

ONTARIO LOW WATER RESPONSE

**Ontario Ministry of Natural Resources
Ontario Ministry of the Environment
Ontario Ministry of Agriculture, Food and Rural Affairs
Ontario Ministry of Municipal Affairs and Housing
Ontario Ministry of Research and Innovation
Association of Municipalities of Ontario
Conservation Ontario**

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PREFACE

In the late 1990s, the Province of Ontario experienced extended periods of low rainfall and high temperatures resulting in some of the lowest surface water levels and driest soils recorded for several decades. A review of these conditions in 1999 led to the development of a response plan to deal with low water conditions. *Ontario Low Water Response* is intended to ensure provincial preparedness, to assist in co-ordination and to support local response in the event of a drought.

Historically, periods of dry weather and low water levels or drought are relatively uncommon in Ontario (about every 10-15 years). However, studies on changing weather patterns indicate that low water levels may become more common, potentially compounded by the province's steadily increasing demands for water and by climate change.

Low water conditions since the inception of *Ontario Low Water Response* have tested the plan. These low water conditions, especially the low water conditions of 2007, brought new issues to light. Gaps and issues identified by conservation authorities, their water response teams, and water users were examined, and various recommendations and changes were made. Extreme low water conditions experienced in 2007 caused shortages of water in some watersheds, resulting in adverse socio-economic impacts and impacts to the aquatic ecosystem

EXECUTIVE SUMMARY

Ontario Low Water Response is intended to ensure provincial preparedness, to assist in coordination and to support local response in the event of a drought. This plan is based on existing legislation and regulations and builds on existing relationships between the province and local government bodies.

Ontario experienced lower than average precipitation and low water levels in 1998 and 1999. In May 1999, the Provincial Low Water Level Response Task Force was formed to coordinate an inter-ministry response to low water levels and make recommendations for long-term management of low water conditions. The task force recommended that the government develop a provincial low water level plan by March 2000. The ministries involved set up a project team to develop the low water response plan.

Ontario Low Water Response was produced to ensure that the province is prepared in case of low water conditions. This plan recognizes the partnership between provincial and local authorities and that natural resource and environmental management must be approached at both the provincial and local levels. The province provides overall direction and coordinates policies, science and information systems. In extreme circumstances support is provided where local declarations of an emergency have been made. At the local scale, the emphasis of this response plan is directed to collecting information, interpreting policy and delivering programs to minimize the effects of low water conditions.

This document provides definitions of drought and low water and describes the means for measuring and quantifying drought and the conditions leading up to it. Three condition levels are described: Level I (Conservation), Level II (Conservation, Restriction) and Level III (Conservation, Restriction, Regulation). Precipitation and streamflow indicators, used to determine the condition level for watersheds, are identified. Thresholds for these indicators are provided and the methodology for determining when an area of the province passes from one level to another is described.

The roles and responsibilities of the province and its agencies are described. Under this plan the Ontario Water Directors' Committee will form a standing Low Water Committee which will become active when any watershed enters a Level II condition. This plan also provides detail on the response process at the local level. This includes the creation of local Water Response Teams and their membership, roles and responsibilities.

In response to dry conditions in several years since the inception of the plan, especially the extreme low water conditions during summer 2007, a provincial steering committee with representation from MNR, MOE, OMAFRA and MMAH was established to review concerns expressed in 2007 about the ability of local water users to achieve water use reductions at Level I and Level II and be able to provide sufficient information to recommend a Level III condition. Two pilot projects were undertaken to address these concerns. Some recommended changes to the program resulting from the review and the pilot projects are reflected in this document.

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ONTARIO LOW WATER RESPONSE

1. CONTEXT

Fresh water is a natural resource crucial to the environmental, social and economic well being of Ontario. Water supports almost all aspects of human activity including health, industrial development, and recreation. Because water is critical to so much of our activity, it is managed from several perspectives and by many jurisdictions, groups and individuals.

1.1 The Spectrum of Water Management

Water management is a joint responsibility of the provincial government, municipalities, conservation authorities, and all water users. Ontario Low Water Response is a response plan that deals with the low water end of the spectrum of water management issues, which varies from flood through normal to low water conditions. It is not a disaster relief or emergency response plan. The plan is for mitigating the effects of drought through the implementation of both short- and long-term low water management strategies. Short-term strategies complement other long-term approaches that manage both water supply and demand. Long-term approaches include public education, one of the essential pieces to ensure the program's success, as well as conservation, the development of appropriate land use policies, integrated water management on a watershed basis, and efficient water management infrastructures such as reservoirs and aquifer recharge facilities.

1.2 Provincial and Local Management

Ontario is large and geographically diverse. One area can have high water levels while another is dealing with lower than normal water levels. In the summer of 1999, for example, southwestern Ontario had near record-low water levels while above average rainfall in some parts of northwestern Ontario resulted in normal river and lake levels.

Natural resource and environmental management must be approached at two scales - provincial and local. The province provides overall direction and coordinates policies, science, information systems, and emergency support. At the local jurisdiction scale, the emphasis is placed on collecting information, interpreting policy, delivering programs, and responding to emergencies.

Ontario Low Water Response reflects this historical partnership between the province and local jurisdictions. Much of Ontario, organized on a municipality and Conservation Authority basis, has the institutions and the will to effectively deal with low water conditions at both scales. Municipalities and Conservation Authorities have a central role in managing water issues on a local level. Municipalities have the authority to provide "any service or thing that the municipality considers necessary or desirable for the public" and have broad powers to pass by-laws concerning the "economic, social and environmental well-being of the municipality" and the "health, safety and well-being of persons". They have specific authority, for example, to pass by-laws regarding the natural environment (i.e. soil or trees) as well as drainage and flood

control (in matters not within provincial jurisdiction).

1.3 Existing Legislation and Information

Ontario Low Water Response is based on existing legislation and regulations. This plan has been developed using existing science, data collection networks, and analysis processes. It can be implemented under established legal authorities (see Appendix 1) such as the *Municipal Act*, the *Lakes and Rivers Improvement Act* and the *Ontario Water Resources Act*. As is the case with developing and implementing any plan, especially one for unusual or emergency situations, this plan will be improved over time based on experiences.

1.4 Emergency Response

Under the *Emergency Management and Civil Protection Act*, there are five pillars of emergency management: prevention, preparedness, response, mitigation, and recovery. Ontario Low Water Response is a mitigation strategy, intended to reduce the effects of low water, and does not address “emergency” response measures or disaster recovery. The declaration of any Level condition and any subsequent response does not imply municipal or provincial compensation for economic losses.

2. LOCAL WATERSHED RESPONSE

2.1 Water Response Teams

Watershed-based water response teams (WRT) are proposed to coordinate local activities. Teams will consist of local water users and local and provincial water managers. Water response teams will use a combination of water data, provincial legislation and regulations and local regulations, communication techniques and local tools to advocate conservation. Success of any WRT depends on local support and commitment to abide by the team’s recommendations. In cases of extreme drought, the WRT will ensure that key local and provincial decision-makers participate actively in the process to see that water management decisions are understood, supported and enforced.

Water response teams are focused on reacting to current low water conditions. Long term drought prevention efforts must be developed and are the responsibility of existing water management agencies and users. Drought management will only be successful through this combination of long-term preventive strategies and shorter-term crisis management actions. However, Water Response Teams are encouraged to meet annually to maintain the team and ensure that the tools and information necessary for drought management are kept current.

2.2. Government and Non Government Agencies

Several existing agencies, policies and statutes in Ontario address water management, including drought. Examples are provincial ministries (Environment and Natural Resources) and Conservation Authorities and municipalities. WRTs will not replace the functions of these agencies but permit coordination of response among these agencies, non-government groups and users. The WRT does not possess any unique legislative authority but can help by advising on the use of current regulations and tools, such as: the *Ontario Water Resources Act*, the *Municipal Act 2001* and the *Environmental Protection Act*. See Appendix 1 for a list of relevant legislation.

2.3 Scale

Normally, water response teams will be based on watershed boundaries. Conservation Authority boundaries will guide each team's geographic jurisdiction. Where no Conservation Authority exists, the Ministry of Natural Resources will determine the appropriate watershed units. Several watersheds may be combined into larger units or divided into sub watersheds in order to address local conditions for low water response purposes.

2.4 Water Response Team Membership and Roles

The WRT will provide a coordinated response from provincial, Conservation Authority, municipal, private and special interest water managers and users. Members of the teams will work cooperatively, share all information and be accountable.

