

## **Walkerton Part 2: Study List**

The following is a preliminary list of studies that may be commissioned for Part 2 of the Inquiry. The list is being provided now in order to give those applying for standing or funding a general idea of what will be involved in Part 2. It is emphasized that the list is preliminary and subject to revision. Updates will be posted from time to time on the Inquiry website. Topics may be combined or repartitioned to fit the competences of authors. Some general principles apply to all:

- Quality is the topmost consideration. The papers will be reviewed by peers, the Advisory Panel,<sup>1</sup> and ultimately the public, including interest groups and the press. Both the science and the public policy implications must stand rigorous scrutiny.
- In general, the Inquiry requires descriptions of the Ontario reality, plus assessments in the light of theory or best practices around the world. From the contrast will spring suggestions for public policy. These are best expressed in terms of guiding principles plus options for their implementation. Detailed prescriptions from different studies may need to be reconciled.
- Some authors may be called on to give expert testimony in the public hearings on Part 1; if so, this will be arranged for separately, but authors should be aware of the possibility.
- Most papers will be reviewed by peers and the Advisory Panel, published as drafts for public comment on the Inquiry's website, and finalized after a period for comment. Authors should expect to present, discuss and defend their work in one or more roundtables and discussion groups involving interested parties, the media and the general public.
- The emphasis will be on reviewing the current state of the art in engineering, science, management etc., rather than performing original research. Where the literature is ample, citing and summarizing it is better than drafting anew. Readers will be intelligent non-specialists.
- Copyright will lie with the Crown in right of Ontario, but authors are encouraged to publish elsewhere after final acceptance by the Inquiry, if they wish, and will have a royalty-free license to do so.

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<sup>1</sup> Dr. George Connell, Prof. Steve E. Hrudey, Prof. William Leiss, Dr. Doug Macdonald, Prof. Allison McGeer, Prof. Michèle Prévost, Dr. Harry Swain (chair)

## **1      *Management of social risks***

Philosophical background. Reprise theory of rational risk management, enrich with attitudinal information regarding probability and severity of bad outcomes. Sketch how applied in water supply management; examples of best practices. Show implications for budgetary allocations given equimarginality of risk reduction as a criterion.

## **2      *History of drinking water management in Ontario***

Institutions, laws, regulations; key individuals; scientific, funding and other resources. The whole story, including provincial and (generic) municipal entities and all regulatory and accrediting bodies, with the last 20 years in some detail. Funding, efficiency and effectiveness evaluations where available, workload, personnel turnover rates, oversight of localities and private sources, labs, reassignments of duties. Should include “field work” in key institutions, perhaps interviews with former employees: MOE and predecessors, MOH, several public utility commissions. Note timing on parts of this may be dictated by progress of Part 1. Could be combined with 4.

## **3      *History of drinking water pollution outbreaks in Ontario***

Emphasis on threats to health. What, when, where, why; non-fatal and chronic as well as acute; institutional responses at all levels of government. Boil-water advisories. Particular attention to pathogens. Costs, impacts and consequences where available. General report, not specific to Walkerton.

## **4      *Ontario machinery of government***

Do the laws and institutions of Ontario conduce to the primacy of clean water among other public goods? Is water supply given an appropriate priority in land use planning? Are there particular regulations, practices or institutional arrangements that stand in the way of high quality source waters? What changes might be made without sacrificing other important objectives (or what might be the price of change)? What has been the effect of the recent downloadings/changes in responsibilities – and what reinvestment and retraining may be required by these changes? (Note timing of parts of this may be dictated by events in Part 1.)

## **5      *Drinking water standards***

How established in Ontario/Canada; basis in risk assessment: descriptive background paper, with comparisons with excellent standard-setting systems elsewhere. Microbiological hazards, present and potential, in Ontario drinking water sources – bacteria, viruses and protozoa. Consequences (quantified risk measures where possible) for population health, including especially vulnerable groups. Could be combined with 6.

## **6      *Water pollution; sources of contamination***

General review of quality of source waters, ground and surface; sources and sinks of major pollutants, both man-made and natural, point and non-point, as they affect the cost and quality of drinking water. Remediation practices and possibilities. Particular attention to pathogens and other contaminants capable of causing acute public health problems, but including an overview of other (chemical, physical) health threats. Governing regulations: describe, assess – with attention to enforcement as well as rules. Requirements (regulatory, personnel, other costs) to bring Ontario up to, and maintain, its current standards.

## **7      *Measurement of source and finished water quality***

Describe and assess current state of art in Ontario, comparing with best practices elsewhere, noting time lags; conclude with principles of good practice and options for implementation in Ontario

(NB not Walkerton-specific). Looking across all contaminants and sizes of systems, how can measurement lead to the most risk reduction per dollar spent?

