



APPENDIX C: PROCEDURES FOR WATER MAIN CLEANING, DISINFECTION, AND BACTERIOLOGICAL TESTING



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I PURPOSE

To establish standard procedures for the cleaning, disinfection and bacteriological testing of COUNTY potable water mains. Inclusive in this standard are newly installed, replaced, and relocated water mains, along with water mains being returned to service after being out of service for a period of time.

II DEFINITIONS

Board - the Board of County Commissioners, Hillsborough County, Florida.

Contractor - the person or persons, partnership, firm, or corporation who enters into a water main construction contract to install, extend, relocate, or otherwise modify the COUNTY's potable water transmission/distribution system. When contracting the work, it is understood that the CONTRACTOR is responsible for executing this procedure and payment of all fees; reimbursement to be made as per the contract.

County - A political subdivision of the State of Florida known as Hillsborough County, as governed by the Board and as administered by the County Administrator.

Department - the County's Public Utilities Department

Environmental Laboratory, Laboratory, or Lab - the DEPARTMENT's laboratory, certified for water quality/bacteriological analysis.

Inspector - a COUNTY employee or representative of the COUNTY assigned to inspect the CONTRACTOR's work to ensure compliance with prescribed standards.

Project Manager - a COUNTY employee assigned to manage and administer the project involving the CONTRACTOR's work. The PROJECT MANAGER may designate a Project Representative to perform certain duties and responsibilities.

Project Representative - a COUNTY employee or representative of the COUNTY designated by the PROJECT MANAGER to act as their representative.

Record Engineer - a professional engineering firm or professional engineer registered in the State of Florida who is responsible for oversight and certification of the water main's construction, including disinfection and testing, permit *certification and record drawing*.

Resident Engineer - a representative of the RECORD ENGINEER charged with oversight duties.

Water Mains - include the pipelines, fittings, valves, and all appurtenances that comprise the potable water distribution or transmission system being installed, replaced, relocated, or being returned to service after being out of service for a period of time.

III PROCEDURES

A. General

1. **References:** Prior to any portion of the COUNTY's potable water system being placed into or restored to service, it must be cleaned, disinfected, and tested for bacteriological contaminants in accordance with the latest applicable provisions of the American Water Works Association (AWWA), "Standard for Disinfecting Water Mains" (AWWA C651); and the Florida Department of Environmental Protection (FDEP), "Permitting, Construction, Operation and



