

II. DESCRIPTION OF THE AREA

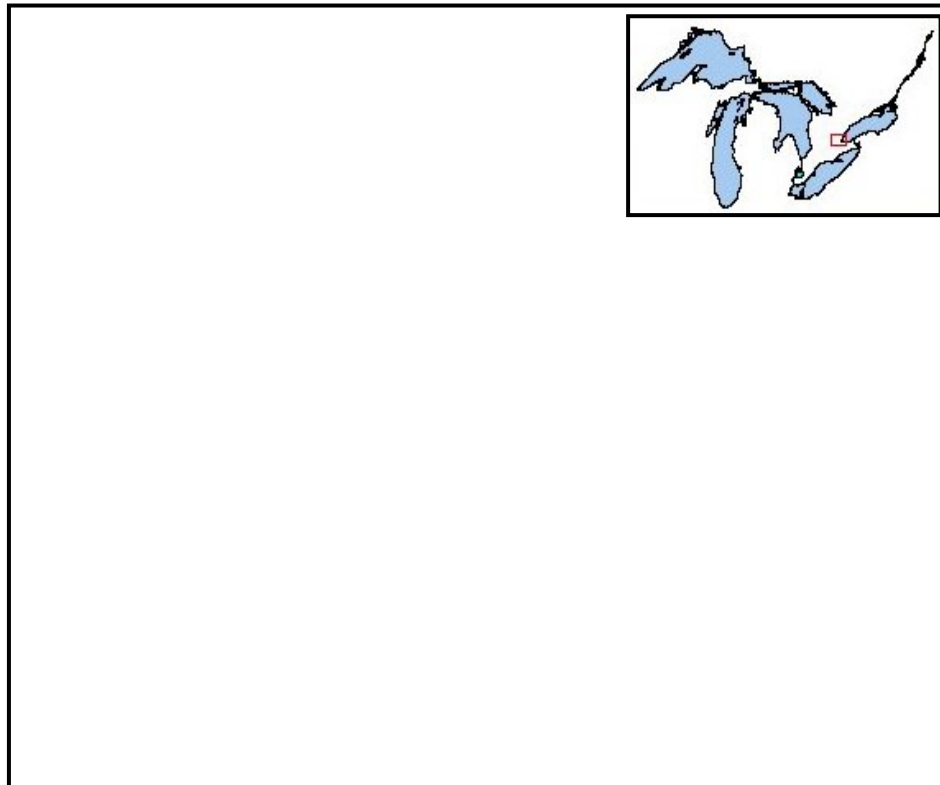
II.1 The Watershed and its Hydrology

Hamilton Harbour is a 2,150 hectare (ha) embayment of Lake Ontario connected to the lake by a single ship canal across the sandbar that forms the bay. The conditions in the Harbour reflect natural inputs, human activities, land uses, and drainage from the watershed of 49,400 ha.

This watershed (Figure 3) is drained by three main tributaries: Grindstone Creek draining the north central area of the watershed (9,000 ha); Red Hill Creek draining the southeast sector of the basin (6,640 ha); and Spencer Creek draining the northwest and western parts of the watershed (28,452 ha). There are also minor tributaries that drain parts of the shore of Cootes Paradise and the north shore of Hamilton Harbour. The urban runoff from a major portion of the City of Hamilton is collected in a combined sewer system (sanitary and storm) that has outfalls discharging directly into the Harbour. There is a program underway to capture and treat all the combined sewer overflows. The urban runoff from the City of Burlington is collected in a stormwater system (separate from the sanitary sewer system) of which a portion outfalls into the Harbour.

Spencer Creek reaches the main part of the Harbour through a 250 hectare, shallow area of both marsh and open water called Cootes Paradise Marsh, discharging at an artificial opening into the west end of the Harbour called the Desjardins Canal.

