Lake Erie Water Quality Issues and the Value of Environmental Public Health Networking

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100 Years of CIPHI: Celebrating Our Evolution, Sustaining Our Future
Presentation Objectives

• Legislative and policy framework.
• Identify mechanisms in place to foster collaboration and implement responses to safe water issues.
• Demonstrate local health unit stakeholder collaboration using three examples involving Lake Erie Water Quality issues.
Mechanisms for Collaboration

Legislative and Policy Framework:

• Ontario Public Health Standards

• Safe Water Protocols

• Guidance Documents
To ensure that boards of health assess, plan, deliver, manage, and evaluate public health programs and services to meet local needs, while continuing to work towards common outcomes, boards of health shall be guided by the following principles:

Need
Impact
Capacity

Partnership and Collaboration
Ontario Public Health Standards
Safe Water

Requirement #10: The board of health shall ensure that the medical officer of health or designate is available on a 24/7 basis to receive reports of and respond to:

• Adverse events related to safe water, such as reports of adverse drinking water on drinking-water systems governed under the Health Protection and Promotion Act or the Safe Drinking Water Act;

• Reports of water-borne illnesses or outbreaks;

• Safe water issues arising from floods, fires, power outages, or other situations that may affect water safety; and.....
Ontario Public Health Standards
Safe Water - cont’d

• Safe water issues relating to recreational water use including public beaches in accordance with the Health Protection and Promotion Act; the Beach Management Protocol, 2008 (or as current); the Drinking Water Protocol, 2008 (or as current); the Infectious Diseases Protocol, 2008 (or as current); the Public Health Emergency Preparedness Protocol, 2008 (or as current); and the Recreational Water Protocol, 2008 (or as current).
Liaison with agencies and ministries:

*The board of health shall engage in activities within the community that increase the safety of drinking water and decrease potential for adverse effects on health, including but not limited to participation on technical committees and assistance in the identification of vulnerable areas and threats to drinking water systems;*
Response to Adverse Drinking Water Quality Incidents Guidance Document MOHLTC 2009

Relationships with Key Partners and Stakeholders:

*Communications and strong working relationship should be initiated and maintained between the local boards of health and key partners such as:*

- Owners or operators of all regulated drinking water systems
- Local Ministry of the Environment (MOE) officials;
- Testing laboratories;
- Local media;
- Local government officials
- Neighbouring local boards of health.
In the case of a municipal system, the owner/operators should be encouraged to form a local water quality advisory group for the development of local emergency plans as a means of ensuring proactive planning and communication. The development of the plan may include consulting with:

- Representatives from the health unit
- Municipal leaders and key stakeholders
- Public works staff involved with water treatment, distribution, sampling or other aspects of providing drinking water.
- Emergency planners for the municipality, county or region
- Representatives from MOE
- Representatives from laboratories
Elgin Area Safe Water Partnerships

Elgin Area Water Supply Working Group

Lake Erie Cyanobacteria Surveillance Working Group

MOE Safe Water Unit/ESTPH Liaison Committee

Thames-Sydenham Region Source Water Protection Committee
Elgin Area Water Supply Working Group

- Elgin Regional Water Supply (Chair)
- Elgin area local Municipalities
  (Aylmer, Bayham, Central Elgin, Dutton-Dunwich, Malahide, St Thomas, Southwold, West Elgin)
- Elgin Area Primary Water Supply System (OCWA)
- West Elgin WTP (OCWA)
- MOE Safe Water Unit (London District Area)
- ESTPH
- MLHU
- City of London
Lake Erie Cyanobacteria Surveillance Working Group

- MOE London District Office (Chair)
- MOE Great Lakes Surface Water Specialists
- MOE Scientific Support Group
- ESTPH, Chatham Kent HU, WECHU
- Local Conservation Authorities (Essex Region, Catfish Creek, Lower Thames Valley, Kettle Creek)
Demonstrate local health unit stakeholder collaboration using three examples involving Lake Erie water quality issues.
Water Quality Issues

