

Shoreline Environmental Studies in Support of Official Plan Policies

Prepared For:

The Corporation of the City of Kawartha Lakes

Prepared By:

Gartner Lee Limited

In Association With

French Planning Services Inc.

GLL 21-436

August, 2002

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August 22, 2002

GLL 21-436

Mr. Rob Griffiths
Senior Planner
City of Kawartha Lakes
P.O. Box 9000, 26 Francis Street
Lindsay, Ontario
K9V 5R8

Dear Mr. Griffiths:

Re: Final Report: Shoreline Environmental Studies In Support of Official Plan Policies

I am pleased to submit our final report on Shoreline Environmental Studies to you on behalf of Gartner Lee Limited and French Planning Services Inc. The report contains:

- a) the hard copy results of our mapping exercises;
- b) our technical review and analyses;
- c) a detailed review of shoreline planning policy and approaches from the Province and five Ontario Municipal jurisdictions, including the former Victoria County; and
- d) an extensive compilation of recommendations to guide your OP policy deliberations. These include recommendations governing social as well as environmental policies, as our review concluded that the two are linked.

The report addresses all of the original study lakes, as well as Canal Lake, Mitchell Lake, Shadow Lake and Silver Lake which were added after the study commenced. It also addresses the comments on the draft report which were provided in your letter of July 30, 2002. We have not attempted to address individual comments made through the public meetings by way of specific policy recommendations for specific lakes. Instead, we have developed planning recommendations which address these concerns for all lakes, or which provide a mechanism (such as lake specific management plans) which can accommodate specific concerns.

I thank you, on behalf of Gartner Lee Limited and French Planning Services, for the opportunity to assist the City of Kawartha Lakes with this important project. It has been a pleasure to work with you and the various project stakeholders in bringing the project to this point. I wish you success in implementing these recommendations into the OP for the City of Kawartha Lakes, and in managing your shorelines for the benefit of all.

Yours very truly,
GARTNER LEE LIMITED

Neil J. Hutchinson, Ph.D.
Senior Surface Water Specialist

NJH:mm / Attach.

1. Introduction

The City of Kawartha Lakes consists of the recent amalgamation of 18 municipal entities in the former County of Victoria. The City encompasses the shorelines of numerous large and smaller lakes which support fisheries, wetlands and sensitive environmental areas. At the same time, recreational uses of these lakes provide an important contribution to the economy of the City. The City is preparing its first Official Plan (OP) and recognizes the need for OP policies to manage the sustainable development of the shorelines of its recreational lakes.

The shorelines and usage of these lakes are evolving through the conversion of seasonal shoreline residences to permanent homes, development of retirement communities on lakeshores, and an increasing number of people who choose to work from their homes in a rural area that is still within commuting distance of urban areas. At the same time, traditional shoreline recreational uses such as cottaging and resort development remain important. As individual shoreline lands are developed, pressures will increase for infilling, back lot development, public shoreline access, urbanization and serviced settlement areas. All of these development pressures will take place in an environment of established single-family cottage development, several larger communities situated on shorelines (e.g., Lindsay, Fenelon Falls), numerous smaller communities (e.g., Coboconk) and existing resorts.

These development pressures come amidst growing concerns over the environmental sustainability of shoreline development. The City of Kawartha Lakes wishes to include sound environmental policies in its first Official Plan in order to guide reasonable and responsible shoreline development and has therefore commissioned the preparation of the environmental baseline studies necessary to:

- a) identify environmental constraints to water-based development;
- b) identify the natural linkages between shoreline and upland areas;
- c) develop defensible management and planning approaches which can be entrenched in its Official Plan. These approaches may take the form of guidance on the environmental sensitivity of shoreline areas and direction as to the scope of follow-up environmental studies and conditions that may be required prior to the development of specific sites; and
- d) identify where additional studies may be required to complete the environmental baseline prior to OP preparation or the development or alteration of specific sites.

In August of 2001, the City of Kawartha Lakes retained Gartner Lee Limited (GLL) and French Planning Services Inc. (FPS) to develop environmental input into shoreline planning policies. Between September of 2001 and January of 2002, the City and GLL obtained and compiled digital mapping of the study area from the Ontario Ministry of Natural Resources (MNR) and other sources to produce the necessary base mapping. From January to April of 2002 the base mapping was supplemented with additional details on natural heritage features, environmental information was synthesized, meetings with agencies and the public were held and OP recommendations were developed into a draft report. The draft report was

submitted to the City of Kawartha Lakes in July of 2002 and review comments incorporated into this final report.

The project included formal agency and public consultation through a series of meetings. The project was presented to agencies and stakeholders to seek their input into the study design in September of 2001. In February of 2002, the mapping of natural heritage features and summary of environmental attributes, features and linkages was presented, along with requests for any additional information. In March, the draft planning recommendations were presented and a final request made for agency and public input. A record of public meetings and formal public submissions is provided in Appendix 1.

This draft report presents our summary of information on natural heritage features and water quality, our review of planning considerations and our recommendations for OP development. These recommendations are intended for consideration by the City of Kawartha Lakes in the development of OP policies to guide future shoreline planning and development.

2. Approach to the Study

The complex mixture of environmental sensitivities, existing land uses and emerging development pressures requires integration of environmental and planning expertise into a guidance document for the City of Kawartha Lakes. This report therefore incorporates :

- a) data sources identified by the City of Kawartha Lakes and staff of GLL;
- b) summaries of recent shoreline mapping initiatives of the Department of Fisheries and Oceans (DFO), the Ministry of Natural Resources (MNR) and the Trent Severn Waterway (Parks Canada). The Kawartha Fisheries Association (KFA) presently manage this fisheries information and are supplementing agency surveys with information of their own;
- c) water quality surveys completed by the Ontario Ministry of the Environment (MOE, now MOEE) in the 1970s and 1980s and ongoing monitoring of water quality at several sites of their Provincial Water Quality Monitoring Network (PWQMN);
- d) a survey of the most recent and comprehensive planning approaches used by rural municipalities to manage shoreline development in southern Ontario;
- e) environmental studies completed by the Four Mile Lake Association;
- f) public and agency input gained in the three public meetings held over the course of the project;
- g) integration of all environmental constraints and sensitivities into “MapSpace” GIS layers to allow identification and delineation of planning areas. These are

included in this report and have been provided to the City in electronic format on CD-ROM; and

- h) integration of ecological mapping and analyses, public input and the review of shoreline planning approaches into recommendations for Official Plan policies for the City of Kawartha Lakes.

2.1 Study area

The City of Kawartha Lakes covers a surface area of 3,067 km². The northern portions of the City are formed by the southern edge of the Precambrian Shield in Haliburton County while, to the south and southwest, it is bordered by the Regional Municipality of Durham. The northwest portions of the City border The County of Simcoe County and The County of Peterborough forms the eastern border (Figure 1).

The southern portions of the City are characterized by rolling terrain and thick glacial soils that support a substantial base of mixed agricultural use, numerous wetlands and large lakes. These include the Kawartha Lakes of the Trent-Severn Waterway. Balsam and Cameron Lakes receive approximately 25% of their flow as local drainage from mixed agricultural, wetland and forested areas and substantial (75%) drainage from the Precambrian Shield to the north by way of the Gull and Burnt Rivers (Hutchinson *et al.* 1994).

The large Kawartha Lakes in the City were included in the shoreline study. These are the northern portion of Lake Scugog which lies within the City boundary, the Scugog River, Pigeon Lake and Pigeon River, Sturgeon, Cameron, Balsam, Mitchell, Canal and Dalrymple Lakes. Balsam Lake drains to the west by way of Mitchell and Canal Lakes and to the east by way of Cameron Lake. Cameron Lake drains to Sturgeon Lake, which also receives drainage from Lake Scugog to the south by way of the Scugog River. Sturgeon Lake drains to Pigeon Lake to the east and Pigeon Lake receives runoff from the south by way of the Pigeon River. Dalrymple Lake is located in the northwest corner of the City. It drains north and west to Lake Couchiching by way of the Head River.

Figure 1. Study Area, City of Kawartha Lakes Shoreline Planning Input

The northern portions of the City are characterized by the transition from Precambrian Shield geology of thin acidic soils, forest and wetlands, to Quaternary geology of thin tills which overlie sedimentary rocks. These areas support forests, wetlands and some agricultural land use. Four smaller lakes with significant recreational usage are found in the northern portions of the City and were included in the shoreline planning exercise. Four Mile Lake occupies thin till plains and drains to Balsam Lake by way of Corben Creek. Head Lake also occupies an area of thin till cover and drains northward into the Head and Black River system. Shadow Lake is a widening of the Gull River and represents Precambrian Shield runoff draining to Balsam Lake by way of Silver Lake.

2.2 Scope of the Planning Study

Definition of the boundaries of the planning exercise was guided by the need to limit the scope of the study to the shoreline area as defined by the needs of the City of Kawartha Lakes, human uses of the waterfront area and by linkages to other ecological units. A true watershed approach, in which all activities upstream of the shoreline are considered, was beyond the scope of this work plan. Activities or attributes with direct ecological connection to the shoreline area were included in the scope of the study while activities in other upstream areas will be governed by other OP policies of the City of Kawartha Lakes. These would include agricultural uses in the watershed and management of sewage and runoff in urban areas, which are addressed by other OP policies or by the regulations and policies of provincial or federal agencies or ministries. In these cases, it is important to ensure that the policies of the City of Kawartha Lakes do not contradict or interfere with those of other management authorities. An arbitrary definition of shoreline uses, such as the 300m boundary often used by the Ontario Ministry of the Environment for Lakeshore Capacity Planning (Dillon *et al.* 1986) does not reflect human use or ecological linkages but was considered in cases where no other features were present which distinguished shoreline from other areas.

