Trainers Manual

A01

CITY OF SASKATOON

Water and Sewer Section

Water Sampling Trainer's Manual

Version # 1-0-1

CITY OF SASKATOON

Water Sampling Trainer's Manual

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Preparation for Training

Resources for Training:

i. A list of the staff requiring training.
ii. Familiarization with training manual.
iii. A meeting room.
iv. Copies of an "Uncontrolled" procedure, trainee manual and Work Method Check List for each trainee. An uncontrolled document has the word "Uncontrolled" watermarked across the page and no control number.
v. The videos: *On the Job Sampling* and *Maintaining Water Quality In the Distribution System*
vi. Example copies of the following forms, for each trainee's manual:
   - Standard Distribution System Flushing and Sampling Form
   - Work Method Check List
vii. Presentation and presentation equipment.
viii. T.V. and V.C.R.
ix. Examples of all equipment and materials if desired.
x. Doughnuts and Coffee

Training Time Table

Session Number	Time	Activity	7:30am Start Time	8:00am Start Time
Session 1	15min	Introduction	7:30am	8:00am
Session 2	15min	Method and Techniques slide show	7:45am	8:15am
	15min	Video: On the Job: Sampling	8:00am	8:30am
	15min	Method and Techniques slide show	8:15am	8:45am
	15min	Break	8:30am	9:00am
Session 3	15min	Method and Techniques slide show	8:45am	9:15am
	30min	Video: Maintaining Water Quality In the Distribution System	9:15am	9:45am
	30min	Method and Techniques slide show / Questions	10:00am	10:30am
	15min	Break	10:30am	11:00am
Session 4	45min	Review Procedure and Forms	10:45am	11:15am
		End of Day	11:30am	12:00pm

Session 1

Session 1 is the introduction. Start by introducing yourself, your name your position how long you have been with the City of Saskatoon and anything else you deem applicable. After your introduction, discuss what the staff will be trained on an example is given below.

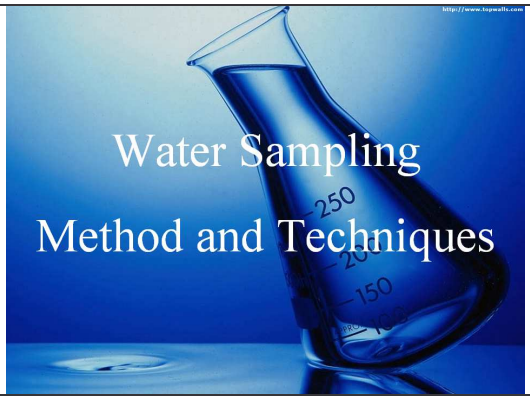
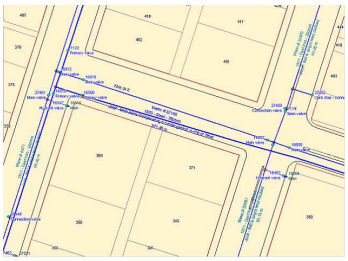
Introduction

The objective of this course is to train staff on how to take water samples in a timely and efficient manner while minimizing disruption in service to the customer and insuring current standards are met.

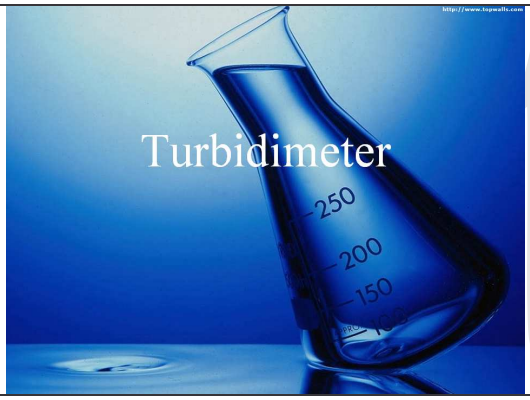
Session 2

Session 2 begins the slide presentation on the methods and techniques section of water sampling. The Trainee Manual will be handed out at the beginning of this session. The overhead transparencies or power point presentation will be used. Show the slide and read any notes in the trainer's copy of the presentation. Feel free to discuss the slide further.

