



Lawrence Livermore National Laboratory Experimental Test Site (Site 300) Potable Water System Operations Plan

Prepared by:

Ruben P. Ocampo

Mechanical Utilities Systems Engineer
Mechanical Maintenance Division
Maintenance Utilities Services Department
Facilities and Infrastructure Directorate

Wendy Bellah

Environmental Analyst
Environmental Functional Area
Environment, Safety & Health

OPERATIONS PLAN
LAWRENCE LIVERMORE NATIONAL LABORATORY – SITE 300
POTABLE WATER SYSTEM
March 4, 2016

1.0 DESCRIPTION OF SITE 300 DRINKING WATER SYSTEM

The existing Lawrence Livermore National Laboratory (LLNL) Site 300 drinking water system operation schematic is shown in Figures 1 and 2 below. The sources of water are from two Site 300 wells (Well #18 and Well #20) and San Francisco Public Utilities Commission (SFPUC) Hetch-Hetchy water through the Thomas shaft pumping station. Currently, Well #20 with 300 gallons per minute (gpm) pump capacity is the primary source of well water used during the months of September through July, while Well #18 with 225 gpm pump capacity is the source of well water for the month of August. The well water is chlorinated using sodium hypochlorite to provide required residual chlorine throughout Site 300. Well water chlorination is covered in the *Lawrence Livermore National Laboratory Experimental Test Site (Site 300) Chlorination Plan* (“the Chlorination Plan”; LLNL-TR-642903; current version dated August 2013). The third source of water is the SFPUC Hetch-Hetchy Water System through the Thomas shaft facility with a 150 gpm pump capacity. At the Thomas shaft station the pumped water is treated through SFPUC-owned and operated ultraviolet (UV) reactor disinfection units on its way to Site 300. The Thomas Shaft Hetch-Hetchy water line is connected to the Site 300 water system through the line common to Well pumps #18 and #20 at valve box #1.

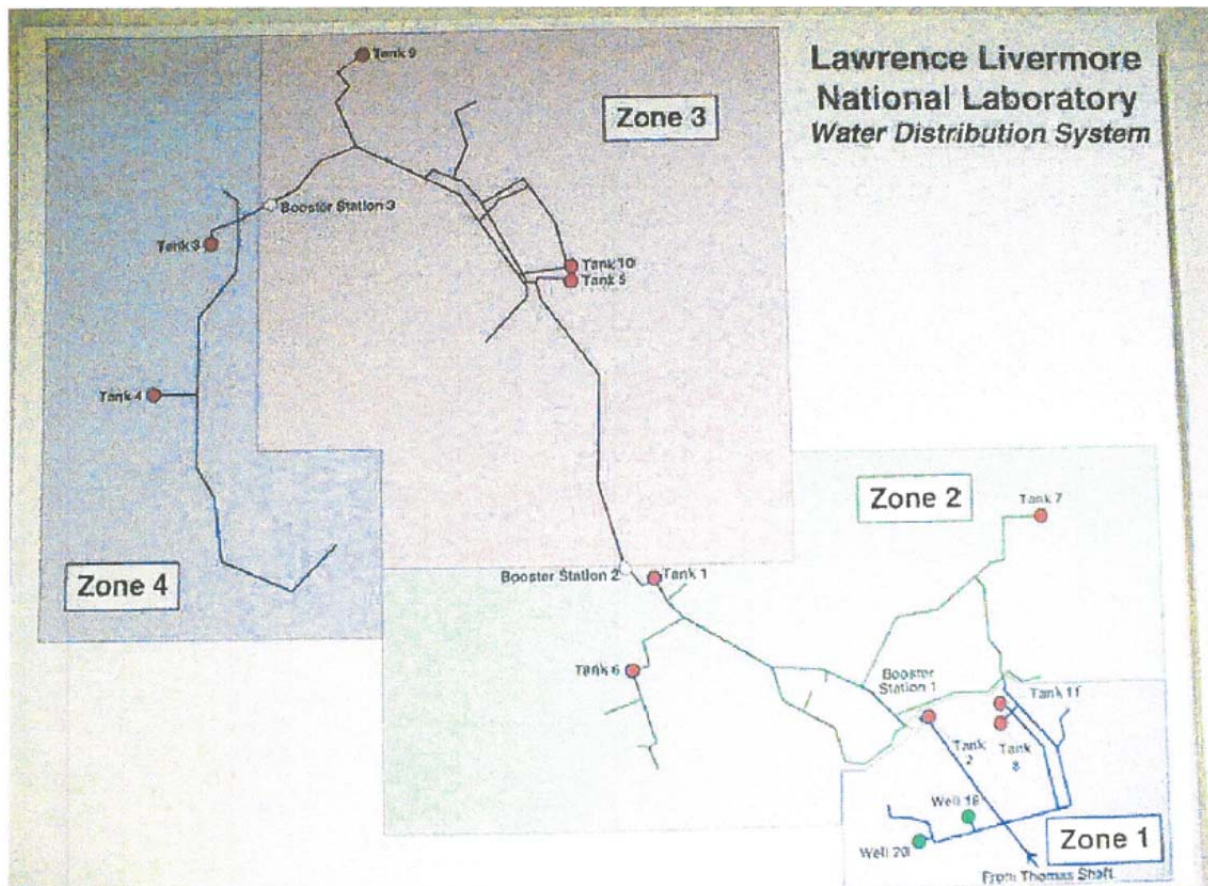


Figure 1 - Lawrence Livermore National Laboratory Site 300 Drinking Water Distribution System

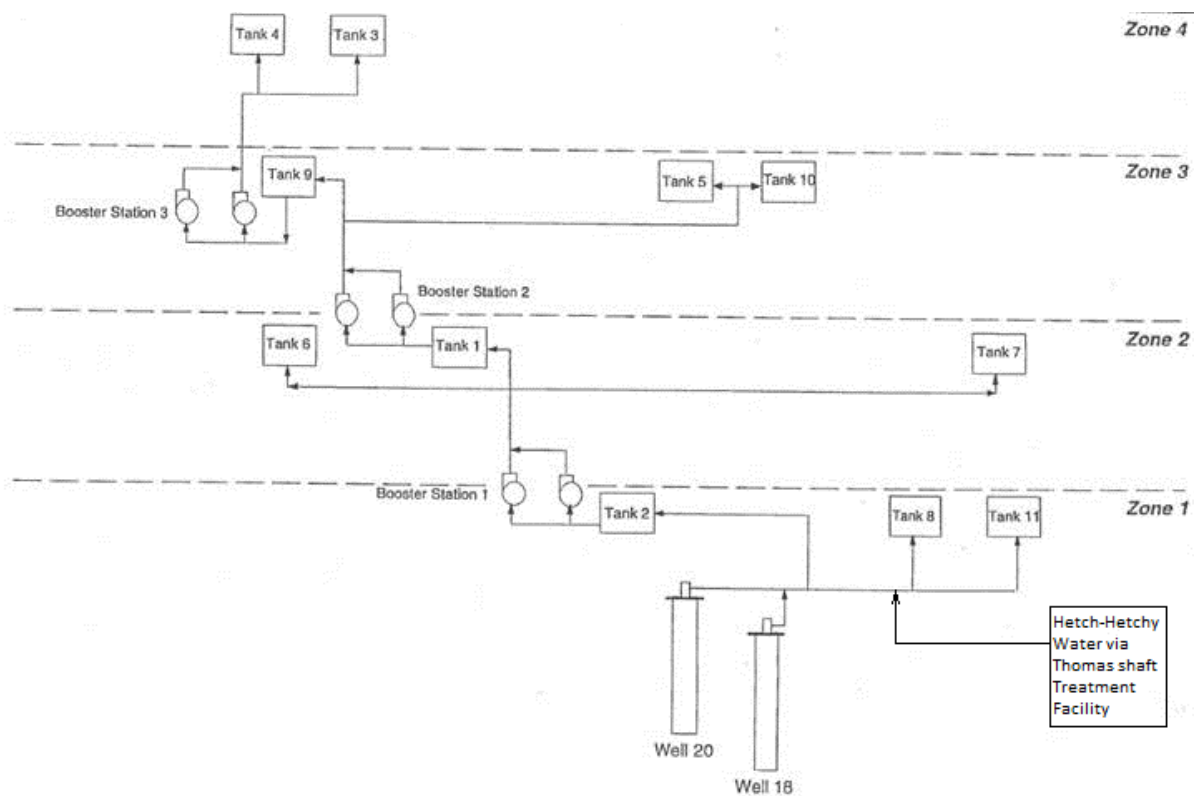


Figure 2 - Lawrence Livermore National Laboratory Drinking Water System Pressure Zones Schematic

The Site 300 water system is divided into four pressure zones (shown on Figure 2) to suit the differences in elevations of the terrain where the buildings and facilities are situated. The water supply is advanced to the higher elevations through booster pumps. The tanks provide required pressures to the intended users. Facility drawing PSM94-300-002EX shows facilities at Site 300 served by the system. A copy of this drawing is included in Appendix A for reference. A full-scale, hard copy of the drawing is maintained in the Building 875 utility maintenance office.

1. The well pumps are in Zone 1, grade elevation 585 feet for Well #20, and 530 feet for Well #18.
2. The Thomas Shaft pumps are at grade 691 feet elevation.
3. The active pump supplies water to the Tanks #2, #8 & #11 to 840.99 feet high water level (HWL) elevation, which store water for the group of buildings in Zone 1, and also as source of water for Zones 2, 3 & 4. The level controller in Tank #2 controls the active well pumps. The level controllers at Tanks #8 & #11 controls the Thomas shaft pumps. Water source is Operator's option depending on availability.
4. Pumps at Booster Station #1 feed Tanks #1, #6 & #7 to 1,123.36 feet HWL elevation, which supply water for Zone 2 buildings and facilities. The level controller in Tank #1 controls the Booster pumps at Station #1.
5. Pumps at Booster Station #2 feed Tanks #5, #9 & #10 to 1,253.00 feet HWL elevation, which supply water for Zone 3 buildings and facilities. The level controller in Tank #10 controls the Booster pump at Station #2.

6. Pumps at Booster Station #3 feed Tanks #3 & #4 to 1523.5 feet HWL elevation, which supply water for Zone 4 buildings and facilities. The level controller in Tank #3 controls the Booster pump at Station #3.
7. The pumps are controlled through a supervisory control and data acquisition (SCADA) system. The tank operating levels and alarm settings are shown on Table 1:

TABLE 1

TANK #	Pump Stop Ft	Pump Start Ft	Low Level Alarm Ft	Low-Low Level Alarm Ft	High-High Level Alarm Ft	Overflow Alarm Ft	Comment
1	19	18	8	6			Controls Booster Sta. #1 pump
2	19	18	8	6			Controls Well pumps #18 & #20
3	21	20	8	6			Controls Booster Sta.#3 pump
10	19	18	8	6			Controls Booster Sta.#2 pump
8 & 11	21.5	19.9	(Equalize w/ Tk#2)	(Equalize w/ Tk#2)	21.75	22	Controls H-H Thomas Shaft Pumps

Site 300 water system operators select the water supply source depending on the availability. Well #20 is preferred over Well #18 based on water quality.

The water distribution system consists of pipe ranging in size from 10” to 2” diameter, in PVC, Ductile Iron and Asbestos cement. The new pipes are of PVC. Older pipes were of the Asbestos Cement Pipe and Ductile Iron Pipes. As pipes are replaced, PVC pipes are used.

The service connections are PVC. Process related functions such as cooling tower make-up that are connected to the potable water system are separated by reduced-pressure (RP) principle backflow devices. A separate RP device is provided for additional protection at the Thomas shaft pumps station.

The water system will be operated according to the Division regulations. The Site 300 operators are certified operators who have knowledge of all drinking water regulatory requirements and will operate the system to comply with all applicable drinking water standards. All water system mechanics receive a minimum of 40 hours of hands on training in equipment operation, safety, electrical and mechanical troubleshooting, preventive maintenance and corrective maintenance for wells, pumps and distribution piping.

Wells #18 & #20 and corresponding well pumps as well as the Booster pumps, Thomas Shaft pumps data sheets are found in Appendix B. Any of the water sources is capable of supplying the required maximum day demand. The storage tanks for each zone are capable of holding enough water to supply their respective zones for 24 hours under maximum day demand (MDD) conditions. Copies of the Reservoir Data Sheets are included for each tank in Appendix C. In addition, a schematic for the piping at each tank (showing fill, drain, and valve locations) are provided in Appendix D.

2.0 SECURITY

The Site 300 water distribution system and well water supply are within the secured boundaries of the government property, where public access is limited. Hetch Hetchy water supply piping crossing a public road between the Site 300 property and a Private property is buried and is out of sight.

3.0 ROUTINE OPERATIONS

3.1 Treatment Chemicals and Disinfection Facilities

The Chlorination system for wells and booster stations utilizes 12.5% sodium hypochlorite for disinfection. The chlorine supply is purchased from Univar in 55 gallon drums, keeping 2 drums extra supply before reordering. The Chlorination Plan is covered under document LLNL-TR-642903, dated August 2013. Supplemental chlorination as required to boost residual chlorine at tank locations is covered in the Appendix E - *LLNL Site 300 Water System Above Ground Storage Tank Chlorine Slugging/Dosing Procedures*.

The Hetch Hetchy water is disinfected at the SFPUC Tesla Chlorination Facility which precedes the Thomas Shaft Pumping Station. The Hetch-Hetchy water is further disinfected through UV reactors at the Thomas Shaft Treatment Facility.

3.2 Well Operation

Under well water control, the combined normal operating volumes on Tank #2, #8 & #11 (Pressure Zone 1) is 18,600 gallons (operating levels are: 19 Ft pump off, 18 Ft pump on), leaving a combined reserve storage capacity of 334,200 gallons, out of the combined gross storage volume of 429,000 gallons. The storage capacity of Tank #2 is 126,000 gallons, Tank #8 is 63,000 gallons, and Tank #11 is 240,000 gallons. Level transducers at Tank #2 control the well pumps through programmable logic controller (PLC) via telephone lines and modem.

The sodium hypochlorite chemical feed pump is set to run when the well pump is running, and includes an automatic controller to adjust speed/injection rate to maintain a residual chlorine level set at each well, in accordance with the Chlorination Plan (LLNL-TR-642903). The set points are adjusted as needed to maintain the desired free chlorine at the nearest user.

3.3 Hetch-Hetchy Water Operation

Under the Hetch-Hetchy water control, the combined operating volume on Tanks #2, #8 and #11 is 30,000 gallons, (operating levels are: 21.5 Ft pump-off to 19.9 Ft pump-on water level), leaving a combined reserve storage capacity of 369,500 gallons. Level transducers at Tank #8 or #11 control the Hetch-Hetchy pumps, through PLC via telephone lines and modem. The difference on the operating level ranges between the Hetch-Hetchy water and the well water sources is to allow the Hetch-Hetchy water to

be used as the primary source of supply, and the well water source as automatic back-up without operator intervention. The 0.9 foot gap is to allow SCADA cycle time delay and instruments accuracy deficiencies and tolerances.

The Thomas Shaft Treatment facility communicates with the SFPUC Tesla Chlorination Facility via very small aperture terminal (VSAT) communications. The communication link between Thomas Shaft Pumping Facility and LLNL Site 300 SCADA is via telephone line and modem.

3.4 Water Circulation System

A system for continuous circulation of water in the storage tanks has been installed and will be operated to aid in maintaining the residual chlorine levels at the tanks. To accomplish the circulation, a single electric motor driven water pump, local motor control, recirculation piping, suction and discharge pressure gages, and a spray nozzle with a solid cone spray pattern characteristic was installed at each existing tank (11 locations total). The pump is a close-coupled PACO Pump Model 10-10707 LC, a NSF 61 compliant, 1-1/4" Inlet, 1" Outlet with a 1/2 horsepower, 1750 RPM TEFC electric motor drive. With the commonly sized pump, the turn over times range from approximately 1.5 days for the smaller tanks (Tanks 1, 3, 4, 5, 6, and 8) to 6.5 days for the largest size (Tank 11). Details of the pump locations and mechanical specifications are provided in the attached plan set (Appendix F).

The circulation system operation will be continuous 24 hours a day, 7 days a week, except at scheduled maintenance of the pump or when issues occur. Scheduled maintenance will be in accordance with the guidelines of LLNL's Preventative Maintenance Management System (PMMS). An uninstalled, spare pump and motor assembly is made available for immediate swap, as necessary. Normal operating pressures will be posted at the pressure gages for reference that may be unique for each tank location. Visual inspection of the pumps to ensure they are operating will occur concurrently with the visual inspection of the water storage tanks.

3.5 Booster Station #1

Booster Station No. 1 pumps water from Tank #2 and discharges to Zone 2 Tanks #1, #6 & #7 through pipelines which also distributes water to Zone 2 buildings and facilities. The Tank #1 level transducer controls the booster pumps.

The sodium hypochlorite chemical feed pump is set to run when the booster pump is running, and includes an automatic controller to adjust speed/injection rate to maintain a residual chlorine level set at the booster station, in accordance with the Chlorination Plan (LLNL-TR-642903). The set points are adjusted as needed to maintain the desired free chlorine at the nearest user.

3.6 Booster Station #2

Booster Station No. 2 pumps water from Tank #1 and discharges to Zone 3 Tanks #9, #5 & #10 through pipelines which also distribute water to Zone 3 buildings and facilities. The Tank #10 level transducer controls booster pumps through PLC via telephone lines and modem.

The sodium hypochlorite chemical feed pump is set to run when the booster pump is running and includes an automatic controller to adjust speed/injection rate to maintain a residual chlorine level set at the booster station, in accordance with the Chlorination Plan (LLNL-TR-642903). The set points are adjusted as needed to maintain the desired free chlorine at the nearest user.

3.7 Booster Station #3

Booster Station No. 3 pumps water from Tank #9 and discharges to Zone 4 Tanks #3, & #4 through pipelines which also distribute water to Zone 4 buildings and facilities. The Tank #3 level transducer controls booster pumps through PLC via telephone lines and modem.

The sodium hypochlorite chemical feed pump is set to run when the booster pump is running, and includes an automatic controller to adjust speed/injection rate to maintain a residual chlorine level set at the booster station, in accordance with the Chlorination Plan (LLNL-TR-642903). The set points are adjusted as needed to maintain the desired free chlorine at the nearest user.

3.8 Supervisory Control and Data Acquisition System

The Site 300 water system is currently monitored and controlled with a Supervisory Control and Data Acquisition (SCADA) system located at B875 control room. The information currently monitored include tank levels, and alarm set point in Tanks 1, 2, 3, 8, 10, and 11, SFPUC Thomas Shaft water quality (turbidity, pH, chlorine residual) and flow rate. The SCADA system also includes the controls for pumps (start/stop levels, and alarm set-points) for the well pumps, booster pumps and SFPUC Thomas Shaft Pumps.

A system integration subcontract is under execution and is scheduled for completion in the fall of 2015. This project is designed to integrate the present Site 300 SCADA water monitoring system and the Site 200 Water SCADA System. In addition, the new SCADA will provide totalized flow data from the Thomas Shaft facility and an improved user interface.

Future plans for the S300 SCADA system include adding the ability to remotely monitor: tank levels for the remaining tanks, THM aeration system flowrates, chlorine residual and pH levels at all of the tanks. At this time there are no definitive plans to implement these SCADA system upgrades. These changes will occur as funding allows. The Operations Plan will be revised, as necessary when upgrades to the SCADA system occur.

4.0 ROUTINE INSPECTIONS AND MAINTENANCE

4.1 Well Site Checks

Well site checks will be performed daily when the well is “on-line”, during equipment and chlorine checks. The well that is “off-line” is inspected weekly. The inspections are done under the supervision of and by the certified Distribution operators. Routine inspections will include security checks and inspection of the well, pump station and chlorination station; collection of samples (as needed), adjustment of hypochlorite feed, recording flow and pressure data and preventive maintenance tasks. Operations staff members are responsible for all routine maintenance, sampling, conducting field analyses and record keeping. Weekly chlorine residual will be checked and adjusted during each visit.

4.2 Storage Tank Checks

Daily visual tank inspections are conducted from the ground and include inspection of the tanks for imminent contamination and health risk factors.

Weekly tank inspections are conducted from the ground and include: 1) general housekeeping; 2) readiness checks; and 3) inspection of equipment, piping and instruments such as tank level indicator, gauges, tank overflow, safety equipment, valves, lighting, tank access ladder, SCADA instrumentation and chlorine residuals.

Quarterly tank inspections include: 1) climbing the tanks (or using a bucket truck) to inspect vents and aeration nozzles; 2) functional checks of electrical equipment; 3) calibration of instrumentation; 4) gage of tank thickness; and 5) general housekeeping. Any identified repairs which cannot be performed immediately and additional maintenance tasks such as painting and weed control will be scheduled, as needed.

The inspection observations, deficiencies and repairs are logged, filed and kept up to date through the LLNL's Preventive Maintenance Management System (PMMS). Summary of maintenance and repair of any individual or all tanks, including start dates, status and completion will be reported from the LLNL's PMMS using the External Reports under the Equipment Work History Report module. See Appendix G for an Equipment Work Schedule. This schedule will be filled for each Tank check at approximately one year interval.

4.3 Professional Tank Inspection and Cleaning

Tanks will be professionally inspected and cleaned (as needed) at least once every five (5) years. The professional inspection and cleaning may be conducted by either: 1) emptying the tank and having workers enter the tank to inspect and remove any sediment by hand; or 2) by using a diver or a remotely-operated vehicle (equipped with a camera) in the full tank to conduct the inspection. In the second method, a suction system is used to remove the solids from the tanks. The deficiencies noted during the inspection will be listed and the respective repairs will be scheduled. The list will be continuously updated and archived.

A summary of maintenance and repair of any individual or all tanks, including start dates, status and completion will be reported from LLNL's PMMS using the External Reports under the Equipment Work History Report module. See Appendix G for Equipment Work Schedule. This schedule will be filled for each tank inspection and cleaning with a 5 year interval.

4.4 Tank Draining Procedures

The following procedures are followed when draining the tanks is necessary:

- The water system is put in manual control and the tank level is lowered by moving water from the tank into the adjacent pressure zones. The water level is initially lowered in the tank by isolating the other tanks in that zone, closing the inlet valve to the tank and pumping down the tank level through the booster station until water in the tank is lowered to within a few feet of the outlet to the booster station.
- The remaining water in the tank is transferred from the tank to a water truck or transportable tank through the service connection at each tank.
- Water from the tank is either de-chlorinated for use as a dust control measure; flushed to the sanitary sewer lines; or is used as make-up water for the on-site sewer pond.

In some cases, the tanks may be drained to the ground. When tanks are drained to the ground, the activity must be coordinated with the Site 300 Environmental Analyst to ensure that the tank draining procedures

are consistent with the California Regional Water Quality Control Board Central Valley Region Order Number R5-2013-0074, *Waste Discharge Requirements for Dewatering and Other Low Threat Discharges to Surface Waters*.

4.5 Maintenance and Testing of Backflow Devices

Lawrence Livermore National Laboratory has certified backflow preventer testers and cross connection prevention specialists who are responsible for LLNL's cross connection control program. All backflow devices are tested annually as PMs are issued for each device. Repair or replacement is done as soon as practical.

4.6 Flushing and Dead End Flushing

Unidirectional flushing of the distribution system will be performed as needed by opening a sample tap at a single service connection at a time beginning at the connection closest to the well and working away from the well to the end of the distribution system. The procedure can be repeated as needed to flush each leg of the system. Dead end flushing is done annually and as needed to increase the chlorine residual in areas of low water use and end of line or dead end areas of the system. This is usually done by opening a fire hydrant closest to the end of the supply line. It may be desirable to increase the chlorine residual prior to flushing to inactivate bacteria. If this is done, the chlorine residual will be monitored at each sample tap and flushing will continue until the residual matches the residual leaving the tank.

4.7 Valve Exercising

Valve exercising is performed by the maintenance mechanics shop and includes inspection of traffic boxes for: identification, access, condition, alignment, dirt/water intrusion and location markers. Valves are initially operated manually and a mechanical exerciser (delivering 70 foot-pounds of torque) may then be deployed, at the operator's discretion, to fully close then fully open the valve. Valve data including condition of the valve and the number of turns are logged. Repairs and additional maintenance tasks will be scheduled as needed. PMs are issued throughout the year so that each valve is exercised annually. PMs are on file in LLNL's PMMS.

4.8 Main Repair and Replacement

Site 300 has distribution operators who oversee main repair and replacement. Main repair and replacement will be performed as needed in accordance with LLNL Facilities Standards relating to Utility (CW) Distribution Piping, Materials of Construction, Testing, Cleaning and Disinfection.

4.9 Flow Meters

Flow meters are calibrated following manufacturer's recommendations. All preventive maintenance is logged and scheduled using an electronic data base to track these procedures.

5.0 MONITORING AND REPORTING

5.1 System Sampling

Sampling of the water sources and distribution system will be conducted in accordance with the schedule defined in the Division's current Drinking Water Permit issued for Site 300 and as described in the most recent versions of the Bacteriological Sample Siting Plan and Stage 2 Disinfection Byproduct Monitoring Plan. A summary of the current sampling schedule is included in the table attached as Appendix H. This

table will be updated when changes to the sampling schedule occur and will be resubmitted to the Division as needed.

LLNL's PMMS will be used monthly to track required sampling events and will include information on: the required sampling locations, the laboratory analyses required for each sample location, and the acceptable time-frame in which the sample must be collected. In the event of a change in sampling frequency, the PMMS will be updated as quickly as possible to reflect the changes.

