Appendix 1 — Brief Description of the Indicators List

Note: The numbers following the indicator name are a means of identifying the indicator in the electronic database.

Open and Nearshore Waters Indicators

State Indicators

Fish Habitat (Indicator #6)

This indicator will assess the quality and amount of aquatic habitat in the Great Lakes ecosystem, and it will be used to infer progress in rehabilitating degraded habitat and associated aquatic communities.

Salmon and Trout (Indicator #8)

This indicator will show trends in populations of introduced trout and salmon populations, and it will be used to evaluate the potential impacts on native trout and salmon populations and the preyfish populations that support them.

Walleye and *Hexagenia* (Indicator #9)

This indicator will show the status and trends in walleye and *Hexagenia* populations, and it will be used to infer the basic structure of warm-coolwater predator and prey communities, the health of percid populations, and the health of the Great Lakes ecosystem.

Preyfish Populations (Indicator #17)

This indicator will assess the abundance and diversity of preyfish populations, and it will be used to infer the stability of predator species necessary to maintain the biological integrity of each lake.

Native Unionid Mussels (Indicator #68)

This indicator will assess the population status of native Unionid populations, and it will be used to infer the impact of the invading Dreissenid mussel on the Unionid mussel.

Lake Trout and Scud (*Diporeia hoyi*) (Indicator #93)

This indicator will show the status and trends in lake trout and *D. hoyi* populations, and it will be used to infer the basic structure of coldwater predator and prey communities and the general health of the ecosystem.

Deformities, Eroded Fins, Lesions and Tumors in Nearshore Fish (Indicator #101)

This indicator will assess the combination of deformities, eroded fins, lesions and tumors (DELT index) in nearshore fish, and it will be used to infer areas of degraded habitat within the Great Lakes.

Benthos Diversity and Abundance (Indicator #104)

This indicator will assess species diversity and abundance in the aquatic oligochaete community, and it will be used to infer the relative health of the benthic community.

Phytoplankton Populations (Indicator #109)

This indicator will assess the species and size composition of phytoplankton populations in the Great Lakes, and it will be used to infer the impact of nutrient enrichment, contamination and invasive exotic predators on the Great Lakes ecosystem.

Zooplankton Populations (Indicator #116)

This indicator will assess characteristics of the zooplankton community, and it will be used over time to infer changes in vertebrate or invertebrate predation, system productivity, energy transfer within the Great Lakes, or other food web dynamics.

Sediment Available for Coastal Nourishment (Indicator #8142) (formerly called Stream Flow and Sediment Discharge) - *also a Nearshore Terrestrial indicator*

This indicator will assess the amount of water and suspended sediment entering the Great Lakes through major tributaries and connecting channels, and it will be used to estimate the amount of sediment available for transport to nourish coastal ecosystems.

Pressure Indicators

Sea Lamprey (Indicator #18)

This indicator will estimate sea lamprey abundance and assess their impact on other fish populations in the Great Lakes.

Phosphorus Concentrations and Loadings (Indicator #111)

This indicator will assess the total phosphorus levels in the Great Lakes, and it will be used to support the evaluation of trophic status and food web dynamics in the Great Lakes.

Contaminants in Young-of-the-Year Spottail Shiners (Indicator #114)

This indicator will assess the levels of PBT chemicals in young-of-the-year spottail shiners, and it will be used to infer local areas of elevated contaminant levels and potential harm to fish-eating wildlife.

Contaminants in Colonial Nesting Waterbirds (Indicator #115)

This indicator will assess chemical concentration levels in a representative colonial waterbird, and it will be used to infer the impact of these contaminants on colonial waterbird physiology and population characteristics.

Atmospheric Deposition of Toxic Chemicals (Indicator #117)

This indicator will estimate the annual average loadings of priority toxic chemicals from the atmosphere to the Great Lakes, and it will be used to infer potential impacts of toxic chemicals from atmospheric deposition on the Great Lakes aquatic ecosystem, as well as to infer the progress of various Great Lakes programs toward virtual elimination of toxics from the Great Lakes.

Toxic Chemical Concentrations in Offshore Waters (Indicator #118)

This indicator will assess the concentration of priority toxic chemicals in offshore waters, and it will be used to infer the potential impacts of toxic chemicals on the Great Lakes aquatic ecosystem, as well as to infer the progress of various Great Lakes programs toward virtual elimination of toxics from the Great Lakes.

Concentrations of Contaminants in Sediment Cores (Indicator #119)

This indicator will assess the concentrations of IJC priority toxic chemicals in sediments, and it will be used to infer potential harm to aquatic ecosystems by contaminated sediments, as well as to infer the progress of various Great Lakes programs toward virtual elimination of toxics from the Great Lakes.

