

Latonnell Conservation Symposium 2019

Currents of Change – Session T1A

Do you know what's in your water?

“Don't know what we don't know”

- ▶ Why should we even look?
- ▶ What do we do when we find something?

Do you know what's in your water?

- **Detection/Identification**
- **Context**
- **Relevance**
- **Materiality**

Do you know what's in your water?

Detection and identification

- Existing baseline data and analysis
 - Ontario has a long history of water quality data, collected for a number of reasons, but all pertinent to an historical record for source water protection
 - We have had few, and thankfully none recently, incidents of cholera, typhoid and typhus but which were not uncommon in our Province's timeline
 - Cities, town and villages built up their own defences for source-water over several centuries, but there were still failures and none more so than Walkerton which resulted in a number of deaths; even Toronto continued to face cholera outbreaks, after the events of the 1840s, right until after WW I
 - Many municipalities built up their own sampling and testing establishments, some over and above what the Provincial requirements of the day might have been, based on their own specific experiences

Do you know what's in your water?

Detection and identification

- Longitudinal analysis
 - We need to know when this issue arose and for how long have we had to deal with it?
 - What were decisions of previous governing bodies on this matter, or did they ever even see it?
 - Longer-term data might tell us that the situation has worsened over time and now we have crossed the threshold from low-level chronic to acute. How do we find out?
 - Would we see impacts only when these become cumulative over a longer term?
 - What do our constituents tell us? What is their collective experience? Is there a role here for First Nations' oral history?

Do you know what's in your water?

Detection and identification

- **Risk assessment environmental scan**
 - Recent changes, eco-indicators

Observable environmental impacts

- Colour, odour, (The Canal turned from green to brown overnight!)
- Dead fish onshore and floating
- Algal blooms and nuisance weed growth
- Overnight die-off of bees
- What's **not** there – martins missing, Monarchs don't come back – then do but much reduced in numbers

Assessed environmental impacts

- Water chemistry
- Water-column biology (parasites, bacteria, other microbials including algae, fungi, viruses); macro flora and fauna
- Benthic biology in lotic water bodies and contributing lentic watersheds

Do you know what's in your water?

Detection and identification

- **Risk assessment environmental scan**
 1. Observable environmental impacts
 2. Assessed environmental impacts

Do you want your clients and customers to be your quality assurance team?

If so, when they ask YOU what's in the water because of the already-observed or assessed impacts, what will your answer be?

Is "I don't know" acceptable?

Do you know what's in your water?

Detection and identification

- **Risk assessment environmental scan**
 - Recent changes, eco-indicators
 - Where else can we look for early-warning indicators?
 - What else in our observable environment is impacted by changes in water quality?
 - Larger beasts such as migratory waterfowl and resident waterfowl and changes in their population mixes
 - Smaller beasts such as bees and other pollinators and the composition of insect populations (Where did all the mosquitoes go in Houston, Texas?)
 - CAs are looking at benthic invertebrates: what's happening with those populations?
 - A mix between the two (phoebes, martins and swallows; bats – that feed primarily on insects; forage fish that sport fish rely upon)

Do you know what's in your water?

Detection and identification

- **Risk assessment environmental scan**
 - Recent changes, eco-indicators
 - Have there been new land-use developments upstream in the watershed?
 - Have there been new or changed industrial uses made upstream?
 - Are there old and established issues that may have changed recently (tailing ponds, extraction mining dams, nuclear-waste storage)?
 - Are these changes
 - chronic (longer-term, and sometimes only seen in longitudinal study comparisons)? “The water used to be so clean and clear that you could drink right from the lake.”
 - or acute (a one-time significant event)? “We never had a fish die-off like this before when so many big ones went belly up all at once! I’ve been here sixty years and never seen the like of this !”

Do you know what's in your water?

▶ Context

- We need to take a sample of the source water and get it assessed (i).
 - Where do we go?
 - Can our CA in the affected watershed help?
 - Do we have our own in-house capability or do we need to out-source?
 - Should we try multiple analysis entities (Provincial labs, private labs, university labs)
 - Who can we trust to keep this confidential and also support us in future actions?

Do you know what's in your water?

