Brief on Water Pipelines Proposed for Bruce County in the Traditional Territories of the Chippewas of Nawash and Saugeen

25 November 2002, Updated 13 December, 9 January 2003, 19 March, 28 March, 26 May
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In the wake of the Walkerton water disaster, municipalities in Ontario are taking a hard look at their ability to deliver clean water to their residents. The municipalities in the traditional territories of the Chippewas of Nawash are no exception. As a result, a number of Class EAs are underway or are being proposed. Of the six we know about, all are considering water pipelines as one option.

Residents in this area are expressing concern about the quality and quantity of their drinking water. Residents on well-based systems have been caught short of water during the dry periods of the past summer. Both Natives and non-Natives worry about the low lake levels which are having an affect on tourism, sport fishing and commercial fishing (for example, it is suspected that inshore waters made warmer by low water levels are discouraging fish populations from coming in-shore and perhaps even using their accustomed spawning beds).

Non-native residents are also concerned with the cost of bringing their water and their water treatment facilities up to new standards. Municipal politicians are caught between the worries of their constituents and the demands of new water legislation and regulations, which put a deadline of June 30, 2003 on municipalities to bring their water systems up to new standards. Options that appear to guarantee long term solutions to drinking water problems without reducing the potential for growth are tempting.

Before proceeding, it is important to realize that no one at the Chippewas of Nawash want to see anyone without safe drinking water. Surely, if any service can be considered a right, clean water from a safe source is it. The people of the town of Walkerton, in the traditional territories of the Chippewas of Nawash, suffered greatly in the Spring of 2000 when that right was abrogated and their drinking water supply became contaminated with a deadly strain of E-coli. The outbreak sickened 2,300 people and killed seven. Twelve hundred people remain under long-term medical treatment that may last the rest of their lives.

Even today, after Walkerton, over 100 First Nations in Canada must boil their water before people dare drink it. No one knows how many Native people have fallen ill or died because of contaminated drinking water.

That said, the Chippewas of Nawash feel that the environmental impacts of proposed solutions to drinking water problems must be assessed fully and properly. Perhaps it is *because* so many have suffered, and continue to suffer, from a contaminated environment, that we should be especially careful that whatever changes we make to the environment will not end up doing even more harm.

Description of the projects

It has taken an inordinate amount of work to obtain the following information. Municipal officials were not entirely forthcoming with all the details of the projects or their status. Ministry of Environment officials in Toronto deferred to their colleagues in area offices. But their colleagues often did not know the details either since the whole process – the Municipal Engineers Association Class EA – is so completely in the hands of the municipal proponent and their engineering consultants.

As one MoE official put it, the public good is now in the hands of the private sector. It is my understanding that all the EAs for the following projects are being done under the Municipal Engineers Association (MEA) Class EA. This EA is recognized under the *Environmental Assessment Act*. MEA members can run their own class EAs under this and the Provincial government keeps its hands off as much as it can. There is only a limited obligation to look at environmental impact. If a municipality follows the rules of the EA it is automatically approved.

The projects identified to date (and their status – see map at end):

1. **Pipeline to Brockton from Southampton (60 km).**
   The proponent is the Municipality of Brockton with support of Saugeen Shores and the towns along the route. The pipeline is one of the options in the Walkerton EA – others include expanding current wells and digging a new well field. This pipeline option is currently being scoped – OCWA is sending a proposal to OSTAR to see if the Ontario government will put up the money for such a project. The EA is at the end of phase 2 and will soon go out for public comment. The cost of building this pipeline is estimated to be over $22 million, excluding spur lines. It would pump 13 million litres a day. The engineers for this project are trying to bring their estimates of the costs of the pipeline and groundwater options closer together by factoring in additional costs to groundwater options such as: water softening equipment and supplies, pollution clean-up, purchase of land for a new well field.
2. **Pipeline to Brockton from Wiarton (90 km) –under the same EA as 1, above.**
   The proponent is the Municipality of Brockton with support of Saugeen Shores and the towns along the route. The pipeline is one of the options in the Walkerton EA – others include expanding current wells and digging a new well field. This pipeline option is currently being scoped – OCWA is sending a proposal to OSTAR to see if the Ontario government will put up the money for such a project. The EA is at the end of phase 2 and will soon go out for

public comment. The cost of building this pipeline is estimated to be over $40 million, excluding spur lines. It would pump 18 million litres a day. The engineers for this project are trying to bring their estimates of the costs of the pipeline and groundwater options closer together by factoring in additional costs to groundwater options such as: water softening equipment and supplies, pollution clean-up, purchase of land for a new well field.

3. **Kincardine-Shoreline-Tiverton Water Supply**.
   Class EA was completed in mid-November. The preferred option is a 12-km "water main" that can be extended to serve Inverhuron Provincial Park. It involves bringing in water from Lake Huron to serve a population of about 1100 and the water will end up in septic systems. Several Native archaeological sites have been identified close to the proposed route.

4. **South Bruce Peninsula Water and Sewage Works Study.**
   This Class EA, regarding sewer and water for Hepworth and Sauble Beach, was completed in August 2000. The preferred option is for a pipeline from Wiarton to Hepworth to Sauble Beach but the EA was shelved due to lack of funding – cost was estimated to be $28.5 million. However, if a pipeline from Wiarton to Brockton is approved, it will be routed through Hepworth. South Bruce Peninsula is waiting to hear whether OSTAR might fund a Wiarton to Brockton pipeline – see 2.

5. **Paisley and Chesley Water Supply.**
   Municipality of Aaran-Elderslie. This EA got to stage 2 and the preferred option is a water pipeline from Chesley's well fields to Paisley where the water would go into septic systems. However, at a public meeting, people told the municipality to consider joining with an area scheme. The municipality will have to do a new EA or amend the current one.

6. **Sauble Beach-Oliphant-Chesley Lake Water Supply.**
   Municipality of South Bruce Peninsula. The preferred short-term option is to amalgamate 11 small communal groundwater systems in the Sauble Beach, Oliphant and Chesley Lake areas into 4 systems linked by pipelines. A major new well will be dug at Sauble public school. The EA is a Schedule B, since the proposal will not increase the rated capacity of the system. This EA has completed its phase 2 and will be brought to South Bruce Peninsula Council on February 3rd. However, in the long run, groundwater reserves are thought to be inadequate to expand capacity and the Municipality would prefer the long-term solution of a pipeline. For more information on the Sauble Beach-Oliphant-Chesley Lake Water Supply, go to www.southbrucepeninsula.com.

It must be remembered that, in the EAs underway or completed, pipelines are only one of several options considered. In the Municipality of South Bruce Peninsula, for example, amalgamation and upgrading wells and treatment facilities were also examined and were identified as more economical solutions – at least in the short term.