Contaminant Exchanges between Media: Air to Water and Water to Sediment (Indicator #120)

This indicator will estimate the loadings of IJC priority pollutants to the Great Lakes, and it will be used to infer the potential harm these contaminants pose to human, animal and aquatic life within the Great Lakes, as well as to infer the progress of various Great Lakes programs toward virtual elimination of toxics from the Great Lakes.

Wastewater Pollution (Indicator #7059)

This indicator will assess the loadings of wastewater pollutants discharged into the Great Lakes basin, and it will be used to infer inefficiencies in human economic activity (i.e., wasted resources) and the potential adverse impacts to human and ecosystem health.

Coastal Wetland Indicators

State Indicators

Coastal Wetland Invertebrate Community Health (Indicator #4501)

This indicator will assess the diversity of the invertebrate community, especially aquatic insects, and it will be used to infer habitat suitability and biological integrity of Great Lakes coastal wetlands.

Coastal Wetland Fish Community Health (Indicator #4502)

This indicator will assess the fish community diversity, and it will be used to infer habitat suitability for Great Lakes coastal wetland fish communities.

Deformities, Eroded Fins, Lesions and Tumours (DELT) in Coastal Wetland Fish (Indicator #4503)

This indicator will assess the combination of deformities, eroded fins, lesions and tumors (DELT index) in coastal wetlands, and it will be used to infer ecosystem health of Great Lakes coastal wetlands.

Amphibian Diversity and Abundance (Indicator #4504)

This indicator will assess the species composition and relative abundance of frogs and toads, and it will be used to infer the condition of coastal wetland habitat as it relates to the health of this ecologically important component of wetland communities.

Wetland-Dependent Bird Diversity and Abundance (Indicator #4507)

This indicator will assess the wetland bird species composition and relative abundance, and it will be used to infer the condition of coastal wetland habitat as it relates to the health of this ecologically and culturally important component of wetland communities.

Coastal Wetland Area by Type (Indicator #4510)

This indicator will assess the periodic changes in area (particularly losses) of coastal wetland types, taking into account natural variations.

Presence, Abundance and Expansion of Invasive Plants (Indicator #4513)

This indicator will assess the decline of vegetative diversity associated with an increase in the presence, abundance, and expansion of invasive plants, and it will be used as a surrogate measure of the quality of coastal wetlands which are impacted by coastal manipulation or input of sediments.

Pressure Indicators

Contaminants in Snapping Turtle Eggs (Indicator #4506)

This indicator will assess the accumulation of organochlorine chemicals and mercury in snapping turtle eggs, and it may be used to infer the extent of organochlorine chemicals and mercury in food webs of Great Lakes coastal wetlands.

Sediment Flowing into Coastal Wetlands (Indicator #4516)

This indicator will assess the sediment load to coastal wetlands and its potential impact on wetland health.

Nitrate and Total Phosphorus Into Coastal Wetlands (Indicator #4860)

This indicator will assess the amount of nitrate and total phosphorus flowing into Great Lakes coastal wetlands, and it will be used to infer the human influence on nutrient levels in the wetlands.

Effect of Water Level Fluctuations (Indicator #4861) - *also a Nearshore Terrestrial indicator*

This indicator will assess the lake level trends that may significantly affect components of wetland and nearshore terrestrial ecosystems, and it will be used to infer the effect of water level regulation on emergent wetland extent.

Human Activity (Response) Indicators

Gain in Restored Coastal Wetland Area by Type (Indicator #4511)

This indicator will assess the amount of restored wetland area, and it will be used to infer the success of conservation and rehabilitation efforts.

Nearshore Terrestrial Indicators (within 1 kilometer of shore)

State Indicators

Indicators related to habitats:

Extent and Quality of Nearshore Natural Land Cover (Indicator #8136)

This indicator will assess the amount of natural land cover that falls within 1 km of the shoreline, and it will be used to infer the potential impact of artificial coastal structures, including primary and secondary home development, on the extent and quality of nearshore terrestrial ecosystems in the Great Lakes.

Indicators related to health and stability of ecological communities/species:

Area, Quality, and Protection of Special Lakeshore Communities (Indicator #8129)

This indicator will assess the changes in area and quality of the twelve special lakeshore communities, and it will be used to infer the success of management activities associated with the protection of some of the most ecologically significant habitats in the Great Lakes terrestrial nearshore.

Nearshore Land Use (Indicator #8132)

This indicator will assess the types and extent of major land uses within 1 km from shore, and it will be used to identify real or potential impacts of land use on significant natural features or processes, particularly on the twelve special lakeshore communities.

Nearshore Species Diversity and Stability (Indicator #8137)

This indicator will assess the composition and abundance of plant and wildlife species over time within the nearshore area, and it will be used to infer adverse effects on the nearshore terrestrial ecosystem due to stresses such as climate change and/or increasing land use intensity.