Several criteria were developed by the study team to determine the geographic and ecological scope of the study. The over-riding definition was “lands that physically or functionally relate to shoreline attributes or characteristics”. These were defined by a variety of factors:

- a) features on the shoreline itself;
- b) the boundaries of any wetlands which intersected with the lakeshore (i.e., no inland wetlands were considered);
- c) human features such as roadways or railways which isolated the shoreline from inland features;
- d) slope breaks such as cliffs or steep areas which physically isolated the shoreline from inland areas; and
- e) 300 m inland from the high water mark where no other features were present.

Finally, the planning study recognizes that all aspects of fish habitat management are controlled by the federal Department of Fisheries and Oceans (DFO); either directly or through delegation of responsibility to MNR, a conservation authority or Parks Canada (Trent-Severn Waterway). This report, therefore, includes mapping of significant fish habitat attributes and OP recommendations governing the need for the City to recognize federal jurisdiction and to encourage consultation with federal authorities.

3. Mapping of Attributes

Mapping of natural heritage features was based on the Natural Resource Values Information System (NRVIS) database of the MNR. The various NRVIS layers were provided to GLL in the "MapSpace" format of ArcInfo and are georeferenced to provincial standards. This mapping was supplemented by hard copy data which were transferred to the mapping system to show approximate locations but which are not georeferenced. In all cases, the mapping is intended to show themes, general locations and attributes. All mapping data must be supplemented and verified by site visits or more detailed mapping to meet requirements for specific environmental impact studies or site plan approval, etc.

The Kawartha Fisheries Association is currently undertaking initiatives to map fish habitat and to transfer these data to digital format for several of the study lakes, in co-operation with MNR and Parks Canada. The key attributes of this mapping (i.e., significant fish spawning areas), were included in the present report to guide OP development but the detailed mapping is incomplete and was not, therefore, provided.

This report contains hard copy maps which summarize natural heritage themes and features for the individual lakes and smaller portions of the City of Kawartha Lakes as well as a large map summarizing information for the entire study area. The large summary maps (Figures 2 and 3) are included in the envelope at the back of the report. A total of ten smaller maps (Figures 4 to 13) provide summaries of ecological features in the vicinity of each of the major study lakes that formed the scope of this study. A complete electronic file of all mapping has been provided to the City of Kawartha Lakes on CD-ROM.

4. Results and Interpretation

The earth science and natural environmental features were obtained from MNR's NRVIS mapping and supplementary information sources. This information was mapped for the entire study area and for each of the smaller areas around each of the study lakes. Brief descriptions of the natural features were prepared for each of the study lakes from the data available in the NRVIS system. These summaries are not intended to be comprehensive and the City of Kawartha Lakes is encouraged to add to them as

**Figure 2. Shoreline Environmental Features – Summary for the City of Kawartha Lakes
(Back Pocket)**

Figure 3. Hydrogeological and Physical Considerations for Development (Back Pocket)

Figure 4. Shoreline Environmental Features – Balsam Lake Area

Figure 5. Shoreline Environmental Features – Cameron Lake Area

Figure 6. Shoreline Environmental Features – Canal and Mitchell Lake Areas

Figure 7. Shoreline Environmental Features – Dalrymple Lake Area

Figure 8. Shoreline Environmental Features – Four Mile Lake Area

Figure 9. Shoreline Environmental Features – Head Lake Area

Figure 10. Shoreline Environmental Features – Lake Scugog Area

Figure 11. Shoreline Environmental Features – Pigeon Lake Area

Figure 12. Shoreline Environmental Features– Shadow and Silver Lake Areas

Figure 13. Shoreline Environmental Features – Sturgeon Lake Area

information becomes available. No mapping was undertaken for water quality. Instead, data were summarized into tables of descriptive water quality characteristics and sensitivities for each of the study lakes.

The mapping and summary exercises formed the basis of a technical workshop which was held by GLL and FPS to review ecological features, attributes and sensitivities. This workshop identified the key features and activities which should be addressed in OP policies. The mapping results were presented to the agencies and the public at a workshop in February of 2002.

Results are presented below for:

- a) earth science factors – hydrogeology, terrain and surficial soils;
- b) wetlands, terrestrial vegetation, wildlife and waterfowl;
- c) fisheries; and
- d) water quality.

4.1 Earth Science Factors

Terrain and soils features are not generally limiting to shoreline development, as site alterations (i.e., grading) and engineering practices (i.e., imported fill for septic fields) are widely practiced means of modifying site characteristics. These are regulated by the Ontario Building Code, Local By-laws and the Environmental Protection Act. Encroachment of shoreline alterations into the aquatic environment is strictly controlled by the Canada Fisheries Act.

Our analysis of terrain and soils was therefore focussed on identifying those conditions where existing terrain or water table features may either preclude development or require site specific evaluation and approval. Mapping was not available at sufficient resolution to identify all of these areas and so the planning recommendations and constraints are intended for consideration during site specific evaluations.

4.1.1 Data Sources

The following sources of terrain information were reviewed and compiled into the GIS mapping exercise:

- a) Surficial Geology Mapping, Geological Survey of Canada and Ontario Geological Survey;
- b) Aggregate Resources Inventory Reports, Ontario Geological Survey;
- c) Wetland Mapping (NRVIS);
- d) Agricultural Soils Mapping;
- e) National Topographic Service (NTS) Topographical Mapping (1:50,000 scale); and
- f) County of Victoria Groundwater Study (Golder Associates, 2001).

The digital base map was prepared from the NRVIS database and bedrock and surficial geology overlays prepared by manual transcription onto the base mapping. Areas where slopes exceeded 25% within 300m of the shoreline and that had high water table conditions such as wetland areas and areas of organic soils were identified as constraints to development and mapped.

The map of surficial soils is presented in Figure 14 and the geological base map in Figure 15.

4.2 Results – Development Considerations

The terrain analysis identified five constraints to shoreline development which should be considered in OP development. The constraints and rationale for each are mapped on Figure 3 and are listed as follows :

- **Areas of high susceptibility to groundwater contamination and potentially difficult building sites** are defined by shallow soil over bedrock and exposed bedrock. These areas will limit septic system construction, may be prone to erosion, may constrain building foundations and may stimulate the import of soils for landscaping. They will require raised septic leaching beds or alternative technologies for on-site servicing.
- **Areas of moderate susceptibility to groundwater contamination** include areas of coarse textured granular soil which are moderate to highly permeable (i.e., sands and gravels). Septic systems will function well within these soils although siting with respect to water supplies is important to allow adequate protection, as the soils may potentially allow rapid contaminant movement.
- **Areas of low susceptibility to groundwater contamination** include most glacial till areas as well as fine grained glaciolacustrine soil (i.e., predominantly silt and clay texture). Contaminant movement is relatively slow through low permeability soils, providing improved protection of groundwater from contaminants. Areas of low permeability may not provide adequate infiltration of septic effluent and will require site specific evaluation.
- **Areas with a high groundwater table** include wetlands and areas of organic soil. These impose physical development limitations due to poor soil conditions for building foundations and may threaten groundwater quality through inadequate separation of septic systems from the water table.
- **Steep slopes (> 25%)** limit development potential as they impose physical development limitations and are prone to erosion. Major grading or import of fill may be required to accommodate structures. Septic installations are prohibited in areas where slope exceeds 25% (Ont. Environmental Protection Act, Reg. 370/97, Sect. 10(2).1.i) and this will stimulate the need for importing fill or alternative types of on-site systems. Only very small portions of lake shorelines are constrained by steep slopes in the City of Kawartha Lakes.

Figure 14. Quaternary Geology in the City of Kawartha Lakes

Figure 15. Bedrock Geology in the City of Kawartha Lakes

Servicing requirements for development should be determined through consultation with a qualified hydrogeologist or engineer.

4.3 Terrestrial Ecology

There are a total of 65 identified features of ecological significance associated with the shorelines of the study lakes. A summary of these areas by feature and type is provided in Table 1. Detailed information was available for many of the significant terrestrial features, as these have been identified and mapped and their attributes recorded in the process of classification of:

- a) Wetlands;
- b) Areas of Natural and Scientific Interest – Earth Sciences and Life Sciences (ANSIs);
- c) Environmentally Sensitive Areas;
- d) Endangered and Threatened Species; and
- e) Significant Wildlife Habitat.

These are discussed in detail below.

Table 1. Numbers and Types of Ecologically Significant Features by Lake

	Sturgeon Lake	Pigeon Lake	Pigeon River	Lake Scugog	Scugog River	Cameron Lake	Balsam Lake	Mitchell Lake	Head Lake
Life Science ANSI's									
Provincial Significance:	Connectivity								
Regional Significance:				2		2	1		
Earth Science ANSI's									
Provincial Significance:	Connectivity								
Regional Significance:		2							
Environmentally Sensitive Areas		1							
Locally Significant Wetlands	3	3		4	1		2		
Provincially Significant Wetlands	10			9		3	5	1	1
Other Evaluated Wetlands	1						1	1	
Significant Waterbird Concentrations or Nesting Colonies	Osprey (2), Least Bittern, Tern, Waterfowl	Least Bittern, Osprey, Tern		Waterfowl					Tern

4.3.1 Wetlands

Wetlands are defined by the Provincial Policy Statement (PPS) as “lands that are seasonally or permanently covered by shallow water, as well as lands where the water table is close to or at the surface.” There are four major types of wetlands in Ontario: marshes, swamps, fens and bogs.

