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U.S. DEPARTMENT OF ENERGY
WASTE ISOLATION PILOT PLANT

WATER DISTRIBUTION SYSTEM (WD00)
SYSTEM DESIGN DESCRIPTION (SDD)

SDD-WD00

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For

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SECTION 1 - SYSTEM DESCRIPTION

The following is a general description of the WIPP Water Distribution System. Detailed information concerning system configuration and specific components is provided in the component indices, drawings and equipment/system files maintained in the Engineering File Room.

The Water Distribution System is composed of two sub-systems. WD01, the Domestic Water Supply and Distribution System, deals with the distribution of all water on the WIPP Site other than water used for fire protection purposes. WD02, the Raw Water, Storage Tanks and Chlorination Subsystem, deals with the supply, treatment, and storage of all water to the WIPP Site. The dividing points between the two subsystems are the discharge and recirc nozzles of the north water storage tank (25-D-001B) and the recirc nozzle of the south storage tank (25-D-001A).

Raw Water, Storage Tanks and Chlorination Subsystem (WD02)

Raw Water

The raw water supply begins about 30 miles north of the WIPP Site, at a connection to a water line owned by the City of Carlsbad (City). The water comes from wells located on the Caprock near Maljamar.

The water line between the City's water line and the WIPP Site is owned by the DOE. The City is contracted by the DOE to operate and maintain the line. In addition, the City is allowed to use the water line to supply water to other customers. In return, the WIPP Site receives its water at no cost.

The water line is a gravity flow design. The major portion of the water line located north of U.S. Highway 62/180 is 24" pipe and was designed for a flow rate of 6375 GPM. Approximately one mile north of the highway, a 16" connection is provided for future water use by the City at a rate of up to 6000 GPM. After the 16" connection, the water line reduces to 10" pipe. This portion of the water line was designed to deliver 375 GPM to the WIPP Site. At the request of the City, WIPP limits its normal flow rate to 100 GPM.

The 30 miles of water line contains the following components along its length: three flow meters (two per design, and one installed by the City at the connection to their commercial water line), three relief valves, two pressure reducing stations, numerous high point air vent valves and blowoff valves, and isolation valves, located at approximately three mile intervals along the water line and on each side of U.S. Highway 62/180's right-of-way.

Each pressure reducing station consists of three parallel lines, two with different size pressure reducing valves and one with a bypass valve. The smaller pressure reducing valve was sized for the design flow rate of 375 GPM while the larger pressure reducing valve was sized for the design flow rate of 6000 GPM.

About two and a half miles north of Highway 62/180, a section of the water line, approximately one mile in length, has been provided with cathodic protection. A total of 40 sacrificial anodes are installed, distributed at ten equally spaced locations. Each location has an above ground test station for monitoring the activity and consumption of the anodes. The cathodic protection installation is maintained by WTS.

At each crossing of a paved road, the pipeline is encased in a larger steel pipe for protection. In addition, the crossing of U.S. Highway 62/180 is sealed to protect against moisture and is electrically insulated.

The water line parallels the west side of North Access Road, turns east towards the site, and comes above ground between the two water storage tanks. This east-west line contains two ultrasonic flow transducers, a relief valve, and a flow control valve; the latter two components are located inside the site's perimeter fence. The flow control valve is adjusted to maintain a flow rate of 100 GPM, as previously stated. The ultrasonic flow transducers supply a flow computer located in the Water Pumphouse, which provides local indication of flow rate and total flow, and remote indication of flow rate in the Central Monitoring Room (CMR).

Once above ground, the water line splits into two fill lines, one for each water storage tank. Each fill line originally contained an automatic fill valve, controlled by the level in its respective water storage tank. However, the fill valves have been removed and the storage tanks are filled manually. A backflow preventer is installed in the fill line to the fire water storage tank for cross-connection protection. The above ground water lines are insulated and electrically heated to prevent freezing in cold weather.

