

**United States
Environmental Protection Agency**

Preventive Maintenance for Small Public Water Systems Using Ground Water

An Interactive PDF with Suggested Preventive Maintenance Tasks and Logs

Guidebook



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Questions and Answers About This Guide Book

Tools for Preventative Maintenance

What do the tools for preventative maintenance and this guide booklet address?

This guidance booklet and associated interactive PDF task and log files provide a schedule of routine operation and maintenance tasks for small drinking water systems that use a ground water supply. These logs and booklet will help you develop a preventive maintenance program for your water system. They will also provide security measures that can be taken as normal operation and maintenance activities are completed.

How is this guide book organized?

This guidebook is divided into sections that outline daily, weekly, and monthly tasks, plus individual sections that describe specific tasks for each month of the year including quarterly, bi-annual and annual tasks which have been assigned to specific months. Each section contains guidance notes that provide additional information on some tasks. The notes correspond to the tasks in the accompanying monthly O&M files. Please note that we have not defined all tasks because some are self-explanatory. Tasks that do not have logs are in italicized print.

How can I use the files?

These files are formatted to fit in a standard 3 ring binder. Enter your system information and emergency contact numbers in the file "*O and M Introduction.pdf*." This file also contains the contact information for EPA Regional, State and Primacy Agencies and other useful reference information. "*O and M Ongoing Logs.pdf*" contains a variety of logs that you will should maintain throughout the year. These cover water quality, electricity use, well pumping levels, equipment repair, valve exercising, customer service and employee training. Twelve monthly files are provided to help guide and document basic daily, monthly, quarterly, biannual and annual O&M activities. The monthly file name format is "*XX - Month Tasks and Logs.pdf*."

You can print copies of all of these PDFs and enter data manually, or use the interactive features of the PDFs to enter and save the data in the files themselves. Some logs will perform basic calculations for you. If you choose to print the forms start by printing this guidebook, "*O and M Introduction.pdf*," "*O and M Ongoing Logs.pdf*," and the file for the current month. Then as you progress through the year you can print the additional monthly files as needed. If you use the interactive forms we recommend that you make a copy of the folder containing the file set using a name that has the current year in it. Remember save often and make backup copies.

How can I customize these tools for my system?

Based on your system's requirements and state regulations, you can add, subtract, or modify tasks and logs from this preventive maintenance program. Refer to your existing monitoring and reporting requirements for more information, or contact your state or primacy agency using the contact information provided on the cards.

How will a preventive maintenance program benefit my water system?

A preventive maintenance program can help you prevent problems, and can help you build and maintain the technical, managerial, and financial capabilities of your system. It can enhance public health protection, improve your system's reliability, and reduce the costs of maintaining your water system.

Who can help me develop a preventive maintenance program for my system?

Additional assistance and guidance are available from many sources. Your state drinking water program or primacy agency can help you develop schedules for monitoring and reporting, and other technical assistance providers may be able to contribute training and information. Please see the list of telephone numbers and web sites in the "Introduction, System Information, Reference Sheets and Contacts" section of this document set contained in the file named "O and M - Introduction.PDF". Be sure to fill out your system contact information as well.

Please note that this booklet does not take the place of a complete operation and maintenance manual. The suggested activities do not take the place of state or primacy agency requirements. Check with your state or primacy agency for more information.

Guidance Notes for O & M Files

The “*Introduction, System Information, Reference Sheets and Contacts*” section of this document set contained in the file named “*O&M - Introduction.PDF*” contains several reference pages with helpful information, including numbers for technical and financial assistance, as well as EPA and state primary agency contacts. The reference pages also contain tables with commonly used conversion factors and formulas for your convenience, which can be used as a basic calculator in the interactive PDF.

Maintain logs of Water Main and Service Line Repairs. Water distribution line repairs should be documented, especially when there are repairs/clamps, etc., placed on the line. These types of repairs are not normally intended for long-term/permanent repairs, but are often performed with that intent. A thorough record of line replacements may help identify areas of the distribution line that are more prone to failure due to age, vibration, or other causes.

Maintain logs of your Safety Equipment Repairs. Chemicals used in water treatment such as chlorine can be dangerous and it is therefore imperative that your safety equipment be carefully maintained and that maintenance be documented. All safety equipment needs to be inventoried and a log of the maintenance and repairs should be kept. Make sure to update the log throughout the year as repairs are made.

