Bill Ketchum, President
bill@atecwatersystems.com

ATEC Systems Associates, Inc.
1329 Broadway, Suite 204-205
Longview, Washington 98632
Telephone: 360-693-6202
Fax: 360-397-0375

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ATEC Systems Background

- We have been building filters since 1982
- We have produced high quality potable water systems since 1992
- ATEC Systems developed high rate iron & manganese removal system in 1992
- Installed first full-scale arsenic removal system using granular ferric hydroxide in 2001
- Arsenic removal is becoming increasingly important. We are building plants that successfully use the same basic process combined with ferric coagulation to remove arsenic at a loading rate of between 5.0 and 8.5 gpm/sf.
We Build All Sizes of Treatment Systems

Brewer Creek, Whistler, BC
15 GPM

Batavia, Illinois, Central Water Plant
4,500 GPM
ATEC Systems Policies and Objectives

- Provide **cost-effective, high performance systems** for the removal of manganese, iron, hydrogen sulfide, arsenic, and radium from groundwater.

- We usually compete with the **decision to treat** not with other companies.

- Adapt our systems to customers needs not our preferences. If what we do isn’t the best solution for the customer, we don’t build it. Find them another option.

- Pilot test **every** installation.

- **Build what we sell** including pressure vessels.

- **Guarantee the performance** of what we sell, without exception
Our Philosophy

- Quality
- Performance
- Simplicity
- Ease of Operation
- Customer Service
- Cost Efficiency

Remember: “You can’t build a reputation on what you’re going to do.” Henry Ford
Constant, Steady Quality Improvements

- **Manufacturing Processes**
  - Automatic Welding & Cutting Processes
  - Underdrain design
    - 316L SS Underdrain System

- **Coating Systems**
  - Fusion Epoxy Coating

- **Filter Media**
  - Consistency and Particle Size Distribution

- **Controller**
  - PLC or Mechanical

- **Backwash Control Valves**

- **Anchoring Systems**
System Performance & Efficiency

- Pilot Testing Ensures Success
  - Loading Rates
  - Chemical Requirements
  - Chemical Feed Rates
  - Chlorine Demand
  - Silica Adsorption
  - Alternate Media Arrangements
Simplicity

- Automatic unattended backwash
- Backwashes with well production finished water without supplemental water supply
- Does not go off line to backwash
- Does not require filter to waste cycle
- Requires only one controlled valve per vessel
Customer Service

- We view our customers as partners, not as a one-time transaction and we:
  - Minimize our service costs by manufacturing well-designed, high quality products
  - Provide the best training we can for our customers
  - Ship out replacement parts quickly when needed
  - Encourage customers to call us immediately when a question or problem arises
ATEC Systems Iron, Manganese, Arsenic, and Radium Removal Plants

- **Treatment Plants by Size**
  - 100 gpm or less: 10%
  - 101-299 gpm: 14
  - 300-499 gpm: 12
  - 500-749 gpm: 15
  - 750-999 gpm: 20
  - 1,001-1,500 gpm: 16
  - 1,501+ gpm: 13

- **Treatment Plants by:**
  - Manganese Levels (µg/L)
    - 0-49: 3%
    - 50-249: 57
    - 250-499: 24
    - 500+: 16
    - Highest level currently being treated at high rate is 2.3 mg/L
  - Iron Levels (µg/L)
    - 0-299: 52%
    - 300-999: 22
    - 1,000-1,999: 16
    - 2,000+: 10
    - Highest level being treated at high rate is ≈ 5.5 mg/L
  - Arsenic Levels from 10 to ≈100 µg/L
  - H₂S Levels range from non-detect to 5 mg/L

ATEC Systems has iron, manganese, arsenic, and radium treatment systems in place with capacities from 15- to-4,500 gpm. Performance of all systems is consistent with pilot test results.
ATEC Systems has an installed base of over 250 Treatment Plants

- **Our Clients Include:**
  - Cal Water
  - Washington Water
  - Clark Public Utilities
  - Jefferson PUD
  - Kitsap PUD
  - Lakewood Water District
  - Lakehaven Utility District
  - Ames Lake Water
  - Sammamish Plateau Water & Sewer
  - Golden State Water Company
  - East Bay MUD
  - Colorado Springs Utilities
  - Skagit PUD
  - Klickitat PUD
  - Battle Ground
  - North Aurora, IL
  - Batavia, IL
  - New Mexico Utilities