- Sampling protocols: sites, frequency, reporting and intervention responsibilities
- Indicator species, risk projection models, new species; risk vs. uncertainty
- Accuracy, timeliness, cost, consequences of error
- Standards in documentation and in operator training
- Quantified economies of scale and scope

## **8      *Production of drinking water***

A major paper – integration of treatment (including disinfection) and measurement. Big systems: best practices in bigger cities; case examples of Toronto and at least one or two other North American/European cities thought exemplary in the industry; effects of source quality on cost and risk. Smaller systems. Best practices, costs and risks, source quality effects on costs. Private supplies: rural homes, cottages, farms; effects of source quality on costs/outcomes. (Could be useful to have a brief early paper on latter, focussing on government role in providing information and assuring availability of timely testing.) Role of ISO standards, if any. Implications of non-real-time measurement. Establish costs in some detail as a function of system scale and scope, water source, and customer density.

## **9      *Wastewater treatment***

Review paper. Municipal sewage treatment plants – best practices v. Ontario norms and actualities, Ontario compared with leading jurisdictions in terms of standards, technologies, costs, training, accreditation, testing, audit, public reporting. The same for rural, untreated industrial, and agricultural wastes, including those from intensive livestock raising – best practices abroad (e.g., Netherlands, Denmark, UK, France...Canadian/US examples). Ontario regulatory system – standards, enforcement; lacunae, costs to bring Ontario up to present and to world-class standards. Quantify costs as a function of scale and scope of systems.

## **10     *Training and accreditation***

Describe Ontario system of training and accreditation of operators, regulators, and public health authorities; likewise approval, inspection, re-inspection of all critical facilities (water treatment plants, distribution systems, sewage treatment plants, testing labs, regulatory oversight labs). Describe (including costs), assess against exemplary practices elsewhere, note gaps, suggest principles and concrete options for improvement.

## **11     *Management and organizational behaviour***

“Why do good people do bad things?” What can be done about it through organizational design, separation of functions, leadership, transparency, independence. Are there machinery of government or public-private implications? What lessons can be drawn from well-performing organizations, concerned with analogous areas of public safety? How does one design for resilience in the face of inevitable error and ignorance? Why do essentials get under-funded? Compare theory and best practices elsewhere with the Ontario drinking water reality, at all scales (but avoid Walkerton specifically).

Where water supply and treatment is privately provided and publicly regulated, describe cases (e.g., France, UK, maybe Germany, Scandinavia, Canada and US), results/outcomes, best practices in terms of accountability, transparency, regulation, effective enforcement, costs, public input. Note the elements of accountability that need to be in place regardless of where the public-private interface lies or whether it exists at all.

Suggest principles for structuring the production, regulation and financing of potable water, plus concrete alternatives for the Ontario reality.

## **12      *Communications***

When some action by the public may be called for (“Boil water!”), what mechanism best balances Type 1 (warning when there is no danger) and Type 2 (no warning when there is danger) risks? What happens when one link in the chain balks? Empirically, how do Ontarians react to warnings – and can public response be improved through better communications? Distinguishing between emergency and longer term situations and big city v. small-town and rural situations, what mechanisms, including media, messengers and maybe novel technologies, are most effective in gaining immediate and continuing compliance in public health crises? When a water crisis occurs, what should be the public communications obligations of the various officials?

## **13      *The costs of Walkerton***

Quantify as best as possible the costs and economic losses suffered by Walkerton-area households and businesses, the ultimate incidence of those losses and their likely course over time. Requires also a descriptive essay on personal, non-quantifiable costs borne by area residents, drawing in part on testimony at informal July community meetings. (*Good answers may require survey research.*)

## **14      *Infrastructure financing***

Drawing on **7-9**, a paper focussing on financing (capital and operating) of potable water treatment and distribution, and sewage collection and treatment facilities. Recognizing the basic responsibility of the municipal level of government, examine borrowing and financial management capacity and costs as a function of size; suggest any institutional reforms that might improve matters, especially for smaller systems. Describe the costs and risks borne by each level of government, and comment on the incentives created by grant and loan schemes of senior governments. Recognizing that there is but one rate (or tax) payer, suggest principles for an infrastructure financing scheme. Model the outcome in terms of costs that would be borne by households, businesses, and intensive water users.

## **15      *The cost of clean water***

Summarize the investments that need to be made (a) to bring Ontario’s drinking water up to its own published standards, and (b) to bring Ontario to the standards of best practices anywhere, under present institutional arrangements. Suggest alternate institutional arrangements that could reduce costs. Produce reasonably detailed alternative plans for attaining (a) and (b) in terms of capital and O&M costs and personnel as well as regulatory and institutional reform. Provide detailed policy options or programming alternatives, taking into account quality management principles and distributional equity questions.