Silicon Valley Advanced Water Purification Center

SJ/SC Regional Wastewater Treatment Facility

SBWR Terminal Pump Station

SVAWPC
Benefits of new purification center

- Water quality benefit
- Operational benefit
- Potable Reuse Demonstration benefit
Purifying with proven technologies

WASTEWATER TREATMENT PLANT

Secondary Effluent

Highly purified water

Silicon Valley Advanced Water Purification Center

1. Microfiltration
2. Reverse Osmosis
3. Ultraviolet Light
Microfiltration

- 0.1 Micron
- 8 racks
- 112 module/rack
- >6000 fibers/module
- 6,500 miles of fiber

Cutaway sample of a microfiltration cell
Reverse Osmosis

- <0.0001 Micron
- 1 nM
- 3 Trains
- 80 Vessels/Train
- 2 Phase
- 85% Recovery
Ultraviolet Disinfection

- 6 reactor sets
- 2 stage
- 50-80 mJ/cm²
- 40 bulbs/reactor
- 480 bulbs
- Low Pressure
- High Output
CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD

SAN FRANCISCO BAY REGION

ORDER 96-011 - GENERAL WATER REUSE REQUIREMENTS FOR: MUNICIPAL WASTEWATER AND WATER AGENCIES
### Water Quality Requirements

#### Operating Permit

<table>
<thead>
<tr>
<th>Total Coliform</th>
<th>&lt;2.2 MPN/100ml (7-day median)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt;23 MPN/100ml (Any sample)</td>
</tr>
<tr>
<td></td>
<td>Daily samples from UV Effluent</td>
</tr>
</tbody>
</table>

#### Filtered Recycled Water (Microfiltration Filtrate)

<table>
<thead>
<tr>
<th>Turbidity</th>
<th>0.2 NTU (No more than 5% of the time within a 24-hr period)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.5 NTU (At any time)</td>
</tr>
</tbody>
</table>
Process Monitoring - MF

April 2014 MF Influent/Effluent Turbidity

Turbidity vs. Date

- MF_FEED_NTU
- MF_FILTRATE_NTU
Process Monitoring - MF

**Goals of Demonstration Testing**

Turbidity

MF Filtrate Turbidity

Online meter fault, actual turbidity ~0.12
## Microfiltration Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Requirement Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Membrane FLUX</td>
<td>≤25 gfd</td>
</tr>
<tr>
<td>Transmembrane Pressure (TMP)</td>
<td>≤25±psi</td>
</tr>
<tr>
<td>Membrane Integrity Test (MIT)</td>
<td>Daily – Decay &lt;0.3psi (air-pressure hold for 5-mins)</td>
</tr>
</tbody>
</table>
Process Monitoring - MF

April 2014 MF Rack Pressure Decay Testing (PDT)
## Requirements for Ultraviolet Disinfection

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Specification</th>
</tr>
</thead>
</table>
| UV Disinfection Dose                       | Under MF Mode, 80 mj/cm²  
Under RO Mode, 50 mj/cm²                                                           |
| UV Reactor Flow                            | 2.0 MGD (MF)  
2.86 MGD (RO)                                                               |
| UV Intensity Sensor Calibration Check      | Monthly (at least)                                                             |
| Duty UV Sensor Intensity: Reference Intensity Ratio | ≤1.2                                                                         |
### More Requirements for Ultraviolet Disinfection

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV Sensor (Wedeco 13599) Recalibration</td>
<td>Annually</td>
</tr>
<tr>
<td>UV Reactor Flow Meter Verification</td>
<td>Monthly</td>
</tr>
<tr>
<td>UV Transmittance (UVT)</td>
<td>65% MF/ 95% RO</td>
</tr>
<tr>
<td>UVT Meter Inspections</td>
<td>Weekly</td>
</tr>
<tr>
<td>UV Lamps (Wedeco XLR30) Hours of Operation</td>
<td>10,074 (Max)</td>
</tr>
</tbody>
</table>
UV Startup Performance

UV Layout
- 8 mgd
- 5 duty trains
- 1 redundant train
- 2 reactors per train

System DDW Approved for Tertiary Recycled Water Production
UV Startup Performance

- Sensors Accurate to UVT of 50%-97%
- RO Permeate UVT of 99.7% (calibrated bench)
- MF Filtrate UVT of 71% (calibrated bench)
# Bioassay Testing and Future Testing

