THE WALKERTON INQUIRY

Commissioned Paper 25

The Cost of Clean Water: Estimates of Costs Arising from the Recommendations of the Walkerton Inquiry

By
Strategic Alternatives – Michael Fortin
Mike Loudon – Public Works Management Inc.

Toronto

2002

Published by Ontario Ministry of the Attorney General

This paper and other Walkerton Inquiry Commissioned Papers are available on the Walkerton Inquiry CD-ROM and at <www.walkertoninquiry.com> with the complete final report.

About the Authors

Strategic Alternatives is a management consulting firm that specializes in helping organizations improve their delivery of environmental programs and services.

Michael Fortin, MA (Economics), is a consulting economist experienced in water resource economics and financial analysis.

Mike Loudon, P. Eng., MBA, is a consulting environmental engineer who specializes in the financial planning of water and wastewater systems.

The Walkerton Inquiry retained the team of Strategic Alternatives,[1] Michael Fortin, consulting economist, Public Works Management Inc., and Mike Loudon, consulting engineer, to develop estimates of the costs of the recommendations contained in Parts 1 and 2 of the *Report of the Walkerton Inquiry.*

This cost report comprises two main parts. This, the first part, contains an overview of the cost estimates, including a description of the approach, the methodology used to develop the cost estimates, a number of assumptions that were used in developing the estimates, and a summary of the estimated costs. The second part of this report contains a table showing each recommendation, estimated costs (where applicable), an indication of who will likely bear the costs (provincial government, municipalities as a whole, or individuals), and the assumptions on which the estimate is based.

The cost estimates in this report are meant to provide a general understanding of the financial consequences arising from the recommendations of the Walkerton Inquiry. All estimated costs and the assumptions on which the costs are based are those of the authors, and not the Commission.

Based on our review, we found that the recommendations called for two types of action – one involved a one-time effort and the other involved continuous action over the long term. Consequently, we have estimated one-time costs, which we define as non-recurring program or capital costs, and ongoing costs, which we define as recurring program costs.

There are a number of recommendations for which costs were not estimated. First, the principal reason why costs were not estimated was that there were insufficient data. Second, a number of recommendations call for new approaches and actions that we believed could be accommodated with existing resources. For example, where a recommendation identified regulation amendments, this was considered to be routine government business that could be accommodated with existing resources. Thus, we assumed that certain recommendations relating to changes in policy and legislation could be implemented by redirecting existing resources. In such cases, we did not estimate a cost. Furthermore, there are a number of recommendations that relate to the federal government, and we have not estimated costs for these recommendations.

[1] Strategic Alternatives, located in Toronto, Ontario, is a boutique management consulting firm that specializes in helping organizations improve the delivery of their environmental programs and services.

Since we do not know how the recommendations will be implemented, nor do we have complete information on which to base the cost, we have assumed a margin of error in our estimates of 20% to 50%. For estimates in which we had relatively more confidence (i.e., more information), we assigned a lower margin of error; for estimates based on relatively less information, we assigned a higher margin of error. The questions we asked ourselves when assessing the margin of error included:

- Could the recommendations be implemented in *different* ways?
- Are the *assumptions* arbitrary, or is there a basis for them?
- Are appropriate *unit costs* available that can be used to make an estimate?
- Are there *comparable programs*, either past or present, that can be used as a reference?
- Can someone else *reasonably* follow how costs are estimated?

To the extent possible, publicly available sources of information were used to develop the cost estimates. The range of estimates reflects the variability and level of accuracy (or lack thereof) inherent in estimates of this nature. All estimated costs have been rounded to two significant digits.[2]

The estimates presented herein and shown in the accompanying table are *not* intended to serve in any way as a guide to implementation or budgeting. It is our expectation that actual implementation of each specific recommendation of the Walkerton Inquiry will be the subject of detailed program planning and budgeting, which will dictate actual costs. We cannot know *a priori* what the overall cost of implementation will be because this will depend on many different factors. Actual costs may differ from the estimated costs for several reasons:

- Costs associated with salaries, consulting fees, and administration will vary in different locations and at different times.
- The number of people and the amount of time it takes to implement the recommendations may differ from the assumptions used here.

[2] To prevent rounding bias, if the remainder was exactly 5, then the cost estimate was rounded to the closest even number. Thus, the number 3.55 would become 3.6, and the number 6.450 would become 6.4.

- Whether the implementation will be done in-house or require external expertise will vary.

- The cost in any one municipality will depend on the resources currently available in the municipality and the extent to which the requirements set out in the recommendation are already satisfied.

- Only direct financial costs are estimated in this report. There may be indirect and/or non-financial costs associated with implementing the recommendations. If these indirect/non-financial costs can be quantified, they could be added to the financial costs.

Caution should be exercised when interpreting the estimates because they are based on our specific assumptions. Any change in the assumptions will affect the estimates.

Notwithstanding the above, we estimate that the total *one-time* costs for the Part 1 and Part 2 recommendations of the Walkerton Inquiry could range from $99 million to $280 million, and we estimate total *ongoing* costs could range from $17 million to $49 million per year. As a point of comparison, Ontario municipalities spent $1.365 *billion* on water systems in 1999 alone – the year immediately prior to the events at Walkerton.[3]

It is not unreasonable to assume that *all* costs are eventually borne by households, either directly through payment of taxes and utility bills, or indirectly through higher prices for goods and services or lower returns on investments. If we amortize the estimated one-time costs, using a 20-year amortization period and a 7% interest rate, and add these to the ongoing costs, then the annual estimated cost per household would range from approximately $6 to $16. Using a shorter amortization period of 10 years yields an annual estimated cost per household of between $7 and $19. We assumed the number of Ontario households to be 4,560,000 based on Statistics Canada census data, as at February 2002. The per household cost estimates presented above are *average* costs, and would have to be adjusted for any one municipality. The *actual* cost that a household will face is a function of a number of factors, such as location, municipal population, age of drinking water infrastructure, quality of the raw water source, and the current water rate, among others.

---

[3] Strategic Alternatives et al. (2002). Financing Water Infrastructure. Toronto: Ontario Ministry of the Attorney General. Walkerton Inquiry Commissioned Paper 16. Walkerton Inquiry. pp. 74–76.

In the same way that we caution readers not to consider individual recommendations in isolation of the others, we examined the estimated costs of the Walkerton Inquiry recommendations in the broader context of other initiatives and actions that the provincial government has already undertaken since the Walkerton tragedy. Two major initiatives include Ontario Regulation 459/00, the Drinking Water Protection Regulation, and Ontario Regulation 505/01, the Drinking Water Protection Regulation for Smaller Water Works Serving Designated Facilities. Based on the approaches and assumptions we describe above, we estimate that the total one-time costs for these two regulations could range from $100 million to $520 million, and the total ongoing costs could range from $41 million to $200 million per year (see tables at the end of this report). There are other provincial government initiatives that may also impact on drinking water, including, but not limited to, the proposed *Nutrient Management Act* and the proposed *Sustainable Water and Sewage Systems Act*. Since these initiatives are still under development, we have not estimated costs for them.

