteria, and assess the impacts of other water quality parameters on arsenic removal. The pilot test was conducted at an average ambient pH level of 7.8. The results of the pilot testing activities are presented below to develop conclusions that can be applied to the design of an arsenic treatment facility.

During the pilot study, additional groundwater quality data was collected to establish the characteristics of the Valley Utilities wells, as shown in Table 2.

Table 2: Ground Water Quality during Pilot Testing

		Average	Minimum	Maximum	90th Percentile
pH	Std. Units	7.8	7.6	8.0	8.0
Arsenic	ppb	12	9	20	15
Fluoride	mg/L	0.7	0.6	1	0.8
Silica	mg/L as Si	11.2	7.6	16.1	12.7
Iron	mg/L	0.14	0.03	0.32	0.30
Phosphate	mg/L as P	<0.05	<0.05	<0.05	<0.05
TDS	mg/L	311	295	328	324
Alkalinity	mg/L as $CaCO_3$	128	126	130	129
Vanadium	mg/L	<0.010	<0.010	<0.010	<0.010

During the pilot testing duration, the well water arsenic levels in well water ranged from 9 ppb to 20 ppb, with an 90th percentile level of 15 ppb. The operating pH levels ranged from 7.6 to 8.0, with an average value of 7.8. Fluoride levels ranged from 0.6 to 1.0 mg/L, with an average level of 0.7 mg/L. Silica levels ranged from 7.6 to 16.1 mg/L, with an average level of 11.2 mg/L. Iron levels ranged from 0.03 to 0.32 mg/L, with an average level of 0.14 mg/L. Phosphorus was not detected in the well water. Vanadium levels were consistently less than 0.010 mg/L. The average TDS and alkalinity levels in the well water were 311 mg/L and 128 mg/L as $CaCO_3$, respectively. The well water quality during the pilot study was found to be similar to the historical well water quality presented in Section 3.2.

The GFH column was tested continuously for approximately six months (04/03/03 to 09/19/03) to the maximum extent possible with 9% of down time. The GFH unit was an 8-inch diameter column with a media depth of 2.0 feet and operated at a flow rate of 2.0 gpm, corresponding to a hydraulic loading rate (HLR) of 5.75 gpm/ft^2 and an EBCT of 2.5 minutes. The column was operating at a very high pressure of 80 psi.

Based on previous experience, results from a 2.5 minute EBCT contactor are similar to results from contactors with greater EBCT values, as far as treatment capacity or BVs treated. This is due to the reaction time between arsenic and the media, which is optimized at 2.5 minutes. Therefore, higher EBCTs were not tested in the evaluation. The pilot results can be adjusted to determine design parameters for full scale facilities with an EBCT of 2.5 minutes per contactor. Well water and treated water were analyzed twice a week for arsenic, silica, iron, pH, fluoride and total phosphorus.

Arsenic in the Salt River Valley aquifer is present primarily as oxidized As(V) species. In the event some As(III) is present, prechlorination with 0.5-1.0 mg/L prior to treatment will oxidize As(III) to As(V). Based on previous experience, it is also known that the media does not exhibit any significant chlorine demand, other than during initial startup. In the final facility design, the influent water to the arsenic treatment system will have provisions to be chlorinated.

Arsenic breakthrough, as a function of BVs treated for GFH, is shown in Figure 3. It was observed that the GFH column treated arsenic to below detection limits (<2 ppb) up to 10,000 BVs (corresponding to 18 days of continuous operation) with two intermittent periods of shutdown for a total of 12 hours. Before 32,000 BVs, the arsenic level in the effluent increased to 8 ppb rapidly. This arsenic breakthrough was found to be coincidental with iron leakage through the media bed. This occurred due to iron leakage from the 50 micron prefilter which was plugged after 60 days of continuous operation. Also, operating the test column at a high system pressure caused the approximately 25% media compaction. Therefore backwashing the media bed was deemed necessary to expand the media. After replacing the filter and media backwash, normal operation of the column was resumed. Another such event was observed at 75,000 BVs when the arsenic levels in the effluent was 22 ppb. Therefore, another backwash was performed during June (after 75,000 BVs) to expand the media bed.

A total of 90,000 BVs were treated before the arsenic levels in the effluent reached the maximum level of 6 ppb. After 90,000 BVs, the test was terminated. If the pilot tests results are extrapolated, it can be predicted that a total of 120,000 BVs can be treated prior to complete arsenic breakthrough (defined as an arsenic level of 8 ppb in the effluent).

During the initial desk-top analyses, based on the historical well water quality, it was speculated that fluoride may impact arsenic removal. Fluoride removal through the media and its impact on arsenic removal was closely monitored. Figure 4 presents the fluoride breakthrough curve for GFH media. No fluoride removal through the media was observed, and therefore it did not impact arsenic removal.

Figure 5 presents the silica removal curve through the GFH media. It was observed that silica did not impact arsenic removal. At an ambient pH of 7.7 to 8.0, silica is predominantly present as a negatively charged ion (silicate) and therefore may compete for adsorption sites on the media. In this operating pH range, silica levels greater than 50 mg/L (as SiO_2) can impact arsenic removal. But, the very low silica levels (<20 mg/L as Si) in the Valley Utilities wells did not seem to impact arsenic

