National Park Service Recommended Procedures for Water Tank, Water Main, and Well Disinfection

Safety Requirements:

- Parks must conduct a job hazard analysis (JHA) prior to initiating work related to water tank, water main, or well disinfection procedures. The JHA must be customized for each type of disinfection procedure. (RM50B Section 3: Occupational Safety)
- Where applicable, the JHA will identify confined spaces and permit required confined spaces. Parks must comply with OSHA General Industry standards and RM50B Section 3: Occupational Safety requirements for permit required confined spaces. Contact the park safety officer or regional safety manager for confined space questions or requirements.
- Where applicable, the JHA will identify excavation and trenching operations. Excavation and trench operations must comply with OSHA requirements found under 29 CFR 1926.650, 29 CFR 1926.651 and 29CFR 1926.652 and RM50B Section 3: Occupational Safety requirements. Contact the park safety officer or regional safety manager for excavation/trenching questions or requirements.
- Those employees who will be exposed to potentially hazardous chemicals must receive Hazard Communications training prior to performing a disinfection procedure for the first time and retraining should occur each time the chemical hazards change. (RM50B Section 4: Occupational Health - Hazard Communications). For additional assistance or guidance, please contact the Park Safety Officer or the Regional Safety Manager.
- Review and follow Safety Data Sheets (SDS) requirements for PPE, handling, ventilation, storage and disposal requirements for the chemical (s) used in the disinfection process. For protection against chemicals, the PPE materials (Gloves, goggles, boots and aprons) must be based on the disinfection products used to ensure the appropriate chemical resistance is provided. If respiratory protection is required, the employee be placed into a Respiratory Protection Program that complies with 29 CFR 1910.134 and RM50B Section 4: Occupational Health - Respiratory Protection. For additional assistance or guidance, please contact the Park Safety Officer or the Regional Safety Manager.
- The use of chlorine requires proper ventilation. If you are unsure if your site meets proper ventilation requirements, contact the park safety officer or regional safety manager for evaluation.
- Lockout/Tagout (LOTO) procedures must be identified **prior** to initiating work to control and prevent hazardous energy release during disinfection procedures where identified. LOTO procedures must comply with OSHA standard 29 CFR 1910.147 and RM50B Section 3: Occupational Safety. During LOTO, it is recommended to inspect the de-energized equipment, well pump, and electric wiring for worn insulation and missing wire nuts, and to make repairs as necessary.
- The following list provides general first aid procedures if exposed to chlorine during the disinfection process. Always refer to the SDS for specific first aid instructions:
    - If chlorine comes in contact with your eyes or skin, use fresh water to flush the affected area for 15 minutes. If chlorine comes in contact with your eyes, see

your doctor immediately after flushing. If you are in a location where fresh water and an eye wash/shower station will be unavailable, you may need to carry a portable eyewash/shower station with you – refer to the SDS.

- If chlorine is accidentally ingested, see a doctor immediately. Do not induce vomiting.
- If exposed to chlorine fumes, immediately move out of the area to fresh air.

Seasonal Water Systems:

- Seasonal water systems require that water system components (well, water mains, and storage tanks) be disinfected prior to start up each season.
- Disinfection of seasonal water systems should be completed in the same manner that is described in this document.
- Please refer to Reference Manual RM-83A, Chapter 1, Appendix 6, "TNC Water System Seasonal Start-Up and Shut-Down" for more information: https://www.nps.gov/policy/DOrders/RM-83A_2-16-2018.pdf

METHODS FOR DISINFECTION OF POTABLE WATER SYSTEMS

Disinfection of Water Storage Tanks

Summary: This procedure includes all above and below ground potable storage tanks for new construction projects, major renovation projects, general maintenance, and cleaning. The intent of the program is to ensure compliance with the methods and procedures outlined in ANSI/AWWA Standard C652-11 and meet the bacteriological standards.

1. Program Description

This procedure was developed to assure potable storage tanks are properly disinfected and meet the American Water Works Association Standard for water systems.