Wetlands are extremely important habitats and perform a myriad of essential ecological, hydrological, and social functions. These include the provision of habitat for a wide range of plants and animals (e.g., waterfowl, shorebirds and songbirds); groundwater discharge; flood attenuation through the storage and control of water; stabilization of shorelines and reduction in damage caused by erosion; water quality improvement; and recreational and tourism opportunities (e.g., hunting, fishing, boating, birdwatching, etc.).

The Province of Ontario has developed a system for evaluating and classifying wetlands, with separate protocols available for northern and southern Ontario (OMNR 1994a, 1994b). The boundary line distinguishing northern and southern Ontario passes through the extreme northern end of the City of Kawartha Lakes, with the bulk of the municipality falling within the area subject to the Southern Ontario Wetland Evaluation Manual. The Northern Ontario system would apply to any wetlands associated with the shorelines of Head Lake, Shadow Lake and the north end of Four Mile Lake. However, although some small wetlands occur within 300 m of these lakes, none have ever been formally evaluated.

In the City of Kawartha Lakes there are a total of 39 evaluated wetlands that occur on or within 300 m of the shorelines of the 11 study lakes. Depending on the point score each attained through its evaluation these wetlands have been classified as either provincially significant (wetlands that achieved a score of 600 points or greater out of a maximum of 1000), or non-provincially significant (wetlands that scored fewer than 600 points). Of the total, 29 wetlands are provincially significant (Table 1), with the remaining 10 non-provincially significant. Non-provincially significant wetlands are often referred to as locally significant, as is the case in Table 1.

The locations of these 39 wetlands are shown on Figure 2 for the entire study area and on Figures 4 to 13 for the detailed areas around each of the study lakes. The attributes of each are summarized in Table 2. In addition to the evaluated wetlands a number of small, unevaluated wetlands are depicted on Figures 3 to 14 in blue cross-hatching. These are “cartographic wetlands (i.e., areas that have been identified as wetlands from the interpretation of aerial photography based on the presence of visual indicators such as wetland vegetation, organic soils and high water table conditions). There are many examples where the boundaries of an evaluated wetland do not coincide with those of the cartographic wetlands. These discrepancies can generally be ascribed to the fact that the wetland evaluation systems for northern and southern Ontario provide specific criteria for the determination of wetland limits that can only be applied on the ground at a site-specific level.

Table 2. Provincially and Locally Significant Shoreline Wetlands within the City of Kawartha Lakes

Under the Provincial Policy Statement, development or site alteration is not permitted within provincially significant wetlands (PSWs) south and east of the Canadian Shield. This applies to all 29 of the PSWs that are the subject of this study, as no PSWs have been identified in that portion of the City of Kawartha Lakes that lies on the Canadian Shield.

From a policy perspective however, ***it is recommended that the City adopt a policy whereby all PSWs are treated equally, regardless of whether they occur on or off the Shield.*** In other words, development or site alteration would not be permitted within any PSW in the City of Kawartha Lakes.

The areas adjacent to wetlands are also important to their function. In the context of the PPS, adjacent lands are defined as those lands that fall within 120 m of the boundaries of a provincially significant wetland. The rationale provided by the Province in defense of this distance is that any development or alteration of land use within 120 m is believed to have “*a reasonable probability of affecting the ecological functions of the wetlands which they surround*”. Therefore, ***any development proposed within 120 m of a PSW must be supported by an Environmental Impact Study (EIS) that demonstrates no negative impact on the features and functions of the wetland.***

It is our recommendation that the same “adjacent land” criterion should also be applied to locally significant and cartographic wetlands, whereby any development proposed within 120 m of any wetland depicted in Figures 3 – 14 requires the preparation of an EIS.

4.3.2 Areas of Natural and Scientific Interest (ANSIs)

ANSIs are defined by the OMNR (1988) as “*areas of land and water containing natural landscapes or features that have been identified as having life science or earth science values related to protection, scientific study, or education*”. They are identified by the OMNR as part of the Ministry’s mandate to conserve the province’s natural heritage resources and are chosen to include sites which best represent the full spectrum of Ontario’s natural diversity. Studies are conducted on a regional basis to identify candidate areas within each of the site districts of Ontario, with the best from among these selected as ANSIs.

There are two types of ANSIs: Life Science ANSIs and Earth Science ANSIs. Life Science ANSIs represent the best examples of the vegetation - landform features of each site district, based on the fulfillment of five criteria: representation, diversity, ecological functions, site condition and special features.

Within each site district, the sites not within a provincial park or other protected area that best exemplify these features are considered provincially significant ANSIs, while those of lesser importance that nevertheless also meet the five criteria are considered regionally significant ANSIs.

For the purposes of the PPS, only those ANSIs identified as provincially significant are subject to the Natural Heritage policies outlined in section 2.3. However, under the Provincial Policy Statement, (PPS) municipalities are encouraged to recognize and protect regionally significant ANSIs in municipal planning documents.

Life Science Areas of Natural and Scientific Interest (ANSI)

There are no Provincially Significant Life Science ANSIs found on or within 300 m of the lakes that are the subject of this study, although the Pigeon Lake and Sturgeon Lake connectivity function is considered significant. There are five regionally significant Life Science ANSIs found within the study area (Hanna 1984; Lindsay 1986; NHIC 2002). A brief description of each is provided below.

Pigeon Lake Marsh

Pigeon Lake Marsh is a 320 ha regionally significant ANSI situated on the southwestern and western shores of Pigeon Lake (Figures 2, 10). It covers much the same area as three local wetlands: the provincially significant Pigeon Lake #15 and Pigeon Lake # 14, and the locally significant Ennismore #10. This extensive marshland is designated an ANSI as a representative example of a marsh within the Peterborough Drumlin Field physiographic region. On the south shore, a narrow strip of marsh has been dredged by cottagers.

Indian Point

Indian Point is a 996 ha regionally significant ANSI covering most of the large peninsula on the north shore of Balsam Lake (Figures 2, 3). Most of this area (947 ha) became a Natural Environment Provincial Park after first being identified as an ANSI. The area is significant because the eastern shoreline of the peninsula is presently undeveloped, unlike much of the surrounding area. In addition, the upland forests found growing across Indian Point are representative of the region, and a nationally endangered and provincially threatened plant species, American Ginseng *Panax quinquefolius*, has been found here.

Approximately 35% of the park is occupied by mesic (moderately moist) hardwood forest dominated by fairly young Sugar Maple *Acer saccharum* intermixed with American Beech *Fagus grandifolia*, White Ash *Fraxinus americana*, Red Oak *Quercus rubra*, and Basswood *Tilia americana*. Abandoned pasturelands are the next most common community, followed by mesic mixed woodland. There are also small areas of conifer-dominated forest and swamp, shrubland, marshes, sandy and limestone barrens, active pasture, and plantation represented in this ANSI. The park lies on the physiographic region known as the Carden Plain, which is an area of flat limestone covered with shallow soils. Fissured limestone pavement is exposed in several areas. Two small drumlins also underlie parts of the park.

Dirt bikes and ATVs regularly use a 4 ha sandy barren, causing disturbance to the soils and vegetation. The park is a non-operating park, meaning that it has no facilities and no on-site staff.

Burnt River Mouth Wetlands

The Burnt River Mouth Wetlands is a 350 ha regionally significant ANSI situated at the north end of Cameron Lake at the mouth of the Burnt River (Figures 2, 4). Some of the wetlands associated with Goose Lake and several ponds are also part of this ANSI. The area is composed of shallow and deep marshes, as well as conifer swamp. Deciduous forest covers the levees that border the Burnt River. There is good waterfowl habitat present in this ANSI and muskellunge *Esox masquinongy* and largemouth bass *Micropterus salmoides* are known to spawn here. The shores of Cranberry Bay and Fells Bays are occupied by cottage development. This site overlaps with the provincially significant wetland referred to by OMNR as Balsam Lake #15 (see Table 2).

Valentia Marsh

Valentia Marsh is a 475 ha regionally significant ANSI situated in a bay on the north shore of Lake Scugog (Figures 2, 9). It overlaps with the southern half of the provincially significant wetland known as Lake Scugog #19. The most common vegetation types are: pondweed open water marsh, cattail marsh, White Cedar *Thuja occidentalis*-alder scrub swamp, and swamp forests dominated by American Elm *Ulmus americanus*, Balsam Poplar *Populus balsamifera*, ash, and White Cedar. It is the least disturbed marsh complex that remains in Lake Scugog and it is a good representative of the wetlands of the region. Valentia Marsh is also high in plant diversity.

East Cross Creek

East Cross Creek is a 583 ha regionally significant ANSI situated to the northeast of Lake Scugog (Figures 2, 9). The area meets the Scugog River at East Cross Creek. Most of the ANSI overlaps a portion of the much larger East Cross Creek #15 provincially significant wetland. Numerous wetland types, such as grass-sedge meadow, riverside meadow, dense alder thicket and open wet spruce, tamarack, birch and elm swamp, are represented in this complex. It is considered significant as a representative swamp within the Peterborough Drumlin Field physiographic region.