Figure 3: Arsenic Breakthrough for GFH Adsorption Media

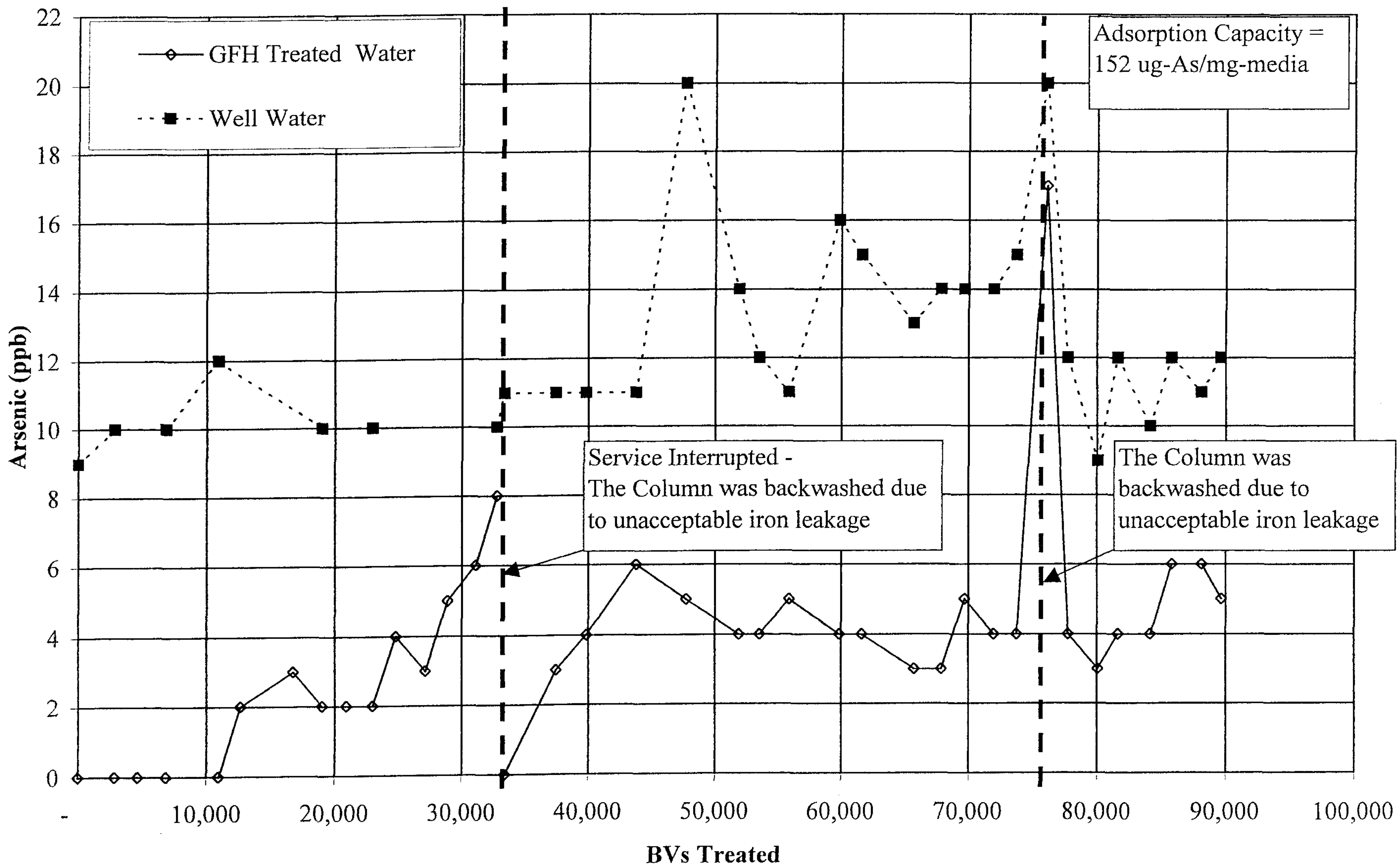


Figure 4: Fluoride Removal in GFH Media

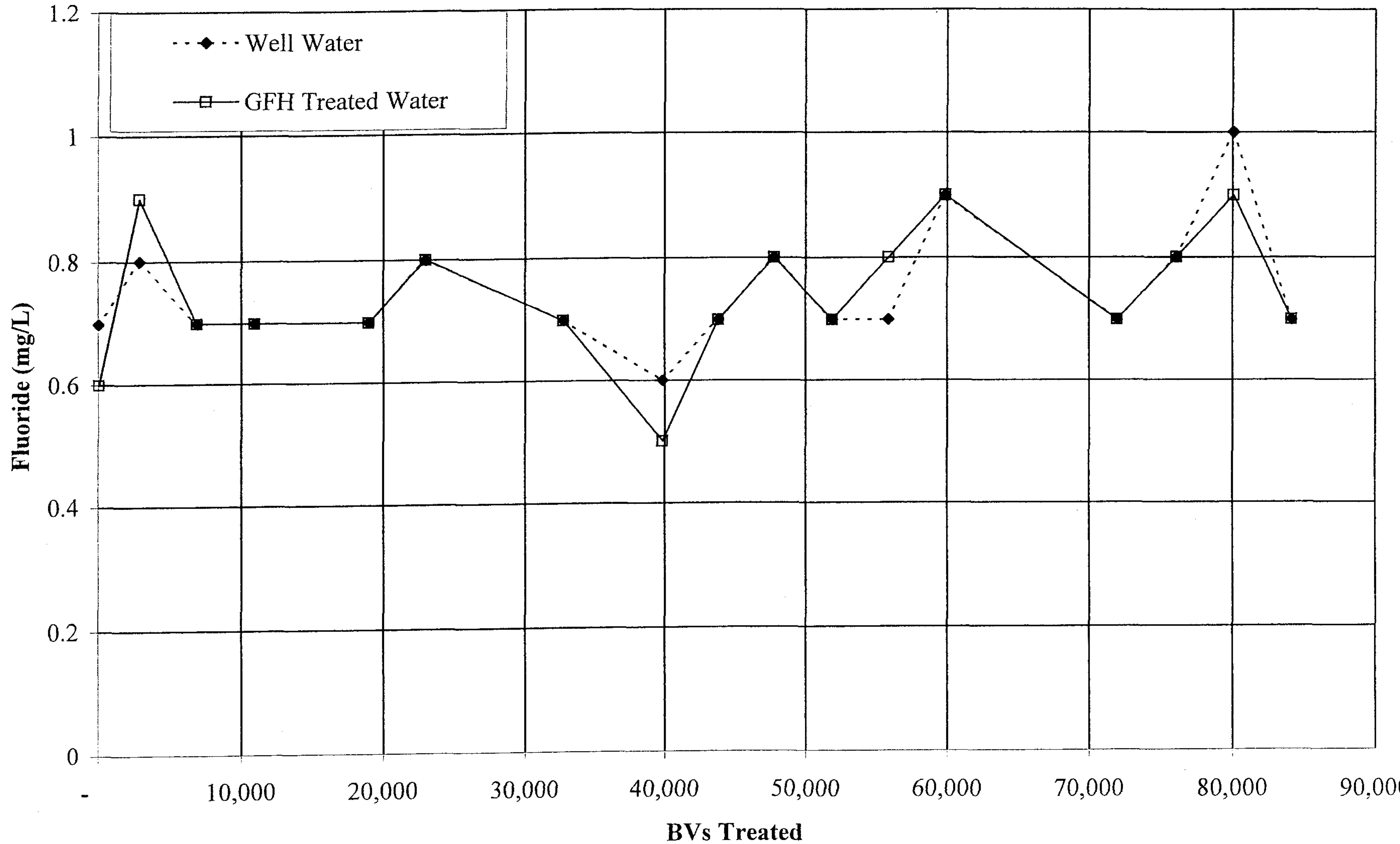
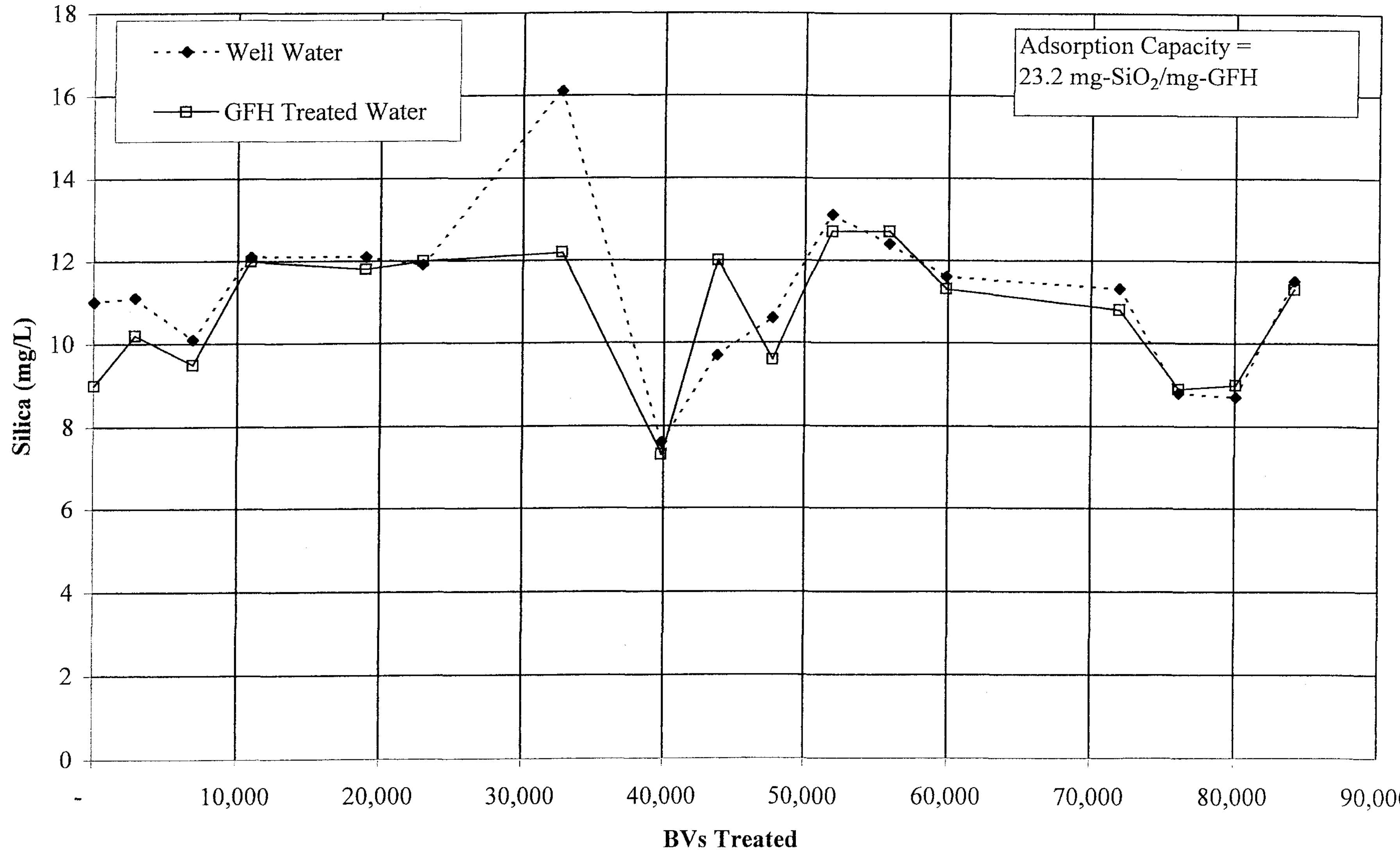


