CRTP

North Shore Micmac District Council Inc.

Circuit Rider Training Program

WATER AUDITS - *ARE FOREVER!*

Presented by

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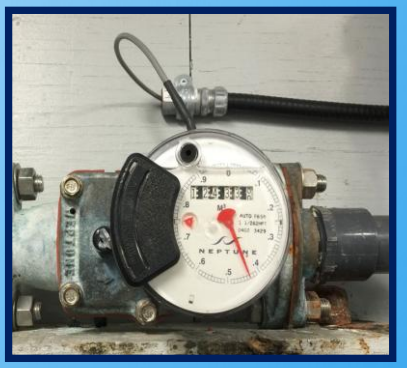
WATER AUDITS - *ARE FOREVER!*

- **FACT** - *WATER SYSTEM OWNERS AND OPERATORS WILL ALWAYS BE AND FOREVER RESPONSIBLE FOR THE DELIVERY OF SAFE DRINKING WATER OF SUFFICIENT VOLUME AND PRESSURE TO CONSUMERS!*
- **FACT** - *SECURE, RELIABLE AND SAFE DRINKING WATER SOURCES CANNOT BE TAKEN FOR GRANTED. ALL COMMUNITY WATER SUPPLIES WILL FOREVER REQUIRE SOME FORM OF TREATMENT AND MAINTENANCE OF WATER QUALITY BEFORE IT IS RECEIVED BY THE CONSUMER!*
- **FACT** – *TO PRODUCE SAFE CLEAN WATER THERE ARE COSTS THUS EVERY DROP THAT IS PUMPED, TREATED AND ENTERS THE DISTRIBUTION SYSTEM BEFORE FLOWING FROM THE TAP, MUST BE ACCOUNTED FOR TO ENSURE LITTLE IS LOST OR WASTED. WATER CONSERVATION MUST BE PRACTICED TO SAVE MONEY AND INCREASE UTILITY EFFICIENCY!*

WATER AUDITS - *ARE FOREVER!*

- This morning we will talk about **DAILY WATER AUDIT fundamentals that should be** performed by the water systems operator after completing the daily system checks. But before we do let's begin by discussing flow measurement and related terms which must be understood when performing a **water audit.**



FLOW MEASURENT

- A flow meter of some type is essential for proper operation of even in the smallest water system. The meter should be of a type that indicates both the instantaneous **rate of flow** and as well as the **production** (total quantity) of water that has flowed through it. The meter must be accurate enough to allow the operator to feed the proper chemical dose. To maintain accuracy a fine screen or WYE STRAINER should be installed upstream from the meter to keep it from becoming clogged or damaged by sand and grit which can impact accuracy.

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FLOW MEASUREMENT – WHAT CAN IT TELL US?

- Pump capacities and efficiencies – pump wear, when to service or replace,
- Pumping rates (**rate of flow**) and total water produced daily (**production**),
- **Water losses** can be determined due to leaks and unauthorized water use; done by comparing past production to current production,
- Capacities of pipelines can be determined for fire fighting needs,
- Can be used to reduce and conserve water thus prevent excess water consumption,
- Cost efficiency of a water utility can be determined and demonstrated,
- Blending water use of different quality so the mix in reservoir is of constant quality (*important in Pabineau and Natuashish),*
- Provides system control information (average & peak demands) to operator, and
- Allows operators to **assess disinfection performance** for correct dosing.

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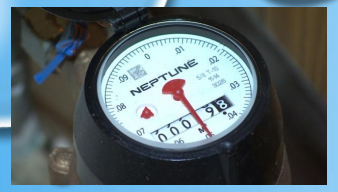
<u>FLOW MEASUREMENT</u> – WHERE DO WE MEASURE?

- Meters can be located at all strategic points in a water system such as:
  - At raw (untreated) water from wells or surface water sources,
  - At treatment plants and boosters stations,
  - At reservoir or storage outlets,
  - At connections to other utility systems or zones (Eel River Bar) within a system, and
  - On each customers service line.

See diagram on next page for further details!