- Maintenance of Public Water Systems", FDEP Rules 62-555.315(6), 62-555.340 and 62-555.345, Florida Administrative Code (FAC).
2. **Approved Plan:** Prior to construction, the CONTRACTOR must submit a **Cleaning, Disinfection and Testing Plan** (CD&T Plan) which meets AWWA C651 standards and the requirements specified in this document, for review and approval by the RECORD ENGINEER and the DEPARTMENT. For developer projects, the **CD&T Plan** must be submitted to the Development Services Department's Engineering Review Team. For Capital Improvement Projects (CIP), the CD&T Plan must be submitted to the DEPARTMENT's Project Manager. The Plan must describe the proposed source of potable water and the proposed methods of cleaning, disinfection, final flushing and bacteriological sample collection. The CD&T Plan must meet the minimum requirements, including minimum number of sample points, specified in the project's design drawings. The Plan must incorporate water conservation principles and include provisions for protection of property and the environment.
 3. **Preventive and Corrective Measures:** During construction, the CONTRACTOR must protect the interiors of the Water Mains from contamination. Precautions must be taken to keep all water main interiors dry and free of particulate, debris and other foreign matter in accordance with the latest edition of AWWA C651, Section 4.3.
 4. **Coordination of Activities:** All cleaning, disinfection and flushing activities must be coordinated with the RECORD ENGINEER and the INSPECTOR; and conducted under the direct supervision of the RECORD ENGINEER or his representative, in the presence of the INSPECTOR and PROJECT REPRESENTATIVE.
 5. **Water Source:** Water used for cleaning, disinfection and flushing must be potable water taken from an approved source.
 6. **Operation of Valves:** At all times, valves on existing COUNTY water mains will be operated by DEPARTMENT Field Maintenance staff, or under their direct supervision, during all phases of water main cleaning, disinfection and flushing. All cleaning, disinfection and flushing activities that require the operation of COUNTY water main valves must be coordinated with Field Maintenance staff, where prior notification of at least one business day is requested. See Exhibit A for a list of contact names and numbers.
 7. **Distribution System Pressures:** Adequate system pressures (35 psig or greater) must be maintained at the metered connection during cleaning and flushing activities.
 8. **Water Conservation Measures:** Where possible, quantities of water used for cleaning, disinfection and flushing must be minimized in consideration of COUNTY water conservation guidelines.
 9. **Discharge and Disposal of Water:** The CONTRACTOR must take care to ensure that the water used during the cleaning, flushing and disinfection activities, is disposed of in a manner that minimizes damage to property or the environment, and without causing a nuisance. All heavily chlorinated discharge water (greater than 4 mg/L free chlorine, or as directed by jurisdictional authority) must be dechlorinated prior to disposal, using a neutralizing chemical, such as Sodium Thiosulfate. The CONTRACTOR must mitigate and restore all damages.
 10. **Approved Testing Lab:** All bacteriological testing must be performed by the DEPARTMENT's Environmental Laboratory (Lab). When previously approved by the Lab the CONTRACTOR, at his discretion and expense, may take samples for analysis to a NELAC/NELAP certified, State approved (DEP), independent testing laboratory certified for the required testing.



B. Cleaning

1. The CONTRACTOR must notify the INSPECTOR at least 48 hours prior to commencing any cleaning or flushing activity.
2. The CONTRACTOR must clean and flush the Water Mains to remove all sand and other foreign matter in accordance with the approved CD&T Plan.
3. The interiors of all new Water Mains must be cleaned by mechanical means such as a hydraulically propelled foam pig. The pig must be of an appropriate material so as not to damage the interior lining of the pipeline. The CONTRACTOR must be responsible for the installation and removal of any connections or appurtenances necessary to accomplish the pipeline pigging. All pigging must be conducted with the INSPECTOR in attendance.
4. After the Water Mains have been thoroughly cleaned and prior to disinfection, hydrostatic testing must be conducted in accordance with Hillsborough County Water, Wastewater, and Reclaimed Water Technical Specifications located on the Hillsborough County Public Utilities Department website.

C. Disinfection

1. The INSPECTOR must be notified at least 24 hours prior to commencing disinfection activities.
2. The CONTRACTOR must disinfect the Water Mains in accordance with the approved CD&T Plan.
3. The disinfecting agent must be free chlorine in aqueous solution. The form of chlorine and the application method must meet the standards prescribed in AWWA C651. Methods generally approved by the COUNTY are the "Tablet Method" and the "Continuous-Feed Method" as outlined in AWWA C651. Use of the "Slug Method" is discouraged and must only be approved on a case-by-case basis. The forms of chlorine that may be used are sodium hypochlorite solution and calcium hypochlorite granules or tablets as outlined in AWWA C651. The use of chlorine gas (i.e., the "Liquid Chlorine" application method specified in AWWA C651) must not be approved unless the CONTRACTOR can demonstrate that properly designed and constructed equipment operated by suitably trained and equipped personnel will be used.
4. The initial free chlorine concentration must not be less than 25 mg/L at all points along the water main. The highly chlorinated water must be retained in the main for at least 24 hours, during which time all valves and hydrants within the treated section must be operated to ensure disinfection of the appurtenances. At the end of this period, the treated water in all portions of the main must have a residual of not less than 10 mg/L free chlorine. To ensure these concentrations are rendered along the entire length of pipe, chlorine concentrations must be measured at regular intervals, using approved methods. The sample points established for bacteriological testing may be utilized for this purpose.