Maintain your Valve Exercising Programs and associated logs. Fast and efficient repairs of main and service line leaks require functioning isolation valves. Following a regular valve exercising program, documenting discovered issues, and making timely required repairs will help ensure that isolation valves work when you need them to saving time and effort.

Maintain your Employee Training Log. Water Operators and Board Members are generally required to complete a specific number of training hours per year in order to maintain their certifications. Keeping a log of completed training will help ensure that required training is completed in a timely manner.

Maintain the Customer Complaint and System Telephone Threat Checklist / Logs. In addition to the log pages in monthly files, a standalone document combining a Customer Complaint Log and a System Telephone Threat Checklist / Log has been included for your system’s use. Copies of this file can be provided to those individuals in your system such as customer service staff, billing clerks and other front line staff, who deal with the general public and are likely to be recipients of complaint/threat calls.

Logs for documenting the above maintenance efforts can be found in the files named “*O and M Ongoing Logs.pdf*” and “*O and M Customer Service Logs.pdf*”.

Guidance Notes for Generally Recommended Daily Operational Duties

Check water meter readings and record water production. The water system should have a working, properly calibrated master water meter to accurately monitor usage. Take a daily water meter reading and then calculate total use during the previous 24 hours by subtracting the previous day's meter reading from the current day's meter reading. Comparing daily use to design capacity allows the system operator to determine whether the system's treatment capacity is adequate. If your customers have meters, they should be read either on a monthly basis or with your billing cycle, totaled, and compared to your system's master meter. A daily water production log card is provided. Also, these logs can be used to identify patterns or trends for analysis (unusually high flows may indicate leaks, unauthorized use, etc.; unusually low flows may indicate reduced pump output, cavitation, etc.).

Check chemical solution tanks and record amounts used. Determine the amounts of chemicals, typically chlorine and fluoride, that are used daily (record in either pounds or gallons). If you use a fluoride feeder (fluoride saturator) that is hooked to a metered water line, you can read the meter daily.

To measure the amount of other solutions used, measure the current day's level (L2) and subtract it from the previous day's level (L1), and multiply the difference in inches by the volume per inch (V = volume (in gallons) of solution per inch in the chemical feed tank).

$(L2 - L1) \times V$ = amount of solution used in gallons
 V = area of tank surface (in square feet) \times 0.623 = gallons/inch of tank

You can then calculate the volume used per day or per month by dividing the volume used by the time increment between measuring L1 and L2. Note the time the tank is filled and at what level so that an accurate usage calculation can be made the next day. As a final step, you should compare the volume of chemical usage to the volume of water produced. This will help you determine whether your chemical usage is in an acceptable range based on the concentration of the chemical and the desired dose. Tanks should also be checked for leaks and blockages. A chemical solution daily usage log card is provided. Care should be taken if solution concentration changes. Trends should be observed. Changes in the trend could indicate underfeed, overfeed, scaling and plugging of lines, etc.

Record other daily chemical solution usage. Chemical additions should be checked routinely for solution used per gallon of water used for easier tracking on chemical feed pump reliability and water quality. Monitoring the raw (untreated) water and the treated water will assist in monitoring the effectiveness of your treatment process.

Check and record water levels in storage tanks. You should check the water level in each storage tank, as well as system pressure, daily to ensure that tank levels are within the normal operating range. Check for evidence of overflow (cup under overflow, erosion, wet ground, etc.). If the tank is overflowing, there may be a problem with the pump controls. If the tank's level is below the normal operating range, there may be a capacity or control problem. Four Storage tank daily water level logs are provided in each monthly file. You can duplicate these pages if you have additional tanks. Check and record water levels in pressure tanks. Pressure tanks come in all shapes and sizes. For small systems, normally a pressure tank will be a small tank of no more than 100psi or a larger tank of over 400 gallons. Maintaining pressure from these tanks is important for maintaining flowing water to the consumers. Hydropneumatic tanks can overflow, or waterlog, at times affecting overall system pressure. Furthermore, monitoring pressure can assist an operator in identifying leaks, open valves and even well pump problems. Four pressure storage tank daily water level logs are also provided. You can duplicate these pages if you have additional tanks.

Note: You only need to fill out a log for your type of tank.

