



# **The Blue Mountains Watermain Commissioning Protocol**

**May 2021**

**Version # 2**

A. Contents

1.	General.....	3
	<b>1.1 Overview</b> .....	3
	<b>1.2 Definitions</b> .....	3
2.	Watermain Commissioning Plan.....	4
3.	Source Water .....	4
4.	Swabbing.....	4
5.	Hydrostatic Pressure Test .....	5
6.	Disinfection .....	5
7.	De-chlorination .....	7
8.	Chlorine Residual and Bacteriological Testing.....	7
	<b>8.1 Procedure</b> .....	7
	<b>8.2 Sample Locations</b> .....	8
	<b>8.3 Free Chlorine Residual Requirements</b> .....	9
	<b>8.4 Bacteriological Requirements</b> .....	9
	<b>8.5 Laboratory Submissions</b> .....	10
	<b>8.6 Custody Control</b> .....	10
	<b>8.7 Post Final Connection Bacteriological Testing</b> .....	10
9.	Final Connection to Existing Water System.....	11
	<b>9.1 Procedure</b> .....	11
	<b>9.2 Connections to Existing System</b> .....	11
	<b>9.3 Tracer Wire</b> .....	12
10.	Tracer Wire Conductivity Test .....	12
11.	Valve Positioning.....	13
12.	Documentation to Be Provided .....	14
13.	Testing Schedule for Watermain Construction .....	14

## 1. General

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Contractor shall follow the Ministry of the Environment, Conservation and Parks Watermain Disinfection Procedure, dated August 1, 2020 as amended from time and in effect as of April 19, 2021. Should the requirements in the Town's Watermain Commissioning Protocol outline more stringent requirements, the Town's Protocol shall be followed.

### 1.1 Overview

In order for a watermain to be considered for acceptance by the Town of The Blue Mountains, the following procedures and tests shall be successfully completed:

- Swabbing
- Hydrostatic pressure test
- Disinfection
- De-chlorination
- Chlorine residual and bacteriological tests
- Final connection (Certified Town Operator to witness)
- Tracer wire conductivity test
- Valve positioning

With the exception of final connection, which shall be witnessed by a Certified Town Water Operator, all field tests conducted in this subsection shall be performed in the presence of the Contract Administrator and Development Engineering Staff to the satisfaction of the Town.

**All chemicals and materials used in the alteration or operation of the drinking water system that come into contact with water within the system shall meet all applicable standards set by both the American Water Works Association (AWWA) and the American National Standards Institute (ANSI) safety criteria standards NSF/60, NSF/61 and NSF/372.**

Where this protocol refers to ANSI/AWWA Standard C651 "Disinfecting Water Mains", the most current version of the Standard shall be used.

### 1.2 Definitions

Town: Town of The Blue Mountains

Director: Director of Operations or designate and/or Director of Planning and Development Services or designate

Contractor: General Contractor as defined in Ontario Provincial Standard Specifications

Contract Administrator: Consulting Engineer or qualified designate responsible for the administration of the Contract

ORO: Overall Responsible Operator for the Town/Water Supervisor or designate

Town Certified Water Operator: Town staff who possess a valid water Operator license issued by the Province of Ontario

Certified Water Operator: Third party Water Operator who possess a valid water Operator license issued by the Province of Ontario

Town Staff: Staff within Development Engineering, Planning and Development Services and Water Division who oversee Development applications including Town Project Manager and Construction Coordinator.

## 2. Watermain Commissioning Plan

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Prior to the initiation of the watermain commissioning procedures, the Contract Administrator shall submit a Watermain Commissioning Plan on behalf of the Contractor for review by the Town. The Watermain Commissioning Plan shall contain a complete description of all the steps the Contractor will undertake to ensure the watermain satisfies all the testing and sampling requirements. The Watermain Commissioning Plan shall be submitted a minimum of two (2) weeks in advance of the initiation of watermain commissioning. This plan shall also include the specific reporting protocols as described under the commissioning procedures in the following sections.