1. Lake Erie Fish Kill and Discoloured West Elgin Drinking Water  (September 2012)

2. Cyanobacteria bloom impacts on recreational water in Port Glasgow  (July 2013)

3. Elevated Sodium in Municipal Drinking Water from EAPWSS  (August 2013)
Outline

- Situation
- Joint Investigations and Response
- Findings
- Net “working”
Water Quality Issue #1 *Fish Kill*

- August 31\(^{st}\), 2012 Friday – September 3\(^{rd}\) (Labour Day weekend) – ESTPH received reports of foul odors and discolored water in the West Elgin Water Treatment Plant that persisted on and off for 2 weeks.
- Reports of large numbers of dead fish along the north shore of Lake Erie from Rondeau to Port Glasgow and some as far east as Port Stanley. (Chatham Kent HU area and ESTPH area).
North Shore of Lake Erie
Port Glasgow area
Official Agencies Involved

- Elgin St Thomas Public Health
- Chatham Kent Public Health
- Ministry of Environment
- Ministry of Natural Resources
- Local Municipalities
- Water Treatment Plant Operators (OCWA)
Possibilities?

- Fish can die in large numbers for many reasons.
- Natural causes and human-induced water pollution.

A natural phenomenon is the most plausible explanation:
  - If a die-off occurs over a broad geographic area
  - 1 time event-deaths don’t continue
  - Weather patterns support an up-well of bottom water

- Ministry of the Environment (MOE) responders called out to attend and ensure not pollutant-related event.
Follow-up investigations by MOE and MNR

- MOE spoke to residents, park staff, local farmers and other stakeholders. Local beaches were investigated, samples and photographs taken.

- On-site evaluations & results of field investigations indicated natural event:
  - pH levels, dissolved oxygen, conductivity and water temperature were found to be within the normal range.
  - Dissolved oxygen tests performed by EMRB August 27th indicated low or no dissolved oxygen in areas offshore of the kill zone
  - There were no visible signs of algae blooms, sheens or visible signs of manure spill in the areas where dead fish were found.

- Affected 40 km shoreline running from Rondeau Provincial Park eastward to a point west of Port Stanley. This area includes Townships of Chatham-Kent, West-Elgin, Dutton-Dunwich and Southwold.
Communications

- Government staff shared information and followed up on other lines of evidence.

- MOE and MNR met with ESTPH and Chatham Kent Health Units on Sept 6, 2012 to share information regarding the cause of the kill.

- Water sample results provide further data points to support there wasn’t a pollution event.

- Fish samples were analyzed in Guelph for additional confirmation that disease was not the cause.
When Lake Erie warms in the spring, it begins to form two distinct layers. The warmer upper layer or epilimnion floats above the cold lower layer or hypolimnion. These two layers are separated by a very thin area of rapid temperature change called the thermocline, which normally forms at a depth of about 50 feet during May/June.

As the thermocline develops in the early summer, there is plenty of dissolved oxygen in the hypolimnion.
Lake Erie - backgrounder

• Lake Erie is divided into three basins:
• Western Basin is too shallow to have a thermocline except on rare occasions.
• Eastern Basin has more water, and therefore more oxygen in its hypolimnion.
• The intermediate depth of the Central Basin allows a very thin hypolimnion to form. This area is the home of Lake Erie’s dead zones.
Lake Erie - backgrounder

- But as organic matter decomposes and uses oxygen on the lake bottom, the amount of oxygen available for fish and other aquatic life decreases.

- The epilimnion will not mix with hypolimnion and replenish its oxygen until fall.