- **We have treatment plants in:**
  - Arizona
  - Washington
  - Oregon
  - California
  - Colorado
  - Nevada
  - Idaho
  - Illinois
  - Texas
  - Alberta
  - British Columbia
  - Mexico
  - Sri Lanka
ATEC Systems Background—Partial List of Design Engineers

- CH2M Hill, Inc.
- Brown and Caldwell
- URS, Inc.
- Montgomery Watson Harza
- Kennedy/Jenks Consultants
- CHS Engineers
- Odell Engineering, Inc.
- Tenneson Engineers
- Gray & Osborne, Inc.
- Jefferson County PUD
- Skagit PUD
- Southern California Water Co.
- Anthratech Western, Inc.
- Black & Veatch
- Coe & Van Loo
- Gibbs & Olson, Inc.
- Urban Systems, Ltd.
- Bullock-Baur
- Carollo Engineers
- Westech Engineering
- Stettler Supply
- OTAK
- Rempe-Sharpe Engineers, Inc.
- Roth-Hill Engineering Partners
- EarthTec, Inc.
- Whiteley Engineering, Inc.
- Parametrix, Inc.
- EES Consulting, Inc.
- Cosmopolitan Engineering
- Klickitat PUD
- CPU Engineering Department
- RBF Engineering
Projects in Process

- **USAID/CH2M Hill**, Pottuvil, Sri Lanka, Ulla Wellfield, **1,650 USGPM**, Iron & Manganese Removal

- **City of Live Oak, CA**
  - Well 1, **1,000 USGPM**, Manganese and Arsenic Removal
  - Well 2, **1,000 USGPM**, Manganese and Arsenic Removal
  - Well 3, **1,000 USGPM**, Manganese and Arsenic Removal
  - Well 4, **1,000 USGPM**, Manganese and Arsenic Removal

- **City of Cottonwood, AZ**
  - Site 7, **800 USGPM**, Arsenic Removal
  - Site#8 & #9, **1,250 USGPM**, Arsenic Removal
  - Site VSF, **775 USGPM**, Arsenic Removal
  - Site C-1, **310 USGPM**, Arsenic Removal
  - Wellhead Site, **1,050 USGPM**, Arsenic Removal
Projects in Process (continued)

- **Sammamish Plateau Water & Sewer District**, Sammamish, WA, Well 4 and 11, 3,500 USGPM, Manganese and H₂S Removal

- **Washington Water Service Co.**, Lacamas Farmstead, Yelm, WA, 345 USGPM, Iron and Manganese Removal

- **Saratoga Beach Owners Association.**, Well 1, Whidbey Island, WA, 110 USGPM, Iron and Manganese Removal

- **Clark Public Utilities**
  - Hayes Road Well, 75 USGPM; Iron, Manganese, & Arsenic Removal
  - Well 36, 1,200 USGPM; Iron & Manganese Removal
  - Well 15.1, 1,600 USGPM, Iron and Manganese Removal

- **Golden State Water Company**
  - Doty Street Well, 1,650 USGPM; Iron and Manganese Removal
  - Bissel Well Site, 2,100 USGPM, Iron and Manganese Removal
Things that makes our system different

- ATEC Systems Builds its Own Equipment
- We use Multiple Vessels to reduce peripheral equipment
- We build vertical filters for one reason—they work better.
- If we can’t guarantee it, we will not build it.
- We are not a “fab shop” we build treatment water systems and provide a level of customer support that exceeds customers’ expectations.
- We work hard to simplify the operation of our filter systems and to make sure that they perform as advertised.
Comparison of Vertical & Horizontal Filters

Comparison of Vertical and Horizontal Filters
Scale Varies
Typical ATEC Systems Vertical Filter
(48” Diameter Filter, 60” Sidewalls, 42” Media Bed Depth)

During the production cycle, this configuration provides equal velocity and loading throughout the filter, 10 gpm/sf is typical.

During backwash, velocity and loading rate (26 gpm/sf) is equal throughout the filter while providing 50% expansion of the media bed, enough to thoroughly clean the media in a short time.

Typical media bed depths—36” to 48”. Selection is dependent on water quality and treatment objectives.
In normal operation (1), the diaphragm is relaxed and the poppet is positioned to allow water from the supply line to enter the valve and pass through the filters.

To backwash, water or air is directed to the diaphragm by a solenoid valve, gradually closing the inlet from the supply line (2) and opening to the backwash port to allow water to discharge to the backwash line (3). The water to backwash is normally supplied by treated water from the several filters operating normally while a single filter is in the backwash mode.
Typical Installations, Indoors & Out

Batavia Central WTP

Marysville Well 11

Battle Ground, Well 7 & 8

Yuba City, Well 9
Case Studies of Existing Installations
Several different treatment systems were evaluated using this water source.