Storage Tanks

Two 180,000 gallon, above ground water storage tanks are located on the WIPP Site. The south tank stores water for use by the Fire Water Supply and Distribution System (FP01). The north tank stores water for use by the Domestic Water Supply and Distribution System (WD01), however, if plant conditions warrant, the north tank can also be used by the Fire Water Supply and Distribution System.

The two storage tanks have essentially the same design, except for the locations of some external connections. Each tank is 32 feet in diameter and 32 feet high at the wall, and is made of carbon steel plate. Each tank has an overflow pipe which prevents its water level from exceeding 30 feet. The tanks are painted on the interior in accordance with AWWA D102, System No. 2, based on vinyl, and are insulated to help prevent the water from freezing.

Each tank was originally required to store water for use by both of the subsystems mentioned above, and to reserve a minimum of 90,000 gallons of water for use only by the Fire Water Supply and Distribution System. To reserve the required fire water, each tank had an internal standpipe connected to the suction piping of the Domestic Water Supply System.

This arrangement limited the amount of water available to the Domestic Water Supply System to approximately 80,000 gallons per tank and reserved the required amount of fire water.

However, due to cross-connection concerns, the tanks are now “split” between the two subsystems. The split was accomplished by creating an “air gap” (main isolation valve removed) in the domestic water connection to the south tank and creating an “air gap” (removed spoolpiece) in the fire water connection to the north tank. This arrangement has reduced the maximum amount of (accessible) domestic water storage to approximately 80,000 gallons, and increased the amount of reserved firewater to approximately 270,000 gallons (all of the south tank plus the reserved portion of the north tank, which is accessed by installing the spoolpiece).

Chlorination

Chlorination of the raw water supplied to the domestic water storage tank is the only form of treatment required to ensure the water meets drinking water quality standards. This is accomplished by the forced injection of fifteen percent hypochlorite solution into the raw water as it enters the water storage tank. The hypochlorite solution can also be injected into the recirc line of the domestic water pumps.

The chlorination equipment is comprised of two identical sets of components. Each set contains a hypochlorite mixing/storage tank, a mixer, an injection pump, and the appropriate instrumentation and controls. One control panel is provided for the equipment. The hypochlorite injection pump has an adjustable discharge rate to permit the addition of the appropriate amount of hypochlorite solution into the raw water supply based on the flow rate of the water.

Operation of the chlorination equipment was to be automatic, operating in conjunction with the automatic fill valves in the water supply lines to the water storage tanks. Since filling of the tanks is performed manually, the chlorination equipment is also operated manually.

The chlorination equipment is located inside the Water Pumphouse, with the exception of the hypochlorite piping between the Pumphouse and the above ground water supply piping to the water storage tanks. The hypochlorite piping outside the Pumphouse is insulated and electrically heated to prevent freezing in cold weather.

Domestic Water Supply and Distribution System (WD01)

The Domestic Water Supply and Distribution System draws water from the north water storage tank and provides domestic water at the design pressure and quantity to site facilities. The system ends at the first above ground connection (flange, union, etc.) to each of the supplied facilities.

Domestic Water Supply System

The Domestic Water Supply System consists of three domestic water pumps, a pressure control valve, a control panel, a flow meter, and necessary valves and piping. The system is located in the Water Pumphouse.

The three water pumps are identical and each will deliver 50% of the system's design flow rate of 375 GPM. Each pump is rated for 188 GPM at 158 feet total head. Each pump end is a single stage, horizontal, end suction, centrifugal type, with mechanical shaft seals. All of the pumps are electric motor driven at constant speed.

The three pumps are arranged in parallel, and are provided with the necessary valves so that any pump may be removed from service for maintenance without affecting the availability of the other two pumps. Additionally, the pumps are positioned within the Pumphouse with adequate space for routine inspection and maintenance.

System pressure to the yard distribution piping is maintained at a constant value by a pressure control valve located in the recirc piping to the water storage tanks. The recirc piping branches off the common discharge piping of the three pumps. The valve opens and closes, recirculating more or less water to the north storage tank, to maintain a constant discharge pressure.