Figure 5: Silica Removal in GFH Media



removal. As observed in Figure 5, there was an initial (up to 10,000 BVs) 15% removal of silica through the media bed. Beyond 10,000 BVs, ambient well water silica levels reached an equilibrium with the solid phase (adsorption on the media) silica levels and no silica removal was observed.

Figure 6 presents the iron release data for the GFH media. Due to continuous operation of the media under high water pressure (80 psi), significant levels of iron were observed in the treated water after 30,000 BVs. Significant media compaction (more than 25% of the media bed) was also observed. The column was then backwashed to relax and expand the media bed. Iron levels in the treated effluent returned to ambient levels after backwash. After 75,000 BVs, the media was again backwashed to allow media expansion and avoid iron release in the effluent.

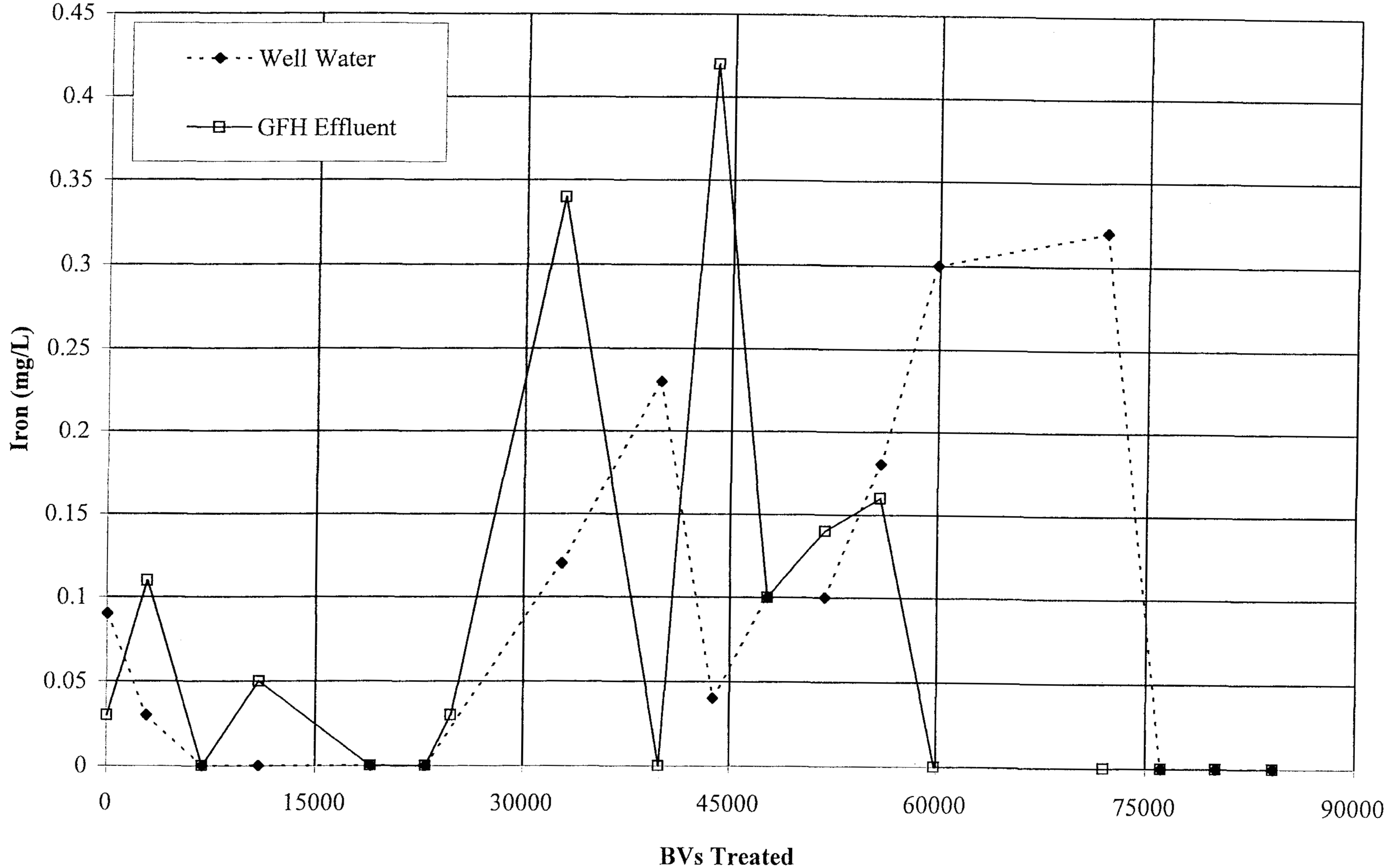
7.0 PILOT TESTING CONCLUSIONS AND ANTICIPATED PROCESS PERFORMANCE

Pilot test results were used to develop design criteria for the full scale facilities. No concurrent contaminants appear to significantly impact arsenic removal in GIM media. The Valley Utilities tested wells have low silica levels, moderate fluoride levels, and low vanadium levels, along with an ambient pH level below 8.0. The water quality in these wells makes iron media adsorption a feasible arsenic treatment technology.