## UV Layout
- 8 mgd
- 5 duty trains
- 1 redundant train
- 2 reactors per train
- 1.6 mgd per train

## Table 5

<table>
<thead>
<tr>
<th>Test #</th>
<th>Flow, mgd</th>
<th>UVT, %</th>
<th>Power, %</th>
<th>Train tested</th>
<th># of reactor(s) in operation</th>
<th>Measured UV Dose(^{(1)}), mJ/cm(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td>1.30</td>
<td>89.0</td>
<td>50</td>
<td>1</td>
<td>1</td>
<td>119.0</td>
</tr>
<tr>
<td>12</td>
<td>1.811</td>
<td>89.2</td>
<td>50</td>
<td>1</td>
<td>1</td>
<td>105.0</td>
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<tr>
<td>13</td>
<td>1.81</td>
<td>93.6</td>
<td>50</td>
<td>1</td>
<td>1</td>
<td>111.0</td>
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<tr>
<td>14</td>
<td>1.82</td>
<td>89.1</td>
<td>50</td>
<td>1</td>
<td>1</td>
<td>98.7</td>
</tr>
<tr>
<td>15</td>
<td>2.86</td>
<td>88.4</td>
<td>50</td>
<td>1</td>
<td>1</td>
<td>67.5</td>
</tr>
<tr>
<td>16</td>
<td>2.85</td>
<td>94.1</td>
<td>50</td>
<td>1</td>
<td>1</td>
<td>110.1</td>
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<tr>
<td>17</td>
<td>2.85</td>
<td>92.2</td>
<td>75</td>
<td>1</td>
<td>1</td>
<td>129.7</td>
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<tr>
<td>18</td>
<td>2.85</td>
<td>99.7</td>
<td>50</td>
<td>1</td>
<td>1</td>
<td>162.3</td>
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<tr>
<td>19</td>
<td>1.29</td>
<td>99.7</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

\[^{(1)}\]: Dose estimated at >800 mJ/cm\(^2\)
Records should be maintained on UV lamp age and replacement.

Monthly reporting to the Regional Board includes:
1. Daily total coliform bacteria monitoring
2. Maximum daily coliform reading for previous month
3. Minimum daily chlorine residual
4. Daily maximum turbidity
5. Daily UV compliance determinations, including minimum daily UV dose.
6. Summary of operational problems, plant & equipment breakdowns, diversions to emergency storage or disposal, and all corrective and preventative actions taken (CM & EM Reports)
## Current Log Removal Estimates

<table>
<thead>
<tr>
<th>Pathogenic Microorganism</th>
<th>Log Removal Goal (Sect 60320.108)</th>
<th>Primary and Secondary Treatment</th>
<th>MF</th>
<th>RO</th>
<th>UV (~800 mJ/cm²)</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viruses</td>
<td>12</td>
<td>1.9</td>
<td>0</td>
<td>1.7</td>
<td>6</td>
<td>9.6</td>
</tr>
<tr>
<td>Giardia</td>
<td>10</td>
<td>0.8</td>
<td>4</td>
<td>1.7</td>
<td>6</td>
<td>12.5</td>
</tr>
<tr>
<td>Cryptosporidium</td>
<td>10</td>
<td>1.2</td>
<td>4</td>
<td>1.7</td>
<td>6</td>
<td>12.9</td>
</tr>
</tbody>
</table>
Loading Reverse Osmosis Membranes
System Analytical Data
Turbidity (NTU) 0.084
Temperature 70 °C
pH (units) 6.8
Conductivity (umhos/cm):
Feed 12.96
Permeate 29.76
Concentrate 815.3

TRAIN PROFILE FORM
SCVWD Train No. 1
System Pressures
Feed (psig) 166
1st Stage DP (psi) 18.15
2nd Stage DP (psi) 9.89
Permeate (psig) 10.25

System Flows
Permeate – Total (gpm) 1350
Concentrate (gpm) 329
Process Monitoring – Reverse Osmosis

EC Log Reduction by RO

Log Reduction of EC

4/11/14 12:00:00 AM 4/12/14 12:00:00 AM 4/13/14 12:00:00 AM 4/14/14 12:00:00 AM 4/15/14 12:00:00 AM 4/16/14 12:00:00 AM 4/17/14 12:00:00 AM 4/18/14 12:00:00 AM 4/19/14 12:00:00 AM 4/20/14 12:00:00 AM 4/21/14 12:00:00 AM 4/22/14 12:00:00 AM 4/23/14 12:00:00 AM 4/24/14 12:00:00 AM 4/25/14
Agreements with the City of San Jose

- TDS <60mg/L
- pH 6.5-8.5
- Chloramine Residual 5-10mg/L
- Blended TDS Target 500 ± 50 mg/L
- Dissolved Oxygen >1.0mg/L and Sulfide <0.1mg/L
- RO Brine and Waste Monitoring (CTR, Chronic Toxicity, other constituents)
Chronic Toxicity Testing
Chronic Toxicity Testing

- Normal test species Ceriodaphnia dubia. Acute Chronic Toxicity test species Rainbow trout (Onchorhynchus mykiss)
- Conduct monthly routine sampling to start, then reduced to quarterly
- 1%, 2%, 4% and 8% dilutions of RO Brine
- If there is a finding of “toxicity”, then accelerated (twice per month) sampling required.
Standard Operating Procedures

- There are currently 53 Standard Operating Procedures completed.
- Developed using ISO 9001:14001 QEMS protocols.
- Reviewed for Quality Control.
- SOP Training Videos for each SOP.