Methods and Techniques

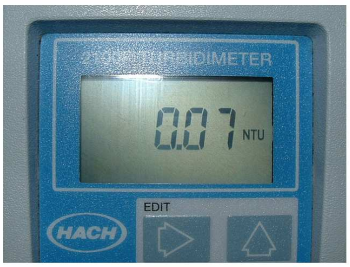
Slide 1		
Slide 2	Opening Valves • Flushing a water line requires valve opening. 	Flushing a water line through a hydrant will require opening or closing valves in the system.
Slide 3	Map • Maps of valves are used to plan the most effective shut down procedures 	Determine the most effective procedure and direction for flushing the water line. A map of the distribution system can be used to determine which valve(s) must be operated and which hydrant will be used for flushing.
Slide 4	Gate Valve • Install gate valve 	Install a gate valve onto the hydrant nozzle.

Slide 5	Disinfect • Disinfect the gate valve, hose coupling, and port. 	Disinfect gate valve, hydrant hose coupling and hydrant nozzle using the procedure in A02 Tool Disinfection SOP.
Slide 6	Diffuser • Install hydrant hose or diffuser. 	Install hydrant hose or diffuser onto gate valve, making sure the gate valve is open. Put the lead hose into storm manhole, sanitary manhole or catch basin. Ensure that if the sanitary sewer is used, manhole levels are monitored to prevent surcharging.
Slide 8	Flushing • Flush for 5 min 	Let the hydrant flush for 15 minutes or until water runs clear. Turn down the gate valve to a trickle and take the required chlorine, turbidity and bacteria samples.
Slide 9	Flushing • Flushing can also be through a tap. 	A watermain be flushed through a private tap if a hydrant is unavailable or the private connection has been contaminated.

Slide 10	Aerator • Remove Aerator • Disinfect Spout 	If water samples are taken at a private tap, remove the aerator and disinfect spout as per A02 Tool Disinfection SOP.
Slide 11	Flush • Flush for 5 min or longer 	Flush through the tap for approximately 15 minutes or as required. Due to the smaller volume through a tap it may require longer flushing times. Perform water quality tests as with hydrant flushing.
Slide 12		
Slide 13	Turbidimeter • Press the I/O button the turn the turbidimeter on. 	With a Hach 2100P Turbidimeter, press the "i/o" button to turn the instrument on. Do not test in direct sunlight and ensure the turbidimeter is on a level surface.

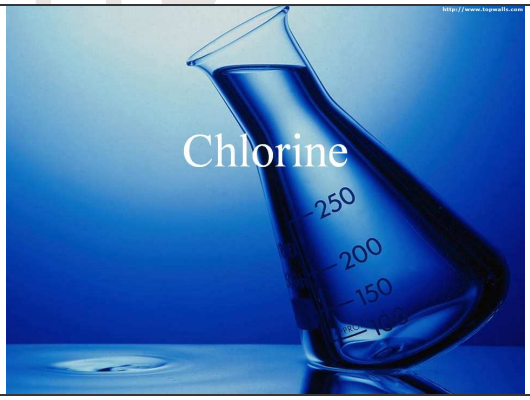
Slide 14	Standards • Gelex samples are used to check the turbidimeter calibration 	Insert the lowest value Gelex Secondary Standard into the cell compartment with the diamond oriented to the raised reference mark in front of the cell compartment.
Slide 15	Close Lid • Close the lid on the turbidimeter 	Gently close the lid so that no outside light enters the compartment.
Slide 16	Key Pad • Press the read button. 	Press the "read" button.
Slide 17	Reading • While taking a reading a light bulb will appear on the screen. 	The only items that should appear on the screen are a small light bulb icon in the bottom left corner and "- - - - ntu" in the centre of the screen.