For a single vessel GIM system, the adsorption column is operated until the effluent arsenic level reaches 8-10 ppb (80-100% of MCL). At this point, the media in the column is replaced. Based on the pilot test results, approximately 120,000 BVs are expected to be treated at ambient pH levels of 7.8 before the treated arsenic level reaches 10 ppb. This corresponds to a media changeout frequency of 347 days at a 60% well utilization rate for an average well arsenic level of 15 ppb. If the pH is reduced to 6.8 prior to the treatment system, it is estimated that run lengths would increase by 25%, based on previous experience at other sites. This would reduce O&M costs associated with media replacement. A carbon dioxide system could be used for pH reduction, if sulfuric acid use is a concern at the well site.

For a two vessel GIM system, the adsorption contactors are operated in sequence as water is treated through the first contactor (lead column) and through the next contactor (lag column). The contactors operate in series until effluent arsenic levels from the lag column reach 3 ppb. This, in most cases, is coincidental with an effluent arsenic level of 10 ppb in the lead column. At this point, the media in the lead column is replaced. Media replacement typically takes two to three days. After the media replacement, the valving in the system is arranged such that the lead contactor assumes the lag position and hence the fresh media is in the lag position. Due to this arrangement, longer run lengths than a single vessel system are possible and media replacement frequency is reduced. Based on previous experience, at least 50% greater run lengths can be achieved with a two vessel system. Based on the pilot test results, approximately 180,000 BVs are expected to be treated at ambient pH levels of 7.8 before the treated arsenic level in the lead column reaches 10 ppb. This corresponds to a media changeout frequency of 520 days at a 60% well utilization rate for an average well arsenic level of 15 ppb.

Figure 6: Iron Release in GFH Media



8.0 IMPLEMENTATION STRATEGY

The treatment and blending alternatives presented in Section 5.0 are further developed below, using the findings from the pilot tests. These include treatment of impacted wells using GIM adsorption or blending with the Airline wells at the new reservoir site. Due to the location of the wells at the Reservoir No. 1 site, all treatment facilities would be constructed at this reservoir site.

There are three wells (Wells No. 4, 5 and 6) located at the Reservoir No. 1 site. All three wells have similar water quality. The combined maximum flow for the three wells is approximately 1500 gpm. Based on the historical data provided by Valley Utilities, the maximum arsenic level (from four samples) was 14 ppb. However, based on the data collected during the pilot study, the 90^{th} percentile level of arsenic in the wells (during the seven-month period) is 15 ppb and is considered for evaluation purposes. The range of arsenic levels during the pilot study was 9 to 20 ppb, with an average of 12 ppb. The design flow for the arsenic treatment facility is 1500 gpm.

8.1 Treatment Options

Option A1 - Single vessel full flow adsorption treatment for the three-impacted wells at the Reservoir No. 1 site

Since all the three wells are located at the Reservoir No. 1, the proposed treatment facility would be located at this reservoir site. After treatment, existing pipeline would be utilized to deliver the portion of the flow to the Reservoir No. 2. The design flow for the facility is 1500 gpm with a design arsenic level of 15 ppb. Under this treatment configuration, the full flow would be treated until each media contactor reaches an effluent arsenic level of 8 ppb. Based on the pilot study, GFH media is estimated to treat arsenic to a level of 8 ppb after 120,000 BVs, which corresponds to 208 days of continuous operation (or 346 days at 60% utilization rate).

For a 1500 gpm arsenic treatment facility, two 12-ft diameter vessels are required to achieve an EBCT of 2.5 minutes at a design loading rate of 6.8 gpm/ft^2. A media depth of 2.4 ft. would be provided in each vessel. No pH adjustment would be required and the treatment facility would operate at an ambient pH of 7.9. The media would be backwashed every month. The volume of the initial backwash (backwash of the virgin media after installation) would be approximately 13 BVs. The volume for the subsequent backwashes for bed relaxation during the operation would be 8-10 BVs. A steel tank would be used for backwash recovery. Spent media would be stored on-site in a holding bin or a concrete staging area and disposed to a municipal landfill as it would not be considered hazardous. The media would be replaced after 120,000 BVs are treated (every 346 days at an utilization rate of 60%). Table 3 provides a preliminary designed criteria for Option A1.

Table 3: Design Criteria for Single Vessel Full Flow Arsenic Adsorption Facility for Valley Utilities Wells

Design Parameter/Operating Condition	Value
Well Flow Rate, gpm	1500
Treatment System Flow Rate, gpm	1500
Design Influent Arsenic Level, ppb	15
No. of Adsorption Vessels	2
Diameter of Adsorption Vessel, ft.	12
Hydraulic Loading Rate per Vessel, gpm/ft^2	6.8
Contact Time, minutes	3.0
Media Depth, ft.	2.3
Media Volume in Each Vessel, gallons	3750
Operating pH	Ambient (~7.9)
Backwash Volume for each Backwash, BVs	13

Cost Evaluation. Treatment costs including capital, annual O&M, total annualized, 20-year present worth, and annualized costs/1000 gallons were calculated for the proposed full stream GIM treatment facility for Wells 4, 5 and 6. These estimated treatment costs are presented in Table 4.
Capital and annual O&M costs for single vessel full flow GIM treatment for the Valley Utilities wells would be $1,201,100 and $250,600, respectively. Annualized costs would be $355,300 ($0.75/1000 gallons of the combined well production). Costs were annualized using a 6% differential interest rate and 20 year amortization period.

Table 4: Full Flow Single Vessel GIM Treatment Costs for Valley Utilities Wells

Capital Costs Summary	GIM System for 1500 gpm
Residuals Handling Facilities	$128,000
Prefiltration	$28,000
GFH System Facilities	$329,400
Concrete Support for Treatment Vessels	$58,300
Piping, I&C, Electrical, Yard Piping Allowances	$194,200
Total Facility Cost, $	$738,000
Site Aesthetics, $	$184,500
Contingency, 20%	$184,500
Taxes & Bonding, 8.5%	$94,100
Total Estimated GFH Facility Cost	**$1,201,100**
Well Utilization Rate	60%
Total Annual O&M Costs	**$250,600**
20-yr present worth	**$4,075,500**

If an operating pH of 6.8 is utilized, the capital costs would increase by $100,000 ($1,301,100) while the annual O&M costs would decrease to $200,500 (20% reduction). The resulting annualized costs are $313,900 ($0.66/1000 gallons of combined well production). Future reductions in adsorption media pricing and operating strategies where some flows are diverted from the treatment plant during the initial stages of the GIM column run (when arsenic levels are low) would result in additional savings in adsorption media replacement costs. These concepts will be further explored during the final design phase.