Inspect chemical feed pumps for proper operation. Make sure the feeder is not broken or plugged up and that it is adjusted correctly. Check to see if the chemical feeder is supplying the correct dosage by measuring how much chemical is being fed and then calculating the dosage. Using a volumetric measuring device such as a graduated cylinder (or the calibration cylinder in newer systems), measure the volume of chemical added to the water over a certain time period (use proper personal protective gear when handling chemicals). Calculate the dosage using the concentration of the chemical solution, the volume of solution pumped, and the volume of water treated over the same time period. Refer to your system's operation manual to determine the correct dosage or other control tests. A daily chemical feed pump log card is provided. Chemicals used in water treatment may be harmful to human health if not used properly. Material Safety Data Sheets should be available to ensure proper usage.

Check and record chlorine residual at the point of application. Chlorine is added to disinfect. Chlorine also helps control microorganisms that might interfere with the treatment plant processes. The free chlorine residual should not be less than 0.2 mg/L at the entry point to the distribution system and should stay below the maximum residual disinfectant level of 4.0 mg/L. The primacy agency can reduce the monitoring frequency to once per day under specific circumstances. A daily disinfectant residual log card is provided.

Check and record chlorine residual in the distribution system. If chlorine is being added, the residual in the distribution system should be regularly monitored. It is recommended that chlorine residual readings be taken within the distribution system to ensure that the system is maintaining a detectable residual at all points. Check with your state or primacy agency to determine your specific residual monitoring requirements. Perform these checks at points where you would expect long water detention times and high loss of residual (dead end mains, oversized mains, mains with low water use, etc.). Move the sample point routinely in order to cover the entire distribution system on a periodic basis. Use the daily disinfectant residual logs to record your readings and the location of the sample. *Note: Systems may have multiple sampling locations. The provided logs can accommodate up to six testing locations. Be sure to copy the log sheets if you require additional sampling locations, and identify and label each location where sampling takes place. Monitor chlorine at sites where coliform samples are taken.*

Inspect booster pump stations. Check on the condition of the pumps (vibration, heat, seal, etc.) and controls to ensure that booster pumps are operating properly. Check to make sure the pump operating times are equalized (i.e., that the pumps automatically switch over). If this is done manually, then make the appropriate switch-over. Check and record meter readings and pressure gauge readings on suction and discharge sides of pumps. A daily booster pump log card is provided.

Check and record fluoride concentration in the distribution system. Fluoride is added to water to reduce tooth decay. However, too much fluoride can stain teeth brown. Optimum fluoride levels are a function of ambient temperature, but generally should remain between 0.7 and 1.2 mg/L, except in Alaska, where they should remain between 1.1 and 1.7 mg/L. Measure and record fluoride concentration levels. If you are using a specific ion electrode to test for fluoride, be sure to consider the life of the electrode. If you are not using a specific ion electrode, check your tests against results from a certified lab at least once a month. *Daily fluoride concentration logs are provided to accommodate up to six testing locations. Be sure to copy the log sheets if you require additional sampling locations, and identify and label each location where sampling takes place.*

Record well pump run times and pump cycle starts. From the hour meter and cycle counter on the control panel, record the running times and number of cycle starts for your well pump. Be sure to take these readings at about the same time every day. Comparing daily numbers will alert you to potential well pump problems. A daily well pump log is contained in each monthly O&M file.

Check instrumentation for proper signal input/output. Check to make sure each instrument is working properly. Make copies of the log sheets provided for each piece of equipment if the base document does not have enough log sheets. Record all manufacturer specifications and notes on each log sheet to make equipment information easily accessible.

Investigate customer complaints. Complaints are often the first indication of a significant or potentially significant problem and should be investigated immediately. In addition to the customer complaint log sheets contained in the file "O and M Ongoing Logs.pdf" an additional customer complaint log/threat assessment log file is provided for use by office staff (O and M Customer Complaints.pdf". Customers are important sources of security related information. Take reports of suspicious activity seriously and record them on the "Telephone Threat" sheets provided in the files. If a serious complaint or threat is received, take immediate action to address the situation. An emergency notification/contact sheet is provided in the reference section of the Introduction file "O and M Introduction.pdf"

Be sure to fill out the sheet before an emergency situation arises, and always keep a copy in the log binder for use during subsequent months.