## 3. Source Water

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The water used to swab the main, conduct the hydrostatic testing, conduct the chlorine residual and bacteriological testing shall be normal to the existing water distribution system. In most cases, test water can be supplied by the adjacent existing distribution system; however if this source is not available, or the Contractor elects not to use it, then potable water from a prior Town approved location within the existing water distribution system may be brought to the watermain under consideration at the Contractor's expense.

When connecting to the adjacent distribution, the Contractor must provide an approved backflow device and have the device tested by a Quality Contractor from the Town's registry. A backflow prevention testers license shall be an OWWA Certified Cross Connection Control Specialist Certificate or Ministry approved equivalent. If a backflow preventer is relocated, the backflow preventer must be re-certified, and proof of certification shall be provided to the Town. The Town will supply the required flow meter. **If the Contractor elects to use potable water from a source other than from the Town's bulk water system, the Contractor will be required to produce verification that the source water was treated and tested in accordance with Ontario Regulation 170/03.**

Should the Contractor elect to undertake a bacteriological sample of source water from a municipal system, the sample must be taken from the new watermain side, downstream of the backflow preventor. If this sample is adverse, the Town will undertake a sample of the municipal system to verify the results.

## 4. Swabbing

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Prior to disinfection, all sections of watermain shall be wet swabbed using a minimum of (3) three new foam swabs. All watermains shall be swabbed along with any hydrant leads greater than 6.1m (or one pipe length). Swabs shall be added (3) three at a time using train approach.

Swabs shall be polyurethane with a density of 24.7 kg/m<sup>3</sup> and shall have a minimum diameter 50mm larger than the diameter of the watermain and have a minimum length of one- and one-half times its diameter.

The Contractor shall charge the watermain fully with potable water prior to the commencement of swabbing. Forty-eight hours' notice is required to schedule Staff.

Swabs shall be numbered in chronological order. Pre-loading swabs shall be at the sole discretion of the Town and loading shall be witnessed by Town Staff.

The Contractor shall discharge water to an approved outlet as per the Watermain Commissioning Plan ensuring all required erosion and sediment control and de-chlorination measures are followed.

The swabbing shall continue until the discharge water runs clear within fifteen seconds of the last swab exiting the discharge point.

After swabbing has been completed, the Contractor shall flush every fire hydrant lead, stub, and service. Flushing shall continue until water runs clear. If water clarity is not to the satisfaction of the Town, additional swabs may be requested at the sole discretion of the Town or Town Staff.

The Contractor shall mark, number and demonstrate to the Contract Administrator that all swabs, or parts thereof, have been retrieved. The Contractor shall be liable for costs associated with damage caused by and retrieving swabs that, for whatever reason, escape into the existing water distribution system. Town Staff shall witness when swabs are removed. Forty-eight hours' notice is required to schedule Staff.

## **5. Hydrostatic Pressure Test**

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**If using backflow connection to existing system, the connection must physically disconnected during pressure test.**

Hydrostatic pressuring testing shall be carried out in accordance with OPSS.MUNI. 441 (formerly OPSS 701). A minimum test pressure of 1050 kPa (150 psi) shall be applied to all points (including high points) in the watermain section being tested. At no time shall the test pressure exceed 1400 kPa (200 psi) at any location in the watermain.

The pressure shall be held for 2 hours and no greater than 8 hours, and the Contractor shall monitor the volume of water required to be added to the watermain to maintain the test pressure during the 2 hours to determine the measured leakage. The Contract Administrator shall calculate the allowable leakage, using the formula provided in OPSS.MUNI 441. If the measured leakage exceeds the allowable leakage, leaks shall be located and repaired, and the section shall be retested until satisfactory results are achieved.

## **6. Disinfection**

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The Contract Administrator or designate and Town Staff is required to be present during disinfection and testing activities. No disinfection or testing activities shall be conducted unless the Contract Administrator or Town Staff are present. Disinfection shall be carried out in

accordance with ANSI/AWWA C-651 and Table 1 of Section 1.1.2 of MECP Watermain Disinfection Procedure as outlined below. All chemicals shall conform to NSF/ANSI 60.

All watermain and hydrant leads shall be disinfected. All services shall be flushed and disinfected.