Approximately two to three weeks before a sampling event is due, sample bottles will be requested from the designated analytical laboratory approved by the State to conduct analysis for drinking water systems. The bottle request will include the sample location identification and the requested analyses for each sample location. Once the sampling is complete, the samples will be delivered under chain of custody protocol to the analytical laboratory for the requested analyses.

5.2 Reporting

Monthly summary reports of all analysis performed will be provided to the Division by the 10th of the following month. Laboratory results will be directly transmitted into the Division database by the analytical laboratory as soon as practical after the analysis as required by State law. Upon learning of an acute water quality event, LLNL Site 300 staff will respond immediately and initiate corrective actions, as appropriate. The Division will be notified of any acute water quality concern as soon as possible, all notifications will comply with the Public Notification Rule. In the event of a violation, LLNL will follow the Division guidance in correcting deficiencies.

6.0 CONSUMER COMPLAINTS

LLNL Site 300 has a customer service department that records all customer complaints and dispatches field crews to address any issues that arise. The phone number (925-423-5211) is provided on the LLNL internal website.

7.0 EMERGENCY OPERATIONS

All storage tanks in each pressure zone provide a reserve capacity. If the potable water storage drops below the respective reserve capacities (See Table 1 for level settings), the control system will send an alarm through SCADA and an autodial alarm notification will be initiated. A manual switchover unit at the electrical service for each well and booster station allows for hooking up and using a portable emergency generator to run the well and at booster pumping stations during power outages.

In the event that potable water cannot be delivered from the storage tank into the distribution system, LLNL will notify the Division and the Site 300 staff will issue a "Do Not Drink" order and post signs at every affected service connection tap and persons on-site will be kept informed through email or direct verbal contact of the status of the water system. Bottled water is always available on site, and will be restocked as needed. Water Shop Leaders and Supervisors are the only persons authorized to lift the "Do Not Drink Order."

In the event of acute contamination of the well, a pump mechanic can lock-out the power supply for the pump if necessary. Well and/or distribution system contamination issues will be responded to by employing standard flushing and disinfection procedures that are used in the public water systems.

7.1 Emergency Power

No emergency generator has been provided with the well and booster stations. However, the main panels are equipped such that a portable generator can be connected in the event of a power failure. The LLNL Site 300 is a major utility operations center and has several emergency portable backup generators on site.

7.2 Emergency Response

The LLNL Site 300 is equipped to respond to emergencies likely to occur in the water system's service area. The Site 300 has a certified operator on call 24 hours a day, seven days a week. The Call Duty Distribution Operator must be able to respond to the site within 60 minutes of receiving notification of an emergency.

7.3 Emergency Notifications

In the event of an emergency involving the water system operation (for instance, a main break), internal notification procedures should be followed. This includes notifying the following personnel as soon as possible of the incident: the shift Operator, the Mechanical Utilities Manager, Site 300 Management, and the Environmental Analyst (if the leak occurs during normal business hours) or the Environmental Duty Officer (EDO; if the leak occurs outside of normal business hours).

In the event of a water quality emergency in which potability of the water has been compromised, the procedures in the Water Quality Emergency Notification Plan should be followed. The Water Quality Emergency Notification Plan is on file with the Division and a copy of the Emergency Notification Plan is provided in Appendix I.

APPENDICES:

- A FACILITY DRAWINGS
Drawing PSM94-300-002EX*

- B PUMP DATA SHEETS
Well Pump #18 Data Sheet*
Well Pump #20 Data Sheet*
Booster Station #1 Data Sheet*
Booster Station #2 Data Sheet*
Booster Station #3 Data Sheet*
Thomas Shaft Well Pumps Data Sheets

- C RESERVOIR DATA SHEETS
T-1 Reservoir Data Sheet*
T-2 Reservoir Data Sheet*
T-3 Reservoir Data Sheet*
T-4 Reservoir Data Sheet*
T-5 Reservoir Data Sheet*
T-6 Reservoir Data Sheet*
T-7 Reservoir Data Sheet*
T-8 Reservoir Data Sheet*
T-9 Reservoir Data Sheet*
T-10 Reservoir Data Sheet*
T-11 Reservoir Data Sheet*

- D TANK PIPING SCHEMATICS

- E LLNL SITE 300 WATER SYSTEM ABOVE GROUND STORAGE TANK
CHLORINE SLUGGING/DOSING PROCEDURES

- F WATER CIRCULATION PUMPING SYSTEM PLAN SET

- G EQUIPMENT WORK SCHEDULE

- H SAMPLING SCHEDULE

- I WATER QUALITY EMERGENCY NOTIFICATION PLAN*

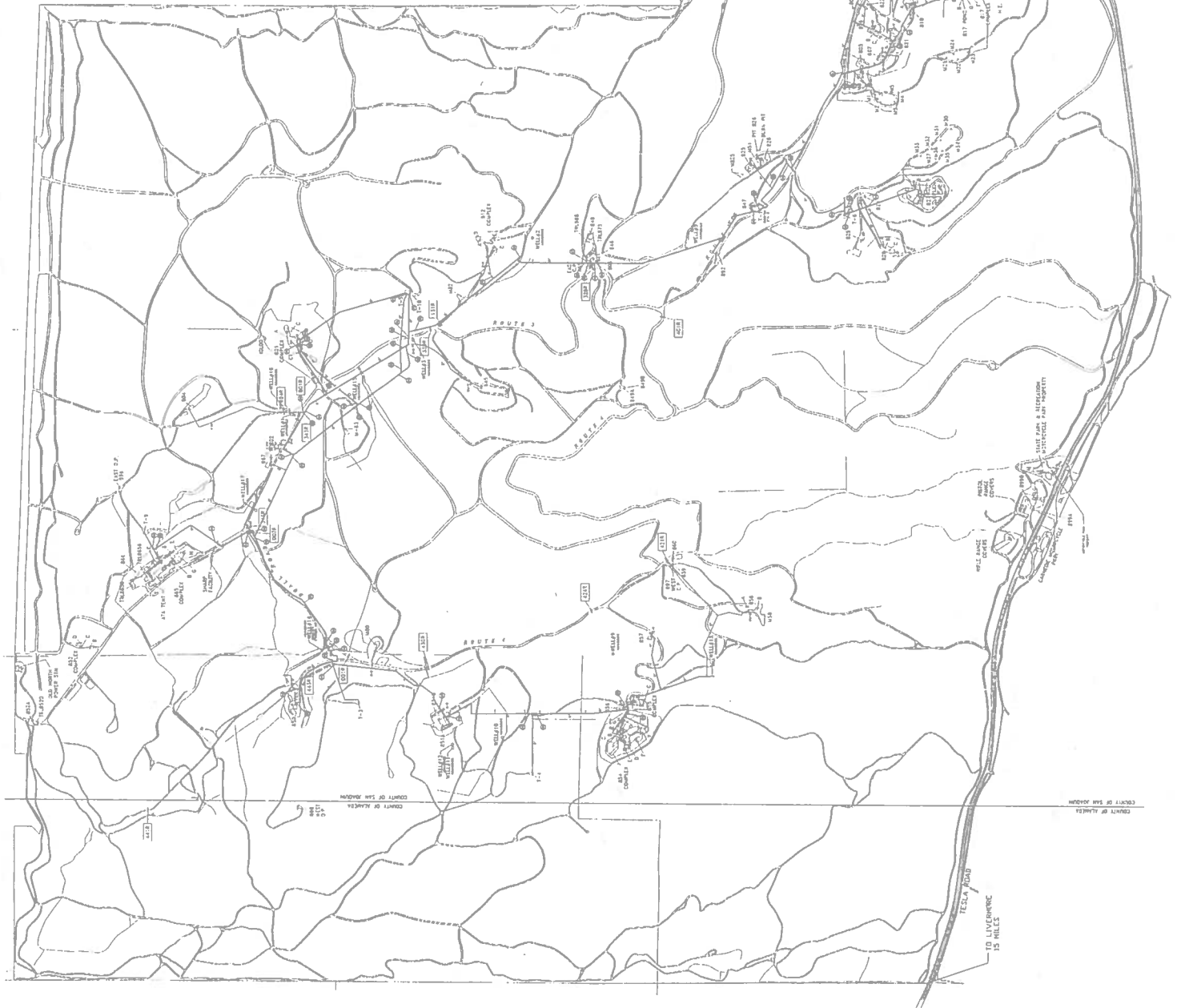
*Also on file with State Water Resources Control Board, Division of Drinking Water

APPENDIX A
FACILITY DRAWINGS

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SITE 300 GENERAL WATER DISTRIBUTION MAP

SCALE: 1" = 600'



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PROJECT NO.		PSM94-300-002E	
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PROJECT NO.		PSM94-300-002E	
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APPENDIX B

PUMP DATA SHEETS

Well Pump #18 Data Sheet

Well Pump #20 Data Sheet

Booster Station #1 Data Sheet

Booster Station #2 Data Sheet

Booster Station #3 Data Sheet

Thomas Shaft Well Pumps Data Sheets

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State of California
DEPARTMENT OF HEALTH SERVICES
Office of Drinking Water

WELL DATA

SYSTEM NAME: Lawrence Livermore National Lab - Site 300
Source of Information: LLNL Plant Engineering Well Logs
Collected by: Karen Folks
Updated by: Karen Folks

System No.:

Date: 4/27/92
Date: 3/02/94

Number or Name	Well 18	
State Well No.	107913	
Date Drilled	August 1979	
Neighborhood	N/A	
Lot size	N/A	

Distance to: Sewer	600 ft.	
Sewage disposal	2400 ft.	
Abandoned well	300 ft. to Well 4 and 6	
Property Line	400 ft.	
Plot plan on file?	See section A	

Housing: Type	16" conductor casing & 10" wall casing	
Pit depth	525 ft.	
Floor material	Unknown	
Drainage	Unknown	

Well Depth	525 ft.	
Casing: Depth(s)	475 ft.	
Diameter(s)	10"	
Type	Conductor and well	
Height above floor	50 ft.	
Dist. to perforations	No perforated casing but 50 ft. of 8" stainless steel well	
Surface sealed?	Yes, sealed with cement grout	
Gravel packed?	Yes, over whole length	
Conductor casing depth	200 ft.	
Conductor casing dia.	16"	
Annular seal depth	200 ft.	
Impervious strata:	Clay	
Thickness	50 ft.	
Depth to	450 ft.	
Well log on file?	Yes	

Water levels: Static	296 - 320 ft.	
Pumping		
Depth to bowls	375 ft.	

Pump: Make	Peerless Pump	
Type	Vertical turbine pumps	
Capacity (gpm)	225 gpm	
Efficiency test (date)	Dec. 12, 1989	
Lubrication	Unknown	
Power	AC	
Auxiliary power	N/A	
Control	N/A	

Frequency of use	Daily	
Discharge location	N/A	
Discharge to	N/A	
Pump to Waste?	No	
Flood Hazard	None, wells are not located in a flood plain	
Remarks and defects		

State of California
DEPARTMENT OF HEALTH SERVICES
Office of Drinking Water

WELL DATA

SYSTEM NAME: Lawrence Livermore National Lab - Site 300
Source of Information: LLNL Plant Engineering Well Logs
Collected by: Karen Folks
Updated by: Karen Folks

System No.:

Date: 4/27/92
Date: 3/02/94

Number or Name	Well 20	
State Well No.	W35C-03	
Date Drilled	February 13, 1989	
Neighborhood	N/A	
Lot size	N/A	

Distance to: Sewer	1300 ft.	
Sewage disposal	1800 ft.	
Abandoned well	600 ft. from Well 6, 1200 ft. Well 4	
Property Line	500 ft.	
Plot plan on file?	See section A	

Housing: Type	Unknown	
Plt depth	537.8 ft.	
Floor material	Unknown	
Drainage	Unknown	

Well Depth	537 ft.	
Casing: Depth(s)	522 ft.	
Diameter(s)	10"	
Type	Black Steel	
Height above floor	14 ft.	
Dist. to perforations	387 ft., stainless steel wire wrap screen, 0.040 mgh	
Surface sealed?	Neat grout	
Gravel packed?	Sand Pack	
Conductor casing depth	338 ft.	
Conductor casing dia.	16"	
Annular seal depth	307 ft.	
Impervious strata:		
Thickness		
Depth to		
Well log on file?	Yes	

Water levels: Static	280 ft.	
Pumping		
Depth to bowls	Unknown	

Pump: Make	Peerless Pump	
Type	Submersible Turbine Pump (Model 7LB - 6 stages)	
Capacity (gpm)	300	
Efficiency test (date)	July 25, 1989	
Lubrication	Unknown	
Power	AC	
Auxiliary power	N/A	
Control	N/A	

Frequency of use	Daily	
Discharge location		
Discharge to		
Pump to Waste?		
Flood Hazard	None	
Remarks and defects		

3910025

State of California

Pumping Station Data

Department of Public Health

System Name: Lawrence Livermore National Laboratory Site 300 No: 39100025
 Source of Information: MUSD
 Collected By: Ruben Ocampo Date: 07/03/13

Number or Name:	Booster Station No 1
Date Constructed:	
Purpose:	Boost Pressure to Zone 2
Location:	U844
Housing:	
Insulation:	
Heating:	
Pit Depth (if any):	
Drainage	
Relation to System:	
Receives From:	Tanks #T-2, T-8 & T-11
Delivers To:	Tanks #T-1, T-6, & T-7
Inlet Pressure:	9.9 psig
Outlet Pressure:	151.3 psig
Maximum Capacity:	
Flood Hazard:	
Pumping Units:	
Make:	The Valley Pump Group Model (Weinman) 3JD
Type:	Multi Stage Horizontal Splitcase Centrifugal
Capacity (gpm):	350
Lubrication:	
Power:	480VAC / 50 HP
Auxiliary Power:	
Control:	Tank #1 Level Control
Frequency of Use:	
Defects and Remarks:	

Pumping Station Data

System Name: Lawrence Livermore National Laboratory Site 300 No: 39100025
 Source of Information: MUSD
 Collected By: Ruben Ocampo Date: 07/03/13

Number or Name:	Booster Station No 2
Date Constructed:	
Purpose:	Boost Pressure to Zone 3
Location:	U847
Housing:	
Insulation:	
Heating:	
Pit Depth (if any):	
Drainage	
Relation to System:	
Receives From:	Tanks # T-1, T-6, & T-7
Delivers To:	Tanks #T-5, T-9, & T-10
Inlet Pressure:	9.7 psig
Outlet Pressure:	135.4 psig
Maxlimum Capacity:	
Flood Hazard:	
Pumping Units:	
Make:	Weinman 3L4
Type:	Double Suction Single Stage Split Case Horizontally Mounted Centrifugal
Capacity (gpm):	375
Lubrication:	
Power:	480VAC /40 HP
Auxiliary Power:	
Control:	Tank #5 Level Control
Frequency of Use:	
Defects and Remarks:	

Pumping Station Data

System Name: Lawrence Livermore National Laboratory Site 300 No: 39100025
 Source of Information: MUSD
 Collected By: Ruben Ocampo Date: 07/03/13

Number or Name:	Booster Station No 3
Date Constructed:	
Purpose:	Boost Pressure to Zone 4
Location:	U853
Housing:	
Insulation:	
Heating:	
Pit Depth (if any):	
Drainage	
Relation to System:	
Receives From:	Tanks # T-5, T-9, & T-10
Delivers To:	Tanks #T-3 & T-4
Inlet Pressure:	99.0 psig
Outlet Pressure:	251.1 psig
Maximum Capacity:	
Flood Hazard:	
Pumping Units:	
Make:	Peerless Pumps Model TU
Type:	Multi Stage Split Case Horizontal Centrifugal
Capacity (gpm):	250
Lubrication:	
Power:	480VAC / 50HP
Auxiliary Power:	
Control:	Tank #3 Level Control
Frequency of Use:	
Defects and Remarks:	

Pumping Station Data

System Name: Lawrence Livermore National Laboratory Site 300 No: 39100025
 Source of Information: MUSD
 Collected By: Ruben Ocampo Date: 12/16/13

Number or Name:	Thomas Shaft Well Pumps (WP-1 & WP-2)
Date Constructed:	2009
Purpose:	Lift water from Coast Range Tunnel to Site 300 Tanks
Location:	Thomas Shaft
Housing:	
Insulation:	
Heating:	
Pit Depth (if any):	351 Ft
Drainage	
Relation to System:	
Receives From:	Hetch-Hetchy Water Coast Range Tunnel
Delivers To:	Tanks #T-2, T-8, & T-11 at HWL 841 Ft
Inlet Pressure:	varies (7 psig- 30 psig) @ pump suction Elev. 385 Ft A.S.L.
Outlet Pressure:	Varies (244 – 268 psig) @ pump discharge Elev. 385 Ft A.S.L.
Maximum Capacity:	200
Flood Hazard:	
Pumping Units:	
Make:	Grundfos 150S or approved equal
Type:	Deep Well Submersible
Capacity (gpm):	150
Lubrication:	
Power:	30 HP, 480VAC / 3 PH / 60 Hz
Auxiliary Power:	
Control:	Tank #8 & #11 Level Control
Frequency of Use:	Primary Supply
Defects and Remarks:	

APPENDIX C

RESERVOIR DATA SHEETS

T-1 Reservoir Data Sheet

T-2 Reservoir Data Sheet

T-3 Reservoir Data Sheet

T-4 Reservoir Data Sheet

T-5 Reservoir Data Sheet

T-6 Reservoir Data Sheet

T-7 Reservoir Data Sheet

T-8 Reservoir Data Sheet

T-9 Reservoir Data Sheet

T-10 Reservoir Data Sheet

T-11 Reservoir Data Sheet

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3910025

State of California		Department of Public Health
Reservoir Data		
<i>(Use For All Distribution Storage, Chlorine Contact Tanks, Etc)</i>		
System Name:	Lawrence Livermore National Laboratory Site 300	
System Number:	39100025	
Source of Information:	MUSD	
Collected By:	R.Ocampo	Date: 07/03/13
Reservoir Number Or Name:	Tank T-1	
Location	Lawrence Livermore Site 300	
Cross Streets:	West Corral Hollow Rd	
Neighborhood:		
Size Of Lot:	Very Big	
Fencing:	None	
Construction		
Date Constructed/Refurbished:		
Purpose (Storage, Chlorine Contact, Etc.):	Fire Protection Water Storage	
Design Capacity (MG):	0.063	
Operating Capacity (MG):		
Construction Type:	Bolted Steel	
Shape:	Cylindrical	
Construction Materials:	Steel	
Slides:	Steel	
Floor:	Steel	
Cover Or Roof:	Steel	
Interior Coating Type:		
Dimensions		
Dimensions (H x L x W) Or (H & Diameter)(feet):	24 Ft H x 21 Ft D	
Tank Bottom Elevation (feet):	1100 Ft Elev	
Height Of Tank (feet):	24 Ft	
Surface Drainage To Reservoir Possible?	No	
Ventilation		
Screened (Y/N):	Y	
Cathodic Protection:		
Inlet Description		
Distance Above Bottom (feet):		
Receives Water From:	Booster Pump #1	
Outlet Description		
Distance From Inlet (feet):		
Distance Above Bottom (feet):		
Delivers Water To:	826, 828A, 828B, 827A, 827B, 827C, 827D, 827E, OSM8, OSM1, OSM2, OSM3, 805, 806, 807, 821, 808, 809A, 810A, 811, 813, 814, 815, 816, 817A, 817D, 817G, 819, 820, 822, 825, 826, 829, 830, 832, 833, 834K, 835, 836B, 836C, 837, 838 COMPLEX, 834 COMPLEX, 882, 894	
Pressure Zone Served:	Zone 2	
Drain Location		
Distance Above Floor (feet):		
Discharge Location:		
Overflow Location		
Overflow Elevation (feet):	1123 FT	
Distance Above Bottom (feet):	23 FT	
Discharge Location:		

Reservoir Data

(Use For All Distribution Storage, Chlorine Contact Tanks, Etc)

System Name:	Lawrence Livermore National Laboratory Site 300
System Number:	39100025
Source of Information:	MUSD
Collected By:	R.Ocampo
Date:	07/03/13
Reservoir Number Or Name:	Tank T-2
Location	
Location:	Lawrence Livermore Site 300
Cross Streets:	West Corral Hollow Rd
Neighborhood:	
Size Of Lot:	Very Big
Fencing:	None
Construction	
Date Constructed/Refurbished:	
Purpose (Storage, Chlorine Contact, Etc.):	Fire Protection Water Storage
Design Capacity (MG):	0.126
Operating Capacity (MG):	
Construction Type:	Bolted Steel
Shape:	Cylindrical
Construction Materials:	Steel
Sides:	Steel
Floor:	Steel
Cover Or Roof:	Steel
Interior Coating Type:	
Dimensions	
Dimensions (H x L x W) Or (H & Diameter)(feet):	24 Ft H x 30 Ft D
Tank Bottom Elevation (feet):	818 Ft Elev
Height Of Tank (feet):	24 Ft
Surface Drainage To Reservoir Possible?	No
Ventilation	
Screened (Y/N):	Y
Cathodic Protection:	
Inlet Description	
Distance Above Bottom (feet):	
Receives Water From:	Well Pump
Outlet Description	
Distance From Inlet (feet):	
Distance Above Bottom (feet):	
Delivers Water To:	818, 823, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 882, 883, 840, 841, 843
Pressure Zone Served:	Zone 1
Drain Location	
Distance Above Floor (feet):	
Discharge Location:	
Overflow Location	
Overflow Elevation (feet):	841 FT
Distance Above Bottom (feet):	23 FT
Discharge Location:	

Reservoir Data

(Use For All Distribution Storage, Chlorine Contact Tanks, Etc)

System Name:	Lawrence Livermore National Laboratory Site 300
System Number:	39100025
Source of Information:	MUSD
Collected By:	R.Ocampo
Date:	07/03/13
Reservoir Number Or Name:	Tank T-3
Location	
Location:	Lawrence Livermore Site 300
Cross Streets:	West Corral Hollow Rd
Neighborhood:	
Size Of Lot:	Very Big
Fencing:	None
Construction	
Date Constructed/Refurbished:	
Purpose (Storage, Chlorine Contact, Etc.):	Fire Protection Water Storage
Design Capacity (MG):	0.063
Operating Capacity (MG):	
Construction Type:	Bolted Steel
Shape:	Cylindrical
Construction Materials:	Steel
Sides:	Steel
Floor:	Steel
Cover Or Roof:	Steel
Interior Coating Type:	
Dimensions	
Dimensions (H x L x W) Or (H & Diameter)(feet):	24 Ft H x 21 Ft D
Tank Bottom Elevation (feet):	1500.5 Ft Elev
Height Of Tank (feet):	24 Ft
Surface Drainage To Reservoir Possible?	No
Ventilation	
Screened (Y/N):	Y
Cathodic Protection:	
Inlet Description	
Distance Above Bottom (feet):	
Receives Water From:	Booster Pump #3
Outlet Description	
Distance From Inlet (feet):	
Distance Above Bottom (feet):	
Delivers Water To:	854A, 855 complex, 856, 857 complex
Pressure Zone Served:	Zone 4
Drain Location	
Distance Above Floor (feet):	
Discharge Location:	
Overflow Location	
Overflow Elevation (feet):	1523.5 FT
Distance Above Bottom (feet):	23 FT
Discharge Location:	

Reservoir Data*(Use For All Distribution Storage, Chlorine Contact Tanks, Etc)*

System Name:	Lawrence Livermore National Laboratory Site 300
System Number:	39100025
Source of Information:	MUSD
Collected By:	R.Ocampo
Reservoir Number Or Name:	Tank T-4
Location	Lawrence Livermore Site 300
Cross Streets:	West Corral Hollow Rd
Neighborhood:	
Size Of Lot:	Very Big
Fencing:	None
Construction	
Date Constructed/Refurbished:	
Purpose (Storage, Chlorine Contact, Etc.):	Fire Protection Water Storage
Design Capacity (MG):	0.063
Operating Capacity (MG):	
Construction Type:	Bolted Steel
Shape:	Cylindrical
Construction Materials:	Steel
Sides:	Steel
Floor:	Steel
Cover Or Roof:	Steel
Interior Coating Type:	
Dimensions	
Dimensions (H x L x W) Or (H & Diameter)(feet):	24 Ft H x 21 Ft D
Tank Bottom Elevation (feet):	1500.5 Ft Elev
Height Of Tank (feet):	24 Ft
Surface Drainage To Reservoir Possible?	No
Ventilation	
Screened (Y/N):	Y
Cathodic Protection:	
Inlet Description	
Distance Above Bottom (feet):	
Receives Water From:	Booster Pump #3
Outlet Description	
Distance From Inlet (feet):	
Distance Above Bottom (feet):	
Delivers Water To:	854A, 855 complex, 856, 857 complex
Pressure Zone Served:	Zone 4
Drain Location	
Distance Above Floor (feet):	
Discharge Location:	
Overflow Location	
Overflow Elevation (feet):	1523.5 FT
Distance Above Bottom (feet):	23 FT
Discharge Location:	