Pressure Indicators

Indicators related to physical stressors:

Effects of Water Level Fluctuations (Indicator #4861) - *also a Coastal Wetland indicator*

This indicator will assess the lake level trends that may significantly affect components of wetland and nearshore terrestrial ecosystems, and it will be used to infer the effect of water level regulation on emergent wetland extent.

Extent of Hardened Shoreline (Indicator #8131)

This indicator will assess the amount of shoreline habitat altered by the construction of shore protection, and it will be used to infer the potential harm to aquatic life in the nearshore as a result of conditions (e.g., shoreline erosion) created by habitat alteration.

Artificial Coastal Structures (Indicator #8146)

This indicator will assess the number of artificial coastal structures on the Great Lakes, and it will be used to infer potential harm to coastal habitat by disruption of sand transport.

Indicators related to biological stressors:

Nearshore Plant and Animal Problem Species (Indicator #8134)

This indicator will assess the type and abundance of plant and wildlife problem species in landscapes bordering the Great Lakes, and it will be used to identify the potential for disruption of nearshore ecological processes and communities.

Indicators related to chemical stressors:

Contaminants Affecting Productivity of Bald Eagles (Indicator #8135)

This indicator will assess the number of fledged young, number of developmental deformities, and the concentrations of organic and heavy metal contamination in Bald Eagle eggs, blood, and feathers. The data will be used to infer the potential for harm to other wildlife and human health through the consumption of contaminated fish.

Contaminants Affecting the American Otter (Indicator #8147)

This indicator will assess the contaminant concentrations found in American otter populations within the Great Lakes basin, and it will be used to infer the presence and severity of contaminants in the aquatic food web of the Great Lakes.

Human Activity (Response) Indicators

Community / Species Plans (Indicator #8139)

This indicator will assess the number of plans that are needed, developed, and implemented to protect, maintain or restore high quality, natural nearshore communities and federally listed endangered, threatened, and vulnerable species. This indicator will be used to infer the degree of human stewardship toward these communities and species.

Shoreline Management Under Integrated Management Plans (Indicator #8141)

This indicator will assess the amount of Great Lakes shoreline managed under an integrated management plan, and it will be used to infer the degree of stewardship of shoreline processes and habitat.

Protected Nearshore Areas (Indicator #8149)

This indicator will assess the kilometers/miles of shoreline in six classes of protective status. This information will be used to infer the preservation and restoration of habitat and biodiversity, the protection of adjacent nearshore waters from physical disturbance and undesirable inputs (nutrients and toxics), and the preservation of essential habitat links in the migration (lifecycle) of birds and butterflies.

Land Use Indicators

State Indicators

Urban Density (Indicator #7000)

This indicator will assess the human population density in the Great Lakes basin, and it will be used to infer the degree of inefficient land use and urban sprawl for communities in the Great Lakes ecosystem.

Habitat Adjacent to Coastal Wetlands (Indicator #7055)

This indicator will provide an index of the quality of adjoining upland habitat which can have a major effect on wetland biota, many of which require upland habitat for part of their life cycle.

Habitat Fragmentation (Indicator #8114)

This indicator will assess the amount and distribution of natural habitat remaining within Great Lakes ecoregions, and it will be used to infer the effect of human land uses such as housing, agriculture, flood control, and recreation on habitat needed to support fish and wildlife species.

Pressure Indicators

Land Conversion (Indicator #7002)

This indicator will assess the changes in land use within the Great Lakes basin, and it will be used to infer the potential impact of land conversion on Great Lakes ecosystem health.

Mass Transportation (Indicator #7012)

This indicator will assess the percentage of commuters using public transportation, and it will be used to infer the stress to the Great Lakes ecosystem caused by the use of the private motor vehicle and its resulting high resource utilization and pollution creation.

Human Activity (Response) Indicators

Brownfield Redevelopment (Indicator #7006)

This indicator will assess the acreage of redeveloped brownfields, and it will be used over time to evaluate the rate at which society rehabilitates and reuses former developed land sites that have been degraded by poor use.

Sustainable Agricultural Practices (Indicator #7028)

This indicator will assess the number of Environmental and Conservation farm plans, and it will be used to infer environmentally friendly practices in place, such as integrated pest management to reduce the unnecessary use of pesticides, zero tillage and other soil preservation practices to reduce energy consumption, and prevention of ground and surface water contamination.

Green Planning Process (Indicator #7053)

This indicator will assess the number of municipalities with environmental and resource conservation management plans in place, and it will be used to infer the extent to which municipalities utilize environmental standards to guide their management decisions with respect to land planning, resource conservation, and natural area preservation.

Human Health Indicators

State Indicators

Geographic Patterns and Trends in Disease Incidence (Indicator #4179)

This indicator will assess geographical and temporal patterns in disease incidences in the Great Lakes basin population, and it will also be used to identify areas where further investigation of the exposure and effects of environmental pollutants on human health is needed.