WRTs will include provincial, municipal and Conservation Authority staff as well as representatives for local interests and users. Team membership will vary, but representation from the following sectors should be considered:

- agriculture
- rural private industry
- business
- recreation
- resource management interests
- First Nations
- municipal government
- provincial government

Certain organizations are required members of the WRT as a result of their organizational mandates, legislative tools, communication abilities and background data. These include:

a) Municipalities

- May monitor and control public water supplies and can provide useful data on watershed characterization,

- Have the authority to provide “any service or thing that the municipality considers necessary or desirable for the public”,
- Have broad powers to pass by-laws concerning the “economic, social and environmental well-being of the municipality” and “health, safety and well-being of persons.” They have specific authority, for example, to pass by-laws regarding the natural environment (i.e. soil or trees) as well as drainage and flood control (in matters not within provincial jurisdiction),
- Can promote strong water conservation messages,
- Implement restrictions on non-essential non-permitted water uses through municipal by-laws,
- Maintain communication links with large local water consumers, specifically commercial and industrial operations,
- Have specific responsibilities under the *Emergency Management and Civil Protection Act*.

b) Conservation Authorities

- Municipally-based, local public sector organizations established under the *Conservation Authorities Act*
- Implement a resource management program at a watershed scale on behalf of municipalities and the Province
- May lead/co-chair Water Response Teams,
- Confirm or declare Level I and II conditions and recommend Level III conditions through the Water Response Team,
- Maintain detailed water monitoring networks, which will enhance provincial networks and better describe drought variations,
- Maintain strong links with local community groups, media and government and may facilitate coordination of water conservation messages,
- Operate dams and reservoirs,
- Can verify MNR data and low water conditions in the field,
- Have agreements with DFO to review plan applications pursuant to S. 35 of the federal Fisheries Act
- Monitor local stream health and water quality.

c) Ontario Ministry of Natural Resources

- Designated lead agency responsible for Low Water and Drought Management under the *Emergency Management and Civil Protection Act*,
- Maintains a provincial network to monitor precipitation and low flow conditions. This data can be provided to WRTs. MNR will also analyze data to provide early warnings,
- Administers portions of the federal *Fisheries Act* and has some legislative authority for maintaining baseflows to protect aquatic life,
- Operates dams and reservoirs,
- Maintains links with local outdoor recreation groups,
- Administers the *Lakes and Rivers Improvement Act* and *Conservation Authorities Act*,

- Participates as a representative of the province on WRTs to assist in the implementation and coordination of low water response activities,
- Provides funding for Water Response Teams.

d) Ontario Ministry of Environment

- Maintain Provincial Groundwater Monitoring Network,
- Maintain Provincial Water Quality Monitoring Network,
- Maintains communication links with permit holders; provides contact information, recorded water use data and information about water takings (e.g. source) of local permit holders to the Conservation Authorities to help quantify local permitted water use, as necessary,
- Administers the *Ontario Water Resources Act* and the *Environmental Protection Act* and has legislative authority to prohibit the discharge of any material that may impair the quality of surface water and groundwater, and to require that no person shall take more than a total of 50,000 litres of water per day without a permit,
- Administers the Permit to Take Water Program (PTTW) under the *Ontario Water Resources Act* to regulate permitted water use by: imposing conditions on every water taker that safeguard against unacceptable interference with other use of the water supply, restricting new or expanded water takings in high use or sensitive watersheds, requiring water use conservation measures to be identified and implemented, and ensuring compliance with permit conditions,
- Provides training and formal communications on responsibilities and obligations of permit holders,
- Participates as a representative of the province on WRTs to assist in the implementation and coordination of low water response activities.

e) Ontario Ministry of Agriculture Food and Rural Affairs

- Maintains communication links with agricultural water users and can advise groups of potential local drought conditions and water conservation recommendations,
- Can coordinate local agricultural representation on the WRT,
- Participates as a representative of the province on WRTs to assist in the implementation and coordination of low water response activities.

The participation of other local groups and users is also necessary for success of the WRT. Examples include First Nation communities, dominant local industries (e.g. pulp and paper, aggregates, hydroelectric power generators), recreation users (e.g. Trent Severn Waterway, downhill ski facilities) or special interest bodies (e.g. Ontario Federation of Anglers and Hunters, Ducks Unlimited).

There is no distinction in decision-making power or responsibility among members of the WRT with the exception of provincial representatives, (the focus of provincial representatives is on advice rather than participating in the decision making process). Each representative should have equal opportunity for input, sharing information and accountability. It is therefore imperative

that the membership of the WRT accurately reflect the balance among the sectors within the watershed.

Responsibilities for team members include attending meetings, communicating back to their sectors, sharing relevant data, and implementing drought management tools (e.g. municipal by-laws, coordinated irrigation, signage, and public awareness communications).

In certain regions, Conservation Authorities or municipalities may not exist, and the network of local users may vary significantly. For these reasons WRT membership is intended to be flexible.

Confirming membership and electing a chair/co-chairs and secretary will be done during initial meetings of the WRT. Teams should not be too big to function. Where they exist, local Conservation Authorities will take the lead in establishing the WRT. It is recommended that Conservation Authorities, or MNR districts in areas without Conservation Authorities, co-chair the Water Response Team with a local water user.

Several watersheds in Ontario already have multi-stakeholder committees that address issues such as local water quality and natural heritage. These committees are encouraged to assume the responsibilities of a WRT if appropriate. They may need to add members.

3. MONITORING AND REPORTING ON DROUGHT

This section provides a definition of drought, the means of measuring and quantifying drought and the conditions leading to it. For additional technical information see Appendix 2.

3.1 Definition – Drought/Low Water

Drought is a complex term that has various definitions depending on individual perspectives. In this document, drought is defined as weather and low water conditions characterized by one or more of the following:

- a) below normal precipitation for an extended period of time (3 months or more), potentially combined with high rates of evaporation, can lower lake levels, streamflows and/or baseflows and reduce soil moisture and/or groundwater storage,
- b) streamflows are at the minimum required to sustain aquatic life while meeting only high priority demands for water; significant decrease in water level of local wells to the point where they become dry; surface water in storage allocated to maintain minimum streamflows, and
- c) socioeconomic effects occurring on individual properties and extending to larger areas of a watershed or beyond.

As larger areas are affected and as low water and precipitation conditions worsen, the effects usually become more severe.

Three Levels of Low Water Conditions

The Level I condition is the first indication of a potential water supply problem. Level II indicates a potentially serious problem. Level III indicates the failure of the water supply to meet the demand, resulting in progressively more severe and widespread socioeconomic effects.

Each level requires a water management response from the local Water Response Team or the province. The authority learning of the change in level will alert the other to the condition.

3.2 Indicators

Measuring drought is a complex process requiring the collection of data for variables such as rainfall, streamflow, soil moisture, and water in storage. The Ontario Low Water Response indicators integrate a number of factors and functions, are based on readily available data, are useful over a range of time periods, and allow water managers to speak consistently about water supply. (Refer to Appendix 2 to understand the application of this section.)

This plan currently uses precipitation and streamflow (surface water flow) measurements as the primary indicators for defining low water levels and drought, subject to field verification.

Indicators to measure groundwater and aquifer levels have been developed and are being tested.

Precipitation Indicators

Precipitation is the most important and convenient indicator. Reviewing the precipitation data and comparing it to trends will warn of an impending water shortage.

Precipitation Indicator 1

The Ministry of Natural Resources (MNR) will compare monthly data from each precipitation station to the average monthly precipitation for that station by calculating monthly data as a percentage of the average. These calculations will be made using averages from the previous 18 months (long-term), for the previous 3 months (seasonal) and, under a Level I condition or higher, for the previous month (short-term), with weekly updates.

Precipitation Indicator 2

If a watershed is under a Level I or Level II condition, MNR will add up the number of consecutive weeks that register no rain (less than 7.6mm) (see Table 2).

Streamflow Indicator

Gauges in streams measure water levels and are used to provide indicators to show if streamflow meets the basic needs of the ecosystem and if water is available for other users.

MNR will compare the monthly flow for each streamgauge station with the lowest average summer month flow for that station.

TABLE 1: Summary of Indicators

Precipitation	Surface Flow
1) % of average = monthly precipitation/ average precipitation for that month x 100 (See App. 2) 2) Weeks with less than 7.6mm of rain (number of consecutive readings)	% of average precipitation = $\frac{\text{Monthly Flow}}{\text{Lowest Average Summer Month Flow}} \times 100$ (See App. 2)

3.3 Moving from One Level to Another

If the indicator for precipitation or streamflow crosses a threshold, then a watershed, or a portion of it, may warrant a change to a Level I, Level II, or Level III condition. Level III designation also requires documentation of ongoing and significant social, environmental and economic impacts and is further detailed in Section 4.3, Response Framework, Level III.

A water response is required to be undertaken when a watershed condition changes from one level (or no level) to another. When a threshold is crossed, usually the Province alerts the Conservation Authority to the change. The values of thresholds have been set for precipitation and streamflow at selected stations. Indicators will be monitored and reviewed periodically to determine if the thresholds are set at the correct levels. WRTs are encouraged to develop local thresholds to augment the provincial thresholds. Conservation Authorities are encouraged to develop local minimum in-stream flow thresholds as indicators of aquatic ecosystem health (adequate water quality, healthy fisheries and biological communities). Such a threshold could then become the Level III indicator for that watershed.

Precipitation thresholds

A watershed may warrant a change to Level I when its 3 month or 18 month total precipitation drops below 80% of the average 3 month or 18 month precipitation for those months.

From an existing Level I or Level III condition a watershed may warrant a change to Level II when its 3 month or 18 month total precipitation is between 60% and 40% of the average 3 month or 18 month precipitation for those months or when its 1-month total precipitation is between 60% and 40% of the average precipitation for that month. An additional indicator is used when a watershed is already in Level I - a watershed may warrant a change to Level II if it has had no rain (less than 7.6mm) for 2 weeks in succession (high demand areas) or for 3 weeks in succession (moderate demand areas).