There seems little doubt that pipelines are the preferred *political* solution. The mayor of Walkerton surprised his own council after the 2002 summer break with a motion "to direct the Ontario Clean Water Agency to submit an application to Ontario Superbuild Corporation for the Bruce Area Water System" (*ie*, the pipeline option). And so OCWA, according to Andy Valickis at OCWA, has submitted the application to the Ontario Small Towns And Rural (OSTAR) fund to ascertain whether the Province would fund a pipeline project. The original motion stated that

the pipeline option was the best solution, but it was successfully amended to exclude this statement.

We understand the Municipalities of South Bruce Peninsula (where Wiarton is) and Saugeen Shores (where Southampton is) support an "Area Water Supply" – *ie*, regional pipeline. And so do the Councils of the towns along the proposed routes -- *eg*, Paisley and Chesley). In fact, we understand that the mayors of these municipalities have made their own pitch to Environment Minister Chris Stockwell in an attempt to discover whether the Province would be willing to put up the money for a regional system, which could cost well over $50 million.

RV Anderson, the engineering firm doing the Walkerton EA estimate the cost of the preferred pipeline option (from Southampton to Brockton) to be $20-40 million, depending on the number of towns served between Southampton and Walkerton. From Lake Huron, the pipeline would take between 8,000 and 12,000 cubic metres a day, again depending on the number of communities served. Using the 12,000 cu.m/da estimate, that's 4,380,000 cu. metres a year.

The Walkerton Environmental Assessment in perspective

A look at the scientific literature and the history of water transfers should ring alarm bells with engineers and planners. In a 1992 paper, three researchers from three continents warned that although water pipelines, canals, and diversions were being constructed around the world, there remains a "chronic paucity of ecological data on their impacts" notwithstanding their extreme complexities. The scientists called for an urgent international meeting on both inter- and intra-basin transfers (IBTs) in order to properly assess their impact.[1]

The researchers' examination of several IBTs showed that the engineers and planners did not take into account the possibility of ecological harm that, in fact, resulted. The authors recognize that even relatively small, intra-basin transfers can move a lot of water in a year and do not take into account the relative natural flow of the receiving stream or river. In fact, as discussed below, even small variations in the natural volume and speed of flow and in water temperature can damage fish communities, their food and habitat.

In California, for example, changes in the natural flow of the Sacramento River due to IBTs have led striped bass to unsuitable spawning areas and contributed to the decline of that highly prized sportfish. Chinook salmon populations have declined in the Sacramento-San Joaquin drainage area, also due to flow variations.[2]

The scientific literature does not pretend to understand the complex interaction of variables in natural fluvial systems. How much more difficult is it, then, to mitigate the harm that IBTs will produce?

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[1] B Davies, M Thoms, M Meador, "An assessment of the ecological impacts of inter-basin water transfers, and their threats to river basin integrity and conservation", *Aquatic Conservation: Marine and Freshwater Ecosystems*, 1, 1992, p 325.

[2] Ibid, p. 341.

The authors say their research indicates a crucial need for "an ecological ethic, integrated catchment planning, and for monitoring the effect of IBTs". In *none* of the projects they looked at did they find that the planners had:

- considered the wider context of integrated catchment management.
- make any contingencies for monitoring impacts.
- undertaken any form of comprehensive, multidisciplinary, ecological impact assessment.[3]

Unhappily, what the authors found to be true of other IBT projects, is true of the Walkerton Class EA. RV Anderson, the engineering firm charged with the task of examining water issues for the Municipality of Brockton, did a thorough job of assessing the costs (including the cost of water softeners) of the main proposals. However, their study asks none of the questions we are asking in this brief (see "Catalogue of Nawash Concerns", below).

Part of the problem lies with the nature of the process of the Class Environmental Assessment. The government has allowed the Municipal Engineers Association (MEA) to create the process of the Class EA for a variety of projects municipalities routinely engage, such as water and waste treatment. The MEA has built in many things – requirements for public consultation, requirements to examine feasibility, costs and environmental impact. However, "environment" is broadly defined.

In fact, in the Walkerton EA, "environmental impact" includes economic, technical, and social impacts. A number of alternatives for drinking water sources were examined and judged according to the following criteria, given the following weights (in percentages):

- economic environment (30%) which includes cost to municipality (9%)
- social environment (28%) which includes safety of source (9%)
- technical environment (22%) which includes level of water treatment of required (3%)
- natural environment (20%) which includes effects on fish and vegetation (3%).[4]

As of March 2003, this process was used to narrow the number of alternatives to four:

- upgrading the current well field,
- digging a new well field,
- building a pipeline from Southampton on Lake Huron,
- building a pipeline from Wiarton on Georgian Bay)

It would be understandable if the people of Walkerton, given the horror of their experiences with their water in 2000, seized on the alternative that guaranteed a safe source of drinking water, as far removed as possible from the source of the contamination – namely a pipeline. However, to their everlasting credit, the Walkerton citizens who attended a public meeting to examine the March 2003 edition of the Walkerton EA, claimed ownership of their groundwater and expressed a desire not to abandon it, but to clean it and use it responsibly. Speakers frankly admitted they were uncertain of the long-term impact of building water pipelines. As one speaker said, "What if everyone around the Great Lakes started building them."

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[3] Ibid, p.344.

[4] RV Anderson Consultants, *Walkerton Long Term Water Supply Class Environmental Assessment*, March 11, 2003, Appendix F.

It seems that the citizens of the area are ahead of their Councils on the matter of pipelines. In a straw poll taken in March of 2003, 500 of Paisley's residents said they did not want a pipeline from Chesley (or any pipeline, for that matter). They want a "made-in-Paisley" solution. Nevertheless, Paisley and Chesley Councils are part of the regional lobbying effort for a pipeline. And, in a referendum that asked Walkerton residents to choose from among the options being considered, over 80% chose an option other than a pipeline.

The manner in which the Environmental Assessments are being done is worth some scrutiny. In the case of the Chesley-Paisley pipeline, only one alternative was examined by the engineering consultant. Some of the problems with the Walkerton EA have been discussed above.

The EA all municipalities use was developed by the Municipal Engineers Association and is accepted by the government. If all the steps in the process outlined in the Association's are followed, acceptance of the proposal by the government is automatic, unless the government can be persuaded to hold a full-scale EA under the Ontario *Environmental Assessment Act*.

I think there is an inherent difficulty in having the professional association of the very people who perform these evaluations set the terms of reference for the process. This difficulty, I believe, is amply demonstrated by the poor EAs on water supply coming out of e Bruce County area.