▶ Context

- We need to take a sample of the source water and get it assessed (ii).
 - What if we get back only negative results from our regular testing, including out-sourcing, but still have observable (negative) impacts?
 - Can the CA help us to reach out to neighbours who may have seen the same issue, to other partners and to comparables, even nationally and internationally?

Do you know what's in your water?

▶ Context

- We need to take a sample of the source water and get it assessed (iii).
 - Finally, we have a positive result for the “weird stuff²” that is in our source water supply.
 - Now what?
 - We need to know what the literature tells us about this “stuff” and the impacts that it manifests.³
 - Is it possible to do a similar analysis of the affected and observed environmental entity (bat, martin, honey bee, chicken egg) to determine if this “stuff” is detectable and measurable, for what PMRA calls maximum residual limits (MRL), in the affected population?
 - MRL is also negotiated in international trade agreements such that any excessive amounts can result in trade limitations or even import bans. Do any of our clients in our municipality trade their products on the international market? (see next slide)

2- City of Ottawa, 2019

3- Ontario CWA (2006) s.86 2. i and ii

Do you know what's in your water?

▶ Context

- Now that we have an idea what it is, what do we do about it?
 - Is there an existing Provincial technical notice? (see Ottawa example?)
 - Is there anything in Health Canada's CWA guidelines?
 - Canadian Guideline for Drinking Water Quality; example, enteric viruses
 - Is there anything in the scientific literature? Is there a best-practice resolution?
 - What if it is truly “beyond the Pale” of expected municipal and CA experiences? Where can we turn?
 - Do any of our local businesses have any sensitivity to this “weird stuff”* being in their end products?

Do you know what's in your water?

▶ Relevance

- Now that we know what this “weird stuff” is and what it does, how do we explain it to our Council members for its impact and consequences in our backyard?
- What do Council members, and sometimes in their extended roles on CAs and SWP boards, have to carry as responsibilities?* (What was the Walkerton outcome for the responsibilities of these elected members?)

*Ontario CWA (2006) s. 22 and 47

Do you know what's in your water?

▶ **Relevance:**

- We have two ends of the province (N/S) as our exemplars
 - **The City of Ottawa**
 - **The Regional Municipality of Niagara**
- Both receive the vast majority of their municipal intake volumes from surface sources: in the case of Ottawa from the eponymous River (and about five rural wells for minor intakes); and in Niagara's case from Lake Erie either by the Welland Canal or from the Niagara River above the Falls, and one smaller source from Lake Ontario
- Both have long-term, extensive sampling and testing for traditional water chemistry and water quality parameters, and access to longitudinal studies on both chemistry and quality
- Both are part of the existing Ontario Drinking Water Surveillance Program (DWSP)

Do you know what's in your water?

▶ Relevance

- We have two ends of the province (N/S) as our exemplars
 - **The City of Ottawa**
 - **The Regional Municipality of Niagara**
 - Ottawa has a vast watershed that contributes to its source-water intake, much of which remains forested, some of which is untouched but also some of which has unique issues: the very old nuclear power facility at Chalk River, a major military base at Petawawa, some of Canada's oldest mining sites (Xstrata, Agnico-Eagle, Richmond), pulp-and-paper and milling factories at Kipewa and Temiskaming (Tembec) with ageing environmental controls
 - Niagara relies on the health and vitality of Lake Erie and all that contributes to it including Chicago, Detroit, Cleveland, Toledo, Windsor and Buffalo, but it is a "Great Lake" and has absorbed abuses and resolutions up and down over a number of decades

Do you know what's in your water?

We have two ends of the province (N/S) as our exemplars

▶ The Regional Municipality of Niagara

- Niagara has a single peninsula-wide source water protection program.
- Niagara relies heavily on an assumption of the ongoing health and vitality of Lake Erie (5) and Lake Ontario (1): existing contamination loads of those things traditionally monitored are already well-known and documented for the region's six municipal water treatment facilities
- The SWPA Assessment Report notes that there are no municipal wells in the NPSP area
- However, much of rural Niagara is reported as vulnerable and already affected to some extent so private-well sources are at risk; Niagara has an area of 1,854 km² compared to the City of Toronto at 630 km², largely rural and agricultural-based for economic activities
- Niagara has a heritage of heavy industry and a significant number of brownfields being monitored; but, the majority of the population is served via the Welland Canal and is relatively independent of the water table and local surface-water courses

Do you know what's in your water?