While the south tank stores water for use only for fire protection purposes, the recirc connection to the tank has been maintained. This allows the Domestic Water Supply System to transfer water from the north tank to the south tank, should the need arise.

The Domestic Water Supply System's suction piping from the north water storage tank contains a spoolpiece, which is normally installed. When it is necessary to use the north tank for providing firewater, the supply system will be removed from service and the spoolpiece removed. This will maintain the "split" between the two systems. Once the north tank is no longer needed for supplying the firewater system, and the firewater spoolpiece has been removed, and the water in the tank has been verified as acceptable for domestic use, the spoolpiece will be reinstalled and the supply system restored to service.

The Domestic Water Supply System has been provided with two connections for the tie-in of a portable domestic water tank; such a tank would be needed when the north storage tank is not available for domestic water storage for an extended time period. One connection is on the suction side of domestic water pump 45-G-604A and the other is downstream of the pressure control valve. This arrangement allows the supply system to function normally while using the portable tank.

Flow metering of the Domestic Water Supply System's discharge to the distribution system is performed using two ultrasonic flow transducers and a flow computer. Local indication of flow rate and total flow is provided.

Domestic Water Distribution System

The Domestic Water Distribution System piping is comprised of a rectangular main loop of 6-inch pipe. The piping is buried a minimum of three feet below the surface of the ground to prevent freezing. The sizes of branch lines range between 1-inch and 3-inch pipe.

Shutoff valves are installed in the loop piping on each side of the branch (supply) line from the Water Pumphouse. In addition, shutoff valves are located on each of the four sides of the loop piping and additional valves are located such that no two valves are more than 1200 feet apart. Shutoff valves are located on each branch connection to the main loop piping.

The material of the main loop piping is PVC per AWWA C900, Class 200. Fittings are made of gray or ductile iron, Class 250 or 350, with mechanical joints. Longitudinal movement blocks (thrust blocks) are installed at all four corners of the loop, at the tee near the Water Pumphouse, and at each major branch from the loop.

A 4-inch branch line runs from the site to the Sewage Lagoon (GC03), ending in three water hydrants. The water is used to fill and clean the lagoon's ponds, when necessary.

SECTION 2 - DESIGN REQUIREMENTS

The following design requirements must be maintained during any Water Distribution System modification and reestablished following any maintenance performed on the system.

General Design Requirements

1. The Water Distribution System shall be designed in conformance with the design criteria set forth in DOE Orders 420.1, Facility Safety, and 430.1, Life-Cycle Asset Management.
2. The Water Distribution System shall have a design operating life of 25 years. Equipment and components which may fail or require replacement during this period shall be designed for ease of maintenance.
3. The functional classifications are defined in the Documented Safety Analysis (DSA) and the General Plant Design Description (GPDD).
4. All Water Distribution System piping shall be designed in accordance with ASME B31.1 using 1.2 times the allowable stress for the combination of design pressure, dead load, live load, and upset pressure conditions. A corrosion allowance on the wall thickness of the metallic piping shall be provided above the thickness required by loading criteria.
5. Piping materials shall conform to ASME B31.1 and related ASTM and ASME material specifications.
6. Backflow and cross-connection protection shall be provide as required to preclude the entrance of contaminants into the system.
7. Pressure relief valves and surge relief devices shall be used to preclude system damage from water hammer.
8. The Water Distribution System shall be designed to allow appropriate periodic inspection, testing, and scheduled maintenance for the valves and pumps. The design of the components shall be such that this activity may be performed while the plant is operating normally.
9. The Water Distribution System shall be protected from freezing, as required, to prevent physical damage.
10. All Water Distribution Piping shall be buried a minimum of three feet below existing grade.
11. All carbon steel exposed to the atmosphere shall be primed and coated for protection from corrosion. Cathodic protection shall not be provided unless soil resistivity tests indicate susceptibility to galvanic corrosion.