Here is a quick list of the consequences of the current Class EA process:

- The definition of "environment" is too broad, especially when you consider that several courts have said that one of the first things municipalities should be concerned about is the environment.[5] In the Walkerton EA, "natural environment" was given the least weight of the other 3 "environments": economic environment, social environment, and technical environment.
- There is absolutely no obligation to examine the science of the solutions being proposed. Although there is relatively good science on water transfers (including intra-basin transfers) and the effects of water flow on river systems, none of that found its way into the engineers' EA for Walkerton water. Nor did the EA consider the need to obtain base-line data from local rivers and streams to determine, if a pipeline was constructed, the degree of disturbance resulting from the pipeline and how to mitigate those disturbances (see notes on Resh et al, below).
- The general looseness of the process and the lack of scientific scrutiny allows the process and the results to be driven by the engineers doing the EA. In the case of Walkerton,

[5] The Ontario Court Judge in Goudreau v. Township of Chandros said, in reference to road allowances: "in a broad general sense a municipality is the trustee of the environment for the benefit of the residents in the area." Similar sentiments are expressed in the Hudson case which ruled a municipality could impose bans on pesticides. And, in November 2002, the Ontario Superior Court ruled in *Grey Association for Better Planning v. Artemesia Waters Ltd*. that water taking is a use of land under the Planning Act and therefore subject to the governance of municipalities (ie, the zoning and, one would presume, environmental bylaws of a municipality).
and in a recent court decision that held the OMB erred by not considering environmental concerns in ruling on a water taking case in Grey County. It is in the legal interest of municipalities to ensure they (and the engineers they hire) do their due diligence in examining the environmental impacts of all proposals.

some people suspect complicity between the engineering firm RV Anderson (who, after all, work for the Brockton Council) and some Councillors, including the Mayor. At the only public meeting on the EA, the engineers were openly accused of steering the process and the results toward the pipeline option.

- There is very little opportunity for public scrutiny aside from the Public Advisory Committee. Only one public meeting was held to collect input on the options examined in the EA. And there is only a window of 30 days to comment on the preferred option, once it is selected by Brockton Council.
- The short comment period allows no real time for citizens to gather expert opinion. Access to scientific and legal expertise is especially hard to come by in rural areas and next to impossible for those with few financial resources – First Nations for example. It took me well over a month to gather the science and other information in the attached report ... and I have contacts in the ENGO and scientific communities.
- It has proven very difficult for Nawash to obtain details of the Walkerton Class EA and the EA for the Municipality of South Bruce Peninsula. Municipal officers were reluctant to share their contents or even the stage the EAs were at. I could find no Provincial official who knew this information – not at the regional Ministry of Environment office in London and not in Toronto. Only after we circulated the earlier editions of this Briefing and made our concerns public did we receive copies of the EAs and invitations to discuss pipelines with the South Bruce Council and with Collingwood Council (who are concerned about the Bradford spur).

In our opinion, the EA process itself needs to be drastically revised, especially to oblige municipalities to seek, along with engineering reports, scientific reports and reports from the First Nation(s) in whose traditional territories the project is being planned.

Known impacts of bulk water transfers

Since much of the research considers the ecological impact of large water transfers, it is worth looking at that in order to anticipate what might happen on a smaller scale. It is worth noting that most of the research looks at the impact of inter-basin transfers, and the proposals for pipelines being considered in Bruce County will not deliver water out of its watershed, let alone its basin (at least as "basin" is defined in Ontario Reg. 285/99, Water Taking and Transfer; namely, the Great Lakes-St. Lawrence water system). However, with the exception of the transfer of fish from one system to another, some of the hydrological difficulties of large transfers will apply to smaller, even intra-basin transfers.

The Chippewas of Nawash, in its 1999 presentation to the International Joint Commission on bulk water transfers, stated: "We are opposed to any large **transfer** of water out of any ecosystem." We pointed to the experience in other jurisdictions (including impacts on the traditional territories of the Cree in Quebec) and to recent research on the effects of water diversions on the St. Lawrence River. That report is available on the web at: www.bmts.com/~dibaudjimoh/page73.html

The James Bay Project

The James Bay Project in Québec diverted massive quantities of water from the Eastmain, Opinaca and Caniapiscau rivers to La Grande Rivière, doubling the flow of La Grande. Huge dams were constructed and huge reservoirs—half the size of Lake Ontario—formed behind them. Forests were incinerated simply to clear debris from the reservoirs. The Eastmain is now just a creek, it's flow reduced by 95%.

The biodiversity of the area has been harmed forever. At least one sturgeon population has been destroyed. Sea grass beds along the James Bay coast are in danger of disappearing. They require a moderate salinity that the huge outpouring of fresh water from La Grande is displacing. Migratory fish stocks are in danger. The critical area where salt water meets fresh (the FSTZ—fresh water-salt water transfer zone) is a breeding ground for a number of species of animals; now it has been flushed out into the Bay.

In spite of the treaties and agreements Québec signed with the Cree, very little information on the effects of the diversions is available. What data collection is being done is being done by Hydro Québec and they are not sharing. *[Personal correspondence with Alan Penn, Grand Council, James Bay Cree]*

The St. Lawrence River

In the IJC presentation, we quoted at length from a paper by Warwick Vincent and Julian Dodson of the Département de biologie, Université Laval, Québec on the impact of water displacements on the St. Lawrence River. The evidence cited in that paper makes one, crucial point: **the ecosystems of rivers and lakes are tremendously complex and extremely fragile**.

The best scientists admit our scientific knowledge of their complexity is shallow. No one can say with certainty what will or won't happen when those ecosystems are thrown out of balance. The situation begs for the application of the precautionary principle: "If we don't know what will be the long-term effect of a project, don't do the project."

The following quotes are taken from the Vincent-Dodson paper, "The St. Lawrence River, Canada-USA: the need for an Ecosystem-Level Understanding of Large Rivers" (in a symposium edition of the Japanese *Journal of Limnology* (1999):

> Discharge plays a pivotal role in the structure and functioning of all flowing water ecosystems including large rivers. According to the analysis by DYNESIUS and NILSSON (1994), the hydrological regime of 77% of the 139 largest rivers in North America and Eurasia has now been subject to modification by dams and other control structures, with deleterious effects (including fragmentation) on habitat quality, land-water interactions and migration corridors for aquatic wildlife. Throughout the twentieth century, the St. Lawrence River has been extensively modified for navigation, flood control and hydroelectricity generation, but little consideration has been given to the ecological impacts of these changes.
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> Certain freshwater fish species have life cycles that are intimately linked to the hydrological cycle and variations in the St. Lawrence. For example, the year class strength for lake surgeon in the river appears to be strongly determined by hydrological conditions in June, the time of year when the larvae drift from their spawning grounds and begin exogenous feeding (NILO et al., 1997).