2. Scope

This procedure includes all potable storage tanks. The intent of the program is to ensure compliance with the methods and procedures outlined in ANSI/AWWA Standard C652-11 and meet the bacteriological standards.

3. Definitions

AWWA: American Water Works Association.

ANSI: American National Standards Institute

ANSI/AWWA Standard C652-11: The current industry practice for the disinfection of underground potable water distribution lines.

Potable Water: Water fit for human consumption.

4. Responsibilities

- The Park is responsible for performing all analytical tests and verifying that the storage tank meets the minimum bacteriological standards as set forth by the Environmental Protection Agency (EPA) or State of jurisdiction.
- The Park Staff is responsible for overseeing the entire disinfection procedure including verification of the chlorine residual in compliance with ANSI/AWWA Standard C652-11.

5. Methods

Method 1
Method 2

Method 3

- **Method 1**
  The water storage facility shall be filled to the overflow level with potable water to which enough chlorine is added to provide a free residual in the full facility of not less than 10 mg/L at the end of the appropriate 24 hour period.

  1. Determine the concentration of chlorine needed to make at least a 10 mg/l solution when the tank is full – (note there is some loss of chlorine due to 24 hour time and reaction to organics in the tank so calculation for 12 – 14 mg/L should be considered).
  2. Pour the determined amount of chlorine solution into the tank first and then fill with potable water to overflow and allow it to stand for 24 hours.
  3. Flush the tank with potable water until the chlorine residual is less than 2 mg/L. Water should be dechlorinated prior to flushing into the sewer, surface water, or ground surface where it could affect surface water or other resources (consult with Resource Management). – See Dechlorination below for more information. As an alternative, highly chlorinated water can be transported offsite for disposal in a water truck.
  4. Conduct bacteriological test on a sample collected from the water in the tank.
  5. If the bacteriological test comes back negative, place the tank into service. If the bacteriological test comes back positive, perform repeat bacteriological testing until 2 consecutive negative bacteriological test results are obtained, or repeat the disinfection process.

  Sample Calculations
  Calculations for a 50,000 gallon tank using 8.25 % bleach (82,500 ppm):

  $$\text{Gallons of 8.25\% bleach} = \frac{(\text{Gallons of Water to be Disinfected}) \times (\text{Desired ppm})}{\text{Bleach ppm}}$$

  $$\text{Gallons of 8.25\% bleach} = \frac{(\text{50,000 gallons of water}) \times (\text{10 ppm})}{(\text{82,500 ppm})} = \textbf{6.06 gallons of bleach}$$

- **Method 2 (Fast)**

  1. Spray or brush a 200 ppm solution directly onto the walls of the tank and allow the solution to react for 30 minutes. This is typically done by workers wearing rubber boots with 6" to 1' of water in the bottom of the tank and using a pressure washer. Confined space considerations should be taken into account. (see sample calculation above to determine how much chlorine bleach to use)
  2. After 30 minutes, fill the tank with potable water to the overflow.
  3. Flush the tank with potable water until the chlorine residual is less than 2 mg/L. Water should be dechlorinated prior to flushing into the sewer, surface water, or ground surface where it could affect surface water or other resources (consult with Resource Management). – See Dechlorination below for more information. Another alternative is to calculate the amount of 200 ppm water needed in the

tank such that when you fill the tank the resultant chlorine residual is < 2 mg/L. This will eliminate the need for dechlorination. As a final alternative, highly chlorinated water can be transported offsite for disposal in a water truck.
4. Conduct bacteriological test on a sample collected from the water in the tank.
5. If the bacteriological test comes back negative, place the tank into service. If the bacteriological test comes back positive, perform repeat bacteriological testing until 2 consecutive negative bacteriological test results are obtained, or repeat the disinfection process