Planning Considerations

Those ANSIs that coincide or partially overlap with provincially significant wetlands (e.g., all but Indian Point) are presently afforded protection from development or incompatible land uses under the PPS. Given the large size of these ANSIs and the fact that they occur along substantial stretches of lake shorelines, it is Gartner Lee's recommendation that the City of Kawartha Lakes treat them with the same level of protection as a provincially significant ANSI. ***All ANSIs should be identified on a schedule to the City's Official Plan and placed in an appropriate designation that recognizes their ecological significance and supports their protection.***

The PPS identifies "adjacent lands" to an ANSI as those lands within 50 m of the feature. *It is recommended that a similar distance be applied to the five regionally significant ANSIs described above*, notwithstanding that in those cases where the feature is also recognized as a provincially significant wetland an adjacent land distance of 120 m will be applied. In accordance with the PPS, *any development or site alteration proposed on or within 50 m of an ANSI will have to demonstrate that there will be no negative impacts on the natural features or the ecological functions for which the ANSI is identified.*

It is important to note that, as with wetlands, ANSIs are dynamic ecosystems and can change as a result of natural processes such as vegetation succession and rising and falling water levels. Over time, these factors, as well as new scientific information pertaining to the ecological resources of these areas, can lead to alterations in the boundaries and status of ANSIs. Any such changes, if required, are the responsibility of the OMNR, which maintains "Open File Ecological Reports" on each ANSI. Although it is expected that the OMNR would advise the City in the event of any boundary changes, it is advisable to consult the appropriate Ministry office to confirm the exact boundaries of ANSIs in relation to nearby development applications.

4.3.3 Endangered and Threatened Species

Endangered Species are defined by the PPS as *"any native species, as listed...under the Endangered Species Act, that is at risk of extinction throughout all or a significant portion of its Ontario range..."*, while Threatened Species are defined as *"any native species that is at risk of becoming endangered through all or part of its Ontario range..."*.

Information regarding the known locations of endangered and threatened species are compiled and mapped by the OMNR's Natural Heritage Information Centre (NHIC) in Peterborough. Although it is possible to access maps of significant natural heritage features through the NHIC website, neither the identity of these species nor their precise locations are revealed. Instead, occurrences of endangered and threatened species are shown by symbols that denote the plant or animal's general location (i.e., within several kilometres) and alpha-numeric codes that are used by select OMNR staff to identify the species in question. The reason for this confidentiality is due to the high degree of sensitivity associated with these species and the need to protect them from human interference (e.g., unscrupulous photographers or bird watchers and egg or medicinal plant collectors, etc.). Although the OMNR does not routinely divulge this confidential information, it is accessible through the district offices on a "need to know" basis.

It is sometimes possible to glean information regarding the occurrence of these species from other public sources such as wetland evaluation records and knowledgeable individuals such as local naturalists.

Under PPS Natural Heritage Policy 2.3 a), development or site alteration is not permitted within the "*significant portions of the habitat of endangered and threatened species*". This policy applies to at least one endangered and one threatened species that are known to occur in the City of Kawartha Lakes, although it is recognized that there may be others. Each is briefly described below.

The eastern population of the Loggerhead Shrike *Lanius ludovicianus migrans* (a bird species) is considered Endangered both nationally and provincially. The reason for this status is that numbers of shrikes are rapidly declining over most of eastern North America. The reasons for the declines are not well understood, but include loss of nesting and feeding habitat, automobile collisions and possibly a negative reaction to an environmental contaminant. The Loggerhead Shrike breeds in alvars (shallow-soiled limestone based habitats with natural open habitat) and some other open grassland habitats, such as pastures with scattered trees or shrubs. There are parts of the City of Kawartha Lakes that provide excellent shrike breeding habitat, in particular the Carden Plain, and as a result numerous occurrences of this species (recent and historical) have been recorded in the municipality. However, because this species is not associated with shoreline or wetland habitats there is no known record of this species within 300 m of any of the study lakes. Nonetheless, there is always the potential for a Loggerhead Shrike occurrence if suitable habitat exists close to the shoreline.

American Ginseng *Panax quinquefolius* is considered a Nationally Endangered plant species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and is therefore treated as Threatened in Ontario, in accordance with OMNR (1999) guidelines. For many years this plant species has been harvested for its root, which has medicinal properties (although it is illegal to export the plant, domestic harvesting is not regulated in Ontario). This plant grows in rich, undisturbed and relatively mature deciduous forests, often in clumps or colonies. Many colonies have declined or disappeared in recent years. There is a record of the species from the Indian Point ANSI (not mapped), however the plant is not located within 300 m of the shoreline. Although this species could be found in relatively close proximity to the water's edge its preferred habitat, namely upland forest, generally occurs well back from the shoreline.

It is imperative that the local OMNR office be contacted to determine whether a shoreline development application is being proposed in an area that is known to represent the significant portions of the habitat of an endangered or threatened species. Furthermore, it is important to note that data regarding species of conservation concern are time sensitive and that some records represent historical (i.e., not recent) records.

4.3.4 Significant Wildlife Habitat

The PPS defines significant wildlife habitat to mean "*areas where plants, animals, and other organisms live and find adequate amounts of food, water, shelter and space needed to sustain their populations.*" Unlike significant wetlands and ANSIs, the province (i.e., OMNR) does not identify significant wildlife habitat. This is, instead, a municipal responsibility. To date, the City of Kawartha Lakes has not carried out a systematic, City-wide study to identify where these areas of significant wildlife occur. The OMNR

(2000) has issued technical guidelines to assist planning authorities in the identification of significant wildlife habitat. This document has been consulted for this study.

Examples of Significant Wildlife Habitat, as defined in OMNR (2000), include:

- a) Seasonal Concentrations of Animals;
- b) Rare Vegetation Communities and Specialized Habitats for Wildlife;
- c) Habitats of Species of Conservation Concern; and
- d) Animal Movement Corridors.

Many of these types of wildlife habitat have not been fully researched and mapped by the OMNR; in fact data pertaining to the above features were requested from the local district offices of OMNR but none were available. Despite this, it is possible to ascertain that some shoreline areas in the City of Kawartha Lakes might fit these criteria. The following subcategories of Significant Wildlife Habitat may be relevant to the City of Kawartha Lakes shoreline study area:

- a) colonial bird nesting sites;
- b) waterfowl stopover and staging areas;
- c) bullfrog concentration areas;
- d) rare vegetation communities (e.g., alvars);
- e) turtle nesting habitat;
- f) specialized raptor nesting habitat; and
- g) habitats of Species of Conservation Concern.

Specific locations of some of these features are described below. It is important to note that many of these sites are found within provincially and locally significant wetlands and ANSIs, and in many instances it is the presence of species of conservation concern or wildlife concentration areas that have contributed to the site's ecological significance.

Colonial Bird Nesting Sites

At least two species of colonially-nesting birds (birds that nest in concentrated groups), the Common Tern *Sterna hirundo* and the Black Tern *Chlidonias niger*, breed in the Kawartha Lakes. A colony of Common Terns is known to occur on rocky outcroppings at the north end of Head Lake (Bradt, pers. comm., 2002; Figure 2). At least two breeding locations of the Black Tern, which nests loosely in small colonies in cattail marshes, occur in the study area (Ellingwood, pers. comm., 2002). One is located at the southeast end of Sturgeon Lake in Sturgeon Lake #27 wetland, where a large cattail island is found. The other location is on the west side of Pigeon Lake in Pigeon Lake/Victoria Park marsh (Figure 2).

Waterfowl Stopover and Staging Areas

Waterfowl on migration often concentrate in areas where there are large quantities of available resources. Two such locations (Figure 2) are the south end of Sturgeon Lake where American Coots *Fulica americana*, diving ducks and loons concentrate, particularly in the fall (Ellingwood, pers. comm., 2002), and the northeast end of Lake Scugog (Bradt, pers. comm., 2002). The deeper Balsam Lake and Cameron Lake are less likely to support concentrations of waterfowl.

Specialized Raptor Nesting Habitat

Osprey *Pandion haliaetus* is a fish-eating bird of prey (or raptor). This species nests in dead trees or on top of artificial structures such as nest platforms or hydro poles above or near water. Numbers of breeding ospreys are very high in the Kawartha Lakes (Ellingwood, pers. comm., 2002). In 2001, there were 12 occupied nests of ospreys at the south end of Sturgeon Lake (Martin, pers. comm., 2002). Some of these individuals nested in artificial structures supplied by the Friends of the Osprey Society. In 1998, four ospreys also nested in Sturgeon Lake where Emily Creek flows into the lake. A Canadian Wildlife Service aerial survey recorded the following numbers of occupied Osprey nests in 2000 on lakes other than Sturgeon Lake: Pigeon Lake, six nests; Canal Lake, three nests; Balsam Lake, two nests; Lake Dalrymple and north Lake Scugog each with one nest; and Cameron Lake with no nests (Martin, pers. comm., 2002).

Habitats of Species of Conservation Concern

Species that are not listed as Threatened or Endangered by the province, but which are listed as either vulnerable by the province or are listed as Special Concern, Threatened and Endangered by the federal government (COSEWIC) are considered Species of Conservation Concern in the Significant Wildlife Habitat Technical Guide (OMNR 2000). Numerous other species with lesser degrees of rarity and concern are also considered Species of Conservation Concern.

The Least Bittern *Ixobrychus exilis* is a small species of heron designated as Vulnerable in Ontario, according to the criteria outlined in OMNR (1999). This bird requires high quality marshlands for breeding, and generally stays hidden in the vegetation, making it a difficult species to observe. It has been deemed vulnerable in Ontario because it has a small and declining population and is losing its habitat to development. The Kawartha Lakes area may hold the highest concentrations of this species in southern Ontario (Ellingwood, pers. comm., 2002). The highest concentrations of Least Bitterns in the study area are found at the south end of Sturgeon Lake in the marshes associated with Sturgeon Lake #27 wetland, and good numbers are also found in Pigeon Lake/Victoria Park Marsh wetland. One or more breeding individuals have been recorded elsewhere in the Kawartha Lakes and they may be present in any cattail marsh or other marsh with dense cover of tall vegetation that is of moderate or large size.