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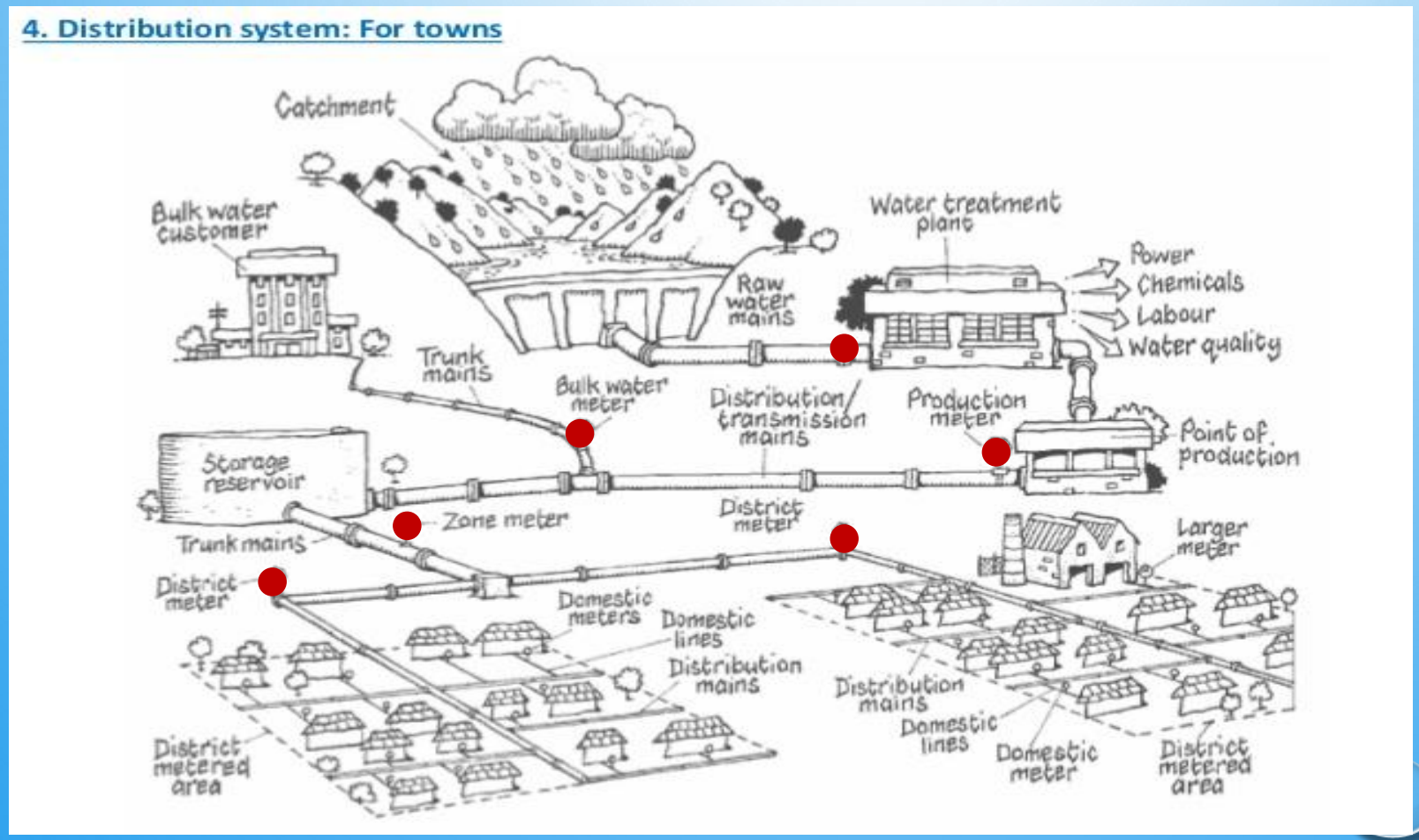
FLOW MEASUREMENT – WHERE DO WE MEASURE?



Meters are located at strategy points in a water system as seen on left. Each red dot is a water meter!

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FLOW MEASUREMENT – WHEN DO WE RECORD WATER FLOW?

- Each day during the daily checks of your facilities flow information displayed on water meters should be recorded. This is the first step to performing a **Water Audit** on your system. See ***5.4.2 Record Keeping in Protocol for Centralized Drinking Water Systems in First Nation Communities***
- **Water Audits** require at a minimum that all water meters are read and recorded the **same time of day each day** in your pumping and treatment facilities. The information found on the meter should be recorded on the daily log and must include "**Rate of Flow**", "**Production**" and "**Time**" the information was read.