Figure 3. Hamilton Harbour Watershed Map



There are four wastewater treatment plants (WWTP) that discharge to the Harbour. The Regional Municipality of Halton operates the Skyway WWTP, which discharges into the northeast end of the Harbour. The City of Hamilton operates the other three plants. The largest plant, the Woodward WWTP, discharges into Red Hill Creek. The Main Street WWTP (also known as the Waterdown WWTP) discharges into Grindstone Creek. The King Street WWTP (also known as the Dundas WWTP) discharges into Cootes Paradise.

The Harbour also receives the treated wastewater from all of Stoney Creek (via the Woodward WWTP) and Burlington (via the Skyway WWTP) - large portions of which are not in the natural watershed of the Harbour. Hence, the recommendations of this report will have to be addressed by all the citizens of these communities in the “sewershed” - not just those in the natural watershed.

The flow contribution from tributaries and WWTPs into the Harbour ranges between 7.3 m³/second (2.3 x 10⁸ m³) in the summer and 10 m³/second (3.2 x 10⁸ m³) in the winter. In addition, there is a flow of water that enters the Harbour from Lake Ontario through the Burlington Ship Canal that is difficult to measure. In the winter there is a surging of the currents back-and-forth in the Canal. In the summer there is an exchange of water with the Lake by a distinct inflow of cold water along the bottom of the Canal into the Harbour and an outflow of warm water from the Harbour out into the Lake. These and other flow related phenomena are studied by researchers at the National Water Research Institute (NWRI) to create models in order to better understand flows in the Harbour, the Canal, and out into Lake Ontario.

II.2 Topography and Geology

The Niagara Escarpment is the most outstanding physiographic feature of the area, dividing the area of the watershed in half. The area above the escarpment is generally very flat (typical gradients of 1 in 2,000). The escarpment itself gives rise to stream gradients of up to 1 in 20 with several scenic waterfalls. Below the escarpment, with stream gradients in the order of 1 in 100, streams move across plains of clay and sand, or down the Dundas Valley.

At the present time, approximately 80 % of the Red Hill Creek, 12 % of the Grindstone Creek, and 20 % of the Spencer Creek watersheds are developed. Erosion in the river valleys below the escarpment is a matter of general concern, although concern for erosion from construction sites is greater.

II.3 Current Land Uses

Urban centres located in the watershed are the City of Hamilton (population 490,268 in 2001 - Statistics Canada, 2001 Census) and the City of Burlington (population 150,836 in 2001 - Statistics Canada, 2001 Census). The City of Hamilton amalgamated with all of the members of the old Region of Hamilton-Wentworth in 2001. Recent urban growth within the watershed has focused on Hamilton Mountain and Flamborough (Waterdown). Development has resulted in a nearly continuous urban area surrounding the Harbour, below the Niagara Escarpment.

II.3.1 Land Use Breakdown

The breakdown of the 1996 Land Use Categories based on property codes for the City of Hamilton is:

- 65 % agricultural land use
- 14 % residential land use
- 8 % combined industrial, commercial and institutional/government land use
- 8 % public open space/conservation land use
- 5 % combination of vacant, private open space, or railways

The agricultural lands in the watershed are primarily mixed farms (livestock, hay, grains, corn) and fruit and vegetable farms.

II.3.2 Recreational and Environmentally Sensitive Areas

Recreational areas include 14 conservation areas (3246 ha) managed by the Hamilton Conservation Authority, 7 conservation areas (360 ha) managed by Conservation Halton, the Royal Botanical Gardens (1102 ha comprised of 687 ha land areas and 415 ha aquatic areas) and the natural areas and trails associated with the Niagara Escarpment.

Recreational boating is available on the Harbour itself through facilities at LaSalle Park Marina, Royal Hamilton Yacht Club, Leander Boat Club, MacDonald Marine, Harbour West Marina, and the Macassa Bay Yacht Club.

Over fourteen thousand hectares (14,514 ha or 29 % of the watershed) are designated as Environmentally Significant/Sensitive Areas (ESA), including the 373.2 ha Cootes Paradise Marsh that is a Provincial Class 1 wetland. Development in ESAs is subject to a range of provincial, conservation authority, and municipal controls in an attempt to prevent or minimize damage to plants, animals, landforms, forests, and to retain the educational, research or aesthetic values embodied in these locations.