From an existing Level II, a watershed may warrant a change to Level III when its:

- 3 month or 18 month total precipitation drops below 40% of the average 3 month or 18 month precipitation for those months or;
- 1 month total precipitation drops below 40% of the average precipitation for that month

TABLE 2: Precipitation Thresholds

Level I	Level II*	Level III**
18-month precipitation < 80% of average precipitation or 3 month precipitation < 80% of average precipitation	18 month precipitation < 60% of average precipitation or 3 month precipitation < 60% of average precipitation or 1 month precipitation < 60% of average precipitation Weeks with less than 7.6mm of rain – more than 2 weeks for high demand areas; more than 3 weeks for moderate demand areas	18 month precipitation < 40% of average precipitation or 3 month precipitation < 40% of average precipitation or 1 month precipitation < 40% of average precipitation

* A watershed can enter a Level II only from an existing confirmed Level I or Level III condition

** A watershed can enter a Level III only from an existing confirmed Level II condition

Streamflow

In the spring (see Appendix 2 Spring Indicator), a watershed may warrant a change to Level I when its monthly flow drops below the lowest average summer month flow for that station (see Appendix 2 Streamflow Indicator paragraph 2). For the rest of the year the watershed may warrant a change to Level I when its monthly flow drops below 70% of the lowest average summer month flow.

In the spring, a watershed may warrant a change to Level II (from an existing Level I condition or Level III) when its monthly flow is between 70% and 50% of the lowest average summer month flow. For the rest of the year, the watershed may warrant a change to Level II if its monthly flow is between 50% and 30% of the lowest average summer month flow.

In the spring, a watershed may warrant a change to Level III (from an existing Level II condition) when its monthly flow drops below 50% of the lowest average summer month flow. For the rest of the year, the watershed may warrant a change to Level III if its monthly flow drops below 30% of the lowest average summer month flow.

TABLE 3: Streamflow Thresholds

Level I	Level II*	Level III**
Spring: – monthly flow < 100% lowest average summer month flow Other times: – monthly flow < 70% of lowest average summer month flow	Spring: – monthly flow < 70% of lowest average summer month flow Other times: – monthly flow < 50% of lowest average summer month flow	Spring: – monthly flow < 50% of lowest average summer month flow Other times: – monthly flow < 30% of lowest average summer month flow

* A watershed can enter a Level II only from an existing confirmed Level I or Level III condition

** A watershed can enter a Level III only from an existing confirmed Level II condition

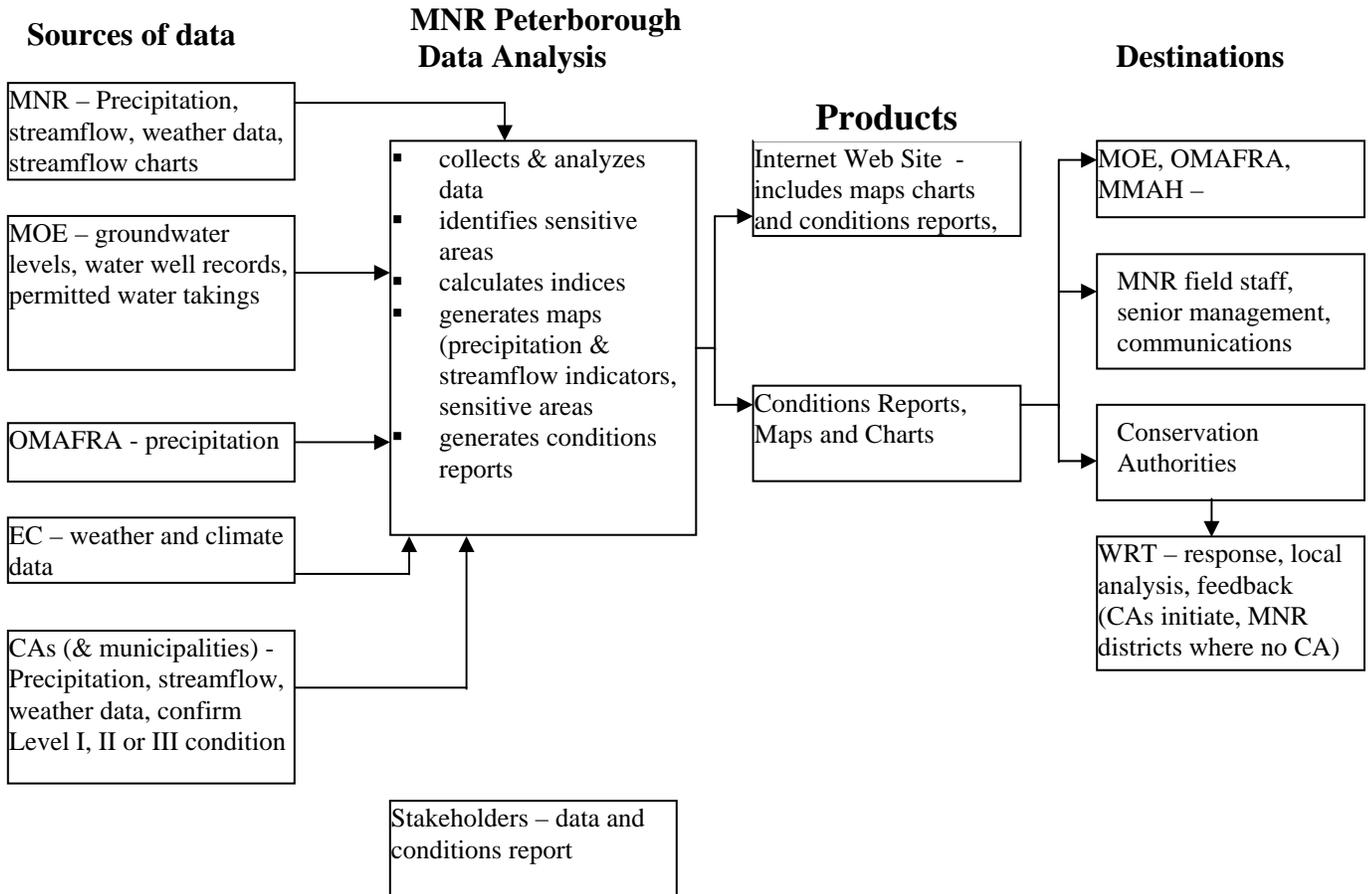
TABLE 4: Summary of Levels and Thresholds

Condition	Indicator	
	Precipitation (3 month or 18 month)	Streamflows
Level I	<80% of average	Spring: – monthly flow < 100% lowest average summer month flow Other times: – monthly flow < 70% of lowest average summer month flow
Level II	<60% of average Weeks with < 7.6mm	Spring: – monthly flow < 70% of lowest average summer month flow Other times: – monthly flow < 50% of lowest average summer month flow
Level III	<40% of average	Spring: – monthly flow < 50% of lowest average summer month flow Other times: – monthly flow < 30% of lowest average summer month flow

3.4 Monitoring and Reporting

Figure 1 shows the participants, data sources, products and information flow for drought monitoring. Data is provided to MNR, which analyzes it and produces and distributes condition reports and maps. Feedback is provided to MNR on local conditions as well as when water management responses are undertaken. Conservation authorities also undertake monitoring in their watersheds and may have more refined local data and/or more locally applicable low water indices in use.

FIGURE 1: INFORMATION FLOW



CAs- Conservation Authorities
 WRT- Water Response Team
 EC – Environment Canada

4. PROVINCIAL RESPONSE

4.1 Principles

Ontario Low Water Response is based on three principles: the response process should be simple and straightforward; low water and drought response is a partnership; and planning is crucial.

a) Simple process

Experience from across the province suggests that effective response happens when there is a straightforward system that sets out clearly who is involved and what their responsibilities are. This plan details a response process for low water conditions. Section 2 covers local response. Section 3 sets out how low water information is to be collected and used. Sections 4.3 and 4.4 detail provincial level roles and responsibilities. Section 5 provides an action plan.

b) Low water and drought response partnership

The response to low water conditions occurs on at least two levels – provincial and local. For example, this plan indicates that the province is responsible for collecting and analyzing information on water levels at the provincial scale. At the local level, however, it is the Conservation Authorities, with their local knowledge and experience, who play the major role in providing and interpreting data that is more specific to each watershed.

c) Planning

Low water conditions do not occur in a few hours or even days, but generally build up over a number of weeks or months. This time factor usually allows advance preparation, at both the provincial and municipal levels. However, Water Response Teams should be ready to act quickly if necessary. Water Response Teams require data and information for decision making under Low Water Conditions. Much of this information can be gathered during the year before the onset of Low Water Conditions.

4.2 Agency Roles and Responsibilities

The key provincial agencies in water management are the Ministries of Municipal Affairs and Housing; Agriculture Food and Rural Affairs; Environment; and Natural Resources. They work in a cooperative, integrated fashion to develop and implement provincial water policy (see Section 2.4 for roles and responsibilities of representatives on Water Response Teams).