Option A2 - Two vessel partial flow adsorption treatment for the three-impacted wells at the Reservoir No. 1 site.

As described in Section 4.1.1, partial flow treatment is applicable to the Valley Utilities arsenic impacted wells. The design arsenic level is 15 ppb. Therefore, the treated flow calculated according to Equation 1 is 875 gpm. The proposed treatment facility would be located at the Reservoir No. 1 site. After treatment, existing pipeline would be utilized to deliver the portion of the flow to the Reservoir No. 2. Under this treatment configuration, the lead (first) column would be operated to a breakthrough of 9-10 ppb at which time the effluent arsenic concentration would be 3 ppb in the lag (second) column. The media in the lead column would then be replaced. All of the water that needs to be treated would be passed through the second column when the media is being replaced in the lead column. It usually takes two to three days for media replacements. After media replacement, the lag column would become the lead column and vice versa. Based on the pilot study, GFH media is estimated to treat 180,000 BVs (50% more than the single vessel breakthrough) before complete arsenic breakthrough is observed. This corresponds to a total of 312 days of continuous operation (or 520 days at 60% utilization rate). Under this implementation strategy, three different treatment sub-options are considered. These options are:

1. One treatment train with two 12-ft diameter vessels in series with no redundancy during media changeout and equipment malfunctioning.
2. One treatment train with two 12-ft diameter vessels in series with an additional 12-ft diameter vessel (total three vessels) to provide redundancy under media changeout and equipment malfunctioning.
3. Two parallel treatment trains with two 9-ft diameter vessels in series

For a 1500 gpm arsenic treatment facility, two 12-ft diameter vessels would be required to achieve a systemwide EBCT of 5.0 minutes (2.5 minutes EBCT through each vessel) at a design loading rate of 7.0 gpm/ft^2. A media depth of 2.4 ft. would be provided in each vessel. No pH adjustment would be required and the treatment facility would operate at an ambient pH of 7.9. The media would be backwashed every month. The backwash volume would be approximately 13 BVs from the initial backwash (after media installation) and approximately 8-10 BVs from the subsequent backwashes for media expansion. A steel tank would be used for backwash recovery. Spent media would be stored on-site in a holding bin or a concrete staging area and disposed to a municipal landfill as it would not be considered hazardous. The media would be replaced after 180,000 BVs are treated (every 312 days). This configuration does not provide any redundancy. To achieve redundancy and flexibility of operation, an additional 12-ft vessel can be provided to be utilized under media changeout or breakdown scenarios. Table 5 provides a preliminary design criteria for Option A2.

Table 5: Design Criteria for Dual Vessel Partial Flow Arsenic Adsorption Facility for Valley Utilities Wells

Design Parameter/Operating Condition	Value
Well Flow Rate, gpm	1500
Treatment System Flow Rate, gpm	875
Design Influent Arsenic Level, ppb	15
No. of Treatment Train	1
No. of Adsorption Vessels per Train	2
Diameter of Adsorption Vessel, ft.	12
Hydraulic Loading Rate per Vessel, gpm/ft^2	6.8
Contact Time through each Vessel, minutes	2.5
Total System Contact Time, minutes	5.0
Media Depth, ft.	2.4
Media Volume in Each Vessel, gallons	3750
Operating pH	Ambient (~7.8)
Backwash Volume for each Backwash, BVs	13

Cost Evaluation. Treatment costs including capital, annual O&M, total annualized, 20-year present worth, and annualized costs/1000 gallons were calculated for the proposed partial stream GIM treatment facility for Wells 4, 5 and 6. The estimated treatment costs are presented in Table 6.

Capital and annual O&M costs for a dual vessel full flow GIM treatment for the Valley Utilities wells would be $1,283,600 and $196,300, respectively. Annualized costs would be $281,200 ($0.59/1000 gallons of the combined well production). Costs were annualized using a 6% differential interest rate and 20 year amortization period. If an additional 12-ft vessel is also utilized to achieve redundancy, the capital and O&M costs would be $1,609,400 and $172,400, respectively.

Table 6: Dual Vessel Partial Flow Treatment GIM Treatment Costs for Valley Utilities Wells

Capital Costs Summary	GIM System for 875 gpm
Residuals Handling Facilities	$128,000
Prefiltration	$28,000
GFH System Facilities	$363,500
Concrete Support for Treatment Vessels	$61,400
Piping, I&C, Electrical, Yard Piping Allowances	$207,800
Total Facility Cost	$788,700
Site Aesthetics, 25%	$197,200
Contingency, 20%	$197,200
Taxes & Bonding, 8.5%	$100,600
Total Estimated GFH Facility Cost	**$1,283,700**
Well Utilization Rate	60%
Total Annual O&M Costs	**$169,300**
20-yr present worth	**$3,225,600**

If an operating pH of 6.8 is utilized, the capital costs would increase by $100,000 ($1,383,700) while the annual O&M costs would decrease to $135,400 (20% reduction). The resulting annualized costs would be $256,000 ($0.54/1000 gallons of well production). Future reductions in adsorption media pricing and operating strategies where some flows are diverted from the treatment plant during the initial stages of the GIM column run (when arsenic levels are low) would result in additional savings in adsorption media replacement costs. These concepts will be further explored during the final design phase.

As an alternative under Option A2, two treatment trains with two 9-ft diameter vessels in each train (total of four 9-ft diameter vessels) can be designed. A design criteria for such a configuration is presented in Table 7. Each treatment train will treat approximately 440 gpm (50% of 875 gpm) and will achieve a systemwide EBCT of 5.0 minutes (2.5 minutes EBCT through each vessel) at a design loading rate of 7.0 gpm/ft^2. The estimated capital and O&M costs of this treatment configuration is $1,764,900 and $189,500, respectively. This alternative would provide flexibility in operation. Given the combination of well flows entering the treatment facility and seasonal variations in the well flows, one of the treatment train can be taken out of service, if the influent flows are less than or equal to 750 gpm (50% of 1500 gpm). Therefore, this alternative will also allow Valley Utilities to economically treat smaller flows using only one treatment train during non-peak demand scenarios.

Table 7: Design Criteria for Dual Vessel Partial Flow (with Two Parallel Trains) Arsenic Adsorption Facility for Valley Utilities Wells

Design Parameter/Operating Condition	Value
Total Well Flow Rate, gpm	1,500
Treatment System Flow Rate, gpm	875
Design Influent Arsenic Level, ppb	15
No. of Treatment Train	2
No. of Adsorption Vessels per Train	2
Flow to Each Treatment Train, gpm	440
Diameter of Adsorption Vessel, ft.	9
Hydraulic Loading Rate per Vessel, gpm/ft^2	6.9
Contact Time through each Vessel, minutes	2.5
Total System Contact Time, minutes	5.0
Media Depth, ft.	2.3
Media Volume in Each Vessel, gallons	1,100
Operating pH	Ambient (~7.8)
Backwash Volume for each Backwash, BVs	13

8.2 Non-Treatment (Blending) Option (B1)

Under this alternative, the Valley Utilities wells would be blended with water from the Airline well field (owned by LPSCO). LPSCO is currently planning on constructing a new reservoir which will be located 0.25 miles north of Bethany Homes Rd. on El Mirage Rd. The new reservoir will be fed from the wells in the Airline Well field. A dedicated pipeline from the new LPSCO reservoir to the Valley Utilities reservoirs would be constructed. The arsenic-impacted well water from Valley Utilities wells would be blended with the low-arsenic Airline wells to meet an arsenic level of 8 ppb at the POE.