II.3.3 Port of Hamilton

The Harbour's deep water port supports the largest concentration of heavy industry in Canada. The port and its associated industries are located along the south and east shores of the Harbour. Direct and indirect employment related to the port facilities is estimated at 30 % of the total Hamilton area employment.

The City of Hamilton has had an economic structure based primarily on the iron and steel industry and other heavy industry. The Harbour is a key element in its development, and in its continuance here. The Harbour is the largest Canadian port (in terms of tonnage handled) in the Great Lakes, and 80 % of the tonnage is iron ore and coal for the two major steel industries, Dofasco and Stelco. In addition, the Hamilton Port Authority (formerly the Hamilton Harbour

Commissioners) exercises control over the Harbour waters, almost all of the remaining water lots, and the major industrial land holdings around the Harbour.

In addition to being a major shipping centre, the Harbour is ringed by major highways, which have an impact on water quality and habitat in the Harbour. A commercial/passenger railway system and an airport also service the watershed.

II.3.4 Harbour Alterations

From the time when Governor Simcoe built a military road in 1793 through the Dundas Valley from Burlington Bay to the Thames River, the present physical basin of the Harbour has been irreversibly altered.

Canals and infilling of the Harbour have had major environmental impacts. In 1823 a ship canal was built through the sandbar separating the Harbour from Lake Ontario. It was placed south of the natural outlet and was wider and deeper. This channel is now 88 m wide and 10 m deep - a situation that makes possible the exchange of Lake Ontario and Harbour waters, as well as accommodating the largest seaway vessels.

The long since abandoned Desjardins Canal, constructed through Cootes Paradise to move shipping up to Dundas in 1853, resulted in a change to the location of the outlet in that major marsh area, from a location near the Valley Inn Road on Grindstone Creek to the artificial cut under the Thomas B. McQueston bridge on York Boulevard.

II.3.5 Shoreline Use

The south and east shores of the Harbour have been filled over time and developed for industrial and commercial activities (primarily the iron and steel industries), marine terminals, railway and highway construction, institutional uses, and recreational uses. Twenty-five percent of the area of the original bay has been filled, eliminating 65 % of the wetlands, protected inlets and shallow areas that served as the nursery habitat for the largest fishery that existed on Lake Ontario until the first decade of this century.

The eastern shore is comprised of the highway, the canal, institutional lands, as well as commercial activities that prevent significant general public access. However, increasing public access in the south eastern end has been set as one of the new tasks of the Hamilton Harbour RAP.

The north shore of the Harbour in the Aldershot district of the City of Burlington consists largely of private homes and a private golf course. There are two cemeteries (Woodland Cemetery and Holy Sepulchre Cemetery) with limited public access due to the nature of the land use. There is one large park, LaSalle Park, which is fully public with recent trail enhancements and lookout. Finally, there is a "Window on the Bay" lookout available to the public along the north shore.

The western shore is now shared between railway land and a public trail due to the construction of the Hamilton Waterfront Trail in 2000.

The western end of the south shore includes Bayfront Park and Pier 4 Park, both with public beaches. The National Parks Service is planning to construct the Canada Marine Discovery Centre on Pier 8. Other lands on Pier 8 are available for development and discussions are underway to decide what should go there. A trail to extend the Waterfront Trail from Pier 4 to Pier 8 is in the planning stages.

In terms of the 42 kilometres of shoreline available, the space is utilized approximately as follows:

- 46% - Industrial, including proposed developments on existing piers (19.4 km)
 - 3% - Transportation (1.4 km)
 - 10% - Residential (4.3 km)
 - 10% - Institutional (cemeteries, public buildings) (4 km)
 - 4% - Private open space (private marinas, golf courses) (1.5 km)
 - 27% - Public open space (public marinas, parkland, wildlife habitat) (11.1 km)
- (Source: Hamilton Port Authority, personal communication 2001)

II.3.6 Public Access

Public accessible shoreline has increased from 7 % of the shoreline in 1992 to 27 % in 2001. This dramatic shift in access has inspired the RAP Forum Stakeholders to raise the bar and set a new goal for 35 % of the Hamilton Harbour shoreline to be physically accessible to the public. The land transfers in 2001 between the Hamilton Port Authority and the City of Hamilton have created new opportunities (e.g. Pier 8 and Windermere Basin) for continuing to increase public access.