Let us visit with an operator as he does his daily inspections.

Play TAKU RIVER video!

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FLOW MEASUREMENT – HOW DO WE READ A WATER METER?

- Meters may look different in their appearance but they all perform the same function, which is to measure water as a **rate of flow** and **production**.
- Water meters can be Mechanical or Electronic in their basic operation with **Analog** or **Digital** displays to be read by the Operator.
- Operators must understand how to read the information found on the meter and record it correctly in order to perform the daily **Water Audit**. The data must be interpreted and entered correctly as seen on the display, having the correct units of measurement indicated with multiplier when entered into the daily log. This information is typically found in the meter display.
  Example: Imp. gals, US gals or Cubic meters, M^3, L/s, L/m, X10, X100 and etc..

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- **WATER AUDIT**

HOW DO WE READ AN ANALOG WATER METER FOR "RATE OF FLOW"?

- **STEP 1 -** Note the large red sweeping hand on meter to the right that rotates like the second hand on a clock. It points to the number scale on the face of the meter. When this red sweep hand makes one complete revolution on the meter; one tenth of a cubic meter of water has past through it. If we time the red sweep hand and it completes one revolution in one minute then we record on the daily log, 1/10 of a cubic meter per minute, 1/10 m^3/min or 100L/min under the heading "**Rate of Flow**".

REPEAT EVERY DAY!

What if the meter was scaled so that one revolution of the red sweep hand was equal to one cubic meter. And, if it went through one and one half revolutions in one minute, what would you record on the daily log for rate of flow? (Answer 1.5 m^3/minute)

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- <u>WATER AUDIT</u>

HOW DO WE READ AN ANALOG WATER METER FOR "PRODUCTION"?

- **STEP 2 -** Now let's look at the totalizer on the same water meter. It counts like a trip meter or odometer found in a car measuring distance but in this instance the **totalizer** measures total volume of water or **production** that has past through the meter since it was read last. Each day the water meter is read precisely the same time of day. The reading is recorded in the "**Totalizer**" column of the daily log and then compared against yesterday's reading. This is done by subtracting previous day's recorded reading from today's recorded reading then the result is placed in the column "<u>**Production/24**</u>" of the daily log.

REPEAT EVERY DAY!

The small triangular pointer shown on meter above, it's movement indicates the meter is functioning. Larger sweep hand will show very little movement under low flow conditions thus the red triangle verifies the meter is operating.

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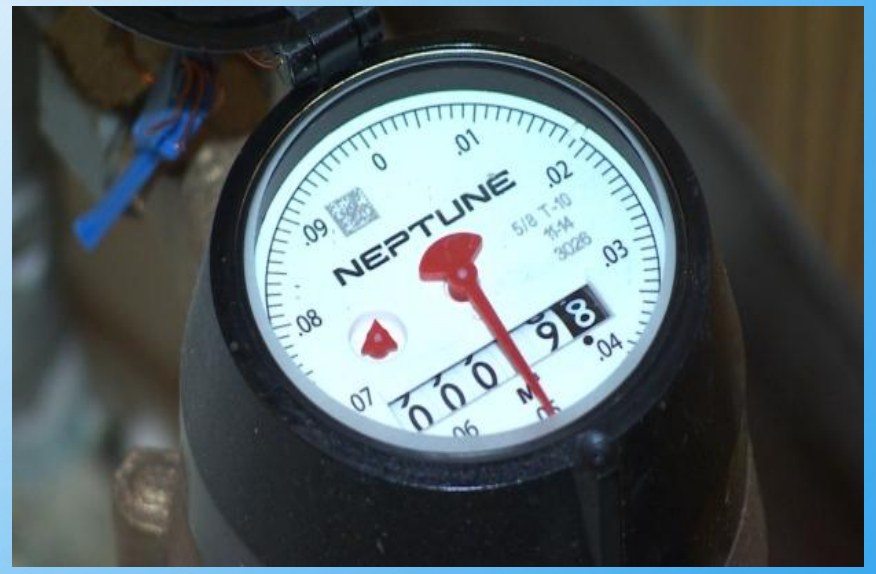
- <u>WATER AUDIT</u>

ANALOG WATER METER "RATE OF FLOW" AND "PRODUCTION"?