The Black Tern is considered Vulnerable in Ontario, due to slow long-term declines in its population and a decrease in its nesting habitat (moderate to large-sized marshes). As mentioned above under Colonial Bird Nesting Sites there are two known colonies of this species in the study area.

Other less obvious species, such as plants that are rare within the City of Kawartha Lakes, but are not rare within the province, could also be considered as being within Significant Wildlife Habitat. The Significant Wildlife Habitat Technical Guide (OMNR 2000) should be consulted when shoreline development is considered.

Deer yards, or areas where significant concentrations of deer overwinter should be identified and protected from encroachment. These have not been mapped in the NRVIS database and so were not presented in Figure 2. We recommend that the City locate and map deer yards as part of an ongoing information update program.

It should be pointed out that the symbols used in Figure 2 to depict the occurrence of colonial nesters and species of conservation concern are very general and are intended to show areas where concentrations of these animals are known to occur, not precise locations.

4.3.5 Environmental Impact Studies

The *Natural Heritage Reference Manual* (OMNR 1999) sets out guidelines to assist a planning authority in determining the circumstances under which an EIS is required in support of a development application. The need for an EIS is triggered by the proximity of the proposed development to the natural heritage feature, referred to as "adjacent lands". For shoreline development proposals in the City of Kawartha Lakes the following "adjacent land" zones are recommended:

Provincially Significant Wetlands	=> 120 m
Locally Significant Wetlands	=> 120 m
"Cartographic" Wetlands (as shown on Figure 2)	=> 50 m
Critical Habitat of Endangered & Threatened Species	=> 50 m
Provincially Significant Life Science ANSIs	=> 50 m
Regionally Significant ANSIs	=> 50 m
Significant Wildlife Habitat	=> 50 m
Fish Habitat.....	=> 50 m

Proponents seeking to develop within the 300 m shoreline zone around any of the study lakes are required to undertake an EIS if any portion of the proposed development falls within any of the "adjacent land" areas identified above. Where a development proposal is put forward, Figure 2 should be consulted to determine, at a first cut, if the development has the potential to affect a mapped natural heritage feature and therefore requires an EIS. However, it should be emphasized that the features depicted on Figure 2 represent the best and most up-to-date spatial information available at the time this study was prepared and accordingly the local district office of the OMNR should be consulted to confirm the status and boundaries of the features.

The overall objective of the EIS will be to identify and assess the potential impacts of specific development proposals on the function, attributes and linkages of shoreline natural heritage systems and to demonstrate compliance with applicable municipal, provincial, and federal planning policy.

An EIS can take the form of either a full site or a scoped study. City planning staff should assist proponents in identifying the key technical issues to be addressed and the appropriate scope and level of effort required in the preparation of an EIS. These exact requirements will vary depending on the scale of the proposed development scenario, the significance and sensitivity of the nearby natural heritage feature(s), and the anticipated magnitude, duration and spatial extent of predicted impacts (direct, indirect and cumulative).

It is recommended that, prior to preparing an EIS, an initial assessment be undertaken among the proponent, the municipality and any relevant approval/commenting agency (e.g., Kawartha Region Conservation Authority, OMNR, Trent-Severn Waterway [Parks Canada]) to review the proposal, determine the applicable environmental regulations and policies, and to provide direction as to the scope of the necessary technical studies.

Scoped EIS

In cases where the development constitutes a relatively minor undertaking (such as construction on a single residential lot) or one that barely encroaches within the adjacent lands zone, municipal planning staff can exercise some discretion and request that the proponent prepare a scoped EIS. This typically involves a simple checklist approach that only addresses the key issues identified at the initial assessment stage.

Full Site EIS

For more complex proposals, such as plans of subdivisions, and resort/recreational developments (e.g., marinas), a full site EIS is the appropriate mechanism for demonstrating that development can meet the test of municipal and provincial natural heritage policies.

Components of a full site EIS typically include consideration of the following:

- a) a detailed description of the natural heritage attributes of the study area, including terrain setting; soils; geology; groundwater and surface water resources; vegetation communities; fish and wildlife communities and habitat; and delineation of the precise boundaries of the natural heritage feature(s);

- b) a characterization of the existing ecological, hydrological, and hydrogeological functions performed by the significant feature(s);
- c) a detailed description of the proposed development, including building type and density, servicing (sewage disposal, water supply) and infrastructure (roads, stormwater management, etc.);
- d) a prediction as to potential impacts (direct, indirect and cumulative) of the development on the natural and physical environment;
- e) the identification and evaluation of measures/options to avoid, reduce or otherwise mitigate impacts to meet the standard of no loss of feature and function;
- f) the selection of a preferred mitigation/rehabilitation strategy;
- g) a summary of predicted net effects after the application of mitigation compared to overall environmental targets and standards; and
- h) an evaluation of the need for and the elements of a monitoring program to assess the effectiveness of the preferred mitigation/rehabilitation strategy.

Additional guidance regarding the specific technical requirements of an EIS and the approach that should be taken to the preparation of an EIS within the context of a typical municipal planning process are discussed further in the *Natural Heritage Reference Manual* (OMNR 1999).

4.4 Fisheries and Fish Habitat

A detailed analysis of fish and fish habitat was not considered essential background to the development of OP policies for the City of Kawartha Lakes. Fish habitat is broadly defined and inclusive and all nearshore areas are of potential importance to fish. The Canada Fisheries Act provides strict management guidelines for fish habitat and it applies to all potential fish habitat. A variety of agencies are actively managing fisheries in the main study lakes on the Kawartha system and the OP can protect all potential fish habitat through the same policies. Fish habitat mapping and classification exercises are currently being undertaken by the Kawartha Fisheries Association and the degree of detail and status varies between the study lakes, such that a consistent analysis could not be done.

Our assessment of fisheries was therefore restricted to summarizing existing information on the fish community in each study lake and mapping significant spawning areas. Our assessment considered that common fish habitat characteristics such as spawning areas for bass and sunfish are present throughout most areas of the study lakes. Existing mapping information provided by the KFA and the NRVIS database is restricted to the spawning areas for walleye (*Stizostedion vitreum vitreum*) and muskellunge (*Esox masquinongy*). These species are important sport fish and their habitat characteristics are specifically defined and restricted to smaller portions of the study lakes. We therefore mapped walleye and muskellunge spawning habitat on Figure 2 and Figures 4-13.

The muskellunge spawns in 30 – 50 cm of water in heavily vegetated flooded areas and the eggs are scattered at random or drop into vegetation (Scott and Crossman, 1973). For walleye, spawning grounds are the rocky areas in white water below impassable falls or dams in rivers, or boulder, to coarse-gravel shoals of lakes (Scott and Crossman, 1973).

4.4.1 Data Sources

Materials from the following sources were collected and reviewed as input to the fisheries assessment :

- a) Kawartha Lakes Fisheries Assessment Unit (MNR);
- b) Ontario Ministry of Natural Resources – Peterborough District;
- c) Ontario Ministry of Natural Resources – Minden District; and
- d) Kawartha Fisheries Association.

Aquatic habitat and fisheries information was gathered from the respective organizations involved in the management of the Kawartha Lakes fishery and aquatic environment. This information includes data on:

- a) observed spawning areas;
- b) potential spawning sites;
- c) fish community composition; and
- d) aquatic habitat features.

4.4.2 Fish Community

The fish communities of the study lakes are characteristic warm water communities of bass, sunfish species, perch, walleye, pike, muskellunge and others (Table 3.) Non of the species listed in Table 3 are considered representative of cold water, with the possible exception of cisco. The species complement is considered incomplete as minnows, for example, were only recorded in Mitchell Lake. Spawning areas for bass and sunfish are common throughout shallow nearshore areas with sand and gravel bottoms and are widely distributed throughout the study lakes. Muskellunge spawning is associated with wetland vegetation, which is less common throughout the study area, and walleye spawn on wave exposed rocky shoals or near river mouths, which are also limiting habitat types in the study area. Figure 2 identifies areas of documented muskellunge and walleye spawning habitat.

Table 3. Fish Communities in the Study Lakes

	Balsam Lake	Canal Lake	Cameron Lake	Dalrymple Lake	Four Mile Lake	Head Lake	Mitchell Lake	Pigeon Lake	Lake Scugog	Shadow Lake	Sturgeon Lake
Muskellunge <i>Esox masquinongy</i>											
White Sucker <i>Catostomus commersoni</i>											
Brown bullhead <i>Ictalurus nebulosus</i>											
Rock bass <i>Ambloplites rupestris</i>											
Smallmouth bass <i>Micropterus dolomieu</i>											
Largemouth bass <i>Micropterus salmoides</i>											
Pumpkinseed <i>Lepomis gibbosus</i>											
Yellow perch <i>Perca flavescens</i>											
Walleye <i>Stizostedion vitreum vitreum</i>											
Carp <i>Cyprinus carpio</i>											
Northern Pike <i>Esox lucius</i>											
Bluegill <i>Lepomis macrochirus</i>											
Cisco <i>Coregonus artedii</i>											
Minnnows											

4.4.3 Fish Habitat Recommendations

The Canada *Fisheries Act* states that no person shall carry on any work or undertakings that result in the harmful alteration, disruption or destruction of fish habitat (Section 35(1)), unless the work has been authorized by the Minister of Fisheries and Oceans Canada (DFO) (Section 35 (2)). Fish habitat is defined in the Act as “*spawning grounds and nursery, rearing, food supply, and migration areas in which fish depend on directly or indirectly in order to carry out their life process*”. Enforcement of the *Fisheries Act* provisions are often undertaken in conjunction with other responsible resource management agencies, in particular the Ontario Ministry of Natural Resources (OMNR), Conservation Authorities, Parks Canada and the Canadian Coast Guard (CCG). It should be recognized that a proponent is ultimately responsible for attaining all appropriate work permits and authorizations from the appropriate regulatory agencies for a proposed project that is in or around water, and where fish habitat is likely to be altered.