II.3.7 Landfills

The Region of Halton does not have any active landfill sites in Burlington. There are two sites within the Harbour watershed under Halton's jurisdiction that have been closed in the last thirty years. Gas (methane), leachate collection system, groundwater and surface water are monitored at both sites.

The City of Hamilton has one active landfill site, but it does not fall within the watershed (Glanbrook); however, leachate from the landfill is discharged to the Woodward WWTP. The Solid Waste Reduction Unit (SWARU) incinerator is also owned by the City of Hamilton, but was permanently closed in December 2002. There are 12 closed landfill sites under Hamilton's jurisdiction, but only six of them are within the watershed (Brampton, Dundas, Edgewood, Rennie, Upper Ottawa, West End). The leachate collection systems used at each site and the monitoring of sites varies. More information on City of Hamilton landfills is available on the City's website (www.city.hamilton.on.ca/CityDepartments/toe/wm/landfills).

Philip Services Inc. owns and operates the Taro Landfill Site. The Taro West Section is closed and Taro East currently accepts solid, non-hazardous, commercial, institutional, and industrial wastes. These landfills discharge leachate to the Woodward WTP.

II.3.8 Jurisdiction

Jurisdiction over matters affecting water quality, the potential for future costs of monitoring the environment, and land use in the watershed or around the Harbour are complex, to say the least. The federal and provincial governments are responsible for numerous statutes and regulations related to navigation, fish and wildlife, as well as water and air quality. Municipal planning for new housing, industrial development, and open spaces can have an important effect on the Harbour. Equally important is the diligent enforcement of by-laws that are designed to minimize the impact of construction activities, and to monitor business or other services to see that regulated activities are carried out effectively.

Jurisdiction for controlling waterfront land uses for shipping and navigation activities rests with the Hamilton Port Authority by virtue of the fact that these regulatory/operation functions are vested in a federal agency. Other waterfront planning authorities include the Regional Municipality of Halton, the Cities of Hamilton and Burlington, and the two local Conservation Authorities (Conservation Halton and Hamilton Conservation Authority).

II.4 Socio-Economic Conditions

This section is based on a report by Schaefer and Robinson (1991), but has been updated with information from the 1996 Census and projections by the Regional Municipality of Halton and the Cities of Hamilton and Burlington.

II.4.1 Population and Demographics

II.4.1.1 Hamilton

In 2002, the City of Hamilton's planning and development department looked at three growth scenarios: slow rate, current rate, aggressive rate. At the current rate of growth the population of Hamilton is expected to increase to about 549,000 by 2011.

Overall, migration into Hamilton is expected to remain positive, stimulated by the higher real estate prices in Toronto, and sustained by the future availability of development infrastructure locally.

The number of households was projected to increase from 161,100 in 1986 to about 211,885 by 2011 according to year 2000 forecasts. The new forecasts look out to 2031 and see numbers ranging from 235,600 – 306,200 for private households in Hamilton. The majority of this household growth is expected to occur in the periphery of the City of Hamilton, such as in the former Town of Stoney Creek and Township of Flamborough.



II.4.1.2 Regional Municipality of Halton

The Regional Municipality of Halton has experienced steady growth both in absolute terms, and in terms of its size as a percent of total Greater Toronto Area (GTA) population. It increased from 5.6 % of the GTA total in 1961, to 7.3 % in 1986 and remained at 7.3 % in 1996. Future population totals in Halton Region are expected to increase from 387,200 in 2001 to 543,000 in 2016. This outlook reflects the Region's strategic location near to Toronto, strong transport links, and other environmental amenities.