The remainder of this report presents each recommendation, estimated costs (where applicable), an indication of who will likely bear the cost, and the assumptions on which the estimate is based. The cost estimates are dependent on our interpretation of the recommendations. We accept that others may determine different costs. There may be a temptation for readers to take issue with the line-by-line assumptions and the estimates we have developed. Readers should note, however, that the authors viewed each recommendation within the *broader* context of a framework for reform – the recommendations are invariably linked and to isolate the cost of one recommendation, without taking into consideration the cost of the others, would violate the spirit and intent of our estimates.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
1. The *Health Protection and Promotion Act* should be amended to require boards of health and the Minister of Health, acting in concert, to expeditiously fill any vacant Medical Officer of Health position with a full-time Medical Officer of Health.	None		• it is assumed that budget is already available to fill vacancies	
2. Random assessments should be conducted on a regular basis by the Minister of Health, or his or her delegate, pursuant to the *Health Protection and Promotion Act*, of public health boards in Ontario to ensure their compliance with the Mandatory Health Programs and Services Guidelines of the Public Health Branch. Further, the Public Health Branch or the Minister of Health's delegate should continue to track, on an annual basis, trends in non-compliance by public health boards in Ontario, in order to assess whether altered programs and services guidelines are required and whether resourcing allocations by the Province of Ontario require adjustment to ensure full compliance.	Ongoing	Province	• random assessments assumed not current practice • assume all 37 local health units in Ontario can be audited within year • allow at least five days or more to assess each board • assume minister's delegate would be a senior staff person • estimate 1 person-year of labour @ $150k (includes salary, benefits, administrative support, and overhead) • a margin of error of ±20% has been applied to the cost estimate • with respect to determining whether resource allocations require adjustment to ensure full compliance – it is difficult to estimate future funding needs	$120k/yr to $180k/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
3. The role of the local Medical Officers of Health and health units in relation to public health issues concerning treated and untreated municipal water systems, should be clarified and strengthened. In particular, clarification is required as to whether local Medical Officers of Health are required to implement a proactive approach to responding to adverse drinking water sample test results upon receiving notification of those results.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs • see also Part 2, 58 and Part 2, 77	
4. Written guidance – developed in cooperation with Medical Officers of Health and the MOE – should be provided to Medical Officers of Health by the Public Health Branch. It should include steps to be taken by Medical Officers of Health upon receipt of MOE inspection reports and adverse drinking water sample test results.	One-time	Province	• reasonable to assume that guidance document could be developed in-house by existing staff – this results in an opportunity cost, which is assumed to be equivalent to the cost of retaining consultants to develop the document • for expediency, consultants may be hired in any event • cost based on a consultant-developed report • "steps to be taken by Medical Officers of Health" assumed to be procedural changes that will not result in additional costs • a margin of error of ±50% has been applied to the cost estimate	$50k to $150k

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
5. Regular meetings should be scheduled between the local MOE office and local health unit personnel to discuss public health issues, including issues related to waterworks facilities as documented in MOE inspection reports. Any affected operator or laboratory should be invited to attend the meeting.	Ongoing	Province	• assumed not current practice • assume one-day meetings every quarter attended by senior staff at 37 local health units • cost to the local health unit represents an opportunity cost – for senior staff cost @$150k per year (including salary, benefits, administration, overhead) – equivalent to $700/day based on 220 business days • for municipality (operator) or laboratories, assume part of doing business • a margin of error of ±20% has been applied to the cost estimate	$83k/yr to $120k/yr
6. Upon the implementation by the MOE of the Integrated Divisional System (management information system), access to it should be made available to local health units and, where appropriate, to the public. This should include access to profiles of municipal water systems, and data concerning adverse drinking water quality sample test results, as included in that database.	One-time	Province	• cost is assumed to be for an interface to facilitate access by health units • a margin of error of ±50% has been applied to the cost estimate • see also Part 1, 25	$50k to $150k

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
7. The Public Health Branch should develop a Boil Water Protocol – a written protocol outlining the circumstances in which a boil water advisory or a boil water order could and should be issued. I will be commenting on the government's current draft proposal in the Part 2 report.	One-time	Province	• assumed to be a review of the existing draft Boil Water Protocol • could be done in-house by existing staff – this results in an opportunity cost, which is assumed to be equivalent to the cost of retaining consultants to review the document • for expediency, consultants may be hired in any event • a margin of error of ±50% has been applied to the cost estimate • see also Part 1, 8	$50k to $150k
8. The Boil Water Protocol should be developed by the Public Health Branch in consultation with Medical Officers of Health, municipalities, and the MOE. The Boil Water Protocol should provide guidance concerning an effective communications strategy for the dissemination of a boil water advisory or order.	See Part 1, 7			
9. The MOE should develop criteria for identifying "groundwater under the direct influence of surface water."	One-time	Province	• reasonable to assume that criteria could be developed in-house by existing staff – this results in an opportunity cost, which is assumed to be equivalent to the cost of retaining consultants to develop the criteria • cost estimate based on a consultant-developed criteria • sa margin of error of ±50% has been applied to the cost estimate	$100k to $300k

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
10. The MOE should maintain an information data system that includes all relevant information arising from an approval application process – in particular, information relating to the quality of source water and relevant details from expert reports and tests.	See Part 1, 25			
11. The MOE should require continuous chlorine and turbidity monitors for all groundwater sources that are under the direct influence of surface water or that serve municipal populations greater than a size prescribed by the MOE.	See Part 2, 36			
12. All Certificates of Approval should be limited to a specific period of time, probably five years, and be subject to a renewal process that considers the current circumstances, including recent indicators of water quality. Conditions should be added as required.	None		• assumed to be incorporated into Part 2 recommendations regarding owner's licences – see Chapter 11 – The Management of Municipal Water Systems • limiting Certificate of Approval (C of A) to a specific period of time assumed to be a change in policy that can be accommodated without incurring additional costs. • O. Reg. 459/00 – Drinking Water Protection Regulation – requires engineer's reports every three years and must include a review of the C of A for all waterworks • costs of the renewal process assumed to be part of O. Reg. 459/00 implementation costs	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
13. The MOE's inspections program for municipal water systems should consist of a combination of announced and unannounced inspections. The inspector may conduct unannounced inspections when he or she deems it appropriate, and at least once every three years, taking into account such factors as work priority and planning, time constraints, and the record of the operating authority.	See Part 2, 75			
14. The MOE should develop and make available to all MOE inspectors a written direction or protocol, for both announced and unannounced inspections: • outlining the specific matters to be reviewed by an inspector in preparing for the inspection of a water system; • providing a checklist of matters that an inspector is required to review, as well as matters that it may be desirable to review, during an inspection of a water system; and • providing guidance concerning those matters to be discussed with the operator of a water system during an inspection.	One-time	Province	• assumed to be an operating manual for field staff • reasonable to assume that manual could be developed in-house by existing staff – this results in an opportunity cost, which is assumed to be equivalent to the cost of retaining consultants to develop the manual • there are likely existing protocols that could be used as a basis • cost based on a consultant-developed manual • a margin of error of ±30% has been applied to the cost estimate	$70k to $130k
15. As a matter of policy, inspections of municipal water systems, whether announced or unannounced, should be conducted at least annually. The government's current program for annual inspections should be continued.	See Part 2, 75			

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
16. There should be a legal requirement that systems with significant deficiencies be inspected at least once per year. Ontario Regulation 459/00, also known as the Drinking Water Protection Regulation, should be amended to require that an inspection be conducted within one year of any inspection that discloses a deficiency as defined in the regulation. In this regard, deficiencies include any failure to comply with the treatment, monitoring, or testing requirements, or with specified performance criteria, set out in the regulation or in the accompanying drinking water standards.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs • see also Part 2, 75	
17. The government should ensure that adequate resources are provided to ensure that these inspections are thorough and effective.	See Part 2, 75			
18. Copies of MOE inspection reports should be provided to the manager of the water system, the members of the operating authority, the owner of the water system, the local Medical Officer of Health, the MOE's local office, and the MOE's Approvals Branch.	See Part 1, 25			
19. The MOE should establish and require adherence to time lines for the preparation and delivery of inspection reports and operator responses, and for the delivery of interim status reports regarding remedial action.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
20. The government should require all water system operators, including those who now hold certificates voluntarily obtained through the grandparenting process, to become certified through examination within two years, and to be periodically recertified.	One-time	Municipalities	• according to the Ministry of the Environment (MOE) there are currently 4,043 licensed waterworks operators in Ontario • it is estimated that 2,281 have not met any exam requirements and obtained their licence through the grandparenting process • assume $2,000 per person, which includes costs of required courses (if any), accommodation, travel, and living • in cases where Ontario Clean Water Agency (OCWA) or private sector is the operating agency, assumed that costs of training will be passed on to the municipality • the cost estimate is assumed to include the cost to invigilate the examinations and to grade examinations and record the results • assume 90% pass rate (and 10% must repeat) • it is assumed that all courses and examinations are delivered on a cost-recovery basis, such that costs incurred by the delivering agency (whether province, community college, or private sector) are fully paid for by the receiving agency • cost assumed to be borne by municipalities, as receiving agencies *(continued on next page)*	$4M to $6M