- **Method 3**

1. Water and chlorine shall be added to the storage facility in amounts such that the solution will initially contain 50 mg/l available chlorine and will fill approximately 5% of the total storage volume.
2. This solution shall be held in the storage facility for 6 hrs.
3. The storage facility shall then be filled to overflow by flowing potable water into the highly chlorinated water.
4. Hold this solution for not less than 24 hours and ensure that a minimum chlorine residual of 2 mg/L is present at the end of the 24 hour retention period.
5. Flush the tank with potable water until the chlorine residual is less than 2 mg/L. Water should be dechlorinated prior to flushing into the sewer, surface water, or ground surface where it could affect surface water or other resources (consult with Resource Management). – See Dechlorination below for more information. As an alternative, highly chlorinated water can be transported offsite for disposal in a water truck.
6. Conduct bacteriological test on a sample collected from the water in the tank.
7. If the bacteriological test comes back negative, place the tank into service. If the bacteriological test comes back positive, perform repeat bacteriological testing until 2 consecutive negative bacteriological test results are obtained, or repeat the disinfection process

6. Pressure Tanks

Pressure tanks should be disinfected in the same manner as water storage tanks. As with water storage tanks, pressure tanks require disinfection before being placed into service, after repair work on the inside of the tank, or any time when there was a potential for contamination. Refer to the manufacturer's recommendations to determine which disinfection methods are possible. Bear in mind that high levels of chlorine may damage the bladder inside bladder pressure tanks.

Disinfection Procedure for Water Distribution Lines

Summary: This procedure includes all underground and above ground potable water lines for new construction projects and major renovation projects. The intent of the program is to ensure compliance with the methods and procedures outlined in ANSI/AWWA Standard C651-14 and meet the bacteriological standards.

1. Program Description

This procedure was developed to assure potable water lines are properly disinfected and meet the American Water Works Association Standard for community water systems.

2. Scope

This procedure includes all underground and above ground potable water lines for new construction projects, major renovation projects, and maintenance or repairs. The intent of the program is to ensure compliance with the methods and procedures outlined in ANSI/AWWA Standard C651-14 and meet the bacteriological standards.

3. Definitions

AWWA: American Water Works Association.

ANSI: American National Standards Institute

ANSI/AWWA Standard C651-14: The current industry practice for the disinfection of underground potable water distribution lines.

Potable Water: Water fit for human consumption.

Sample point: The location of water sampling.

4. Responsibilities

- The Park is responsible for performing all analytical tests and verifying that the building's plumbing system meets the minimum bacteriological standards as set forth by the EPA or State of jurisdiction.
- The Park Staff is responsible for overseeing the entire disinfection procedure including verification of the chlorine residual in compliance with ANSI/AWWA Standard C651-14.

5. Specific Program Components

5.1 Underground Potable Water Lines

5.1.1 Standard Disinfection Procedure for all Underground Potable Water Lines

- The forms of chlorine that may be used in the disinfection operations are sodium hypochlorite solution or calcium hypochlorite granules or tablets. All forms of chlorine shall meet NSF/ANSI Standard 60.
- Acceptable disinfection methods include:
    - Tablet Method
    - Continuous Feed Method
    - Slug Method
    - Emergency Slug Method
- The Park will verify the chlorine residual at the beginning of the disinfection process to ensure that it meets minimum chlorine concentration requirements. The park will also measure the chlorine residual at the end of the retention time and issue a flush order.
- Continuously flush the entire system with clear potable water. The dechlorinated water shall be directed into a sanitary sewer system in accordance with Park requirements. Alternative methods of collection of the flush water can be utilized after consultation with the public health consultant.
- Monitor the chlorine residual in the discharge on a periodic basis. When the chlorine residual is equal to the chlorine residual in the distribution system, the system has been properly flushed. Bacterial testing shall be completed prior to the system open for public consumption.