II.4.1.3 City of Burlington

For the City of Burlington, the only Region of Halton area municipality located in the Hamilton Harbour watershed, population growth averaged 1.7 % annually over the period from 1986 to 1996. Future growth in the Halton Region is expected to focus primarily on urban Milton however, and Burlington's growth is expected to average only 1.1 % annually from 2000 to 2011. From 2001, population is expected to increase by 24,100 to reach 178,900 by 2016. As a percent of Halton's total population, Burlington will therefore account for roughly 33 % in 2016, compared to 43 % in 1986.

The number of households in the City of Burlington is projected to increase from 50,250 in 1996 to 68,760 in 2016. The greatest pressure for development will be in the Alton community (north of Hwy 5 and south of Hwy 407).

II.4.2 Age Structure

A widely recognized demographic feature, the aging population phenomenon, applies particularly to Hamilton and Burlington. The Hamilton Census Metropolitan Area (CMA), which includes both areas, was identified in the 1986 Census as having the third oldest average population of the 33 Canadian cities listed (33.4 years). As of the 1996 Census the average age of the Hamilton CMA populations had risen to 36.7 years in comparison to the national average of 35.8 years. This "aging" phenomenon obviously comes as the result of fewer babies and more seniors living longer.

II.4.3 Regional Growth Patterns

One widespread transition experienced in the Hamilton Harbour area, as in many communities throughout North America, is a substantial increase in peripheral development and suburban sprawl. While there are substantive advantages in terms of individual land and property ownership, there are, from a more holistic or sustainable perspective, a number of limitations. As with many North American communities, the spilling of development outside of the urban framework has resulted in: lost open space; reductions in agricultural land; an increased reliance on the automobile, yielding increased traffic congestion, air pollution and ultimately, water

pollution; increased flooding activity during heavy rainfall; costly infrastructure expansion; and a deterioration of downtown core area.

Both Halton and Burlington have strong Official Plan policies to limit development outside of defined urban areas and to control sprawl. Based on forecasted population projections, the existing urban areas in Halton should be sufficient to accommodate the Region's projected growth to 2016. A comprehensive urban structure review is required under the Official Plan as part of the five-year review of the Official Plan before considering the designation or expansion of urban area boundaries.

Due to the 2001 amalgamation, the City of Hamilton is undergoing a consolidation and review of all of the former Official Plans. Policies on defining urban areas and controlling sprawl are expected to be examined during this review.

II.4.3.1 Implications for Harbour Remediation

An increase in population in the Hamilton Harbour area has at least two implications for remediation. First, there will be increased stress on existing wastewater treatment plants, most of which are near capacity. From a socio-economic perspective, this highlights the enormous potential for water demand management (water conservation, pricing mechanisms, leak detection, pressure reductions, etc.) in the Halton and Hamilton area to reduce the quantity of water being used, thereby extending the life of treatment plants and potentially reducing the concentrations of certain contaminants in plant effluent.

Secondly, as the population around the Harbour continues to grow, there will undoubtedly be an increase in the demand for water-based recreational activity. This warrants a closer look at the anticipated growth of the existing and potential uses in the Harbour to facilitate the allocation of waterfront land. This point will become increasingly important as waterfront land becomes available in an already intensely used waterfront on the main Harbour.

The aging phenomenon may be most significant in the context of RAP plans for waterfront recreational use. For planning future remedial options, it suggests relatively more demand for passive uses like trail walking and bird watching, and less demand for strenuous water sports and other active uses. This implies that passive multi-use greenspace might be given higher priority among competing foreshore uses. The construction of the Waterfront Trail in the west end of the Harbour in 2000 is an example of a passive, multi-use space.