The water quality is within the normal range of problem water.

The well’s production is large enough that it applies to many systems.
### Typical Water Quality at Well 21

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Operating flow (gpm)</td>
<td>1,025</td>
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<tr>
<td>pH</td>
<td>6.8</td>
</tr>
<tr>
<td>Temperature</td>
<td>11° C</td>
</tr>
<tr>
<td>Iron (mg/l)</td>
<td>0.30</td>
</tr>
<tr>
<td>Manganese (mg/l)</td>
<td>0.215</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>present</td>
</tr>
<tr>
<td>TDS (mg/l)</td>
<td>76</td>
</tr>
</tbody>
</table>
Treatment Objectives at Well 21

Operating flow (gpm) 1,025

Finished Water Quality
- Iron (mg/l) < 0.001
- Manganese (mg/l) < 0.001
- Hydrogen sulfide non-detect
- Turbidity (NTU) < 0.50
- Residual free Cl₂ (mg/l) 0.60
Removal Methods Evaluated

- Manganese greensand filtration
- Ultra-filtration (membrane)
- Mixed media filtration
- ATEC Iron & Manganese Removal System
## Operating Parameters

<table>
<thead>
<tr>
<th></th>
<th>Greensand</th>
<th>Ultra-filtration</th>
<th>Mixed Media</th>
<th>ATEC Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cl$_2$ Dose</td>
<td>2.4</td>
<td>2.4</td>
<td>2.4</td>
<td>1.6</td>
</tr>
<tr>
<td>KMnO$_4$</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>0.0</td>
</tr>
<tr>
<td>Flow (gpm/ft$^2$)</td>
<td>5.0</td>
<td>295</td>
<td>7.0</td>
<td>11.0</td>
</tr>
<tr>
<td>Head Loss (psi)</td>
<td>2-10</td>
<td>150</td>
<td>3-5</td>
<td>2-3</td>
</tr>
</tbody>
</table>
Comparison of Water Quality

<table>
<thead>
<tr>
<th></th>
<th>Mn (mg/L)</th>
<th>Fe (mg/L)</th>
<th>H₂S</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influent Water</td>
<td>0.25</td>
<td>0.3</td>
<td>Present</td>
</tr>
<tr>
<td>Greensand</td>
<td>0.005</td>
<td>0.01</td>
<td>Absent</td>
</tr>
<tr>
<td>Mixed Media</td>
<td></td>
<td></td>
<td>Absent</td>
</tr>
<tr>
<td>Ultrafiltration</td>
<td>0.005</td>
<td>0.01</td>
<td>Absent</td>
</tr>
<tr>
<td>ATEC Systems</td>
<td>0.0013</td>
<td>0.01</td>
<td>Absent</td>
</tr>
</tbody>
</table>

Note: Mn and Fe for Mixed Media not completed due to long contact time.
Summary of Capital Costs

- Greensand $1,160,000
- Ultra-filtration 1,375,000
- Mixed media 1,160,000
- ATEC system 355,000
## Capital Cost, ATEC Systems

- Filtration equipment: $108,000
- Pump & control installation: 45,000
- Chlorine generator, etc.: 25,000
- Site work and building: 82,000
- Design, permits & other: 75,000

Total cost: $355,000
Comparative O & M Costs

- Greensand filtration: $31,000
- Ultra-filtration: 28,000
- Mixed media filtration: 25,000
- ATEC systems: 7,400

Source: Clark Public Utilities
Clark Public Utilities, Well 21
Reasons for Cost Difference

- More efficient removal of soluble metals results in higher service flow rates
- Simple, uncomplicated system, small footprint
- Mono-media filter beds
- Flexible, adaptable modular design
- Rapid installation
- Less chemical feed and control equipment
- ATEC Systems builds its own filter vessels and related equipment
Clark Public Utilities, Well 110

- Capacity 420 gpm
- AS-721 06/ 1996

**Raw Water**
- Fe = 0.7 -1.6 mg/L
- Mn = 0.17 mg/L

**Treated Water**
- Fe = <0.001
- Mn = <0.001

**Loading Rate** = 14.9 gpm/sf

**Backwash--infiltration**

**Cost**
- Equipment $30,000
- Project $100,000
CPU Well 110 Cost Detail

- Treatment equipment $ 29,800
- Chlorine generator 15,000
- Installation & piping 15,000
- Building, electrical, etc. 20,000
- Design, permits, etc. 15,000
- Sales tax 6,000
- Total $100,800
# CPU Well 110 Treatment Equipment Bids