6. Disinfection Methods

- Tablet Method

    1. Place calcium hypochlorite granules at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500 foot intervals during water main installation to achieve 25 mg/L of chlorine residual when the water main is filled. The quantity of granules required is shown in the Table 1 at the end of this section. (Note that tablets can also be used in lieu of granules, but since this method is not as common, it will not be explained in this document.)
    2. When the water main is completed and ready for disinfection, water shall be introduced into the water main slowly, at a velocity less than 1 ft/s.
    3. The residual chlorine level shall be checked when the water main is full to ensure that 25 mg/L of chlorine is present (use chlorine test strips). If the residual chlorine is less than the required 25 mg/L at the beginning of the disinfection process, the water main must be disinfected again using an alternate AWWA C651-14 approved method.
    4. The water shall remain in the water main for a minimum of 24 hours if the water temperature is above 41° F, 48 hours if the water temperature is below 41° F.
    5. After the 24 or 48 hour contact period is over, the water shall be tested to ensure that a detectable chlorine residual is present.
    6. The water main shall then be flushed until the chlorine residual is consistent with the rest of the water system. The location for flushing the water mains and for disposal of chlorinated water shall be subject to approval by the Park (see dechlorination below).

Table 1: Calcium Hypochlorite Granule Quantities to be Placed at the Beginning of Main and at Each 500 foot Interval to Achieve 25 mg/L Chlorine Residual		
Water Main Diameter (inches)	Calcium Hypochlorite Granules (ounces)	Calcium Hypochlorite Granules (grams)
4	1.7	57
6	3.8	113
8	6.7	200
10	10.5	300
12	15.1	430
14 and larger	D^2 x 15.1	D^2 x 427.9
where D is the inside pipe diameter in feet		

An alternate method shall be used for solvent welded plastic water mains and screw-joint steel pipe.

- Continuous Feed Method

    1. Fill water main with potable water, remove air pockets, and flush the water main at a velocity > 3 ft/sec. Ensure that a backflow device is installed on the potable water system before the injection point into the water main to be disinfected. A water meter should also be installed near the backflow device to monitor the flow rate.
    2. Refill the water main at a point no more than 10 feet downstream of where the new water main begins with water that has been chlorinated to 25 mg/L. The dose of the chlorine feed into the water should be at a constant rate and must not cease until the water main is filled with chlorinated water.
    3. Check the concentration of the chlorinated water to ensure that it is > 25 mg/L.
    4. Operate valves and hydrants in the water main being disinfected to ensure disinfection of the appurtenances.
    5. Let 25 mg/L water sit in the water main for a minimum of 24 hours.
    6. Ensure that chlorine residual in water is > 10 mg/L after 24 hour contact period (check with chlorine test strips).
    7. The water main shall then be flushed until the chlorine residual is consistent with the rest of the water system. The location for flushing the water mains and for disposal of chlorinated water shall be subject to approval by the Park (see dechlorination above).

- Slug Method
    1. Fill water main with potable water, remove air pockets, and flush the water main at a velocity > 3 ft/sec. Ensure that a backflow device is installed on the potable water system before the injection point into the water main to be disinfected. A

water meter should also be installed near the backflow device to monitor the flow rate.

2. Refill the water main at a point no more than 10 feet downstream of where the new water main begins with water that has been chlorinated to 100 mg/L. The dose of the chlorine feed into the water should be applied continuously and for a sufficient time period to develop a slug of chlorinated water that will move through the new water main at a concentration of > 100 mg/L for > 3 hours.
3. Check the concentration of the chlorinated water to ensure that it is > 100 mg/L.
4. Slowly flow a slug of water chlorinated at > 100 mg/L through the water main.
5. Measure the free chlorine residual in the chlorine slug as it moves through the water main to ensure that it is > 50 mg/L (use chlorine test stips). If the chlorine concentration of the slug drops below 50 mg/L, the process should be stopped and a new chlorine slug measuring > 100 mg/L should be introduced.
6. Operate valves and hydrants in the water main being disinfected to ensure disinfection of the appurtenances.
7. The water main shall then be flushed until the chlorine residual is consistent with the rest of the water system. The location for flushing the water mains and for disposal of chlorinated water shall be subject to approval by the Park (see dechlorination above).