▶ The City of Ottawa

- Ottawa has enjoyed relatively safe and healthy source-water supplies as upstream development has been limited; and, while it has three CAs covering watersheds inside the City boundaries, it takes no City water from these; however, there are no CAs further upstream to support more-rural municipalities and there are two provinces involved in watershed management; it is the largest urban municipality in Ontario at 2,790 km².
- Wells supply former villages, but now amalgamated with the City, beyond the Greenbelt and beyond the reach of the main water and sewer systems; much of the area beyond the original city limits is supported by private wells
- More recently, because of the wild nature of the headwaters, cryptosporidium and Giardia have re-emerged as water-treatment concerns and the City has continued to stay ahead of these issues with more-than-adequate technical responses (Relevance linked to Context)
- Emerging issues of **PFHs** used in fire retardants and extinguishers and of nucleotides from nuclear experimental stations have taken on new meaning in Ottawa as those federal government research activities upstream of the main intakes continue to occupy ongoing sampling and analysis capacity, and standards (7,000 or 20 Bq./L.?) remain to be assessed long-term.
- Ottawa has a dedicated in-house water quality research group and a network of university researchers and private sector analysis firms

Do you know what's in your water?

▶ **Materiality**

- So now what, we have discovered bad stuff in our water supply?
- What are we expected to do about it as a municipality, as a Conservation Authority?
 - Determining the source of the contamination
 - Determining the level of contamination that may exceed acceptable standards
 - Determining a course of action if these standards are being exceeded
 - Setting out a risk management approach to deal with such detections in the future

Do you know what's in your water?

▶ Materiality

- So now we have found something that exceeds acceptable water quality standards
 - Distinguishing between chronic and acute
 - Is future contamination preventable?
 - If not preventable is it treatable?
 - If not treatable, are there other alternatives?
 - For example, if acute and temporary, can we shut down the intakes until it passes?
 - If chronic and sustained, are there alternate sources available?
 - What do we do about “weird stuff” that we can detect and measure, but which goes right through our conventional treatment facilities and into our tap water?

Do you know what's in your water?

▶ Materiality

- City of Ottawa recommends* staying ahead of emerging issues
 - New regulations or guidelines from federal, and then provincial, authorities: as recent examples
 - 1,4-dioxane (Health Canada, 2018)
 - PFOS, PFOA (as found in fire retardants and suppressants)
 - Enteric viruses (noroviruses, hepatitis, rotaviruses)
 - Emerging contaminants and increased media attention
 - Legionella
 - Pharmaceuticals and Personal Care Products
 - Microplastics
 - Neonicotinoids

* Monika Schwering MSc; May 2019 – City of Ottawa

Do you know what's in your water?

▶ Materiality

- City of Ottawa recommends* staying ahead of emerging issues
 - Pharmaceuticals and Personal Care Products
 - Between 2009 and 2018 Ottawa analyzed source water for over 140 pharmaceuticals and personal-care products (none of these are included under Ontario Drinking Water Quality Standards, O Reg 169/03; nor are they sampled and assessed under the DWSP program)
 - 46 of these persistent ones were analyzed throughout 2018; 23 (50%) appeared in at least one treated-water sample; 5 appeared in 25% of all treated samples: Albuterol, Caffeine, Carbamazepine, DEET and Metformin

* Monika Schwering MSc; May 2019 – City of Ottawa

Don't know what we don't know

▶ **Materiality**

- What can you imagine that your municipality knows about micro and nano-plastic loading in its source water?
 - What do you think your municipality has in terms of pesticide-residue testing and about its reporting capacity at the level of toxicity impact for neonics (nano and picograms)?
- ▶ Now, if you can't answer the materiality questions, then how can you back up and deal with relevance and context concerns?