Subsystem WD01 Design Requirements - Domestic Water Supply & Distribution System

Domestic Water Supply System

1. The system shall be capable of pumping water from the north water storage tank to the Domestic Water Distribution System at a peak flow rate of 375 GPM and a pressure of 60 PSIG.
2. System pressure shall be automatically controlled at a constant value.
3. Three identical centrifugal pumps, all electric motor driven, shall be provided. Each pump shall be capable of delivering 50% of the system's peak flow rate. The pumps shall have cast iron casings and bronze impellers and trim.
4. Pump controls shall allow each pump to operate as follows: in manual, or in automatic, as either a 50% peak flow pump or as a 50% spare. Automatic operation shall be controlled by system pressure signals. As system pressure drops, the designated 50% peak flow pump shall start first, followed by the designated 50% spare pump at a second, lower setpoint. Both pumps shall stop when system pressure rises to a high pressure setpoint. A time delay shall minimize erratic start/stop operation of the pumps.
5. The piping arrangement and configuration at the pumps shall be such that any one pump may be taken out of service for maintenance without interrupting the operability or availability of the other two pumps. The pumps shall be located and arranged in such a manner that access for maintenance, repair, or removal for replacement is possible. Piping shall be arranged for ease of operation, accessibility, maintenance, economy, and appearance.
6. The suction piping to the north water storage tank shall be provided with a spool piece to allow the creation of an air gap, to avoid a cross-connection, when the north tank is being used to supply the Fire Water Supply System (FP01).
7. Piping smaller than ½ inch shall not be used except for necessary instrument service.
8. A flow meter shall be installed in the discharge line from the Water Pumphouse to the distribution system.
9. The following alarms and indication shall be provided locally and in the CMR:
 - High and low water pressure alarms
 - The status of the domestic water pumps

Domestic Water Distribution System

1. The distribution system shall be comprised of one main loop of 6-inch pipe, generally encircling the buildings.
2. Gate valves shall be provided as follows:
 - At a maximum interval of every 1,200 feet.
 - On each side of the tee where the waterline from the Water Pumphouse joins the loop piping.
 - In each branch line, near where the line connects to the main loop piping.
3. Branch lines shall be a minimum size of 2" pipe to the outlet side of their isolation valves. After the valves, branch lines shall be a minimum size of one inch pipe.
4. All piping used in the system shall have a minimum pressure rating of 150 psi.
5. Domestic water supply lines shall comply with the requirements of 40 CFR 141 and 40 CFR 142.

Subsystem WD02 Design Requirements - Raw Water, Storage Tanks and Chlorination**Raw Water**

1. The water line to the site shall be capable of delivering 180,000 gallons of water (fire water reserve) in 8 hours (375 GPM).
2. The water line shall provide a tap, north of U.S. Highway 62/180, for the future use by the City of Carlsbad. The water line above this tap shall be capable of supplying 6,000 GPM, in addition to the 375 GPM flow rate for the WIPP Site.
3. Isolation valves shall be provided in the water line at approximately each three-mile intervals and on both sides of the right-of-way of U.S. Highway 62/180.
4. Flow meters shall be provided at the start of the water line and at the entrance to the WIPP Site.
5. A self-acting flow regulator shall be installed in the supply line to maintain a flow rate of up to 375 gallons per minute.

Storage Tanks

1. Two water storage tanks shall be provided. Each tank shall be sized to store the required fire water reserve of 180,000 gallons. The north storage tank shall store water for use by the Domestic Water Supply System.
2. The tanks shall be of welded steel construction. The tanks shall be designed and fabricated in accordance with NFPA 22, AWWA D100 and AWS D1.1. Erection shall conform to AISC S302 and AISC S326.
3. The Fire Water Supply System (FP01) suction piping inside each tank shall be provided with a vortex plate as required by NFPA 20.
4. The storage tanks shall be insulated to help maintain the temperature of the stored water at or above 42°F, as required by NFPA 22.
5. The interiors and exteriors of the storage tanks shall be painted in accordance with the requirements of NFPA 22 and AWWA D102.
6. Water level indication and a low water level alarm shall be provided for each storage tank, both locally and in the CMR.

