



|            |          |
|------------|----------|
| PROCEDURE  | 7102-02  |
| EFFECTIVE  | 03/16/06 |
| SUPERSEDES | 11/01/04 |

## STANDARD OPERATING PROCEDURE NO. 7102-02

### Low-Chlorine Potable Water Discharges

#### Purpose

This Standard Operating Procedure (SOP) describes the procedures to be followed when flushing any part or portion of the Santa Cruz Water Department's (SCWD) distribution system and free chlorine residual is less than or equal to 2 parts per million (ppm). (ppm = mg/L) This includes water discharged during flushing activities, hydrant testing, and main breaks.

The main objectives for planned water main flushing are sediment removal; taste and odor control; control of color, high turbidity, low chlorine residuals, or bacterial growth; corrosion control; or response to customer complaint(s).

Dechlorination of discharges of superchlorinated water with chlorine residual exceeding 2 ppm is addressed in SOP No. 7102-01.

Sediment control (i.e. pumping a trench to a drain inlet) is addressed in SOP No. 7105-01.

#### Discharges Requiring Dechlorination

All discharges from the distribution system must be treated to ensure the chlorine residual does not reach waters of the State. These include streams, rivers, ponds, lagoons and oceans. Discharges to be dechlorinated include those generated in the course of performing any of the following:

- Main or hydrant flushing (for any purpose).
- Hydrant testing.
- Main dewatering (for any purpose).
- Any other activity requiring discharge of chlorinated water (other than exempt discharges as defined below).

#### Exempt Discharges

The following discharges are exempt from the dechlorination requirement described in this SOP:

- Discharges of raw, untreated water with no chlorine residual.
- Discharges of non-chlorinated groundwater.
- Discharges less than 1000 gallons.
- Unplanned discharges at unstaffed locations (e.g., main breaks, broken fire hydrant, and reservoir overflow).
- Trench dewatering during distribution system maintenance and construction activities. (Reference SOP No. 7105-01 for sediment control.)



|                   |          |
|-------------------|----------|
| <b>PROCEDURE</b>  | 7102-02  |
| <b>EFFECTIVE</b>  | 03/16/06 |
| <b>SUPERSEDES</b> | 11/01/04 |

---

**Scope of this Procedure**

This procedure addresses manual dechlorination of SCWD-generated potable water discharges with free chlorine residual of 2 ppm or less. Dechlorination of discharges of superchlorinated water with a free chlorine residual of greater than 2 ppm are addressed in SOP 7102-01.

The specifications do not give instructions for making up dechlorinating solution or determining appropriate feed rates. See manufacturer's instructions for dechlorination solution application.

---

**Changes to Procedure**

This formal procedure has been revised. Any previously released informal procedures are no longer acceptable and should be replaced with this SOP. Any suggestions or ideas pertaining to this procedure as well as informal or older procedures should be forwarded to the Engineering division to be reviewed.

This procedure may evolve over time as new dechlorination chemicals or methods become available that makes dechlorination of potable water discharges quicker and/or easier.

Note that references to existing interdepartmental SOPs related to this topic are made throughout this SOP.

---

**Impacts of Flushing and Dechlorination**

- Environmental: Flushing at high velocities can erode soil and cause instability, uproot vegetation and cause drainage problems.
- Fish and Wildlife / Endangered Species: Chlorine in concentrations exceeding 0.05 ppm kills nitrifying bacteria and other aquatic life. Spikes of ammonia and nitrite, through gill necrosis, result in respiratory failure, suffocation, etc.
- Wastewater Treatment Plant: High doses of chlorine kills nitrifying bacteria and can cause certain unit treatment processes to fail, resulting in potential contamination of effluent discharging to the receiving water.
- Degradation/Capacity of Storm/Sanitary Sewer: Prolonged contact with high concentrations of chlorine may cause corrosion in cast iron pipe. Further, large discharges may exceed pipe capacity such that normal flows are restricted.

These concerns should be evaluated prior to each discharge and impacts should be minimized as prescribed by regulations.



|                   |          |
|-------------------|----------|
| <b>PROCEDURE</b>  | 7102-02  |
| <b>EFFECTIVE</b>  | 03/16/06 |
| <b>SUPERSEDES</b> | 11/01/04 |

---

**Priority of  
Dechlorination  
Relative to  
Other Jobsite  
Tasks**

For any job involving flushing or dechlorination, jobsite tasks should be prioritized in order of the following concerns.