Efforts to develop and implement provincial water policy are directed by the Land and Resource Use Committee of Deputy Ministers and are implemented by the existing provincial Ontario Water Directors' Committee (OWDC). This committee is co-chaired by the Water Policy Directors from the Ministries of Natural Resources and Environment. *A project team reporting to this committee prepared Ontario Low Water Response.*

Ministry of Municipal Affairs and Housing (MMAH) is responsible for overseeing such legislation as the *Planning Act* and the *Municipal Act, 2001*. The *Planning Act* provides for and supports the control of land use and development throughout the province. The appropriate use of this legislation helps ensure that areas critical to the long-term ecological health of aquatic ecosystems are not degraded by changes in land use. The *Municipal Act, 2001* provides municipalities with the authority to provide “any service or thing that the municipality considers necessary or desirable for the public”. Municipalities have broad powers to pass by-laws concerning the “economic, social and environmental well-being of the municipality” and the “health, safety and well-being of persons” as long as they do not frustrate provincial acts and regulations. Toronto has the same broad powers under the *City of Toronto Act, 2006 (COTA)*. *The Municipal Act, 2001* provides specific authority, for example to pass by-laws regarding the natural environment (i.e. soil or trees) as well as drainage and flood control, in matters not within provincial jurisdiction.

Ministry of Economic Development and Trade (MEDT) plays a leading role in promoting and explaining the government’s position and policies on water management issues that cross provincial or national boundaries. Previously, MEDT has represented the province in discussions about bulk water transfers and diversions from the Great Lakes.

Ministry of Agriculture, Food and Rural Affairs (OMAFRA) has an important role in the protection of aquatic ecosystems across the rural landscape of Ontario. The ministry supports programs for the agricultural sector that assist in maintaining potable water supplies, supports the use of appropriate irrigation and drainage methods and helps protect surface and groundwater quality.

Ministry of Environment (MOE) administers several pieces of legislation directed at environmental protection, conservation and stewardship of Ontario's resources. In particular, the Ontario Water Resources Act (and companion regulations) is directed at the protection of the quality and quantity of Ontario’s surface and groundwater resources. The legislation provides for prohibitions related to the discharging of pollutants to surface or groundwater and water quality standards. The legislation also provides for a permit system (Permit to Take Water) that governs the taking of large amounts of surface or groundwater (>50,000 litres per day). The Ministry of the Environment administers and is responsible for ensuring compliance with these permits.

Ministry of Natural Resources (MNR) has two primary focuses in water management: managing surface water flows and levels and protecting fish and wildlife habitat. In many areas MNR is directly responsible for operating water control structures. The major pieces of legislation this ministry oversees include the *Lakes and Rivers Improvement Act* (regulates location, design and operation of dams and other water structures), the *Public Lands Act* (authorization of water power sites), some aspects of the federal *Fisheries Act*, the *Conservation Authorities Act* (supporting legislation for the province’s 36 watershed-based Conservation Authorities), the *Fish and Wildlife Conservation Act* and the *Crown Forest Sustainability Act*. Under the *Emergency Management and Civil Protection Act*, MNR is listed as the lead agency for large-scale flood, fire and drought emergencies.

Although MMAH, MEDT, OMAFRA, MOE and MNR are the five provincial agencies with various leadership roles in water management, other agencies and organizations are also involved in water issues. The Ministry of Northern Development, Mines and Forestry has a responsibility for setting policy regulating mine waste control structures, and the Ministry of Transportation is involved with water crossing standards. In addition, the federal government has legislation, such as the *Fisheries Act* and the *Navigable Waters Protection Act*, which must be considered in any approach to water management.

Municipalities and Conservation Authorities also have discrete water management responsibilities, which require them to be included in any low water and drought response.

4.3 Response Framework

This plan provides that:

- a) In the organized areas of the province where Conservation Authorities exist, the local Conservation Authority will establish a water response team (WRT) at the beginning of the season or if Level I conditions are confirmed. It is recommended that Conservation Authorities and MNR districts establish these teams prior to a Level I condition declaration as a precautionary measure and to ensure available information is up to date.
- b) In organized areas with no Conservation Authorities, the district office of the Ministry of Natural Resources establishes a WRT at the beginning of the season or if Level I conditions are confirmed.
- c) In unorganized areas, the Ministry of Natural Resources maintains responsibility for water management issues, and deals directly with local communities, First Nations, dam owners/operators and other stakeholders.
- d) The Ontario Water Directors' Committee (OWDC) shall set up a standing Low Water Committee to interact with any watershed in a confirmed Level II (or greater) condition. The OWDC has designated the position of the Water Resources Section Manager (MNR) to serve as the "Low Water Committee Coordinator". The principal members of the Low Water Committee will be the appropriate Field Directors and Water Directors (or their delegated representatives) of the Ministries of Environment and Energy, Agriculture, Food and Rural Affairs, Municipal Affairs and Housing and Natural Resources. The OWDC through the Low Water Committee will be responsible for coordinating provincial response efforts.

Conditions Verification

The Surface Water Monitoring Centre and Conservation Authority and/or MNR District Office will verify Level I or Level II watershed conditions based on monthly average streamflow and precipitation indicators, and local watershed conditions. If the leading agency (CA or MNR) chooses to confirm that the watershed(s) has entered a Level I or Level II condition the leading agency will make appropriate contacts and host a WRT meeting; the leading agency should verify the watershed conditions and convene a WRT meeting to discuss measures to be taken within one week. Prior to the first water response team meeting, the leading agency should collect or update appropriate information that characterizes the watershed. The local WRT should lead discussions with its local groups well in advance of a drought. These discussions would help establish priorities and set up mitigation strategies.

Level I - Initial Water Use Conservation

The Level I condition will be managed through existing programs of the Conservation Authorities, municipalities and other key provincial agencies with leadership and direction provided by the WRT. The WRT, using a variety of communications tools, will emphasize the need for water use conservation with a target reduction of water use of 10 per cent. District or regional level provincial ministry staff will be part of the WRT.

Level II - Conservation and Restrictions on Non-Essential Use

As with a Level I condition, the local Conservation Authority and/or MNR district office will confirm that a watershed has entered a Level II condition. In this condition the WRT will continue in a leadership role, communicating a strong conservation message, and implementing restrictions through the municipalities on non-essential use. At this time, the OWDC Low Water Committee Coordinator will advise the OWDC CoChairs and under their guidance, will activate the Low Water Committee to enhance and reinforce cross-ministry program support. The OWDC Low Water Committee Coordinator will also notify the Provincial Emergency Response Coordinator (MNR) and request commencement of regular briefings with Emergency Management Ontario regarding any Level II condition.

Level III - Conservation, Restriction, Regulation

The OWDC Low Water Committee is responsible for making declarations of a Level III condition based on the recommendations of the local CA and WRT and advice of the provincial field representatives.

A Level III declaration represents the most severe level condition and corresponding response is designed to mitigate the impacts of an escalated drought condition. These may include water use restrictions affecting a range of small and large water users. Consequently, prior to any declaration decision the OWDC Low Water Committee is obligated to ensure that:

1. The WRT has clearly implemented and documented the conservation and reduction efforts taken through the Level I and II strategies and can demonstrate that the majority of the water users have participated in these efforts (including bylaw restrictions by municipalities on non essential uses).
2. Any significant social, environmental and economic impacts arising from current low water conditions have been documented and adequately described.
3. Recommendations have been provided on priorities for water use restrictions and other reduction activities within the watershed.

Following a level III declaration, the OWDC Low Water Committee is obligated to ensure that:

4. Any significant social, environmental and economic impacts arising from the recommended water use restrictions have been documented and adequately described.

The local WRT and the OWDC Low Water Committee will jointly discuss the range and type of implementation measures to be taken. The OWDC Low Water Committee Coordinator will be the liaison with the local WRT Chair(s) as necessary, and with the OWDC CoChairs prior to the declaration of a Level III condition.

4.4 The Ontario Water Directors' Committee (OWDC) Low Water Committee

The Ontario Water Directors' Committee (OWDC) has set up a standing Low Water Committee to interact with any watershed in a confirmed Level II (or greater) condition. The OWDC has designated the position of the Water Resources Section Manager (MNR) to serve as the "Low Water Committee Coordinator." The OWDC Low Water Committee will be comprised of the following:

- i) The existing provincial OWDC membership of Water Policy Directors (or their delegated representatives) from MOE, MNR, OMAFRA, and MMAH and;
- ii) The Field Directors (or their delegated representatives), of the MNR, MOE, OMAFRA and MMAH in affected areas with confirmed Level II or greater conditions.

The OWDC Low Water Committee will be linked to WRTs through the local provincial representatives who are members on each WRT team (see section 2.4). In addition, the Low Water Committee Coordinator will liaise with the WRT Chair(s) and the OWDC CoChairs when making joint decisions as required.

The primary tasks of the OWDC through the Low Water Committee will be to:

- Coordinate provincial response to WRT recommendations,
- Ensure that the provincial responsibilities are fulfilled,
- Address recommended water use restrictions (with the advice and support of the WRT).

4.5 Priority Water Uses

When low water conditions develop, water managers may have to deal with the question of priority use. Various approaches to this difficult situation have been proposed and used in Ontario and in other jurisdictions. A synthesis of these approaches suggests a basic model that can be applied. This model divides water uses into three classes: essential, important and non-essential.