Don't know what we don't know

▶ Materiality

- A study undertaken by Carleton University* and referenced by the Ottawa Riverkeeper found microplastic fibres in **all** raw water samples taken in multiple sites
- Microplastics were found in nine of eleven tap water samples across the watershed
- Fibres were found to be more toxic than micro pellets and spheres but the levels in the Ottawa River and other sources were generally below that level of immediate toxicity as evidenced by sample testing for crayfish
- Some areas, notably below municipal sewage treatment plants, had concentrations similar to those found in the Rhine River
- The Riverkeeper might ask – what is the long-term, chronic and cumulative impact of micro and nano plastics in our water sources?

*Meaghan Murphy et al, 2019

Don't know what we don't know

▶ **Materiality**

- Who is doing the assessments of the data?
- DWSP provides a lot of water chemistry and water biology data – who in the municipality is looking at it for trends and changes?
 - Let's take a look at Port Colbourne, at the front-end of the Welland Canal system, upon which the other major urban areas in Niagara rely as their source
 - DWSP notes a higher-than-expected concentration of selenium for the Port City – So what? Whose looking?
 - There is an old INCO settling pond right on the shoreline just east of the canal entrance – Coincidence?

Do you know what's in your water?

▶ **Materiality**

- What if the “weird stuff*” that we discover has no current Provincial standard?
- What is the value of staying ahead of emerging issues (see sections 47 and 88 of the OCWA)?
 - What are the observed impacts on the environment, the ecology of the watershed and on human health?
 - We still need to go through the Materiality test (see slide 20)

* Monika Schwering MSc; May 2019 – City of Ottawa

Do you know what's in your water?

▶ City of Ottawa

◦ Water Quality Monitoring Objectives

1. Meeting and **exceeding** regulatory requirements
2. Establishing a strong historical record
3. **Staying ahead** of emerging issues
4. Increasing public confidence in our product

- Is this reasonable to expect from all municipalities across the Province? If not, why not? (\$)

Don't know what we don't know

▶ **Materiality**

- Oh crap! I really don't know what I don't know and my own client base is still suffering. Where do I turn?

Let's look in the next few minutes at a particular concern as an example of this issue, and how we might expect the Province to step in with improved policy–statement guidance and up–dated standards. In the case of both Ontario and Canada, we are not looking at plowing a new field but rather making good on policy pronouncements already enunciated, some of them several years old.

Don't know what we don't know

▶ **Materiality**

- **Neonicotinoids**, as nervous–system–impacting agents, are used for seed treatment, for prophylactics against potential pests and as suppressants for any emerging issues (when did you ever see a cockroach or ant in a doctor's office in the past few years?)
- Neonoics are widely used as a pet medication for ticks and fleas – where do you think this gets excreted?
- What would you imagine is the level of recommended concentrations in horticultural or veterinary treatments compared to the manufacturer's limitations for farm–gate applications, such as seed coatings?
- How much of this can you envision is getting into our watercourses?
- For how long to you think that it persists? What do we know about chronic, cumulative and compound* impacts?

*Action in concert with other agents including fungicides, herbicides or even chlorine used to treat water supplies

Don't know what we don't know

▶ **Materiality**

- How do we turn data into information?
- How do we convert information into intelligence?
- How do we combine data, information and intelligence into science-based evidence?
- How do we use this evidence to inform decision makers and to help guide an appropriate course of action?
- What do we use as an evidence-based performance indicator to evaluate if our actions have been successful or not?
- Should we/could we use this same set of data, information and intelligence both for ongoing monitoring and for reporting out?

Once I know what I didn't know, I can't un-know it!

Do you know what's in your water?

- Where do you view that the Province has picked up, or wants to take up, new and additional accountabilities and responsibilities for source–water protection?
- How would you view Walkerton–like concerns in your own municipality or CA/SPA? What are your own risk assessments telling you?
- What are you now seeing with these emerging issues putting pressure on municipalities, and the Conservation Authorities as their allies?
- How do we get equitable treatment for all municipalities across the Province.
- In the next part of our session, we are going to focus on one particular issue – **neonicotinoid** pesticides (not just an insecticide because it is lethal to much more than just insects)

Do you know what's in your water?

▶ NOTES

- Risk assessment for Source Water Protection
- Implications for Wetland Management
- Impacts on Freshwater Biodiversity
- Impacts on Human Health