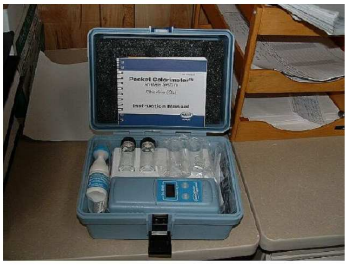
Slide 18	Value • Gelex values should be as shown 	When the reading is complete, a numeric value will replace the dashes on the screen. Repeat this with the other two Gelex samples. Compare these readings with the values given. If they are significantly different, the turbidimeter should be taken for service. Record the test values on the sample form.
Slide 19	Fill Sample • Fill a 15 mL sample cell. • Wipe outside 	After the Gelex standards have been confirmed, fill an empty 15 mL sample cell. Tightly cap the cell. Wipe the outside of the cell with the soft, lint free cloth to remove fingerprints and water spots.
Slide 20	Roll • Roll sample to remove bubbles 	Gently roll the sample bottle to remove any air bubbles.
Slide 21	Oil • Oil the outside of the sample cell. 	Apply a couple drops of the silicone oil to the outside of the sample cell. Wipe with a cloth to spread the oil over the entire exterior surface of the cell. This will help to fill in small scratches and minor imperfections in the sample cells to allow a more accurate reading.

Slide 22	Arrow • Align the cell arrow 	Place the cell into the compartment in the same manner you did for the Gelex cells. If the power has shut off, press the "i/o" button to turn the unit on again.
Slide 23	Limits • Turbidity must be below 1.0 NTU 	The turbidity in a potable water sample must be below 1.0 NTU. Record the value and turn the unit off.
Slide 24	Over Limit • If Turbidity is over 1 NTU, continue flushing 	If the turbidity value is over 1.0 NTU continue flushing and retest.

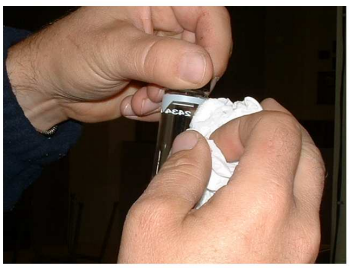
Stop and Show Video:

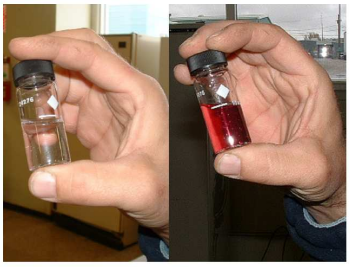
On The Job: Sampling

Slide 25	

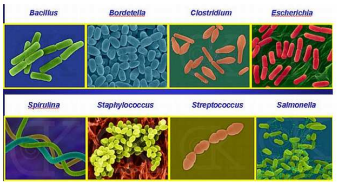
Slide 26	Colorimeter • The colorimeter is used to test for chlorine. 	To test for chlorine, a pocket colorimeter will be used. The chlorine meters will test for free chlorine or total chlorine depending on the reagent used.
Slide 27	Fill • Fill sample bottles 	Using a Hach Pocket Colorimeter kit, fill two 10-mL bottles to the line below the white diamond with the sample water.
Slide 28	Diluting • Dilute the sample if high chlorine levels are present. 	If the chlorine test is being preformed following chlorination of the water main, it will need to be diluted.
Slide 29	Deionized Water • 175 mL Deionized water. 	To dilute, take a 10mL sample and mix with 175mL distilled water. Cap and gently invert to mix. Fill two chlorine sample bottles with the diluted solution.

Slide 30	DPD • Chlorine Reagent DPD 	Add the contents of one Chlorine reagent pillow pack (or one squeeze of the pop dispenser) to one of the bottles.
Slide 31	DPD Free or Total • Chlorine Reagent DPD can be for total or free chlorine 	The DPD reagent (is used for either) Free Chlorine or Total Chlorine. Make a note on the Standard Distribution System Flushing and Sampling Form which reagent is used.
Slide 32	Dispenser • Reagent Dispenser 	A reagent dispenser can be used instead of the pillow pack.
Slide 33	Roll Sample • Roll gently to dissolve DPD 	Cap the bottle and gently roll it for 20 seconds to dissolve the DPD and release any trapped gasses.