Pressure Indicators

Indicators of Exposure

Contaminants in Recreational Fish (Indicator #0113)

This indicator will assess the levels of PBT chemicals in fish, and it will be used to infer the potential harm to human health through consumption of contaminated fish.

E. coli and Fecal Coliform Levels in Nearshore Recreational Waters (Indicator #4081)

This indicator will assess fecal coliform contaminant levels in nearshore recreational waters, acting as a surrogate indicator for other pathogen types, and it will be used to infer potential harm to human health through body contact with nearshore recreational waters.

Contaminants in Edible Fish Tissue (Indicator #4083)

This indicator will assess the concentration of persistent, bioaccumulating, toxic (PBT) chemicals in Great Lakes fish, and it will be used to infer the potential exposure of humans to PBT chemicals through consumption of Great Lakes fish caught via sport and subsistence fishing.

Chemical Contaminant Intake From Air, Water, Soil and Food (Indicator #4088)

This indicator will estimate the daily intake of PBT chemicals from all sources, and it will be used to evaluate the potential harm to human health and the efficacy of policies and technology intended to reduce PBT chemicals.

Drinking Water Quality (Indicator #4175)

This indicator will assess the chemical and microbial contaminant levels in drinking water, and it will be used to evaluate the potential for human exposure to drinking water contaminants and the efficacy of policies and technologies to ensure safe drinking water.

Air Quality (Indicator #4176)

This indicator will monitor the air quality in the Great Lakes ecosystem, and it will be used to infer the potential impact of air quality on human health in the Great Lakes basin.

Chemical Contaminants in Human Tissue (Indicator #4177)

This indicator will assess the concentration of PBT chemicals in human tissues, and it will be used to infer the efficacy of policies and technology to reduce PBT chemicals in the Great Lakes ecosystem.

Radionuclides (Indicator #4178)

This indicator will assess the concentrations of artificial radionuclides in cow's milk, surface water, drinking water, and air, and it will be used to estimate the potential for human exposure to artificial radionuclides.

Societal Indicators

State Indicators

Aesthetics (Indicator #7042)

This indicator will assess the amount of waste and decay around human activities in the Great Lakes basin, and it will be used to infer the degree to which human activities are conducted in an efficient and ordered fashion consistent with ecosystem harmony and integrity.

Economic Prosperity (Indicator #7043)

This indicator will assess the unemployment rates within the Great Lakes basin, and it will be used in association with other Societal indicators to infer the capacity for society in the Great Lakes region to make decisions that will benefit the Great Lakes ecosystem.

Pressure Indicators

Water Withdrawal (Indicator #7056)

This indicator will assess the amount of water used in the Great Lakes basin per capita, and it will be used to infer the amount of wastewater generated and the demand for resources to pump and treat water.

Energy Consumption (Indicator #7057)

This indicator will assess the amount of energy consumed in the Great Lakes basin per capita, and it will be used to infer the demand for resource use, the creation of waste and pollution, and stress on the ecosystem.

Solid Waste Generation (Indicator #7060)

This indicator will assess the amount of solid waste generated per capita in the Great Lakes basin, and it will be used to infer inefficiencies in human economic activity (i.e., wasted resources) and the potential adverse impacts to human and ecosystem health.

Human Activity (Response) Indicators

Capacities of Sustainable Landscape Partnerships (Indicator #3509) - *unreviewed*

This indicator assesses the organizational capacities required of local coalitions to act as full partners in ecosystem management initiatives. It includes the enumeration of public-private partnerships relating to the pursuit of sustainable ecosystems through environmental management, staff, and annual budgets.

Organizational Richness of Sustainable Landscape Partnerships (Indicator #3510) - *unreviewed*

This indicator assesses the diversity of membership and expertise included in partnerships. Horizontal integration is a description of the diversity of partnerships required to address local issues, and vertical integration is the description of federal and state/provincial involvement in place-based initiatives as full partners.

Integration of Ecosystem Management Principles Across Landscapes (Indicator #3511) - *unreviewed*

This indicator describes the extent to which federal, state/provincial, and regional governments and agencies have endorsed and adopted ecosystem management guiding principles in place-based resource management programs.

Integration of Sustainability Principles Across Landscapes (Indicator #3512) - *unreviewed*

This indicator describes the extent to which federal, state/provincial, and regional governments and agencies have endorsed and adopted sustainability guiding principles in place-based resource management programs.

Citizen/Community Place-Based Stewardship Activities (Indicator #3513) - *unreviewed*

Community activities that focus on local landscapes/ecosystems provide a fertile context for the growth of the stewardship ethic and the establishment of a "a sense of place." This indicator, or suite of indicators, will reflect the number, vitality and effectiveness of citizen and community stewardship activities.