D. Final Flushing

1. Prior to the final flushing, the proposed discharge site must be inspected for conformance with the CD&T Plan by the COUNTY and the applicable regulatory agency for potential environmental impact.
2. After the applicable retention period, the heavily chlorinated water must be discharged from the Water Mains until the chlorine or chloramine concentration of the discharge water is no higher than that found in the existing, adjacent water distribution system.
3. If it appears that there may be a problem meeting minimum system residual requirements after the Water Mains are flushed, (.2 mg/L free, and .6 mg/L total), the CONTRACTOR should



- contact the DEPARTMENT's Water Operations/Water Quality Supervisor (see Exhibit A for contact names and numbers) for assistance in flushing the existing main.
4. If the adjacent water distribution system is chloraminated, any water with free chlorine residual must be flushed out so as not to mix with the chloraminated water in the existing distribution system.
 5. Prior to discharge into the environment, all heavily chlorinated water must be dechlorinated using a neutralizing chemical, such as sodium thiosulfate, to thoroughly neutralize the chlorine residual.
- E. Bacteriological Sampling & Testing
1. After final flushing, each sample location must be sampled on two separate consecutive days (with samples at least 6 hours apart, per AWWA C651). The sample point locations and chlorine residual readings must be clearly indicated on the sampling report. All sampling must be in accordance with the approved CD&T Plan. The plan must include the sample point locations, with map(s) and station numbers, of all proposed sample points.
 - a. Sample points must be located at a maximum spacing of 1200-foot intervals along the water main; at each end of the pipeline; and at each branch in the system. If dirt and debris were allowed to enter the piping system during construction, the sample points must be at 200-foot intervals – as prescribed in AWWA C651;
 - b. Samples must not be taken from fire hydrants;
 2. Prior to sample collection, the CONTRACTOR must contact the Lab for a sampling kit which will include the following: sample bottles (twist on/off caps), labels, disinfectant residual test kit with deionized water and approved test reagent suitable for determining residual concentrations, alcohol for disinfecting the sample taps, plastic zip-lock bag to store sample bottles in, lockable ice chest (cooler) for sample storage, and a copy of the Water Main Bacteriological Clearance Report and Chain-of-Custody Form (Exhibit C) with a set of instructions for sample collection and delivery (Exhibit D). See Exhibit A for locations, phone numbers and contact names.
 3. The CONTRACTOR must be responsible for measuring and recording the disinfectant residual of the water from each sample tap as well as a system tap upstream of the Water Mains, collecting the required water samples, sealing the sample bottles, labeling the sample bottles, enclosing in zip-lock bags, and placing in the ice chest – with bags in direct contact with wet ice. If the residual from the system tap differs by more than + 0.5 from the samples this is an indication that there is a potential problem with the new main (improper cleaning or flushing of the line).
 4. The CONTRACTOR must also be responsible for completing the required information on the Chain-of-Custody Form as well as the sample containers. A COUNTY representative (e.g., INSPECTOR, PROJECT MANAGER or PROJECT REPRESENTATIVE) must witness the sample collection, lock the ice chest, and certify on the Chain-of-Custody Form that proper procedure was followed. The CONTRACTOR must hand-deliver the samples contained in ice chest to the Lab.
 5. The CONTRACTOR must be responsible for payment of testing and administration fees for each 2-day sample event. See Exhibit B for a current breakdown of fees. Payments must be by check or money order only, made out to Hillsborough County BOCC, and are due upon delivery of the second day's samples (Day 2).
 6. After completing the analyses of the second day sample(s), the Lab will email all test results to the PROJECT MANAGER or the RECORD ENGINEER. Release of the test results is contingent upon CONTRACTOR payment of fees and return of the sampling kit to the Lab.