Reservoir Data*(Use For All Distribution Storage, Chlorine Contact Tanks, Etc)*

System Name:	Lawrence Livermore National Laboratory Site 300
System Number:	39100025
Source of Information:	MUSD
Collected By:	R.Ocampo
Date:	07/03/13
Reservoir Number Or Name:	Tank T-5
Location	
Location:	Lawrence Livermore Site 300
Cross Streets:	West Corral Hollow Rd
Neighborhood:	
Size Of Lot:	Very Big
Fencing:	None
Construction	
Date Constructed/Refurbished:	
Purpose (Storage, Chlorine Contact, Etc.):	Fire Protection Water Storage
Design Capacity (MG):	0.063
Operating Capacity (MG):	
Construction Type:	Bolted Steel
Shape:	Cylindrical
Construction Materials:	Steel
Sides:	Steel
Floor:	Steel
Cover Or Roof:	Steel
Interior Coating Type:	
Dimensions	
Dimensions (H x L x W) Or (H & Diameter)(feet):	24 Ft H x 21 Ft D
Tank Bottom Elevation (feet):	1230 Ft Elev
Height Of Tank (feet):	24 Ft
Surface Drainage To Reservoir Possible?	No
Ventilation	
Screened (Y/N):	Y
Cathodic Protection:	
Inlet Description	
Distance Above Bottom (feet):	
Receives Water From:	Booster Pump #2
Outlet Description	
Distance From Inlet (feet):	
Distance Above Bottom (feet):	
Delivers Water To:	803, 812B,848,867,895, 801 COMPLEX, 802 COMPLEX, 865 COMPLEX
Pressure Zone Served:	Zone 3
Drain Location	
Distance Above Floor (feet):	
Discharge Location:	
Overflow Location	
Overflow Elevation (feet):	1253 FT
Distance Above Bottom (feet):	23 FT
Discharge Location:	

Reservoir Data

(Use For All Distribution Storage, Chlorine Contact Tanks, Etc)

System Name:	Lawrence Livermore National Laboratory Site 300
System Number:	39100025
Source of Information:	MUSD
Collected By:	R.Ocampo
Date:	07/03/13
Reservoir Number Or Name:	Tank T-6
Location	
Location:	Lawrence Livermore Site 300
Cross Streets:	West Corral Hollow Rd
Neighborhood:	
Size Of Lot:	Very Big
Fencing:	None
Construction	
Date Constructed/Refurbished:	
Purpose (Storage, Chlorine Contact, Etc.):	Fire Protection Water Storage
Design Capacity (MG):	0.063
Operating Capacity (MG):	
Construction Type:	Bolted Steel
Shape:	Cylindrical
Construction Materials:	Steel
Sides:	Steel
Floor:	Steel
Cover Or Roof:	Steel
Interior Coating Type:	
Dimensions	
Dimensions (H x L x W) Or (H & Diameter)(feet):	24 Ft H x 21 Ft D
Tank Bottom Elevation (feet):	1100 Ft Elev
Height Of Tank (feet):	24 Ft
Surface Drainage To Reservoir Possible?	No
Ventilation	
Screened (Y/N):	Y
Cathodic Protection:	
Inlet Description	
Distance Above Bottom (feet):	
Receives Water From:	Booster Pump #1
Outlet Description	
Distance From Inlet (feet):	
Distance Above Bottom (feet):	
Delivers Water To:	826, 828A, 828B, 827A, 827B, 827C, 827D, 827E, OSM8, OSM1, OSM2, OSM3, 805, 806, 807, 821, 808, 809A, 810A, 811, 813, 814, 815, 818, 817A, 817D, 817G, 819, 820, 822, 825, 826, 829, 830, 832, 833, 834K, 835, 836B, 836C, 837, 838 COMPLEX, 834 COMPLEX, 882, 894
Pressure Zone Served:	Zone 2
Drain Location	
Distance Above Floor (feet):	
Discharge Location:	
Overflow Location	
Overflow Elevation (feet):	1123 FT
Distance Above Bottom (feet):	23 FT
Discharge Location:	

Reservoir Data*(Use For All Distribution Storage, Chlorine Contact Tanks, Etc)*

System Name:	Lawrence Livermore National Laboratory Site 300
System Number:	39100025
Source of Information:	MUSD
Collected By:	R.Ocampo
Date:	07/03/13
Reservoir Number Or Name:	Tank T-7
Location	
Location:	Lawrence Livermore Site 300
Cross Streets:	West Corral Hollow Rd
Neighborhood:	
Size Of Lot:	Very Big
Fencing:	None
Construction	
Date Constructed/Refurbished:	
Purpose (Storage, Chlorine Contact, Etc.):	Fire Protection Water Storage
Design Capacity (MG):	0.113
Operating Capacity (MG):	
Construction Type:	Bolted Steel
Shape:	Cylindrical
Construction Materials:	Steel
Sides:	Steel
Floor:	Steel
Cover Or Roof:	Steel
Interior Coating Type:	
Dimensions	
Dimensions (H x L x W) Or (H & Diameter)(feet):	40 Ft H x 22 Ft D
Tank Bottom Elevation (feet):	1083.36 Ft Elev
Height Of Tank (feet):	40 Ft
Surface Drainage To Reservoir Possible?	No
Ventilation	
Screened (Y/N):	Y
Cathodic Protection:	
Inlet Description	
Distance Above Bottom (feet):	
Receives Water From:	Booster Pump #1
Outlet Description	
Distance From Inlet (feet):	
Distance Above Bottom (feet):	
Delivers Water To:	826, 828A, 828B, 827A, 827B, 827C, 827D, 827E, OSM8, OSM1, OSM2, OSM3, 805, 806, 807, 821, 808, 809A, 810A, 811, 813, 814, 815, 816, 817A, 817D, 817G, 819, 820, 822, 825, 826, 829, 830, 832, 833, 834K, 835, 836B, 836C, 837, 838 COMPLEX, 834 COMPLEX, 882, 894
Pressure Zone Served:	Zone 2
Drain Location	
Distance Above Floor (feet):	
Discharge Location:	
Overflow Location	
Overflow Elevation (feet):	1123.36 FT
Distance Above Bottom (feet):	40 FT
Discharge Location:	

Reservoir Data*(Use For All Distribution Storage, Chlorine Contact Tanks, Etc)*

System Name:	Lawrence Livermore National Laboratory Site 300
System Number:	39100025
Source of Information:	MUSD
Collected By:	R.Ocampo
Date:	07/03/13
Reservoir Number Or Name:	Tank T-8
Location	
Location:	Lawrence Livermore Site 300
Cross Streets:	West Corral Hollow Rd
Neighborhood:	
Size Of Lot:	Very Big
Fencing:	None
Construction	
Date Constructed/Refurbished:	
Purpose (Storage, Chlorine Contact, Etc.):	Fire Protection Water Storage
Design Capacity (MG):	0.063
Operating Capacity (MG):	
Construction Type:	Bolted Steel
Shape:	Cylindrical
Construction Materials:	Steel
Sides:	Steel
Floor:	Steel
Cover Or Roof:	Steel
Interior Coating Type:	
Dimensions	
Dimensions (H x L x W) Or (H & Diameter)(feet):	24 Ft H x 21 Ft D
Tank Bottom Elevation (feet):	818 Ft Elev
Height Of Tank (feet):	24 Ft
Surface Drainage To Reservoir Possible?	No
Ventilation	
Screened (Y/N):	Y
Cathodic Protection:	
Inlet Description	
Distance Above Bottom (feet):	
Receives Water From:	Well Pump
Outlet Description	
Distance From Inlet (feet):	
Distance Above Bottom (feet):	
Delivers Water To:	B870, B871, B872, B873, B874, B875, B876, B877, B878, B879, B880, B840, B841
Pressure Zone Served:	Zone 1
Drain Location	
Distance Above Floor (feet):	
Discharge Location:	
Overflow Location	
Overflow Elevation (feet):	841 FT
Distance Above Bottom (feet):	23 FT
Discharge Location:	

Reservoir Data*(Use For All Distribution Storage, Chlorine Contact Tanks, Etc)*

System Name:	Lawrence Livermore National Laboratory Site 300
System Number:	39100025
Source of Information:	MUSD
Collected By:	R.Ocampo
Date:	07/03/13
Reservoir Number Or Name:	Tank T-9
Location	
Location:	Lawrence Livermore Site 300
Cross Streets:	West Corral Hollow Rd
Neighborhood:	
Size Of Lot:	Very Blg
Fencing:	None
Construction	
Date Constructed/Refurbished:	
Purpose (Storage, Chlorine Contact, Etc.):	Fire Protection Water Storage
Design Capacity (MG):	0.165
Operating Capacity (MG):	
Construction Type:	Weided Steel
Shape:	Cylindrical
Construction Materials:	Steel
Sides:	Steel
Floor:	Steel
Cover Or Roof:	Steel
Interior Coating Type:	
Dimensions	
Dimensions (H x L x W) Or (H & Diameter)(feet):	24 Ft H x 34 Ft D
Tank Bottom Elevation (feet):	1229 Ft Elev
Height Of Tank (feet):	24 Ft
Surface Drainage To Reservoir Possible?	No
Ventilation	
Screened (Y/N):	Y
Cathodic Protection:	
Inlet Description	
Distance Above Bottom (feet):	
Receives Water From:	Booster Pump #2
Outlet Description	
Distance From Inlet (feet):	
Distance Above Bottom (feet):	
Delivers Water To:	803, 812B,848,867,895, 801 COMPLEX, 802 COMPLEX, 865 COMPLEX
Pressure Zone Served:	Zone 3
Drain Location	
Distance Above Floor (feet):	
Discharge Location:	
Overflow Location	
Overflow Elevation (feet):	1252 FT
Distance Above Bottom (feet):	23 FT
Discharge Location:	

Reservoir Data

(Use For All Distribution Storage, Chlorine Contact Tanks, Etc)

System Name:	Lawrence Livermore National Laboratory Site 300
System Number:	39100025
Source of Information:	MUSD
Collected By:	R.Ocampo
Date:	07/03/13
Reservoir Number Or Name:	Tank T-10
Location	
Location:	Lawrence Livermore Site 300
Cross Streets:	West Corral Hollow Rd
Neighborhood:	
Size Of Lot:	Very Big
Fencing:	None
Construction	
Date Constructed/Refurbished:	
Purpose (Storage, Chlorine Contact, Etc.):	Fire Protection Water Storage
Design Capacity (MG):	0.0945
Operating Capacity (MG):	
Construction Type:	Welded Steel
Shape:	Cylindrical
Construction Materials:	Steel
Sides:	Steel
Floor:	Steel
Cover Or Roof:	Steel
Interior Coating Type:	
Dimensions	
Dimensions (H x L x W) Or (H & Diameter)(feet):	24 Ft H x 26 Ft D
Tank Bottom Elevation (feet):	1230 Ft Elev
Height Of Tank (feet):	24 Ft
Surface Drainage To Reservoir Possible?	No
Ventilation	
Screened (Y/N):	Y
Cathodic Protection:	
Inlet Description	
Distance Above Bottom (feet):	
Receives Water From:	Booster Pump #2
Outlet Description	
Distance From Inlet (feet):	
Distance Above Bottom (feet):	
Delivers Water To:	803, 812B, 848, 867, 895, 801 COMPLEX, 802 COMPLEX, 865 COMPLEX
Pressure Zone Served:	Zone 3
Drain Location	
Distance Above Floor (feet):	
Discharge Location:	
Overflow Location	
Overflow Elevation (feet):	1253 FT
Distance Above Bottom (feet):	23 FT
Discharge Location:	

Reservoir Data

(Use For All Distribution Storage, Chlorine Contact Tanks, Etc)

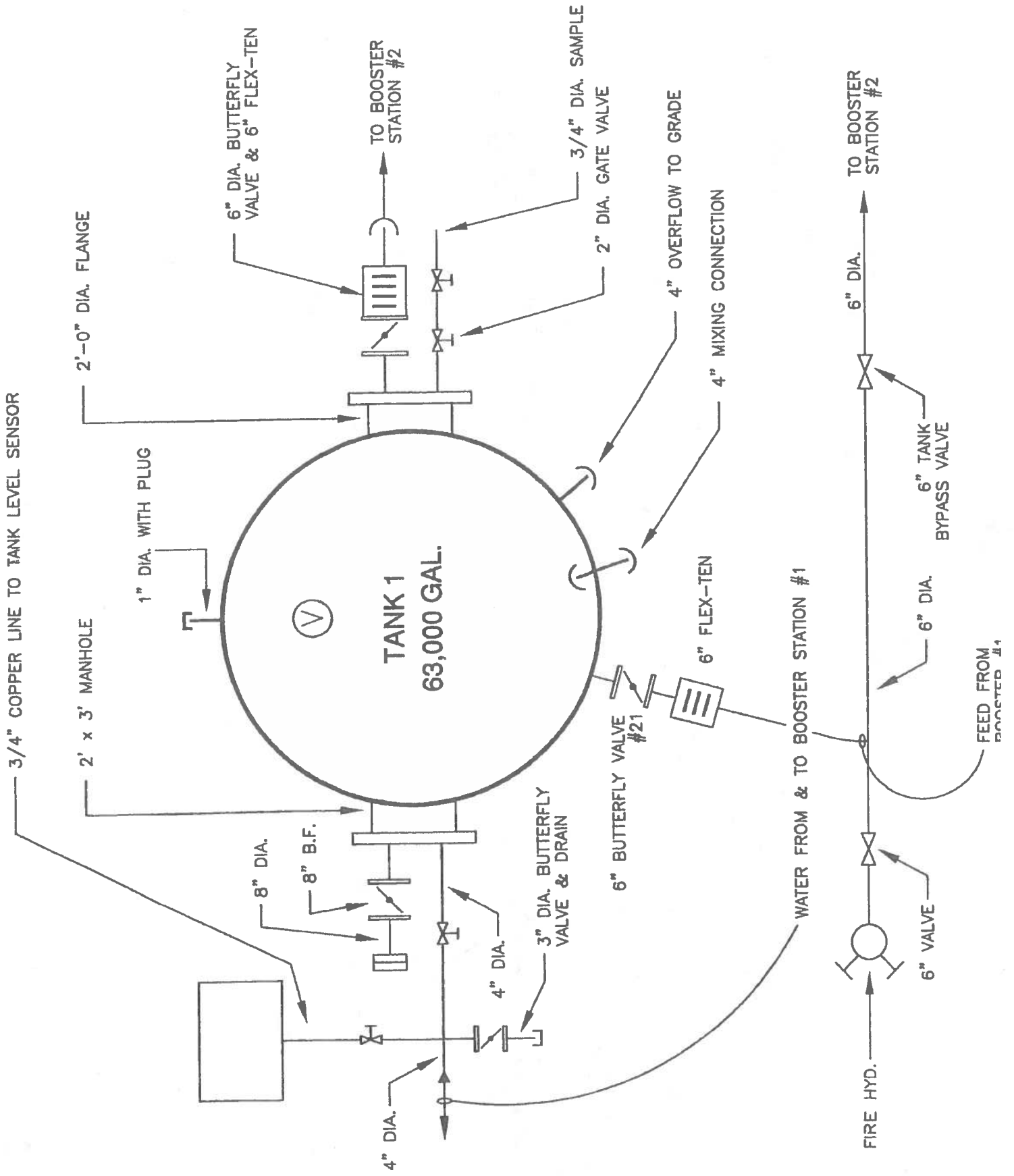
System Name:	Lawrence Livermore National Laboratory Site 300
System Number:	39100025
Source of Information:	MUSD
Collected By:	R.Ocampo
Date:	07/03/13
Reservoir Number Or Name:	Tank T-11
Location	
Location:	Lawrence Livermore Site 300
Cross Streets:	West Corral Hollow Rd
Neighborhood:	
Size Of Lot:	Very Big
Fencing:	None
Construction	
Date Constructed/Refurbished:	
Purpose (Storage, Chlorine Contact, Etc.):	Fire Protection Water Storage
Design Capacity (MG):	0.238
Operating Capacity (MG):	
Construction Type:	Bolted Steel
Shape:	Cylindrical
Construction Materials:	Steel
Sides:	Steel
Floor:	Steel
Cover Or Roof:	Steel
Interior Coating Type:	
Dimensions	
Dimensions (H x L x W) Or (H & Diameter)(feet):	24 Ft H x 41 Ft D
Tank Bottom Elevation (feet):	818 Ft Elev
Height Of Tank (feet):	24 Ft
Surface Drainage To Reservoir Possible?	No
Ventilation	
Screened (Y/N):	Y
Cathodic Protection:	
Inlet Description	
Distance Above Bottom (feet):	
Receives Water From:	Well Pumps
Outlet Description	
Distance From Inlet (feet):	
Distance Above Bottom (feet):	
Delivers Water To:	818, 823, 870, 871, 872, 873, 874, 875, 876, 877, 878, 879, 880, 882, 883, 840, 841, 843
Pressure Zone Served:	Zone 1
Drain Location	
Distance Above Floor (feet):	
Discharge Location:	
Overflow Location	
Overflow Elevation (feet):	841 FT
Distance Above Bottom (feet):	23 FT
Discharge Location:	

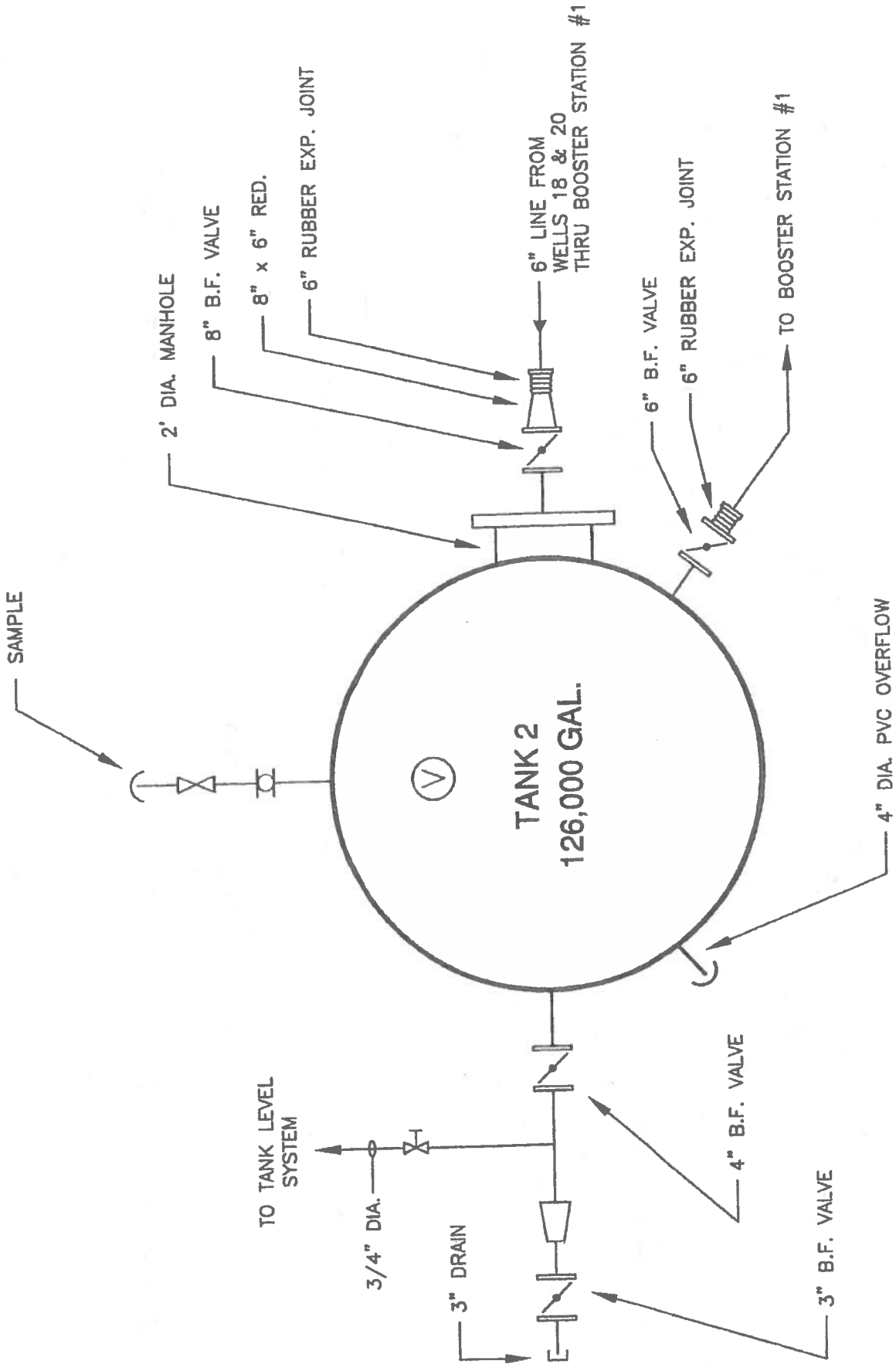
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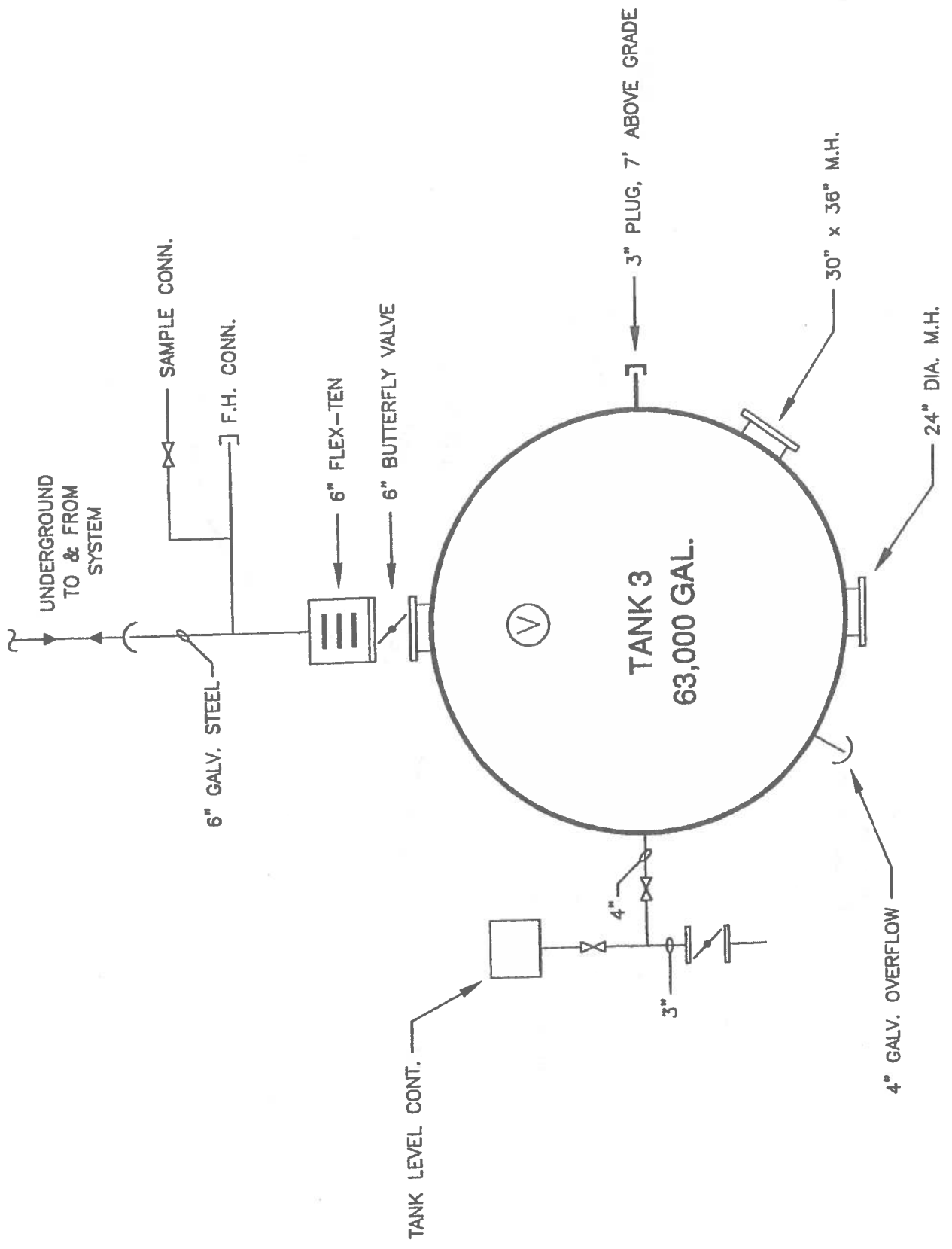
APPENDIX D