> ...
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> There is some preliminary evidence that discharge influences certain biological variables in the downstream, marine reaches of the St. Lawrence ecosystem. SUTCLIFFE (1972) found a strong positive correlation between the lobster and halibut catch in Québec (mostly from the Gulf of St. Lawrence) and the mean annual discharge of the St. Lawrence which he attributed to the influence of freshwater flow on thermohaline circulation, upwelling and nutrient supply in the Gulf. He subsequently extended these observations by showing that the catch of halibut and lobster was most highly correlated with the discharge during certain months in which the larvae are passing through critical life stages (Fig. 3). More recently, SAVENKOV et al. (1997) have shown that peaks in freshwater discharge of the St. Lawrence River can exert a strong influence on mesoscale circulation and the distribution of algal blooms in the lower St. Lawrence Estuary.
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> ...
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> A major impediment to a full understanding the pathways and effects of contaminants in the St. Lawrence is the lack of information about food web relationships and biogeochemical cycling processes in this system. Even for the base of the food web our understanding of in situ production processes is still rudimentary.

Although the examples from the Nawash 1999 paper to the IJC involve large ecosystems and massive transfers of water, there is no reason to believe the effects of smaller water transfers on smaller ecosystems would not be similar. And there is some evidence for this.

What the scientific literature says

Most scientific investigations of IBTs (Inter- and Intra-basin Transfers of water) deal with large transfers such as the ones briefly described above. However, the studies reviewed for this paper indicate researchers have found, even in cases of relatively small transfers of water, that fish populations can be harmed and the hydrosystems of rivers compromised.

Perhaps the most telling aspect of the research is the huge number of variables involved in transferring water from one place to another. Water temperature, water flow rates, water flow volumes, water chemistry, timing of stream flow can change both biologic populations and the structure of the streams. Changes in a river's hydrosystem (from the gravel on a river bed, to the moisture content of the river banks, to the wetness in a river's flood plain) all have consequences for fish and other aquatic life. Even groundwater can be affected by man-made changes to a river or stream if the hyporeic zone is compromised (the shallow region of surface and groundwater interaction).[6]

All impact the receiving waters and therefore the health of the receiving river and the biota in it. By some measures, more than 80% of riparian ecosystems have been lost in the US, and nearly 30% of freshwater fish species in North America are extinct, endangered, or threatened.[7]

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[6] In Peter J. Whiting, Streamflow necessary for environmental Maintenance. *Annu. Rev. Earth Planet. Sci.* 2002. 30:181–206, page 181.
[7] Ibid, page 182.

Streams and rivers are extremely complex – clever engineering may be able to mitigate some of the damage, it is impossible to know and then control for all the variables.

A literature survey by RJ White looked at over 1,000 studies that examined the things humans did that lead to the degradation of habitat and therefore of fish populations.[8] It's a long list that includes activities such as deforestation, livestock grazing, pipelines, dredging, removal of woody debris (which fosters communities), damming, roadbuilding, sprawl, use of pesticides on fields, sedimentation from run-off, etc.

White concludes (as are an increasing number of biologists and resource managers) that the most helpful strategy is to concentrate on "preventing, reducing, and removing anthropogenic causes of deterioration and letting natural interactions of vegetational regrowth, hydraulics, and sediment redistribution improve and maintain habitat." In other words, don't break it in the first place and if it's broken, let it be until it heals itself.

Ironically this is very close to the environmental ethic of Native people even today and one of the reasons, First Nations don't spend a lot of time rehabilitating streams or other natural habitat areas – much to the chagrin of some fish and wildlife managers. It is also one of the reasons why the Chippewas of Nawash, when addressing environmental issues in its traditional territories focus on preventing harm rather than trying to ameliorate damage.

Or, as White puts it: "[Ecosystem] health, an elusive but important concept, creates unease in those who view the world mechanistically. A biotic system is healthy when its inherent potential is approached, its condition is 'stable,' its capacity for self-repair is intact, and external support for its maintenance is minimal. ... We should avoid the mistake of those physicians who, in focusing on disease and treatment, forget health."[9]

Water flow variances harm fish communities

It is useful to look at the research that has examined the specific impacts of IBTs (Inter- and Intra-Basin Transfers of water).

More specifically, transfers have been shown to change the flow and water quality characteristics of the receiving river, changes that can lead to alterations in the structure of invertebrate and fish communities. Gibbons *et al* found that life cycles of many species are in synch with seasonal flows and that this is specific to each river. If natural flow variations are altered (even if water is pulsed out to increase volume – to raise levels for tourists for example) a deleterious effect on fish and fish habitat results. Increasingly, research findings highlight the importance of natural flow variation in maintaining ecological integrity. [10]

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[8] RJ White, "Notes from Growth and Development of North American Stream habitat management for fish", *Can. J. Fish. Aquat. Sci*. 53(Suppl. 1): 342–363 (1996).
[9] Ibid, page 352.
[10] CN Gibbins & C Soulsby, MJ Jeffries & R Acornley, Developing ecologically acceptable river flow regimes: a case study of Kielder reservoir and Kielder water transfer system. *Fisheries Management and Ecology*, 2001, 8, 463-485.

Perhaps not surprisingly, variances in stream flow affect juvenile fish the most. This is akin to an observation made by Charles O'Keefe, Chief of the Eabametoong First Nation during a conversation about the effects on river flow caused by hydro dams on the Albany River: "By now our rivers should be two feet lower than they are. We don't know where the sturgeon are—they are not in their usual places. We can't prepare to fish. The beaver can't prepare either. The wild rice won't grow."[11]

Here, of course we're dealing with high volumes of water, but the principle remains the same—change one aspect of a river system and you end up dealing with a cascade of effects impossible to predict. There is something to be said about living in a place all your life—you get to know it so well that you learn when to leave well enough alone.

Not only are fish populations affected by variances in stream flow, but so are small invertebrates—which fish often rely on for food.[12] [13] They tend to be swept downstream by pulses of water, but manage to seek refuge in eddies and backwaters. In the O'Keeffe study, the researchers found that one of the consequences of the water pipeline built to connect two major rivers in South Africa turned out to be a plague of black flies that caused a great many problems for cattle ranchers.

However, another problem with IBTs surfaces with respect to small invertebrates: inter- and intra-basin transfers of water are a conduit by which species move out of their home system and into the receiving waters. They may be exotic to the new ecosystem and may prove harmful to fish populations there.[14]

The O'Keeffe study reiterates the finding of other studies – it is the seasonal variations of watercourses that are the important measure of disturbance, not the mean annual flow. In other words, *variations* of flow disrupt the ecological balance, even when mean annual flows remain unchanged.

O'Keeffe and De Moor were able to ascertain the impact of the water transfer because there was a great deal of information available on the Great Fish River *before* the pipeline was built. The researchers were able to measure before and after differences in water flow, in water chemistry and in the fish and insect populations

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[11] D. McLaren, "Last Words," *Alternatives Journal*, 29, 1, Winter 2003.