Decisions regarding priority water uses can be facilitated with input from local stakeholders. Ultimately, the goal is to balance efficient use, protection of the resource, and equity among users. For these reasons decisions on low water and drought response and potential water use restrictions are best made with the support and advice of local water managers and users.

Priority water uses will be unique for each watershed and should be assessed by the Water Response Team, with consideration for the social, environmental and economic impacts of water use reductions and the effect of timing of restrictions on seasonal or periodic water uses.

Essential

Essential uses of water deal with human and animal life and health: a reasonable supply of water for drinking and sanitation, water for health care, water for public institutions and public protection (e.g. wastewater treatment, some fire protection, schools), water for livestock, and water necessary for basic ecological functions.

Important

The second category deals with uses important for the social and economic well being of a particular area. This includes activities critical to industrial processes, commercial facilities such as hotels and restaurants and key agricultural crops. This category poses the most difficulty, as it may be necessary to rank priorities between activities and between groups within the same activity (e.g. between farm irrigation and a local car manufacturing plant or between food or non-food agriculture irrigation). Another factor is that priorities will vary between watersheds.

The local water response team should lead discussions with their local groups well in advance of a drought. These discussions would help establish priorities and set up mitigation strategies. For example, depending on the nature of the business it may be economically viable to truck in water to maintain social and economic wellbeing, thus ensuring that ecological functions are not impaired by continued withdrawals from the threatened water system.

Non-Essential

Non-essential uses can be interrupted for the short term without significant impact. These include private swimming pools, lawn watering, public and private fountains and vehicle washing. Many Ontario jurisdictions already have by-laws and other controls to deal with this category.

4.6 Long Term Management

Restricting water use is only a short-term solution. Best management practices and integrated watershed management to ensure long-term management of supply and demand should provide the foundation for managing water resources in stressed watersheds and for climate change adaptation. Ecological health is considered essential and is covered under basic ecological functions. Long term economic health and welfare of the citizens are intertwined with ecological health. If natural water systems are consistently starved of water major negative effects will be realized. The resulting degradation of the water quality and quantity can have considerable effects on all users. In stressed watersheds a more proactive approach to water management should be considered. In order to reduce the potential for water systems to reach levels where ecological damage occurs, it is recommended that an integrated watershed management strategy be developed as a proactive approach to help prevent low water conditions from arising on these watersheds.

5. COORDINATION AND ADMINISTRATION

5.1 Water Response Team Action Plan

The Ministries of Natural Resources and Environment are responsible for monitoring low water conditions. Some conservation authorities also maintain their own monitoring networks which may be more sensitive, and may notify MNR of conditions. Generally, MNR will notify Conservation Authorities and MNR district offices of potential low water conditions. Conservation Authorities and MNR districts will verify this data with their own monitoring network, as well as considering other information sources in addition to their own monitoring network. The Conservation Authority and/or MNR will verify the conditions, taking into account predetermined watershed characteristics. Following this assessment, Conservation Authorities and/or MNR may confirm a Level I condition. If the leading authority chooses to confirm a Level I condition, it can then convene a meeting of its WRT.

1. Conservation Authorities and/or MNR Districts will arrange and host the first WRT meeting in order to establish its goals and objectives. These goals and objectives should include:
 - Establishing WRT structure,
 - Characterization of the watershed, if not available or current,

- Identification of any new local water supply needs and concerns beyond those already documented,
- Establishing consensus building and decision-making process.

Water Response Team members should also disclose any potential conflicts of interest (situations in which a person's private interest or an organization's interest may be seen to influence his or her objectivity as a member of the Water Response Team) at the first meeting, and these should be recognized by the team.

If a low water situation has been confirmed, goals and objectives should include:

- Affirming severity of low water situation/condition,
 - Implementing water conservation, preservation and restriction strategies,
 - Evaluating effectiveness of local actions,
 - Providing advice to local and provincial decision-makers,
2. Conservation Authorities and/or MNR Districts determine if the watershed is in a Level I or Level II condition based on the monitoring network data and local information and will confirm Level I or Level II conditions as appropriate. Watershed conditions should be verified and confirmed and a Water Response Team meeting convened within one week of notification of an existing condition.
 3. The WRT is responsible for making recommendations of a Level III condition to the OWDC Low Water Committee based on watershed conditions which must include information as outlined in Section 3.3. These recommendations can be presented through the Provincial Government Representatives or the local WRT Chair as necessary can communicate them directly to the OWDC Low Water Committee Coordinator (see Figure 2).
 4. WRT will complete its membership as suggested in Section 2.4.
 5. The WRT will elect a chair or co-chairs from its membership (provincial representatives excluded). It is recommended that Conservation Authorities act as co-chair of the WRT with another member of the WRT. The WRT will also elect a secretary from its membership (provincial representatives excluded).
 6. WRT will develop its terms of reference, detailing mandate, membership, roles (chair, secretary), meeting frequency, quorum conditions and team and external communications needs.
 7. WRT will develop or update a brief summary of existing information that characterizes the watershed, which generally describes supply and demand conditions. The summary will help the WRT to target their response and serve as a context for communications.
 - a) The local water supply information should include:

- MNR's, MOE's and Conservation Authorities' precipitation, streamflow and groundwater level data summaries if information is available,
- General status of municipal wells, rural dug and drilled wells,
- Anecdotal information on local effects.

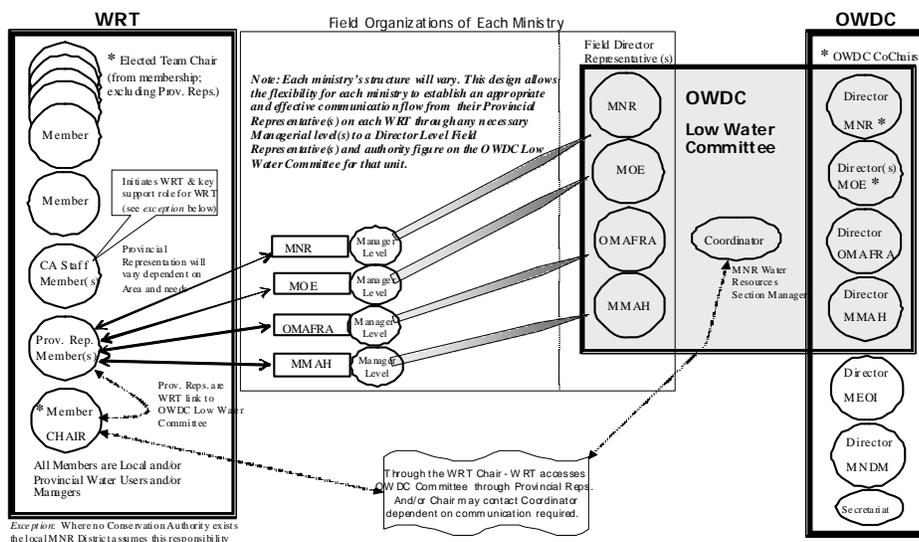
b) The water demand information should include:

- Summary listing of water takers based on MOE's Permit to Take Water database plus estimates of other takings < 50,000 litres per day.
- General assessment of water taking sectors e.g. agriculture (irrigation areas, livestock demands), recreation (golf courses), industry (aggregates).

8. The WRT identifies the actions needed to manage the response to drought or Low Water conditions and carries them out. The actions will maximize water supply, reduce demand, or do both. The recommendations offered here are the minimum. Teams should develop their own solutions to address local problems.

FIGURE 2: Organizational Links

OWDC Low Water Committee & Local WRT
Organizational Model and Linkages - Level II and Level III Conditions



Level I Response: Actions to Consider

- Goal:** Promote initial water use conservation and management among all users to reduce further water shortages
- Target:** 10% initial reduction in water use among all sectors

Action	Detail
Communicate	<ul style="list-style-type: none"> - each WRT member is responsible for contributing to developing and communicating water conservation messages within their sector - Include media releases, farm papers, newsletters, newspapers, radio, etc. - messages focus on <ul style="list-style-type: none"> - watershed characterization information - statement of local conditions and near term prognosis - clear understanding of the need for initial water use conservation with 10% reduction target
Water Use Reductions	- target 10% reduction
Prepare for Level II	<ul style="list-style-type: none"> - develop a database of users based on Permit to Take Water database - prepare to inform the OWDC Low Water Committee Coordinator of potential Level II conditions

Recommendations for water use conservation will be sector specific. Many examples are already in place and are to be used by the WRT where available. Residential examples include:

- installing toilet dams
- using rain barrels
- repairing leaky faucets
- encouraging minimal use of non-essential water (car washing, lawn watering)

Other examples are in *Green Tips*, published by the Ontario Ministry of the Environment.

For the agricultural sector, see OMAFRA fact sheets (1999) *How to Prepare for Irrigation During Water Shortages* and *Private Water Well Owners – Dealing with Water Shortages*.