Chlorination

1. The water stored in the domestic water storage tank shall be chlorinated.
2. The chlorination equipment shall have a capacity to handle 150% of the maximum expected dosage needed for sterilization of the water, and elimination of tastes and odors.

Applicable Codes and Standards

Subject	Number	Title
General Design	DOE Order 420.1	Facility Safety
General Design	DOE Order 430.1	Life-Cycle Asset Management
Water Quality	EIB/WSR 3	Water Supply Regulations of New Mexico
Water Quality	40CFR141	National Primary Drinking Water Regulations of the US EPA
Water Quality	40CFR142	National Interim Primary Drinking Water Regulations Implementation
Water Quality	AWWA D651	Standard for Disinfecting Water Mains
Water Quality	AWWA D652	Standard for Disinfection of Water Storage Facilities.
Storage Tanks	AWWA D100	Standard for Welded Steel Tanks for Water Storage
Storage Tanks	AWWA D102	Standard for Painting Steel Tanks for Water Storage
Storage Tanks	AWS D1.1	Structural Welding Code, Steel
Storage Tanks	AISC S302	Code of Standard Practice for Steel Buildings and Bridges
Storage Tanks	AISC S326	Design, Fabrication and Erection of Structural Steel for Buildings
Storage Tanks	NFPA 20	Standard for the Installation of Centrifugal Fire Pumps
Storage Tanks	NFPA 22	Water Tanks for Private Fire Protection
Storage Tanks	NFPA 25	Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems
Electrical	NFPA 70	National Electrical Code
Piping	ASME B31.1	Power Piping
Piping	ANSI B16.1	Cast-Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250, and 800
Piping	AWWA C110	Ductile Iron and Gray Iron Fittings, 2 in. through 48 in., for Water and Other Liquids
Piping	AWWA C151	Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand Lined Molds, for Water and Other Liquids
Piping	AWWA C153	Ductile-Iron Compact Fittings, 3 in. through 121 in., for Water and Other Liquids
Piping	AWWA C600	Installation of Ductile-Iron Water Mains and Their Appurtenances
Piping	AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe, 4 in. through 12 in., for Water
Piping	ASTM 1785	Polyvinyl Chlorine (PVC) Plastic Pipe, Schedules 40, 80 and 120
Piping	ASTM 2466	Polyvinyl Chlorine (PVC) Plastic Pipe Fittings, Schedule 40
Valves	AWWA C509	Standard for Resilient-Seated Gate Valves for Water and Sewerage Systems
Water Hydrants	AWWA C502	Dry-Barrel Fire Hydrant
Water Hydrants	NFPA 1963	Standard for Screw Threads and Gaskets for Fire Hose Connections

SECTION 3 - SYSTEM OPERATION AND PRECAUTIONS

System Operation

The Domestic Water Supply System is operated from a control panel in the Water Pumphouse. This panel includes displays of system parameters and alarms. Key system parameters and alarms are also displayed in the CMR.

The receipt and storage of water at the WIPP Site is performed manually. The minimum water level maintained in each water storage tank is administratively controlled by Facility Operations.

Operation of the injection pumps on the two hypochlorite tanks is controlled by float operated switch interlocks which prevent operation of any pump should the level in its associated hypochlorite tank fall below a predetermined minimum level.

Normal operation of the Water Distribution System requires that one hypochlorite tank be available for use at all times.

Distribution system pressure is automatically maintained by the 3 pumps in conjunction with the recirc line pressure control valve. Each pump can be selected to operate in MANUAL, AUTO, or SPARE, as determined by the operator. The MANUAL pump runs continuously, the AUTO pump will come on line if header pressure drops to a predetermined value, and the SPARE pump will come on line if header pressure drops further to another predetermined value. Interlocks prevent the pumps from operating if the north storage tank level is too low.

