

Oak Ridges Moraine Conservation Plan

**RECREATION PLANS AND VEGETATION
MANAGEMENT PLANS**

Technical Paper # 15

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DRAFT

Acknowledgements

This technical paper is one in a series of technical papers that provides guidance for implementing the water-related provisions of the Oak Ridges Moraine Conservation Plan. This technical paper was prepared for the Ministry of the Environment by MacViro Consultants Incorporated. Stephen Maude and Diane Blachford of the Ministry of the Environment coordinated the preparation of this series of technical papers.

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Recreation Plans and Vegetation Management Plans

1. PURPOSE AND OVERVIEW

This technical paper provides guidance to assist municipalities and recreational land developers for planning and developing major recreational uses and implementing the provisions of Section 38 of the Oak Ridges Moraine Conservation Plan (ORMCP). In particular, it promotes an ecosystem-based approach for major recreational development, including the preparation of recreation plans and vegetation management plans in the implementation of the ORMCP. Within the Moraine, major recreational developments are permitted only in Countryside Areas and Settlement Areas. Subsection 13 of the ORMCP states the purposes and objectives of Countryside Areas within the Moraine, and the uses permitted within them.

It is the intent of the ORMCP that major recreational developments shall conserve water through an ecosystem-based approach to planning, design and management; conserve and enhance vegetation resources, be compatible with the natural character of the surrounding area, and not conflict with adjacent land uses. It is not the intent of this technical paper to provide comprehensive guidance on all aspects of major recreation planning, development, and management. Where appropriate, the reader will be directed to existing guides and references.

2. REQUIREMENTS OF THE OAK RIDGES MORAINÉ CONSERVATION PLAN

The Oak Ridges Moraine Conservation Plan (ORMCP) states:

38.(1) *Major recreational uses are recreational uses that require large-scale modification of terrain, vegetation or both and usually also require large-scale buildings or structures, including but not limited to the following:*

1. *golf courses;*
2. *serviced playing fields;*
3. *serviced campgrounds;*
4. *ski hills.*

(2) *An application to establish or expand a major recreational use shall be accompanied by a recreation plan demonstrating that,*

- (a) *water use for maintenance or snow-making or both will be kept to a minimum;*
- (b) *grassed, watered and manicured areas will be limited to sports field surfaces, golf fairways, tees and greens, and landscaped areas around buildings and structures;*
- (c) *crossings of intermittent and permanent streams will be kept to a minimum;*
- (d) *water-conserving technologies (such as low flow toilets and shower heads) will be used in clubhouses and restaurants;*
- (e) *water-conserving technologies (such as timed irrigation systems designed to reduce evaporation losses, and recycling of water from under greens) will be used in the irrigation and watering of sports field surfaces, golf fairways, tees and greens, and*

- landscaped areas around buildings and structures; and*
- (f) *stormwater treatment facilities will be used to capture and treat runoff from areas with impervious surfaces.*
- (3) *An application to establish or expand a major recreational use shall be accompanied by a vegetation management plan demonstrating that,*
- (a) *the application of fertilizers, pesticides, herbicides and fungicides will be limited to sports field surfaces, golf fairways, tees, greens and landscaped areas around buildings and structures, and, in those locations, will be kept to a minimum;*
- (b) *grass mixtures that require minimal watering and upkeep will be used for sports field surfaces and golf fairways; and*
- (c) *wherever possible, intermittent stream channels and drainage swales will be kept in a free-to-grow, low-maintenance condition.*
- (4) *An application to establish or expand a major recreational use shall demonstrate that,*
- (a) *the recreational activities on the site,*
- (i) *will be compatible with the natural character of the surrounding area, and*
- (ii) *will be designed and located so as not to conflict with adjacent land uses; and*
- (b) *new technologies relating to construction, grounds maintenance and water conservation will be explored and incorporated, as they become available, to help maintain, and where possible improve or restore the ecological integrity of the Plan Area.*

This technical paper deals with Section 38 (1-4) of the ORMCP explicitly, but also recognizes the integrating nature of watershed management within the broader framework of an ecosystem approach.

This technical paper should be used as a guide when a major recreational development that is located within the Countryside Area and/or Settlement Area of the Oak Ridges Moraine Conservation Plan, and as defined in the ORMCP, is being considered. All information requirements of the ORMCP should be provided with the application prior to any review of the application by the appropriate approval agency. Technical papers prepared by the Province must be consulted where appropriate.

