OPERATION AND MAINTENANCE MANUAL

Water System Name:

Water System Number:

Street Address:

City & Zip:

Phone:

FAX:
# TABLE OF CONTENTS

**Operations and Maintenance Manual**

<table>
<thead>
<tr>
<th>Section</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section 1</td>
<td>System Identification and Ownership</td>
<td></td>
</tr>
<tr>
<td>Section 2</td>
<td>Introduction and Overview</td>
<td></td>
</tr>
<tr>
<td>Section 3</td>
<td>Responsibilities of Personnel</td>
<td></td>
</tr>
<tr>
<td>Section 4</td>
<td>Regulatory Agency(s) and Regulations</td>
<td></td>
</tr>
<tr>
<td>Section 5</td>
<td>General System Description</td>
<td></td>
</tr>
<tr>
<td>Section 6</td>
<td>System Operation and Control</td>
<td></td>
</tr>
<tr>
<td>Section 7</td>
<td>Testing</td>
<td></td>
</tr>
<tr>
<td>Section 8</td>
<td>Maintenance</td>
<td></td>
</tr>
<tr>
<td>Section 9</td>
<td>Spare Parts, Supplies, and Chemicals</td>
<td></td>
</tr>
<tr>
<td>Section 10</td>
<td>Records and Reports</td>
<td></td>
</tr>
<tr>
<td>Section 11</td>
<td>Emergency Preparedness and Response Procedures</td>
<td></td>
</tr>
<tr>
<td>Section 12</td>
<td>Utilities</td>
<td></td>
</tr>
<tr>
<td>Section 13</td>
<td>Appendices</td>
<td></td>
</tr>
</tbody>
</table>
Appendix A. Equipment Technical Data and Drawings Operations and Maintenance Procedures including Preventive Maintenance and Manufacturer’s Instructions

Appendix B. Operation and Maintenance Forms and Reports

Appendix C. Testing Schedule, Procedures, Forms, and Reports

Appendix D. Spare Parts, Supplies, and Chemicals

Appendix E. Certification Date, Operator # & Classification

Appendix F. Office of State Engineers Well Driller’s Log

Appendix G. Water System Maps, Drawings, Etc. including Points of Collection Identified
Section 1. System Identification And Ownership

System Owned By:
Owner (City, Person, etc.):
Street Address:
City/Town:
Phone:
FAX:

Federal Type: Community
(Circle One) Non-Community
Transient
Non-Transient

Federal Source: Groundwater
(Circle One) Groundwater Purchase
Surface Water
Surface Water Purchase
Groundwater GUDI Surface Water
Groundwater GUDI Surface Water Purchase

Describe Raw Water Source(s):

(EXAMPLE)

Description, Name, Type

Groundwater

- Subsurface water occupying the zone of saturation, from which springs and wells are fed.
- A ground water source includes all water obtained from drilled wells or springs.
- Groundwater is from an approved sand and gravel aquifer.

Groundwater Under the Direct Influence of Surface Water

- any water beneath the surface of the ground with significant occurrence of insects or other microorganisms, algae, or large-diameter pathogens such as Giardia lamblia or Cryptosporidium, or

- significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity, or pH which closely correlate to climatological or surface water conditions.
Direct influence must be determined for individual sources in accordance with criteria established by the State. The State determination of direct influence may be based on site-specific measurements of water quality and/or documentation of well construction characteristics and geology with field evaluation.

**Surface Water**
All water which is open to the atmosphere and subject to surface runoff. Characterized by extreme variability in:

- quantity;
- quality;

**Persons To Contact:**
Name (Mayor, Owner, etc.):
Title (Mayor, Owner, etc.):
Address (Street, P.O. Box):
City/Town:
Phone:

Name:
Title:
Address (Street, P.O. Box):
City/Town:
Phone:

Name:
Title:
Address (Street, P.O. Box):
City/Town:
Phone:

Name:
Title:
Address (Street, P.O. Box):
City/Town:
Phone:

Name:
Title:
Address (Street, P.O. Box):
City/Town:
Phone:

Name:
Certified Operators:
Name:
Title:
Certification Date, Operator # & Classification:
Address (Street, P.O. Box):
City/Town:
Phone:

Name:
Title:
Certification Date, Operator # & Classification:
Address (Street, P.O. Box):
City/Town:
Phone:

Name:
Title:
Certification Date, Operator # & Classification:
Address (Street, P.O. Box):
City/Town:
Phone:

Section 2. Introduction And Overview
This Operations & Maintenance (O&M) Manual is to be used as a reference in the overall operation and maintenance of the Name of Water System Water System. This manual contains the necessary O&M procedures, work sheets and record keeping forms, safety and emergency procedures, and testing and monitoring procedures. This manual is to be updated form time to time to reflect physical and procedural changes to the water system. Also, it is intended this manual be used as a training tool for new employees and as a guide for qualified substitute operators.