Additional pumping costs would be incurred in transporting water from the LPSCO reservoir to the Valley reservoirs. The capital and installation cost for the boosters pumps is estimated to be $250,000. The total pipeline costs for transporting water is estimated to be $307,000. LPSCO has preliminary indicated that the Valley Utilities would be charged $1.10 to $1.30 per 1000 gallons of the water supplied by LPSCO.

In the future, if the arsenic level in the Airline well water increases to greater than 10 ppb, LPSCO will construct a new arsenic treatment facility at the new reservoir site. Under such a scenario, the water from LPSCO may not be suitable for blending and Valley Utilities would be required to install treatment anyway. Further, since the costs of the non-treatment alternative is almost twice the treatment alternative, it does not appear to be a viable option. Also, from future demand and operational flexibility perspective, it would be more appropriate for Valley Utilities to own an arsenic treatment facility to meet future increasing demands while complying with the new Arsenic regulation.

9.0 RECOMMENDED ALTERNATIVE

A comparison of capital, O&M, and annualized costs for each of the two treatment options is presented in Table 8. Costs for options A2, the partial flow treatment scenario, are significantly less than option A1. The partial flow GIM treatment option with pH adjustment is the most economical alternative with an overall annual cost of $0.59/1000 gallons. Further, media replacement costs will likely be lower in the future as the market develops for GIM. For these reasons, GIM with pH reduction to 6.8 is the recommended treatment system for the Valley Utilities wells. A combined facility would be constructed at the reservoir site to treat Well Nos. 4, 5 and 6. Figure 7 presents the layout a dual vessel facility at the reservoir site.

Table 8: Comparison of Valley Utilities Well Treatment Costs

Implementation Option	Operating pH	Capital Costs	Annual O&M Costs	Annual Costs ($/1,000 gallons)
A1 - Full Flow GIM Treatment of Well 4, 5 and 6	ambient	$1,201,100	$250,600	$0.75
	6.8	$1,301,100	$200,500	$0.66
A2 - Partial Flow GIM Treatment of Well 4, 5 and 6	Ambient	$1,283,700	$169,300	$0.59
	6.8	$1,383,600	$135,400	$0.54

9.1 Site Criteria and Piping

The arsenic treatment facility is proposed to be installed at the existing reservoir site (Reservoir No. 1) located on the north side of the Valley Utilities main office on Bethany Homes Road. The onsite reservoir has a total capacity of 500,000 gallons. All three wells under consideration (Wells No. 4, 5, and 6) are also located at the site. There appears to be sufficient space available at the existing reservoir site to construct a 1500 gpm arsenic treatment facility.

Wells 4, 5, and 6 combine into one collector line. A part of the flow (approximately 40%) from this collector line is supplied to an offsite reservoir (Reservoir No. 2) located 0.25 miles southeast of the site. The remaining 60% of the flow enters the Reservoir No. 1. The flow from the collector line would be supplied to the proposed arsenic treatment facility. After treatment, a portion of the treated flow would be supplied to the Reservoir No. 2 using the existing pipeline. It is anticipated that insignificant site piping would have to be performed.

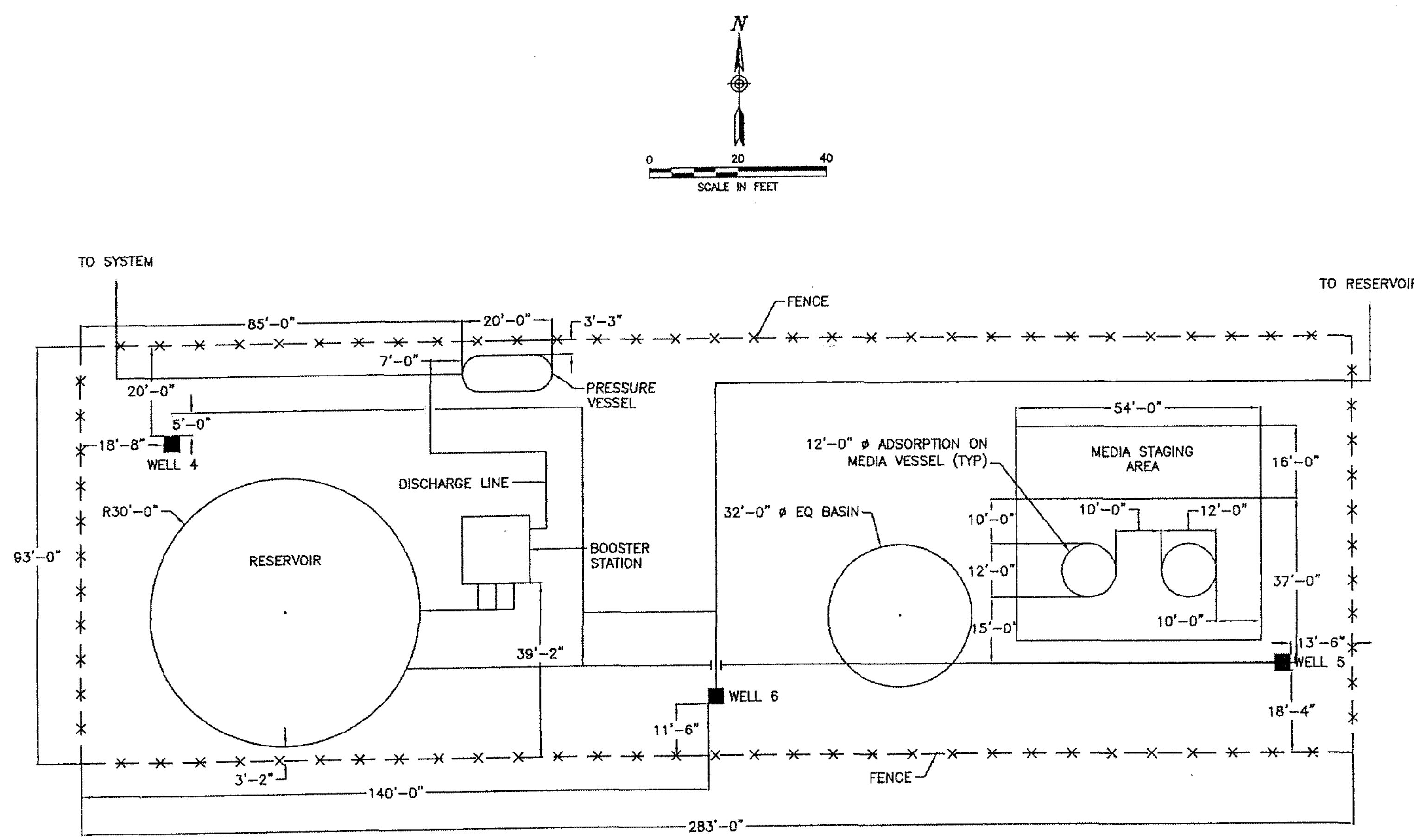


FIGURE 7 - LAYOUT OF A DUAL VESSEL FACILITY AT RESERVOIR SITE

9.2 Pumping Requirements

All three wells (Wells No. 4, 5, and 6) at the site discharge water to the reservoirs at a low pressure. Additional pumping may be required to provide sufficient head for an arsenic treatment facility. Pumping costs are included in the arsenic treatment costs discussed earlier. The maximum allowable head loss through the arsenic treatment facility is 15 psi. Therefore, a low lift pump station providing a minimum of 20 psi of pressure may be required. The existing booster station would not be modified to deliver water into the system.