1. Worker Health and Safety (e.g., don safety gear, set up traffic control, identify any site contamination concerns).
  2. Public Health & Safety (e.g., stop flows from breaks that are impeding traffic or threatening homes or businesses, operate valves as necessary to prevent contamination of mains and minimize number of customers out of water).
  3. Environmental Protection (e.g., set up dechlorination and/or sediment control equipment as necessary, ensure trench spoils are disposed of properly).
- 

**Flushing  
Equipment**

The following equipment is needed for flushing:

Hydrant Flushing:

- 2 ½" Hydrant adaptor fitting by 2" male end cam-lock fitting
- 2" Fire hose with cam-lock fittings
- 2 ½" Hydrant adaptor fitting with hose bib sampling port
- Pitot tube
- Pipe wrench
- Hydrant wrench
- Various valve keys

Blowoff Flushing:

- 2" Blowoff assembly with hose bib sampling port
  - 2" Fire hose with cam-lock fittings
  - Pipe wrench
  - Pitot tube
  - Various valve keys
- 

**Dechlorination  
Equipment**

The following equipment is needed for dechlorination when following this procedure:

- LPD-250 Diffuser with tablet chamber.
- Diffuser tablets (sodium sulfite).
- Personal Protective Equipment (i.e. respirator, goggles and rubber gloves).
- Analytical equipment for measuring temperature, free chlorine residual concentration, and turbidity. (As described in "Measuring Equipment" below.)
- Lab sampling bottles – 1 general physical (GP) bottle and 2 small sterile Bact bottles for each sampling station, labeled per "Field Chlorination Report".

Note that the LPD-250 diffuser equipment is capable of dechlorinating up to 4 ppm in free chlorine concentration.

---



|                   |          |
|-------------------|----------|
| <b>PROCEDURE</b>  | 7102-02  |
| <b>EFFECTIVE</b>  | 03/16/06 |
| <b>SUPERSEDES</b> | 11/01/04 |

---

**Chemical  
Handling &  
Personal  
Protective  
Equipment  
Requirements**

Diffusers with tablets (new or used) should be stored in vehicles in secondary containment to prevent particles of sodium sulfite from being deposited directly onto vehicle, tools or other surfaces.

See the Production Division's SOP 7106-IV-4 for handling of dry and liquid chlorine products.

---

**First Aid**

See MSDS for specific chemical to determine best course of action:

*Eye Contact:* Immediately flush eyes with large amounts of water for at least 15 minutes holding lids apart to ensure flushing of entire eye surface. Seek medical attention.

*Skin Contact:* Wash thoroughly with soap and water.

*Inhalation:* Remove person from contaminated area to fresh air. If breathing has stopped, resuscitate. Seek medical attention.

*Ingestion:* Induce vomiting. Seek medical attention.

---

**WARNING!**

Some work units that will be using sodium sulfite (LPD-250 Diffuser) for dechlorination also use calcium hypochlorite (HTH) or sodium hypochlorite to disinfect water distribution system mains or appurtenances. These two chemicals can react when mixed in the presence of water. The reaction can produce heat and both hydrogen and chlorine gas, creating both a potentially toxic and explosive/flammable atmosphere. Should the chemicals become mixed, staff should immediately evacuate to a safe area and contact the fire department (911). These chemicals and associated mixing and dispensing equipment must be kept segregated from each other at all times.

---

**PROCEDURE**

This procedure includes instructions for flushing and dechlorination when hydrant flushing, hydrant flow testing or main dewatering through a hydrant or blowoff.

• **Notification**

Give 48-hour notice, using door hangers, to areas that will be affected by flushing, particularly to certain categories of customers who are seriously affected by flushing (e.g., laundries and dialysis patients). Notification of flushing as part of the department's flushing program shall be given via a newspaper ad.

Internal notification of all planned flushing shall be given to all divisions of the Water Department.

Get permission of City or County Public Works Departments to use sanitary sewer for water disposal. In the City, inform the Wastewater Mains Supervisor in the Water Dept. and Wastewater Mains Field Crew Leader in Public Works, via email. Provide date, location, rough quantity, and main size to be flushed.

---



|            |          |
|------------|----------|
| PROCEDURE  | 7102-02  |
| EFFECTIVE  | 03/16/06 |
| SUPERSEDES | 11/01/04 |

- 
- **Notification (continued)** In the County, inform Santa Cruz County Sanitation Dispatch at 464-5462 with date, location, and estimated quantity of water to be flushed.
  - **Preparation** Direct flushing-water away from traffic, pedestrians, underground utility vaults, watercourses and private lands. Check that travel path of water is clear of hazardous contaminants such as puddles of gas, oil, paint thinners, etc. Take measures necessary to prevent sediment, debris, spilled auto fluids, etc., from entering the sanitary or storm sewer. (See SOP 7105-01.)
  - **Dechlorination** Dechlorination is accomplished by the addition of sodium sulfite tablets to the discharge flow. For main flushing, hydrant flow testing or main dewatering through a blowoff, a dechlorinating diffuser assembly is typically used. For the diffuser, tablets are placed inside a chamber of the flow-through diffuser attached to the discharge face of the diffuser. The diffuser is then connected to a hose bib assembly attached to the hydrant or blowoff. As the discharged water flows over and around the tablets, chemical is released as the water contacts the tablets, reacting with and destroying the chloramines. Refer to equipment manuals for specific instruction on use of the diffuser.
- 
- **Flushing & Testing**
    1. Obtain a water sample from a hose bib sample port or at a home in the area to be flushed. Perform a turbidity and chlorine test (as described in SOP No. 7102-03) before starting the flush. This will provide you with target levels of the surrounding area. If the area is experiencing low chlorine levels (<0.2 mg/L) contact the Water Quality Manager. Record levels on “*Field Chlorination Report*” (attached).
    2. Connect hose bib sampling assembly to hydrant or blow off. Connect fire hose then diffuser (full of tablets) to sampling assembly with diffuser positioned over storm drain, gutter, or sanitary sewer inlet.
    3. Slowly operate the appropriate valves to isolate the water main or area to be flushed to prevent water hammer.
    4. Begin the flushing by opening the hydrant or blow off valve slowly until a desired flow is obtained. Measure flow rate with a pitot tube and note length of time. Record on “*Field Chlorination Report*.”
    5. Monitor the supply of tablets in the diffuser tablet chamber periodically to ensure that there are adequate tablets available to complete the flushing. Add tablets as needed.
    6. Continue to flush the water, sampling and testing until turbidity is close to a standard set by the Water Quality Control Lab, usually  $\leq 0.5$  NTU. Record on “*Field Chlorination Report*”.
    7. Confirm chlorine concentration using a sample with the colorimeter. Chlorine level should meet or exceed the target level of the surrounding area (between 0.5 and 1 ppm). Record on “*Field Chlorination Report*.”
-