Given the comprehensive nature of remedial action planning, as outlined in the Great Lakes Water Quality Agreement, there is some merit in investigating the implications of changing development patterns for improving water quality in Hamilton Harbour. In fact, as outlined above, the linkages are inherent. A decentralized development pattern, from an environmental perspective, is usually quite unsustainable. To alleviate many of the problems of decentralization and to make more efficient use of existing land, more attention should be directed at strengthening metropolitan districts, largely through more diverse housing (for all ages and income groups), improved public transportation (increased number of links with employment hubs, etc.), and strengthened commerce. In short, there is a greater need to integrate the various 'people activities' (i.e. living, working, shopping, entertainment, etc.). These suggestions provide

little help for immediate water-related problems in the Harbour, but can go a long way to facilitating the maintenance of restored beneficial uses, in the long term.

II.4.4 Employment and Industry Outlook

On a combined basis, employment growth within the Greater Hamilton Census Metropolitan Area (CMA) has been strong between 1986 and 1996, with the total labour force increasing by 44.3 % from 214,895 to 310,105. Meanwhile, unemployment rates have fluctuated from a peak of over 11.0 % in 1982, 6.1 % in 1988, 8.1 % in 1996, and to down to 5.0 % in 2000. The expanding labour force and a generally declining unemployment rate suggests that job creation in the CMA has been sufficient to absorb the annual increase in those employed or looking for work.

The Labour Force Employment numbers for 1981, 1986 and 1996 are shown in Figure 4, with a focus on the percent change between 1986 and 1996. 2001 Census information was not yet available at the time of publication.

Underlying this recent employment growth is a fundamental shift in the nature of local employment, away from manufacturing and towards the service sector. Also, the aging population is expected to create substantial new job opportunities in the service sector, ranging from tourism services to nursing-home care.

This shift from manufacturing jobs has apparently had a positive impact on real wages in the community. From 1981 to 1986, average employment income for males increased from \$18,337 to \$32,737 (1986 dollars), and by 1996 was \$34,691 (in 1996 dollars). For females from 1981 to 1986, average employment income increased from \$8,316 to \$19,697 (1986 dollars), and by 1996 was \$20,506 (in 1996 dollars).

The “new economy” not only brings higher pay, but it attracts the best and the brightest individuals. These people will be looking for a place to relocate their families that offers a clean environment and academic opportunities. Hamilton certainly has the academic opportunities with McMaster University and Mohawk College located here. However, the stigma of Hamilton’s old reputation of being a dirty, smelly place remains. It may be difficult to convince these top-notch candidates to bring their families to Hamilton with this environmental reputation. It follows then that a cleanup of the Harbour may be an important consideration to future economic prosperity of Hamilton.

Figure 4. Labour Force Employment by Industrial Sector

Industry Sector	1981	1986	1996	% Change 1986 - 1996
Primary	3,905	4,595	5,690	23.8
Manufacturing	69,945	61,575	62,770	1.9
Construction	12,715	13,200	16,280	23.3
Transportation ⁽¹⁾	10,955	11,325	18,240	61.0
Trade	32,900	37,610	57,150	52.0
FIRE ⁽²⁾	8,875	10,375	18,695	80.2
Government	7,725	7,635	12,295	61.0
Education	not available	not available	23,935	not available
Health and social service	not available	not available	33,070	not available
Accommodation, food and beverage service	not available	not available	18,845	not available
Other Services	59,000	68,580	22,960	73.5 ⁽³⁾
TOTAL	206,020	214,895	310,105	44.3 %
(1) Transportation includes Communications and utilities				
(2) FIRE refers to Finance, Insurance and Real Estate				
(3) Calculation based on comparison of 1986 Other Services number to sum of 1996 Education, Health, Accommodation, and Other Services numbers.				
Source: 1992 Stage 2 Report and 1996 Census				

Trends within the steel industry continue to involve changing technologies including continuous casters, direct reduction, and an eventual shift to non-coke based steel making. Already there is restructuring taking place, with continuous casting having made the intermediate operations like the ingot floor virtually obsolete. Dofasco has two continuous casters, one of them using 100% scrap metal from their Electric Arc Furnace. Dofasco's long-term strategy as of 2001 includes the gradual reduction on the dependence on coke, but there is no definite date on this eventual operational change. Stelco has reduced its use of coke in its Blast Furnace operation by installing a Pulverized Coal Injection facility, which injects coal directly into the Blast Furnace, thus eliminating the coke production phase. This has permitted the shutting down one of its two Coke Oven Batteries. Stelco has also shut down the older one of two Blast Furnaces due to the increased efficiency of operating the remaining furnace. Stelco believes that the future of iron and steel making lies in direct reduction technology that will eliminate the need for coke and the coke oven and by-product facilities.