F. Redisinfection

If the initial disinfection fails to produce satisfactory bacteriological results, the Water Main(s) may be refushed and must be resampled per Section E. If a second set of samples also fail to produce acceptable results, the CONTRACTOR must repeat the disinfection and flushing procedures until two consecutive sets of samples taken on two separate days at least 6 hours apart are satisfactory.

G. Letter of Clearance

1. Upon receipt of a set of satisfactory test results, the RECORD ENGINEER must submit FDEP Form #62-555.900(9), "Certification of Construction Completion and Request for Clearance to Place Permitted PWS Components into Operation" to the Hillsborough County Department of Health (HCDOH). The certification is also signed by the permittee, usually the PROJECT MANAGER, and the DEPARTMENT Director or designated signature authority. The submittal must include a set of the Lab's bacteriological test reports showing satisfactory results, a copy of the hydrostatic test report, and a set of record drawings - signed and sealed by the RECORD ENGINEER. The location of sample collection points must be indicated on the record drawings.
2. Upon approval, the HCDOH will send a letter of clearance to the Permittee, with courtesy copies sent to the RECORD ENGINEER, the DEPARTMENT, and the Development Services Department.
3. No newly constructed or altered COUNTY water main/system must be placed into service until a Letter of Clearance is issued for the facility from the County.

H. New Water Main Activation

1. Following HCDOH's clearance and approval by the County, the water main must be placed into service, with the CONTRACTOR coordinating activities with the DEPARTMENT's Field Maintenance Section. If more than sixty (60) calendar days have passed from the date of the successful bacteriological second day test results, the CONTRACTOR must reflush the Water Main(s) and repeat the sampling and testing procedures, as outlined in Sections D. and E. herein. If these samples fail to produce acceptable results, the CONTRACTOR must repeat the disinfection and flushing procedures until two consecutive sets of samples taken at least 24 hours apart are satisfactory.
2. No water main must be placed into service without meeting the disinfection requirements specified in this document and AWWA C651.



EXHIBIT A

HILLSBOROUGH COUNTY PUBLIC UTILITIES WATER RESOURCES DEPARTMENT

Contact Names/Numbers

Field Maintenance

Northwest: Jason Makinson, 554-5011, x43856
Central Thomas Parmentier, 671-7604, x43842
South: Terry Shiflett, 671-7604, x43078

Water Operations

South Water Quality: Rich Garner, 744-5544, x43905
North Water Quality: Ray Harmon, 635-7393, 43793

Environmental Laboratory

9456 E. Columbus Dr., Tampa FL
Dale Uvino, Environmental Supervisor, 272-5977, x43260
Sandra Fernandez-McCoin, Chief Environmental Scientist, 663-3209
Sample Custodian, 813-272-5977 Ext. 43618 or 43635