Section 3. Responsibilities of Personnel
(EXAMPLE)
Mary White, Mayor
All Managerial and Financial decisions are made by the Mayor.

Sue Black, City Clerk
Responsible for meter reading, billing and collecting, issuing CCR. Reports to the Mayor.
Ken Brown, Chief Operator
Responsible for operation and maintenance of the system; ordering spare parts, chemicals, and supplies; generating the annual Operating and Maintenance Budgets, and generating the monthly report to OPH. Reports to the Mayor.

Bob Blue, Operator
Responsible for recording all readings and performing all tests. Reports to the Chief Operator.

**Section 3. Responsibilities of Personnel**

Name:
Title:
Responsibilities:

Name:
Title:
Responsibilities:

Name:
Title:
Responsibilities:

Name:
Title:
Responsibilities:

**Section 4. Regulatory Agency and Regulations**

New Mexico Environment Department (NMED) is an executive agency of the State of New Mexico. NMED through its Drinking Water Bureau (DWB) was delegated Safe Drinking Water Act (SDWA) primacy in 1978 from the U.S. Environmental Protection Agency (EPA). This delegation gives the NMED the authority to regulate the state drinking water regulations and National Primary Drinking Water Regulations (NPDWR) at Public Water Systems.

DWB is available to answer your questions. For immediate assistance, call the Drinking Water Bureau during regular business hours (Monday through Friday - 8 a.m. to 5 p.m.) - TOLL FREE at 877-654-8720.

**Links**

Drinking Water Bureau
http://www.nmenv.state.nm.us/dwb/Index.htm

Drinking Water Watch
https://eidea.nmenv.state.nm.us/DWW/
General System Description

Raw water is supplied to the system by three (3) 300 GPM @ 65 PSI well pumps pumping from 6 inch casings 600 feet deep with 20 feet long 6 inch screens. The pumps are automatically started and stopped by level control on an elevated 150,000 gallons storage tank. The elevation of the tank maintains 42 to 50 PSI on the distribution system. The raw well water is disinfected with gaseous chlorine prior to leaving each well site. The distribution system consists of 6, 4, 3, and 2 inch PVC pipe and fittings; sampling, isolation, back flow prevention, and flush valves; and fire hydrants. Provisions for line isolation, flushing, and the five entry point sites have been installed. In the event of an electrical power outage, a 50 HP diesel driven generator at each well site will provide the power necessary to keep the total system running. The water system name can supply water to the water system name via a 6 inch tie-in. The tie-in valve is normally closed and a check valve prevents backflow into the Anyplace Waterworks system. Fire protection for the city is also provided. A Site Plan, Water Production System Diagram, and Sampling Tap Locations are provided in the Appendices.

System Operation and Control

Daily operating data are recorded on the Weekly Operations Log Sheet. In addition, sampling and recording of Chlorine content of the finished treated water and residuals in the distribution system are performed daily. Treated water chlorine content is maintained at 1.3 to 1.5 ppm to ensure a minimum 0.2 ppm throughout the distribution system. The results are recorded on the Monthly Chlorine Residual Report. Repairs outside of Routine Maintenance are recorded in a separate Maintenance Log Book.

Well

Operation of the three (3) water well turbine centrifugal pumps is simple. The pump are basically maintenance free. They are started by the low level pressure and shut down by the high level pressure switches on the Treated Water Storage Tank. Manual operation of the pumps can be accomplished by turning the control switch mounted on the pump base from “auto” to “manual” and using the start/stop buttons for the pump motor. See pump operating instructions in the Appendices for detailed Operating and Maintenance Procedures. The pump 4 inch discharge line is equipped with a pressure gauge and a total flow meter. Pressure and flow are recorded once daily at 10 AM on the Weekly Operations Log Sheet.