Complete a daily security check. Check locks, hatches, doors, windows, and vents. Routinely check for signs of intrusion or vandalism. Check all security lighting and alarms to ensure proper operation. Make a brief visual check of fences to identify damage or needed repairs. Check that all well caps, seals, and vents are intact and sealed. Use the daily security checklist log card provided.

Inspect well pumps, motors, and controls. System operators should always be on the lookout for any defects in the system. Look, listen, and feel for unusual sights, sounds, or vibrations. Make sure seals are intact and the system is not "running hot." Check all timers to ensure that pump operating times are equalized. Controls should be operated manually to verify that they are working. When you shut down or turn off equipment for repairs, make sure it will not start up accidentally and cause injury.

Inspect heater operation during winter months. Heaters should be checked throughout the winter on a daily basis to determine that they are working properly. Ensure that wiring and heater are above floor level and not placed where water leakage could cause a safety hazard, an electrical outage, or short any breakers.

Guidance Notes for Generally Recommended Weekly Operational Duties

Inspect chlorine and fluoride testing equipment. Testing equipment is essential for a comprehensive monitoring program and must be kept in proper working order. Make sure you are using the correct chemical reagents for each type of application. Reagents should be safely stored and clearly marked with the name and date of preparation. Manufacturer-prepared reagents should be properly discarded when the expiration date is reached. A weekly chemical equipment testing log card is provided.

Clean pump house and grounds. Keeping your pump house and grounds clean will help with overall maintenance and operation of your system. The useful life of bearings can be reduced if dirt gets into lubricants. Also, dirt and moisture will form an insulating coating on motor windings and can cause motors to burn out. In addition to cleaning, screen all drain and vent openings in the building to prevent entry by animals and insects, and in the summertime, mow the areas around the pump house and storage tanks. A weekly cleanliness log that also addresses fire hydrant accessibility is provided.

Make sure fire hydrants are accessible. Fire hydrants provide water for fire fighting and are a means to flush the system. The hydrants should be easy to get to and highly visible. This includes removing snow drifts during the winter, tall grass or weeds during the summer, and painting the hydrants a highly visible color. Hydrants should be color coded according to the available fire flows. During inspection, be sure to check for tampering or vandalism. Record your findings on the weekly cleanliness log card.

Record pumping rate for each well or source water pump. Record the pumping rate from your well or source water pumps. You can do this if your system has a meter that registers flow. A change in pumping rate can indicate that you may have a pump problem. Keep in mind that pumping rates will vary based on water level in the well (i.e., the pump produces less when the well has been drawn down from the static water level to the deepest pumping level) and based on the head the pump is pumping against (i.e., the water level in the gravity storage tank or the current pressure of the hydropneumatic tank). Weekly pumping rate logs are provided for up to six wells. Make copies if you require additional log sheets

WEEKLY

WEEKLY

WEEKLY

Conduct a weekly security check. Inspect the grounds and equipment weekly. Are all security measures in good condition? Use the weekly security check log card to record any needed repairs or changes you observe in the following inspections:

Inspect all pump house plumbing for leaks. Excess moisture in the pump room can damage motors and other equipment and create unsafe conditions for operators. Leaks also open pathways for contaminants to enter the water supply.

Check all sump pumps for proper operation.

Check all station alarms.

Check your backup power source to ensure it will operate when needed.

Inspect fencing and gates. Treatment, storage, and pumping facilities should be inspected at least weekly to ensure that they provide adequate protection against vandalism and unauthorized entry. Appropriate fencing, locks, and locked well covers should be used to protect the facilities from stray livestock and tampering. Warning signs should be posted to deter trespassing. Warning signs should indicate a building and phone number for reporting incidents.

Guidance Notes for Generally Recommended Monthly Operational Duties

Read electric meter at pump house and record. Monitor and note any unusual or unexpected changes in electricity use over time. If pumping accounts for a large proportion of your system's energy use, track water production and compare it to energy use. (In the winter, you will also need to consider energy use for heating. High meter readings can also be an indicator that your booster or well pumps are working harder to perform their job, which could mean immediately, or at least soon, maintenance will be required. Monthly electric meter readings can be tracked in the Electric Meter Logs in the "*O and M Ongoing Logs.pdf*" file.