9.3 Sanitary Sewer Connection

A sanitary sewer connection to dispose of the backwash and rinse streams collected at the backwash equalization basin would be required at the arsenic treatment facility. A small diameter force main (4-inch or 6-inch) would be installed from the equalization basin to the nearest manhole (location to be verified in final design).

10.0 SUMMARY AND RECOMMENDATIONS

Partial stream GIM with pH reduction to 6.8 is the recommended treatment system for the Valley Utilities wells. The GIM treatment option has significantly lower O&M ($135,400) and annual costs ($0.54 per 100 gallons of treated water) than the other treatment options. A 875-gpm partial flow GIM arsenic treatment facility would be constructed at the Reservoir No. 1 site to treat Well Nos. 4, 5, and 6. To obtain system redundancy and flexibility in operation, a two train treatment system utilizing a total of four 9-ft diameter vessels is recommended. The treated water would be blended with the bypassed flow to maintain an arsenic level of 8 ppb in the reservoir at all times. In order for Valley Utilities to comply with the new arsenic MCL of 10 ppb, the GIM treatment facility would need to be completed and online by January 2006.

ATTACHMENT B

HOOK-UP FEE COMPUTATION

Arsenic Treatment System

Location	Capacity	Cost
Well Nos. 4, 5, and 6	1,500 GPM	$1,383,600
Well Nos. 1 and 2	500 GPM	$542,500
Total	2,000GPM	$1,926,100

Capacity required per Customer	1.15 GPM
Customers ATS will Serve	1,750
Average Cost per Customer	$1,100
Total Customers Served by ATS	1,750
Existing Customers	1,250
New Customers to be Served by ATS	500
Receipts from HUF's	$550,000

(500 X $1,100 = $550,000)

Valley Utilities Water Company, Inc.
Balance Sheet
As of December 31, 2003

Line No.		
1	**ASSETS**	
2	Plant In Service	$ 4,313,786
3	Property Held for Future Use	40,000
4	Non-Utility Plant	-
5	Construction Work in Progress	-
6	Less: Accumulated Depreciation	(1,533,754)
7	Net Plant	$ 2,820,032
8		
9	Debt Reserve Fund	$ -
10		
11	CURRENT ASSETS	
12	Cash and Equivalents	$ 273,079
13	Accounts Receivable, Net	45,304
14	Notes/Receivables from Associated Companies	-
15	Materials and Supplies	26,800
16	Prepayments	-
17	Other Current Assets	-
18	Total Current Assets	$ 345,183
19		
20	Deferred Debits	$ -
21		
22	Other Investments & Special Funds	$ -
23		
24	TOTAL ASSETS	$ 3,165,215
25		
26		
27	**LIABILITIES AND STOCKHOLDERS' EQUITY**	
28		
29	Common Equity	$ (413,375)
30		
31	Long-Term Debt	$ -
32		
33	CURRENT LIABILITIES	
34	Accounts Payable	$ 11,179
35	Current Portion of Long-Term Debt	-
36	Payables to Associated Companies	-
37	Customer Deposits	46,999
38	Taxes Payable	19,511
39	Interest Payable	-
40	Other Current Liabilities	3,123
41	Total Current Liabilities	$ 80,812
42	DEFERRED CREDITS	
43	Advances in Aid of Construction	$ 3,180,500
44	Accumulated Deferred Income Taxes	24,057
45	Contributions In Aid of Construction, Net	293,221
46	Accumulated Deferred Income Credits	-
47	Total Deferred Credits	$ 3,497,778
48		
49	Total Liabilities & Common Equity	$ 3,165,215

ATTACHMENT C

Valley Utilities Water Company, Inc.
Income Statement
Year Ended December 31, 2003

Line No.		
1	**Revenues**	
2	Metered Water Revenues	$ 773,023
3	Unmetered Water Revenues	-
4	Other Water Revenues	41,791
5		$ 814,814
6	**Operating Expenses**	
7	Salaries and Wages	$ 253,382
8	Purchased Water	-
9	Purchased Power	104,387
10	Chemicals	2,225
11	Repairs and Maintenance	21,743
12	Office Supplies and Expense	30,348
13	Outside Services	5,382
14	Water Testing	1,599
15	Rents	71,493
16	Transportation Expenses	39,015
17	Insurance - General Liability	9,083
18	Insurance - health and Life	69,194
19	Regulatory Commission Expense - Rate Case	1,888
20	Miscellaneous Expense	46,526
21	Depreciation Expense	171,263
22	Other Taxes and Licenses	19,291
23	Property Taxes	25,424
24	Income Tax	17,820
25		
26	**Total Operating Expenses**	$ 890,063
27	**Operating Income**	$ (75,249)
28	**Other Income (Expense)**	
29	Interest Income	2,970
30	Other income	-
31	Income Tax Provision	-
32	Interest Expense	(366)
33	Other Expense	-
34	Gain/Loss Sale of Fixed Assets	-
35	**Total Other Income (Expense)**	$ 2,604
36	**Net Profit (Loss)**	$ (72,645)

Valley Utilities Water Company, Inc.
Statement of Cash Flows
Year Ended December 31, 2003

Line No.			
1			
2			
3	Cash Flows from Operating Activities		
4	Net Income	$	(72,645)
5	Adjustments to reconcile net income to net cash		
6	provided by operating activities:		
7	Depreciation and Amortization		171,262
8	Deferred Income Taxes		13,295
9	Accumulated Deferred ITC		-
10	Changes in Certain Assets and Liabilities:		-
11	Accounts Receivable		1,327
12	Materials and Supplies Inventory		(25,300)
13	Prepaid Expenses		-
14	Misc Current Assets and Deferred Expense		1,888
15	Accounts Payable and Accrued Liabilities		(5,187)
16	Accrued Taxes		5,142
17	Net Cash Flow provided by Operating Activities	$	89,782
18	Cash Flow From Investing Activities:		
19	Capital Expenditures		(476,483)
20	Plant Held for Future Use		-
21	Non-Utility Property		-
22	Net Cash Flows from Investing Activities	$	(476,483)
23	Cash Flow From Financing Activities		
24	(Decrease) Increase in Net Amounts due to Parent and		
25	Affiliates		5,000
26	Changes in Customer Deposits		842
27	Changes in Advances for Construction		337,359
28	Changes in Contributions for Construction		-
29	Net Proceeds from Long-Term Debt Borrowing		-
30	Repayments of Long-Term Debt		-
31	Dividends Paid		-
32	Deferred Financing Costs		-
33	Paid in Capital		-
34	Net Cash Flows Provided by Financing Activities	$	343,201
35	Increase(decrease) in Cash and Cash Equivalents		(43,500)
36	Cash and Cash Equivalents at Beginning of Year		-
37	Cash and Cash Equivalents at End of Year	$	(43,500)