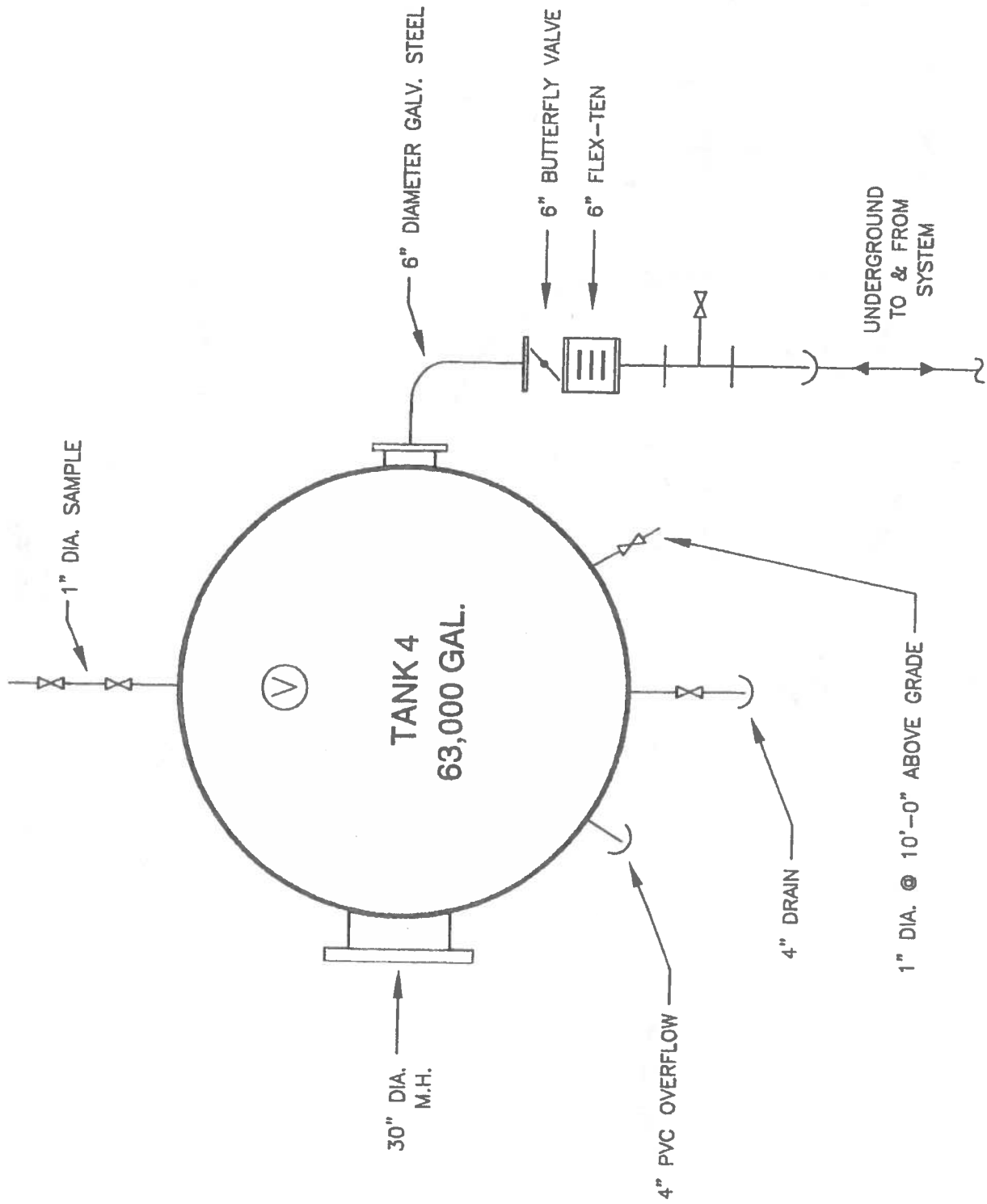
TANK PIPING SCHEMATICS

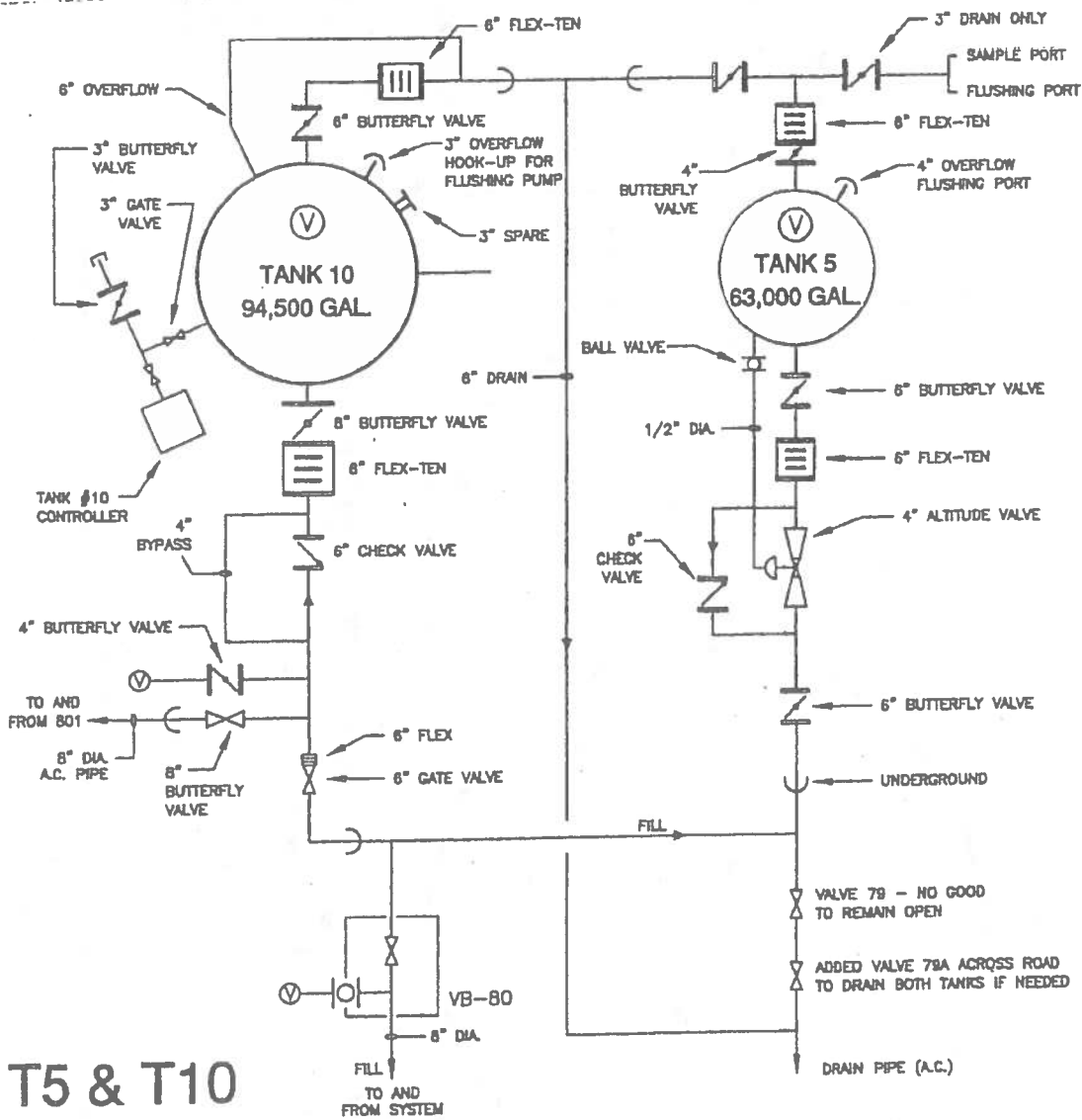
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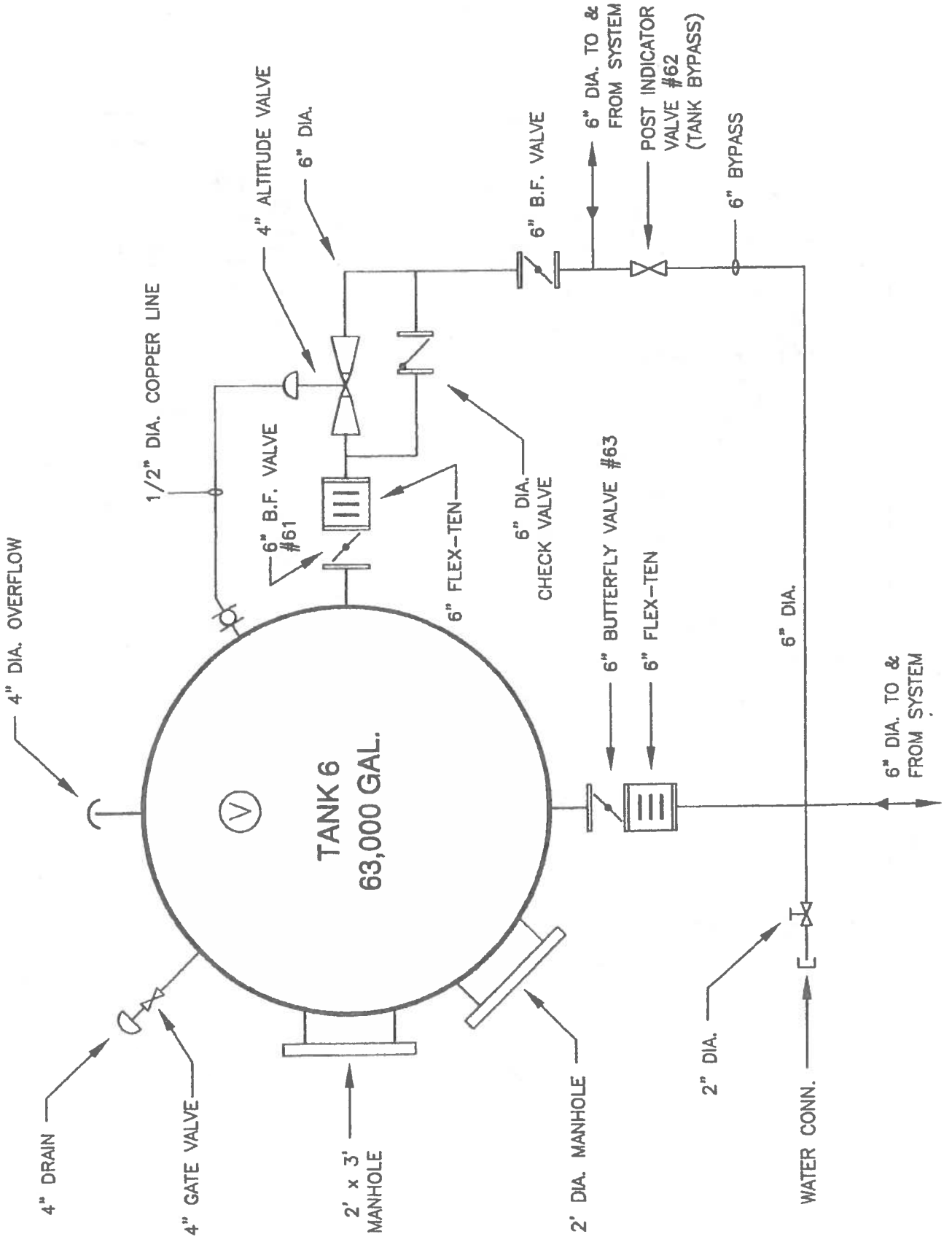


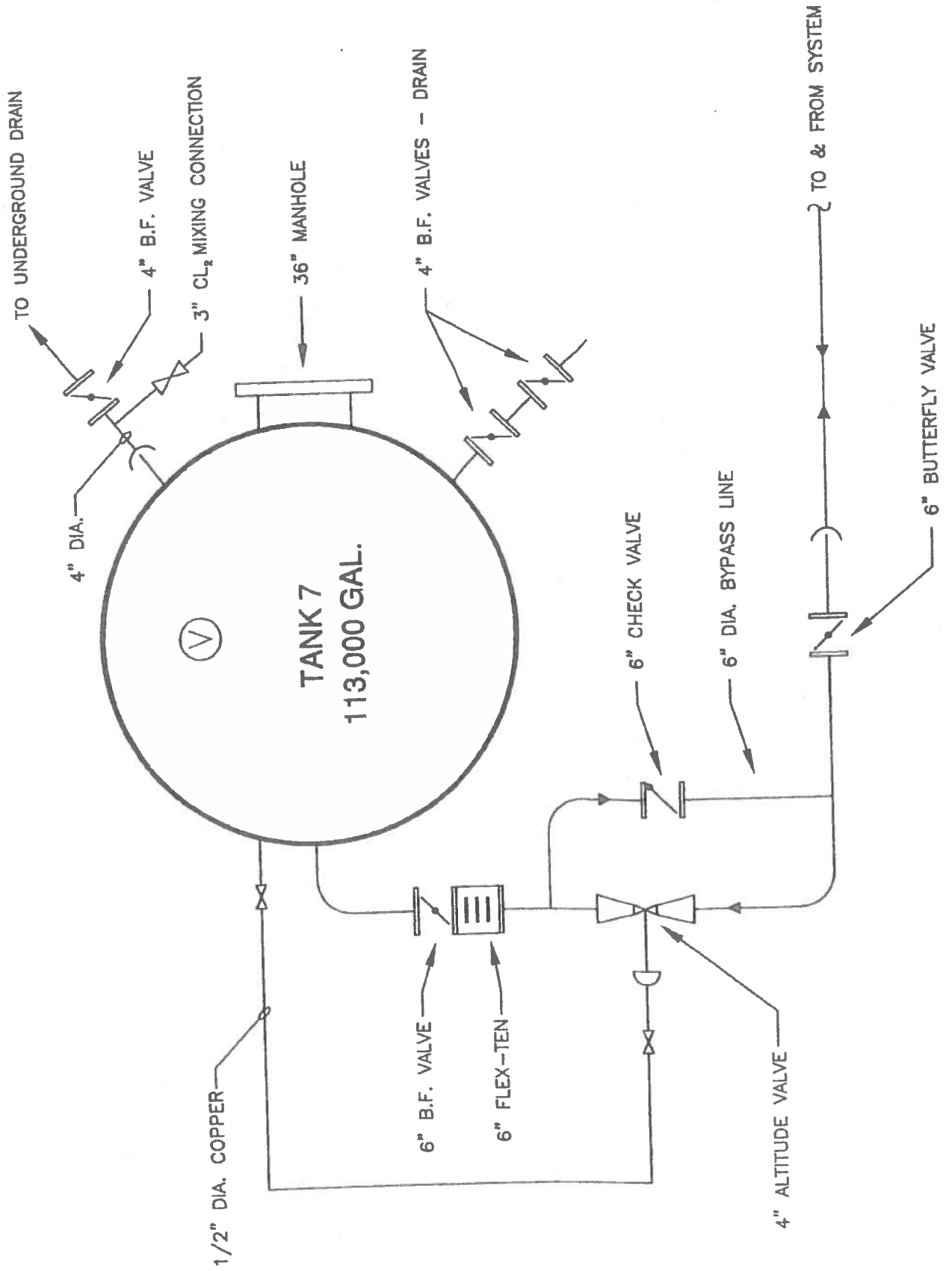


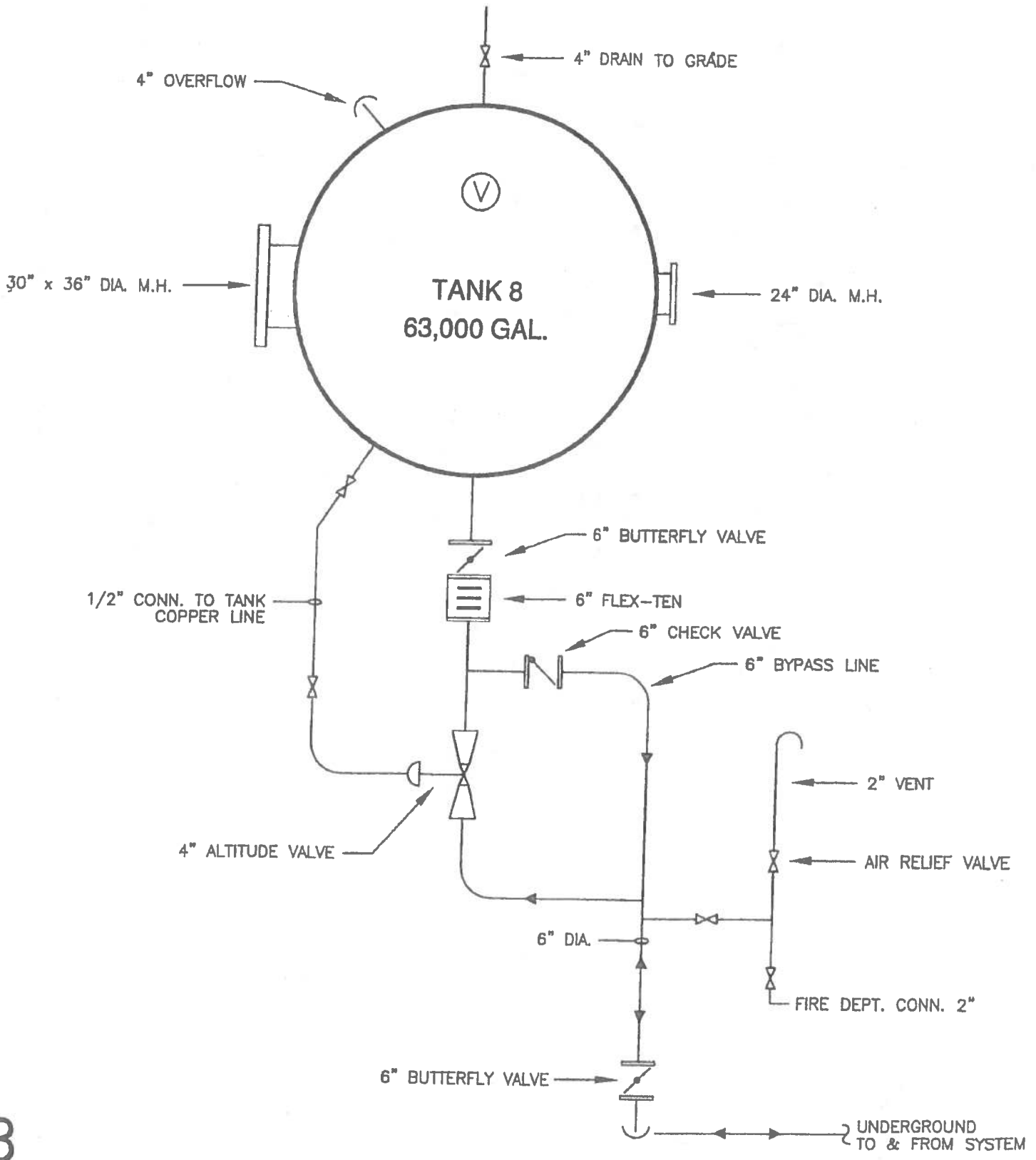


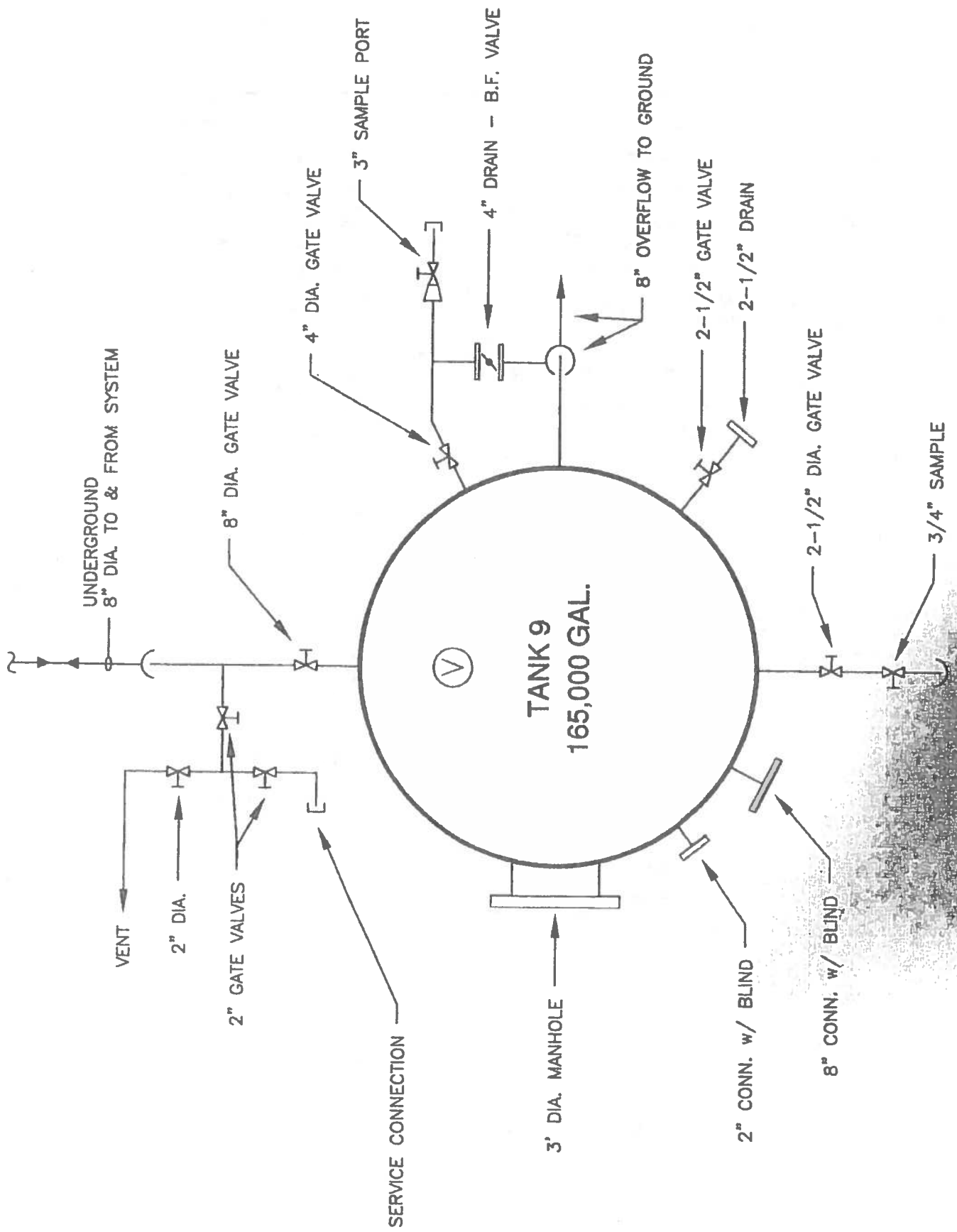


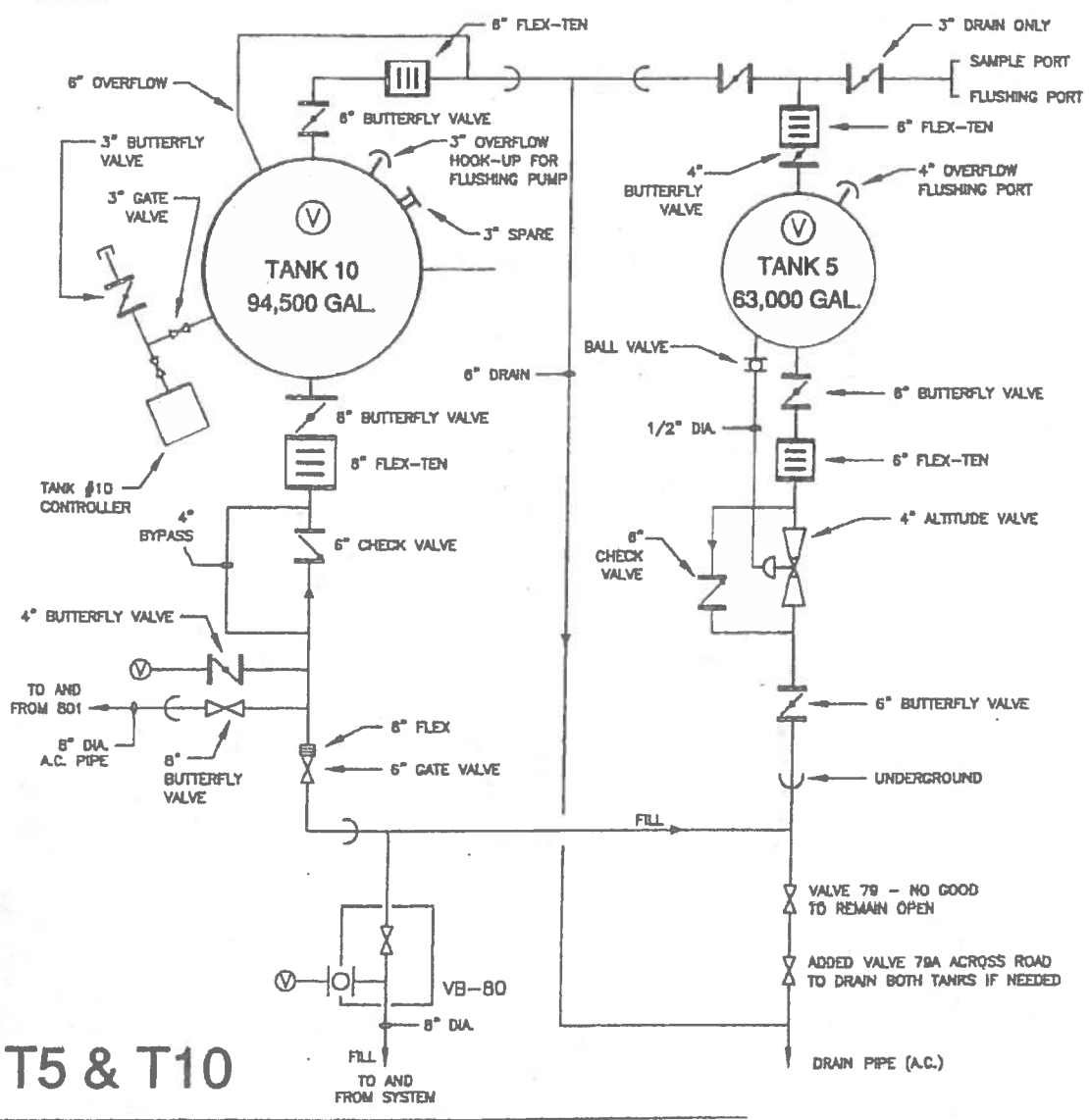
T5 & T10



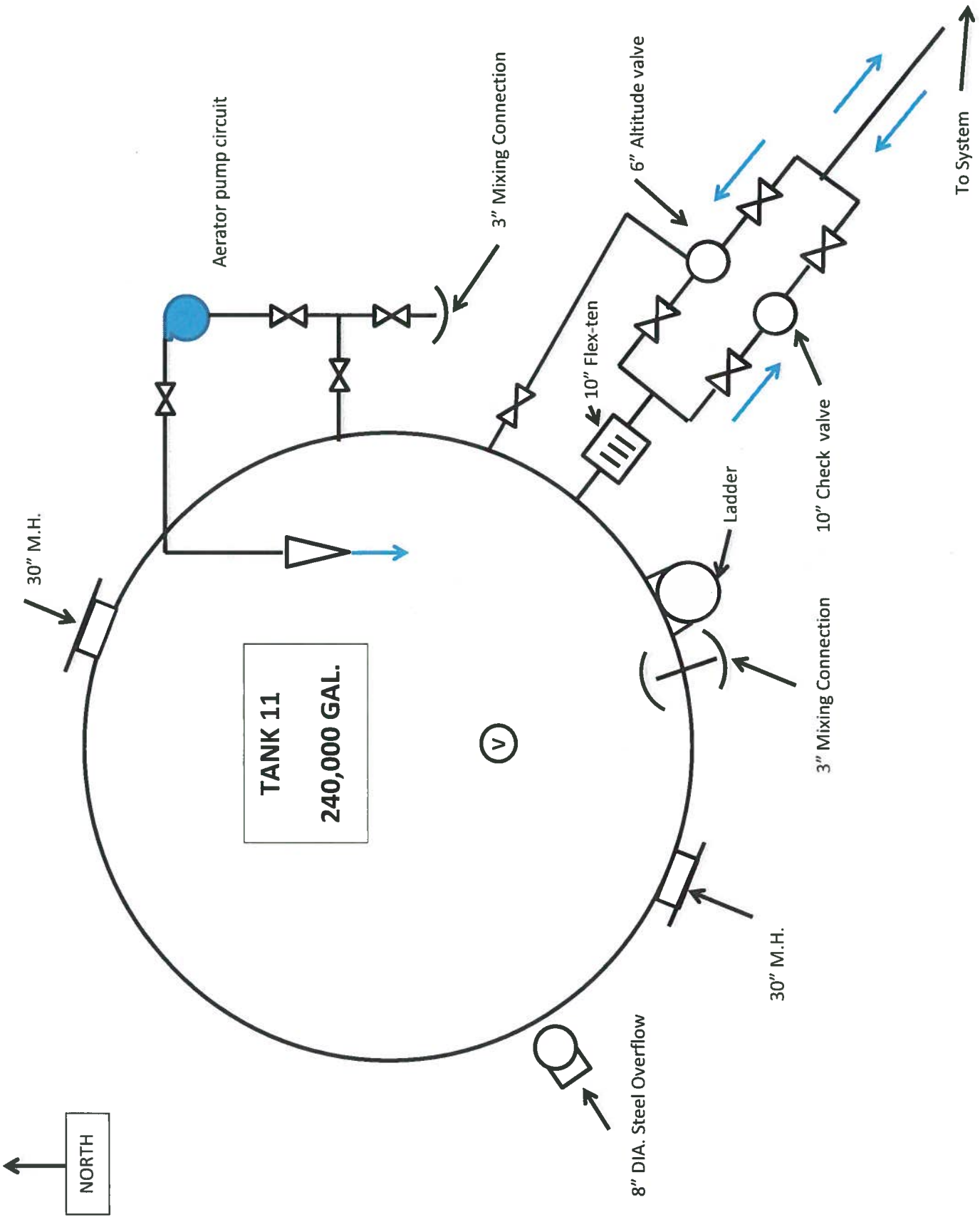








T5 & T10



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APPENDIX E

LLNL SITE 300 WATER SYSTEM ABOVE GROUND STORAGE TANK CHLORINE SLUGGING/DOSING PROCEDURES

Method 1

This procedure is a one-time dose, generally used to correct quick losses of chlorine residual due to rapid use of water or high water temperatures.