Take appropriate monthly water quality samples. Water quality samples should be taken routinely in accordance with SDWA, state, and EPA requirements. Take samples according to approved procedures and submit them to a certified laboratory or your state (as required for analysis. Your state or primacy agency can give you an annual schedule for your required sampling. Use state forms and/or procedures as required, and use the monthly sampling logs provided to record all water sampling you conduct each month. Though you may only be required to sample for some contaminants quarterly or annually, you should still record the sample in the month it was taken. Monthly water quality readings can be tracked in the Water Quality Sampling logs in the "*O and M Ongoing Logs.pdf*" file.

Check and record static and pumping levels of each well. This task is important for determining the reliability of the aquifer and for establishing baseline information that can be useful if others tap into the aquifer or take actions that will affect it (e.g., gravel mining). The static level is the level of the water in a well when the pump is not operating. You can measure this level as the distance in feet from the centerline of the pump discharge. The pumping level is the distance from the centerline of the pump discharge to the level of the available pool while water is being drawn. You can check these levels by using bubbler lines, electrical sensors, or manual drop lines. The pumping level should be measured at various stages of pumping. You should also measure the recharge time (amount of time it takes to return to static level). Monthly Static and Pumping Level Logs are provided in the "*O and M Ongoing Logs.pdf*" file.

Guidance Notes for Generally Recommended Monthly Operational Duties
(... continued)

Read all customer meters and compare against total water produced for the month. The sum of all customer monthly meter readings, subtracted from the total water produced for the month, will provide you with a rough calculation the total amount of water loss. Be sure you consider how much water is used in the treatment process. (Note that to accurately assess your systems losses it is recommended that you perform an annual water audit using the AWWA's free water audit software which can be downloaded at <https://www.awwa.org/home/awwa-news-details/articleid/2641/awwa-free-water-audit-software-version-5-0-now-available.aspx>)

Inspect well heads. Well head covers or seals prevent contaminated water and other material from entering the well. Visually inspect all well covers and pump platforms. They should be elevated above the adjacent finished ground level, sloped to drain away from the well casing, and free of cracks or excessive wear.

Lubricate locks. Locks should be lubricated as needed to protect against corrosion. Defective locks should be repaired or replaced immediately.

Check on-site readings against laboratory results. It is useful to compare water sample test results returned by the laboratory against on-site readings. Be sure you are comparing the results from samples that were collected at the same time. Major discrepancies should be noted and equipment or chemicals adjusted accordingly. Confirm submittal of monthly reports to your state or primacy agency.

Guidance Notes for Specific Monthly, Quarterly, Annual and Bi-Annual Recommended Operational Duties

This guidebook and the accompanying monthly logs also include additional recommended operational duties typically conducted in specific months, or on a quarterly, biannual or annual schedule. For your convenience, the quarterly, biannual and annual recommended operational duty checklists and log sheets have been assigned to the months in which they are typically performed. If you choose to modify some or all of the recommended scheduled tasks, remember to print out the associated checklists and logs and move them to the month you have selected to ensure that the duties are accomplished and documented in a timely manner.

Guidance Notes for Recommended January Operational Duties

Complete a January log sheet for each feed pump. Each feed pump log should contain equipment-specific information on maintenance needs, including supplier, age of pump, changes or repairs, etc. A blank feed pump sheet is provided. Make enough copies of the sheets for each feed pump.

Overhaul chemical feed pumps (O rings, check valves, and diaphragms). Chemical feed pumps should be completely overhauled at least once a year. The overhaul should include cleaning the feeder head, cleaning and checking all valves and O rings for wear, and cleaning and checking the condition of check valves and pump control valves.

Replace any worn-out parts, including diaphragms. Spare parts should be kept on hand so breakdowns can be repaired quickly and worn parts can be replaced when the feeder is disassembled for cleaning.

Guidance Notes for Recommended January Operational Duties (continued)

Inspect and clean chemical feed lines and solution tanks. To ensure that your chemical feed system functions properly, inspect the lines to make sure they're not clogged or kinked and that the solution tanks are clean. Regular cleaning of chemical feeders will prevent many breakdowns in this equipment. This should be done every 3 months.