II.4.4.1 Implications for Harbour Remediation

The steady growth in business services since 1971 is a trend that will likely continue into the future. To some extent it depends on whether the local mix of labour skills continues to meet the demands of new highly paid business service occupations. But more importantly perhaps, it

depends on the ability of local policy-makers to ensure a healthy working environment for attracting more skilled labour into the area. This means not only providing affordable office space with suitable access, but also implies a willingness to control pollution and to create additional recreation amenities. In this way, the Hamilton Harbour area can promote a well diversified labour force, which will minimize the risk of depending too much on one economic sector.

With respect to the large 'footprint' of the industrial uses of the waterfront land, it seems difficult to foresee how public access could be realized in the face of proven safety and security concerns. However, access is such an important public issue that consideration should be given to establishing a community committee to explore the practical potential for providing access through existing industrial or Hamilton Port Authority properties.

II.4.5 Summary

This section is not exhaustive in its description of socio-economic conditions in the Hamilton Harbour watershed. It has, however, shown the importance of including social and economic information in the remedial action planning process, and has provided some illustrations of its relevance in facilitating the selection of remedial options to ensure the maintenance of restored beneficial uses. Some of these observations are summarized below.

Increases in population levels will continue to put stress on existing water supply and wastewater infrastructure, and exacerbate the pressure for improved access to the Harbour. Specifically, demographic trends point towards an aging population base for the future, with more leisure time on their hands. This suggests a relatively strong future demand for passive recreational uses like trail walking and bird watching and improved employment opportunities in the tourism, recreational, and other service sector industries.

The Area of Concern's economic structure is becoming increasingly diverse. With the adoption of new technologies, more automation, and increased international competitiveness, the area's main manufacturers may become less labour and land intensive. Steel making may no longer be the engine of growth for Hamilton. Skilled service sector occupations have grown substantially in the recent past and this trend is expected to continue into the foreseeable future, with the growth of small business.

Successfully adapting the local economy to this structural change will depend on policy makers' ability to create a healthy working and living environment and the creation of new and improved recreation amenities to attract more skilled labour into the area.

The image of Hamilton as a polluted environment both in air and water, may be a significant deterrent to attracting the best and the brightest individuals and their families to Hamilton and therefore may impact on the economic conditions of Hamilton.

Finally, there is a real need to examine water demand management and effluent charges as a cost effective approach for improving water quality and for extending the sewage carrying capacity of the Harbour.

II.5 Environmental Conditions and Problem Definition

This section has been significantly altered in content and layout from the 1992 Stage 2 Report to better reflect the situation in the late 1990s. (The following is as approved by the RAP Forum in 1999.)

II.5.1 Water Clarity, Oxygen Levels and Nutrient Levels

Water clarity is poor. The desirable clarity is described as 3-metre secchi disc visibility. Water clarity is affected by:

- sediment from soil erosion
- solid particles from industrial waste water, waste water treatment plants and combined sewer overflows
- excessive growth of microscopic plants stimulated by excessive loadings of phosphorus from waste
- water treatment plants and other sources

Oxygen levels are too low. Desirable oxygen concentrations (to support fish) would be greater than 4 ppm. Oxygen levels are affected by:

- ammonia from waste water treatment plants
- decomposing plant material

Special issues to be investigated include the following. These may be integrated into the problem definition if investigations show that they are indeed a problem, in the sense that they impede progress toward goals.

- impact of zebra mussels
- impacts of climate change
- impacts of road salt
- impact of spills
- significance of groundwater
- impacts of landfill leachate
- impacts of Harbour discharge on water intakes in Lake Ontario
- impacts of blue-green algae and related toxicity.