When using the continuous feed method, the chlorine injection concentration, and the chlorine concentration at any time and at any point in the piping shall not exceed 100 mg/l. The free chlorine residual shall be tested by a Certified Operator and witnessed by the Contract Administrator.

Refer to Table 1 for allowable decrease in chlorine residual:

Table 1: Chlorine Concentrations* and Contact Times for Disinfecting New Watermains			
Disinfection Method	Minimum Contact Time	Initial Chlorine Concentration	Maximum Allowable Decrease in Chlorine Concentration
Tablet or Continuous Feed	24 hours	≥ 25 mg/L	40% of the Initial Chlorine Concentration to a maximum of 50 mg/L**
Slug	3 hours	≥ 100 mg/L	25 mg/L
Spray	30 minutes	≥ 200 mg/L	Measurement Not Required

\* At concentrations over 10 mg/L, measurements of total chlorine and free chlorine shall be deemed equivalent.

\*\* **Exception:** Where copper pipe is used as a watermain, disinfection shall be performed using the continuous feed method, with an initial chlorine concentration of ≥ 50 mg/L and a minimum 24-hour contact time. Due to the chlorine demand exerted by the copper, the maximum allowable decrease requirement in Table 1 does not apply, and the effectiveness of the disinfection process shall be demonstrated by the *Microbiological Sampling* referred to in Section 1.1.3.

The following examples are provided to demonstrate the proper use of Table 1.

**Example 1**

When using the Continuous Feed Disinfection Method with an initial chlorine concentration of 50 mg/L, the maximum allowable decrease in chlorine concentration is 40% of 50 mg/L, or 20 mg/L. Therefore, at least 30 mg/L of chlorine must be present after 24 hours.

**Example 2**

When using the Continuous Feed Disinfection Method with an initial chlorine concentration of 150 mg/L, the maximum allowable decrease in chlorine concentration is 50 mg/L, because 40% of 150 mg/L is greater than the maximum allowable decrease of 50 mg/L. Therefore, at least 100 mg/L of chlorine must be present after 24 hours.

## 7. De-chlorination

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All water wasted during the construction and commissioning of the watermain shall be discharged into the stormwater system and shall be neutralized to provide a free chlorine residual of  $\leq 0.2$  mg/l. The Contract Administrator will monitor the discharge of waste water. Should tests show a residual greater than 0.2 mg/l, the discharge shall be ceased immediately, and the procedure modified to meet the 0.2 mg/l requirement. A chlorine discharge which may cause an adverse effect on the natural environment will be considered a potential spill. The Ministry of the Environment, Conservation and Parks (MECP) and Town shall be notified by the Contract Administrator.

Where detrimental effects may be suffered by plants and/or animals in the natural environment, the wasted water shall be neutralized to provide a total chlorine residual of less than 0.002 mg/l (2 ppb) (Provincial Water Quality Objective) at the outfall. The Contract Administrator will monitor the discharge of waste water. Should tests show a residual greater than 0.002 mg/l, the discharge shall be ceased immediately, the Director shall be notified, and the procedure modified to meet the less than 0.002 mg/l objective. Sites within 100m of natural drainage, or with direct discharge to a water body, should be considered high risk. In such instances, the Director may request a de-chlorination plan along with contingency and mitigation plans if the chlorine residuals exceed those specified.

As witnessed by Town Staff, the Contractor shall flush every part of the water system including fire hydrant leads, stubs for future watermains and services to remove all super-chlorinated water.

## 8. Chlorine Residual and Bacteriological Testing

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### 8.1 Procedure

As part of the Watermain Commissioning Plan, the Contractor shall submit the following:

- a sampling plan detailing the source water location
- final connection locations and the sampling locations via the Contract Administrator to Town Staff for approval. The Contractor shall allow two (2) weeks for review and approval.
- For any re-submission, an additional two (2) weeks for review and approval is required.
- Appropriate coding or labelling shall be provided on the plan to clearly correlate the sample results to the sampling locations.

The watermain test section shall not be disturbed or flushed during the period between the 1st and 2nd sampling rounds, except to obtain a water sample.