7. Bacteriological Analysis of the Potable Water Lines

1. After flushing is completed, the contractor shall take two consecutive sets of acceptable water samples, taken at least 16 hours apart, from the new water main. As an alternative, the water main could be allowed to sit with chlorinated water for a minimum of 16 hours and then two consecutive sets of acceptable water samples can be taken at least 15 minutes apart while the water is being flushed. At least one set of samples shall be collected at the end of the new water main, plus one set from each branch, plus one set every 1,200 linear feet of new water main.
2. If all tests indicate the absence of coliform and fecal coliform bacteria, then the water main may be placed into service. If bacteria are found to be present, then the water main must be redisinfected. The water main may be flushed and resampled. If these samples fail to produce acceptable results, the water main shall be rechlorinated using the continuous feed or slug method per AWWA C651-14. This shall be repeated until a negative result (satisfactory bacteriological test) is obtained.

Disinfection of Drinking Water Wells

Summary: This procedure includes disinfection for all drinking water wells for new construction projects, major renovation projects, and general maintenance. The intent of the program is to ensure compliance with the methods and procedures outlined in ANSI/AWWA Standard C654-13 and meet the bacteriological standards.

1. Program Description

This procedure was developed to assure that drinking water wells are properly disinfected and meet the American Water Works Association Standard for water systems. All chlorine used for disinfection shall meet NSF/ANSI 60 standards for use in drinking water systems.

2. Disinfection (New Wells)

- Gravel pack shall be disinfected by one of the following methods
  - uniformly mixing ¼ to ½ pound of calcium hypochlorite per ton of gravel, or
  - chlorinating the drilling fluid by thinning the drilling fluid, chlorinating the drilling fluid, adding the gravel pack into the annular space between the borehole and casing, and then introducing the 50 ppm (minimum) chlorinated water into the well after all of the drilling mud has been displaced. Chlorinated water shall be introduced to the gravel pack until the gravel pack will no longer accept water, or until the volume of chlorinated water introduced is at least twice the volume of the annual space between the borehole and casing. Measure chlorine periodically during the process to ensure a minimum of 50 ppm (use chlorine test strips).
- Permanent equipment and materials in the well shall be chlorinated just before installation by spraying them with a minimum 200 ppm chlorine solution.
- After the permanent equipment is installed, the water in the well shall be chlorinated to a minimum of 50 ppm.
  - Granular calcium hypochlorite, calcium hypochlorite tablets, or sodium hypochlorite solution can be used for disinfection (see Table 2 below).

Table 2: Chlorine Compound Required to Dose 100 Feet of Water-Filled Well at 50 ppm

Well Hole or Casing Diameter (inches)	Volume per 100 feet of Water Depth (gallons)	Estimated Amount of Chlorine to Use		
		Calcium Hypochlorite (ounces) - 65% available Cl_2	Sodium Hypochlorite (fluid ounces) – 12% solution	Liquid Chlorine (pounds) – 100% available Cl_2
4	65.28	0.7	3.5	0.03
6	146.9	1.5	7.8	0.06
8	261.1	2.7	13.9	0.11
10	408.0	4.2	22.4	0.17
12	587.5	6.0	32	0.25