[12] CN Gibbons, MJ Jeffries and C Soulsby, "Impacts of an inter-basin water transfer: distribution and abundance of Micronecta poweri (Insecta : Corixidae) in the River Wear, north-east England," *Aquatic Conservation: Marine and Freshwater Ecosystems* **1**0: 103–115 (2000).

[13] JH O'Keeffe and FC De Moor, "Changes in the Physico-Chemistry and Benthic Invertabretes of the Great Fish River, South Africa, following an interbasin transfer of water," *Regulated Rivers: Research and Management* Vol. 2, pp39-55, 1988.

[14] CD Snaddon and BR Davies, "A preliminary assessment of the effects of a small South African inter-basin water transfer on discharge and invertebrate community structure," *Regulated Rivers: Research & Management* **1**4: 421–441 (1998).

O'Keeffe and De Moor emphasize in their conclusion: "Thorough, long-term surveys of rivers before such [water transfer] schemes are begun, are necessary to assess the effects of the scheme on the ecology afterwards."[15]

Protocols for understanding stream ecology

In a paper authored by ten biologists and geologists in 1998, Resh et al offer a useful protocol for examining the effects of all disturbances to the ecology of streams.[16] They define "disturbance" as "any relatively discrete event in time that is characterized by a frequency, intensity, and severity outside a predictable range, and that disrupts ecosystem, community or population structure and changes resources or the physical environment."

The protocol is useful for planners to watch for changes in these components of streams:

- Standing crop biomass of algae, invertebrates, fish, etc.
- Transport/drift (total dissolved orgainc carbon, invertebrates, fish)
- Primary and secondary production
- Taxomomic richness.
- Trophic-functional diversity
- Nutrient-cycling functional dynamics
- Patterns of life history tactics (*eg*, reproductive responses)
- Size spectra (indication of short life-span)
- Biotic interactions (*eg*, competition, parasitism).

For example, the richer the biodiversity the more likely a stream will recover from a disturbance. The shorter the life cycle of insects and other biota, the more likely the stream will recover from a disturbance.

Again, the authors of this study stress that stream components should be measured before a man-made disturbance is decided to ascertain the ability of the stream to cope and, if the disturbance is constructed, to determine the degree of harm done.

None of the researchers say it is an easy matter to try to quantify the components of a river or stream – the very complexity of the components identified by the researchers testify to that. Resh et al stress the problems:

- the ecological components of streams and how they react to disturbances vary from one region of the country to another;
- very little historical data on the components of streams has been collected and is being collected;
- it is very hard to quantify all the variables, and impossible to isolate them from one another.

Perhaps, for these reasons, complex ecosystems prove the limit of science. However, they do not prove the limit of aboriginal Traditional Environmental Knowledge (TEK):

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[15] O'Keeffe, op cit, p. 53.

[16] VH Resh et al, "The role of disturbance in stream ecology," J. N. Am. Benthol. Soc. 7, 4: 433-455, 1988.

- TEK is specific – Native people know their traditional territories very well – the knowledge of how and what to observe in an ecosystem has been handed down for generations. TEK is specific and does not try to generalize to other regions or even ecosystems.
- TEK is, by its nature, historical: the information from previous generations is passed on, and an individual continues to mark the changes in his or her surroundings for a lifetime.
- Quantifying the components of an ecosystem is not as important as understanding the complex interactions they make with one another – how species interact, how they interact at different times of the year, the impact of the ususal variances of flood and drought are all observed.

When Justice O'Connor, in his report on the Walkerton Inquiry, recommended that First Nations be involved in watershed planning, he may have been wiser than he knew. It is not simply because what happens to a water shed might affect First Nations rights that they need to be involved. First Nations need to be involved because they may know more about a specific water shed than most scientists.

I suggest that First Nations need to be involved in water shed planning, not as a member of a stakeholder committee, but as a resource as important as the scientific community. I would further suggest that, among the many revisions that the Municipal Engineer's Class EA needs, is a section obliging municipal proponents to:

- obtain a review of relevant scientific literature,
- obtain an opinion on the project's options from an independent scientist, and
- pay for a First Nation study of the options under consideration.

This brief summary is by no means an exhaustive survey of the literature, and, indeed, the studies cited here deal principally with one variable—stream flow. There are two other major sources of disturbance: water chemistry and exotic introductions of flora and fauna. However, the research on water flow alone indicates that more questions need to be asked about the potential impact of water pipelines on fish communities. The studies quoted here also indicate the complicated inter-connectedness of stream and river ecosystems.

Unfortunately, our investigations of the pipeline options being proposed by both Brockton and the Municipality of South Bruce Peninsula, found that none of the EAs has addressed the concerns already raised by the scientific community on IBTs—not the proponents, not the engineers, not even the Ontario Clean Water Association. Nor are there any plans to examine and measure the features (*eg*, stream flow, chemistry, biological inventory of species) of the rivers and streams that would be affected by pipelines *before* a pipeline is constructed. It should be pointed out that most of the studies quoted in this section are not recent. In fact, Resh's paper on protocols for studying stream ecology and the impacts of disturbances is over 20 years old.

It will prove nearly impossible to determine the true environmental effects of a pipeline (assuming one is built) without this base-line of information. Certainly none of the EAs looking at pipelines have factored the cost of such an ecological inventory into the cost of a pipeline.

Other Pipelines in Ontario

The Grand Bend to London and the Lake Erie to London pipelines

The two pipelines that serve London were built several years ago to supply surface water to London. The most visible effect has been on the Thames River into which the treated water from the pipeline is being dumped after London is through with it. The banks of the Thames (especially around Chatham) are being eroded by the force of the extra water being pumped into it. The excess flow is silting spawning beds. *(Personal communication from Ron Griffith, Ministry of Environment).*

The people of the Delaware of the Thames have noticed their pickerel fishery has declined, although this may be as much due to repeated droughts, farm run-off, and the actions of the Lower Thames Authority as to the impact of piping water from Lake Huron to London. Nevertheless, at least one fisherman has noticed that his fishing place on the bank is caving in from erosion. *(Personal communication from Darryl Stonefish)*

NOTE: These observations are not confirmed by City of London engineers or by the Upper Thames Water Authority both of whom maintain the pipeline has no impact on fisheries habitat and discount the effect of the pipeline almost entirely, saying the Thames is more influenced by run-off and seasonal flooding.

Alliston to Bradford pipeline crosses a watershed

The Collingwood to Alliston pipeline was built a few years ago to serve the needs of the Honda plant at Alliston. The water from that pipeline is treated and dumped into the Nottawasaga River which flows back into Georgian Bay. The Nottawasaga flows over a sandy plain and is tremendously vulnerable to erosion. *(Personal communication from Ron Griffith, Ministry of Environment and the Nottawasaga Conservation Authority).*

The proposed "spur" from Alliston to Bradford, to the southeast, would take Georgian Bay water across a watershed to a river system that empties into Lake Simcoe. The town of Collingwood has recently (February 2003) voiced its opposition to the proposal.