Level II Response: Actions to Consider

Goals: Target further water conservation and management messages more directly
 Publicize water use restrictions
 Ensure compliance with restrictions
 Consider priorities for water restrictions and other water use reductions at Level III

Target: Further 10% water use reduction (20% total)

Action	Detail
Communicate	<ul style="list-style-type: none"> - Strongly encourage water use reductions by contacting key users identified from database developed during Level I Response - Contact includes mailings, personal contact, advertising, provincial contact with permit holders and meetings - Messages focus on <ul style="list-style-type: none"> o specific water conservation examples using fact sheets where available o further 10% reduction target - Either the conservation authority or the Ministry of the Environment may contact permit holders, at the preference of the conservation authority - Inform OWDC Low Water Committee Coordinator of confirmed Level II conditions - OWDC Low Water Committee Coordinator will initiate formation of an active Low Water Committee
Manage supply	<ul style="list-style-type: none"> - Modify flood prevention, flow augmentation and power generation reservoir operations to minimize impacts of drought - Increase monitoring of compliance with effective water conservation practices
Water Use Reductions	<ul style="list-style-type: none"> - Further 10% reduction - Recommend that approvals of new water takings >50,000 litres per day be limited - Discuss need for reduced water use by existing permit holders - Enforce or strengthen municipal water restriction by-laws - Monitor water takings for compliance with permits and by-laws
Prepare for Level III (Drought)	<ul style="list-style-type: none"> - Document conservation efforts taken through Level I and Level II - Record existing and potential social, environmental and economic impacts

Action	Detail
	<ul style="list-style-type: none"> - Develop recommendations on water use restriction priorities (refer to section 3.3) - Notify OWDC Low Water Committee and local decision-makers of actions taken to prepare them for their involvement at Level III

Level III Response (Drought): Actions to Consider

Goal: Develop and implement priorities on water management strategies and water use reductions

Target: Reduce and manage water use demands to the maximum extent

Action	Detail
Involve senior decision-makers	<ul style="list-style-type: none"> - Involve senior local and provincial decision-makers directly in refining and implementing water management proposals including potential reductions in water use - Maintain regular contact with the OWDC Low Water Committee through provincial WRT representatives (WRT Chair may liaison with OWDC Low Water Committee Coordinator as required)
Develop and implement priorities on water management strategies and water use reductions	<ul style="list-style-type: none"> - Continue to record and assess social, environmental and economic impacts of low water conditions - Continue to record and assess water management strategies and water use reductions - Confirm priorities for water use reductions among sectors through a consensus building process - Continue to implement and enforce water restrictions using existing tools such as municipal by-laws and provincial legislation (OWRA). - Record and assess social, environmental and economic impacts arising from water use restrictions

Water use regulation and related water management strategies become the focus during the severe shortages experienced in a Level III condition. Actions move from largely voluntary compliance to regulatory control. Strong local involvement and provincial support will be

necessary to assess options, confirm priorities and implement water use regulation and water management strategies. Heads of local municipal councils and Conservation Authorities as well as provincial field managers should now be directly involved in the process. Local team representatives of private groups are also encouraged to involve their senior provincial representatives. WRT should provide recommendations for water use reductions and potential restrictions to the OWDC Low Water Committee Coordinator. Existing legislation may be required to assist with implementing reductions in water use by large users (>50,000 litres per day). For example, the Ministry of the Environment has the authority to review and amend conditions on existing water-taking permits under the *Ontario Water Resources Act*. Municipalities may pass by-laws restricting water usage.

During all three levels of response, MNR and MOE as well as Conservation Authorities and municipalities should continue monitoring activities and communicate results through their members on the WRT. This allows the WRT to anticipate and respond to changing conditions.

9. Communications

The WRT will maintain communication links with the province, Conservation Authorities, municipalities and special interest groups through its members. These communications are critical to generate awareness and support for local needs and WRT decisions.

The WRT has the primary responsibility for ensuring that effective communications are maintained with the local media and the citizens living and working within the watershed. The OWDC Low Water Committee will provide communications support for issues that have a broad provincial perspective.

10. Evaluation

WRTs will conduct annual self-evaluations during the drought and at the conclusion of the drought to assess equity, efficiency and effectiveness of communications, information, actions and monitoring.

5.2 Future Refinements

A comprehensive low water and drought management plan for Ontario requires a combination of long term preventive strategies and shorter-term response to depleted groundwater and surface water resources during extreme dry conditions. Ontario Low Water Response is designed to protect existing water supplies and modify the demand for water during those extreme dry conditions. Long term preventive strategies are also needed.

6. SUMMARY

Level	Indicator	Information flow	Decision	Goal	Target	Communications	Supply management	Imposed restrictions
I – potential water supply problems	Precipitation: <80% long or mid-term average Streamflow: <70% lowest average summer month	From: EC, MNR, CAs, MOE To: MNR for analysis Then: CA for confirmation	By province, in some cases by WRT chair Confirmed by CA or MNR	Voluntary conservation	10% reduction in water use	WRT members to own groups Media releases, newsletters, etc. Local conditions		
II – minor problems, potential major supply problems	Precipitation: <60% long, mid-term or short-term average or more than 1 week no rain Streamflow: <50% lowest average summer month	as above	By province or CA Confirmed by CA or MNR Set up a Low Water Committee of the OWDC	Voluntary conservation and restrictions	Additional 10% reduction	Direct contact with major users Sector-specific info on restrictions	Modify reservoir operations	Recommend Limiting new permits Implement by-laws Monitor and enforce compliance with existing permits
III – supply fails to meet usual demand, social and economic impact	Precipitation: <40% long, mid or short-term average Streamflow: <30% lowest average summer month	as above	Joint decision by WRT and OWDC	Conservation, restrictions and regulation	Maximum reduction	Sector and user specific info on restrictions, regulations	Modify reservoir, water power operations Consider hauling water	Reduce permit levels Set and institute water use priorities Enforcement

Appendix 1: Existing Legislation

Summary of Water-related Legislation - Water Quality, Water Quantity, and Water-Related Land Management

SUMMARY OF MAJOR LEGISLATION ON WATER QUALITY

Legislation by Function	Administering Agency	Description of Legislation	Implementing Agency
<i>Provincial Legislation</i>			
*Ontario Water Resources Act	MOE	<ul style="list-style-type: none"> allows for the regulation of water supply allows surveillance and monitoring of all surface and ground water in Ontario regulates sewage disposal and controls water pollution allows MOE to construct and operate wastewater facilities or require it be done by an industry or municipality 	MOE
*Environmental Protection Act	MOE	<ul style="list-style-type: none"> forbids discharge of any contaminant to the environment in amounts exceeding regulations prohibits discharge of any substance likely to impair the environment requires spills of pollutants be reported and cleaned up promptly and establishes a liability on the party at fault 	MOE
Environmental Assessment Act	MOE	<ul style="list-style-type: none"> requires environmental assessment of any major public or designated private undertaking 	MOE
Pesticides Act	MOE	<ul style="list-style-type: none"> controls use of chemicals for the destruction of plant and animal pest and investigates possible harmful effects of pesticides on the environment 	MOE

Legislation by Function	Administering Agency	Description of Legislation	Implementing Agency
Conservation Authorities Act	MNR	<ul style="list-style-type: none"> • enables municipalities and the Province to create a conservation authority to implement a “program” in local resource management • enables conservation authorities to regulate activities that may interfere with a watercourse or wetland, and regulate development in areas prone to water-related hazards (floodplains, shorelines) for impacts to the control of flooding, erosion, dynamic beaches, pollution or conservation of land • allows conservation authorities to be involved in MOE led water quality monitoring programs: <ul style="list-style-type: none"> • Provincial Water Quality Monitoring Network • Provincial Groundwater Monitoring Network • Ontario Benthos Biomonitoring Network • also enables conservation authority boards to approve programs or have agreements with municipalities for other water quality monitoring programs, i.e. for wetland monitoring, watershed plans or other studies for information about the aquatic health for resource management initiatives undertaken by the conservation authority 	CAs

Legislation by Function	Administering Agency	Description of Legislation	Implementing Agency
Lakes and Rivers Improvement Act	MNR	<ul style="list-style-type: none"> ensures proposed water works do not adversely affect water quality or cause undue erosion and silting 	MNR
Planning Act	MMAH	<ul style="list-style-type: none"> guides municipal planning activities (e.g. requires local governments to assess the impact of a proposed subdivision on existing water supplies) 	Municipalities, MMAH
Municipal Act	MMAH	<ul style="list-style-type: none"> The <i>Municipal Act, 2001</i> provides municipalities with the authority to provide “any service or thing that the municipality considers necessary or desirable for the public” and have broad powers to pass by-laws concerning the “economic, social and environmental well-being of the municipality” and the “health, safety and well-being of persons”. They have specific authority, for example, to pass by-laws regarding the natural environment (i.e. soil or trees) as well as drainage and flood control. 	Municipalities, MMAH
<i>Federal Legislation</i>			
*Fisheries Act	DFO	<ul style="list-style-type: none"> protects fish habitat by prohibiting habitat disturbance and deposition of deleterious substances in water frequented by fish 	DFO, MNR
Canada Shipping Act	Transport Canada	<ul style="list-style-type: none"> controls pollution from ships by imposing penalties for dumping pollutants or failing to report a spill 	Transport Canada
Canada Water Act	EC	<ul style="list-style-type: none"> authorizes agreements with provinces for designation of water quality management areas 	EC