EXAMPLE - 1a (Rate of Flow?)

The operator arrives daily 8:30am at the pump house to perform daily checks and read the water meter. Every day she determines <u>Rate of Flow</u> and <u>Production/24</u> from the source water meter. She first reads the **rate of flow** by timing the red sweep hand which completes just ¼ of a revolution in one minute. If one revolution is equal to 1 cubic meter of water, what will she record for a rate of flow on the daily log?



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- **WATER AUDIT**

ANALOG WATER METER "RATE OF FLOW" AND "PRODUCTION"?

- ***EXAMPLE - 1a (Rate of Flow?) Solution***
- The operator read the flow rate and noted that the red sweep hand had completed just ¼ of a revolution in one minute.

Known: one revolution is equal to 1 cubic meter ($1\ m^3 = 1000\ L$)

- ***Therefore:*** ¼ of a revolution per minute is equal to 1/4 cubic meter/minute or 250 L/minute.
- The operator records a normal expected **rate of flow** of **250L/min**. If the rate of flow was 500L/min would that be acceptable?

$$1/4 \times 1000\ L = \frac{1000\ L}{4} = 250\ L \text{ per minute}$$

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- **WATER AUDIT**

ANALOG WATER METER "RATE OF FLOW" AND "PRODUCTION"?

➢ ***EXAMPLE - 1b (Production/24?)***

The same operator must now determine the **water production** over the past 24 hours. She records the reading displayed in the totalizer on the meter at 8:30am. Then she subtracts the previous day's meter reading from the value recorded today? Today the meter read 239.8 m^3 and yesterday's recorded reading was 119.8 m^3; determine the total water production over the past 24 hours from the pump house?

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- **WATER AUDIT**

ANALOG WATER METER "RATE OF FLOW" AND "PRODUCTION"?

- ***EXAMPLE - 1b (Production/24?) Solution***
- The operator records the values displayed in the meter totalizer to determine total production over the past 24 hours.

Known: Today's recorded reading is 239.8 m^3

Yesterday's recorded reading was 119.8 m^3

- ***Therefore:*** Total Production over the past 24 hours is:

239.8 m^3 - 119.8 m^3 = 120 m^3 Answer

- ***Operators*** records a normal production of 120 m^3/day on the daily log! If a production of 192 m^3 were observed what should the operator do?

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- <u>WATER AUDIT</u>

HOW DO WE READ A DIGITAL WATER METER "RATE OF FLOW" AND "PRODUCTION"?

Rate of Flow - The operator can read and record the rate of flow directly off a digital water meter with indicate units. It may require a push of a button to display the information. Most electronic meters can be programmed and configured to display information to the preference of the operator.

Production - The operator can read and record the production values directly off a digital water meter with indicated units. The information read on digital water meter must be recorded in the same manner as describe above under the correct columns of the daily log to be interpret later.

This meter shows a flow rate of 0.24 m^3 per hour and total production of 127 m^3.

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- <u>WATER AUDIT DATA</u> – EVALUATE AND ANALYZE!

The operator is expected to record water meter readings with their daily checks. Then he or she evaluates and analyzed the information gathered. They must determine if **rate of flow** and **total production** values are within expected norms for their community as part of the **water audit**!

We have learned that in order to perform the **daily water audit** we must first have the:

1. **Time** the daily reading was done,
2. **Daily readings** from all water meters (raw, treated and storage outlet if available),
3. **Rate of flow** from all meters,
4. **Totalizer readings** from all meters,
5. **Calculate total production/24hr** based on totalizer readings, then
6. **Analyze the data!**

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- **<u>WATER AUDIT DATA</u> – EVALUATE AND ANALYZE!**

The daily information is analyzed by the operator; comparing it against past data collected yesterday and yesterdays' data compared against the day before and that data compared against the previous day and etc.…as needed in order for the operator to better understanding the water system and pattern of water use in their community.

Daily log

Every community water system has different water requirements thus rates of flow and total production values will different from one community to another. What are **normal** rates of flow and production for your system? It is found in the daily logs along with past recorded data since your water system came into existence. The water record or logs are the history of your system operations and demonstrates what is **normal or abnormal** water use for your system.