Oakville to Milton pipeline

Milton receives water via a pipeline from Lake Ontario and the treated effluent empties into a small receiving stream. Treatment facilities were upgraded. Both the Canadian Environmental Assessment Agency and the Department of Fisheries and Oceans were involved.

Lake Erie to Kitchener-Waterloo

The debate around water for Kitchener Waterloo is heating up again. Originally, the area decided on a reservoir of groundwater after looking at the cost of building pipelines from Lake Huron and Georgian Bay. Now however, people are looking at a pipeline from Lake Erie. Treated water would be returned to the Grand River which flows into Lake Erie. A pipeline won't make sense if the government's user-pay philosophy holds, since the cost of building pipelines is significant.

Pipelines raise both water quantity and water quality issues. The flow regime in receiving waters changes. We know from the research examined above that even moderate variances in flow

regimes can affect fish and the small invertebrates some species rely on for food. Any assessment of a pipeline would have to determine if flow changes would affect fish and fish habitat. This is hard to predict, but a beginning would be to measure current flow rates during the spring and while the eggs are developing.

Chlorine treatment raises questions around water quality, particularly the production of chemicals downstream – for example, trichloromethanes. Any environmental assessment of proposals to supply drinking water should be looking at how well treatment plants deal with endocrine disrupters – present in effluent containing birth control substances and steroids (especially those given to animals which are increasingly finding their way water sources via run off from agricultural operations). Are treatment plants able to deal with these chemicals before returning water to local streams and rivers? Higher cost solutions include ozonating and ultraviolet light.
(Personal correspondence from Dr. Dan Shrubshoe, Chair Department of Geography, University of Western Ontario)

Sprawl follows water pipelines (US research)

One of the chief concerns in the US with respect to water pipelines in the rapid spread of low-density development sprawl. According to American Rivers, an ENGO with particular focus on rivers:

> Sprawling land development – characterized by strip malls and highway-dependent residential, commercial, and office developments – is gobbling up the American countryside at an alarming rate. Government figures suggest **that 365 acres of forest, farmland, and other open space succumb to sprawl *per hour*.** In most communities the amount of developed land is growing much faster than the population. And in fact, economic expansion does not necessarily follow an increase in sprawl.

US ENGOs concerned with sprawl are urging communities adopt “smart growth” strategies, for example promoting higher density development in smaller areas in order to contain sprawl.

Munroe County Pipelines

The Rochester branch of the NY Sierra Club has produced a report entitled: “Sprawl Follows the Pipes.” It is an in depth look at the operations of the Monroe County Water Authority and how they support and fund the infrastructure of poorly planned regional growth, called “sprawl”.

The Sierra Club report examines the link between recent increases of sprawl and the expansion of water pipelines:

> Particularly in the last 10 years or so we have seen a vast increase in roads, a doubling of the number of cars, malls springing up like mushrooms after rain and, of course, an explosion of new housing tracts and other suburban developments. All this translates into the loss of woodlands, the loss of bird and small animal habitat, increase in non-point source pollution, increased air pollution - the whole dreary, anti-environmental story. The 50 page Sierra Club study documents

> how this 'profit at the price of nature' occurs, showing the link between private development projects, local government and water pipe expansion. ...
>
> The paper reveals a number of little known facts and figures related to the local Water Authority operations, such as the fact **they are the third largest user of electricity in Monroe county**. This is attributable to the fact their Lake Ontario water must be pumped up hill as high as 900 feet and transported over a distance of 35 miles through over 1,500 miles of pipes.
>
> The "Sprawl Follows The Pipes" Paper concludes with 11 environmentally related recommendations for controlling sprawl by controlling the water distribution network. Seven of these recommendations relate directly to regaining citizen control over the Authority.

According to the author, Hugh Mitchell, long pipelines require pumping stations with chlorinating ability every 12 miles. If the pressure in the pipes drops below the pressure outside the pipes, it is possible for water and bacteria to leak into the pipes from outside sources. For a pipeline that is 120 km long, some 6 or 7 stations will be needed. Advocates of pipelines should be asked if they have factored in the cost of electricity and cholorination along the length of the pipeline.

For more information go to http://newyork.sierraclub.org/rochester/ or contact the Sierra Club at 585-244-2625 or gosshawk@frontiernet.net.

The effect of sprawl on water courses

The US-based Natural Resources Defense Council has done a lot of work on the effects of sprawl and how to combat it. One of their reports, "Paving Paradise, Sprawl and the Environment" is worth quoting extensively:

> Haphazard sprawl development also brings runoff water pollution to more and more watersheds, degrading streams, lakes, and estuaries. Natural landscapes, such as forests, wetlands, and grasslands, are typically varied and porous. They trap rainwater and snowmelt and filter it into the ground slowly. When there is runoff, it tends to reach receiving waterways gradually. Cities and suburbs, by contrast, are characterized by large paved or covered surfaces that are impervious to rain. Instead of percolating slowly into the ground, stormwater becomes trapped above these surfaces, accumulates, and runs off in large amounts into waterways, picking up pollutants as it goes.
>
> It is now thoroughly documented that, as the amount of impervious pavement and rooftops increases in a watershed, the velocity and volume of surface runoff increases; flooding, erosion and pollutant loads in receiving waters increase; groundwater recharge and water tables decline; stream beds and flows are altered; and aquatic habitat is impaired. As a result, there is a strong correlation between the amount of imperviousness in a drainage basin and the health of its receiving stream.
>
> **Stream degradation begins as impervious cover in a watershed exceeds 10 percent**. This amount of imperviousness is typically achieved by the rooftops, streets, and driveways of even large-lot subdivisions whose density is one dwelling unit per acre or less. If one includes the arterial roadways and commercial parking lots and buildings typically surrounding such subdivisions, the threshold of 10 percent imperviousness in a watershed would be achieved even with much larger lots.