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
20. The government should require all water system operators, including those who now hold certificates voluntarily obtained through the grandparenting process, to become certified through examination within two years, and to be periodically recertified.	One-time	Municipalities	*(from previous page)* • it is acknowledged that there are 11 water treatment plants that are not municipally owned; however, it is assumed that only about 1% to 2% of the total cost associated with this recommendation would be borne by the non-municipal owners – this amount is less than the margin of error for the cost estimate, and as a result, a separate cost for the non-municipal owners has not been estimated • a margin of error of ±20% has been applied to the cost estimate	$4M to $6M
21. The materials for water operator course examinations and continuing education courses should emphasize, in addition to the technical requirements necessary for performing the functions of each class of operator, the gravity of the public health risks associated with a failure to treat and/or monitor drinking water properly, the need to seek appropriate assistance when such risks are identified, and the rationale for and importance of regulatory measures designed to prevent or identify those public health risks.	One-time	Province	• assumed to be an update of current course materials and exams • reasonable to assume that material could be updated in-house by existing staff – this results in a opportunity cost, which is assumed to be equivalent to the cost of retaining consultants to update materials • cost based on a consultant-developed report • a margin of error of ±20% has been applied to the cost estimate	$80k to $120k
22. The government should amend Ontario Regulation 435/93 to define "training" clearly, for the purposes of the 40 hours of annual mandatory training, with an emphasis on the subject matter described in Recommendation 21.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
23. The government should proceed with the proposed requirement that operators undertake 36 hours of MOE-approved training every three years as a condition of certification or renewal. Such courses should include training in emerging issues in water treatment and pathogen risks, emergency and contingency planning, the gravity of the public health risks associated with a failure to treat and/or monitor drinking water properly, the need to seek appropriate assistance when such risks are identified, and the rationale for and importance of regulatory measures designed to prevent or identify those public health risks.	Ongoing	Municipalities	• assumes 4,043 operators • assume $1,000 per person per year for 36 hours of coursework which includes cost of course, accommodation, travel and living – this results in a cost of $4,043,000 • assume cost spread equally over three years • in cases where OCWA or the private sector is the operating agency, it is assumed that training costs will be passed on to the municipality • it is acknowledged that there are 11 water treatment plants that are not municipally owned; however, it is assumed that only about 1% to 2% of the total cost associated with this recommendation would be borne by the non-municipal owners – this amount is less than the margin of error for the cost estimate, and as a result, a separate cost for the non-municipal owners has not been estimated • a margin of error of ±20% has been applied to the cost estimate	$1.1M/yr to $1.6M/yr
24. The MOE should inspect municipal water systems regularly for compliance with Ontario Regulation 435/93, enforce the regulation strictly, and follow up when non-compliance is found in order to ensure that operators meet certification and training standards.	See Part 2, 75			

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
25. The MOE should proceed expeditiously to complete the design and implementation of the management information system now under development (that is, the Integrated Divisional System, or IDS). That system should include the capacity for the creation and maintenance over time, in electronic form, of water system operator profiles consisting of any hydrogeological or other consultant's report relating to the water system; relevant operator chlorine residual measurements; past inspection reports; drinking water test results for a reasonable period; all operator responses to inspection reports; and all applicable Certificates of Approval, Permits to Take Water (PTTW), Field and Director's Orders, occurrence reports, and information concerning the safety and security of public water sources and supplies.	None		• this initiative was started in 1998 by the MOE • assumed currently being funded • see also Part 2, 79	
26. A full needs assessment for training should be undertaken for MOE technical staff, and a component of that assessment should focus on communal drinking water.	One-time	Province	• reasonable to assume that this could be done in-house by existing staff – this results in an opportunity cost, which is assumed to be equivalent to the cost of retaining consultants • cost based on a consultant doing the assessment • a margin of error of ±50% has been applied to the cost estimate • see also Part 1, 28	$50k to $150k

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
27. The MOE, on the basis of the needs assessment, should develop and maintain both introductory and advanced mandatory courses for environmental officers pertaining to communal drinking water systems. These courses should emphasize science and technology, including all matters that could present a risk to public health and safety; emerging pathogen risks; existing, new, and emerging treatment technologies; the limits of particular technologies; and the proper interpretation and application of government regulations, guidelines, and policies.	See Part 1, 28			
28. The MOE should devote sufficient resources to technical training to allow the ministry to meet the challenges outlined in its "Human Resources Business Plan and Learning Plan for Fiscal Year 2000–2001."	Ongoing	Province	• according to the Ministry of the Environment records, it appears that 125 person-years were involved in drinking water in fiscal year 2000-2001 (out of total staff complement of 1,575) • training required for existing staff and new staff: • Part 2, 33 – 6 person-years for water sciences and standards • Part 2, 42 -– 3 person-years for inspections of laboratories • Part 2, 69 – 26 person-years for new Drinking Water Branch • Part 2, 70 – 26 person-years for new Watershed Management Branch • Part 2, 72 – 5 person-years for new Office of Chief Inspector – Drinking Water • Part 2, 75 – 26 person-years for waterworks inspections • Part 2, 75 – 27 person-years for farm water protection plan inspections *(continued on next page)*	$240k/yr to $730k/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 1 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
28. The MOE should devote sufficient resources to technical training to allow the ministry to meet the challenges outlined in its "Human Resources Business Plan and Learning Plan for Fiscal Year 2000–2001."	Ongoing	Province	*(from previous page)* • total existing and new staff potentially involved in drinking water assumed to be 244 person-years • assume number of person-years is equivalent to number of staff; thus training is needed for 244 (existing plus new) • assume $2,000 per staff per year for training; this training assumed specific to drinking water issues • a margin of error of ±50% has been applied to the cost estimate • see also Part 1, 26	$240k/yr to $730k/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
1. Drinking water sources should be protected by developing watershed-based source protection plans on a watershed basis. Source protection plans should be required for all watersheds in Ontario.	One-time	Province	• recommendation requires both planning and implementation activities • currently about 10 million ha are managed by Conservation Authorities (CA) • assume planning is required for 15 million ha (17% of province) • assume a 2-stage planning process: (1) inventory and mapping for entire area @ $1.76/ha, and (2) detailed technical studies @ $5.48/ha for 20% of area (unit costs based on information in "Inventory of watershed management projects in Ontario," MOE, 1997) • this yields an estimated cost of $43 million • the MOE has announced $10 million to fund municipal groundwater studies as part of Operation Clean Water, and $4.3 million to fund groundwater studies under the Provincial Water Protection Fund during fiscal year 2000-2001 – it assumed that the results of these programs can be used for planning; thus the $43 million can be reduced by $14.3 million to $28.7 million • a margin of error of ±50% has been applied to the estimated cost • see also Part 2, 8	$14M to $43M
2. The Ministry of the Environment should ensure that draft source protection plans are prepared through an inclusive process of local consultation. Where appropriate, this process should be managed by conservation authorities.	See Part 2, 1			