- This can eventually result in the hypolimnion becoming anoxic (no oxygen).
Investigation Findings

- All visual and field work points to natural event: tests within normal range; no algae seen, no evidence of spill or pollutant; fish not visibly diseased.
- Review of water intake temperature records shows there was a temperature change at around the time of the fish kill.
- MOE modelling of the strong SW or W winds prior to the fish kill illustrate reasonableness of hypothesis that the bottom water could “up-well” near shore causing a rapid drop in water temperature and drop in dissolved oxygen.
- MOE sampling on Aug 27, 2012: low or no dissolved oxygen (DO) in areas offshore of the kill zone.
- Lake Erie cyanobacteria monitoring: no indication of major bloom
- Water sample results rule out pollution event as a cause.
- Fish samples to be analyzed at the University of Guelph to confirm that fish disease was not a cause.
Clean-Up

- Property owners are cleaning their properties.

- Ministry of Natural Resources (MNR) available to assist on best practices for clean-up and safe handling.

- MNR cleaning provincial park.

- Municipalities, volunteer groups cleaning public lands.

- Government reaching out to public to provide information on clean-up best practices and ensure people understand what happened.

- MNR document “Understanding Fish Die-Offs”
Guidance on Disposal

• Bury them or dispose of them in the garbage.
• Wear rubber gloves or protective material, and dispose of the gloves or protective material in the garbage.
• Be sure to wash your hands thoroughly with antibacterial soap and water after handling the carcasses.
• Make sure to wash any tools with a disinfectant, such as bleach.
Drinking Water Impacts

• In Elgin County the impacted area has two major Water Treatment Plants that draw from Lake Erie.
• Elgin Primary Water Treatment Plant
• West Elgin
• Ontario Clean Water Agency
Elgin Area Primary Water Treatment Plant

Experienced impacts from decrease in water temperature, odors and increased turbidity in Lake Erie water during this upwelling situation.
West Elgin Water Treatment Plant

- Services Port Glasgow, West Lorne, Dutton, Wallacetown, Iona and Iona Station in Elgin County
- Services Wardsville, Newbury, Appin, Glencoe, and Melbourne in Middlesex County
- Services Bothwell in Chatham Kent
Water Discolouration

• The intake water at the treatment plant has a high level of manganese – seems like it is naturally there.
• baseline levels of manganese in the water not available
• On September 9th the raw water had 623 ug/L (ppb) of manganese and the aesthetic objective is 50 ug/L.
• The level is not an issue until the water becomes low in DO – then the manganese becomes soluble. The soluble manganese gets through the filters at the plant and the oxidation of the soluble manganese coloured the water.
West Elgin Water Treatment

• The Advanced Oxidation Process (AOP) was turned on to remove the taste and smell, but it caused the coloring of the water.
• Determined what level to set the AOP to maximize taste and odor removal but minimize discoloration.
• The treatment plant had to shut down and rely on water from the Elgin Primary Water Treatment Plant which supplies several communities jointly in the West Elgin area.
• Ongoing ESTPH staff consultation with OCWA.
• Samples taken for Microcystin were negative.
Water Quality Issue #2 Cyanobacteria

- July 15, 2013
  Cyanobacteria bloom reported at beaches along Lake Erie north shore along Chatham Kent, east to Port Glasgow in Elgin County.
- MOE Cyanobacteria surveillance that began July 8th for the season.
- Reports from Lower Thames Valley CA
- ESTPH beach sampling staff
- West Elgin Municipality staff
- West Elgin WTP reported AOP started up and sample for microcystin after observing algae bloom offshore. MOE Safe Water Unit reported to ESTPH.
Cynaobacteria Bloom
Port Glasgow Beach Closed – July 16
Public Health Messaging

- Do Not Drink, Swim or Wade in beach water due to the presence of Blue-Green algae at the Port Glasgow Beach.
- People and pets should not swim or wade in the lake.
- Any fish from here should not be eaten and people should also avoid contact with blue-green algae along the shoreline.
- People who come in contact with or ingest water containing the blue-green algae may experience skin irritation, rash, sore throat, sore red eyes, swollen lips, fever, nausea and vomiting and/or diarrhea.
- Symptoms usually appear within one to three hours and resolve in one to two days. Symptoms in children are often more pronounced because they spend more time in the water and are more likely to accidentally ingest contaminated water.
- This posting is in effect until further notice when these conditions improve.
New Contact - NOAA