Legislation by Function	Administering Agency	Description of Legislation	Implementing Agency
		and other projects	
Canadian Environmental Protection Act	EC	<ul style="list-style-type: none"> controls manufacture, transportation, use, disposal of chemicals and wastes not adequately regulated by other legislation 	EC
Pest Control Products Act	Agriculture Canada	<ul style="list-style-type: none"> regulates products used to control pests via registration according to prescribed standards 	Agriculture Canada

***Includes tools that can be used for drought management response within 24 hours.**

SUMMARY OF MAJOR LEGISLATION ON WATER QUANTITY

Legislation by function	Administering agency	Description of legislation	Implementing agency
<i>Provincial Legislation</i>			
Conservation Authorities Act	MNR	<ul style="list-style-type: none"> • enables conservation authorities to regulate activities that may interfere with a watercourse or wetland, and regulate development in areas prone to water-related hazards (floodplains, shorelines) for impacts to the control of flooding, erosion, dynamic beaches, pollution or conservation of land • requires conservation authorities to implement a program in flood and erosion control, flood forecasting and warning, ice management. • allows conservation authorities to own over 900 structures including 256 dams, and numerous engineered channels, dykes, and erosion control along rivers and shorelines works with an estimated replacement value of \$2.7 billion 	CAs
Lakes and River Improvement Act	MNR	<ul style="list-style-type: none"> • empowers MNR to regulate the construction and operation of water works • requires that new water works be approved 	MNR
Public Lands Act	MNR	<ul style="list-style-type: none"> • authorizes MNR to construct and operate dams and acquire land for their purposes • authorizes power generation projects on Crown land 	MNR

Legislation by function	Administering agency	Description of legislation	Implementing agency
Municipal Act	MMAH	<ul style="list-style-type: none"> The <i>Municipal Act, 2001</i> provides municipalities with the authority to provide “any service or thing that the municipality considers necessary or desirable for the public” and have broad powers to pass by-laws concerning the “economic, social and environmental well-being of the municipality” and the “health, safety and well-being of persons”. They have specific authority, for example, to pass by-laws regarding the natural environment (i.e. soil or trees) as well as drainage and flood control. 	municipalities, MMAH
Public Utilities Act	MMAH	<ul style="list-style-type: none"> empowers municipalities to acquire and operate water works and divert a lake or river for their purposes 	municipalities, MMAH
Ontario Water Resources Act	MOE	<ul style="list-style-type: none"> requires the issuance of a permit for the taking of more than a total of 50, 000 litres of water in a day from a ground or surface source of supply Allows the MOE Director to refuse to issue, cancel, impose terms and conditions in issuing a permit or alter the terms and conditions of a permit after it is issued. requires the issuance of a permit for the construction of a well allows municipalities to establish or replace water works with ministerial 	MOE

Legislation by function	Administering agency	Description of legislation	Implementing agency
		approval	
<i>Federal Legislation</i>			
Fisheries Act	DFO	<ul style="list-style-type: none"> protects fish habitat by prohibiting habitat disturbance ensures construction of a fishway around any obstruction in a waterway 	DFO, MNR
Navigable Waters Protection Act	Department of Fisheries and Oceans	<ul style="list-style-type: none"> prohibits dumping of wastes that may interfere with navigation prohibits construction in navigable waters 	Department of Fisheries and Oceans
Canada Water Act	EC	<ul style="list-style-type: none"> authorizes agreements with provinces for the delineation of flood plains and hazardous shorelines for flood and erosion control 	EC
International River Improvement Act	External Affairs EC	<ul style="list-style-type: none"> prohibits damming or changing the flow of a river flowing out of Canada 	EC

SUMMARY OF WATER-RELATED LAND MANAGEMENT LEGISLATION

Legislation by function	Administering agency	Description of Legislation	Implementing agency
<i>Provincial Legislation</i>			
Drainage Act	OMAFRA	<ul style="list-style-type: none"> facilitates construction, operation and maintenance of rural drainage works provides legal mechanism where riparian landowners can drain their lands and divide the costs among themselves 	OMAFRA, municipalities
Tile Drainage Act	OMAFRA	<ul style="list-style-type: none"> provides for low interest loans to farmers from municipalities for tile draining their property 	municipalities, MMAH
Planning Act	MMAH	<ul style="list-style-type: none"> provides for and governs land use 	municipalities,

		<p>planning</p> <ul style="list-style-type: none"> deals with provincial administration in land use planning and local planning requires the planning decisions of municipalities and other decision makers to be consistent with the policies of the Provincial Policy Statement which sets out provincial interests related to land use planning 	MMAH
Public Lands Act	MNR	<ul style="list-style-type: none"> authorizes MNR to manage and control activities on Crown land 	MNR
Mining Act	MNDMF	<ul style="list-style-type: none"> registers mining lands and lands forfeited to the Crown exempts lands and mining rights from taxes 	MNDMF, MNR
Beds of Navigable Waters Act	MNR	<ul style="list-style-type: none"> declares the beds of navigable waters as the Crown's responsibility 	MNR
Public Transportation and Highway Improvement Act	MTO	<ul style="list-style-type: none"> requires a permit for any work carried out within the right-of-way of a provincial highway 	MTO
Conservation Authorities Act	MNR	<ul style="list-style-type: none"> enables conservation authorities to regulate activities that may interfere with a watercourse or wetland, and regulate development in areas prone to water-related hazards (floodplains, shorelines) for impacts to the control of flooding, erosion, dynamic beaches, pollution or conservation of land enables conservation authorities to own and acquire land and currently have the largest collective land holdings, (145,000 hectares or ~ 560 sq. mi), second to the Crown in Ontario, includes wetlands, hazard lands, shorelines, conservation land, areas of natural & scientific interest, recreational lands, natural heritage & cultural sites, forests 	

Environmental Assessment Act	MOE	<ul style="list-style-type: none"> requires environmental assessment of any major public or designated private undertaking 	MOE
<i>Federal Legislation</i>			
Fisheries Act	DFO	<ul style="list-style-type: none"> controls erosion and sedimentation for the purpose of fish habitat preservation 	DFO, MNR

EMERGENCY RELATED LEGISLATION

Legislation by function	Administering agency	Description of Legislation	Implementing agency
Emergency Management and Civil Protection Act	EMO	<ul style="list-style-type: none"> may take action and make such orders as he or she considers necessary to implement the emergency plans to protect property and health, safety and welfare of inhabitants of the emergency area 	MNR, Municipalities

MNR - Ministry of Natural Resources

MOE - Ministry of the Environment

DFO - Department of Fisheries and Oceans Canada

MTO - Ministry of Transportation of Ontario

MNDMF - Ministry of Northern Development, Mines and Forestry

OMAFRA - Ministry of Agriculture, Food and Rural Affairs

EMO – Emergency Management Ontario

EC – Environment Canada

HWC – Health and Welfare Canada

Appendix 2: Additional Technical Information

Distinguishing Between the Levels of Response

Thresholds for Level I must be sensitive enough to give enough time for action but not so sensitive as to activate when problems are not likely to occur. Some areas may reach the threshold for Level I several years in a row. Indicators will be monitored and reviewed periodically to determine if the thresholds are set at the correct levels.

Indicators

Research was done in 1999 to find out how precipitation and streamflow data might be used to quantify low water and drought conditions. Based on this experience, the project team has used precipitation and streamflow as the two primary indicators.

Precipitation Indicator 1

For each station, MNR will compare the monthly precipitation with the average monthly precipitation for that station. For each month, the comparison will be made by using the total precipitation in the month divided by the average precipitation for that month. These calculations will then be averaged over the previous 18 months (long term) and the previous 3 months (seasonal).

When an area reaches a Level I, or higher condition level, the comparison for the previous month for each station will also be used as an indicator. As well, on the 7th, 14th, and 21st of each month, a weekly comparison will be made of the accumulated 1, 2 and 3-week precipitation to the average precipitation for the current month.

Precipitation Indicator 2

When a watershed is already in a Level I condition or greater, the number of consecutive readings of less than 7.6mm (no rain) will be determined at each reading (on the 7th, 14th, 21st and at the end of the month).

In sensitive watersheds (very high water demand or very sandy soils), two readings of less than 7.6mm will be the threshold to reach a Level II condition. In a less sensitive watershed, (moderate water demand and sandy soils or high demand and silty soils), three or more consecutive readings of less than 7.6mm will be the threshold.

Streamflow

Surface flow indicators demonstrate if there is enough streamflow in the river to meet the basic needs of the ecosystem and if there is additional water available for needs such as navigation, recreation, hydropower generation, irrigation, and other takings.

Baseflow response contributes to surface flow and indicates the state of the groundwater supply. After a rainfall or snowmelt, there may be an immediate surface runoff response in streamflow followed, sometimes after a delay, by a baseflow response from groundwater. In many cases, baseflow is relied upon to provide the needs of the ecosystem and to maintain the surface water quality at an acceptable level. Baseflow response will indicate if there is enough water to meet basic ecosystem needs. If baseflow is insufficient, water management authorities will have to manage the structures to provide water for surface water takings, where possible.