Although the Fisheries Act clearly states roles for proponents and fisheries management authorities the role of the municipality (beyond the cases where it is a proponent) is not elaborated. The OP policies for the City of Kawartha Lakes should distinguish between activities occurring within the lake (which must be reviewed by fisheries authorities) and activities occurring on shorelands adjacent to the lake in determining municipal input. Sound OP policies can reduce the potential for shoreline activities to harm fish habitat. Implementation of minimum setback distances and shoreline naturalization policies for all shoreline areas will protect fish habitat as a matter of course but other policies may be required where specific fish habitat concerns exist. OP policies should require EIS studies as a condition of development proposals on lands adjacent to documented muskellunge and walleye spawning habitat. These EIS studies must include consultation with the appropriate management body (i.e., MNR). *We therefore recommend a) a setback of 15m for onshore disturbance adjacent to study lakes to protect fish habitat and b) an EIS be completed for onshore developments adjacent (within 50 m) to identified walleye or muskellunge spawning areas.*

4.5 Water Quality

Although there are many potential stressors of recreational water quality some (e.g., climate change or invading species), are beyond the scope of municipal governments and OP policy. Municipal policies are best focussed on :

- **Nutrient enrichment, or eutrophication**, which stresses water quality through the accelerated addition of phosphorus to water from human sources such as septic systems, point source inputs (e.g., sewage treatment plants), agriculture or urban runoff. Eutrophication is manifest as reduced recreational water clarity, increased incidence of nuisance algal blooms and enhanced consumption of oxygen from deeper waters. Many of the Kawartha Lakes suffer from eutrophication, mostly as a result of natural conditions in their watersheds, but also because of inputs from agricultural, urban and recreational activities. Municipal policy can address nutrient enrichment through land use policies to reduce conflicts with water quality from agriculture or urban development and through encouragement of Best Management Practices in sewage treatment, urban and shoreline development.
- **Bacterial water quality** which is critical in recreational waters. Bacteria can be managed through implementation of local septic inspection programs and through encouragement of Best Management Practices for agriculture and urban runoff.
- Implementation and encouragement of **monitoring programs** to track spatial and temporal changes in water quality. These allow the municipality to react to problem areas or emerging trends, to alert other agencies as required, to develop planning mechanisms to address changes in water quality and to provide timely information on water quality to residents. Water quality programs can be implemented through co-operation with other agencies such as MOEE, the Conservation Authority or Health Unit, with the assistance of stakeholders such as lake resident associations, or directly by the municipality.

The following sections of the report review water quality characteristics of the study lakes, use recent monitoring data to illustrate trends, and make recommendations on water quality management in OP policies.

4.5.1 Water Quality Trends

Two major and several minor sources of water quality data for the study lakes were reviewed. The Ontario Ministry of the Environment completed limnological descriptions of the major Kawartha Lakes in the early 1970s and, although these data are 30 years old, the lake survey reports (on file at MOEE Kingston) remain the most complete source of information. The MOEE maintain the Provincial Water Quality Monitoring Network (PWQMN) at river sites and lake outlet sites for the major Kawartha Lakes and these provide a useful long-term record of water quality changes for points of interest to the City of Kawartha Lakes Study. The PWQMN sites of interest and periods of record are shown in Table 4.

Table 4. Active MOEE Water Quality Sites in the City of Kawartha Lakes

Station	Sample Point	First Year	Last Year	Total Years	Latitude	Longitude
17002102102	Sturgeon Lake Outlet at Hwy 36, Bobcaygeon	1966	2000	34	78.547	44.538
17002102302	Cameron Lake Outlet at Hwy 35, Fenelon Falls	1966	2000	34	78.740	44.535
17002102502	Gull River at Hwy 35, Coboconk	1966	2000	34	78.798	44.658
17002113002	Scugog River Upstream of Lindsay lagoons	1996	2000	5	78.730	44.329
17002104102	Scugog River Downstream of Lindsay lagoons	1970	2000	30	78.753	44.396
17002105402	Balsam Lake Outlet at Rosedale dam	1971	2000	29	78.786	44.574
17002107402	Pigeon River at Fees Landing, 3 km North of Omeme	1972	2000	28	78.542	44.343
17002107502	Burnt River at 11th Ln Somerville, 5 km S of Kinmount	1972	2000	27	78.660	44.740

Other sources of data include a major study of the limnology of Sturgeon Lake completed by MOE from 1986-1989 (Hutchinson *et al.*, 1994) and data cited in a report for Four Mile Lake completed by Michael Michalski Associates (1986). Although these data are useful, they are not complete and not current and there is no co-ordinated program in place to monitor water quality in the City's lakes. ***We recommend that the City of Kawartha Lakes develop and implement a recreational water quality monitoring program which targets, at a minimum, the present study lakes.***

The program need not be elaborate but should include:

- a) the MOEE PWQMN data and sites;
- b) a targetted sampling of total phosphorus in all lakes at spring overturn, in co-operation with MOE's Inland Lakes management program;
- c) co-operative programs with lake associations or the Kawartha Region Conservation Authority to monitor water clarity (Secchi depth) and algal growth (chlorophyll "a" measurements) in all lakes;
- d) co-operative programs with MOE and MNR to monitor dissolved oxygen levels in lakes; and
- e) co-operative programs with Health Units to monitor bacterial water quality.

The following sections illustrate the utility of long term data sets for tracking changes in water quality. The interpretation is incomplete, however, as data are lacking for several key study lakes.

The PWQMN data for the study lakes show a consistent trend of decreasing phosphorus concentrations in the study lakes through the 1970s and 1980s, with stable levels since that time. The improvements are due to a variety of factors, most notably improved sewage treatment, but they may also reflect improved analytical capabilities for phosphorus at low levels. Figure 16 shows long-term trends in phosphorus for the Gull River upstream of Balsam Lake (downstream of Shadow and Silver Lakes), the Burnt River (inflow to Cameron Lake), the outlets of Balsam and Cameron Lakes and the Pigeon River inflow to Pigeon Lake. Figure 17 shows long term and recent trends for the outflow of Sturgeon Lake and for the Scugog River upstream of Lindsay (Lake Scugog) and downstream of the former discharge from the sewage lagoons at Lindsay. Phosphorus is a reliable indicator of human influence on water quality, as it is added to the lakes from sewage treatment (treatment plants and septic systems), agricultural runoff, urban runoff and land clearing. There is therefore no indication that nutrient enrichment of the study lakes is increasing.

The most recent five years of data from the PWQMN sites are summarized in Table 5. The Gull River drains Precambrian Shield watersheds in Haliburton and Shadow and Silver Lakes are formed by widenings in the river. The phosphorus concentration of 8.2 µg/L represents very good water quality and Figure 17 shows that water quality is stable.

Figure 16. Long -Term Trends of Phosphorus in Kawartha Lakes from MOE PWQMN Data.
Bars indicate mean annual concentrations and crossed lines indicate one standard deviation