- **ATEC Systems Bid**: $28,000
- **Bid 2**: 69,158
- **Bid 3**: 165,125
- **Bid 4**: 237,800

*Note: Prices do not include freight or sales tax.*
Well 110 Backwash Facts

- Backwash frequency -- typically at about 16 hours of operation or 375,000 gallons of production (4,400 gallons per cubic foot of media or about 588 bed volumes)
- Backwash rate is approximately 30 gpm/ft² for an average of 4 minutes per filter or 4,200 gallons per cycle. This is less than 0.9 % of total production
Backwash (Continued)

- Backwash rate is the minimum required to properly fluidize the media bed. This is because of comparatively high weight of media which is, for example, similar to garnet.
- Our system uses frequent backwash to reduce the total effluent volume handled at any one time and, thereby, reduce costs for related items.
Clark Public Utilities, Well 110
Backwash Cycle, June 1996
California Water Service Co.
Bakersfield Station 107-1

- Production 575 gpm *
- AS-721 04/2002

- Raw Water
  - Fe = 0.6 mg/L
  - Mn = 0.31 mg/L

- Treated Water
  - Fe = <0.01
  - Mn = <0.005

- Loading Rate = 7.3 gpm/sf
- Backwash--infiltration

- Cost
  - Equipment $75,000
  - Project $212,000

* Plant capacity is 800 gpm.
Bakersfield Station 107-01
California Water Service Company
Marysville Well 11-01

- Capacity: 1,100 gpm
- Installed: Spring 2003
- Raw Water:
  - pH: 7.5
  - Fe: 0.025mg/L
  - Mn: 0.45 mg/L
  - H₂S: ND-0.2 mg/L
- Finished Water:
  - Fe: ND
  - Mn: <0.01 mg/L
- Loading Rate: 11 gpm/sf
- Disposal to Sanitary Sewer
- Cost:
  - Equipment: $115,000
  - Project: $635,000
Yuba City Well 9
Yuba City Well 9, Pre-Existing 600 gpm Layout
Yuba City Well 9
New 1,200 gpm Treatment Plant
## Yuba City Well 9 Cost Summary

### Design/Build GMP
- Engineering: $73,000
- Electrical: 20,000
- Installation, Yard Piping & Mechanical: 67,000
- Building & Chlorine: 20,000
- Filters: 180,000
- Sales Tax: 26,500
- Bonding, OH, Profit & Contingency: 70,000
- Total: $456,500

### Water Quality
- **Design Flow**
  - GPM: 1,200
  - GPM/SF: 7.95
- **Raw Water Quality (mg/L)**
  - Iron: 0.150
  - Manganese: 0.277
  - Arsenic: 0.020
  - Ferric Chloride Dose: 3.000
- **Treated Water Objective (mg/L)**
  - Iron: ≤0.003
  - Manganese: ≤0.001
  - Arsenic: ≤0.004
City of Lacey, WA Well 7

- City’s first and only treatment facility
- Treats Iron, Manganese and H$_2$S
- City initially required dechlorination
- Design/Build Project
- Project Completed in Summer of 2001
### City of Lacey, Well 7

**Water Quality Parameters**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating flow (gpm)</td>
<td>1,700</td>
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<tr>
<td>pH</td>
<td>7.8</td>
</tr>
<tr>
<td>Temperature</td>
<td>11° C</td>
</tr>
<tr>
<td>Iron (mg/l)</td>
<td>0.450/&lt;0.001</td>
</tr>
<tr>
<td>Manganese (mg/l)</td>
<td>0.445/&lt;0.001</td>
</tr>
<tr>
<td>Hydrogen sulfide</td>
<td>present/&lt;0.001</td>
</tr>
</tbody>
</table>
Lacey Well 7, Iron & Manganese WTP
Site Schematic
Lacey Well 7, Iron & Manganese WTP
Supply and Backwash Drain Detail
Lacey Well 7
## City of Lacey
### Well 7 Project Budget