In the spring, surface flows are much higher than at other times of the year. It is necessary to take this into account when determining streamflow indicators. As a result, thresholds were selected to reflect seasonal variability. It is also necessary to recognize that wide, flat streams and headwater streams (streams at the top of the watershed) are more sensitive to low flows. Representative streamgauge stations need to be selected to take account of varying stream channel conditions.

Streamflow Indicator

Water level gauges provide data that is used for surface flow, or streamflow, indicators. An indication of streamflow approaching the minimum needed to maintain the ecosystem is the statistical flow value, 7Q20. (The minimum 7-day, 1-in-20-year flow that is calculated for individual gauges.)

The historical average monthly flow for each month for each station is available from the Environment Canada streamflow historical archive HYDAT. For each station, the lowest average summer month flow will be the lowest average monthly flow for July, August or September. Comparing the value of the current flow with the historic low value will determine when the streamflow is approaching the 7Q20. All flow indicators will be expressed as a per cent of the lowest average summer month flow. On the 14th of each month, when a Level I or greater condition has been attained, there will also be a calculation of the flow for the first half of the month that will be compared to the lowest average flow.

Spring Indicator

For the analysis at the provincial level, the criteria will be the same for all streamflow gauges. In April, May, and June, flows are expected to be higher, therefore, the indicator flows will be expected to be higher. This will be factored into the streamflow thresholds. While a low flow in the springtime may not indicate existing water supply problems, it indicates that potential low water conditions may develop in the summer.

Local Streamflow Indicator

Streams in the headwaters or those having high width-to-depth ratio are expected to be more sensitive to low flows. An indication of streamflow approaching the minimum needed to maintain the ecosystem in these streams is the statistical flow value, 7Q2. (The minimum 7-day 1-in-2-year flow, which is also calculated for individual gauges.). At the local level, where this detail is known, the indicator flows can be higher than for the main channel streams or streams that are narrow and deep. The local WRT can factor this into the streamflow thresholds.

Precipitation Thresholds

Level I Condition

A watershed enters Level I when its 3-month or 18-month precipitation drops below 80% of the average 3-month or 18-month precipitation for those months.

The watershed leaves Level I when indicators that resulted in the watershed entering Level I have risen above the Level I threshold such that a 10% voluntary reduction in use is no longer required and it is anticipated that the watershed will not return to Level I condition over the next few weeks.

Level II Condition

The threshold for Level II condition is 60% of the 1-month, 3-month or 18-month average precipitation. A watershed enters Level II when its 1-month, 3-month or 18-month total precipitation drops below 60% of the average 1-month, 3-month or 18-month precipitation for those months and it is already in a Level I condition.

OR

The threshold for Level II condition may also be more 2 or more consecutive weeks of less than 7.6mm precipitation (no rain). A watershed enters Level II when there is an existing Level I condition and a reading of cumulative precipitation less than 7.6mm in high-demand areas, or 2 or 3 readings in succession when the cumulative precipitation is less than 7.6mm in moderate-demand areas. At the local level, when precipitation is monitored daily, a watershed enters Level II if it has 7 to 14 days of less than 7.6mm in a sensitive area or 14 to 21 days of less than 7.6 mm in a less sensitive area.

The weekly update to the monthly per cent of average (calculated on the 7th, 14th, and 21st) indicates improving or degrading conditions but is not used to determine a Level II condition. This measurement is only taken during an existing Level I or Level II condition.

The watershed reenters Level I when indicators that resulted in the watershed entering Level II have risen above the Level II thresholds—such that the additional 10% voluntary reduction in use is no longer required.

Level III Condition

The threshold for the Level III condition is 40% of the 1-month, 3-month or 18-month average precipitation. A watershed enters Level III when the 1-month, 3-month or 18 month total precipitation drops below 40% of the average 1-month, 3-month or 18-month precipitation for those months and there is an existing Level II condition.

The weekly update to the monthly per cent of average (calculated on the 7th, 14th, and 21st) indicates improving or degrading conditions but is not used to determine a Level III condition. This measurement is only taken during an existing Level I or Level II condition.

The watershed reenters Level II when indicators that resulted in the watershed entering Level III have risen above the Level III threshold such that water use restrictions are no longer required and are not anticipated to be required over the next several weeks.

Streamflow Thresholds

Level 1 Condition

A watershed enters Level I when its 1-month flow drops below 100% of the lowest average summer month flow in the spring or if the flow drops below 70% of the lowest average summer month flow during other times.

Level II Condition

A watershed enters Level II when its 1-month flow drops below 70% of the lowest average summer month flow in the spring or if the flow drops below 50% of the lowest average summer month flow during other times.

Level III Condition

A watershed enters Level III when its 1-month flow drops below 50% of the lowest average summer month flow in the spring or if the flow drops below 30% of the lowest average summer month flow during other times.

For Level II and Level III conditions, streamgauges known to represent more sensitive streams (streams in headwaters or wide and shallow streams) may have the comparison levels raised by 10%. For example, more sensitive streams may enter a Level II in the spring when the flow drops below 80% instead of 70% of the lowest average summer month flow. The WRT should

address this level of detail at the local level. A watershed can enter a Level II only from an existing confirmed Level I or Level III condition and a watershed can only enter a Level III from an existing confirmed Level II condition.

Groundwater Baseflow Protection

At present, baseflow indicators have not been identified. There are current efforts in place to develop such indicators in the future.

Groundwater Aquifer levels

To date, aquifer level indicators have not been identified. Well log data can be used to estimate representative groundwater elevations. A network for measuring the water table is currently being developed. Threshold water table levels will be subsequently developed and matched against demand. Water table levels near demand level would generate a Level I condition. Exceeding the demand level would generate a Level II condition. A Level III condition would occur when water levels drop below the level needed for high-priority demand. Critical water table heights for baseflow protection need to be determined.

Monitoring and Reporting

Data Acquisition

- precipitation and streamflow data is obtained through the MNR Water Resources Information System (WRIS) computer located in Toronto and maintained through the MNR Sault Ste. Marie office
- Climate data is obtained from Environment Canada through satellite connection and decoded by WRIS. This data is obtained through a cost sharing agreement between Environment Canada and MNR (including the Conservation Authorities) and MOE
- streamflow data and precipitation data located at streamflow sites is collected by telephone modem and decoded by WRIS
- historic streamflow and climate records are used to determine monthly average historical values for each station

Addressing Gaps

- MNR will continue to work with partners to improve the monitoring network to cover a greater geographic area and to measure conditions for a greater variety of areas that are sensitive to drought (i.e. sensitive soils, differing stream types, high demand areas)
- Groundwater indicators will be developed and applied to the Provincial Groundwater Monitoring Network data that MOE will provide to MNR Peterborough. This information will be included in the analysis and conditions reports.
- MNR will continue to investigate the application of snowpack and snowmelt information to improve on the inadequacies of snowfall information.

- A means of determining how much water is available for melting from the snowpack and whether it is replenishing the supply or evaporating is needed
- SSM/I (Special Sensor Microwave Imagery) data from satellite imagery will be used to determine the snow water content of the snowpack across Ontario
- Snowpack and the depth of snow on the ground will be measured and the snow pack density determined. This data will be used to augment and interpolate between the snow survey data collected by the flood program.

Assessment Process and Communicating

- Summary precipitation data and data from streamgauges is obtained manually from WRIS over intranet
- Additional precipitation and streamgauge information unavailable through WRIS is obtained by e-mail (e.g. from Conservation Authorities with gauges off line, from monitoring network of volunteers)
- Additional sources of precipitation and streamflow monitoring networks will be sought out
- Data collected by MNR Peterborough, in text flat files and text email messages are entered into spreadsheets and generate streamflow indicator plots
- Peterborough Geomatics Centre will continue to obtain fire weather data, run routines to incorporate data into databases containing monthly precipitation averages and the lowest average summer flows where the percent of the average is calculated and generate precipitation plots and present these to MNR Peterborough for review.
- MNR Peterborough will continue to verify data and information, determine corrected data where necessary and provide this information to Peterborough Geomatics Centre
- Peterborough Geomatics Centre will produce contour maps using indicator thresholds as breakpoints on base mapping showing the watershed boundaries and provide these to MNR Peterborough in Adobe format for review.
- MNR Peterborough will continue to verify data and information, determine corrected data where necessary and provide this information to Peterborough Geomatics Centre to update products

Appendix 3: Project Development Team (1999)

Ron Running - Ministry of Natural Resources

Ian Cameron - Ministry of Natural Resources

Maxine Kingston - Ontario Ministry of Agriculture, Food and Rural Affairs

Jim Myslik - Ontario Ministry of Agriculture, Food and Rural Affairs

Jim Richardson - Ministry of the Environment

Fred Fleischer - Ministry of the Environment

Ian Wilcox - Conservation Ontario

Gary Cousins - Association of Municipalities of Ontario

Support provided by:

- Margaret Mack, Ministry of Natural Resources
- Pam Jeff, Ministry of Natural Resources
- Pat Inett, Ontario Ministry of Agriculture, Food and Rural Affairs
- Jim Clifford, Ministry of the Environment
- Jena Leavoy, Ministry of Natural Resources
- Rhonda Bateman, Ministry of Natural Resources
- Jennifer Jacobson, Ministry of Natural Resources