Calibrate chemical feed pumps after overhaul. At least every 3 months (and particularly after the chemical feed pumps have been overhauled) the pumps should be re-calibrated to ensure that they deliver the appropriate amount of chemicals to the system. Measure the amount of solution withdrawn by the pump over a given time period, record this value and speed/stroke length settings, and compare this rate with the desired feed rate. Refer to the manufacturer's instructions to adjust the feed pump accordingly. Be sure to record any new speed and stroke settings anytime a change is made.

Begin Safety Equipment Repair Log Card. All safety equipment needs to be inventoried and a log of the maintenance and repairs should be kept. Make sure to update the log throughout the year as repairs are made.

Operate all valves inside the treatment plant and pump house. All valves in a system should be inspected and exercised routinely. The frequency of inspection depends on the type of valve, but you should inspect the valves at least twice a year. The inspection should include completely closing, reopening, and reclosing the valve until it seats properly. Record the number and direction of turns to closure. Leaking or damaged valves should be scheduled for repair. Use the valve log sheet to track inspections. The log sheet should be routinely updated throughout the year.

Review emergency response plans. Review all contacts for accuracy, make sure all equipment is working, ensure all procedures match the plant conditions as they presently exist. Contact your local emergency response agency to update any contact changes, new processes, or chemical inventories.

Guidance Notes for Recommended February Operational Duties

Inspect chemical safety equipment and repair or replace as needed. Review use of all equipment and update safety training. Chemical safety equipment should be checked and tested at least once each year to be certain that it is operable. Follow the manufacturer's instructions on the proper upkeep of all safety equipment, including portable ventilators or respirators, safety harnesses or belts, goggles, gloves, hard hats, and protective clothing. Detection devices for hazardous gases should be calibrated based on the manufacturer's instructions. All equipment should be repaired or replaced as needed. Review all safety procedures. Record actions on February task card. Safety equipment logs are provided in the "*O and M Ongoing Logs.pdf*" file to track all inspections and repairs.

Operate all valves inside the treatment plant and pump house. All valves should be inspected to ensure proper working order. Use the plant/pumphouse valve logs in the "*O and M Ongoing Logs.pdf*" file to track all inspections and repairs.

Use the February task log sheet to record completion dates and any notes or comments.

Guidance Notes for Recommended March Operational Duties

Inspect, clean, and repair control panels in pump house and treatment plant. The control panels in the pump house and treatment plant should be inspected at least once a year for corrosion and other problems that could cause shorts or failures. Control panels should be carefully cleaned with air. Repair the panels if needed.

Exercise half of all mainline valves. It is important to exercise all mainline valves in the system at least once a year to ensure that you can locate them and that they can be opened and closed properly during emergency shut-down periods. Record the number and direction of turns to closure. Be sure to describe the physical condition (rusted, new and the operational condition (leaking, failing of each valve in the appropriate column on the card. Half of the mainline valves should be exercised in March, and the other half should be exercised in 6 months. You should develop a map that identifies the valves and their locations. Keep this information in a secure place. It is important to be able to isolate the system or sections of the system. Any failures should be scheduled for repair. Use the mains valve logs in the "*O and M Ongoing Logs.pdf*" file to track all inspections and repairs.

Use the March task log sheet to record completion dates and any scheduled repairs.

Guidance Notes for Recommended April Operational Duties

Inspect and clean chemical feed lines and solution tanks. To ensure that your chemical feed system functions properly, inspect the lines to make sure they're not clogged or kinked and that the solution tanks are clean. Regular cleaning of chemical feeders will prevent many breakdowns in this equipment. This should be done every 3 months.

Calibrate chemical feed pumps. At least every 3 months the pumps should be recalibrated to ensure that they deliver the appropriate amount of chemicals to the system. Measure the amount of solution withdrawn by the pump over a given time period, record this value and speed/stroke length settings and compare this rate with the desired feed rate. Refer to the manufacturer's instructions to adjust the feed pump accordingly. Be sure to record any new speed and stroke settings anytime a change is made.

Exercise/check all fire hydrant valves and note which need to be repaired or replaced. Use the valve logs in the "*O and M Ongoing Logs.pdf*" file to track all inspections and repairs.

Complete quarterly and biannual tasks listed in April file:

- Inspect storage tanks for sanitary deficiencies. Clean if necessary.
- Make sure fire hydrants are accessible.
- Overhaul control valves.