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
3. Draft source protection plans should be reviewed by the Ministry of the Environment and subject to ministry approval.	See Part 2, 70			
4. Provincial government decisions that affect the quality of drinking water sources must be consistent with approved source protection plans.	See Part 2, 70			
5. Where the potential exists for a significant direct threat to drinking water sources, municipal official plans and decisions must be consistent with the applicable source protection plan. Otherwise, municipal official plans and decisions should have regard to the source protection plan. The plans should designate areas where consistency is required.	See Part 2, 70			
6. The provincial government should provide for limited rights of appeal to challenge source protection plans, and provincial and municipal decisions that are inconsistent with the plans.	Ongoing	Province	• assume reliance on existing board • assume $300/day honorarium for five board members • assume five days of meetings per month • assume support equivalent to 2 person-years @ $100k (includes salary, benefits, and overhead) • a margin of error of ±50% has been applied to the estimated cost	$140k/yr to $440k/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
7. The provincial government should ensure that sufficient funds are available to complete the planning and adoption of source protection plans.	One-time	Province	• assume cost is for developing a guidance document • reasonable to assume that this could be done in-house by existing staff – this results in an opportunity cost, which is assumed to be equivalent to the cost of retaining consultants • cost based on a consultant doing the assessment • a margin of error of ±50% has been applied to the cost estimate	$50k to $150k
8. Conservation authorities (or, in their absence, the Ministry of the Environment) should be responsible for implementing local initiatives to educate landowners, industry, and the public about the requirements and importance of drinking water source protection.	Ongoing	Province	• assume an average requirement of 1 person-year for each of the 36 Conservation Authorities (CAs) plus another 14 person-years for areas not managed by CAs; this results in estimated 50 person-years @ $100,000 each • a margin of error of ±50% has been applied to the cost estimate	$2.5M/yr to $7.5M/yr
9. Septic systems should be inspected as a condition for the transfer of a deed.	Ongoing	Individuals	• assume that population not served by a communal sewage system is served by septic systems • total Ontario population is 11.4 million (2001 census); serviced population is 8.25 million (Doyle, 2002); unserviced population is (11.4 – 8.25 million) 3.15 million • assume 2.5 persons per household – yields approximately 1.26 million households on septic systems • alternatively, it has been estimated that there are 400,000 to 1,000,000 septic systems in Ontario *(continued on next page)*	$2.5M/yr to $7.5M/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
9. Septic systems should be inspected as a condition for the transfer of a deed.	Ongoing	Individuals	*(from previous page)* • assuming 1,000,000 septic systems and 5% turnover of properties with septic systems per year, yields 50,000 inspections annually • assume $100 per inspection of septic tank only; inspecting field beds would likely incur extra costs, not included here • a margin of error of ±50% has been applied to the cost estimate • note that making septic system inspection a requirement on transfer of deed would require legislative amendment(s); assume this could be accommodated without incurring additional cost to the Province	$2.5M/yr to $7.5M/yr
10. The Ministry of the Environment should not issue Certificates of Approval for the spreading of waste materials unless they are compatible with the applicable source protection plan.	See Part 2, 70			
11. The Ministry of the Environment should take the lead role in regulating the potential impacts of farm activities on drinking water sources. The Ministry of Agriculture, Food and Rural Affairs should provide technical support to the Ministry of the Environment and should continue to advise farmers about the protection of drinking water sources.	See Part 2, 15			
12. Where necessary, the Ministry of the Environment should establish minimum regulatory requirements for agricultural activities that generate impacts on drinking water sources.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
13. All large or intensive farms, and all farms in areas designated as sensitive or high-risk by the applicable source protection plan, should be required to develop individual water protection plans consistent with the source protection plan.	One-time + Ongoing	Individual farm owners/Province	• costing based on the Environmental Farm Plan (EFP) program "Revamped Environmental Farm Plan Program Continues To Spark Global • Interest." AGCare Archives <http://www.agcare.org/achome.gif> • under EFP program, 3,100 farm operators developed and implemented EFPs at a cost of • $19.5 million, or $6,267 per farm ($6,800 in 2002 dollars) • assume recommendation applies to largest 5% of farms, based on income and crop land area plus 20% of all other farms • estimate there are 15,000 such farms (based on 1996 census data) • ongoing costs will be incurred by individuals to update the plans from time to time • assume plans revised every ten years at 20% of original cost • a margin of error of ±50% has been applied to the cost estimate • see also Part 2, 16 – cost-sharing	One-time: $51M to $150M Ongoing: $1M/yr to $3.1M/yr
14. Once a farm has in place an individual water protection plan that is consistent with the applicable source protection plan, municipalities should not have the authority to require that farm to meet a higher standard of protection of drinking water sources than that which is laid out in the farm's water protection plan.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
15. The Ministry of the Environment should work with the Ministry of Agriculture, Food and Rural Affairs, agricultural groups, conservation authorities, municipalities, and other interested groups to create a provincial framework for developing individual farm water protection plans.	One-time	Province	• assume Province could rely on EFP program experience and information to develop framework • cost assumed to be for additional technical studies required to compile and review source protection research data and for consultations with stakeholders • a margin of error of ±50% has been applied to the cost estimate • for resources required for enforcement of the farm protection plans see Part 2, 75	$100k to $300k
16. The provincial government, through the Ministry of Agriculture, Food and Rural Affairs in collaboration with the Ministry of the Environment, should establish a system of cost-share incentives for water protection projects on farms.	See Part 2, 13			
17. The regulation of other industries by the provincial government and by municipalities must be consistent with provincially approved source protection plans.	See Part 2, 70			
18. In setting drinking water quality standards, the objective should be such that, if the standards are met, a reasonable and informed person would feel safe drinking the water.	None		• assumed to be a policy that could be accommodated without incurring additional costs	
19. Standards setting should be based on a precautionary approach, particularly with respect to contaminants whose effects on human health are unknown.	None		• assumed to be a policy that could be accommodated without incurring additional costs	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
20. Regarding drinking water quality research, I encourage Health Canada and other agencies to adopt as a priority the development of sufficiently detailed definitions of the susceptibility of vulnerable population groups to drinking water contaminant exposures to allow appropriate adjustments in drinking water quality guidelines.		Federal		Not estimated
21. I suggest that the federal-provincial process for proposing drinking water quality guidelines be refined to provide for greater transparency and public participation.		Federal		Not estimated
22. The regulation of other industries by the provincial government and by municipalities must be consistent with provincially approved source protection plans.		Federal		Not estimated
23. I encourage the federal government to adopt standards that are as stringent as, or more stringent than, Ontario Regulation 459/00 for all federal facilities, Indian reserves, national parks, military installations, and other lands under federal jurisdiction in Ontario.		Federal		Not estimated
24. The provincial government should continue to be the government responsible for setting legally binding drinking water quality standards.	None		• assumed to be a policy that could be accommodated without incurring additional costs	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
25. In setting drinking water quality standards for Ontario, the Minister of the Environment should be advised by an Advisory Council on Standards.	Ongoing	Province	• assume five appointees • assume $300/day honorarium for each appointee • assume five days of meetings per month • assume support equivalent to 2 person-years @ $100k each (includes salary, benefits, and overhead) • assume a research budget of $100k per year • a margin of error of ±50% has been applied to the cost estimate	$200k/yr to $580k/yr
26. The Advisory Council on Standards should have the authority to recommend that the provincial government adopt standards for contaminants that are not on the current federal-provincial agenda.	None		• assumed to be a policy that could be accommodated without incurring additional costs	
27. The Advisory Council on Standards should consider whether to replace the total coliform test with an *E. coli* test.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	
28. No formal maximum contaminant level for protozoa should be established until real-time tests are available. The objective, as with bacterial and viral pathogens, should be zero, and the regulations should so state; but the standard should be a treatment standard, specified in terms of log removal dependent on source water quality.	None (at this time)		• there are insufficient data to estimate a cost at this time	Not estimated