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
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</thead>
<tbody>
<tr>
<td>Engineering/Design</td>
<td>$85,000</td>
</tr>
<tr>
<td>SCADA Design/Fabricate</td>
<td>$30,000</td>
</tr>
<tr>
<td>Filters &amp; Media</td>
<td>$240,000</td>
</tr>
<tr>
<td>Chlorine Generation System</td>
<td>$61,000</td>
</tr>
<tr>
<td>Construction</td>
<td>$173,000</td>
</tr>
<tr>
<td>Sales Tax</td>
<td>$40,000</td>
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<tr>
<td><strong>Sub-total</strong></td>
<td><strong>$629,000</strong></td>
</tr>
<tr>
<td>Building (2,400 sf)</td>
<td>$225,000</td>
</tr>
<tr>
<td>City Administration</td>
<td>$120,000</td>
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<tr>
<td><strong>TOTAL</strong></td>
<td><strong>$974,000</strong></td>
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</table>
Sample Bid Results
Treatment Equipment Bids

- **King County WD 111**
  - 09/30/2004
  - Iron & Manganese Treatment equipment for four wells for delivery between 1/15/2005 to 8/15/2005
    - 177 GPM Well
    - 450 GPM Well
    - 650 GPM Well
    - 850 GPM Well

**Bid Summary by Vendor**
- Bid #1 $410,176
- Bid #2 $400,956
- ATEC Bid $289,201

- **Bayview Beach WD**
  - 01/22/2007
  - Iron & Manganese Treatment Equipment for 250 gpm Well for Delivery 04/2007

**Bid Summary by Vendor**
- Bid #1 $140,000
- Bid #2 $110,000 ($192K 1st)
- ATEC Bid $48,000

- **Cottonwood, Arizona**
  - 12/19/2006
  - Iron, Manganese & Arsenic Treatment Equipment for 11 wells treated on five sites, 5,000 gpm, Late 2007-2008

**Bid Summary by Vendor**
- Bid #1 $2,650,000
- Basin/ATEC $1,550,000
Typical Cost
50 GPM Arsenic Treatment Train

- 5 GPM/SF
  - 18-60-06
  - $27,000
- 6 GPM/SF
  - 18-60-05
  - $22,500
- 7 GPM/SF
  - 18-60-04
  - $19,000

- These systems all backwash at approximately 50 gpm which corresponds to the well output.
Typical Cost
100 GPM Arsenic Treatment Train

- 5 GPM/SF
  - 24-60-07
  - $37,800
- 6 GPM/SF
  - 24-60-06
  - $32,000
- 7 GPM/SF
  - 24-60-05
  - $26,500
- These systems backwash at approximately 95 gpm.
Typical Cost
500 GPM Arsenic Treatment Train

- 5 GPM/SF
  - 48-60-08
  - $124,000
- 6 GPM/SF
  - 42-60-10
  - $115,000
- 7 GPM/SF
  - 42-60-08
  - $95,000
- These filters backwash at 350 GPM.
Typical Cost
1,000 GPM Arsenic Treatment Train

- **5 GPM/SF**
  - 48-60-16
  - $250,000

- **6 GPM/SF**
  - 48-60-14
  - $220,000

- **7 GPM/SF**
  - 48-60-12
  - $186,000

- The 48” diameter filters backwash at about 350 GPM while the 42” diameter filters backwash at 270 GPM
Pilot Testing

The Critical First Step
Why Pilot Test?

- ATEC Systems Pilot Tests every installation because:
  - We believe that pilot testing is good science, good engineering, and good business
  - It saves our customers money both in the short-run and over the life of the treatment plant
  - It allows us to control costs by removing the need to account for probable failure of some installations
  - It can significantly affect how a plant is designed. It helps engineers do a better job
Pilot Testing and Pre-Design Objectives

- Develop a reliable prediction of full-scale treatment system performance.

- Develop Basis of Design.
  - Identify any unusual treatment requirements.
  - Optimize flow and oxidant feed rates for specific source water.
  - Properly size the treatment system and its components.
  - Develop basis for accurate cost estimates.

- Develop accurate cost estimates
  - Capital cost
  - O & M expenses
Pilot Testing and Pre-Design

Objectives (continued)

- Determine method of waste stream disposal
- Identify any permit issues that affect the project
- Satisfy Health Department and other regulatory requirements.
- Fulfill requirements for ATEC Systems performance guarantee.
A_TEC Systems Pilot Filters

- Built to mimic full-scale system
- Manifold and backwash set up similar to full-scale system except that it is manually controlled rather than automatic
- Flow rates of up to 20 gpm/sf
- Variable sidewall height for alternative media and conditions.
Pilot Testing Equipment