The watermain shall be continually pressurized from the start of bacteriological testing until the final connection to the existing system is undertaken. If a Development or watermain project is commissioned and is not connected to the Town system within 14 days, the commissioning shall be repeated.

Only after the tested watermain has passed all chlorine residual and bacteriological requirements and has received written approval to be put into service by ORO, shall the watermain be connected to the existing water distribution system.

Before the watermain can be approved for connection to the existing water distribution system, two (2) consecutive rounds of water samples, taken at least 16 hours apart, shall pass both the chlorine residual and bacteriological standards outlined in Section 5 of AWWA Standard C651-14 option A unless approved by ORO for Option B. Prior to chlorine residual and bacteriological testing, all other testing (i.e. hydrostatic, disinfection) shall be completed and any super-chlorinated water removed from all portions of the watermain system under consideration including fire hydrant leads, stubs, branches, services, etc. All tails shall be flushed.

## **8.2 Sample Locations**

Chlorine residual and bacteriological testing samples shall be taken:

- at the end of each branch or stub (excluding fire leads);
- at the end of each branch greater than one pipe length;
- at end of services 100 mm or larger and at the end of the line;
- a maximum of 150m from the source water connection and a maximum of every 350 meters thereafter along the watermain test section;
- as identified in the Special Provisions;
- as directed by the Contract Administrator;
- as directed by Town Staff

Sampling of fire hydrant leads is not required unless the Contractor has elected or is requested to utilize a fire hydrant location to satisfy any of the above sampling location criteria. Regardless of whether fire hydrants are used for a sampling location, all fire hydrant leads shall be thoroughly flushed to remove debris and any super-chlorinated water.

In the event that the maximum distance criteria can't be satisfied or if additional sampling points are required by the Town, the Contractor may be directed by Town Staff to install sampling taps on the watermain for the sole purpose of obtaining a water sample. During the completion of the final connection or after the watermain has been commissioned, the Contractor shall remove the sampling line and replace the main stop with a plug. Stainless steel plugs must be installed on saddles, brass plugs for ductile iron and observed to be drip tight after pressurization to working pressure.

All sampling ports shall be 25mm or smaller and brought a minimum of 1.0m above the surface and marked. The Contractor shall be available to operate underground valves for the new works only as necessary during sampling.

All chlorine and bacteriological samples shall be witnessed by Town Staff and performed by a Certified Water Operator.



### **8.3 Free Chlorine Residual Requirements**

All chlorine residual sampling shall be performed by a Certified Water Operator and taken at the same time as the collection of bacteriological samples.

The Town requires a third-party Certified Water Operator as defined in Ontario Regulation 128/04 to measure and report free chlorine residual and collect bacteriological samples.

During each sampling round, and at each sampling location, free chlorine residual shall be between 0.20 and 2.00 mg/L. If a concentration of 0.20 mg/L of free chlorine residual is not maintained prior to placing into service, the microbiological sampling shall be repeated. The Contractor shall endeavor to maintain an Acceptable Disinfectant Concentration until the new watermain is placed into service.

A single failed chlorine residual parameter will constitute a failure of that entire sampling round, both chlorine residual and bacteriological, and will necessitate the Contractor re-initiating Sampling Round 1 testing. The Contractor, in consultation with Town Staff, may elect to re-sample (chlorine and bacteriological) or take other corrective action to achieve two (2) consecutive rounds of acceptable chlorine residual and bacteriological results.

The source water chlorine residual readings, against which all sampled chlorine residual results are measured, are those chlorine residuals representative of the source water charged into the watermain for the intention of bacteriological testing. The source water chlorine readings are taken only at the beginning of the bacteriological testing protocol. If the watermain is flushed to re-initiate another bacteriological testing protocol, new source water free chlorine residuals readings shall be taken. The source water free chlorine residual readings shall be taken within four (4) hours of charging the watermain for bacteriological testing.

If a free chlorine residual at the source water location is less than 0.05 mg/L, Town Staff shall be notified immediately to take appropriate action.

### **8.4 Bacteriological Requirements**

At each sampling location, the water shall satisfy the bacteriological requirements as follows for both Sampling Round 1 and 2:

- E. coli
- Total Coliform
- HPC < 500 CFU/mL

Bacteriological samples shall be taken as outlined on the sampling plan.