- US National Oceanic & Atmospheric Administration (NOAA)
- Experimental Lake Erie Harmful Algal Bloom Bulletin (HUB)
- National Centers for Coastal Ocean Science and Great Lakes Environmental Research Laboratory (GLERL)
- 19 July 2013; Bulletin 08
Cyanobacterial Index from 15 July 2013. Grey indicates clouds or missing data. Black represents no cyanobacteria detected. Colored pixels indicate the presence of cyanobacteria. Cooler colors (blue and purple) indicate low concentrations and warmer colors (red, orange, and yellow) indicate high concentrations. The estimated threshold for cyanobacteria detection is 35,000 cells/mL.
Forecast position of bloom for 20 July 2013 using GLCFS modeled currents to move the bloom from the 15 July 2013
Position of bloom for 19 July 2013 using GLCFS modeled currents to move the bloom from the 17 July 2013 image.
Beach Re-opens July 19th

- Due to the improvement in the water quality at the Port Glasgow beach and the dissipation of the cyanobacteria (blue green algae) conditions that were experienced for most of this week, the Elgin St Thomas Acting Medical Officer of Health, Dr. Franklin Warsh, has recommended that the Port Glasgow Beach be reopened effective today.

- Information reviewed by health unit staff indicates the algae bloom is moving away from shore in a southerly direction. A re-occurrence of cyanobacteria is possible as the summer progresses.

- A reminder to beach users that if the water appears bright green or pea soup in colour, please stay out of the water.

- Health unit staff will continue to monitor for these conditions in consultation with the Ministry of the Environment and the Municipality of West Elgin.
August 2013

EAPWSS sodium concentration reported as >20 mg/L

Risk Communication for those on Na-restricted diets for medical reasons.

Joint Statement issued by Elgin Area Water Supply, MLHU and ESTPH

Health Information Advisory to HP’s
On August 8, 2013, the Elgin Area Water Supply System, Elgin St. Thomas Public Health and the Middlesex-London Health Unit issued a joint statement advising that recent routine water quality monitoring had detected slightly elevated sodium levels in the water produced by the Elgin Area Water Supply System.
Elgin Area Primary Water Treatment Plant

• Services St. Thomas, London, Aylmer, Bayham, Central Elgin, Malahide and Southwold.

• Treatment capacity of 91 million litres per day (20 million Imperial gallons per day) and serves a population of approximately 112,000 people.
A “Health Information Advisory for Health Professionals about Sodium in Drinking Water for those on Sodium Restricted Diets” was distributed to:

- Local Physicians
- Long term care facilities in the affected area.
- St Joseph’s Regional Mental Health Facility
- St Thomas Elgin General Hospital
- SW CCAC
- Regional Home Dialysis Unit
- Elgin area Registered Dieticians
- CMHA
Partnership Net “working”

Existing partnerships as per the OPHS and emerging connections were key in these situations:

• Communications and dialogue.
• Media communications.
• Intelligence and information.
• Roles and responsibilities.
• Working together.
• Leadership.
Net “working”

Health Unit linked with:
- Lake Erie Cyanobacteria Surveillance and Reporting Working Group
- MOE Great Lakes Surface Water Specialists and Scientific Support Group
- MOE Safe Water Unit
- MNR Fish Specialists
- Other Local Health Units
- Local Municipalities
- US NOAA
- OCWA
- Conservation Authorities

Health Unit linked with:
- Elgin Area Water Supply
- Elgin Area Water Supply Working Group
- Elgin area local Municipalities
- Elgin Area Primary WTP (OCWA)
- West Elgin WTP (OCWA)
- MOE Safe Water Unit
- MLHU – City of London
- TSR Source Water Protection Committee

Lake Erie Water Quality

Public Health

Drinking Water Safety
Thank you

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