> Above 10 percent imperviousness, fish species begin to decline. Brown trout, for example, may disappear altogether at around 10 to 12 percent imperviousness. When the watershed reaches 25 percent imperviousness, as it might with half-acre residential lots coupled with modest convenience shopping and arterial roadways, additional species may disappear. Indeed, at levels above 30 percent imperviousness, a watershed may be considered generally degraded. These levels are easily exceeded by sprawl: research indicates that commercial and shopping center development, for example, typically brings 75 to 95 percent imperviousness to its site.
>
> The consequences of watershed degradation from development have been felt across the country. In the Puget Sound region of Washington state, for example, major floods that were 25-year events now occur annually; "the sponge is full," according to King County analyst Tom Kiney. Similarly, in Akron, Ohio, runoff from residential area
>
> s has been estimated at up to 10 times that of pre-development conditions, and runoff from commercial development has been estimated at 18 times that before development. In several Maryland, Pennsylvania, and Virginia watersheds that drain into the Chesapeake Bay, pollution from development has been found to exceed -- in some cases dramatically -- pollution from industry and agriculture. Even in counties that have enacted stormwater-management regulations, the pace of development is causing pollutant loads to increase.
>
> Partly as a result, runoff pollution is now the nation's leading threat to water quality, affecting about 40 percent of our nation's surveyed rivers, lakes, and estuaries. Among the various pollution categories, urban runoff is the second-most prevalent source of impairments to our estuaries, affecting some 46 percent of the impaired estuaries in EPA's *National Water Quality Inventory*. It is tied for third-most-prevalent among sources of impairments to our lakes.

Degradation of water courses can stem not only from pollution but also simply from increased flow of water into streams and rivers.

For more information, go to: http://www.nrdc.org/cities/smartGrowth/rpave.asp.

Sprawl exacerbates drought

Sprawl is exacerbating drought in the US, according to a report released in August 2002 by American Rivers, the Natural Resources Defense Council, and Smart Growth America. Sprawl impairs the land’s ability to recharge groundwater and surface water sources. The authors estimate that in Atlanta, the nation's most rapidly sprawling metropolitan area, recent sprawl development sends an additional 57 billion to 133 billion gallons of polluted runoff pour into streams and rivers each year. This water would have otherwise filtered through the soil to recharge aquifers and provide underground flows to rivers, streams and lakes.

Here are some excerpts from the Executive Summary:

> As we pave over more and more wetlands and forests, this new report shows that we are depleting our water supplies. It’s not only the arid West that is facing critical shortages. The rapidly suburbanizing Southeast, blessed with a seemingly inexhaustible water supply, is now in serious trouble, as are many other formerly water-rich regions of the country.
>
> Undeveloped land is valuable not just for recreation and wildlife, but also because of its natural filtering function. Wetlands, for example, act like sponges, absorbing precipitation and runoff and slowly releasing it into the ground. More than one-third of Americans get their drinking water

directly from groundwater, and the remaining two-thirds who depend on surface water also are affected, given that about half of a stream's volume comes from groundwater.

By adopting a regional smart-growth approach, metropolitan areas could reduce the spread of impervious surfaces. An analysis completed in 2000, for example, estimated that over the next 25 years smart growth techniques could save more than 1.6 million acres of land in all 20 metropolitan regions in our study. And if these communities focused their efforts on preserving forests, wetlands and other valuable lands, their vital role in recharging groundwater would not be compromised.

American Rivers, NRDC and Smart Growth America urge policymakers to embrace smart-growth policies to address water shortage issues. Specifically, the groups recommend that state and local authorities:

- Allocate more resources to identify and protect open space and critical aquatic areas.
- Practice sound growth management by passing stronger, more comprehensive legislation that includes incentives for smart growth and designated growth areas.
- Integrate water supply into planning efforts by coordinating road-building and other construction projects with water resource management activities.
- Invest in existing communities by rehabilitating infrastructure before building anew --a "fix it first" strategy of development.
- Encourage compact development that mixes retail, commercial and residential development.
- Manage stormwater using natural systems by replacing concrete sewer and tunnel infrastructure, which conveys stormwater too swiftly into our waterways, with low-impact development techniques that foster local infiltration of stormwater to replenish groundwater.
- Devote more money and time to research and analysis of the impact of development on water resources, and make this information accessible.

For more information, go to: http://www.americanrivers.org/landuse/sprawldroughtreport.htm.

While the focus of the study is on metropolitan areas, people in rural areas should be planning far enough ahead to avoid the problems the report highlights. Or as aboriginal peoples say, before you do what you do, look seven generations into the future.

Catalogue of Nawash Concerns

The Chippewas of Nawash are concerned that effect of the pipelines being proposed will impact negatively on the environment and on the First Nation's aboriginal and treaty rights to fish for food and commerce. We believe the Class EAs under which the various projects are being considered is inadequate to properly evaluate the potential impacts.

We have the following concerns and questions which only a full, independent EA can properly address:

1. What will be the effect of the proposed pipelines on the environment of receiving waterways? For example: What is the change in flow-rates (and the variances that may affect aquatic habitat)? What will be the change in the chemical composition of receiving waters and how might that affect aquatic biota? What are the disturbances to stream morphology (for example, will erosion increase, will gravel beds silt up)?

2. What is the inter-relationship between ground water and surface water in the basin in which these pipelines are being proposed and how would a pipeline or network of pipelines affect this?
3. How do these proposals for regional water pipelines add to the cumulative impact of water diversions in the Great Lakes Basin?
4. Pipelines will allow municipalities to avoid cleaning up their groundwater or protecting otherwise clean groundwater.
5. Pipelines will do nothing to guarantee citizens water quality and quantity at source. In fact, they may help compromise source water because if treated pipeline water is returned to its source at all, it may return there via polluted pathways (*eg*, through land fills, through areas polluted with farm or urban run-off).
6. The pipelines being considered for the traditional territories of the Chippewas of Nawash and Saugeen are being planned in advance of the watershed and source protection planning recommended by the Walkerton Inquiry *(see Justice O'Connor's recommendations on source protection – Appendix B)*
7. Research from the US indicates low density sprawl follows in the wake of water pipeline construction. In addition to other effects, sprawl seems to increase the effects of drought – chiefly because rainwater cannot replenish groundwater sources due to developments covering previously open fields and forests.
8. The impact on aboriginal and treaty rights to fish for trade and commerce is not being considered.
9. Pipelines will allow people to continue to use water in amounts in excess of their actual needs. North Americans are already over their per capita water budget and are they most wasteful of water users in the world.
10. The process around the current proposals considering pipelines as an alternative to area water problems has suffered from a lack of transparency – at least as far as the First Nation is concerned. Information on the projects has been difficult to get. No notice of the EAs was received by the Chippewas of Nawash (we have yet to see a copy of the EA). The First Nation was not officially invited to give comment on the pipeline options being considered, despite the First Nation's aboriginal and treaty rights to fish and its rights to a healthy and biologically diverse environment that would protect those rights. *(See recommendation 88 from the Walkerton Inquiry in Appendix B which recommends First Nations should be included in watershed planning.)*

Summary

The Great Lakes hold 18% of the world's fresh water, but 99% of Great Lakes water is prehistoric and non-renewable. Only 1% is renewable from rainwater. Across the Great Lakes Basin we are all playing too fast and loose with that 1%.