DAILY LOGS AND WATER AUDITS ARE FOREVER!

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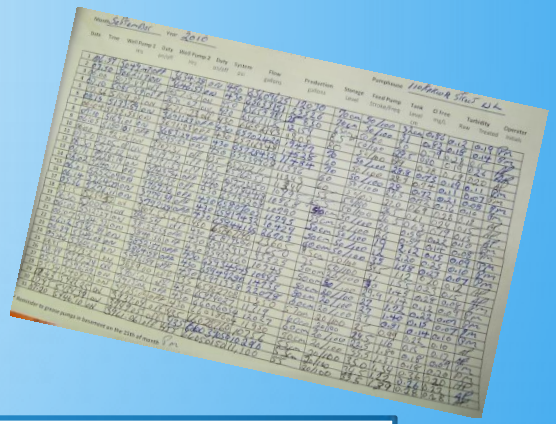
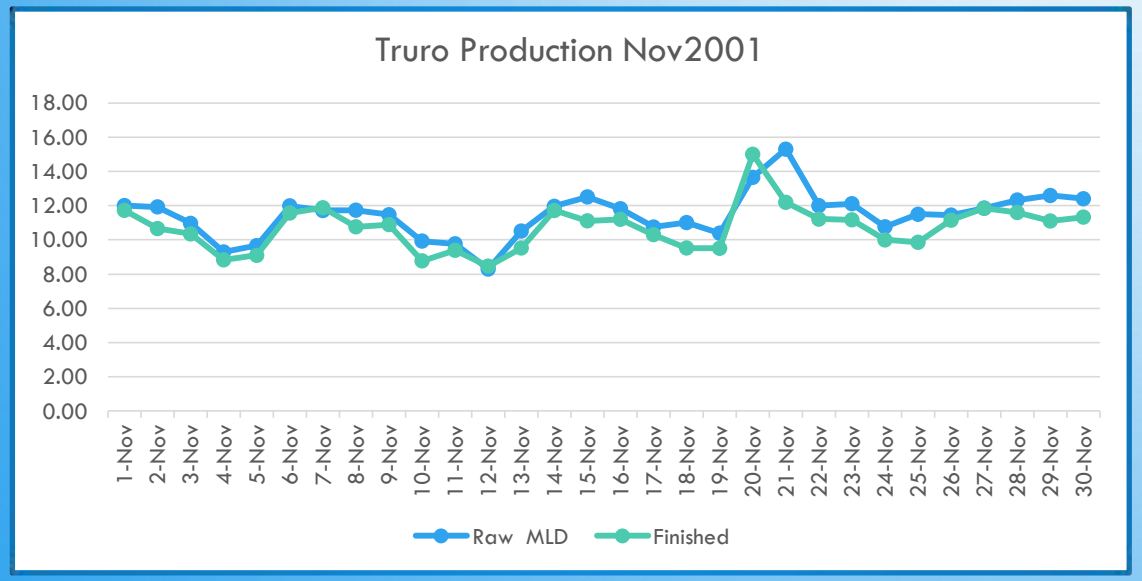
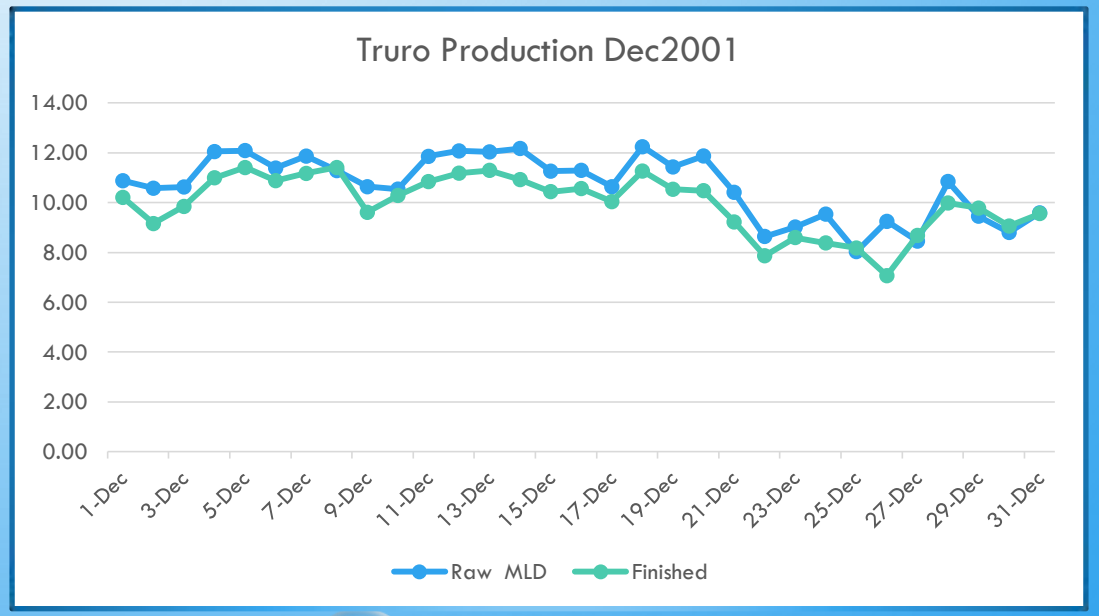