Slide 34	DPD Reaction • Sample will change colour. 	For total chlorine wait 3 to 6 minutes after addition of the reagent until reading the sample in the colorimeter. For free chlorine the sample can be read within one minute of adding the reagent.
Slide 35	DPD Reaction • High Chlorine colour 	If chlorine levels are high the reagent will turn a brown colour.
Slide 36	DPD Reaction • Highest Chlorine level 	If the sample temporarily turns yellow after reagent addition and then turns clear, the chlorine levels may be very high and the sample my require dilution.
Slide 37	Wipe • Wipe bottle outside 	Cap the second sample bottle. Gently wipe both sample bottles with a lint free cloth to remove any fingerprints and water drops on the outside of the bottle.

Slide 38	Samples • Blank sample has no DHD reagent 	The sample bottle without reagent is the blank sample.
Slide 39	Blank Sample • Zero the blank sample first 	Insert the blank sample into the cell holder with the white diamond facing keypad. Replace the cover to avoid letting light into the sample.
Slide 40	Zero • With the blank sample inside press the "zero" and hold. 	Press and hold the "zero". Once the reading on the blank is complete, "0.00" will appear on the screen.
Slide 41	Test Sample • Insert test sample 	Remove the blank sample and insert the test sample with the white diamond facing the keypad. Replace the cover.

Slide 42	Read • Press the read button 	Press "read". The value on the screen is the amount of total chlorine in mg/L. If the screen flashes a "2.22", this means that the chlorine in the sample is over range (greater than 2.22 mg/L). A fresh sample will have to be taken and diluted accordingly.
Slide 43	Limits Total Chlorine • Lower 0.7 mg/L • Upper 1.7 mg/L 	Total Chlorine limits for potable water are 0.5 to 3 mg/L. These are the upper and lower maximums, but it is preferred to have readings in the range of 0.7 mg/L to 1.7 mg/L for total chlorine.
Slide 44	Limits Free Chlorine • Lower 0.1 mg/L 	For Free Chlorine the lower limit is 0.1mg/L. US EPA lists the maximum residual disinfectant level for free chlorine at 4 mg/L. There is no current provincial or federal high-end limits for free chlorine. Saskatoon district health has stated in the past that due to the offensive odour and taste of free chlorine, it would be unlikely that anyone would actually drink water with very high levels present. Also, your body would reject the water.
Slide 45	Diluted Sample • Reading X 22.6 	For a diluted sample the actual chlorine level will be the chlorine meter reading multiplied by 22.6. If the chlorine level is still too high dilute again.

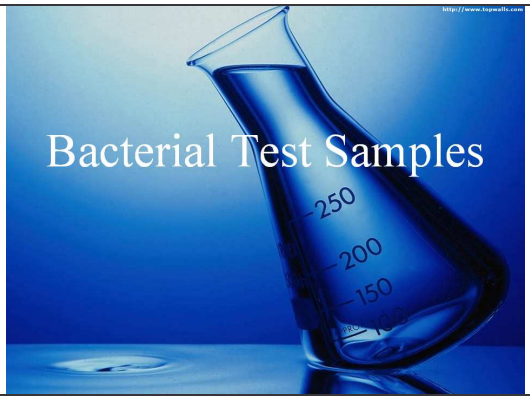
Slide 46	**Case** • Rinse bottles before returning to case 	Empty and rinse both sample bottles and return to the box.
Slide 47	**Flush** • If test fails re-flush 	Should these tests fail, resume flushing and retest. If the tests still do not pass continue flushing and notify the Supervisor IV, hydrants and water quality.
Slide 48	**Form** • Standard Distribution and Flushing Form 	Record result on the sample form and fill out all necessary data.
Slide 49	**Bacteria** • Bacteria samples must also be taken. 	Once the allowable levels of turbidity and chlorine are obtained, take the required number of bacteria test samples.

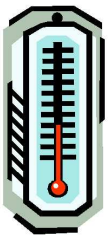
Session 3

Session 3 completes the review of the methods and techniques section of the slide presentation. You should be able to finish reviewing the slides during this session. Try to leave a little time at the end for a question period.