A single failed bacteriological parameter will constitute a failure of that entire sampling round and will necessitate the Contractor re-initiating Sampling Round 1 testing. The Contractor may elect to re-sample (chlorine and bacteriological) or take other corrective action to achieve two (2) consecutive rounds of acceptable bacteriological results. Corrective action for a failed water sample during the 3rd round (after the final connection has been made) will be addressed by Town Staff, consultation with the Contract Administrator.

### **8.5 Laboratory Submissions**

Bacteriological samples for analysis shall be accompanied by fully completed chain of custodies and shall be submitted by the Contract Administrator to appropriate Town staff for shipment to the Town's accredited laboratory. The Town will supply sample bottles and chain of custody. Only samples submitted in bottles supplied by the Town will be accepted. The Town shall be notified a minimum of two (2) full working days prior to water sampling being initiated. The Town will notify the laboratory appropriately that samples should be expected.

The Contractor or Contractor Administrator will be responsible for fees related to all sampling including shipping.

Water samples for analysis will only be received Monday to Thursday 8:30am to 1:00pm. Special arrangements may be made for Friday submission from 8:30am to 1:00pm but only with the prior approval of the laboratory and Town Staff. The Contractor will be responsible for any additional laboratory fees.

### **8.6 Custody Control**

The Contract Administrator shall conduct or witness all chlorine residual and bacteriological sampling and all water samples shall stay under the control of the Contract Administrator until the samples are delivered to Town Staff.

The laboratory results will be sent to the ORO.

All sampling results shall be reviewed and approved by the ORO before the new watermain can be approved for connection to the existing water distribution system. The ORO will contact the Contract Administrator who in turn will relay the information to the Contractor.

### **8.7 Post Final Connection Bacteriological Testing**

Contractors are advised that the Contract Administrator, ORO and/or the Director may request a third round of water samples for bacteriological analysis after the final connection has been made to the existing water distribution system to confirm the continued quality of the water. In the event an adverse water samples occurs; the Director will direct the corrective actions to be taken. The Contractor shall cooperate and participate fully in the corrective actions at the Contractor's expense.

In the event the Contractor does not take appropriate measures to correct adverse water samples and/or at the discretion of the Director, the new system may be isolated from the municipal water system and the Contractor will be required to provide two (2) consecutive rounds of chlorine and bacteriological to the standards set out to commission the new water system initially.

Flushing may be required if final connection is not made within 7 days at the sole discretion of the Town.

If a Development/Watermain project is commissioned and not connected to the Town system within 14 days, the commissioning shall be repeated.

## **9. Final Connection to Existing Water System**

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### **9.1 Procedure**

After the pressure, leakage, chlorine residual and bacteriological tests have passed; the Contractor shall obtain written approval from the ORO to make the final watermain connection to the existing watermain distribution system.

If a temporary water system has been installed, the temporary system shall not be removed until after the ORO has accepted the final connection of the new watermain to the existing municipal system and has authorized the removal of the temporary water system.

The Town shall be contacted two (2) full working days prior to the final connection. The Contractor will be responsible for all costs for call outs of Town staff if the Contractor fails to notify the Town that the connection will not take place prior to two (2) hours of the intended start time.

The Contract Administrator and Town Certified Operator shall be present to witness the entire final connection process of the new watermain to the existing water distribution systems.

Watermains shall be cut back to remove all temporary taps. The Contractor shall disinfect the watermain and appurtenances as outlined below and shall, using all means possible, dewater the watermains and trench in a controlled manner to not allow backflow into the watermains.

The Contract Administrator and Town Certified Operator at their discretion may require the Contractor to flush water through a nearby fire hydrant to remove water with elevated chlorine residual.

If trench water, dirt or debris has entered or is suspected of entering the watermain during the final connection, the watermain shall be aggressively flushed and additional bacteriological samples shall be taken as directed by the Contract Administrator and Town Certified Operator. Town Staff reserves the right to request the above steps be taken regardless.