Valley Utilities Water Company, Inc.
Proforma Capital Structure

Line No.	Item of Capital	Dollar Amount	Percent of Total
1	Long-Term Debt	1,926,100	127.33%
2			
3	Stockholder's Equity	(413,375)	-27.33%
4			
5	Totals	1,512,725	100.00%
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			
26			
27			
28			
29			

ATTACHMENT D

CERTIFICATE OF SECRETARY

I, the undersigned, being the Secretary of Valley Utilities Water Company. Inc. do hereby certify the foregoing to be duly adopted resolutions of the Corporation's Board of Directors as adopted at a Special Meeting of the Directors held on October 7, 2004.

By:____________________________________

Secretary

ATTACHMENT E

VALLEY UTILITIES WATER COMPANY, INC.

RESOLUTION OF THE BOARD OF DIRECTORS

October 7, 2004

The President reported on the need for certain facilities needed to provide arsenic treatment within the service area of the Corporation, the long-term financing of those facilities and the need for an Arizona Corporation Commission Order authorizing that financing. Discussion of those matters ensured.

Thereafter, upon motion duly made, seconded and unanimously carried, it was:

RESOLVED, that the Board hereby authorizes the officers of the Corporation to file an Application with the Water Infrastructure Authority of Arizona (WIFA) for a loan at terms favorable to the Corporation for the purpose of funding construction of certain arsenic treatment facilities, and

FURTHER RESOLVED, that the Board hereby authorizes the officers of the Company to seek long term financing from WIFA in an amount not to exceed $1, 926,100 for the purpose of funding the plant and equipment described in Exhibit A hereto, and

FURTHER RESOLVED, that the Board hereby authorized the officers of the Corporation to file an Application with the Arizona Corporation Commission for authority to increase its rates and charges such that the Company's operating expenses, debt service, and reasonable rate of return on its rate base can be duly recovered, and

FURTHER RESOLVED, that the Board hereby authorizes the officers of the Corporation to file an application with the Arizona Corporation Commission for authority to issue promissory note(s) and evidence of indebtedness upon the terms and conditions hereinbelow mentioned and the filing of any and all amendments and supplements to said application, and

FURTHER RESOLVED, that upon receiving the requisite authority from the Arizona Corporation Commission, and subject to other legal requirements, the Corporation shall issue Promissory Note(s) and such evidence of long-term indebtedness for up to $1, 926,100 under terms and conditions advantageous to the Corporation for the purpose of funding certain plant and equipment additions, as herein above described, and

FURTHER RESOLVED, that the proper officers of the Corporation be, and each of them hereby is, authorized to deliver promissory notes and other evidence of indebtedness upon receipt by the Corporation of the full purchase price or loan proceeds therefore, all in the manner and in the terms and conditions provided in the above-mentioned resolutions, and

FURTHER RESOLVED, that the proper officers of the Corporation be and each of them hereby is, authorized, in the name and on behalf of the Corporation, to conduct any and all negotiations, to make any and all arrangements, do and perform any and all acts and things and to execute and deliver any and all officer's certificates and other documents and instruments as they deem necessary or appropriate in order to consummate the issuance and otherwise to effectuate the purposes of each and all of the foregoing resolutions.

Richard L. Sallquist (002677)
SALLQUIST & DRUMMOND, P.C.
4500 S. Lakeshore Drive, Suite 339
Tempe, Arizona 85282
Telephone: (480) 839-5202
Fax: (480) 345-0412
Attorneys for Valley Utilities Water Company, Inc.

BEFORE THE ARIZONA CORPORATION COMMISSION

IN THE MATTER OF THE APPLICATION OF VALLEY UTILITIES WATER COMPANY, INC. FOR AUTHORITY TO ISSUE PROMISSORY NOTE(S) AND OTHER EVIDENCES OF INDEBTEDNESS PAYABLE AT PERIODS OF MORE THAN TWELVE MONTHS AFTER THE DATE OF ISSUANCE.	DOCKET NO. W-01412A-04-___ **NOTICE OF PUBLICATION**

STATE OF ARIZONA)
)ss
County of Maricopa)

I, Robert Prince, President of Valley Utilities Water Company, Inc. hereby file the original Affidavit of Publication attached hereto as Attachment 1 and incorporated herein by reference for all purposes, as published by ____________________, a newspaper of general circulation in the area subject to the application, said application being completed on the date set forth in the attached Affidavit of Publication.

DATED this ____ day of __________, 2004.

VALLEY UTILITIES WATER COMPANY, INC.

By:____________________________
Robert Prince, President

ATTACHMENT F

The foregoing instrument was acknowledged before me this ____ day of __________________, 2004, by Robert Prince.

____
Notary Public

My Commission Expires:

____

Original and ten copies of the
foregoing filed this ___ day
of __________________, 2004:

Docket Control
Arizona Corporation Commission
1200 West Washington
Phoenix, Arizona 85007

____

PUBLIC NOTICE
OF
AN APPLICATION FOR AN ORDER AUTHORIZING
THE ISSUANCE OF PROMISSORY NOTE (S) AND
OTHER EVIDENCE OF INDEBTEDNESS
BY
VALLEY UTILITIES WATER COMPANY INC.

Valley Utilities Water Company, Inc. (Applicant) has filed an Application with the Arizona Corporation Commission (Commission) for an order authorizing Applicant to issue up to $1,926,100 in promissory notes and other evidence of indebtedness. The Application is available for inspection during regular business hours at the offices of the Commission in Phoenix, Arizona, and Applicant's offices at 12540 W. Bethany Home Road, Litchfield Park, Arizona 85340.

Intervention in the Commission's proceedings on the Application shall be permitted to any person entitled by law to intervene and having a direct substantial interest in this matter. Persons desiring to intervene must file a Motion to Intervene with the Commission which must be served upon the Applicant and which, at a minimum, shall contain the following information:

1. The name, address and telephone of the proposed intervenor and of any person upon whom service of documents is to be made if different than the intervenor.

2. A short statement of the proposed intervenor's interest in the proceedings.

3. Whether the proposed intervenor desires a formal evidentiary hearing on the Application and the reasons for such a hearing.

4. A statement certifying that a copy of the Motion to Intervene has been mailed to Applicant.

The granting of Motions to Intervene shall be governed by A.A.C. R14-3-105, except that all Motions to Intervene must be filed on, or before, the 15th day after this notice.

If you have any questions or concerns about this application of have any objections to its approval, or wish to make a statement in support of it, you may contact the Consumer Services Section of the Commission at 1200 West Washington, Phoenix, Arizona 85007 or call 1-800-222-7000.

93055-00000.141

EXHIBIT 1 TO ATTACHMENT F