  - If calcium hypochlorite tablets are used, 30 minutes shall pass after the tablets are introduced to the well before the water is circulated to ensure adequate time for the tablets to dissolve.
  - A tremie pipe shall be used if a chlorine solution is used, and the solution introduced from the bottom of the well to the top.
  - The chlorinated water shall be circulated in the casing to ensure chlorinate is uniformly distributed throughout the well casing (water column plus void space above the static water level to the top of the well casing). A minimum of 3 surges shall be used to distribute the chlorine throughout the water column.
  - Verify that the chlorine residual is still greater than 50 ppm using chlorine test strips.
  - Allow the chlorinated water to remain in the casing for 12 hours.
  - The chlorinated water shall be pumped out of the well (see dechlorination section below). Flushing shall continue for 15 minutes after there is no detectable chlorine residual.
- Perform bacteriological testing by:
  - Taking a minimum of 2 water samples while the well is being continuously pumped, a minimum of 30 minutes apart.
  - If either sample are positive, pump the well to waste for a minimum of 15 minutes and take a minimum of 2 additional samples while the well is being continuously pumped, a minimum of 30 minutes apart.
  - If all bacteriological samples are negative, the well can be placed into service.
  - If any of the bacteriological samples are positive, re-chlorinate the well.

Emergency Disinfection of Drinking Water Wells (Shock Chlorination)

Summary: This procedure includes emergency disinfection (shock chlorination) for all drinking water wells that have experienced bacteriological contamination and/or have been subject to flooding. There is no ANSI/AWWA Standard for emergency disinfection (shock chlorination) of drinking water wells. Therefore, this section was prepared using best practices recommended by public health officials.

1. Program Description

Emergency disinfection, or shock chlorination, of drinking water wells may be performed to remove organic matter from wells, removing iron reducing bacteria growing on the well casing, and whenever there is a positive bacteriological test obtained from the raw water in the well. This process should also be used when the water quality is in question after a natural disaster such as a flood. This process should not be used for routine disinfection of drinking water wells. All chlorine used for disinfection shall meet NSF/ANSI 60 standards for use in drinking water systems.

2. Emergency Disinfection (Shock Chlorination) of Existing Wells

- Pump the well to waste until the water is relatively clear.
- Stop the pump.
- Introduce enough chlorine into the well to obtain a chlorine residual between 100 and 200 ppm in the well water (see section above on disinfection of new wells for chlorine options).
- Use a hose (with proper backflow devices) to wash the chlorine off of the inside of the well casing above the water line after the chlorine is placed into the well.
- The chlorinated water shall be circulated in the casing to ensure chlorinate is uniformly distributed throughout the water column. A minimum of 3 surges (starting and stopping the well pump) shall be used to distribute the chlorine throughout the water column.
- If the well is for a single residence or home, open all plumbing fixtures until the highly chlorinated water reaches each fixture. If the well is for a larger water system, water mains should be disinfected by the method described above, if needed.
- Verify that the chlorine residual is still greater than 100 ppm using chlorine test strips.
- Allow the highly chlorinated water to sit for a minimum of 30 minutes.
- The chlorinated water shall be pumped out of the well (see dechlorination section below). Flushing shall continue for 15 minutes after there is no detectable chlorine residual. The highly chlorinated water shall not be flushed into the wastewater collection system or septic system.
- Perform bacteriological testing by:
    - Taking a minimum of 2 water samples while the well is being continuously pumped, a minimum of 30 minutes apart.

- If either sample are positive, pump the well to waste for a minimum of 15 minutes and take a minimum of 2 additional samples while the well is being continuously pumped, a minimum of 30 minutes apart.
- If all bacteriological samples are negative, the well can be placed into service.
- If any of the bacteriological samples are positive, re-chlorinate the well.

Dechlorination Procedures for Disposal of Chlorinated Water

1. Dechlorination

Highly chlorinated water should be dechlorinated prior to flushing into the sewer, surface water, or ground surface where it could affect surface water or other resources (consult with Resource Management). Field dechlorination should be conducted in accordance with ANSI/AWWA C655-09 or the latest version.