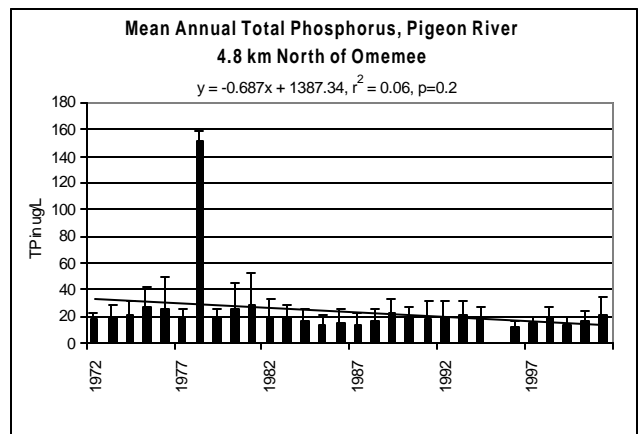
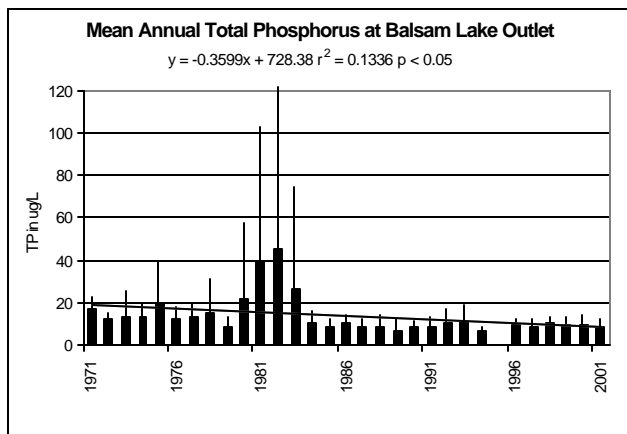
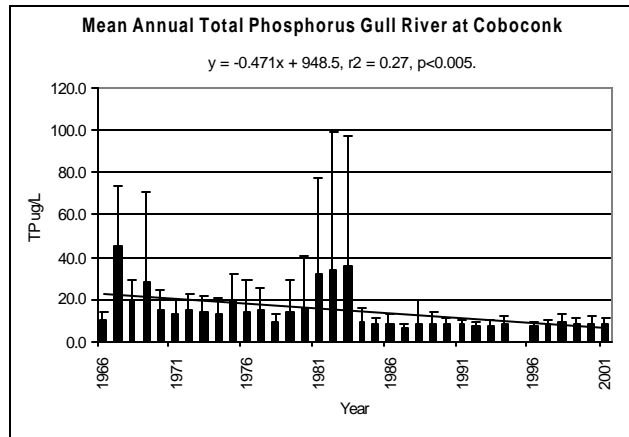
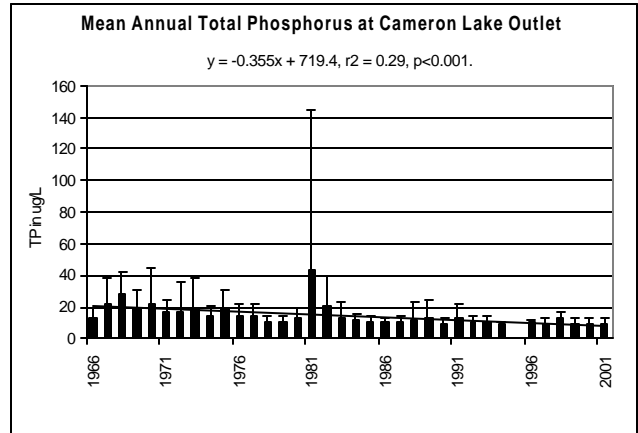
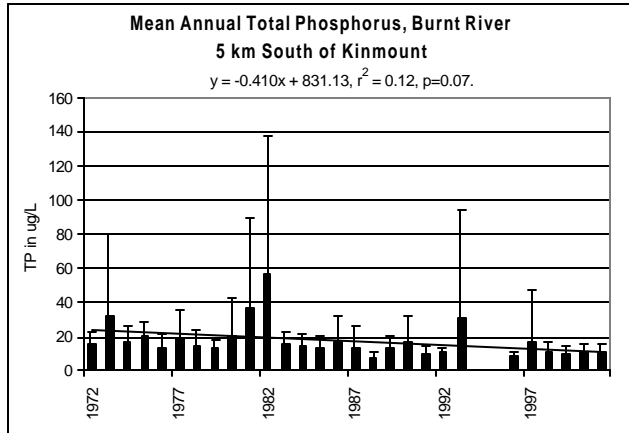
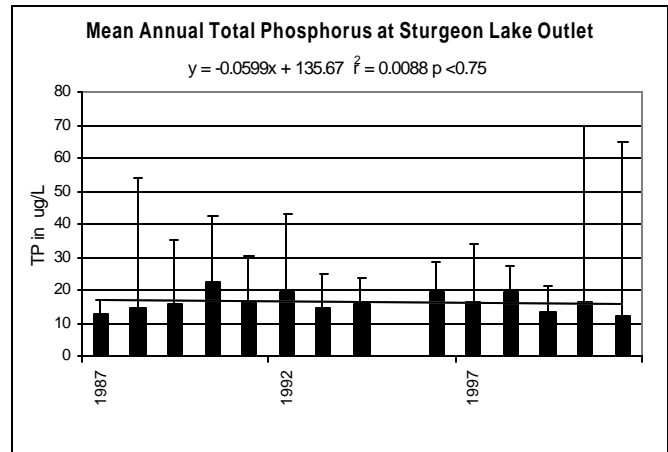
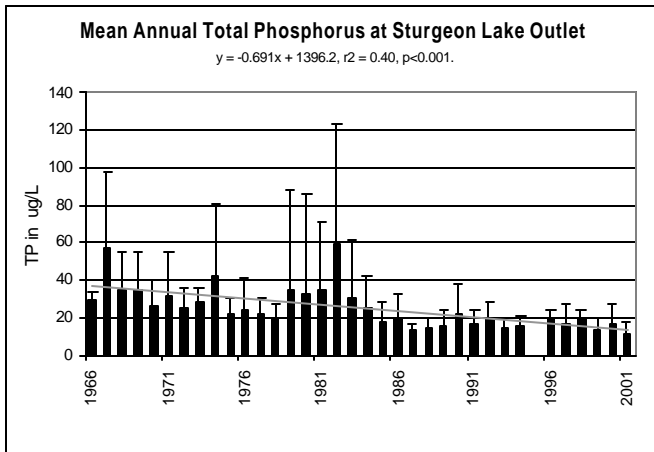
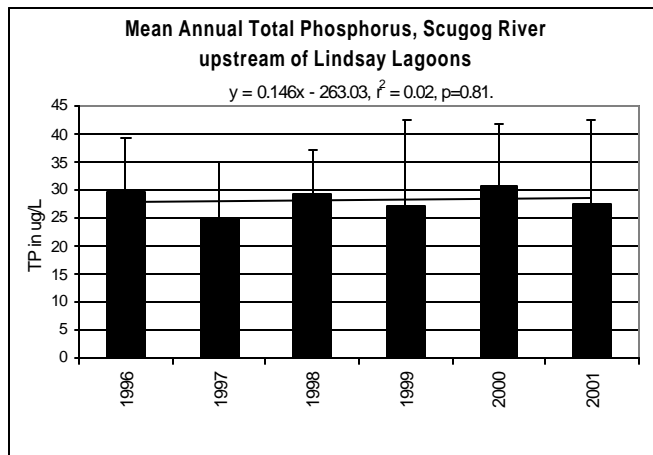
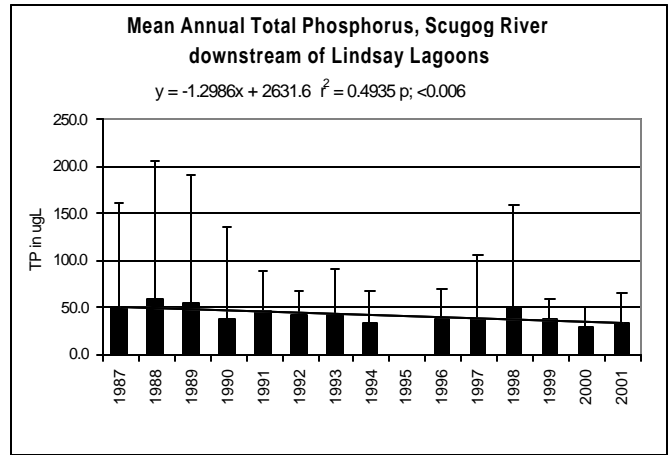
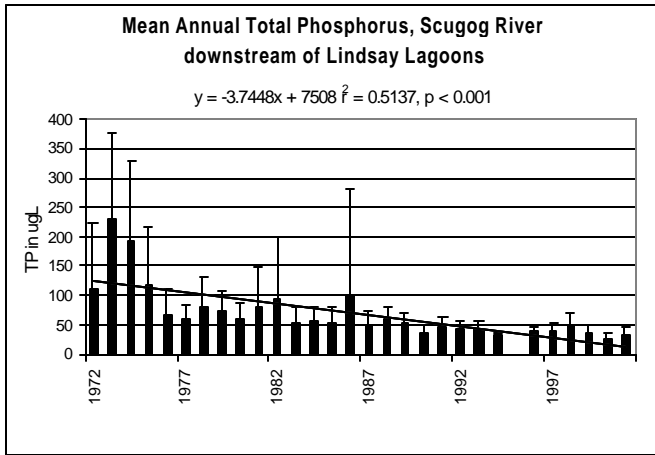


Figure 17. Comparison of Long and Short Term Trends of Phosphorus in Sturgeon Lake Outflow and Scugog River. Bars indicate mean annual concentrations and crossed lines indicate one standard deviation.



The Burnt River, Balsam and Cameron Lakes all show the dominance of Precambrian Shield water quality with moderately low total phosphorus concentrations. The Pigeon River and Lake Scugog are influenced by wetlands, thick soils and agricultural land use and show moderate and high levels of nutrient enrichment. Sturgeon Lake is moderately enriched, receiving waters of moderate nutrient levels from Cameron Lake, and water with high nutrient levels from the Scugog River.

Table 5. Mean Concentrations of Total Phosphorus in Kawartha Lakes, 1996-2000

	TP in ug/L
Burnt River	11.8
Gull River (Shadow and Silver Lakes)	8.2
Pigeon River	17.4
Balsam Lake Outlet	9.3
Cameron Lake Outlet	9.7
Scugog River upstream of Lindsay	27.9
Sturgeon Lake Outlet	15.4

The influence of improved sewage treatment is shown in Figure 17, as improved water quality downstream of the Lindsay sewage lagoons and in the outflow of Sturgeon Lake in the 1980s and 1990s.

4.5.2 Lake Specific Assessments

Table 6 summarizes water quality and physical characteristics of relevance to the study lakes. Overall, available data support a conclusion that the study lakes are nutrient enriched but that shoreline development and human factors do not have a measurable impact on water quality. The study lakes reflect their origins as warm, shallow lakes that are influenced by thick soils and wetlands in their catchments, such that they are naturally enriched. Dissolved oxygen levels are low in most of the lakes, again reflecting their shallow depths and enriched nutrient status. Although physical limitations to the natural environment have been documented for some lakes (i.e., Four Mile Lake, Michael Michalski Associates, 1986), the water quality does not indicate problems related to shoreline development.

Many of the study lakes have been invaded by zebra mussels, according to the records of MNR's "Invading Species Hotline". In others, the free swimming larval stages of zebra mussels ("veligers") have been observed but adults have not. The presence of the zebra mussels can be expected to improve water clarity, as the mussels filter suspended algae from the water. Although this may be considered an improvement by some, the increased clarity will increase the depth of light penetration, such that rooted aquatic plants will proliferate. This may result in increased pressure for aquatic plant management to allow swimming and boating activities. All such requests should be forwarded to MNR, to address potential alterations of fish habitat by aquatic plant removal.