Example SOP:

**Receiving and Unloading Aquous Ammonia**

1.0 Scope
This SOP provides information and direction for the safe handling, ventilation, spill response and receiving of the bulk treatment chemical Ammonium Hydroxide.

2.0 Safety

2.1 Chemical Information

2.2 Hazard Properties

2.2.1 Refer to MSDS Sheet for most current safety information.

2.2.2 Highly corrosive liquid, reactive with strong oxidizers, bleaches, and strong acids, producing toxic gases. pH is in the 11.12 range.

2.2.3 Flash Point: N/A

2.2.4 Vapor Pressure: 3.0 psi at 60 °F

2.2.5 Flammability Limits: Lower: 16% (ammonia vapor) Upper: 25% (ammonia vapor)

2.2.6 OSHA PEL 50 ppm (ammonia vapor)

2.2.7 ACGIH TLV-TWA: 25 ppm (ammonia vapor)

2.2.8 IDLH: 300 ppm (ammonia vapor)

2.2.9 Ingestion: Ingestion causes burning pain in mouth, throat, stomach, and esophagus. This is followed by vomiting of blood or by passage of loose stools containing blood. Ingestion of 5-4 ml may be fatal.

2.2.10 Inhalation: if inhaled, will cause nausea, vomiting, breathing difficulty, and convulsions. Shock or loss of consciousness may result. Brief exposure to 500 ppm may be fatal.

2.2.11 Skin Absorption: Ammonia, because of its alkalinity and water solubility, tends to break down and disrupt the outer skin layers, permitting rapid penetration. Even so, ammonia is not a systemic poison, and the effects will be limited to the locally affected areas.

2.2.12 Contact: Causes skin pain and first-degree burns on short exposure. May cause second-degree burns on long exposure.

2.2.13 Eyes: Vapor is irritating to the eyes. Liquid will cause burns.

2.2.14 Effects of Overexposure: Irritation and possible burns of the skin and mucous membranes, headache, saliva, nausea, and vomiting. Difficult or labored breathing and cough with bloody mucus discharge. Bronchitis, laryngitis, soiling up of blood, and pulmonary edema.
Next, close the butterfly valve on the discharge line of the auto strainer.
Consumables
Asset Management

Equipment Data Sheet
Silicon Valley Advanced Water Purification Center

Equipment Type: Influent Strainer
(PMP-1101 Pictured, Typical)

Location #: SVA-1
Location Label: Influent Pumps and Strainers
Drawing Page #: 091

LINKS TO EQUIPMENT REFERENCES
- Submittals
- Manufacturer Specifications
- Manufacturer Cut Sheet
- Manufacturer O&M Manual
- Contract Specifications
- Electrical Wiring Drawings
- Technical Information

**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Manufacturer:</th>
<th>Amiad</th>
<th>Equipment Cost:</th>
<th>Replacement Cost:</th>
</tr>
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<tbody>
<tr>
<td>Type:</td>
<td>EBS-10000</td>
<td></td>
<td>$1,614.00</td>
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<tr>
<td>Cal. #:</td>
<td>KES110B, 14J0101</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In/Out Diameter:</td>
<td>14&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perforation:</td>
<td>300 micron</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manufacturer:</td>
<td>Amiad</td>
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</tr>
<tr>
<td>Type:</td>
<td>EBS-10000</td>
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</table>

**ASSETS**

<table>
<thead>
<tr>
<th>SCADA Tag:</th>
<th>Serial:</th>
<th>Asset Number:</th>
<th>MAXIMO ID:</th>
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<tbody>
<tr>
<td>STR-1101</td>
<td>11-05-100015103</td>
<td>E52345</td>
<td>SVA_00M152345</td>
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</tbody>
</table>

Continued on the next page...
A Training and Knowledge Retention Tool for Operators and Maintenance.

This wiki is designed as a resource for district staff to aid in the operation and maintenance of the Silicon Valley Advanced Water Treatment Plant. **This site is not intended for public use.** Any and all edits/additions must be approved by an administrator. If there are any questions, concerns, or issues with obtaining or using a login, please contact an administrator.
Find more information visit...

www.purewater4u.org

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