II.5.2 Bacterial Contamination

Bacteria levels are too high. Desirable concentrations would be less than 100 E. coli per 100 ml of water, to permit swimming. Bacteria make the surface water in and around the Harbour less safe for recreational uses. They tend to be elevated in the creeks and streams, primarily because of urban runoff and combined sewer overflows, which occur during precipitation events, but also during dry weather due to sewer cross-connections. They can be elevated in the Harbour when prolonged or heavy rains or snowmelt carries them down to its shores. Special issues in this

category include: the negative impact of Harbour discharges on the beaches in Lake Ontario and restricted use of the Harbour for waste discharges to avoid use conflicts.

II.5.3 Urbanization and Land Management

Changes in urban, rural and industrial activities have resulted in destruction of sustainable natural ecosystems. This has taken the form of increased erosion, increasing demands on wastewater treatment plants, increased number and volume of toxic substances entering the watershed, and loss of access to the Harbour for the general public.

Desirable land management would include:

- an assessment of environmental impacts within an ecosystem approach to land-use planning;
- farmers and developers implementing erosion prevention techniques;
- integration of RAP goals and standards for the Harbour with other planning documents such as official plans, etc.; and
- watershed planning and stewardship of privately and publicly owned resources.

Special issues in this category include analysis of the uses of foreshore areas, impacts of growth in human populations, increases in water use and corresponding increases in rapidity of rates of runoff, analysis of Windermere Basin's function and the land uses surrounding it, infilling to meet RAP objectives should meet provincial guidelines and be subject to impact assessment, land use adjacent or close to the Harbour, and nonpoint source pollution. These may be integrated into the problem definition if investigations show that they are indeed problems, in the sense that they impede progress toward RAP goals.

II.5.4 Toxic Contaminants

Zinc, lead, nickel, PCBs, and PAHs contaminate water and sediments. Fish flesh is contaminated with some of these and with mercury.

Contributors to the problem include: large industry, small industry, business and householders who use municipal sewers to dispose of chemical waste, landfill leachate, farmers, homeowners and municipalities which use chemicals to control weeds and insects, atmospheric fallout, chlorine used in treatment of municipal waste (reaction).

Contaminated sediments pose a special problem because of the difficulty of remediation.

Special issues to be investigated include the need for information on the presence and sources of PAHs, PCBs, mercury, dioxins and furans and radioactive materials. With the exception of radioactive material, these persistent toxic substances are already defined as part of the problem, but little has been done since 1989 to determine whether diminished loadings continue to result in diminishing concentrations in the ecosystem. Other special issues are: sediment contamination with early action at Randle Reef, airshed depositions, and the emerging issue of endocrine disrupting compounds (EDCs) and pharmaceuticals.

II.5.5 Stresses on Fish and Wildlife

Fish and wildlife species are under stress, as indicated by:

- domination of fish and wildlife populations by pollution-tolerant non-indigenous species
- cancers, malformations and dysfunctions
- low species richness among fish and wildlife
- “impaired” status of abundance and diversity of marsh birds
- elevated rates of genetic mutation in herring gulls
- presence of fish consumption advisories because of high contaminant levels in fish flesh

Factors creating stress include historical loss of habitat (65% of littoral habitat has been lost) through infilling and restructuring, presence of carcinogens in bottom sediments, lack of oxygen, high levels of ammonia in the water from municipal and industrial sources (Stelco and Dofasco loadings of ammonia are within RAP targets), toxic substances in the water, sediments and the food chain.

Special issues falling into this category include the impact of weed proliferation and the impacts of growth in non-human populations. These results may be integrated into the problem definition if results of investigations show that they are indeed problems.

II.5.6 Public Access and Aesthetics

Adequate and useable public access to the Harbour shorelines is improving but still below the target. The target is for 35% of the Harbour shoreline to be accessible to the public and suitable for the enjoyment of residents and visitors. Shoreline aesthetics are much improved, but there remain occasions when floatables are visible, and there continue to be water- and air-related odour problems.