The chlorine content of the domestic water delivered to the distribution system is monitored on a daily basis. Water samples are taken in the Water Pumphouse and the chlorine content determined using a pocket colorimeter.

Precautions

The following special precautions shall be observed during all Operations and Maintenance activities in the Water Distribution System.

1. Chlorine liquids and solids are present in the Water Pumphouse. These compounds are potentially harmful to skin and lungs and should be avoided.
2. Calcium hypochlorite is present in the Water Pumphouse and can react violently with hydrocarbons (oils, greases, etc.).
3. Face mask, apron, and gloves shall be used when handling calcium hypochlorite.
4. Open and close all valves slowly, so as not to cause sudden pressure changes in the system.
5. Never operate pumps unless they are primed (pump casing full of water), and vented (air removed).

6. Observe pump discharge pressure when first energizing a pump to ensure the pump is operating properly.
7. If the raw water supply to the water storage tanks is shut off manually, the chlorinator shall be isolated from the storage tanks.
8. If the storage tanks are drained, provisions to disperse the water on land and/or storm sewers shall be made.
9. The above ground outdoor piping shall remain trace heated, unless specific actions have been made to drain the piping.
10. If necessary, the section of the raw water pipeline to be maintained or repaired shall be isolated, drained, and vented prior to the removal or repair of equipment located in the raw water pipeline.
11. Differential pressure transmitters can easily be damaged if vendor bypassing and isolation procedures are not followed step by step.
12. Disinfection per AWWA D651 or AWWA D652 shall be performed following any intrusive maintenance work performed on the system downstream of the hypochlorite injection point. Intrusive maintenance work shall be defined as any work which has the potential to adversely affect domestic water quality.

APPENDIX A - SYSTEM INTERFACES

System Providing Service	Service to be Provided For WD00
CF00 & GC00	Provides housing space, support, and embedment for the system equipment. Provides accessibility for periodic maintenance, removal and replacement of equipment. Provides support anchors for performing the maintenance of the equipment.
CM00	Provides electrical signal interfaces from the LPU to the CMR for data, alarms, and control. Provides monitoring of the status of the equipment, parameters, and alarms (both digital and analog).
ED00	Provides normal electric power, lighting, lightning protection, safety grounding and cabling for the equipment. Provides cabling from the instruments to the LPU's. Provides power to motors as follows: <ul style="list-style-type: none"> - 3 pump motors - 15hp, 460v±10%, 3 phase, 60 Hz. - 2 chlorinator pump motors - 1/8hp, 120V±10%, single phase, 60 Hz. - 2 chlorinator mixer motors - 1/20hp, 120V±10%, single phase 60 Hz.
FP00	Provides fire suppression and fire detection & alarm capability.
HV00	Provides suitable environmental conditions (room temperature and relative humidity) for the water distribution equipment in the Water Pumphouse.
PC00	Provides communications equipment in the various locations of equipment as needed for control, surveillance, inspection, and maintenance activities.
System Requiring Service	Service to be Provided by WD00
CA00	Provides makeup water as needed for the Cooling Water System.
CF00 & GC00	Provides water as needed for each building on site for domestic, process, and irrigation needs.
ED00	Provides makeup water for the diesel generators' cooling systems.
FP00	Provides two independent 180,000 gallon storage tanks, designed in accordance with NFPA 20 & 22. (One tank normally supplies FP00, while the other tank reserves a minimum of 90,000 gallons for FP00 use.) Provides a fire water refill capability of 180,000 gallons in 8 hours.
HV00	Provide makeup water as needed for the Chilled Water System.