Use the April task log sheet to record completion dates and any notes or comments.

Guidance Notes for Recommended May Operational Duties

Inspect storage tanks for defects and sanitary deficiencies. All storage tanks should be inspected at least annually to ensure that they are protected from contamination. Screen any openings to stop the entry of small animals, small insects, and other organic matter. Screens should be in place on vents and overflows (or a flap gate on any overflows). Thoroughly disinfect storage facilities after any construction or repair. The storage tank inspection should include:

- Checking vents and screens for blockages or tears
- Checking for overflows
- Checking water level measuring devices*
- Checking that hatches are properly sealed and locked*
- Checking for any deterioration in the tank's walls or the tank's foundation

* These security checks should also be conducted daily.

Use the May task log sheet to record completion dates and any notes or comments.

Clean storage tanks if necessary. Thoroughly clean the tank after any construction, maintenance, or repairs. Add chlorine to the water used to fill the tank during the disinfection process and mix thoroughly. Be sure to use National Sanitation Foundation (NSF)– approved chemicals. Maintain a chlorine residual of at least 50 mg/L for at least 6 hours and preferably for 24 hours. The storage tank also needs to be cleaned above the water line. When the disinfection procedure is complete, properly dispose of the disinfection water and test the system. You may have to dechlorinate the disinfection water before disposing of it. Improper disposal can lead to contamination of potable water due to backflow or to unlawful surface water pollution. If you use a strong disinfectant solution to clean the tank and afterwards fill the tank with water, the disinfection water may be diluted enough for pumping straight to the distribution system for domestic use. Procedures for large tanks (holding more than 1 million gallons) may be somewhat different. When you are planning to take a tank out of service for cleaning, make sure provisions are made to supply adequate water to the distribution system. If you are not sure how to provide service while the tank is off-line, contact the Rural Water Association or your primacy agency for technical assistance. You may also want to consider the use of certified divers to do tank inspections. This may prevent taking the tank out of service or losing significant amounts of water. After the tanks are cleaned, they need to be properly tested before returning to service.

Guidance Notes for Recommended June Operational Duties

Flush the distribution system and exercise/check fire hydrant valves. The entire system should be flushed in one direction, outward from plant or storage facility, at least once a year, depending on the quality of your source water. Flushing clears any sediment deposition in the lines. During the flushing, check the operation of the fire hydrant valves and observe the color of the water. Continue flushing until the water is clear. When operating a dry-barrel hydrant, you must open it completely so that the drain will become fully closed. Otherwise, water seeping through could result in hydrant damage from freezing. Make sure that any open hydrants are flushing away from private property. After flushing or using a hydrant, check to make sure the drain is working. Use the hydrant valve logs in the “*O and M Ongoing Logs.pdf*” file to track all inspections and repairs.

Perform preventive maintenance on treatment plant and pump house buildings. Plant piping, buildings, and tanks should be painted regularly to prevent deterioration. Store all pipes, plumbing fittings, chemicals, tools, and other materials in a safe place. Pump house ventilation should be checked to ensure there are no blockages and that fans are operable.

Use the June task log sheet to record completion dates and any notes or comments.

Guidance Notes for Recommended July Operational Duties

Inspect and clean chemical feed lines and solution tanks. To ensure that your chemical feed system functions properly, inspect the lines to make sure they're not clogged or kinked and that the solution tanks are clean. Regular cleaning of chemical feeders will prevent many breakdowns in this equipment. This should be done every 3 months.

Overhaul and calibrate chemical feed pumps. At least every 3 months the pumps should be recalibrated to ensure that they deliver the appropriate amount of chemicals to the system. Inspect and clean your chemical feed lines and solution tanks. Measure the amount of solution withdrawn by the pump over a given time period, record this value and speed/stroke length settings and compare this rate with the desired feed rate. Refer to the manufacturer's instructions to adjust the feed pump accordingly. Be sure to record any new speed and stroke settings anytime a change is made.

Complete quarterly and biannual tasks listed in July file:

- Measure source capacity to detect pump outage problems.

- Evaluate the need for video inspection of well interiors and well screens.

- Check and record static and pumping levels of each well.

- Check pressure relief valves.

- Evaluate the water turnover of stored water.

- Operate all valves inside the well house(s), treatment plant(s) and pump house(s).

- Exercise all mainline gate valves.