Daily log

- **WATER AUDIT DATA – LET'S EVALUATE AND ANALYZE!**



Analyze and pick out the pattern change (leak)?



When did "Christmas Holidays" start according to the meter? Christmas Day fell on Tuesday.

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SUMMARY

- **Managers** and **Operators** their roles are critically important in the production of safe drinking water. They are hired to ensure daily inspections are performed, data collection is done, data is recorded and information is evaluated and analyzed to ensure consistent drinking water quality, good system performance and operations are cost effective. **If**, after the data is analyzed; it is found that normal operation parameters are not within expected ranges then an investigation should begin immediately and work orders issued to address the problem. It starts with the **Operator** and the **Water Audit.**
- The **Circuit Rider Trainer** can assist you to improve or develop your **water audit program** through daily inspections, record keeping and data analysis!
- See **PROTOCOL FOR CENTRALIZED DRINKING WATER SYSTEMS IN FIRST NATIONS COMMUNITIES** for water system managers and operators Section 5.4 Document Management and Record Keeping on page 20. Also, see Section 5.5 Compliance Assurance on page 21.

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SUMMARY

- ALSO, as part of the multiple barrier approach Community Based Water Quality Monitors (CBWQM) play an important role in monitoring water quality as a **team member** with Operators. The CBWQM provides additional checks by collecting samples and documenting key data for critical analysis in assessing the safety of a drinking water supply. The information collected by CBWQM should be shared with system Managers and Operators in a timely fashion and visa versa.
- See **CHAPTER 1: ROLE OF A COMMUNITY-BASED DRINKING WATER QUALITY MONITOR** in your CBWM training manuals Section 1.1.

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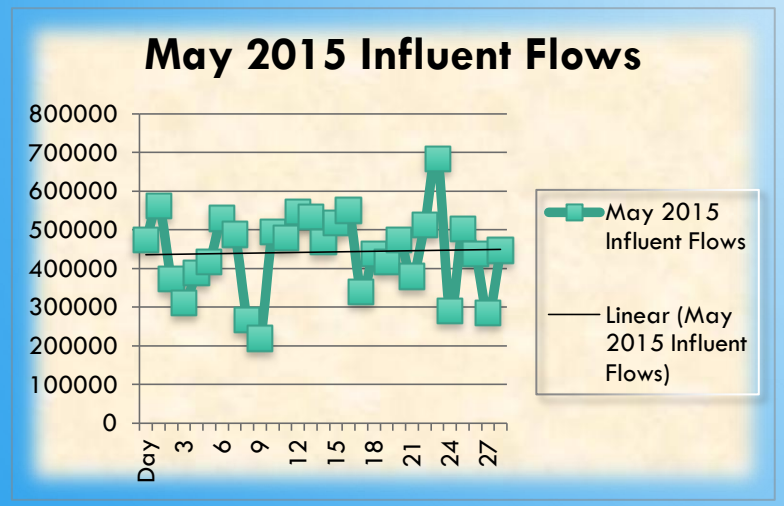

Water audits work for wastewater too!

Questions?

Thank you!