Town Staff requires the Contractor to submit written procedures for completing the final connection as part of the Watermain Commissioning Plan, including the method of dewatering to ensure the existing or new water system is not contaminated.

### **9.2 Connections to Existing System**

During the final connection, a Town Certified Water Operator must be present. After completion of the final connection, the watermain shall be re-pressurized by the existing system as soon as possible.

Town Staff or the Contract Administrator may request additional sampling after the final connection has been made as a precaution against or in response to possible contamination during the final connection.

In the event that the final connection point of the new watermain to the existing watermain distribution system is in a location that requires a connection length greater than one pipe length, the new piping, fittings and valves required for the connection shall be assembled aboveground, disinfected and tested in accordance with ANSI/AWWA C- 651. The connection

pipng shall satisfy the chlorine residual and bacteriological requirements outlined for new watermains.

The pre-assembled watermain connection shall be drip tight. Only after satisfactory chlorine residual and bacteriological results have been achieved, shall the pre-assembled connection be installed. The pre-assembled watermain shall be maintained under pressure from the start of chlorine residual and bacteriological testing protocol until just prior to the installation. All caps shall be kept in place during the installation procedure until immediately prior to making the connection.

The Contractor shall not hand disinfect one pipe length at a time to circumvent the requirements to preassemble connection piping over one pipe length aboveground.

Only Town Certified Operators shall operate valves on existing Town system and on new watermain once connected to the Town's distribution system.

### **9.3 Tracer Wire**

During the final connection of the new watermain to the existing distribution system, the Contractor shall insure that the new tracer wire is connected to the existing tracer wire.

## **10. Tracer Wire Conductivity Test**

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The Contractor shall demonstrate the integrity of the underground tracer wire by applying a conductivity signal and confirming the signal on all watermains and services. The Contract Administrator and Town staff shall witness the conductivity test(s).

The intent of this test is to confirm that the tracer wire has been installed on all non-metallic watermains and services as specified. Specifically, the test shall demonstrate the integrity and continuity of the tracer on all watermains and services.

A continuity signal shall be applied to the tracer wire and the signal confirmed over the entire length of all tracer wire installed. The signal shall be detectable for a distance of at least 300m from either side of the signal connection point. At no time shall there be a break in the continuity of the tracer wire.

Services require tracer wire from the main stop along the service line to the curb stop and brought to the surface.

For non-metallic watermains, the tracing wire shall not be brought to the surface inside of valve boxes. The tracer wire must be brought up the outside of the valve box and installed through a grommet near the surface.

The Contractor shall demonstrate that the tracer wire in chambers can be accessed from finished grade and that the signal is detectable on the watermain outside of the chamber.

Acceptable means of undertaking the conductivity test include using traditional locating techniques and/or determining if a low voltage electrical current travels from the connection point to test points.

## **11.Valve Positioning**

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The Contractor shall demonstrate that all valves, main line, and service, are in the final positioning as outlined in the Contract Documents or as directed by the Contract Administrator. Only a Town Certified Water Operator shall operate valves, hydrant etc. after connection is completed to the existing system.

## 12. Documentation to Be Provided

The following information shall be completed by the Contract Administrator / Site Inspector and provided to the Town as per the record-keeping requirements of Section 27 of Ontario Regulation 128/04.

	Requirement	Description	Yes	Initials
1	<b>Backflow Prevention:</b>	Air gap (as defined in CSA Standard B64.10 "Selection and Installation of Backflow Preventers) or Reduced Pressure Principle Backflow Preventer installed as per Section 4.8.9 of ANSI/AWWA Standard C651; and		
		Backflow preventer tested		
		Pre-disinfection swabbing and/or flushing have been completed		
2	<b>Disinfection Process:</b>	Method of disinfection		
		Disinfection chemical meets the requirements of both the AWWA and NSF/ANSI/CAN 60 Standards		
		Date and time disinfection started and ended		
		Chlorine concentration at start and end of contact time at each sampling point; and		
		Decrease in chlorine concentration in mg/L and/or percentage as applicable		
3	<b>Microbiological Sampling:</b>	Schematic or drawing showing approximate location where Microbiological samples were taken;		
		Microbiological and disinfectant residual sample results; and		
		For staged sampling: flow rate, time each sample was taken and calculated length		
4	<b>Connections</b>	Length of Connection		
		Confirmation whether sanitary construction practices were followed;		
		Confirmation that proper disinfection was performed;		
		Name of Certified Operator present for the installation of the Connection if required;		
		Results of Microbiological and disinfectant residual samples if required;		
		Disinfectant residual after watermain is flushed and put in service; and		
		Date and time placed into service		
5	<b>Appurtenances and Materials</b>	Confirmation Drinking Water System Components meet requirements of NSF/ANSI 61/372		