|            |          |
|------------|----------|
| PROCEDURE  | 7102-02  |
| EFFECTIVE  | 03/16/06 |
| SUPERSEDES | 11/01/04 |

---

- **Flushing & Testing, cont.**

8. If the main is dewatered or the residual pressure drops below 5 psi, bacteriological samples need to be drawn at each sample point. Disinfect hose bib nozzle with propane torch for a minimum of 30 seconds. Take one (1) GP sample, filling to neck of the bottle. Carefully fill two (2) small, sterile Bact test sample bottles (two (2) per sample point) to the 100-mL line and cap immediately. Take additional samples if contamination is suspected. Record sample identification on "*Field Chlorination Report*."
9. Close valve to hydrant or blowoff and disassemble dechlorination equipment. Reopen all previously closed valves.
10. Estimate the flow rate and amount of water flushed. Record on "*Field Chlorination Report*."
11. Submit "*Field Chlorination Report*" as well as samples to lab within one (1) hour of sampling. Transport samples in insulated cooler with ice packs.

---

**Method of Measurement**

Free chlorine is measured by adding DPD Free Chlorine Reagent pillow to a sample of a given discharge. If a pink or red color develops when reagent is added to the sample, chlorine is present. This is known as colorimetric analysis. Absence of color indicates there is no detectable chlorine present.

Turbidity is measured utilizing the Hach Portable Turbidimeter, which operates on the nephelometric principle of turbidity measurement. This instrument measures the degree of cloudiness by means of transmitted light. See manufacturer's manual for complete instructions.

---

**Measuring Equipment**

DPD Free Chlorine Reagent Pillows, manufactured by HF Scientific, Inc., are used to dispense the reagent into the sample. Utilize the clear, clean sample tubes included in the Hach Colorimeter kit to analyze the water. Transfer 5 mL of sample water taken with the glass quart bottle to the sample tube and add one (1) DPD Free Chlorine Reagent pillow (for 5mL sample).

Cover and shake the sample tube. If a pink or red color remains, use the colorimeter to directly read the approximate concentration. Absence of color indicates that there is no detectable chlorine present. The target chlorine concentration is 0.5 ppm, with an acceptable range of 0.5 to 1.0 ppm.

The Hach Portable Turbidimeter is used to measure turbidity. Verify calibration using the standards. Scratches, fingerprints, or condensation on the bottles will affect the readings. Wipe bottles carefully with Kimwipes, using silicon oil if bottles are scratchy. Line up diamond on bottle with instrument's orientation mark. Close cover. Press READ in AUTO RANGE mode.

---



|                   |          |
|-------------------|----------|
| <b>PROCEDURE</b>  | 7102-02  |
| <b>EFFECTIVE</b>  | 03/16/06 |
| <b>SUPERSEDES</b> | 11/01/04 |

---

**Measuring  
Equipment, cont.**

Fill sample bottle to white line, cap, and wipe with Kimwipe. Gently rotate bottle to remove air bubbles. If turbidity >0.5 NTU, continue to flush. If turbidity remains over 0.5 NTUs for over an hour, stop flushing and continue procedure with note to lab about high turbidity level.

---

**Regulating  
Agencies**

- USEPA
  - US Fish and Wildlife
  - California Department of Health
  - California Department of Fish and Game
  - Central Coast RWQCB
  - City of Santa Cruz
  - NOAA Fisheries
- 

**Applicable  
Regulations**

- Clean Water Act Section 309, etc.
  - Endangered Species Act Sections 9 and 11
  - California Water Code Sections 13300-13361
  - California Fish and Game Code Sections 5650 and 2050
  - City of Santa Cruz Municipal Code
  - California Code of Regulations, Title 22, Section 64421
- 

**Attachments**

- MSDS, Sodium Sulfite
  - MSDS, Ascorbic Acid
  - Field Chlorination Report
- 

**References**

- ANSI/AWWA C651-99 Standard for Disinfecting Water Mains
  - AWWA Research Foundation Guidance Manual for Disposal of Chlorinated Water (2001)
  - State of California RWQCB Water Quality Control Plan for the Central Coastal Basin (September, 1994)
-