Financial Resources Allocated to Great Lakes Programs (Indicator #8140)

This indicator will assess the amount of dollars spent annually on Great Lakes programs, and it will be used to infer the responsiveness of Great Lakes programs through annual funding focused on research, monitoring, restoration, and protection of Great Lakes ecosystems by federal and state/provincial agencies and non-governmental organizations.

Unbounded Indicators

State Indicators

Breeding Bird Diversity and Abundance (Indicator #8150)

This indicator will assess the status of breeding bird populations and communities, and it will be used to infer the health of breeding bird habitat in the Great Lakes basin.

Threatened Species (Indicator #8161)

This indicator will assess the number, extent and viability of threatened species, which are key components of biodiversity in the Great Lakes basin, and it will be used to infer the integrity of ecological processes and systems (e.g., sand accretion, hydrologic regime) within Great Lakes habitats.

Pressure Indicators

Global Warming: Number of Extreme Storms (Indicator #4519)

This indicator will assess the number of "extreme storms" each year, and it will be used to infer the potential impact on ecological components of the Great Lakes of increased numbers of severe storms due to climate change.

Global Warming: First Emergence of Water Lilies in Coastal Wetlands (Indicator #4857)

This indicator will assess the change over time in first emergence dates of water lilies in coastal wetlands as a sentinel of climate change affecting the Great Lakes.

Global Warming: Ice Duration on the Great Lakes (Indicator #4858)

This indicator will assess the temperature and accompanying physical changes to each lake over time, and it will be used to infer potential impact of climate change on wetlands.

Acid Rain (Indicator #9000)

This indicator will assess the pH levels in precipitation and critical loadings of sulphate to the Great Lakes basin, and it will be used to infer the efficacy of policies to reduce sulphur and nitrogen acidic compounds released to the atmosphere.

Appendix 2 — Relevancies (or Alternate Indicator Groupings)

The SOLEC list of indicators was developed according to the categories of open and nearshore waters, coastal wetlands, nearshore terrestrial, human health, land use, societal and unbounded. These groupings are convenient for SOLEC reporting, but they represent only one of many ways to organize information about the Great Lakes. Depending on the user's perspective, other groupings will be more convenient or will provide insight to aspects of the Great Lakes that differ from the SOLEC groupings.

Each of the proposed SOLEC indicators has been evaluated by the Indicators Group for relevance to several other organizational categories, and the results are displayed in the attached table. The categories include;

- Indicator Type. Based on the State-Pressure-Human Activity model, each SOLEC indicator has been assigned to the appropriate category. Measurements of contaminants in an environmental compartment are considered a pressure on the ecosystem rather than a measurement of a state condition. There are currently 28 State, 37 Pressure and 15 Human Activity indicators proposed.

- Environmental Compartments. This category sorts the SOLEC indicators by media, i.e., air (6), water (14), land (14), sediments (4), biota (21), fish (13), and humans (14). Fish have been separated from biota as a special case.

- Issues. Environmental management decisions often reflect an attempt to address an issue rather than a medium or geographic location. Specific issues that SOLEC indicators support include toxic contaminants (29), nutrients (12), exotic species (8), habitat (28), climate change (4), and stewardship (11).

- GLWQA Annexes. Several of the annexes of the GLWQA include monitoring and reporting requirements. The proposed SOLEC indicators currently address 10 of the 17 annexes. Annex 11 (Monitoring) is supported if an indicator supports any of the other annexes, and Annex 2 (LaMPs and RAPs) is supported if the indicators address any of the Beneficial Use Impairments.

- GLWQA Beneficial Use Impairments. Under Annex 2 of the GLWQA, fourteen Beneficial Use Impairments are listed for consideration by Lakewide Management Plans and Remedial Action Plans. The SOLEC indicators address to some extent 11 of the 14 listed use impairments.

- IJC Desired Outcomes. The IJC listed nine Desired Outcomes in its report *Indicators to Evalutate Progress under the Great Lakes Water Quality Agreement* (1996). SOLEC indicators address to some extent all nine Desired Outcomes. The many indicators with relevance to the outcomes of Biological Community Integrity and Diversity, and Physical Environment Integrity (including habitat) reflect SOLEC's emphasis on the biotic components of the Great Lakes ecosystem.

- Great Lakes Fish Community Objectives. A series of fish community objectives have been released or are being developed for each of the Great Lakes with the support of the Great Lakes Fishery Commission. Some SOLEC indicators specifically reflect the state of fish communities, and others address related habitat issues.

To facilitate cross referencing of the SOLEC indicators to the alternate categories, a section has been added to each indicator description (Appendix 1) that lists all the applicable categories. This matrix of alternate groupings of SOLEC indicators is also being incorporated into the SOLEC indicators database. Users will be able to retrieve the list of indicators associated with any of the sorting categories.