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
29. The provincial government should seek the advice of the Advisory Council on Standards regarding the desirability of a turbidity limit that is lower than the limit specified in the federal-provincial Guidelines.	See Part 2, 25			
30. All raw water intended for drinking water should be subject to a characterization of each parameter that could indicate a public health risk. The results, regardless of the type of source, should be taken into account in designing and approving any treatment system.	None		• already required by O. Reg. 459/00 (see non-Inquiry costs at end of this report) • assumed to apply to municipal water systems • current practice is to base design on characterization	
31. The Advisory Council on Standards should review Ontario's standards for disinfection by-products to take account of the risks that may be posed by the by-products of all chemical and radiation-based disinfectants.	See Part 2, 25			
32. The provincial government should support major wastewater plant operators in collaborative studies aimed at identifying practical methods of reducing or removing heavy metals and priority organics (such as endocrine disruptors) that are not removed by conventional treatment.	Ongoing	Province	• assumes Province will provide financial assistance to run pilot studies • cost per pilot study assumed to be $500k/yr • assume four pilot studies each year • a margin of error of ±50% has been applied to the cost estimate	$1M/yr to $3M/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
33. The Ministry of the Environment should be adequately resourced to support a water sciences and standards function in relation to drinking water.	Ongoing	Province	• assume 6 person-years @ $100k (includes salary, benefits, and overhead) • focus would be on research, standard-setting, inspection and oversight of accredited laboratories, providing specialist expertise to new branches, and coordinating collaborative studies • a margin of error of ±50% has been added to the cost estimate • it is assumed that the 6 person-years will be part of the new Drinking Water Branch – see Part 2, 69	$300k/yr to $900k/yr
34. The provincial government should encourage the federal government, working with the Standards Council of Canada and with advice from municipalities, the water industry, and other stakeholders, to develop standards for materials, including piping, valves, storage tanks, and bulk chemicals, that come into contact with drinking water.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	
35. As part of an asset management program, lead service lines should be located and replaced over time with safer materials.	One-time	Municipalities/ Individuals	• service connections comprised of municipal portion (on municipal right-of-way) and private portion (on private property) • assume replacement cost is $3k ($1.5k for municipal portion and $1.5k for private portion) per service connection • however, total number and length of lead service lines in Ontario is unknown	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
36. All municipal water providers in Ontario should have, as a minimum, continuous inline monitoring of turbidity, disinfectant residual, and pressure at the treatment plant, together with alarms that signal immediately when any regulatory parameters are exceeded. The disinfectant residual should be continuously or frequently measured in the distribution system. Where needed, alarms should be accompanied by automatic shut-off mechanisms.	One-time	Municipalities	• it is difficult to estimate the cost of this recommendation – many waterworks have monitors already, and many would require more than one set of monitors • nonetheless, assuming one of each type of monitor for all waterworks (672 waterworks). • assume cost of continuous chlorine detector to be $7k, cost of continuous turbidimeter to be $5k, and cost of continuous pressure monitor to be $4k • cost of installation, ancillary equipment, data storage, remote display, etc., is extra and is assumed to be 50% of capital cost • includes cost of Part 1, 11 • a margin of error of ±50% has been applied to the cost estimate	$8.1M to $24M
37. Every municipal water provider should be responsible for developing an adequate sampling and continuous measurement plan as part of its operational plan, as recommended in Chapter 11 of this report.	See Part 2, 56			
38. Sampling plans should provide for sampling under the conditions most challenging to the system, such as after heavy rainfalls or spring floods.	See Part 2, 56			
39. Ontario Regulation 459/00 should be modified to require standard protocols for the collection, transport, custody, labelling, testing, and reporting of drinking water samples, and for testing all scheduled contaminants, that meet or better the protocols in *Standard Methods*.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
40. Where remoteness dictates that samples for bacteriological analysis cannot be delivered to a lab within regulated times or under guaranteed conditions, the Ministry of the Environment should determine the feasibility of alternative means of providing microbiological testing that meet the requirements of *Standard Methods*.	One-time + Ongoing	Province	• assume that feasibility study could be done in-house by existing staff – this results in an opportunity cost, which is assumed to be equivalent to the cost of retaining consultants • cost based on a consultant undertaking the feasibility study • a margin of error of ±50% has been applied to the cost estimate • no attempt has been made to estimate the costs associated with providing the testing because the need for alternative means of testing will not be known until the feasibility study has been completed	One-time: $50k to $150k Ongoing: not estimated
41. The provincial government should phase in the mandatory accreditation of laboratories for all testing parameters, and all drinking water testing should be performed only by accredited facilities.	See Part 2, 42			
42. The Ministry of the Environment should license and periodically inspect, as required, environmental laboratories that offer drinking water testing; as with water treatment operations, continuing accreditation should be a condition of licence.	One-time + Ongoing	Province	• assume administrative fee of $200 per licence application for 50 laboratories • assume 3 person-years @ $100k each (includes salary, benefits, and overhead) for inspection • a margin of error of ±50% has been applied to the cost estimates • it is assumed that the 3 person-years will be part of the existing Laboratory Services Branch of the Ministry of the Environment	One-time: $5k to $15k Ongoing: $150k/yr to $450k/yr
43. The results of laboratory accreditation audits should be provided to the Ministry of the Environment and should be publicly available.	See Part 2, 79			

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
44. Municipalities should review the management and operating structure for their water system to ensure that it is capable of providing safe drinking water on a reliable basis.	One-time	Municipalities	• it is assumed that municipalities will rely on external consulting advice at an estimated cost of $20k to $250k (the lower cost is assumed to apply to smaller municipalities and the higher cost is assumed to apply to larger municipalities), and/or if the full suite of expertise (i.e., legal, financial, management advice) is pursued • according to MOE database, 262 municipalities own waterworks • cost to undertake reviews – 80% at $20k, 15% at $50k each, and 5% at $250k each • a margin of error of ±30% has been applied to the cost estimate	$6.6M to $12M
45. Given that the safety of drinking water is essential for public health, those who discharge the oversight responsibilities of the municipality should be held to a statutory standard of care.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	
46. The provincial government should provide guidance and technical advice to support municipal reviews of water systems.			• assume preparation of a guidance document • reasonable to assume that this could be done in-house by existing staff – this results in an opportunity cost, which is assumed to be equivalent to the cost of retaining consultants • cost based on a consultant participation • a margin of error of ±50% has been applied to the cost estimate • assume ongoing technical assistance available from new Drinking Water Branch and the costs for this would be included as part of the cost of the new branch – see Part 2, 69	One-time: $50k to $150k Ongoing: see Part 2, 69

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
47. The provincial government should require municipalities to submit a financial plan for their water system, in accordance with provincial standards, as a condition of licence for their water systems.	One-time + Ongoing	Municipalities/ Province	• if a municipality has complete information about assets, then cost to develop a financial plan assumed to range from $20k to $50k per plan • there are 262 municipal owners; assume one plan will be developed by each • review of the financial plans assumed to be based on a 5-year cycle, per Part 1, 12 • assume 1 person-year @ $100k (includes salary, benefits, and overhead) • a margin of error of 50% has been applied to the ongoing cost estimate • person-year assumed assigned to Ministry of Municipal Affairs and Housing (MMAH) • assume technical assistance and oversight of financial plans provided by new Drinking Water Branch – see Part 2, 69 • assume that Bill 155 will become law	One-time: $5.2M to $13.0M Ongoing: $50k/yr to $150k/yr
48. As a general principle, municipalities should plan to raise adequate resources for their water systems from local revenue sources, barring exceptional circumstances.	See assumption		• recommendation refers to the source of funding, not the amount, therefore it is not considered a cost	
49. Municipal contracts with external operating agencies should be made public.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
50. The role of the Ontario Clean Water Agency in offering operational services to municipalities should be maintained. The provincial government should clarify the Ontario Clean Water Agency's status and mandate. In particular, OCWA should be: • an arm's-length agency with an independent, qualified board responsible for choosing the chief executive; and • available to provide standby emergency capabilities.	Ongoing	Province/ Municipalities	• with respect to the first item, that is, OCWA as an arm's-length agency with an independent, qualified board, any amendment to the agreement between the provincial government and OCWA could be considered a change in policy that could be accommodated without incurring additional costs • with respect to the second item, that is, the provincial government contracting with OCWA for emergency standby services, the incidence of emergencies is indeterminate	Not estimated
51. The provincial government should require all owners of municipal water systems, as condition of their licence (see Recommendation 71), to have an accredited operating agency, whether internal or external to the municipality.	One-time	Municipalities	• assume one operating agency per municipal owner, this yields 262 operating agencies to be accredited • there are water-industry specific models for assessing operational aspects of water systems (i.e., AWWA Partnership for Safe Drinking Water, QualServe, Australia's Framework for Management of Drinking Water Quality, and Guidelines for Drinking Water Quality Management in New Zealand); these models vary in terms of their focus and none are full-scale accreditation programs *(continued on next page)*	$3.7M to $11M

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
51. The provincial government should require all owners of municipal water systems, as condition of their licence (see Recommendation 71), to have an accredited operating agency, whether internal or external to the municipality.	One-time	Municipalities	*(from previous page)* • while not specific to the water industry, ISO accreditation can provide a point of comparison; e.g., accreditation under ISO 9000 ranges from a few thousand dollars to upwards of $50,000 (depending on the consultant's involvement), and the cost of ISO 14001 certification process, beginning with gap analysis and culminating with certification, can run from $40k to more than $100k • cost of accreditation will depend on a range of factors, including the size of the system, and the quality management standard • assume costs may range from a few thousand to $100k per operating agency – assume 80% at $20k, 15% at $50k each, and 5% at $100k each • it is assumed that the cost of accreditation will be borne by the municipality (i.e., if the municipal owner contracts with an operating agency, then the operating agency will pass along the costs of accreditation) • a margin of error of ±50% has been applied to the cost estimate	$3.7M to $11M