## 13. Testing Schedule for Watermain Construction

Appendix A provides a testing schedule for Watermain Construction. This form must be completed in full by the Contract Administrator / Site Inspector, including obtaining Town and Contractor initials, and submitted to the Town once steps A-F are complete. The Town will

review in conjunction with receiving bacteriological results from the lab before approving Final Connections.



## TESTING SCHEDULE FOR WATERMAIN CONSTRUCTION

Location: \_\_\_\_\_

Development / Project Name: \_\_\_\_\_

Contractor: \_\_\_\_\_

Inspector on-site: \_\_\_\_\_

Source Water (Truck or Location): \_\_\_\_\_

Step	Test Type	Date mm/dd/yy	Time Started	Time Completed	Result	Inspector Initials	Town Initials	Contractor Initials	Instructions / Comments
<b>LOADING, SWABBING, FLUSHING AND PRESSURE TESTING (ALL WORK TO BE DONE BY OWNER / CONTRACTOR WITH A TOWN REPRESENTATIVE PRESENT)</b>									
A	Loading of main								
B	Blow Swabs and Flush				# IN   # OUT				
C	Hydrostatic Testing				Make-up Volume Needed _____ Allowable _____ PASS / FAIL				Test to 1035 kpa (150 psi) at high point and hold for 8 hrs.
D	Disinfect - Initial Free Cl <sub>2</sub> (25 - 100 mg/L - max 36 hrs.)				Record details on back				Chlorine all stubs, services, hydrant leads
E	Check Cl <sub>2</sub> after at least 24 hrs. Flush to normal system residual including stubs, services, hydrant leads				Record details on back PASS / FAIL				Minimum Concentration Required as per TBM Protocol
F	Curb Stop Checks								Straight, cap, nut, consistent flow
<b>1ST SET OF BACTERIOLOGICAL SAMPLES. TO BE TAKEN FOLLOWING COMPLETION OF STEP F. SAMPLING WILL BE CONDUCTED BY THE CONTRACTOR'S LICENSED WATER OPERATOR. TOWN WILL PROVIDE BOTTLES/CHAIN OF CUSTODY AND COORDINATE DELIVERY TO THE LAB AT DEVELOPER'S EXPENSE.</b>									
G	Free Cl <sub>2</sub> Residual				Record details on back PASS / FAIL				
H	1st set of Bacteriological samples				Attach results PASS / FAIL				
<b>2ND SET OF BACTERIOLOGICAL SAMPLES MUST BE TAKEN AT MINIMUM 16 HOURS AFTER 1ST SET (SAMPLING AND DELIVERY SAME AS ABOVE)</b>									
I	Free Cl <sub>2</sub> Residual (0.20 - 4.00 mg/L)				Record details on back				
J	2nd set of Bacteriological samples				Attach results				

**Other Comments / Notes:**      Documentation to be provided as per Section 12 of TBM Watermain Commissioning Protocol

Authorization by Overall Responsible Operator to connect:  
(NO CONNECTIONS SHALL BE MADE UNTIL SIGNED AND DATED)

Print Name	Signature	Date



	Initial Chlorination Free Cl <sub>2</sub> (mg/L)		24 Hr. Check Free Cl <sub>2</sub> (mg/L)		1st Bacti Sample Free Cl <sub>2</sub> (mg/L)		2nd Bacti Sample Free Cl <sub>2</sub> (mg/L)		
Date:									
Location	Time	Result	Time	Result	Time	Result	Time	Result	Comments
Source									
Contractor's Initials:									
Licensed Operator's Initials:									