While the SOLEC indicators are intended to meet the criteria of necessary, sufficient and feasible for SOLEC reporting, no attempt has been made to evaluate the adequacy of the subset of SOLEC indicators that are relevant to any of the alternate organizing categories from the perspective of other users. For example, LaMPs and RAPs are expected to require a greater level of detail and geographic specificity to assess Beneficial Use Impairments than will be provided by the proposed SOLEC indicators. **Suggestions and comments on the relevance of the SOLEC indicators to these or other alternate categories are encouraged**.

ID#	Indicator Name	Indicator Type			Environmental Compartments							Great Lakes Issues						SOLEC Groupings[1]								GLWQA Annex[2]				
		State	Pressure	Human Activity	Air	Water	Land	Sediments	Biota (excluding fish & humans)	Fish	Humans	Contaminants & Pathogens	Nutrients	Exotics	Habitat	Climate Change	Stewardship	Open Waters	Nearshore Waters	Coastal Wetlands	Nearshore Terrestrial	Land Use	Human Health	Societal	Unbounded	1 Spec Objctvs	2 LaMPs / RAPs / BUIs	3 Phosphorus	4 Oil - Vessels	5 Wastes - Vessels
Nearshore and Open Waters Indicators																														
6	Fish Habitat	X				X				X					X			**X**	**X**	X							X			
8	Salmon and Trout	X								X		X	X	X	X			**X**	**X**								X			
9	Walleye and Hexagenia	X							X	X		X	X	X	X			**X**	**X**								X			
17	Preyfish Populations	X								X		X	X	X	X			**X**	**X**								X			
18	Sea Lamprey		X							X				X				**X**	**X**								X			
68	Native Unionid Mussels	X							X					X				**X**	**X**	X							X			
93	Lake Trout and Scud *(Diporeia hoyi)*	X							X	X		X	X	X	X			**X**								X	X			
101	Deformities, Eroded Fins, Lesions and Tumors (DELT) in Nearshore Fish	X								X		X							**X**								X			
104	Benthos Diversity and Abundance	X							X			X	X		X			**X**	**X**	X							X			
109	Phytoplankton Populations	X							X			X	X	X				**X**	**X**								X	X		
111	Phosphorus Concentrations and Loadings		X			X							X					**X**	**X**	X						X	X	X		
114	Contaminants In Young-of-the-Year Spottail Shiners		X							X		X							**X**							X	o			
115	Contaminants in Colonial Nesting Waterbirds		X						X			X						**X**	**X**							X	X			
116	Zooplankton Populations	X							X			X	X	X				**X**	**X**								X			
117	Atmospheric Deposition of Toxic Chemicals		X		X	X						X						**X**									o			
118	Toxic Chemical Concentrations in Offshore Waters		X			X						X						**X**								X				
119	Concentrations of Contaminants in Sediments Cores		X					X				X						**X**	**X**								X			
120	Contaminant Exchanges Between Media: Air to Water, and Water to Sediment		X		X	X		X				X						**X**	**X**							X				
7059	Wastewater Pollution		X			X						X	X						**X**							X	X	X		
8142	Sediment Available for Coastal Nurishment	X				X		X							X				**X**		**X**						X			
Coastal Wetland Indicators																														
4501	Coastal Wetland Invertebrate Community Health	X							X						X					**X**							X			
4502	Coastal Wetland Fish Community Health	X								X				X	X					**X**							X			
4503	Deformities, Eroded Fins, Lesions and Tumors (DELT) in Coastal Wetland Fish	X								X		X								**X**							X			
4504	Amphibian Diversity and Abundance	X							X						X					**X**										
4506	Contaminants in Snapping Turtle Eggs		X						X			X								**X**						X				
4507	Wetland-Dependent Bird Diversity and Abundance	X							X						X					**X**							X			
4510	Coastal Wetland Area by Type	X				X	X								X					**X**							X			
4511	Gain in Restored Coastal Wetland Area by Type			X		X	X								X		X			**X**							X			
4513	Presence, Abundance & Expansion of Invasive Plants	X							X					X	X					**X**	X						X			
4516	Sediment Flowing Into Coastal Wetlands		X			X		X							X					**X**	X					X	X			