- **Process Equipment and Supplies**
  - Multiple Treatment Trains
  - Flow meters
  - In-line Chlorine Analyzers & pH Meter
  - Data Logging Equipment
  - Solution metering pumps
  - Necessary chemicals
  - Automatic Samplers

- **Test Equipment**
  - Spectrophotometer and appropriate reagents
  - pH meter
  - Turbidimeter
  - Digital Titrator/Stir Plate
  - Scales
  - 0.45 micron filter
  - Other Equipment as needed
ATEC Systems Pilot Test Equipment
Pilot Trailers (Continued)
Site Requirements for Testing

- Access to site
- Source water, 15-30 gpm, 35-100 psig
- Power, 110 VAC for injection equipment and lighting
- Disposal of water and backwash effluent
Information Needed from Utility

- Inorganic test results—all available
- Organic test results—all available
- Well log *
- Pump curve *
- Drawing of well building and site *
- Standard building layout or specifications *
- Water rights permit *
- Existing electrical capacity *

* Items needed for pre-design report
What we test for and Why

- **Raw Water**
  - pH and Temperature
  - Iron
  - Manganese
  - Arsenic
  - Hydrogen Sulfide
  - Ammonia
  - Silica
  - Chlorine Demand
  - Other parameters as appropriate

- **Treated Water**
  - pH and Temperature
  - Iron
  - Manganese
  - Arsenic
  - Hydrogen Sulfide
  - Ammonia
  - Silica
  - Chlorine Residual
  - Other parameters as necessary
### Table 8
Summary of Pilot Study Test Conditions
Lakewood Water District, Angle Lane Well S-1
June 5-8, 2000

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Time</th>
<th>Media Meter Reading (Gallons)</th>
<th>Average Flow (gpm)</th>
<th>Loading Rate (gpm/ft²)</th>
<th>Contact Rate (gpm/ft³)</th>
<th>Contact Time (Minutes)</th>
<th>Cl₂ Dose (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start</td>
<td>11:15</td>
<td>-</td>
<td>8.60</td>
<td>10.95</td>
<td>3.65</td>
<td>2.05</td>
<td>1.42</td>
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<tr>
<td>1</td>
<td>11:20</td>
<td>42.6</td>
<td>8.52</td>
<td>10.85</td>
<td>3.62</td>
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<td>2</td>
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<td>383.4</td>
<td>8.52</td>
<td>10.85</td>
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<td>3</td>
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<td>897.6</td>
<td>8.57</td>
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<td>4</td>
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<td>1,413.9</td>
<td>8.61</td>
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<td>5</td>
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<td>6:00</td>
<td>8,683.8</td>
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<td>68</td>
<td>7:00</td>
<td>9,313.5</td>
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<td>13.40</td>
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<td><strong>9.50</strong></td>
<td><strong>12.09</strong></td>
<td><strong>3.64</strong></td>
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</table>

**Notes:**
- Run #1 ended at 12:40 on June 7, 2000. Run #2 began at approximately 16:00, June 7, 2000.
- Sodium hypochlorite concentration was 5,927 mg/L (0.05927%).
Table 9
Summary of Pilot Test Results
Lakewood Water District, Angle Lane Well S-1
June 5-8, 2000

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Influent Water</th>
<th>Effluent Water</th>
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<tr>
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<td>NH₃-N</td>
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<tr>
<td>3</td>
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<tr>
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<tr>
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</table>

Total or Average 7.9 0.08 0.035 0.064 0.101 7.9 0.45 0.001 0.003 0.002

Average as Percent of MCL 21.3% 202.0% 0.89% 4.29%
Average Removal Rate 95.81% 97.87%

Non Detect, indicating the absence of a metal or chemical at or above the method detection limit is shown as "-" and calculated in the total or average as zero.
Pilot Test Results
Chlorine Dosage & Free Chlorine Residual
Angle Lane Well S-1
June 5 – 8, 2000
Pilot Test Results
Manganese Removal Using AS-721 Filter Media
Angle Lane Well S-1
June 5 – 8, 2000
Pilot Test Results
Iron Removal Using AS-721 Filter Media
Angle Lane Well S-1
June 5 – 8, 2000
Pilot Test Results
Detailed Flow and Chlorine Dose and Residual Data
Angle Lane Well S-1
June 5 – 8, 2000
Preliminary Design

- Water quality analysis
- Pump sizing
- Preliminary building layout
- Piping requirements
- Treatment requirements & calculations
- Site review and site layout
- List of materials and manufacturers specifications to be used
- 30% design drawings
- Cost estimate
- Schedule for completion of the project