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
52. Accreditation should be based on an independent audit and a periodic review by a certified accrediting body.	Ongoing	Province	• assume 262 audits on a two-year auditing cycle • assume five days per audit and four persons per auditing team, yields 12 person-years @ $100k (includes salary, benefits, and overhead), based on 220 business days per year • a margin of error of ±50% has been applied to the cost estimate	$600k/yr to $1.8M/yr
53. The Ministry of the Environment should initiate the development of a drinking water quality management standard for Ontario. Municipalities, the water industry, and other relevant stakeholders should be actively recruited to take part in the development of the standard. The water industry is recognized as an essential participant in this initiative.	One-time	Province	• development of a committee-based standard assuming 40 stakeholder participants are provided participatory funding to attend 20 days of meetings • assume $300 per day honorarium per participant • assume $500 per day for travel and living per participant • a margin of error of ±50% has been applied to the cost estimate	$320k to $960k
54. The Ministry of the Environment's Drinking Water Branch (see Recommendation 69) should have the responsibility for recognizing the drinking water quality management standard that will apply in Ontario and for ensuring that accreditation is properly implemented.	See Part 2, 69			

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
55. The drinking water quality management standard should come into force by a date to be fixed by the provincial government. All municipalities should be required under the *Safe Drinking Water Act* (see Recommendation 67) to have an operating agency for their water system accredited within a specified time.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	
56. The provincial government should require municipalities to have operational plans for their water systems by a date to be fixed by the provincial government.	One-time	Municipalities	• there are 672 waterworks identified by the Ministry of the Environment • assume one plan for each • 80% at $10k, 15% at $25k each, and 5% at $50k each • a margin of error of ±50% has been applied to the estimated cost	$4.8M to $14M
57. Operational plans should be approved and reviewed as part of the Ministry of the Environment approvals and inspections programs.	Ongoing	Province	• review of operational plans considered addition to existing provincial approvals • assume review could take 0.5 days per operational plan • there are 672 waterworks identified by the Ministry of the Environment; assume one plan for each, this yields approximately 1.5 person-years @ $100k each • a margin of error of ±50% has been applied to the estimated cost • for inspections, see Part 2, 75	$75k/yr to $220k/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
58. The Ministry of the Environment should work with Emergency Measures Ontario and water industry associations to develop a generic emergency response plan for municipal water providers. A viable and current emergency response plan, and procedures for training and periodic testing of the plan, should be an essential element of mandatory accreditation and operational planning.	One-time	Province	• reasonable to assume that this could be done in-house by existing staff – this results in a opportunity cost, which is assumed to be equivalent to the cost of retaining consultants • cost estimate based on consultant-developed plan • a margin of error of ±50% has been applied to the cost estimate • see also Part 1, 3	$50k to $150k
59. The Ministry of the Environment should continue to require the mandatory certification of persons who perform operational work in water treatment and distribution facilities. Education, examination, and experience are essential components of ensuring competence.	None		• assumed to be a policy that could be accommodated without incurring additional costs	
60. The Ministry of the Environment should require water system operators who currently hold certificates obtained through the grandparenting process to become certified through examination within two years, and it should require operators to be recertified periodically.	See Part 1, 20			
61. The Ministry of the Environment should require all applicants for an operator's licence at the entry level to complete a training course that has a specific curriculum to ensure a basic minimum knowledge of principles in relevant subject areas.	None		• assumed to be a policy that could be accommodated without incurring additional costs	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
62. The Ministry of the Environment should develop a comprehensive training curriculum for operators and should consolidate the current annual training requirement in Ontario Regulation 435/93 and the proposed requirement of ministry-approved training into a single, integrated program approved by the Ministry of the Environment.	One-time	Province	• reasonable to assume that this could be done in-house by existing staff – this results in an opportunity cost, which is assumed to be equivalent to the cost of retaining consultants • cost based on consultant participation • a margin of error of ±50% has been applied to the cost estimate • for cost of training, see Part 1, 23	$50k to $150k
63. The Ministry of the Environment should take measures to ensure that training courses are accessible to operators in small and remote communities and that the courses are tailored to meet the needs of the operators of these water systems.	Ongoing	Province	• assumes a review of existing training and greater involvement in ensuring availability of training than currently exists • there are different delivery mechanisms, including web-based courses through to a mobile trainer based on 1 or more person-years • for purpose of estimating cost assume 2 person-years @ $100k each (includes salary, benefits, and overhead) • a margin of error of ±50% has been applied to the cost estimate	$100k/yr to $300k/yr
64. The Ministry of the Environment should require water system operators who currently hold certificates obtained through the grandparenting process to become certified through examination within two years, and it should require operators to be recertified periodically.	See Part 1, 20			

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
65. The provincial government should develop a comprehensive "source to tap" drinking water policy covering all elements of the provision of drinking water, from source protection to standards development, treatment, distribution, and emergency response.	None		• assumed to be a policy that could be accommodated without incurring additional costs	
66. The Ministry of the Environment should be the lead ministry responsible for developing and implementing the "source to tap" Drinking Water Policy.	See Part 2, 69			
67. The provincial government should enact a *Safe Drinking Water Act* to deal with matters related to the treatment and distribution of drinking water.	None		• assumed to be a policy that could be accommodated without incurring additional costs	
68. The provincial government should amend the *Environmental Protection Act* to implement the recommendations regarding source protection.			• assumed to be a change in policy that could be accommodated without incurring additional costs	
69. The provincial government should create a Drinking Water Branch within the Ministry of the Environment to be responsible for overseeing the drinking water treatment and distribution system.	Ongoing	Province	• assume head office staff re-organized from existing complement • assume an additional 26 person-years @ $100k (includes salary, benefits, and overhead) each to serve the needs of the regional/district offices • assume a margin of error of ±50% • responsibilities expected to include, but not limited to, plan review, approvals, standard setting, technical support, and inspections *(continued on next page)*	$1.3M/yr to $3.9M/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
69. The provincial government should create a Drinking Water Branch within the Ministry of the Environment to be responsible for overseeing the drinking water treatment and distribution system.	Ongoing	Province	*(from previous page)* • note: it is assumed that the Branch would also comprise the following (costs shown elsewhere): - Part 2, 33 – 6 person-years for water sciences and standards - Part 2, 72 – 5 person-years for new Office of Chief Inspector - Part 2, 75 – 26 person-years for inspections of waterworks	$1.3M/yr to $3.9M/yr
70. The provincial government should create a Watershed Management Branch within the Ministry of the Environment to be responsible for oversight of watershed-based source protection plans and, if implemented, watershed management plans.	Ongoing	Province	• assume head office staff reorganized from existing complement • assume, at a minimum, an additional 26 person-years @ $100k (includes salary, benefits, and overhead) each to serve the needs of the regional/district offices • assume a margin of error of ±50% • note: it is assumed that the branch would also comprise the 27 person-years for farm water protection plan inspectors (costs shown elsewhere) – see Part 2, 75	$1.3M/yr to $3.9M/yr
71. The Ministry of the Environment should require the owners of municipal water systems to obtain an owner's licence for the operation of their waterworks. In order to obtain a licence, an owner should have: • a Certificate of Approval for the facility; • a Permit to Take Water; • approved operational plans; • an approved financial plan; and, • an accredited operating agency.	One-time	Municipalities	• costs to prepare operational plan, financial plan and obtain accredited operator shown elsewhere under respective recommendation • assumed that owners already have Certificates of Approval and Permits to Take Water in hand • assume licence application administrative fee of $200 per owner for 262 municipal owners • a margin of error of ±50% has been applied to the cost estimate	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
72. The provincial government should create an office of Chief Inspector - Drinking Water Systems.	Ongoing	Province	• assume this is primarily a coordinating function • assume 5 person-years – 1 Chief Inspector @ $250 k/yr, 2 person-years @ $150k/yr each and 2 person-years @ $100k/yr each (includes salary, benefits, and overhead) • a margin of error of ±20% has been applied to the cost estimate	$600k/yr to $900k/yr
73. Inspectors should be required to have the same or higher qualifications as the operators of the systems they inspect and should receive special training in inspections.	See Part 1, 28			
74. The Ministry of the Environment should increase its commitment to the use of mandatory abatement.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs • see also Part 2, 75	
75. The Ministry of the Environment should increase its commitment to strict enforcement of all regulations and provisions related to the safety of drinking water.	Ongoing	Province	*Waterworks* • assume, at a minimum, an additional 26 person-years @ $100k (includes salary, benefits, and overhead) to serve the needs of the regional/district offices • see also Part 1, 13; Part 1, 16; Part 1, 17; Part 1, 24 • assume inspectors contemplated here will become part of new Drinking Water Branch (see Part 2, 69) *(continued on next page)*	$2.7M/yr to $7.9M/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
75. The Ministry of the Environment should increase its commitment to strict enforcement of all regulations and provisions related to the safety of drinking water.	Ongoing	Province	*(from previous page)* *Farm Water Protection Plans* • assume 10% of 15,000 farms (see Part 2, 13) inspected randomly every year, yields 1,500 farm inspections per year • assume one farm inspection takes two days and is done by a two-person inspection team; • yields approximately 27 person-years @ $100k each (includes salary, benefits, and overhead), based on 220 business days per year • see also Part 2, 11 and Part 2, 13 • assume inspectors contemplated here will become part of the new Watershed Management Branch (see Part 2, 70) • a margin of error of ±50% has been applied to the cost estimate	$2.7M/yr to $7.9M/yr
76. The Ministry of the Environment should initiate a process whereby the public can require the Investigations and Enforcement Branch to investigate alleged violations of drinking water provisions.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
77. A steering group should be established within each public health unit area in the province, comprised of representatives of affected local hospitals, municipalities, local Ministry of the Environment offices and local boards of health, for the purpose of developing in a coordinated fashion emergency response plans for the control of, or the response to, infectious diseases and public health hazard outbreaks.	Ongoing	Province/ Municipalities	• there are 37 public health units in Ontario • assume 8 participants per steering group and 37 steering groups • assume 1 day of meetings per month, yields 12 days per year • cost to participate on steering group represents an opportunity cost – if participants are assumed to be senior staff @ $150k per year (including salary, benefits, administration, and overhead), this is equivalent to $700/day based on 220 business days • a margin of error of ±50% has been applied to the cost estimate • see also Part 2, 58	$1.2M/yr to $3.7M/yr
78. The provincial government should ensure that programs relating to the safety of drinking water are adequately funded.	Ongoing	Province	• assume the provincial government will establish a financial plan for programs relating to the safety of drinking water, and that this will be done in-house using existing resources • the amount of funding deemed to be adequate will depend on the provincial government's adoption of these recommendations, as well as costs associated with other initiatives, either currently in place or proposed in the future – the total cost of which is not known at this time	Not estimated