GLWQA Annex (con'd)													IJC Desired Outcomes									GLFC Objectives					Beneficial Use Impairments													
6 Shipping / Pollution	7 Dredging	8 Facilities	9 Contingency Plan	10 Hazard. Poll. List	11 Monitoring	12 Pers. Toxic Subs.	13 Non-point Sources	14 Contam. Sed's	15 Airborne Toxic Subs.	16 Groundwater	17 Res. & Devel.		1 Fishability	2 Swimmability	3 Drinkability	4 Healthy Humans	5 Economic Viability	6 Bio. Integ. & Divers.	7 Virt. Elim. PTS	8 Excess Phos.	9 Physical Env. Integ.	Ontario	Erie	Huron	Michigan	Superior	1 F&W Consumption	2 Tainting	3 F&W Pop's	4 Tumors	5 Deformities/Reprod.	6 Benthos	7 Dredging	8 Eutrophication	9 Drinking Water	10 Beach Closings	11 Aesthetics	12 Ag./ Indust. Costs	13 Phyto-/ Zoo-plankton	14 F&W Habitat	Totals
					X													X			X	X	X	X	X	X												X	17
					X													X				X		X	X	X			X											16
					X													X				X	X	X					X											17
					X													X				X	X	X	X	X			X											17
					X													X				X	X	X	X	X			X											14
					X													X													X									10
					X													X				X	X	X	X	X			X		X									19
					X	X												X	X											X										10
					X													X																						12
					X													X		X																	X		13
					X		X											X		X			X									X	X		X		X		18
					X	X												X	X																					10
					X	X												X	X				X						X										14
					X													X																				X		11
					X	X			X		X								X																					11
					X	X													X																						8
	X				X	X		X											X												X	X								13
					X	X			X	X		X							X																					14
					X	X													X	X														X			X			14
					X																X																		X	10
					X		X											X			X										X										10
					X		X											X			X								X											X	12
					X	X	X					X						X	X										X												12
					X		X											X			X								X											X	10
					X	X	X												X																						9
					X													X			X								X											X	10
					X		X											X			X																			X	11
					X		X											X			X																			X	12
					X		X											X																						X	11
					X		X														X																			X	12

ID#	Indicator Name	Indicator Type			Environmental Compartments							Great Lakes Issues						SOLEC Groupings[1]								GLWQA Annex[2]				
		State	Pressure	Human Activity	Air	Water	Land	Sediments	Biota (excluding fish & humans)	Fish	Humans	Contaminants & Pathogens	Nutrients	Exotics	Habitat	Climate Change	Stewardship	Open Waters	Nearshore Waters	Coastal Wetlands	Nearshore Terrestrial	Land Use	Human Health	Societal	Unbounded	1 Spec Objctvs	2 LaMPs / RAPs / BUIs	3 Phosphorus	4 Oil - Vessels	5 Wastes - Vessels
4860	Nitrate and Total Phosphorus Into Coastal Wetlands		X			X							X							**X**							X	X		
4861	Effect of Water Level Fluctuations		X			X									X	X				**X**	**X**						X			
Nearshore Terrestrial Indicators[3]																															
8129	Area, Quality, and Protection of Lakeshore Communities	X					X		X						X		X				**X**						X			
8131	Extent of Hardened Shoreline		X				X								X						**X**	X					X			
8132	Nearshore Land Use	X					X								X						**X**	X					X			
8134	Nearshore Plant and Animal Problem Species		X						X					X	X						**X**						X			
8135	Contaminants Affecting Productivity of Bald Eagles		X						X			X						X	X		**X**						X			
8136	Extent and Quality of Nearshore Natural Land Cover	X					X								X						**X**						X			
8137	Nearshore Species Diversity and Stability	X							X					X							**X**						X			
8139	Community / Species Plans			X					X								X				**X**			X						
8141	Shoreline Managed Under Integrated Management Plans			X			X										X				**X**	X		X						
8146	Artificial Coastal Structures		X				X								X				X		**X**						X			
8147	Contaminants Affecting the American Otter		X						X			X								X	**X**					X	X			
8149	Protected Nearshore Areas			X			X								X		X				**X**			X			X			
Land Use Indicators																															
7000	Urban Density	X					X															**X**									
7002	Land Conversion		X				X															**X**									
7006	Brownfield Redevelopment			X			X										X					**X**									
7012	Mass Transportation		X		X		X									X	X					**X**									
7028	Sustainable Agricultural Practices			X			X										X					**X**					X	X			
7053	Green Planning Process			X		X	X										X					**X**		X							
7055	Habitat Adjacent to Coastal Wetlands	X					X								X					X	X	**X**					X				
8114	Habitat Fragmentation	X					X								X							**X**					X				
Human Health Indicators																															
113	Contaminants in Recreational Fish		X							X		X						X	X				**X**			X	X				
4081	*E. coli* and Fecal Coliform Levels in Nearshore Recreational Waters		X			X			X			X							X				**X**			X	X				
4083	Contaminants in Edible Fish Tissue		X							X		X						X	X				**X**			X	X				
4088	Chemical Contaminant Intake from Air, Water, Soil and Food		X								X	X											**X**								
4175	Drinking Water Quality		X			X						X	X					X	X				**X**			X	X				
4176	Air Quality		X		X							X											**X**			X	o				
4177	Chemical Contaminants in Human Tissue		X								X	X											**X**			X					
4178	Radionuclides		X		X	X			X			X											**X**			X					