Stop and Show Video:

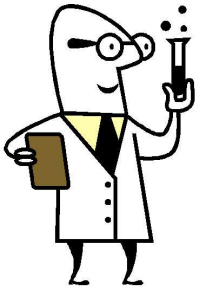
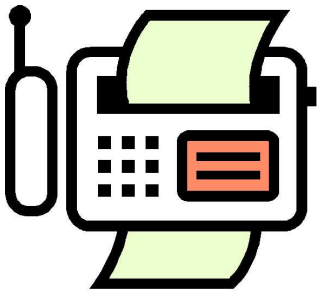
Maintaining Water Quality In the Distribution System

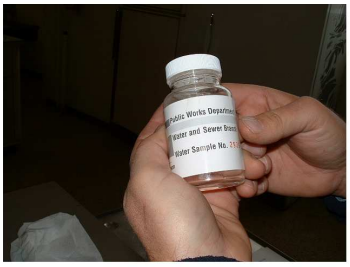
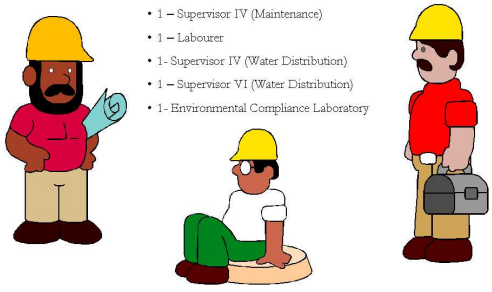
Slide 50		
Slide 51	Sample Bottle • 120 mL sample sealed bottle • Chlorine neutralizer 	Samples are to be taken for bacterial testing. Use sealed 120 mL plastic bottles with sodium thiosulfate (an agent used to neutralize the chlorine in the water). The bacteria sample bottles cannot be reused as the sodium thiosulfate powder gets washed out.
Slide 52	Seal • Only used sealed bottles 	Peel the plastic seal off from around the lid of the bottle. Do not open the bottle until immediately before use. Do not use sample bottles that are not sealed. Do not set the sample bottle lid down while taking the sample.
Slide 53	Fill • Fill bottle directly from source. 	Turn the water stream down to allow filling the sample bottle without having any splashing occur. Let run for 30 sec. then place the bottle under the full stream of water. No water from the stream should be running down the sides of the bottle.

Slide 55	**Label** • All samples must be labeled 	Dry off the outside of the bottle and attach the sample id sticker. Record the sample ID # on the sampling form.
Slide 56	**Contamination** • Ensure the samples are not contaminated. 	Extreme care must be taken to ensure the sample is not contaminated by hand or air borne particles. If in doubt discard the sample and bottle.
Slide 57	**Forms** • For each sample a standard distribution system flushing and sampling form must be completed. 	For each water-sample taken for bacteriological testing, a Standard Distribution System Flushing and Sampling Form must be filled out and accompany the sample to the Water Treatment Plant. See the back of the form for instructions on how to fill it out.
Slide 58	**Keep Cool** • Keep samples cool and in a dark place. 	Place samples into a cooler immediately after drawing, keeping the sample out of the light. They must be delivered with a completed sample form to the water treatment plant lab within 6 hours of collection.

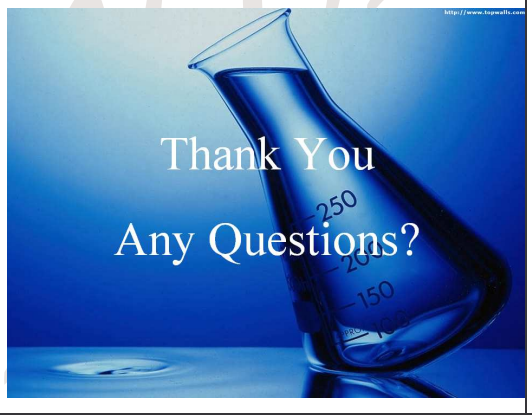
Slide 59		
Slide 60	Isolated • Keep watermain isolated until test results are known. 	If the repair requires bacteriological testing it will be left isolated from the rest of the water system until bacteriological results have been received.
Slide 61	Close hydrant • Close hydrant and check for drainage. 	Close hydrant and check for proper drainage. Port on hydrant should create a vacuum when hand is placed over.
Slide 62	Throttle Valve • Remove throttle valve and hose 	Remove valves and hose from hydrant. Replace hydrant cap leave cap loose to let air draw into hydrant to allow for proper draining.