Emergency Generator

The emergency generators are operated for one hour each week to ensure good working condition of the generator and electrical systems. See Emergency Generator operating instructions in the Appendices for detailed Operating and Maintenance Procedures.
Chlorine Disinfection
Each of the well sites has a sheltered Gas Chlorination System and is forced ventilated. Chlorine
gas is injected into the raw well water just downstream of the pump discharge block valve to
provide 1.3 to 1.5ppm Chlorine in the treated water to storage in order to maintain minimum 0.2
ml/l in the distribution system. Chlorine is supplied to each of the systems from two Chlorine
cylinders via a Regal Gas Chlorination System. Chlorine injection is electrically tied to the well
water pump electricals and automatically starts/stops with the well pump motor start and stop.
The electric powered Royal Chlorinator is fully automatic including the switch over from an
empty Chlorine to the standby full one. See Chlorinator operating instructions in the Appendices
for detailed Operating and Maintenance Procedures.

The treated water is then routed to the Treated Water Storage Tank. Treatment items checked
daily include: Chlorine concentration in the treated water to storage, Chlorine cylinder automatic
switchover, and empty Chlorine cylinder. The chlorine residual is recorded on the Monthly
Chlorine Residual Report. The other readings are recorded on the Weekly Operations Log Sheet.

Treated Water Storage and Transfer
Treated (or Finished) Water is stored for consumption in the 150,000 gallons Treated Water
Storage Tank. The tank is epoxy coated inside and outside for corrosion protection. When the
level in the tank falls to 135,000 gallons, a Low Level Pressure Switch will turn the water well
pumps on. When the tank level rises to 150,000 gallons, a High Level Pressure Switch will shut
the well water pumps down.

Treated Water System items checked daily include: Tank level and Chlorine residual in the
storage tank. Tank level is recorded on the Weekly Operations Log Sheet. Chlorine residual is
recorded on the Monthly Chlorine Residual Report.

Distribution System
The distribution system consists of solid PVC 12 inch water mains; 8, 6, 4, and 3 inch branches,
and 2 inch service connections complete with isolation valve, backflow check valve, and water
meter. Isolation valves are located on the downstream side of all branched tees. 6 inch flush
valves are located at appropriate sites in the system. A site plan is provided in the Appendices
complete with line and valve sizes, isolation and flush valve locations, and ENTRY POINT
monitoring points.

Four sites are tested daily for Chlorine residual. These results are recorded on the Monthly
Chlorine Residual Report.
If a supply interruption occurs, water system name may maintain its treated water supply through a 6 inch tie-in with water system name. A block valve for isolation of the two systems is normally closed. In addition, a check valve was installed to prevent backflow into the water system name. The 6 inch block valve is located at the northwest corner of the trailer park inside a locked valve box.

Fire Protection
4 inch monitors, 300 hundred feet apart, are located on all 6, and 6 Inch lines.

Safety Considerations
Chlorine gas is hazardous and is lethal at high concentrations. Before opening the door to the Chlorine shelter, the exhaust fan must be activated by the outside switch. Inhalation of Chlorine produces Hydrochloric Acid in the lungs. Exposure to Chlorine gas should be immediately followed by a medical examination.

All electricity carrying equipment is in excellent condition to prevent electrical shock. Only awareness will prevent electrical shock when working on part of the electrical systems. When performing maintenance on rotating or electrical equipment, the equipment electrical breaker is locked and tagged.

All rotating equipment couplings are guarded and should remain that way.

Common Operating Problems
No power:
- check emergency generators
- check emergency generator switchovers
- check main breakers
- check pump breakers

Low or no water pressure:
- check for power
- check for broken lines
- check water level in the storage tank

Low Water Storage Tank Storage Level:
- check for water well pumps running
- check for a broken line
- check for faulty low pressure switch
- check for faulty electrical starter system on the water well pumps
Water Storage Tank Overflowing:
- check for faulty high level pressure switch
- check for faulty electrical shutdown on the water well pumps

Trouble shooting individual manufacturer’s or supplier’s equipment or chemical may be found in the Appendices.

Section 7. Testing
Bacterial samples are collected once a month and testing is performed by the Department of Public Health. Lead & Copper samples are collected every three years by the Owner and tested at a certified lab. All test results are kept in a file in the owner’s office.

A standard Chlorine Test Kit is used to determine Chlorine content (maintained at 1.3 to 1.5 ppm) to the Treated Water Storage Tank and free Chlorine residuals (minimum 0.2 ppm at all ENTRY POINT sites) in the distribution system. Samples are caught on the inlet to the Treated Water Storage Tank and at four sample taps on the distribution system. The test is colorimetric. Results are recorded on the Monthly Chlorine Residual Report which is kept in a file in the owner’s office.

Section 8. Maintenance
Well Pump – Little maintenance is required on a turbine centrifugal pump. Replace parts when worn out. See Fair More Pump operating and maintenance instructions in the Appendices.