This process involves estimating the chlorine demand and dosing the tank to an approximate level of 1 to 1.5 PPM

Calculate the chlorine dosage. This is approximate for it does not account for the amount of organic material or minerals that are in the water that may react with chlorine.

1. Use a gasoline powered centrifugal pump to re-circulate the water and the 12.5% Free Chlorine Sodium Hypochlorite solution introduced at the intake side of the pump by starting the pump and throttling the intake until there is sufficient suction to draw in the 12.5% chlorine Sodium Hypochlorite.
2. At the point when the residual chlorine is near the desired level, stop adding Sodium Hypochlorite but continue circulating the water until the free chlorine readings levels off.
3. At this point decide whether or not to increase the dosage or to stop when the residual chlorine level is considered satisfactory.
4. Remove pump and secure tank.

Method 2

This is a slow dose used over long periods of time, generally used when the above ground tank is subjected to high summer heat. This is intended to evenly distribute chlorine over time to avoid drastic peaks and valleys in the tank chlorine residuals and to allow maximum contact time.

This is also to make up for an increasing chlorine demand beyond the capabilities of the current automated systems in keeping up with the water usage.

As with method 1, this is approximate for it does not account for the amount of organic material or minerals that are in the water that may react with chlorine. And sometimes the chlorine has been on the shelf for a while and has decayed and is no longer at the same concentration that is listed on the package.

1. Use an electric circulating pump with a capacity to turn over the volume in the tank in 24 to 48 hours, an adjustable chemical metering pump and a sufficiently sized chlorine dual containment container.
2. Determine the dose based on previous historical data from daily records of high chlorine demand periods and the corresponding dose rates and residual levels, and tank volumes, targeting a window of 1 to 1.5 PPM.
3. Monitoring 24 hours a day is done by each shift, dose changes are done by and under the supervision of the Operator.

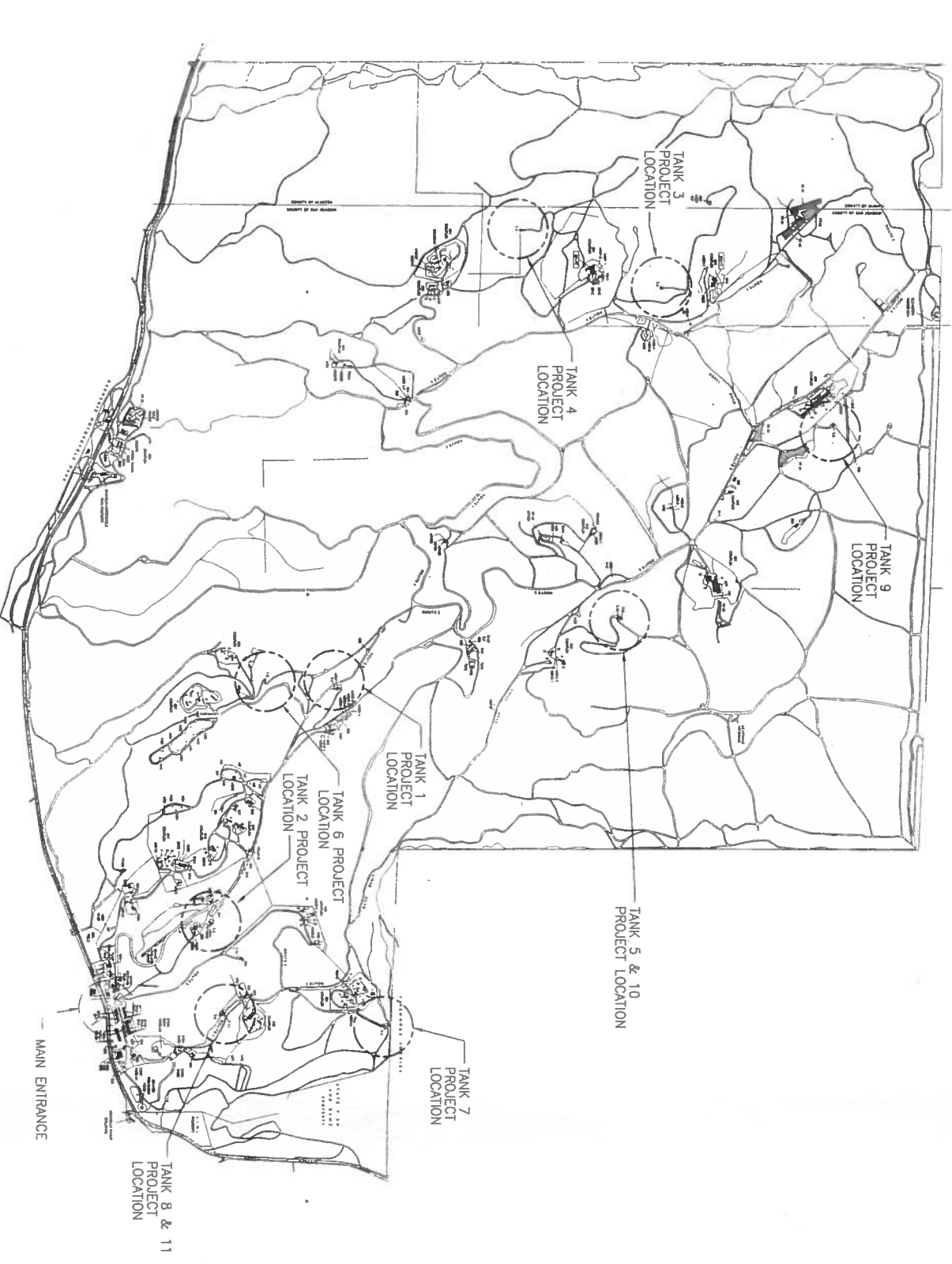
4. When any problems are observed, the pump is shut off and isolated from the tank until the operator is able to correct the issue.
5. When the dosing need is over and automated dosing is sufficient, the equipment is removed from the tank and normal operation is resumed.

APPENDIX F

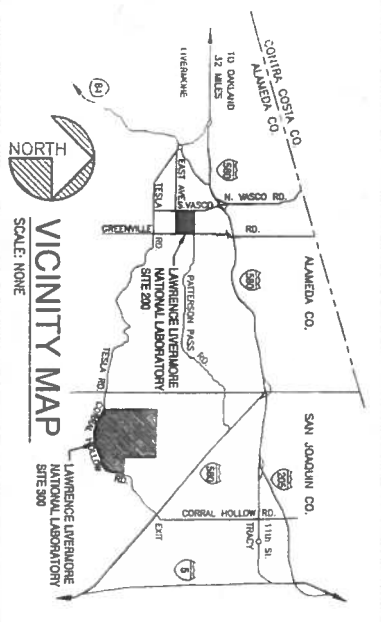
WATER CIRCULATION PUMPING SYSTEM PLAN SET

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SITE 300 WATER TANKS - NEW CIRCULATING WATER PUMP INSTALLATION



LAWRENCE LIVERMORE NATIONAL LABORATORY - SITE 300
SCALE: NONE



APPLICABLE CODES

CODE, REGULATION OR FACILITY STANDARD	EDITION
CALIFORNIA BUILDING CODE (2006 IBC)	2007
NFPA 101 - LIFE SAFETY CODE	2009
NFPA 1 - UNIFORM FIRE CODE	2009
NATIONAL ELECTRIC CODE (NFPA 70)	2011
CALIFORNIA PLUMBING CODE (2006 UPC)	2007
CALIFORNIA MECHANICAL CODE (2006 UMC)	2007
UNIFORM FEDERAL ACCESSIBILITY STANDARDS (NOT CALIFORNIA TITLE 24)	LATEST EDITION
ASHRAE STANDARD 90.1-2007 FOR ENERGY COMPLIANCE	LATEST EDITION
NATIONAL SANITATION FOUNDATION STD 61	2011

PROJECT SCOPE

- INSTALL WATER CIRCULATION PUMPING SYSTEM FOR TRICHALOMETHANES (THMs) CONTROL AT SITE 300 DOMESTIC WATER TANKS 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, & 11, INCLUDING HEAT TRACING REQUIREMENTS.
- FOR ELECTRICAL WIRING AND ACCESSORIES TO EXTEND POWER TO THE PUMPS AND ASSOCIATED PIPING HEAT TRACING CIRCUITS PLEASE SEE DRAWINGS PSE2012-0300-0001D THROUGH 0028D.

INDEX OF DRAWINGS

DRAWING NUMBER:	SHEET NO.:	DRAWING TITLE:
GENERAL:		
PSM2012-0300-0001D	G-001	SITE MAP, VICINITY MAP, INDEX OF DRAWINGS, AND MISCELLANEOUS NOTES
MECHANICAL:		
PSM2012-0300-0002D	M-101	PIPING PLAN - TANK 1 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0003D	M-102	PIPING PLAN - TANK 2 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0004D	M-103	PIPING PLAN - TANK 3 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0005D	M-104	PIPING PLAN - TANK 4 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0006D	M-105	PIPING PLAN - TANK 5 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0007D	M-106	PIPING PLAN - TANK 6 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0008D	M-107	PIPING PLAN - TANK 7 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0009D	M-108	PIPING PLAN - TANK 8 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0010D	M-109	PIPING PLAN - TANK 9 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0011D	M-110	PIPING PLAN - TANK 10 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM
PSM2012-0300-0012D	M-111	PIPING PLAN - TANK 11 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM

RELEASED FOR CONSTRUCTION

EMEC Dept. Head:	<i>Rich Shanteed</i>	01-09-15
Client:	WUSD DH	7-24-15
Project Manager:	Ray Chin	8/11/12
Design Manager:	Kevin Osmano	5-8-12
Maint. & Site Util:	<i>Eleana Castaneda</i>	5-9-12
ES&H:	<i>Barbara D'Amico</i>	5-8-12
Security:	<i>Wayne Walters</i>	5-8-12
Site Planning:	<i>Paul Chu</i>	5/8/12
Fire Marshal:	<i>Baron Goodwin</i>	5/8/12
Facility:	<i>DAVE ARNDT</i>	5-9-12

Project Title
SITE 300 WATER TANKS
NEW CIRCULATING WATER
PUMP INSTALLATION

REV No	DATE	REV BY	CHK BY	DATE
0	4/26/12	ISSUED FOR CONSTRUCTION	RO	04/26/2012

Des: RUBEN OCAMPO
Dwn: RUBEN OCAMPO
Chk: RAY CHIN

File Name: PSM2012-0300-0001D.dwg
Scale: AS NOTED
Sheet Title: SITE MAP, VICINITY MAP, INDEX OF DRAWINGS AND MISCELLANEOUS NOTES
Dwg. No.: PSM2012-0300-0001D
Sht. No.: G-001
Classification: UNCLASSIFIED/UNLIMITED RELEASE

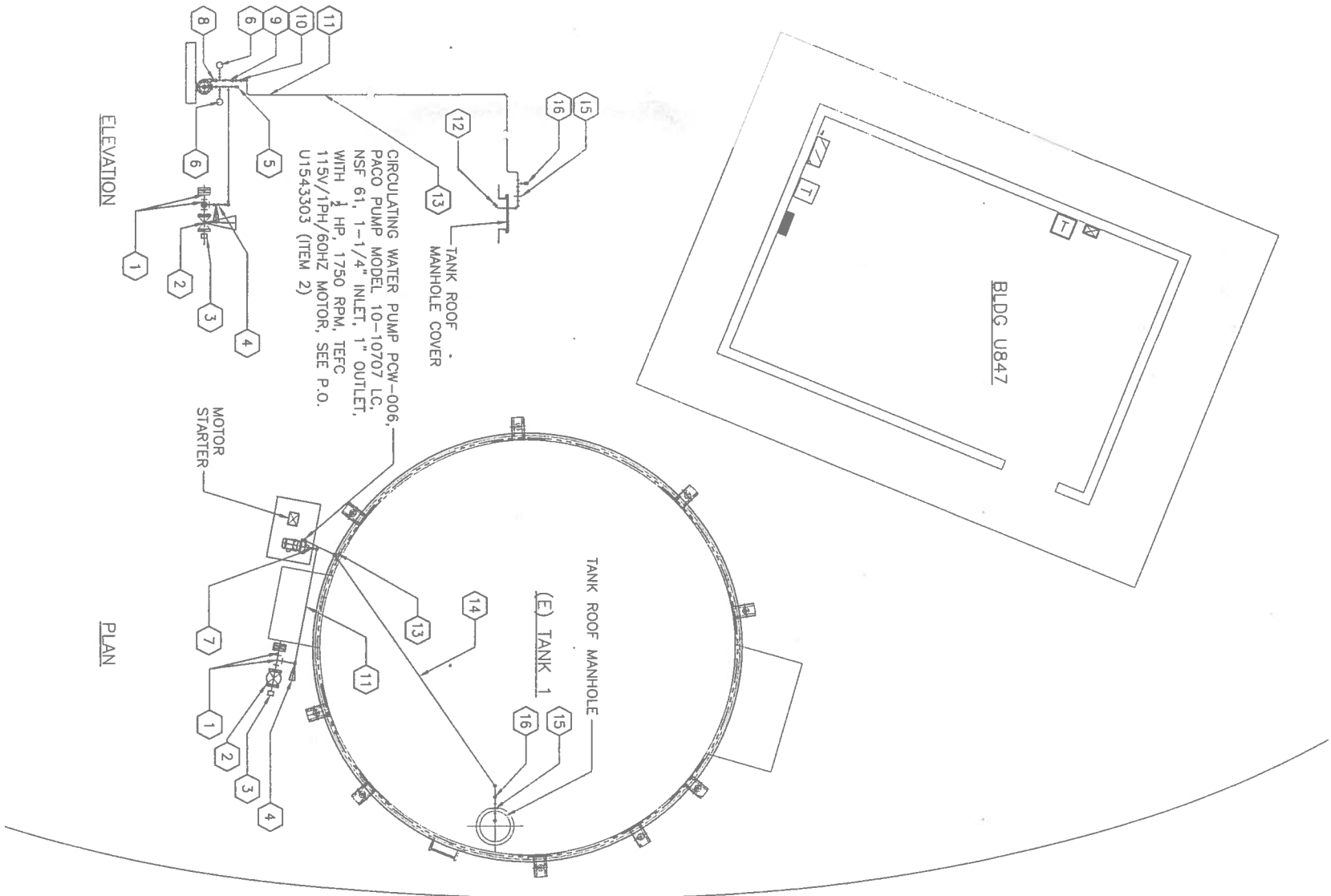
Lawrence Livermore National Laboratory
P.O. Box 808 Livermore, California 94551

F&I Infrastructure
Facilities & Infrastructure
Consultants



SITE PIPING PLAN & ELEVATION CIRCULATING PUMP PCW-006 INSTALLATION

SCALE: 1/4"=1'-0"



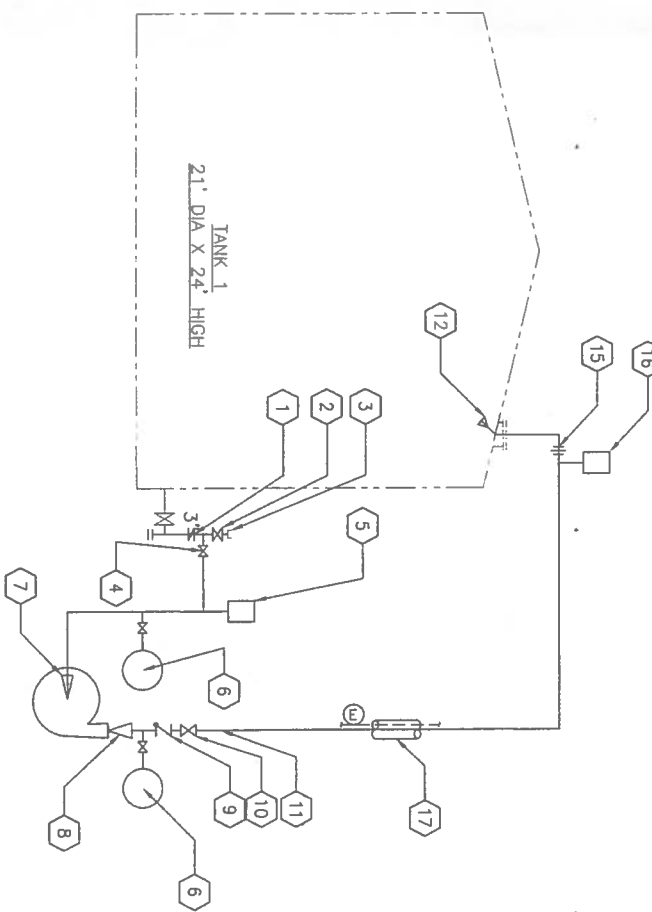
NOTES

- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# FLANGED BRONZE GATE VALVE, O.S. & Y.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER GATE VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS. SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B31.22, EXCEPT SCREWED SCH 40 COPPER. NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.

CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.

PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0°F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE. PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET. THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



CIRCULATING WATER PUMP PCW-006,
PACO PUMP MODEL 10-10707 LC, NSF
61, 1-1/4" INLET, 1" OUTLET, WITH 1/2
HP, 1750 RPM, TEFC 115V/1PH/60HZ
MOTOR, SEE P.O. U1543303 (ITEM 2)

PIPING & INSTRUMENT DIAGRAM CIRCULATING PUMP PCW-006 INSTALLATION

SCALE: NONE



Dwg. Scale



Project Title
**NEW 300 WATER TANKS
NEW CIRCULATING WATER
PUMP INSTALLATION**

REV	NO	DATE	REV. S. N	WH	BR	HK
0	4/26/12		ISSUED FOR CONSTRUCTION			
Des:	RUBEN OCAMPO			11/27/2011		
Dwn:	RUBEN OCAMPO			11/27/2011		
Chk:	RAY CHIN			4/25/2012		
File Name:	PSM2012-0300-0002D.dwg					
PFIND:	Scale AS NOTED	Software AutoCAD 2010				

Sheet Title
**PIPING PLAN - TANK 1
CIRCULATING WATER PUMP
INSTALLATION AND
P & I DIAGRAM**

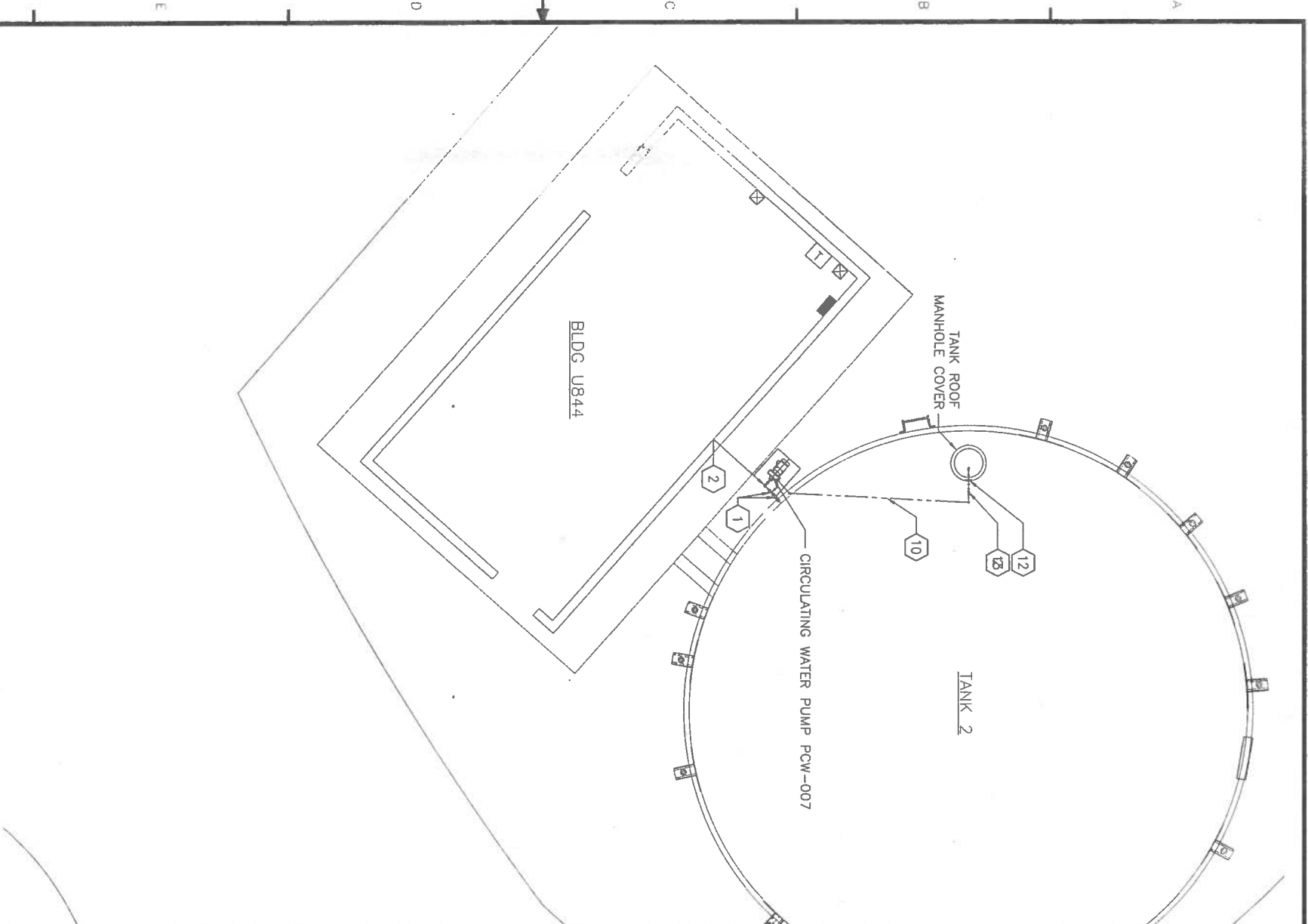
Dwg. No. PSM2012-0300-0002D
Sht No. M-101
Classification UNCLASSIFIED/UNLIMITED RELEASE

NOTES

- 1 REPLACE EXISTING NIPPLE AND FAUCET WITH A NEW NIPPLE, 1/2"x1/2"x2" REDUCING TEE, 1/2" FAUCET AND REQUIRED NEW 1/2" PIPING AS SHOWN ON P & I D.
- 2 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS. SCREWED ENDS.
- 3 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 4 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 5 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 6 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 7 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 8 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.22, EXCEPT SCREWED SCH 40 COPPER NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 9 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 10 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 11 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 12 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 13 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 14 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X, TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE. CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.