GLWQA Annex (con'd)													IJC Desired Outcomes									GLFC Objectives					Beneficial Use Impairments														
6 Shipping / Pollution	7 Dredging	8 Facilities	9 Contingency Plan	10 Hazard. Poll. List	11 Monitoring	12 Pers. Toxic Subs.	13 Non-point Sources	14 Contam. Sed's	15 Airborne Toxic Subs.	16 Groundwater	17 Res. & Devel.	1 Fishability	2 Swimmability	3 Drinkability	4 Healthy Humans	5 Economic Viability	6 Bio. Integ. & Divers.	7 Virt. Elim. PTS	8 Excess Phos.	9 Physical Env. Integ.	Ontario	Erie	Huron	Michigan	Superior	1 F&W Consumption	2 Tainting	3 F&W Pop's	4 Tumors	5 Deformities/Reprod.	6 Benthos	7 Dredging	8 Eutrophication	9 Drinking Water	10 Beach Closings	11 Aesthetics	12 Ag./ Indust. Costs	13 Phyto-/ Zoo-plankton	14 F&W Habitat	Totals
					X		X												X													X							10
					X						X						X			X																		X	12
					X												X			X																		X	11
					X															X																		X	9
					X												X			X																		X	10
					X						X						X			X								X										X	12
					X	X					X						X	X										X		X									14
					X												X			X																		X	9
					X												X											X											8
																	X																						6
																																								6
					X															X																		X	9
					X	X					X						X	X										X		X									14
					X												X			X																		X	11
																				X																				4
					X		X													X																				6
																				X																				5
					X					X										X																				9
					X	X	X												X	X											X							X	13
							X													X																				8
					X		X													X																			X	11
																	X			X																			X	8
					X	X						X			X		X	X			X	X	X	X	X	X														20
					X		X						X		X																		X							13
					X	X						X			X		X	X			X	X	X	X	X	X														20
					X	X									X			X																						8
					X	X					X			X	X																		X							15
					X		X			X					X																									10
					X	X									X			X																					X	10
					X						X				X																								X	10

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4179	Geographic Patterns and Trends in Disease Incidence	X									X												**X**							
Societal Indicators																														
3509	Capacities of Sustainable Landscape Partnerships			X							X						X							**X**						
3510	Organizational Richness of Sustainable Landscape Partnerships			X							X						X							**X**						
3511	Integration of Ecosystem Management Principles Across Landscapes			X							X						X							**X**						
3512	Integration of Sustainability Principles Across Landscapes			X							X						X							**X**						
3513	Citizen/Community Place-Based Stewardship Activities			X							X						X							**X**						
7042	Aesthetics	X									X						X							**X**			X			
7043	Economic Prosperity	X																						**X**						
7056	Water Withdrawal		X			X					X						X					X		**X**						
7057	Energy Consumption		X		X						X					X	X					X		**X**						
7060	Solid Waste Generation		X		X		X				X	X				X	X							**X**						
8140	Financial Resources Allocated to Great Lakes Programs			X							X						X							**X**						
Unbounded Indicators																														
4519	Climate Change: Number of Extreme Storms		X		X											X				X	X				**X**						
4857	Climate Change: First Emergence of Water Lily Blossoms in Coastal Wetlands		X						X							X				X					**X**						
4858	Climate Change: Ice Duration on the Great Lakes		X			X										X		X	X	X					**X**						
8150	Breeding Bird Diversity and Abundance	X							X						X										**X**			X			
8161	Threatened Species	X							X	X				X	X										**X**			X			
9000	Acid Rain		X		X	X	X					X													**X**	X					
9002	Exotic Species		X						X	X				X											**X**						
79	COUNT	30	36	13	9	19	19	4	24	14	13	29	11	14	27	7	19	21	24	21	18	13	9	15	7	18	49	5	0	0

[1] Bold **X** designates the primary SOLEC Grouping for each indicator

[2] o = Some LaMPs /RAPs are incorporating these measures into their plans even though the indicators do not have an associated BUI

[3] #8142 Sediment Available for Coastal Nurishment and #4861 Water Level Fluctuations are also co-grouped with Nearshore Terrestrial Indicators

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											X					X																									5
																																									4
																																									4
																																									4
																																									4
						X																														X				7
																	X																							3
																																									6
										X																															8
							X													X																					10
																																									4
																					X																					7
																																									5
																					X																					8
						X												X			X							X											X		10
						X					X							X			X							X											X		13
						X				X											X																					10
																																										5
0	1	0	0	0	58	19	17	2	6	1	11		2	1	1	9	1	37	17	5	30	8	9	8	7	7	2	0	15	2	3	6	1	4	2	1	3	0	3	22	