Gas Chlorinator – A spare Chlorinator is kept in spare parts. Chlorinator repair is performed by the factory. See Royal Chlorinator operating and maintenance manual in the Appendices.

Emergency Generator – Preventative maintenance performed by running unit once per week for one hour. Unit should last 30 to 40 years between overhauls. See Irrigator operating and maintenance instructions in the Appendices.

All equipment is inspected daily. The distribution system is inspected daily when Chlorine residual tests are performed.

Section 9. Spare Parts, Supplies, and Chemicals

(EXAMPLE)
Spare Parts
A. Water Well Pump
   Impeller
   Shaft
   Seal
   Coupling
B. Distribution Piping
6 – 2” Water Meters
2 – 2” Plug Valves
2 – 2” Check Valves
100’ – 2” PVC Pipe
100’ – 3” PVC Pipe
100’ – 4” PVC Pipe
100’ – 6” PVC Pipe
100’ – 8” PVC Pipe
2 – 4” Fire Hydrants
Various 2, 3 and 4 inch pipe fittings

C. Chlorination System
1 - Chlorinator
Tubing
Tubing Fittings
Tubing Valves

II. Supplies
Chlorine Residual Test Tablets
Log Books
Log Sheets
Lab Sheets
Reporting Forms

III. Chemicals
Chlorine Gas

List of Manufacturers and Suppliers
Water Well Pump
Bayne Pump, Inc.
1111 Elm Blvd.
Anytown, La 70001
Phone: (225) 987-1111
FAX: (225) 987-1112

Emergency Generator
Adams Electrical
9999 Elm Blvd.
Section 10. Records and Reports

Following is a list of records and reports kept in the owner’s office:

1. Weekly Operations Log Sheet*
2. Monthly Chlorine Residual Report*
3. Maintenance and Repair Log Book
4. Lead & Copper Test Results
5. E-coli Test Results including MCL’s
6. Sanitary Surveys
7. Consumer Confidence Reports*
8. Operator Certifications and Re-certification Certificates*
9. Monthly Reports sent to OPH Region II
10. La State Sanitary Code, Chapter XII (LAC 51:XII)
11. All correspondence with the Office of Public Health*

* Copies of these are included in the Appendices.

Section 11. Emergency Preparedness and Response Plan

(EXAMPLE)

The Chief Operator is responsible for initiating Emergency Response action. Below are appropriate Emergency Agencies and phone numbers.
State Police                 Town Hospital
    (225) 321-1234             (225) 432-5555

Sheriff Office               Electric Company
    (225) 432-2222             (225) 432-6666

City Police                  Natural Gas
    (225) 432-3333             (225) 432-7777

Fire Department
    (225) 432-4444

Section 12. Utilities
Section 13

Appendices
Please Attach

Appendix A

Equipment Technical Data and Drawings

Operations and Maintenance Procedures
Including

Preventive Maintenance and Manufacturer’s Instructions

Appendix B

Operation and Maintenance
Forms and Reports

Appendix C

Testing Schedule, Procedures, Forms, and Reports
Appendix D

Spare Parts, Supplies, and Chemicals

I. Spare Parts
(EXAMPLE)

A. Water Well Pump
   Impeller
   Shaft
   Seal
   Coupling

B. Distribution Piping
   6 – 2” Water Meters
   2 – 2” Plug Valves
   2 – 2” Check Valves
   100’ – 2” PVC Pipe
   100’ – 3” PVC Pipe
   100’ – 4” PVC Pipe
   100’ – 6” PVC Pipe
   100’ – 8” PVC Pipe
   2 – 4” Fire Hydrants
   Various 2, 3 and 4 inch pipe fittings

C. Chlorination System
   1 - Chlorinator
   Tubing
   Tubing Fittings
   Tubing Valves

II. Supplies

   Chlorine Residual Test Tablets
Log Books
Log Sheets
Lab Sheets
Reporting Forms

III. Chemicals
  Chlorine Gas

Appendix E
  Certification Date, Operator # & Classification

Appendix F
  Well Driller’s Report

Appendix G
  Water System Maps, Drawings, Etc.
    Including
    Points of Collection

TESTING SCHEDULE
  (EXAMPLE)
Chlorine Residual At ENTRY POINT’s – sampled and tested by OPH once per month.

Treated Water Chlorine Content – tested once per day.

Distribution System Chlorine Residuals – four sample taps tested once per day.

Lead & Copper – sampled by Owner and tested at a certified lab once every three years

Disinfection by Products TTHM & HAA5

Asbestos