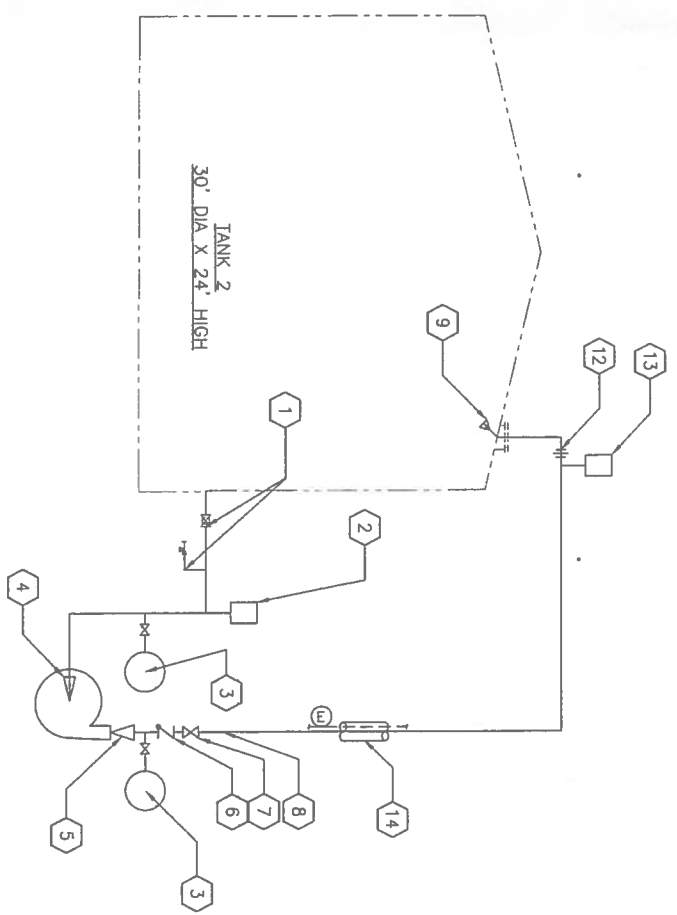
PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0" F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE. PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



PIPING PLAN

CIRCULATING PUMP PCW-007 INSTALLATION

SCALE: 1/4"=1'-0"



CIRCULATING WATER PUMP PCW-007, PACO PUMP MODEL 10-10707 LC, NSF 61, 1-1/4" INLET, 1" OUTLET, WITH 1/2 HP, 1750 RPM, TEFC 115V/1PH/60HZ MOTOR, SEE P.O. U1543303 (ITEM 2)

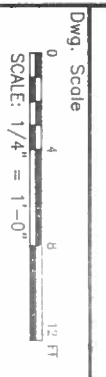
PIPING & INSTRUMENT DIAGRAM

CIRCULATING PUMP PCW-007 INSTALLATION

SCALE: NONE

Lawrence Livermore National Laboratory
 P.O. Box 808 Livermore, California 94551

F & I Facilities & Infrastructure
 Consultants



Project Title: **SITE 300 WATER TANKS NEW CIRCULATING WATER PUMP INSTALLATION**

REV NO	DATE	REVISIONS	DWR	CHK
0	4/26/12	ISSUED FOR CONSTRUCTION	RO	FIG

Des: RUBEN OCAMPO (12/14/2011)
 Dwn: RUBEN OCAMPO (12/14/2011)
 Chk: RAY CHIN (4/25/2012)
 File Name: PSM2012-0300-0003D.dwg
 PFINID: AS NOTED
 Scale: AutoCAD 2010

Sheet Title: **PIPING PLAN - TANK 2 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM**

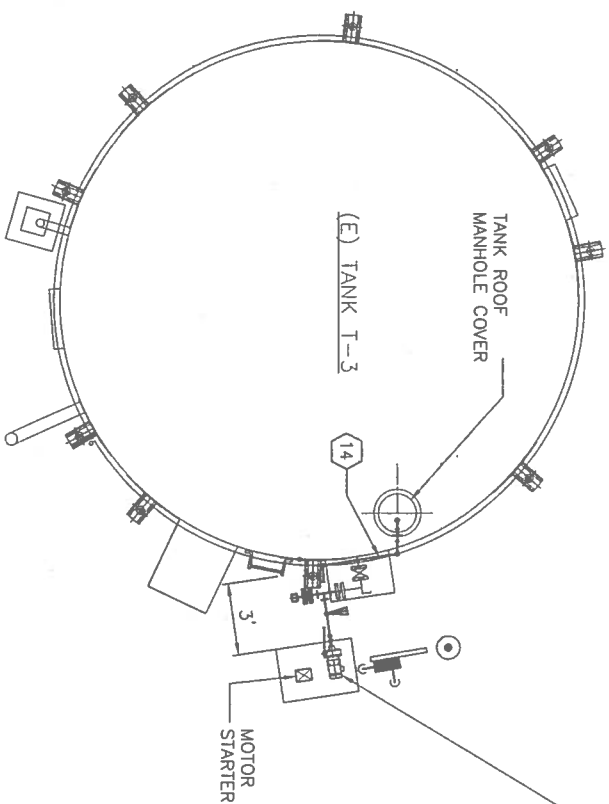
Dwg. No.: **PSM2012-0300-0003D**

Sht. No.: **M-102** (3 of 12)

Classification: UNCLASSIFIED/UNLIMITED RELEASE

NOTES

- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150FF ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS, SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B31.22, EXCEPT SCREWED SCH 40 COPPER NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK. SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 13 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 14 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 15 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 16 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
- 17 HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE. CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP. PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-50 FT-2 F) OR LESS @ 0 F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE. PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT



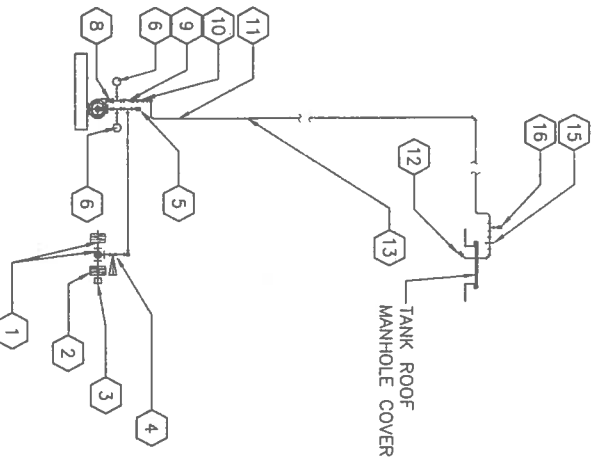
CIRCULATING WATER PUMP PCW-004.
PACO PUMP MODEL 10-10707 LC,
NSF 61, 1-1/4" INLET, 1" OUTLET,
WITH 1/2 HP, 1750 RPM, TEFC
115V/1PH/60HZ MOTOR, SEE P.O.
U1543303 (ITEM 2)

PIPING PLAN

CIRCULATING WATER PUMP PCW-004 INSTALLATION



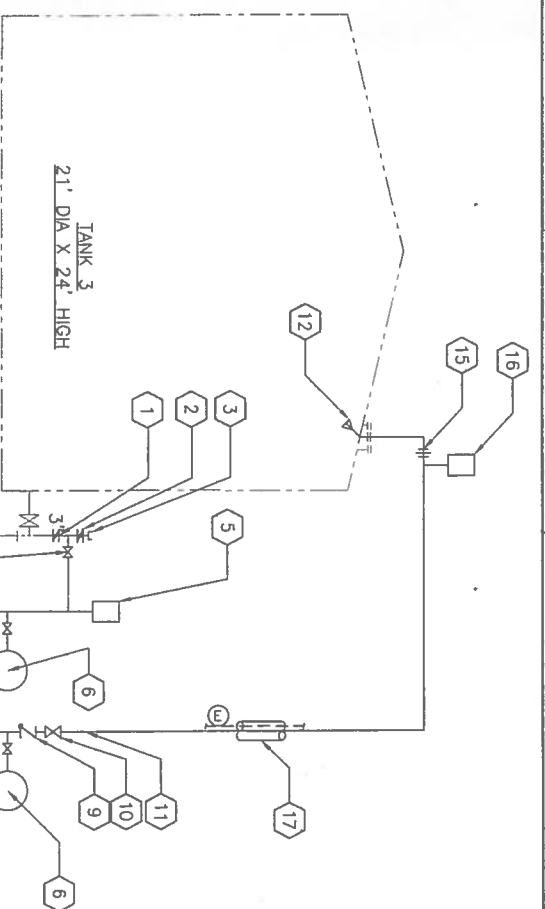
SCALE: 1/4"=1'-0"



PIPING ELEVATION

CIRCULATING PUMP PCW-004 INSTALLATION

SCALE: NONE



CIRCULATING WATER PUMP PCW-004,
PACO PUMP MODEL 10-10707 LC, NSF
61, 1-1/4" INLET, 1" OUTLET, WITH 1/2
HP, 1750 RPM, TEFC 115V/1PH/60HZ
MOTOR, SEE P.O. U1543303 (ITEM 2)

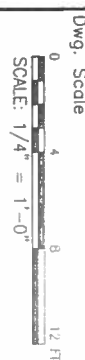
PIPING & INSTRUMENT DIAGRAM

CIRCULATING PUMP PCW-004 INSTALLATION

SCALE: NONE

Lawrence Livermore National Laboratory
P.O. Box 808 Livermore, California 94551

F&I Facilities & Infrastructure
Consultants



Project Title
**SITE 300 WATER TANKS
NEW CIRCULATING WATER
PUMP INSTALLATION**

Rev. No. DATE REV'S. N
0 4/26/12 ISSUED FOR CONSTRUCTION

Des: RUBEN OCAMPO	12/19/2011
Dwn: RUBEN OCAMPO	12/19/2011
Chk: RAY CHIN	4/25/2012
File Name: PSM2012-0300-0004D.dwg	
PFNID: AS NOTED	Software: AutoCAD 2010

Sheet Title
**PIPING PLAN - TANK 3
CIRCULATING WATER PUMP
INSTALLATION AND
P & ID**

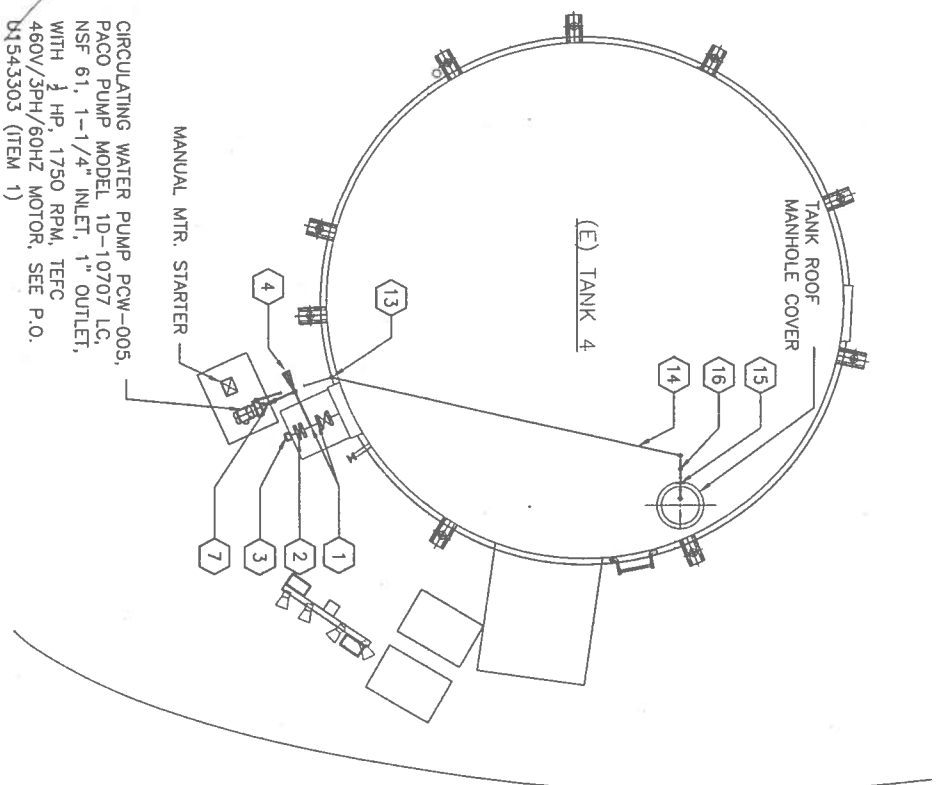
Dwg. No. PSM2012-0300-0004D

Sht. No. M-103

Classification UNCLASSIFIED/UNLIMITED RELEASE

NOTES

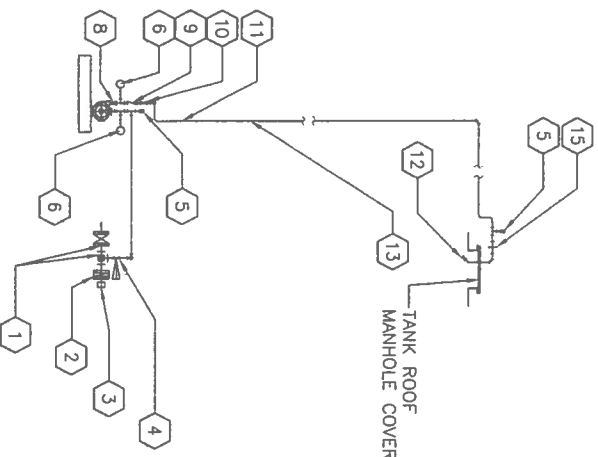
- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150FT ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS, SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B6.22, EXCEPT SCREWED SCH 40 COPPER NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
 HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.
 CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.
 PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0°F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE.
 PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



PIPING PLAN

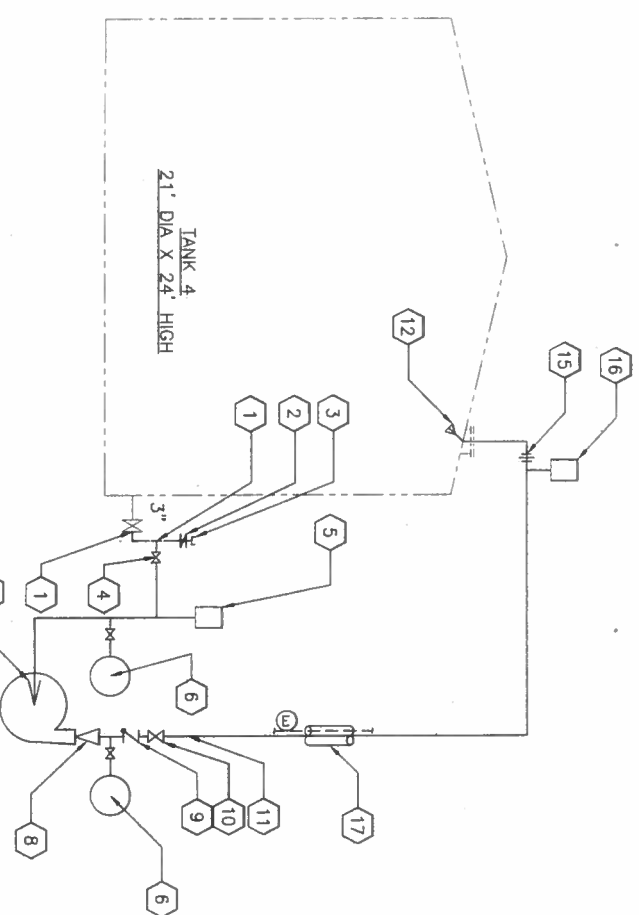
CIRCULATING WATER PUMP PCW-005 INSTALLATION
 SCALE: 1/4"=1'-0"

CIRCULATING WATER PUMP PCW-005,
 PACO PUMP MODEL 1D-10707 LC,
 NSF 61, 1-1/4" INLET, 1" OUTLET,
 WITH 1/2 HP, 1750 RPM, TEFC
 460V/3PH/60HZ MOTOR, SEE P.O.
 U1543303 (ITEM 1)



PIPING ELEVATION

CIRCULATING PUMP PCW-005 INSTALLATION
 SCALE: NONE



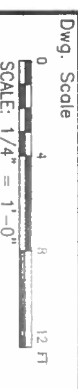
PIPING & INSTRUMENT DIAGRAM

CIRCULATING PUMP PCW-005 INSTALLATION
 SCALE: NONE

CIRCULATING WATER PUMP PCW-005,
 PACO PUMP MODEL 1D-10707 LC, NSF
 61, 1-1/4" INLET, 1" OUTLET, WITH
 1/2 HP, 1750 RPM, TEFC 460V/3PH/60HZ
 MOTOR, SEE P.O. U1543303 (ITEM 1)

Lawrence Livermore National Laboratory
 P.O. Box 808 Livermore, California 94551

F&I Facilities & Infrastructure
 Consultants



REGISTERED PROFESSIONAL ENGINEER
 RUBEN OCAMPO
 No. 0171942
 Exp. 09/30/13
 CIVIL ENGINEER
 STATE OF CALIFORNIA

Ruben Ocampo
 5/2/2012

Project Title
**SITE 300 WATER TANKS
 NEW CIRCULATING WATER
 PUMP INSTALLATION**

REV. No.	DATE	REVISION	ISSUED FOR	BY	RO	RC
0	4/26/12	ISSUED FOR CONSTRUCTION				

Des:	RUBEN OCAMPO	12/20/2011
Dwn:	RUBEN OCAMPO	12/20/2011
Chk:	RAY CHIN	4/29/2012
File Name:	PSM2012-0300-0005D.dwg	
Scale:	AS NOTED	AutocAD 2010

Sheet Title
**PUMP PIPING PLAN - TANK 4
 CIRCULATING WATER PUMP
 INSTALLATION AND
 P & ID**

Dwg. No.	PSM2012-0300-0005D
Sht. No.	M-104
Classification	UNCLASSIFIED/UNLIMITED RELEASE

NOTES

- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150# ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS, SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.22, EXCEPT SCREWED SCH 40 COPPER NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK. SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 13 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 14 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 15 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 16 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
- 17 HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUNCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE. CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.

PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0°F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE. PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



PE Stamps



Project Title
**SITE 300 WATER TANKS
NEW CIRCULATING WATER
PUMP INSTALLATION**

REV. No.	DATE	REVISIONS	DRAWN BY	CHECK BY
1	4/26/12	ISSUED FOR CONSTRUCTION	RO	RC

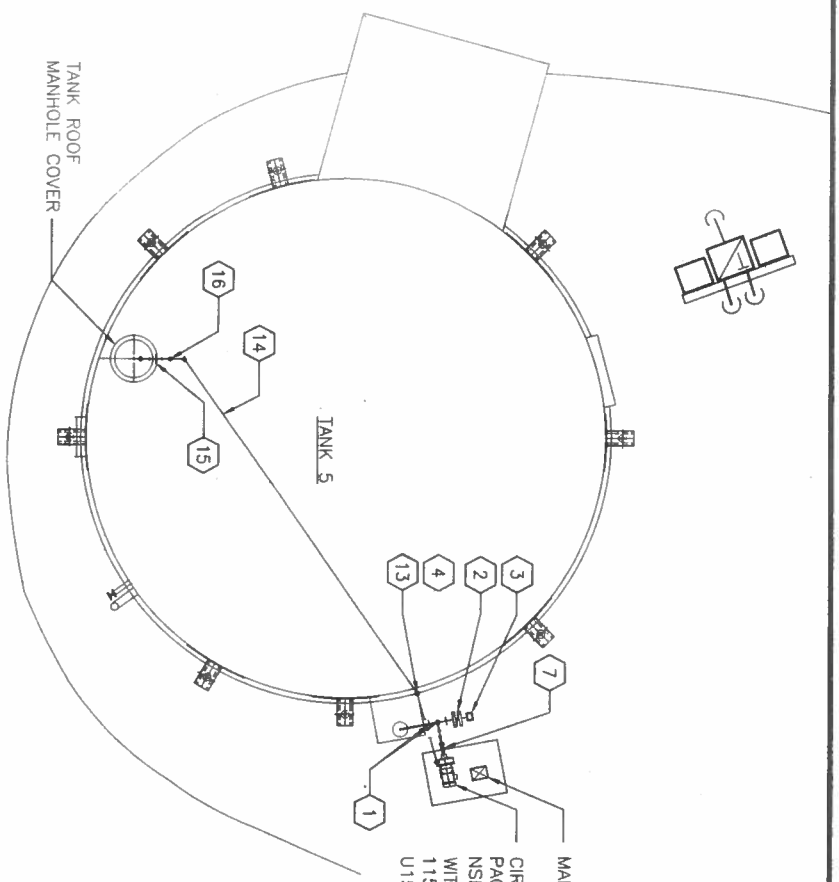
Des: RUBEN OCAMPO 12/22/2011
Dwn: RUBEN OCAMPO 12/22/2011
Chk: RAY CHIN 04/25/2012
File Name: PSM2012-0300-0006D.dwg
Scale: 1/4" = 1'-0"
Scale: AS NOTED
AutocAD 2010

Sheet Title
**PIPING PLAN - TANK 5
CIRCULATING WATER
PUMP INSTALLATION AND
P & I DIAGRAM**

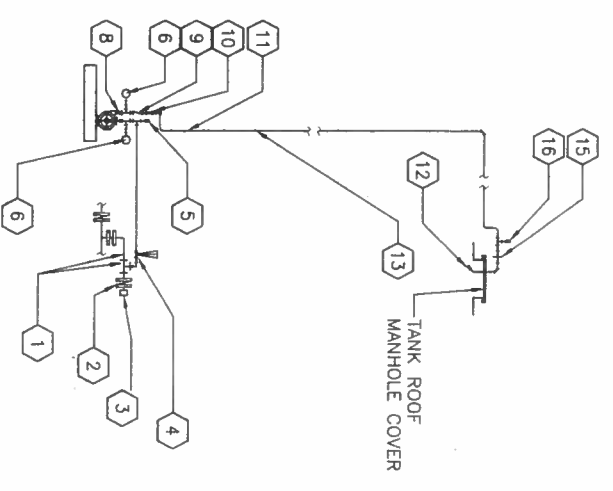
Dwg. No. **PSM2012-0300-0006D**

Sht. No. **M-105** 6 of 12

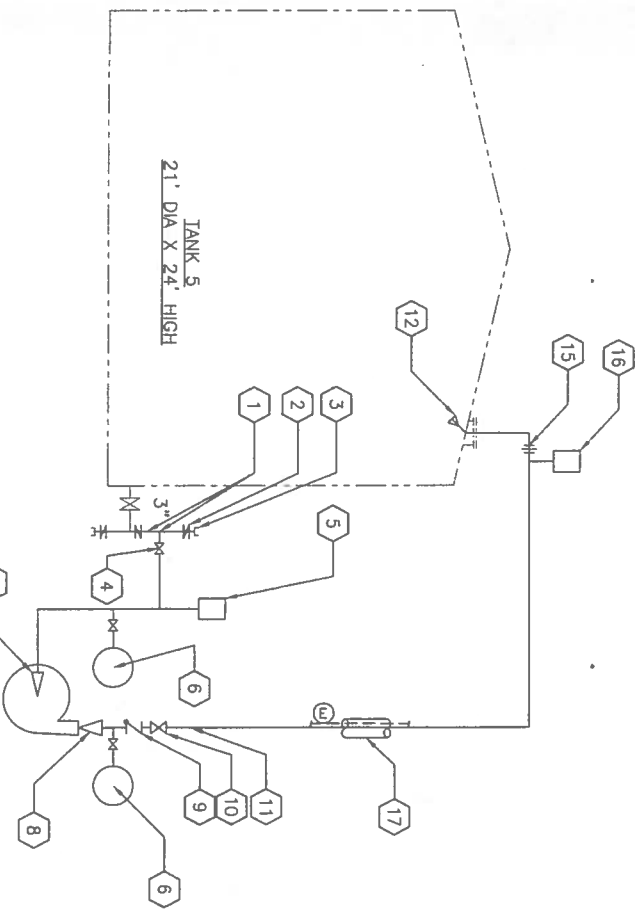
Classification
UNCLASSIFIED/UNLIMITED RELEASE



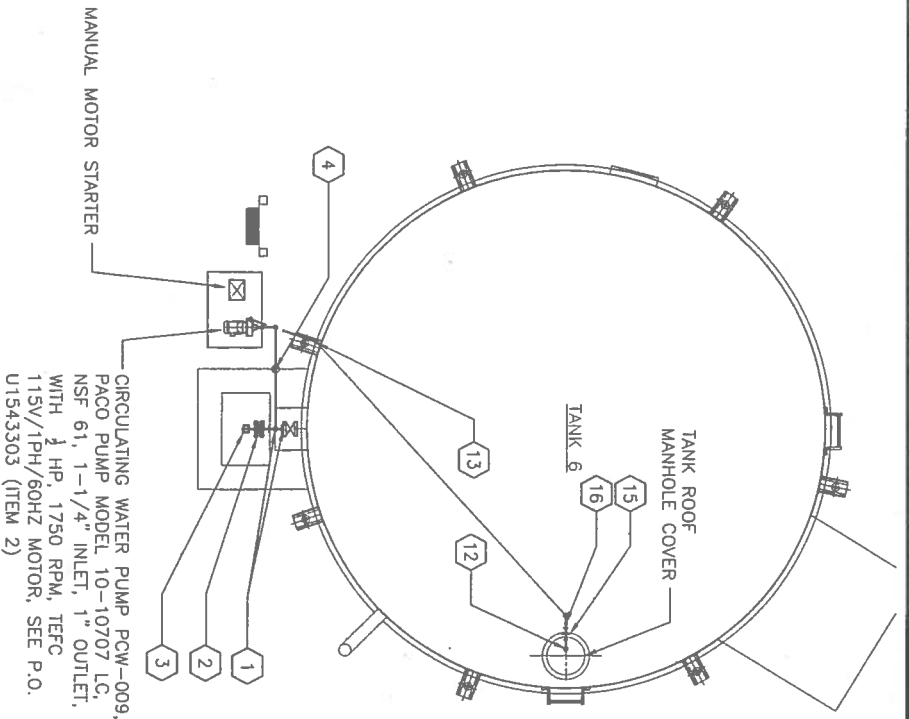
PIPING PLAN
CIRCULATING WATER PUMP PCW-002 INSTALLATION
SCALE: 1/4"=1'-0"