Slide 63	Drain • Drain hose • Replace manhole lid 	Drain hydrant hose and replace manhole lid if applicable.
Slide 64	Store Equipment • Store equipment as required. 	Store valves, hydrant hose, turbidity meter and chlorine meter in their respective locations.
Slide 65	Delivering Samples • Deliver samples to the water treatment plant. 	During regular work hours for the water treatment plant lab, the bacteria sample bottles and the form should be placed in the fridge designated "Public Works". Enter the plant from the doors on Avenue H. You must be "buzzed in", press the red button to the right and wait for a response from the control room
Slide 66	Sample placement • Place samples in the fridge provided. 	Once through the double doors, turn left. The small fridge is next to the control room.

Slide 67	After Hours • Place sample in fridge • Notify control room personal and submit form. 	Put the sample bottles in the fridge. Then take the sample form to the person working in the Control Room at the time, indicate to them that it is for a Public Works sample that was just placed in the fridge.
Slide 68	Lab Personal • Lab personal will be call by the control room personal. 	The control room personnel must be notified that a sample has just been left so that they can contact lab personnel to set up the tests in the appropriate time.
Slide 69	Test Results • Test results are faxed to the Water Distribution Supervisor IV. 	The water distribution Supervisor IV or VI will receive the results from the bacteriological testing via. FAX.
Slide 70	Open Valve • Opening valves after bacteriological test pass. 	The water distribution Supervisor IV or VI will arrange for the opening of the remaining closed valves when the bacteriological tests pass.

Slide 71	Re-testing • If test fails re-flush and re-test. 	If the bacteriological test fails the Supervisor IV or VI will arrange for re-flushing and re-sampling of the affected area, and repeat the process until all tests pass.
Slide 72		
Slide 73	People • 1 – Supervisor IV (Maintenance) • 1 – Labourer • 1- Supervisor IV (Water Distribution) • 1 – Supervisor VI (Water Distribution) • 1- Environmental Compliance Laboratory 	The employee's involved in this task are: Supervisor IV (Maintenance), Labourer, Supervisor IV (Water Distribution), Supervisor VI (Water Distribution), and the Environmental Compliance Laboratory.
Slide 74		

Slide 75	Chlorine Meter 	The chlorine meter is used to test the levels of chlorine in water.
Slide 76	Turbidity Meter 	The turbidity meter is used to test the turbidity of water.
Slide 77	Hydrant Hose 	The hydrant hose is used to direct the hydrant flow.
Slide 78	Throttle Valve 	The throttle valve is used to vary the amount of flow.

Slide 79	Hydrant Key 	The hydrant key is used to open and close the hydrant.
Slide 80	Valve Key 	The valve key is used to open and close the valves.
Slide 81	Water Sample Bottle 	The water sample bottle is used to take bacterial samples.
Slide 82		

Session 4

Session 6 will review the procedure and all the required forms. Start by handing out all the forms, then review each. A general overview of the procedure is given below.

Procedure Introduction

The procedure is a document that focuses: the roles and responsibilities of the required persons, for a specific task and the critical steps of the task.

Procedures are used primarily during training for a task, and then mainly as a reference document. Procedures should be auditable by either inspection during the process or by review of an audit trail upon completion of the process. Procedures are not intended for use while the task is being preformed.

Standard Distribution System Flushing and Sampling Form

This is for tasks that require water quality testing. This form is taken with the water sample to the water treatment plant for testing. A form is completed for every bacterial sample.

Work Method checklist

This form is taken to the job site and the critical steps are checked off as they are completed. The purpose of this form is to ensure none of the important steps are forgotten and to understand how each crew performs each task.