Service Availability

Service Availability: 813-272-5917, ext. 13611

Engineering/Hydraulics

John McCary, 813-272-5977, ext. 43337

EXHIBIT B ENVIRONMENTAL LABORATORY FEES

Testing Fee	\$10.00 / sample
Admin Fee	\$10.00 / event



EXHIBIT C

Revision #10, Effective 02/01/2021 Bottle Lot #: 		Hillsborough County Public Utilities Department Environmental Laboratory 9456 E. COLUMBUS DR. TAMPA, FLORIDA 33619 BACTERIOLOGICAL CLEARANCES Clearance Type (Check One): <input type="checkbox"/> Water Main <input type="checkbox"/> Tank <input type="checkbox"/> System <input type="checkbox"/> High Service Pump				DOH# E44104 Phone (813) 272-5977 Fax 813-635-8266 DAY # _____			
PROJECT NAME / LOCATION: _____ PROJECT / WORK ORDER/CIP # _____ Permit # _____ DESCRIPTION OF REPAIR/MODIFICATION: _____ SAMPLE DATE: ____/____/____ SAMPLER NAME / TITLE: _____ TYPE OF CLEARANCE: <input type="checkbox"/> 2-DAY <input type="checkbox"/> 10-DAY Contractors Only: PROJECT MANAGER: _____ PHONE NUMBER: _____ EMAIL ADDRESS: _____ CONTRACTOR (Paying for Tests, If Applicable): _____ ADDRESS: _____ CITY/STATE/ZIP: _____									
<table style="width:100%; font-size: small;"> <tr> <td style="width:30%;"> Standard Methods 9221B (2nd Edition) Fluorogel/Disinfectant Test for Coliforms Fluorogel/Ammonia using 150 mL Sample Total Free Chlorine - BM 4500 </td> <td style="width:30%;"> Total Coliform Reporting: T - Positive: Absence of T allow color in sample comparable to comparison A - Absence: No yellow or yellow to orange in sample than comparison </td> <td style="width:40%;"> E. coli Reporting: P - Positive: Fluorescence A - Absence: No Fluorescence </td> </tr> </table>							Standard Methods 9221B (2nd Edition) Fluorogel/Disinfectant Test for Coliforms Fluorogel/Ammonia using 150 mL Sample Total Free Chlorine - BM 4500	Total Coliform Reporting: T - Positive: Absence of T allow color in sample comparable to comparison A - Absence: No yellow or yellow to orange in sample than comparison	E. coli Reporting: P - Positive: Fluorescence A - Absence: No Fluorescence
Standard Methods 9221B (2nd Edition) Fluorogel/Disinfectant Test for Coliforms Fluorogel/Ammonia using 150 mL Sample Total Free Chlorine - BM 4500	Total Coliform Reporting: T - Positive: Absence of T allow color in sample comparable to comparison A - Absence: No yellow or yellow to orange in sample than comparison	E. coli Reporting: P - Positive: Fluorescence A - Absence: No Fluorescence							
SAMPLE NUMBER	SAMPLE TIME	Northwest 6250388 South/Central 6250387 Seaboard 6250353 PWS#	Flush Time (min) Disinfectant Residual (mg/L) Total Chlorine Free Chlorine	Received Temperature °C Total Coliform (P/A) E. coli (P/A)	FIELD CODE C - MMDDYY - Location	LIMS SAMPLE #			
		LOCATION							
		Disinfectant residual upstream of new main.							
1									
2									
3									
4									
5									
6									
7									
8									
COST: Analytical Fee \$10.00 x _____ Samples = \$ _____ + Administrative Fee: \$ 10.00 = Total Fee: \$ _____ Amount Received: \$ _____ Check Number: _____ Received By: _____									
"For Collet 18 Set-Up" Analyst: _____ Set-Up Date: _____ Waterbath Incubation Start Time: _____ BACT-INC- _____ Incubator Transfer Time: _____ BACT-INC- _____		Media: Collet Inventory #: _____ Take-Out: Analyst: _____ Incubation End Date: _____ Incubation End Time: _____ Collet Comparator Inventory #: _____ Secondary Take-out Time Review: _____		Review Date: ____/____/____ () CLEARED () RE-SAMPLE () CONTINUE - SEE DAY 2 Chief Scientist/Environmental Supervisor	For Health Dept Use Only Review Date: ____/____/____ () SATISFACTORY () UNSATISFACTORY () RESUBMIT Hillsborough County Health Department				
County Agent certifying samples collected in accordance with Tech Manual Section 3.13. (Print) _____ (Signature) _____ Date: ____/____/____ Time: _____ Company / Department: _____ Phone Number: _____									
Requisitioned By: _____ Date: ____/____/____ Time: _____ for Public In Code? T / N			Received For Lab By: _____ Date: ____/____/____ Time: _____						