PIPING ELEVATION
CIRCULATING PUMP PCW-002 INSTALLATION
SCALE: NONE



PIPING & INSTRUMENT DIAGRAM
CIRCULATING PUMP PCW-002 INSTALLATION
SCALE: NONE



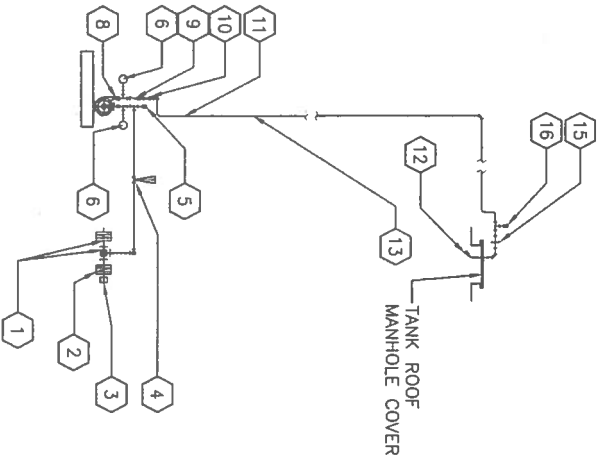
MANUAL MOTOR STARTER
CIRCULATING WATER PUMP PCW-009,
PACO PUMP MODEL 10-10707 LC,
NSF 61, 1-1/4" INLET, 1" OUTLET,
WITH 1/2 HP, 1750 RPM, TEFC
115V/1PH/60HZ MOTOR, SEE P.O.
U1543303 (ITEM 2)

PIPING PLAN

CIRCULATING WATER PUMP PCW-009 INSTALLATION



SCALE: 1/4"=1'-0"



PIPING ELEVATION

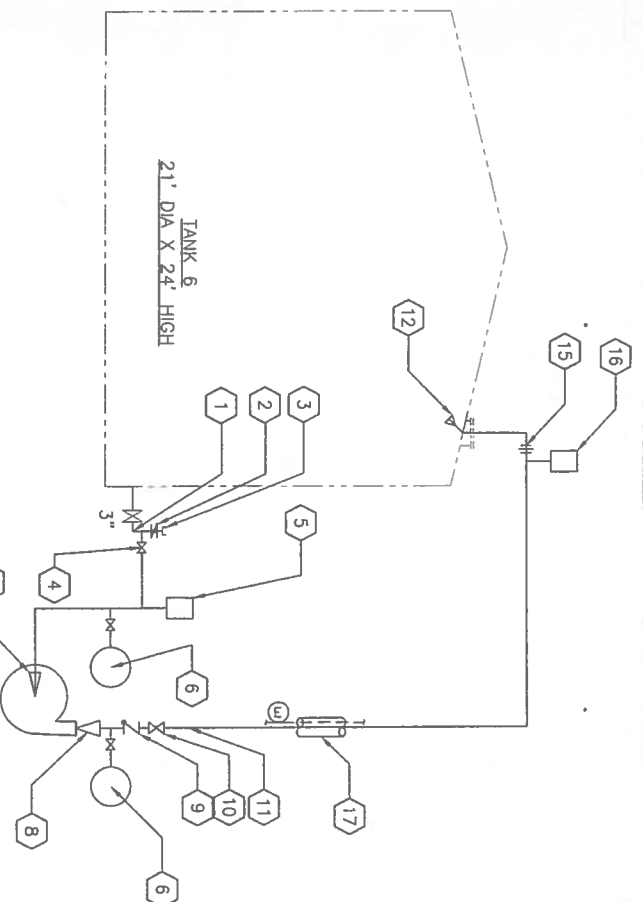
CIRCULATING PUMP PCW-009 INSTALLATION

SCALE: NONE

NOTES

- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150FF ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS, SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE. CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP. PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0°F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE. PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



CIRCULATING WATER PUMP PCW-009,
PACO PUMP MODEL 10-10707 LC, NSF
61, 1-1/4" INLET, 1" OUTLET, WITH
1/2 HP, 1750 RPM, TEFC 115V/1PH/60HZ
MOTOR, SEE P.O. U1543303 (ITEM 2)

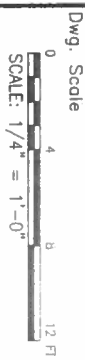
PIPING & INSTRUMENT DIAGRAM

CIRCULATING PUMP PCW-009 INSTALLATION

SCALE: NONE

Lawrence Livermore National Laboratory
P.O. Box 808 Livermore, California 94551

F&I Facilities & Infrastructure
Consultants



Project Title
**SITE 300 WATER TANKS
NEW CIRCULATING WATER
PUMP INSTALLATION**

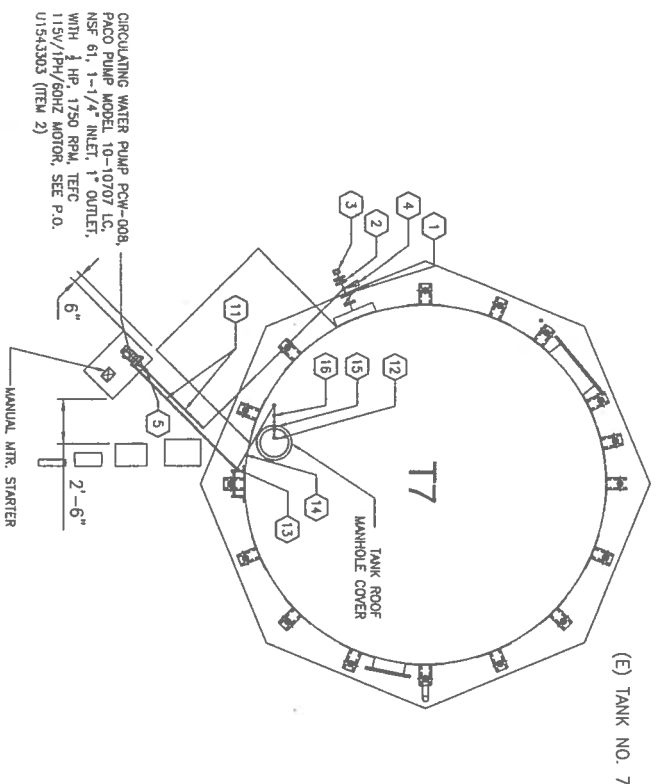
REV/NO	DATE	REVISIONS	APP'D	CHK'D
0	4/26/12	ISSUED FOR CONSTRUCTION	RO	RC

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Dwn:	RUBEN OCAMPO	01/02/2012
Chk:	RAY CHIN	4/25/2012
File Name:	PSM2012-0300-0007D.dwg	
PFNID:	Scale:	Software:
	AS NOTED	AutoCAD 2010

Dwg. No.	PSM2012-0300-0007D
Sht. No.	M-106
Classification	UNCLASSIFIED/UNLIMITED RELEASE

NOTES

- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150FF ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS, SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-50 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882) INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE LADDER SUPPORT.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
 HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION. LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.
 CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.
 PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0" F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE.
 PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.

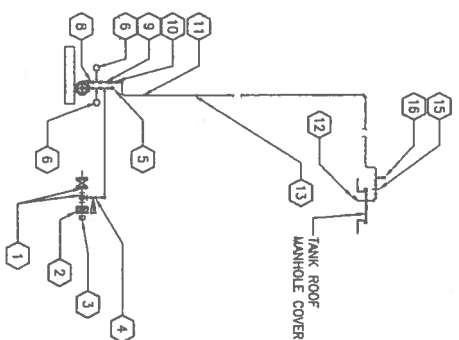


PIPING PLAN

CIRCULATING WATER PUMP PCW-008 INSTALLATION



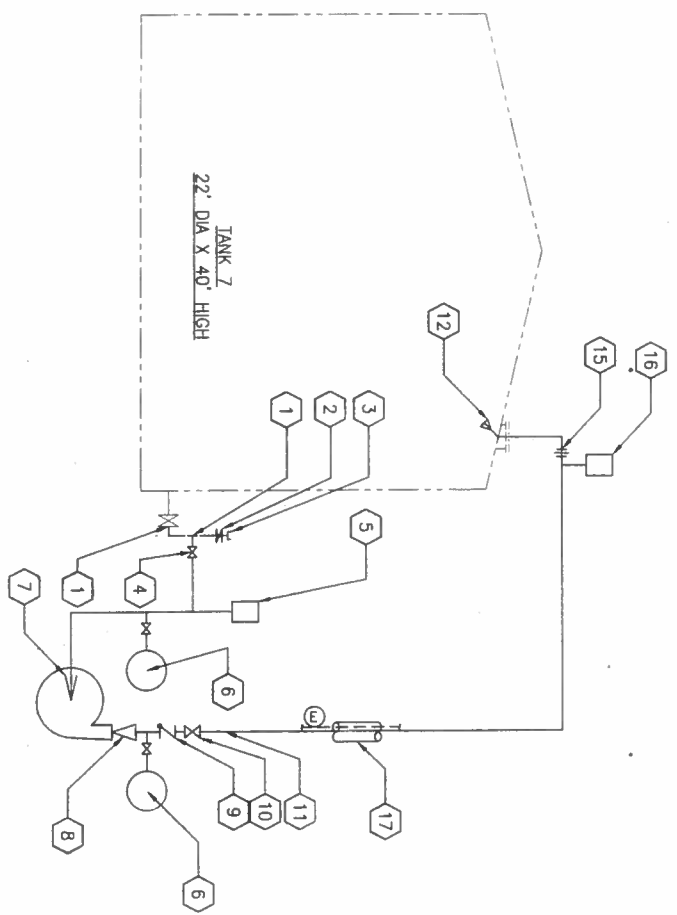
SCALE: 1/4" = 1'-0"



PIPING ELEVATION

CIRCULATING PUMP PCW-008 INSTALLATION

SCALE: NONE



PIPING & INSTRUMENT DIAGRAM

CIRCULATING PUMP PCW-008 INSTALLATION

SCALE: NONE

Lawrence Livermore National Laboratory
 P.O. Box 808 Livermore, California 94551

F&I Facilities & Infrastructure
 Consultants

Dwg. Scale
 0 4 8 12 FT
 SCALE: 1/4" = 1'-0"

REGISTERED PROFESSIONAL ENGINEER
 No. A17842
 Exp. 09/30/13
 STATE OF CALIFORNIA
 RAY CHIN
 5/2/2012

Project Title
**SITE 300 WATER TANKS
 NEW CIRCULATING WATER
 PUMP INSTALLATION**

REV	DATE	REVISIONS	DWN	CHK
0	4/26/12	ISSUED FOR CONSTRUCTION	Y	RC

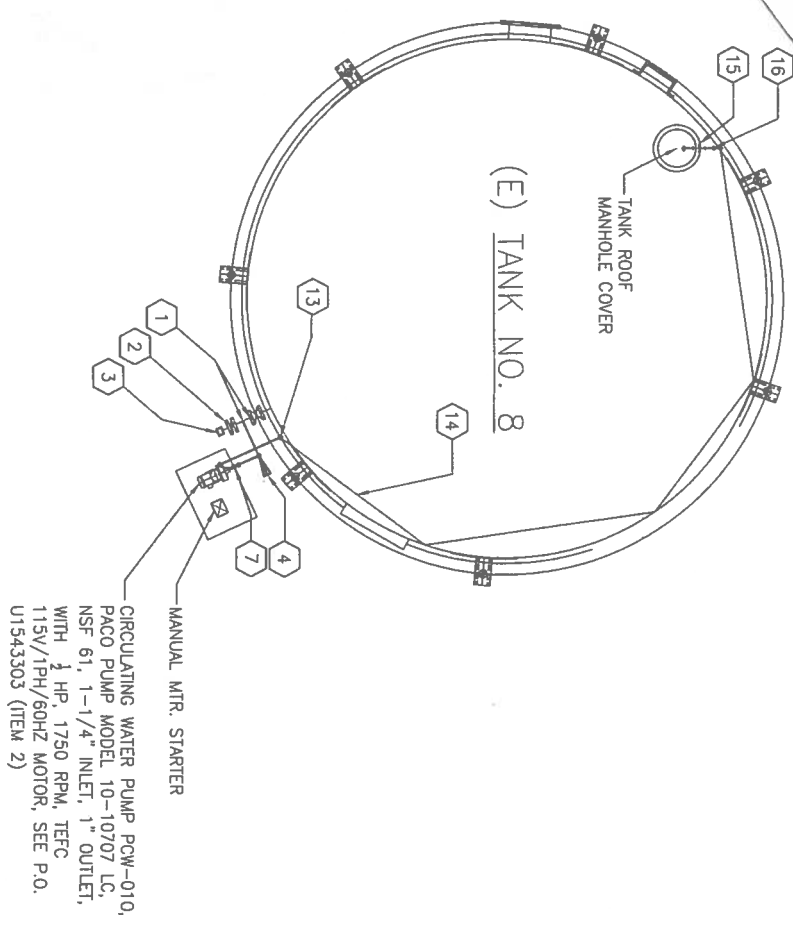
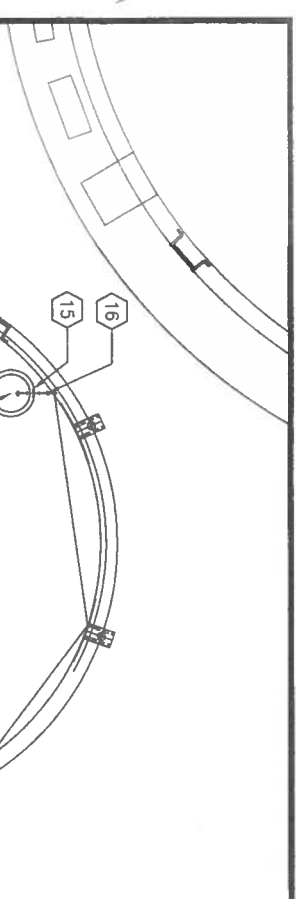
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Sheet Title
**PIPING PLAN - TANK 7
 CIRCULATING WATER
 PUMP INSTALLATION AND
 P&I DIAGRAM**

Dwg. No. PSM2012-0300-0008D

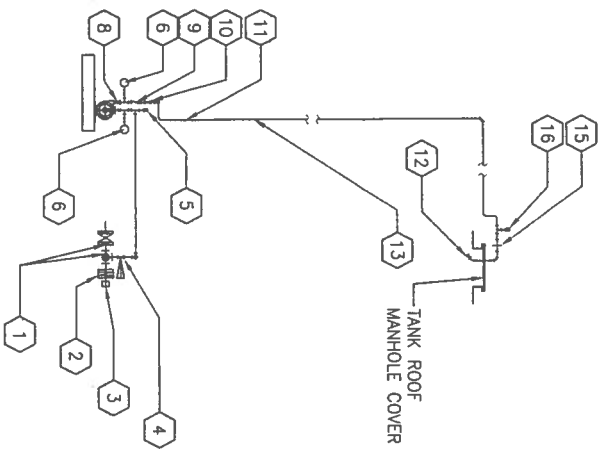
Sht. No. M-107 8 of 12

Classification
 UNCLASSIFIED/UNLIMITED RELEASE



PIPING PLAN

CIRCULATING WATER PUMP PCW-010 INSTALLATION
SCALE: 1/4"=1'-0"



PIPING ELEVATION

CIRCULATING PUMP PCW-010 INSTALLATION
SCALE: NONE

NOTES

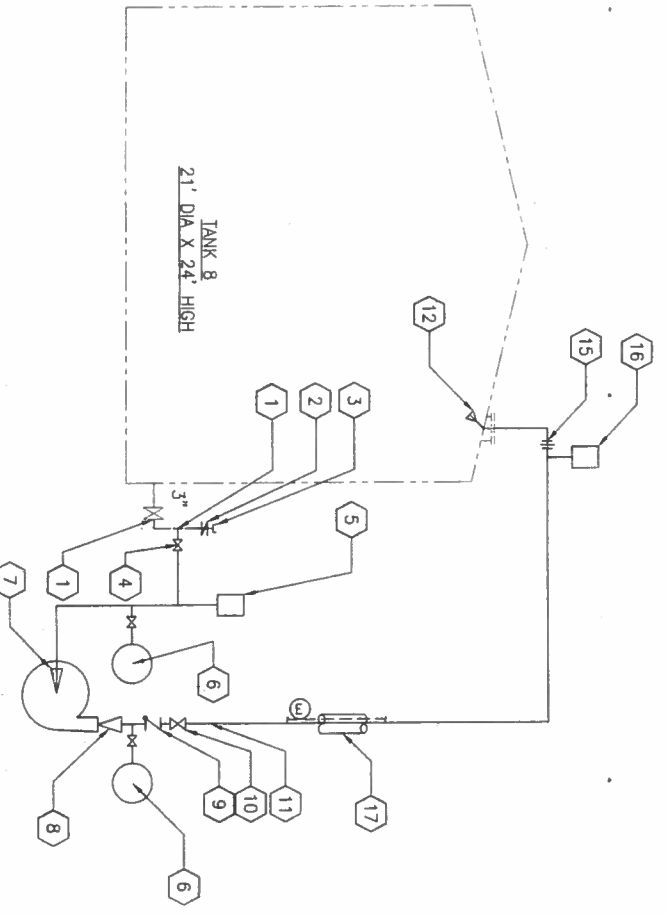
- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150FF ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS, SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAD, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.

CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.

PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0°F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE.

PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



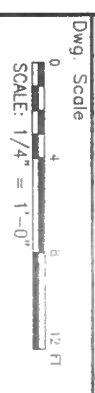
CIRCULATING WATER PUMP PCW-010, PACO PUMP MODEL 10-10707 LC, NSF 61, 1-1/4" INLET, 1" OUTLET, WITH 1/2 HP, 1750 RPM, TEFC 115V/1PH/60HZ MOTOR, SEE P.O. U1543303 (ITEM 2)

PIPING & INSTRUMENT DIAGRAM

CIRCULATING PUMP PCW-010 INSTALLATION
SCALE: NONE

Lawrence Livermore National Laboratory
P.O. Box 808 Livermore, California 94551

F&I Facilities & Infrastructure
Consultants



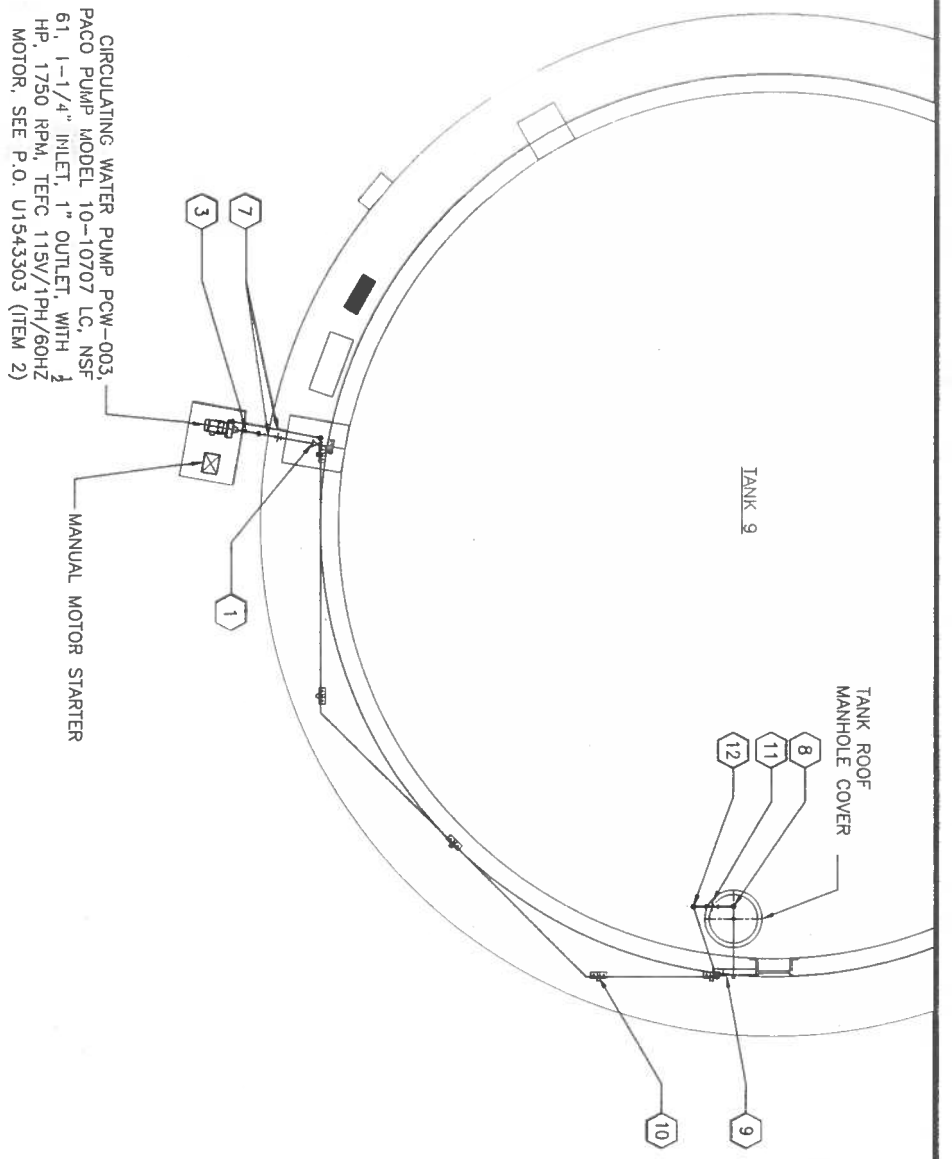
Project Title
SITE 300 WATER TANKS NEW CIRCULATING WATER PUMP INSTALLATION

REV	DATE	REVISION	DRN	CHK
0	4/26/12	ISSUED FOR CONSTRUCTION	RO	RC

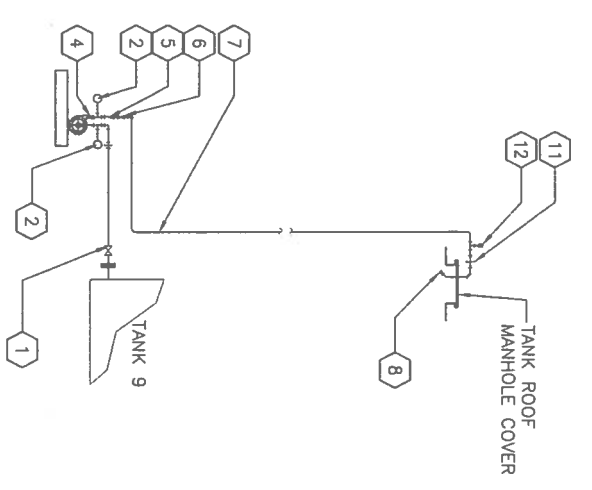
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Dwn	RUBEN OCAMPO	2/02/2012
Chk	RAY CHIN	4/25/2012
File Name	PSM2012-0300-0009D.dwg	
PFNID	Scale AS NOTED	2 fl y or e AutoCAD 2010

Sheet Title
PIPING PLAN - TANK 8 CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM

Dwg. No. PSM2012-0300-0009D
Sht. No. M-108 9 of 12
Classification UNCLASSIFIED/UNLIMITED RELEASE



SITE PIPING PLAN
CIRCULATION PUMP PCW-003 INSTALLATION
 SCALE: 1/4"=1'-0"



PIPING ELEVATION
CIRCULATION PUMP PCW-003 INSTALLATION
 SCALE: NONE

NOTES

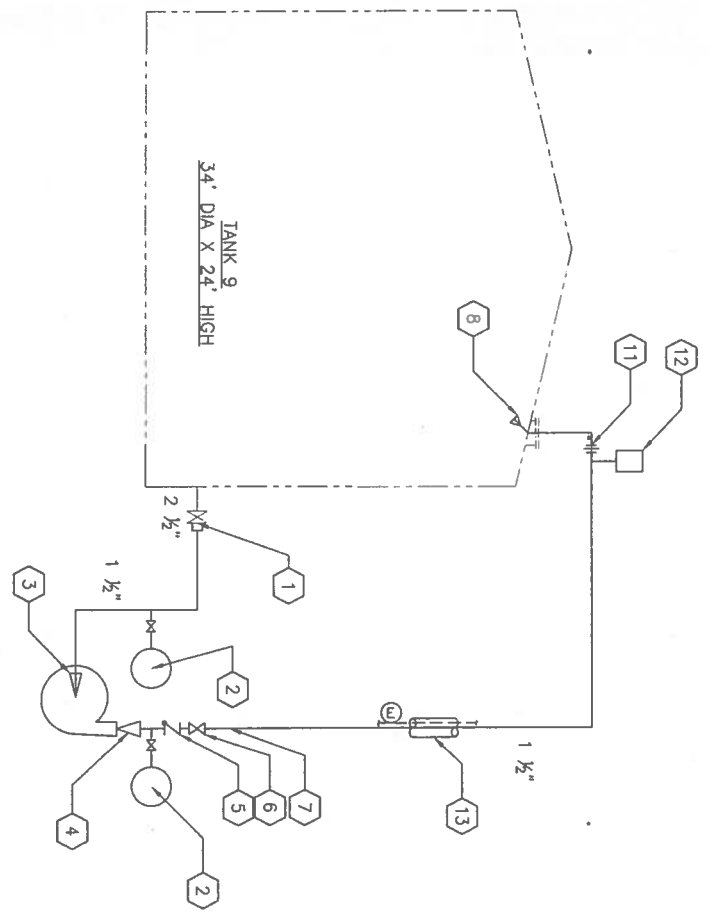
- 1 REMOVE EXISTING PLUG AND REPLACE WITH 2 1/2" X 1 1/2" REDUCING BUSHING.
- 2 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE. LOCATE GAUGE DIAL FACES OF SUCTION AND DISCHARGE AT SAME ELEVATIONS AS MUCH AS POSSIBLE.
- 3 SWAGED NIPPLE 1-1/2"X1-1/4" COPPER, SCH 40.
- 4 SWAGED NIPPLE 1-1/2"X1" COPPER, SCH 40.
- 5 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 6 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 7 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B31.22. EXCEPT SCREWED SCH 40 COPPER NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 8 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 9 SUPPORT RISER PIPING WITH COOPER B-LINE B-22 STRUT EXTENSIONS ALONG LADDER USING COOPER B-129 2-HOLE SPLICE PLATE, AND B-2011DCU CLAMP.
- 10 SUPPORT PIPING WITH COOPER B-LINE B-22 STRUT, B-2011DCU CLAMP AND 280FL POST BASE ANCHORED ON TANK FOUNDATION.
- 11 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 12 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 13 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:

HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.

CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.

PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS PIPE INSULATION WITH K=0.23 BTU-IN/(HR-SQ FT-F) OR LESS @ 0°F (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE.

PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.



PIPING & INSTRUMENT DIAGRAM
CIRCULATION PUMP PCW-003 INSTALLATION
 SCALE: NONE

Lawrence Livermore National Laboratory
 P.O. Box 808 Livermore, California 94551

F&I Infrastructure
 Consultants

Project Title
 SITE 300 WATER TANKS
 NEW CIRCULATING WATER
 PUMP INSTALLATION

Rubén Ocampo
 5/2/2012

REGISTERED PROFESSIONAL ENGINEER
 No. 117842
 Exp. 09/30/13
 STATE OF CALIFORNIA
 MECHANICAL ENGINEER

Dwg. Scale
 0 4 8 12 FT
 SCALE: 1/4" = 1'-0"

PE Stamps

REV	DATE	REVISIONS	D/WN	CHK
0	4/28/12	ISSUED FOR CONSTRUCTION	RO	RC

Des: RUBEN OCAMPO 01/10/2012
 Dwn: RUBEN OCAMPO 01/10/2012
 Chk: RAY CHIN 04/28/2012
 File Name: PSM2012-0300-0010D.dwg
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Sheet Title
PIPING PLAN - TANK 9
CIRCULATING WATER PUMP
INSTALLATION AND
P & I DIAGRAM

Dwg. No: PSM2012-0300-0010D
 Sht. No: M-109 10 of 12
 Classification: UNCLASSIFIED/UNLIMITED RELEASE

NOTES

- 1 REPLACE EXISTING NIPPLE AND HOSE FITTING WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 3"-125# LUGGED RESILIENT SEATED BUTTERFLY VALVE, 316 S.S. DISC, FOOD GRADE EPDM SEAT, KEYSTONE AR2 OR EQUAL, WITH MATCHING CLASS 150FF ANSI B16.5 GALVANIZED STEEL SCREWED FLANGES.
- 3 RE-INSTALL 3" MPT X HOSE FITTING WITH CAP, AFTER BUTTERFLY VALVE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS. SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
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- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
 HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUAL, OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.
 CABLE WRAPPING FACTOR SHALL BE 1.0 FOR 1.5" PIPE, AND 1.5 FOR 3" PIPE (3" PITCH). PROVIDE 5 FT CABLE ALLOWANCE FOR PUMP.
 PIPE INSULATION SHALL BE 1" THICK FIBERGLASS INSULATION WITH ALL-WEATHER SERVICE JACKET. ACCEPTABLE SUBSTITUTE INSULATION IS P P INSULATION WITH K=0.23 BTU-IN/HR-SQ. FT.-F. OR LESS @ 0.1" (EQUIVALENT TO FIBERGLASS) AND IS NON-CORROSIVE TO THE PIPE. PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.

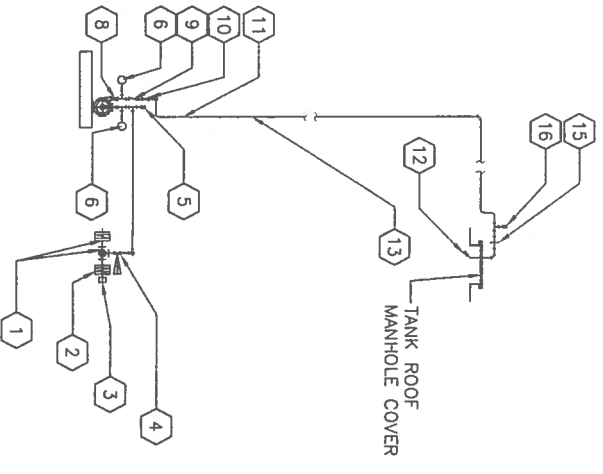
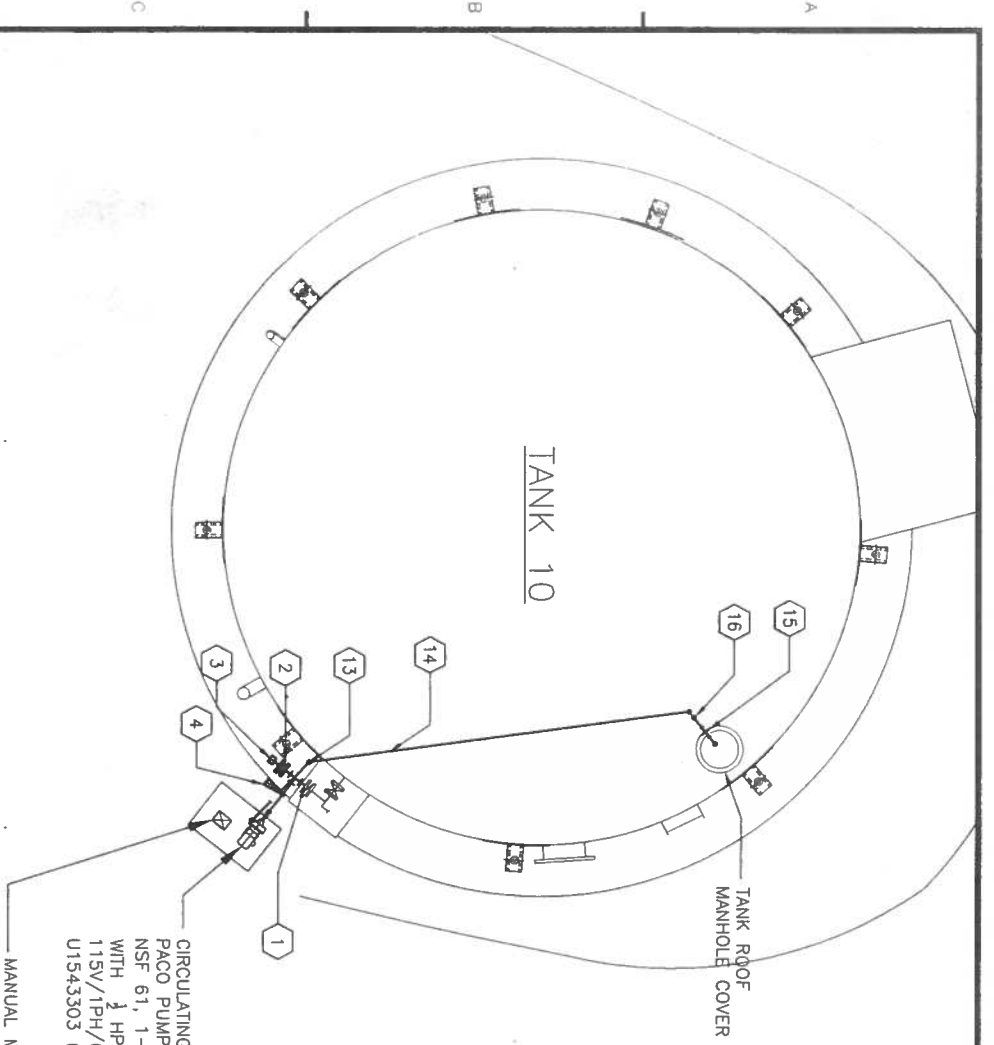
CIRCULATING WATER PUMP PCW-001, PACO PUMP MODEL 10-10707 LC, NSF 61, 1-1/4" INLET, 1" OUTLET, WITH 1/2 HP, 1750 RPM, TEFC, 115V/1PH/60HZ MOTOR, SEE P.O. U1543303 (ITEM 2)

MANUAL MTR. STARTER

PIPING PLAN

CIRCULATING WATER PUMP PCW-001 INSTALLATION

SCALE: 1/4"=1'-0"



PIPING ELEVATION

CIRCULATING PUMP PCW-001 INSTALLATION

SCALE: NONE

Lawrence Livermore National Laboratory
 P.O. Box 808 Livermore, California 94551

F&I Facilities & Infrastructure
 Consultants

Dwg. Scale
 0 4 8 12 FT
 SCALE: 1/4" = 1'-0"

PE Stamps



Project Title
**SITE 300 WATER TANKS
 NEW CIRCULATING WATER
 PUMP INSTALLATION**

REV	DATE	ISSUED FOR	BY	CHKD	APP'D
0	4/26/12	CONSTRUCTI N			RC

wn: RUBEN OCAMPO	1 2 2011
hk: RAY CHIN	4 5/2012
file Name PSM2012 0300 0011	
FNID: Scale: AS NOTED	Aut. AD 2010

Sheet Title	PIPING PLAN - TANK 10
PIPING PLAN - TANK 10	
CIRCULATING WATER PUMP INSTALLATION AND P & I DIAGRAM	

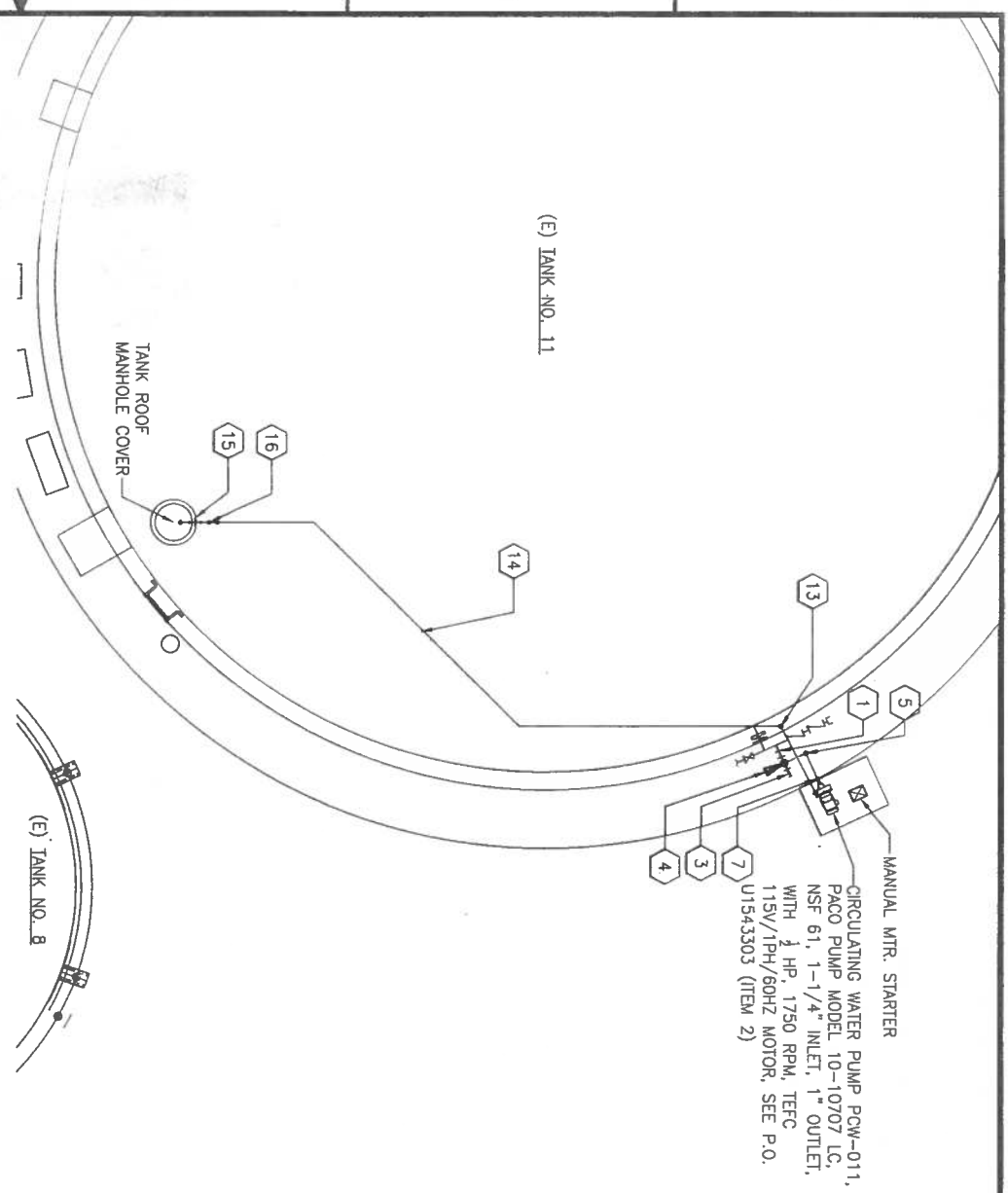
Dwg. No. PSM2012-0300-0011D	
Sht. No. M-110	11 of 12
Classification UNCLASSIFIED/UNLIMITED RELEASE	

NOTES

- 1 REPLACE EXISTING REDUCING BUSHING AND HOSE BIBB WITH NEW GALV. STEEL NIPPLE ASTM A120 AND 3"x3"x1-1/2" RED. TEE GALV. IRON ASME/ANSI B16.3 CLASS 150.
- 2 NOT USED
- 3 INSTALL REDUCING BUSHING AND A NEW HOSE BIBB AT THE NEW 3" TEE.
- 4 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 5 1/2" 125# BALL VALVE, BRONZE BODY, STAINLESS STEEL BALL AND STEM, TEFLON SEATS AND SEALS. SCREWED ENDS.
- 6 4.5" PRESSURE GAUGE, 0-30 PSIG RANGE, PROVIDE BLOCK VALVE.
- 7 SWAGED NIPPLE 1-1/2"x1-1/4" COPPER, SCH 40.
- 8 SWAGED NIPPLE 1-1/2"x1" COPPER, SCH 40.
- 9 1-1/2" 125# SCREWED BRONZE CHECK VALVE, S.S. TRIM, SCREWED CAP.
- 10 1-1/2" 125# SCREWED BRONZE GATE VALVE, SCREWED BONNET.
- 11 1-1/2" COPPER PIPING PER ASTM B88 TYPE L AND COPPER SOLDER FITTINGS PER ASME/ANSI B31.22, EXCEPT SCREWED SCH 40 COPPER NIPPLES AND SCREWED CAST BRONZE FITTINGS PER ASME/ANSI B16.15 CLASS 125.
- 12 FULL CONE SPRAY NOZZLE, BRASS, 1-1/4" FEMALE NPT, 20 GPM @ 7 PSIG CAPACITY, SPRAYING SYSTEMS PART # 1-1/4H-20 (SEE P.O. U1545882). INSTALL NOZZLE AS HIGH AS POSSIBLE DIRECTING THE DISCHARGE 45 DEGREE DOWNWARD TOWARDS THE CENTER OF THE TANK.
- 13 SUPPORT RISER PIPING WITH BRACKETS MOUNTED ON THE FLANGES OF THE TANK SHELL, USING TWO TANK FLANGE BOLTS SPACED AT LEAST 3-SUCCESSIVE BOLT SPACING APART.
- 14 ROUTE PIPING ON THE ROOF TO SUIT AVAILABLE MEANS TO SUPPORT PIPE. ALLOW 3' X 3' ACCESS CLEARANCE FROM LADDER SIDE OF THE MANHOLE.
- 15 PROVIDE BREAK UNION FOR REMOVAL OF MANHOLE COVER.
- 16 AIR RELEASE VALVE, 1/16" ORIFICE, 1/2" NPT INLET.
- 17 ALL NEW WATER PIPING, VALVES & PUMP SHALL BE HEAT TRACED AND INSULATED, IN ACCORDANCE WITH THE FOLLOWING SPECIFICATIONS:
 HEAT TRACING SYSTEM SHALL BE CHROMALOX OR EQUIV., OF THE SELF REGULATING TYPE, 3-WATT/FT, 120V, COPPER OVERBRAID, COMPLETE WITH SUITABLE ACCESSORIES AND INSTALLED PER MANUFACTURER'S RECOMMENDATIONS. CABLE LENGTH SHALL NOT EXCEED THAT FOR THE 15 AMP CIRCUIT BREAKER. SEE PROJECT ELECTRICAL DRAWINGS FOR POWER SUPPLY LOCATION. ENCLOSURES SHALL BE NEMA 4X. TEMPERATURE CONTROL SHALL BE PIPE WALL SENSING BULB AND CAPILLARY TYPE, STRAPPED TO PIPE CLOSEST TO POWER SUPPLY. PROVIDE ONE END SEAL WITH SIGNAL LIGHT PER CIRCUIT FOR INDICATION OF HEATING ACTIVATION, LOCATED AT SUCTION PIPING WHERE IT SHOULD BE MADE VISIBLE FROM GRADE.
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 PUMP SHALL BE INSULATED WITH REMOVABLE/REUSABLE INSULATION BLANKET, THERMAL ENERGY PRODUCTS (TEP) "ENERGY WRAP" OR EQUIVALENT.

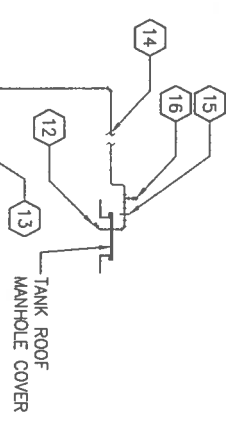


CIRCULATING WATER PUMP PCW-011 INSTALLATION
 SCALE: 1/4"=1'-0"



PIPING PLAN

SCALE: 1/4"=1'-0"

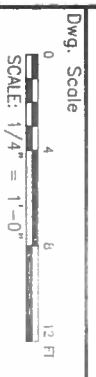


PIPING ELEVATION

CIRCULATING PUMP PCW-011 INSTALLATION
 SCALE: NONE

Lawrence Livermore National Laboratory
 P.O. Box 808 Livermore, California 94551

F&I Facilities & Infrastructure
 Consultants



Project Title
**SITE 300 WATER TANKS
 NEW CIRCULATING WATER
 PUMP INSTALLATION**

REV	DATE	REVISION	WH	CHK
0	4/26/12	ISSUED FOR CONSTRUCTION	RO	RC
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Des: RUBEN OCAMPPO 2/06/2012
 Dwn: RUBEN OCAMPPO 2/06/2012
 Chk: RAY CHIN 04/25/2012
 File Name: PSM2012-0300-0012D.dwg
 PflNID: Scale: AS NOTED
 Software: AutoCAD 2010

Sheet Title
**PIPING PLAN - TANK 11
 CIRCULATING WATER PUMP
 INSTALLATION AND
 P & I DIAGRAM**

Dwg. No. PSM2012-0300-0012D
 Sht. No. M-111

Classification
 UNCLASSIFIED/UNLIMITED RELEASE

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APPENDIX H

SAMPLING SCHEDULE

Table - Current System Sampling Schedule According to Permit 03-10-13P-003 dated January 24, 2014

Sample Type	Sample Locations	Frequency	Notes
Source Sampling Schedule			
Coliform Density (upstream of chlorination)	Well #18; Well #20	monthly	If coliform is detected, additional sampling is required in accordance with the groundwater rule.
Inorganic Chemicals	Well #18; Well #20	36 months	Permit specifies: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, fluoride, mercury, nickel, selenium, thallium, hexavalent chromium
Perchlorate	Well #18; Well #20	36 months	Sample must be collected between May 1 and September 30 of the year in which it is due. Sampling outside this timeframe is considered a violation.
Nitrate	Well #18; Well #20	12 months	If result is greater than or equal to 1/2 the maximum contaminant level; sampling must increase to quarterly
Nitrite	Well #18; Well #20	36 months	If result is greater than or equal to 1/2 the maximum contaminant level; sampling must increase to quarterly
Volatile Organic Compounds (VOCs)	Well #18; Well #20	24 months	Permit specifies the specific VOC analytes
Synthetic Organic Chemicals (SOCs)	Well #18; Well #20	36 months	Permit specifies the specific SOC analytes
Hexavalent chromium	Well #18; Well #20	36 months	
Gross Alpha and Uranium	Well #18; Well #20	36 months	
Tritium, Strontium, Gross Beta	Well #18; Well #20	36 months	
Distribution System Sampling			
Bacteriological	B-875 (odd months); B-871 (even months) B-827; B-836; B-812B; B-854	monthly	If coliform is detected, additional sampling is required. Refer to the Bacteriological Sample Siting Plan.
Chlorine residuals (field measurement)	B-875 (odd months); B-871 (even months) B-827; B-836; B-812B; B-854	monthly	Must be maintained at level of 0.2 ppm
Total trihalomethane (TTHM) and five haloacetic acids (HAA5; Stage 2 Disinfection Byproduct Rule)	B-875 Water Department Sink; B-827 Mop Sink; B-836 Mop Sink; B812 Mop Sink;	Quarterly	Sample must be collected the second week of January, April, July, and October. Refer to the Stage 2 Disinfection Byproduct Monitoring Plan dated June 23, 2015.

APPENDIX H

SAMPLING SCHEDULE

Table - Current System Sampling Schedule According to Permit 03-10-13P-003 dated January 24, 2014

Sample Type	Sample Locations	Frequency	Notes
	B854 Mop Sink		
Lead and Copper	B-875; B-827; B-836; B-812B; B-854	36 months	Must be conducted in summer months (June, July, August or September)
Asbestos	812	9 years	

APPENDIX I

WATER QUALITY EMERGENCY NOTIFICATION PLAN

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EDMUND G. BROWN JR.
GOVERNOR



MATTHEW RODRIGUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

State Water Resources Control Board
Division of Drinking Water

WATER QUALITY EMERGENCY NOTIFICATION PLAN

Name of Utility Lawrence Livermore National Laboratory – Site 300	System No.: 3910025
Physical Location/Address: Physical Location: 15999 West Corral Hollow Road, Tracy, CA 95376 Mailing Address: P.O. Box 808, Livermore, CA 94551	

The following person(s) have been designated to implement the plan upon notification by the State Water Resources Control Board, Division of Drinking Water that an imminent danger to the health of the water user exists:

Name	Title	Telephone-Day & E-mail Address	Telephone-Night
1. Ray Chin (normal working hours)	Mechanical Utilities Manager	925-422-9386 Chin4@llnl.gov	510-502-1443
2. Wendy Bellah (normal working hours)	Environmental Analyst	925-423-6626 Bellah1@llnl.gov	415-314-0368
3. Environmental Duty Officer (EDO; off hours)	Environmental Duty Officer	925-784-5231 edo@llnl.gov	925-784-5231

DIVISION OF DRINKING WATER PERSONNEL TO BE NOTIFIED:

Name	Title	Telephone-Day	Telephone-Night
1. Bhupinder Sahota	District Engineer	209-948-3881	209-608-9108
2. David Remick	Sanitary Engineer	209-948-3878	209-523-1503
3. Tahir Mansoor	Sanitary Engineer	209-948-3879	916-714-5383
4. Brian Kidwell	Associate Sanitary Engineer	209-948-3963	209-603-2814
5.			

If the above personnel cannot be reached, contact: **Office of Emergency Services (24 Hrs.) @ 1-800-852-7550 or (916) 845-8911.** Ask for Division of Drinking Water Duty Officer.

FELICIA MARCUS, CHAIR | THOMAS HOWARD, EXECUTIVE DIRECTOR

31 E. Channel Street, Room 270, Stockton, CA 95202 | www.waterboards.ca.gov



COUNTY HEALTH DEPARTMENT TO BE NOTIFIED:

Name	Title	Telephone-Day	Telephone-Night
1. Adrienne Ellsaesser	Program Coordinator, REHS	209-468-0343	209-468-3420 ER Staff
2. Steven Shih	Lead Senior, REHS	209-468-9850	209-468-3420 ER Staff

NOTIFICATION PLAN

Describe methods or combinations of methods to be used (radio, television, door-to-door, sound truck, etc.) For each section of your plan give an estimate of the time required, necessary personnel, estimated coverage, etc. Consideration must be given to special organizations, particularly non-English speaking groups and outlying water users. (Use another sheet of paper if necessary.)

Please use this area for your notification plan: (use additional sheets of paper if needed)

LLNL Site 300 is a secured government facility with a non-transient population of approximately 100 employees. Multiple methods would be utilized to notify the employees of water quality issues depending on whether the notification occurred during or after normal working hours. As soon as practical (but no more than one hour) after learning of a water quality issue requiring emergency notification, notification would be provided to the Office of the Site Manager for Site 300 of the water quality issue. The Office of the Site Manager would then conduct the following water quality notification procedures within approximately one hour of learning of the water quality issue:

- A. Notify Fire, Security and Maintenance personnel via phone.
- B. Notify personnel via voice paging system (normal working hours)
- C. Batch page alphanumeric pagers (normal working hours)
- D. Send email detailing water quality issues (normal working hours)
- E. Create handout for distribution by security personnel at entry checkpoint (normal working hours)

If the emergency occurred during off hours, notification through A. could be implemented within one hour after learning of a water quality issue requiring emergency notification through the EDO. Notification via B through E would be implemented the next business day by the Office of the Site Manager for Site 300.

Normal working hours for Site 300 are Monday through Thursday 7AM to 5:30PM.

Report prepared by:
Ms. Wendy Bellah, Environmental Analyst


Signature and Title



Date