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
79. The Ministry of the Environment should create an Integrated Divisional System which provides central electronic access to information: • relevant to source protection; • relevant to each drinking water system in Ontario (including a description of the system, trend analyses, water quality, and systems data); • required by the Drinking Water Branch (including for approvals and inspections); and • required by local Boards of Health.	One-time	Province	• this initiative was started at the MOE in 1998 • assume cost is for software development, estimated to be $200k • reasonable to assume this could be done in-house by existing staff – this results in • opportunity cost, which is assumed to be equivalent to the cost of retaining consultants to integrate the components into the system • a margin of error of 20% has been applied to the cost estimate (this initiative is nearing completion – see Part 1, 25)	$160k to $240k
80. The Drinking Water Branch should prepare an annual "State of Ontario's Drinking Water Report" which should be tabled in the Legislature.	See Part 2, 72		• assumed to be duty of the Chief Inspector – Drinking Water Systems (Part 2, 72)	
81. Ontario Regulation 459/00 should apply to any system that provides drinking water to more than a prescribed number of private residences.	Ongoing	Individuals	• there are insufficient data available to estimate the number of such systems	Not estimated
82. The Ministry of the Environment should establish a procedure under which owners of communal water systems may apply for a variance from provincial regulations only if a risk analysis and management plan demonstrate that safe drinking water can be provided by means other than those laid down in regulations.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs • on implementation of the procedure, cost to the individual water providers could increase or decrease, depending on the type of variance.	
83. The provincial government should not approve water systems that would not be economically viable under the regulatory regime existing at the time of the application.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs • assumed to take place at the time of review of financial plan, operational plan, and owner's licence	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
84. Approved systems that are not economically viable under the improved regulatory scheme should be required to explore all managerial, operational, and technological options to find the most economical way of providing safe drinking water. If the system is still too expensive, the provincial government should make assistance available to lower the cost per household to a predetermined level.	Ongoing		• the incidence of systems that are not economically viable is indeterminate at this time	Not estimated
85. The application of Ontario Regulation 505/01 should be broadened to include all owners of water systems that serve the public for a commercial or institutional purpose and that do not come within the requirements of Ontario Regulation 459/00.	One-time + Ongoing		• there are insufficient data available to estimate the number of such water providers at this time	Not estimated
86. With regard to private drinking water systems that are not covered by either Ontario Regulation 459/00 or Ontario Regulation 505/01, the provincial government should provide the public with information about how to supply water safely and should ensure that this information is well distributed. It should also maintain the system of licensing well drillers and ensure the easy availability of microbiological testing, including testing for *E. coli*.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	
87. The provincial government should review the current practices for the delivery of drinking water in bulk and the need for a regulatory framework in this area.	None		• assumed to be a change in policy that could be accommodated without incurring additional costs	

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
88. 88. Ontario First Nations should be invited to join in the watershed planning process outlined in Chapter 4 of this report.	None		• assumed to be a policy that could be accommodated without incurring additional costs	
89. I encourage First Nations and the federal government to formally adopt drinking water standards, applicable to reserves, that are as stringent as, or more stringent than, the standards adopted by the provincial government.		Federal		Not estimated
90. I encourage First Nations and the federal government to consider moving to a quality management standard over time, even if the consequence is that several communities, perhaps both reserve and non-reserve, might collaborate on a regional basis, or that First Nation communities might choose to contract with others to manage their water supply systems.		Federal		Not estimated
91. The provincial government should require the Ontario Clean Water Agency (OCWA) to offer its services to First Nations band councils for operating on-reserve water systems on a normal commercial basis.		Federal		Not estimated
92. The provincial government should actively offer, on a cost-recovery basis, its training facilities and curriculum to First Nations water system operators.		Federal		Not estimated

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

Part 2 Recommendation	Type	Borne by	Assumptions	Estimated Cost*
93. As a matter of principle, the provincial government should make technical assistance, drinking water testing, inspection, and enforcement available to First Nations communities on a cost-recovery basis, if requested.		Federal		Not estimated

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report and the full text of the Part One Report of the Walkerton Inquiry. All estimated costs have been rounded to two significant digits.

O. Reg. 459/00 Item	Type	Borne by	Assumptions	Estimated Cost*
Minimum Treatment Requirements per s. 5(5): "(1) The owner of a water treatment or distribution system that obtains water from a ground water source shall ensure provision of a minimum level of treatment consisting of disinfection. (2) The owner of a water treatment or distribution system that obtains water from a surface water source shall ensure provision of a minimum level of treatment consisting of chemically assisted filtration and disinfection.".	One-time	Municipalities	• MOE database does not contain complete information about treatment processes at all Ontario waterworks • available information indicates 132 waterworks affected by s. 5(5) – 74 list groundwater source, but do not indicate that disinfection is provided, 18 waterworks list surface water source, but do not indicate that chemically assisted filtration is provided, and 40 waterworks list a surface water source, but indicate neither disinfection nor chemically assisted filtration • chlorination assumed to be disinfection method used because regulation requires that chlorine residual be maintained in the water distribution system • one approach is to use U.S. EPA capital cost curves for disinfection (assumed to be chlorination) and for filtration – this yields an estimated cost of $180,000,000 • another approach is to use Canadian Water and Wastewater Association estimated cost for minor upgrades (identified to include such upgrades as installation of filtration), equal to $300 per capita (assumed to be per person served) • population affected by s. 5(5) is approximately 430,000 per Ministry of the Environment data – at $300k per person, this yields $130,000,000 • a margin of error of ±50% has been applied to the range	$65M to $270M

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report. All estimated costs have been rounded to two significant digits.

O. Reg. 459/00 Item	Type	Borne by	Assumptions	Estimated Cost*
Operations and maintenance costs at waterworks affected by section 5(5).	Ongoing	Municipalities	• one approach is to base increased operations and maintenance costs on historical expenditures • using Ontario Ministry of Municipal Affairs and Housing Financial Information Return (FIR) data, operations and maintenance expenditures by Ontario municipalities amounted to $969.5 million in 1999 (the latest year for which data were readily available) – this results in a unit cost of $117 per person, based on a serviced population of 8.25 million (Doyle, 2002) • applying unit cost to the population served by the affected waterworks (430,000) yields $50 million per year • another approach is to prorate the amount reported spent on water system operations by a % equivalent to the design capacity at waterworks affected by s. 5(5) • capacity affected is approximately 8% • 8% of 1999 O&M expenditures is about $78 million • a margin of error of ±50% has been applied to the estimated cost range	$25M/yr to $120M/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report. All estimated costs have been rounded to two significant digits.