LIMS Data Entry _____

10-1-10



EXHIBIT D

HILLSBOROUGH COUNTY PUBLIC UTILITIES

DEPARTMENT ENVIRONMENTAL LABORATORY

BACTERIOLOGICAL CLEARANCE PROCEDURE

1. Water samples for bacteriological analysis may be delivered to the Environmental Laboratory at 9456 East Columbus Dr. between 8:00AM and 4:00PM Monday through Friday.
2. Contact Laboratory Sample Custodian at 813-272-5977 Ext. 43635 or 43618 to arrange pick up of a sample kit including sterile sample bottles, a chlorine residual test kit, forms, labels, alcohol and a lockable ice chest.
3. **Day #1 Sample Collection:**
 - a. On the Water Main Clearance Form, fill in all pertinent information including an email address to which the test results are to be sent. Use pen only. **DO NOT USE PENCIL.**
 - b. At a point in the *existing system upstream of the new line*, measure the chlorine residual as follows: (1) Rinse then fill the two viewing tubes to the second (10 mL) line with sample water; (2) Put the tubes into the color wheel case and add **ONE (1)** DPD #4 (Total Chlorine) packet to the tube on the right; (3) Agitate the tube until the reagent is dissolved; (4) Wait 3 minutes; (5) Rotate the color wheel until the pink in the left view port matches the pink in the right (sample) port; (6) If the residual is greater than 3.5 mg/L, a dilution is needed. Empty both viewing tubes, rinse with sample, and refill both viewing tubes to the first (5 mL) line with sample. Fill both viewing tubes to the second (10 mL) line with the provided DI water. Repeat steps (2) thru (5) above. Multiply this answer by 2. (7) Record the residual under “Disinfectant Residual (mg/L)” and the time the residual was analyzed under “Sample Time” on the Water Main Clearance form for “Disinfectant residual upstream of new main”. A sample is not collected at this location, only the residual is needed.
 - c. At your sampling point, flush the sample tap no more than 2 minutes, then measure the chlorine residual in the new line (see “b” above). Record the residual in the column labeled “Disinfectant Residual (mg/L)” on the form. Provide a description of the sample location under “Location”. **NOTE:** If the new line’s residual is significantly greater or lower than the upstream system residual, the line has probably not been adequately flushed or chlorinated respectively. Contact the Project Manager for further instructions.
 - d. Turn off the sample tap and disinfect the inside and outside of the sample spigot using the squirt bottle of alcohol.
 - e. Wait 15 seconds, flush the tap for no more than 2 minutes, and then reduce the flow to a gentle stream. Unscrew the cap on the sample bottle taking care not to touch the inside lip of the bottle or cap. **Do not rinse the bottle**, it contains a de-chlorinating agent. **Fill the bottle to the 100 mL mark or slightly above.** Screw on the cap. Record the time the sample was collected under “Sample Time”. **Please use military/24hr time.**
 - f. Repeat the above steps for each additional sample collected.
 - g. Record the sample date and sampler name/title at the top of the form. Fill out all information requested on the label provided. Fill out the field code (W-MMDDYY-Location) on the COC and on the label. “W” is code for Water Main, “MMDDYY” for month, day and year, and “Location” for location of sample taken. Place the label on its corresponding sample bottle.
 - h. Drain any melted ice from the cooler. Place the sample in a small Ziploc baggie provided by



the lab. If a Ziploc baggie was not provided, place the sample on ice so that the sample bottle(s) will not be in direct contact with the ice in the cooler. For example, place the ice in a separate plastic bag so that the sample is not in direct contact with the ice or water from melted ice.

- i. The County inspector or agent must witness the sample collection and locking of the cooler. After the inspector has verified sample collection and signs the Water Main Clearance form, deliver the locked ice chest and form to the laboratory.

4. Day #2 Sample Collection:

- a. Call the lab in the morning to verify that the first samples have passed.
- b. Repeat Step 3 above for Day #2 sample collection.
- c. A report of the test results will not be provided until the sample kit has been returned and payment is submitted. Checks or money order only. No cash will be accepted. Make checks payable to Hillsborough County BOCC. The analytical fee is \$10.00 for each bacteriological sample tested in the 2-day clearance and \$10.00 for processing for each clearance event.

10/2021