Table 6. Summary of Water Quality and Physical Characteristics of the Study Lakes

Overall, water quality in the Kawartha Lakes indicates that shoreline development, on its own, does not have an appreciable impact on nutrient levels in the lakes. Shoreline development is well advanced in the lakes such that policies which limit the amount of development may create a planning disparity between sections of the lakes which are well developed and those which have little shoreline development.

Official Plan policies should still focus on the management of existing and future land uses to protect water quality. Policies which enforce regular inspections of septic systems and inspections when properties are transferred will, over the long term, eliminate leaking and inadequate systems and will promote awareness of the need for maintenance. Policies which encourage shoreline naturalization will reduce the need for fertilizer uses adjacent to the lakes and will reduce runoff and erosion from shoreline properties. Much of the water quality data presented in Table 6 is dated, reinforcing the need for present-day monitoring programs.

Present economic conditions favour expansion or modernization of shoreline resorts or development of condominiums or cluster development. Long term maintenance can best be assured through encouragement of communal sewage treatment facilities, but these may require assumption by the City. The MOEE favour policies of land based effluent disposal (i.e., tile fields or infiltration trenches) over additional direct discharges to surface water.

4.5.3 Sources of Nutrients

The Ontario Ministry of the Environment (Hutchinson *et al.*, 1994) completed a phosphorus budget for Sturgeon Lake for the period 1986-1988 to estimate sources of nutrient loading and management options for the lake (Table 7). This nutrient budget has been used to categorize phosphorus sources to the lake. Sturgeon Lake is one of the major Kawartha Lakes and is used to represent the relative magnitude of nutrient loadings to the other lakes on the Kawartha System, namely Cameron, Balsam, Canal and Mitchell Lakes. The Sturgeon Lake nutrient budget is dominated by inputs from the watershed, with the upper system (Cameron Lake, 43%), the southern watershed (Scugog River, 27%) local drainage (13%) and precipitation (8%) dominating the nutrient budget. Human influence on water quality is minor. Point sources add 3.2%, urban runoff 1.7% and shoreline development 2.5% (Table 7, from Hutchinson *et al.*, [1994]). Improvements to sewage treatment for Lindsay, have reduced the phosphorus loading from 3.67 tonnes in 1986-1988 to 0.84 tonnes in 2002 (S. Irwin, City of Kawartha Lakes, pers. comm.).

Table 7. Phosphorus Budget for Sturgeon Lake, 1986-88, 2002

	1986-88		2002	
	TP (tonnes)	TP (%)	TP (tonnes)	TP (%)
Cameron Lake	11.54	39.23	11.54	43.51
Scugog River	7.31	24.86	7.31	27.57
Local Drainage	3.60	12.25	3.60	13.59
Precipitation	2.12	7.22	2.12	8.01
Point Sources	3.73	12.70	0.84	3.18
Urban Runoff	0.44	1.50	0.44	1.66
Shoreline Development	0.66	2.24	0.66	2.49
	29.41	100.00	26.52	100.00

The Sturgeon Lake nutrient budget can be used as a guide to OP policies for water quality, as it represents the conditions for the major Kawartha Lakes. It suggests that OP policies should address nutrient loadings by:

- a) encouraging the use of Best Available Technologies for Sewage Treatment to reduce point sources of phosphorus from urban centres;
- b) managing shoreline development by recognizing that it represents an insignificant source of nutrient loading to the main Kawartha Lakes. Water quality-based shoreline development capacities will not influence overall water quality in the City of Kawartha Lakes; and
- c) adopting the use of Best Management Practices to reduce nutrient loading from urban and shoreline development.

In the past, the Province of Ontario and some municipalities have adopted the Ontario Lakeshore Capacity Model (Dillon *et al.* 1986) or its variants in order to limit shoreline development to protect water quality. Our assessment concludes that this approach is not worthwhile for the City of Kawartha Lakes because:

- a) for the major Kawartha Lake, shoreline development is an inconsequential component of the nutrient budget;
- b) for Shadow and Silver Lake, the flow of the Gull River marks the major component of their hydrologic and nutrient budgets, such that controls on the quantity of shoreline development will have very limited influence on water quality;
- c) recent assessments of nutrient loading have concluded that shoreline septic systems do contribute to the nutrient budget, but that the loadings are less than previously assumed. Establishment of nutrient based shoreline development

capacities for the smaller, inland lakes such as Four Mile and Head Lake, will do little to protect water quality and may not be technically defensible (Robertson *et al.* 1998, Hutchinson, 2002); and

- d) lake management through lake-specific plans which address a variety of ecological and social concerns is, a better means of achieving a balance between human usage and environment features.

4.5.4 Development Intensity

Table 8 provides several indices of development intensity on the study lakes which were derived for this project. “Building Counts” were obtained as a total count of buildings along the shoreline of each lake from the NRVIS database. The count does not distinguish types of buildings (i.e., cottages from boathouses) and is intended as an index of crowding.

Table 8. Building Densities on Shorelines of Study Lakes

Lake	Building Count	Lake Area (ha)	Shoreline (km)	Density (Bldgs/km)	Average Frontage (m)	Average Frontage (ft)	Density (Bldgs/ha)
Balsam	1730	4665	78.7	22.0	45.5	149	0.37
Cameron	1077	1304	23.2	46.4	21.5	71	0.83
Canal	682	1085	39	17.5	57.2	188	0.63
Dalrymple	481	1323	33.6	14.3	69.9	229	0.36
Four Mile	415	773	21.3	19.5	51.3	168	0.54
Head	389	919	19.3	20.2	49.6	163	0.42
Mitchell	292	852	42.2	6.9	144.5	474	0.34
Pigeon	1270	5349	145.2	8.7	114.3	375	0.24
Scugog	2609	8262	112.6	23.2	43.2	142	0.32
Scugog River	1894	n/a	38.5	49.2	20.3	67	
Shadow/Silver	485	320.2	22	22.0	45.4	149	1.51
Sturgeon	4436	4499	96.9	45.8	21.8	72	0.99

Shoreline density is presented as average frontage for each lake and as average surface area of the lake per building. The results show that the Scugog River, Sturgeon Lake and Cameron Lake have the greatest intensity of shoreline crowding as each building has, on average, less than 100’ of available shoreline.

Some municipalities in the County of Haliburton use an index relating lake area to the number of shoreline lots as a filter. In practice, densities of 0.25 lots/acre (~0.62 lots/ha) or less are considered acceptable, while densities exceeding these levels may trigger detailed lake studies as a requirement for additional development. This criterion suggests that Cameron Lake, Canal Lake, Sturgeon Lake and Shadow/Silver Lake are heavily developed and may be sensitive to further development. Shadow and Silver Lakes, and Cameron Lake are very well flushed by the Gull River system, and shoreline development represents 2.5% of the nutrient loading to Sturgeon Lake (Table 7). Any sensitivity to additional development may reflect social concerns with lake or shoreline crowding and this is not effectively managed through water quality based development limits. Social concerns are better addressed through a co-operative lake planning process, which includes water quality but which also considers a much broader spectrum of environmental sensitivities.

Our assessment concludes that protection of the shoreline and lake environment can be achieved effectively through OP policies which:

- a) set minimum lot sizes to maintain acceptable shoreline development densities;
- b) mandate septic inspection and replacement to prevent excessive loadings of nutrients and bacteria;
- c) enforce shoreline naturalization to protect fisheries and wildlife habitat, reduce erosion and set manicured lawns away from the waters edge; and
- d) encourage the development of individual lake plans to guide future development and stewardship initiatives.

5. Review of Planning Materials

The review of planning materials is presented in Appendix B as a series of Tables. These tables present a review of current planning policy direction and approaches that municipalities have used to satisfy the intent of the Provincial Policy Statement (Government of Ontario, 1997) and formed the basis of the recommendations presented in Section 6. The review includes the following materials:

- a) **Planning Direction** ➤ Provincial Policy Statement
- b) **Planning Approaches** ➤ Official Plan Policies and approaches for:
 - District Municipality of Muskoka
 - Township of Lake of Bays
 - Township of Muskoka Lakes
 - Former County of Victoria
 - City of Sault Ste. Marie

6. Conclusions and Recommendations

The following sections present planning approaches which are recommended for consideration by the City of Kawartha Lakes. They build on the environmental constraints presented above and policies from other jurisdictions to provide a thorough list of specific planning advice. Although the intent of this report was to address ecological and biophysical recommendations to OP Policy, we recognize that the human element is of critical importance. Social concerns will govern the quality of the shoreline experience and may be presented as ecological concerns if they are not clearly defined. In our experience, residents' opinions that a lake has reached a "carrying capacity" or a "water quality limit" may be based on observations of crowding, noise or visual aesthetics. Attempts to manage the lake environment through a limited focus, such as water quality, may not be technically defensible and may focus attention away from other important factors. The following sections therefore contain recommendations to address social issues, such as backlot development, density, lighting and visual aesthetics. We believe that residents' desires for a complete lake environment can be addressed through comprehensive OP Policy which includes these elements.

We also note the emergence of "Lake Plans" for formulating input to policy. OP Policy, no matter how comprehensive, cannot reflect the characteristics of each lake within the City of Kawartha Lakes. Lake character varies with human use as well as the natural environment. We therefore recommend that the City encourage the development of individual lake plans as a co-operative process among lake residents, the City, businesses and provincial and federal agencies.

The following tables represent our recommendations on OP Policy to the City of Kawartha Lakes. They were prepared by French Planning Services, with review input by Gartner Lee Limited.

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Lakes Official Plan**

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Appendices

- A. Record of Public Meetings
- B. Summary Review of Official Plan Policies

Appendices

Appendix A

Record of Public Meetings

Appendix B

Summary Review of OP Policies

- separate file