2. Dechlorination Methods

Many dechlorination methods are available. Non-chemical dechlorination methods are only viable for chlorine concentrations less than 4 mg/L. Therefore, non-chemical dechlorination methods will not be discussed in this guidance document. Many different types of chemicals are available for dechlorination, but only the most common are listed below for application in the NPS:

- Ascorbic Acid (Vitamin C) may be the most environmentally friendly option for NPS. Approximately 2.5 parts of ascorbic acid is required to neutralize 1 part of chlorine. Ascorbic acid is not reported to reduce dissolved oxygen, but it is slightly acidic and therefore may slightly lower the pH of any surface water that it comes in contact with. Ascorbic acid has a NFPA rating of 1,0,0. Caution should be exercised to prevent accidental inhalation of ascorbic acid or contact with skin, eyes, or lungs. For more information, see: https://www.fs.fed.us/t-d/pubs/html/05231301/05231301.html
- Sodium Ascorbate is another environmentally friendly option. Approximately 2.8 parts of sodium ascorbate is required to neutralize 1 part of chlorine. Sodium ascorbate is not reported to scavenge dissolved oxygen and it has a pH of 7.5, so it will not significantly affect the pH of any surface water it comes in contact with. Sodium ascorbate has a NFPA rating of 2,1,0. Sodium ascorbate is relatively stable, but once it is in solution, it degrades within a day or two.
- Calcium Thiosulfate is only available in liquid form. Approximately 0.99 and 0.45 mg of calcium thiosulfate is required to neutralize one mg of residual chlorine at pH 7.35 and 11, respectively. Calcium thiosulfate is not toxic to aquatic species and has a NFPA rating of 0,0,0. One concern with using calcium thiosulfate is that dechlorination reactions using stoichiometric concentrations require nearly five minutes for complete neutralization. Over-dosing of calcium thiosulfate may produce milky-colored suspended solids, causing turbidity violations. Also, excess thiosulfate release may promote thiobacillus bacterial growth.
- Sodium thiosulfate is another widely used chemical by for dechlorination. It is available in tablet form, which can be more convenient. The amount of thiosulfate required for dechlorination may vary with solution pH, but in general, 2 parts of sodium thiosulfate are required to neutralize 1 part of chlorine. Sodium

thiosulfate is a reducing agent. However, it scavenges less oxygen than sodium sulfite, bisulfite or metabisulfite. Sodium thiosulfate is a skin, eye, nose and throat irritant. It has a NFPA Rating of 1,0,0 for health, fire and reactivity, respectively. An EPA toxicity study indicated that sodium thiosulfate is not very toxic to aquatic species. Sodium thiosulfate may react slowly with chlorine under some conditions, and requires more time for dechlorination than most dechlorination chemicals. Over-dechlorination with sodium thiosulfate may encourage thiobacillus and some other bacterial growth in receiving streams, particularly during low flow conditions.

- Sodium sulfite is also used widely for dechlorination. The amount of sodium sulfite required for dechlorination is about 1.775 parts of sodium sulfite to neutralize 1 part of chlorine. Sodium sulfite is a reducing agent and is reported to scavenge more oxygen than sodium thiosulfate. It is available in tablet form and is effective for use when dechlorinating constant, low flow releases of chlorinated water. It has a NFPA Rating of 1,0,1 for health, fire and reactivity, respectively.

For more information on dechlorination, see:
https://www.pollardwater.com/pdf/pdf_web_manuals/AWWARF_Dechlor_Guides_Pollard_dmb.pdf

3. Dechlorination Procedure

The following procedure should be used for dechlorination:

a. A dechlorination plan should be drafted by the party responsible for performing the dechlorination and sent to the water operator, resource management, and Public Health Consultant for review.
b. The dechlorination plan should contain the following information:
    - Method of dechlorination
    - Time available for dechlorination
    - Volume of water to be dechlorinated
    - Chlorine or chloramine concentration of water to be disinfected
    - Flow rate
    - Any physical obstructions to the dechlorination process (fire hydrants, flanges, risers, etc.)
    - Dechlorination equipment to be used
    - Monitoring instrumentation
    - Amount of dechlorination chemicals to be used
    - Procedures for handling and mixing (if required)
    - Site preparation for water disposal and safe operations onsite
c. The dechlorination process should be monitored to ensure that adequate dechlorination is taking place.