APPENDIX B - OPERATING LIMITS

Parameter	Limit
Ambient Pumphouse Temperature	65°F to 95°F
Maximum Domestic Water Pressure	80 psi
Minimum Domestic Water Pressure	40 psi
Dissolved Chlorine in Domestic Water - Minimum	0.7 ppm
Dissolved Chlorine in Domestic Water - Maximum	1.2 ppm

APPENDIX C - INSTRUMENTATION & GAUGE REQUIREMENTS

Parameter	Units	Range	Accuracy	Location
Water Storage Tank Level	2	1-100%	±2% FS	CP, CMR
Domestic Water Pressure	1	0-100 psig	± 1% FS	CP
Domestic Water Flow	1	0-200 GPM	± 1%	FC
Domestic Water Flow, Totalized	1	0-999999 Gal.	± 1%	FC
Domestic Water Pumps Running Time	3	0-99999 hr	N/A	CP
Domestic Water Pumps Discharge Pressure	3	0-100 psig	± 5 psi	PH
Domestic Water Pumps Suction Pressure	3	0-15 psig	± 1 psi	PH
Raw Water Pressure	1	0-300 psig	± 5% FS	OS
Raw Water Flow	1	0-150 GPM	± 1%	FC, CMR
Raw Water Flow, Totalized	1	0-999999 Gal.	± 1%	FC

Note: PH = Pumphouse 456
 CP = Control Panel in Pumphouse
 FC = Flow Computer in Pumphouse
 CMR = Central Monitoring Room
 OS = Outside Pumphouse

APPENDIX D - CONTROL SET POINTS

Parameter	Function	Set Point
North Or South Water Storage Tank Level Low Low	Stops Pumps	17' - 6"
Domestic Water Low Pressure	Starts AUTO Pump	60 psig
Domestic Water Low Low Pressure	Start SPARE Pump	50 psig
Domestic Water High Pressure	Stops AUTO & SPARE Pumps	70 psig
Domestic Water System Pressure	Controls Pressure Control Valve	65 psig
Pressure Regulating Valve Open	Pump Interlock	Open
Pressure Regulating Valve Closed	Pump Interlock	Closed

APPENDIX E - ALARMS

Parameter	Set Point	Location
North Water Storage Tank Level Low Low	17'-6"	PH, CMR
South Water Storage Tank Level Low Low	17'-6"	PH, CMR
Pressure Low Low	50 psig	PH, CMR
Pressure Hi Hi	75 psig	PH, CMR
Chlorination Tank #1 Level Low	4"	PH, CMR
Chlorination Tank #2 Level Low	4"	PH, CMR
Domestic Water Pumps Stop	N/A	CMR

Note: PH = Pumphouse (Building 456)
CMR = Central Monitoring Room (Building 451)

APPENDIX F - INSPECTION, TESTING & MAINTENANCE SCHEDULE

Minimum Inspection, Testing, and Maintenance requirements and frequencies for the Water Storage Tanks shall be in accordance NFPA 25. Exemptions to the above requirements are allowed with the approval of the Authority Having Jurisdiction (AHJ).

Maintenance on the water line coming to the site, with the exception of the cathodic protection installation, is performed by the City of Carlsbad via a contract with the DOE.

The need for maintenance on the remainder of the system shall be based on such criteria as the manufacturer's recommendations, the functional classification of the system, the intended function of the components, the consequences of component failure, etc. As an equipment history is accumulated for these components, the scope and frequency of the preventive maintenance should be reviewed, and where appropriate, modified to ensure optimum performance and resource utilization.

The system's maintenance requirements and recommendations are delineated in the following tables:

Subsystem WD01		
Item	Frequency	Activity To Be Performed
Pumps	Semi-Annually	Visual inspection & grease pump end bearings.
Backflow Prevention Devices	Annually	Test to ensure proper operation.
Instrumentation and Controls	Annually	Calibrate gages & pressure loops.
Subsystem WD02		
Item	Frequency	Activity To Be Performed
Storage Tanks	Quarterly	Visual inspection of exterior surfaces, ladders, foundations, and surrounding areas.
	Annually	Visual inspection of exterior paint & insulation.
	3 Years	Internal Inspection.
Supply Line Relief Valve	Annually	Verify proper operation.
Instrumentation and Controls	Semi-Annually	Test storage tanks' low water level alarms.
	Annually	Calibrate gages & storage tanks' level indication loops.
Cathodic Protection	Annually	Monitor activity and consumption of anodes.