Watersheds are complicated ecosystems. We should be very careful when we tinker with them. We should ask, "what will be the consequences of our actions in one generation, in three generations, in seven generations?" If you make a change at one end of such as system, you have to assume there will be some unanticipated changes at the other end.

We can no longer change things in isolation from everything else—surely this is one of the lessons of the Walkerton tragedy. You can't just chlorinate and flush and assume the system is fixed. And can't just cut from budgets and assume there will be no effect "downstream". And just can't pipe water 50 km and assume there will be no effect on the environment.

Recent court decisions are saying that municipalities have a responsibility to look to the health of the environment for the benefit of its residents. Municipalities may have a legal interest to ensure options being proposed in a Class EA process are being adequately scrutinized. If the current Class EA process is not changed, it is in the interest of municipal councils to gather scientific and First Nation expert opinion on proposed options.

In summary, there is enough unknown about the effects of water pipelines on the environment, to ask for a bump-up from the MEA's Class EA to a full, individual EA which the Minister of Environment is legislated to call under the *Ontario Environmental Assessment Act*.

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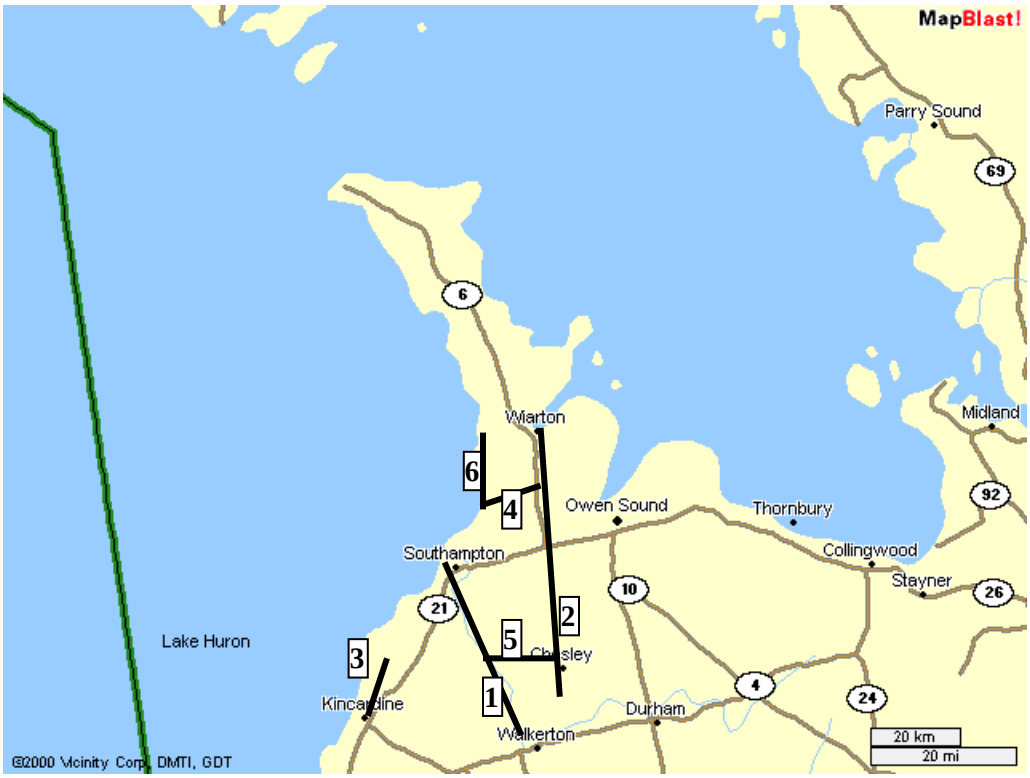
Appendix A—Map of the Pipelines



The 6 proposed pipelines (map):

1. **Pipeline to Brockton from Southampton** (One of the options in the Walkerton EA. The pipeline option is currently being scoped – OCWA is sending a proposal to OSTAR to see if the Ontario government will put up the money for such a project. At end of phase 2 – out for public comment.)
2. **Pipeline to Brockton from Wiarton** (One of the options in the Walkerton EA. Pipeline option is currently being scoped – OCWA is sending a proposal to OSTAR to see if the Ontario government will put up the money for such a project. At end of phase 2 – out for public comment.)
3. **Kincardine-Shoreline-Tiverton Water Supply** (Class EA completed Nov/02 and sent to MoE)
4. **South Bruce Peninsula Water and Sewage Works Study** (Class EA regarding sewer and water for Hepworth and Sauble Beach. It was completed August 2000 – the preferred option is for a pipeline to Hepworth but the EA was shelved for lack of funding, but it will be revived with the approval of a Wiarton to Walkerton pipeline).
5. **Paisley and Chesley Water Supply** (Class EA at stage 2, but the Municipality is awaiting word from OSTAR about funding for a Southampton-Walkerton pipeline.).
6. **Sauble Beach-Oliphant-Chesley Lake Water Supply**. (Schedule B EA. Project presented to South Bruce Peninsula Council Feb. 3). The preferred short-term solution is to amalgamate existing groundwater systems in Sauble, but the long-term preference of local politicians remains a regional pipeline for South Bruce Peninsula which run from Wiarton to Hepworth and across the Peninsula to Sauble and Oliphant.

Appendix B—Recommendations from the Walkerton Inquiry on Source Protection

Recommendation 1: Drinking water sources should be protected by developing watershed-based source protection plans. Source protection plans should be required for all watersheds in Ontario.

Recommendation 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.

Recommendation 3: Draft source protection plans should be reviewed by the Ministry of the Environment and subject to ministry approval.

Recommendation 4: Provincial government decisions that affect the quality of drinking water sources must be consistent with approved source protection plans.

Recommendation 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 constancy is required.

Recommendation 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.

Recommendation 7: The provincial government should ensure that sufficient funds are available to complete the planning and adoption of source protection plans.

Recommendation 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.

Recommendation 9: Septic systems should be inspected as a condition for the transfer of a deed.

Recommendation 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.

Recommendation 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.

Recommendation 12: Where necessary, the Ministry of the Environment should establish minimum regulatory requirements for agricultural activities that generate impacts on drinking water sources.

Recommendation 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 binding individual water protection plans consistent with the source protection plan.

Recommendation 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.

Recommendation 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.

Recommendation 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.

Recommendation 17: The regulation of other industries by the provincial government and by municipalities must be consistent with provincially approved source protection plans.

Recommendation 38: Sampling plans should provide for sampling under the conditions most challenging to the system, such as after heavy rainfalls or spring floods.

Recommendation 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.

Recommendation 68: The provincial government should amend the Environmental Protection Act to implement the recommendations regarding source protection.

Recommendation 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.

Recommendation 88: Ontario First Nations should be invited to join in the watershed planning process outlined in Chapter 4 of this report.