O. Reg. 459/00 Item	Type	Borne by	Assumptions	Estimated Cost*
Sampling and Testing per s. 7(1)(a): "(1) The owner of a water treatment or distribution system shall ensure that water sampling and analysis is carried out in accordance with, (a) Schedule 2 (Sampling and Analysis Requirements).".	One-time + Ongoing	Municipalities	• assume all subject waterworks were complying with the requirements of the Ontario Drinking Water Objectives (ODWO) at the time O. Reg. 459/00 came into effect, so estimate here is for testing over and above ODWO requirements • costs per test assumed to be: - microbiological parameters – $16 to $21 - volatile organics – $100 to $120 - inorganics – $75. (nitrate/nitrite – $30) - pesticides and PCB – $650 to $800 • "Initial Characterization" estimated to be approximately $2,500 per works for 672 works • estimated annual extra cost for testing is estimated to be $7million to $14 million, based on an extra 430,000 tests per year • costs of sample shipping, data management, and reporting (cost $1-$3 per parameter charged by some labs) not included • a margin of error of ±50% has been applied to the estimated cost range	One-time: $850k to $2.6M Ongoing: $3.5M/yr to $21M/yr
Engineer's Reports per s. 13(1),(7): "(1) The owner of a water treatment or distribution system shall ensure that written reports are prepared for the Ministry by a person referred to in subsection (2) in accordance with the Ministry of the Environment publication entitled 'Terms of Reference for Engineers' Reports for Water Works'.".	Ongoing	Municipalities	• required to be undertaken every three years • estimated cost to prepare an engineer's report for a waterworks ranges from $20k to $40k per report, depending on the complexity of the works • a margin of error of ±50% has been applied to the estimated cost ranges	$2.3M/yr to $13M/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report. All estimated costs have been rounded to two significant digits.

O. Reg. 459/00 Item	Type	Borne by	Assumptions	Estimated Cost*
Oversight of O. Reg. 459/00 by the Province, including review of engineer's reports, management of test data, inspections, and enforcement.	Ongoing	Province	• assume costs associated with review of engineer's reports (leading to amendment of Certificates of Approval) to be $6,200 per works (per MOE fee schedule) – assume this represents full recovery of MOE costs for this function • engineer's reports required once every three years for 672 waterworks • assume all other functions can be accommodated by 26 person-years @ $100k , one for each regional/district office • a margin of error of ±50% has been applied to the cost estimate	$2M/yr to $6M/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report. All estimated costs have been rounded to two significant digits.

O. Reg. 505/01 Item	Type	Borne by	Assumptions	Estimated Cost*
Minimum Treatment, per s. 4(2) and 4(3) of O. Reg. 505, which is dependent on raw water source. If the water system relies on groundwater, then disinfection is required; if the water system relies on surface water, then treatment must consist of filtration plus disinfection.	One-time	Waterworks owners	• the Province estimates there are between 6,422 and 7,172 waterworks subject to O. Reg. 505 (as of October 2001) • 1,396 of these rely on groundwater (no data about number of wells, capacity, or any other treatment details) • the MOE has published a guide for owners of small water systems, including approximate costs for treatment; e.g., $15k for centralized chlorination, $5k for centralized ultraviolet irradiation, $1,500 for mechanical filtration, $2,500 for reverse osmosis (all costs are per waterworks) • for the purpose of estimating costs, assume none of the facilities provide treatment • if all the waterworks rely on groundwater as the raw water source, then the estimated cost to comply with the minimum treatment requirement (in this case disinfection) would range from $32 million (based on ultraviolet irradiation) to $108 million (based on chlorination) • if only 1,396 of these waterworks rely on groundwater, and the remainder rely on surface water, then filtration would be required at these latter facilities – filtration would result in an additional cost of between $7.5 million (based on mechanical filtration) and $14 million (based on reverse osmosis). • costs could range from $32 million to $122 million, depending on treatment required • a margin of error of ±50% has been applied to the estimated cost range	$16M to $180M

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report. All estimated costs have been rounded to two significant digits.

O. Reg. 505/01 Item	Type	Borne by	Assumptions	Estimated Cost*
Testing: s. 8(1) of O. Reg. 505 requires microbiological testing; specifically, that "(a) a water sample is taken, at least once every two weeks or, if chlorination is not used, at least once every week, from the water distribution system.", and s. 8(2)(a) requires that waterworks owners sample the raw water source "at least once every month." Section 9 of the regulation requires that owners of waterworks test water samples taken from the distribution system for chemical parameters every five years. Schedule 2 of O. Reg. 505 lists the chemical parameters that must be tested, and these include inorganic parameters, volatile organics, pesticides, and PCBs.	Ongoing	Waterworks owners	• for microbiological parameters, number of samples per waterworks will vary depending on type of disinfection (at least 38 when chlorination used, at least 64 if other form of disinfection) • chemical parameters tested on a five-year cycle • costs per test assumed to be: - microbiological parameters – $16to $21 - volatile organics – $100 to $120 - inorganics – $75 (nitrate/nitrite – $30) - pesticides and PCB – $650 to $800 • if all waterworks rely on chlorination, the microbiological parameters estimated costs would range from $3.9 million to $5.7 million. • if all waterworks rely on a disinfection method other than chlorination, then estimated cost for microbiological parameter, is estimated to be $6.6 million to $9.6 million per year • the per sample cost to test chemical parameters is estimated to be between $825 and $995 per sample – applying unit costs to the number of facilities yields a range of estimated costs from $5.3 million to $7.1 million; spread equally over five years, this yields annual estimated costs of $1.1 million to $1.4 million. • a margin of error of ±50% has been applied to the estimated cost range	$2.5M/yr to $16M/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report. All estimated costs have been rounded to two significant digits.

O. Reg. 505/01 Item	Type	Borne by	Assumptions	Estimated Cost*
A licensed operator is required to run the waterworks.	Ongoing	Waterworks owners	• assume that no licensed operators or appropriately trained personnel are presently operating the designated facilities • for purpose of estimating a cost, assume • owners will enter into service agreements with equipment suppliers for the appropriate "licensed" operator • exact value of service contracts will vary depending on the type of equipment in place, the raw water quality, the location of the facility, among others • assume an annual cost of $1,000 per works, which includes cost of operations and maintenance, for 6,422 to 7,172 waterworks (per provincial government estimate) • a margin of error of ±50% has been applied to the estimated cost range	$3.2M/yr to $11M/yr
Notice of Compliance – s. 5 of O. Reg. 505/01 requires owners of designated facilities to inform the Ministry of the Environment and interested authorities of compliance with the minimum treatment and equipment requirements of the regulation. An engineer's report is required. Section 15 requires annual reporting.	One-time + Ongoing	Waterworks owners	• assume cost of Notice of Compliance equivalent to cost to prepare an engineer's report • assume cost of engineer's report to be $5,000 per works, for 6,422 to 7,172 waterworks (per provincial government estimate) • cost will vary depending on the type of equipment in place, the raw water quality, the location of the facility, among others • assume annual reporting cost to be 10% of engineer's report cost • a margin of error of ±50% has been applied to the estimated cost ranges	One-time: $16M to $54M Ongoing: $1.6M/yr to $5.4M/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report. All estimated costs have been rounded to two significant digits.

O. Reg. 505/01 Item	Type	Borne by	Assumptions	Estimated Cost*
Oversight of O. Reg. 505/01 by the Province, including review of Notice of Compliance, management of test data, inspections, and enforcement.	One-time + Ongoing	Province	• assume engineer's reports for subject waterworks will be relatively less complex than those required under O. Reg. 459/00 • assume costs associated with review of engineer's reports to be $1,500 per works, for 6,422 to 7,172 waterworks • assume all other functions can be accommodated by 26 person-years @ $100k, one for each regional/district office • a margin of error of ±50% has been applied to the cost estimate	One-time: $4.8M to $16M Ongoing: $1.3M/yr to $3.9M/yr

*The cost estimates must be read in conjunction with the explanatory notes presented at the beginning of this report. All estimated costs have been rounded to two significant digits.