Use the July task log sheet to record completion dates and any notes or comments.

Guidance Notes for Recommended August Operational Duties

Operate all valves inside the treatment plant and pump house. All valves in a system should be inspected and exercised routinely. The frequency of inspection depends on the type of valve, but you should inspect the valves at least twice a year. The inspection should include completely closing, reopening, and reclosing the valve until it seats properly. Record the number and direction of turns to ensure. Leaking or damaged valves should be scheduled for repair. Use the valve logs in the “*O and M Ongoing Logs.pdf*” file to track all inspections and repairs.

Use the August task log sheet to record completion dates and any notes or comments.

Guidance Notes for Recommended September Operational Duties

Exercise mainline valves that were not exercised in March. It is important to exercise all mainline valves at least once a year to ensure that you can locate them and that they can be opened and closed properly during emergency shut-down periods. Record the number and direction of turns to closure. Any failures should be scheduled for repair. Use the valve logs in the “*O and M Ongoing Logs.pdf*” file to record all inspections and repairs.

Prepare system for winter operation. This includes checking all exposed facilities such as pumps, valves, and pipes. Make sure that all exposed facilities are properly insulated, the heaters in the treatment plant and pump house are operable and in good safe working condition, and vents are closed. Also, check all fire hydrants and sprinkler systems to ensure that they are drained, check that all propane or fuel tanks used for heating the pump house are topped off, and lower the water level in the storage tank just slightly (circulating more of your water in storage facilities helps to prevent freezing. Please note that this task may be postponed until October or November based on local conditions. **Make sure unnecessary equipment is properly decommissioned.**

Conduct an inspection focusing on fencing and gates. Make any necessary repairs.

Use the September task log sheet to record your maintenance this month.

Guidance Notes for Recommended October Operational Duties

Inspect and clean chemical feed lines and solution tanks. To ensure that your chemical feed system functions properly, inspect the lines to make sure they're not clogged or kinked and that the solution tanks are clean. Regular cleaning (every 3 months) of chemical feeders will prevent many breakdowns in this equipment.

Calibrate chemical feed pumps. At least every 3 months the pumps should be recalibrated to ensure that they deliver the appropriate amount of chemicals to the system. Inspect and clean your chemical feed lines and solution tanks. Measure the amount of solution withdrawn by the pump over a given time period, record this value and speed/stroke length settings and compare this rate with the desired feed rate. Refer to the manufacturer's instructions to adjust the feed pump accordingly. Be sure to record any new speed and stroke settings anytime a change is made.

Complete quarterly tasks listed in October file:

- Inspect storage tanks for sanitary deficiencies
- Make sure fire hydrants are accessible.

Use the October task log sheet to record completion dates and any notes or comments.

Guidance Notes for Recommended November Operational Duties

Prepare system for winter operation. This task should be completed now if you did not complete it in September or October. This includes checking all exposed facilities such as pumps, valves, and pipes. Make sure all exposed facilities are properly insulated, the heaters in the treatment plant and pump house are operable and in good safe working condition, and that vents are closed. Also, check all fire hydrants and sprinkler systems to ensure that they are drained, check that all propane or fuel tanks used for heating the pump house are topped off, and lower the water level in the storage tank just slightly (circulating more of your water in storage facilities helps to prevent freezing).

Use the November task log sheet to record completion dates and any notes or comments.

Guidance Notes for Recommended December Operational Duties

Contact an electrician to check running amps on well pumps. A change in running amps can indicate a change in the condition of the motors or pumps. When pumps start drawing more amps, it generally means that the motors should be repaired. Checking the amps and voltage on pumps can be a complicated and dangerous task; **do not attempt it yourself.** Contact an electrician to complete this procedure. This task should be performed at least once a year and any time you sense a problem with your pump (i.e., unusual sounds, vibrations, or the pump is running hot).

Verify that any unnecessary equipment has been properly decommissioned.

Review source water quality tests for trends such as increasing nitrate or seasonal coliform.

Evaluate general source capacity to meet water system demand.

Use water use and production to prepare a demand forecast for coming year.

Begin assembling data to conduct an annual AWWA water audit. (This task may be shifted to a fiscal year if your fiscal year does not correspond to the calendar year.)

Use the December task log sheet to record completion dates and any notes or comments.