3. RATIONALE FOR THE REQUIREMENTS

The rationale for the requirements relates to the purpose of the ORMCP, that is: “to provide land use and resource management planning direction to provincial ministers, ministries, and agencies, municipalities, municipal planning authorities, landowners and other stakeholders on how to protect the Moraine’s ecological and hydrological features and functions”.

Major recreational developments, if not planned, constructed, and managed in concert with the requirements of the ORMCP and other relevant approval processes, including approvals under the Ontario Water Resources Act, have the potential to negatively affect water quality, aquatic ecosystems, drinking water sources, biological integrity, the natural character of the surrounding area, and adjacent land uses. The requirements are intended to prevent, or at least mitigate,

negative impacts through sound planning and management methods and procedures.

4. IMPLEMENTATION OF THE REQUIREMENTS

To meet the requirements of Section 38 of the ORMCP, a six-step process is recommended.

4.1 STEP 1 – Land Use Designation

Determine that the proposed recreational development site falls within the Countryside Area or Settlement Area of the ORMCP.

4.2 STEP 2 – Background Information

Prepare and/or source required studies and documentation as required for Landform Conservation, Key Natural Heritage Features (wetlands, significant portions of the habitat of endangered, rare and threatened species, fish habitat, significant valleylands, significant woodlands, significant wildlife habitat, sand barrens, savannahs and tallgrass prairies), Hydrologically Sensitive Features, Minimum Areas of Influence, Minimum Vegetation Protection Zones, Connectivity, subwatershed imperviousness, and stormwater management.

4.2.1 Landform Conservation

Determine if the subject lands are located within Landform Conservation Area – Category 1 or Category 2 and examine the policies of Section 30 of the ORMCP and Oak Ridges Moraine Technical Paper #4, *Landform Conservation on the Oak Ridges Moraine*, MNR.

4.2.2 Key Natural Heritage Features and Hydrologically Sensitive Features

Determine if the subject lands contain Key Natural Heritage Features, Hydrologically Sensitive Features, Minimum Vegetation Protection Zones and Minimum Areas of Influence. Examine the policies of Sections 22 and 23 of the ORMCP and Oak Ridges Moraine Technical Paper #8, *Preparation of Natural Heritage Evaluations of all Key Natural Heritage Features on the Oak Ridges Moraine*, MNR, and Section 26 of the ORMCP and ORM Technical Paper #12, *Hydrological Evaluations for Hydrologically Sensitive Features*, MOE. If Key Natural Heritage Features and Hydrologically Sensitive Features are present, determine the spatial extent and location of the Minimum Area of Influence and Minimum Vegetation Protection Zone for Key Natural Heritage Features and Hydrologically Sensitive Features in accordance with the requirements of the table in Part III of the ORMCP (“Key Natural Heritage Features, Hydrologically Sensitive Features and Areas of Natural and Scientific Interest (Earth Science): Minimum Areas of Influence and Minimum Vegetation Protection Zones”).

Ensure that the site plan area does not encroach onto these features and their minimum vegetation protection zone, and ascertain if there is a requirement to conduct a Hydrological Evaluation and Natural Heritage Evaluation to determine whether any development or site alteration can be considered in the Minimum Area of Influence.

4.2.3 Connectivity

Review the Oak Ridges Moraine Technical Paper #3, *Supporting Connectivity within the Oak Ridges Moraine*, MNR, specifically Section 5.2. Examine the proposed Recreation Plan to ensure that it includes maintenance and monitoring measures that serve to maintain and enhance ecological connectivity.

4.2.4 Stormwater Management

Consult the Oak Ridges Moraine Technical Paper #17, *Stormwater Management Plans*, MOE, for the preparation of site-specific Stormwater Management Plan objectives and a Stormwater Management Plan.

4.2.5 Subwatersheds (Impervious Surfaces)

Consult the Oak Ridges Moraine Technical Paper #13, *Subwatersheds (Impervious Surfaces)*, MOE, and determine the present imperviousness of the subwatershed within which the proposed project is situated, for the preparation of site-specific measures to limit impervious surfaces and comply with the Technical Paper requirements.

4.3 STEP 3 – Planning, Design and Construction Standards and Targets

Sufficient information will have been gathered and recorded in steps 1 and 2 to identify the basic opportunities and constraints of the site. Utilizing that documentation:

- identify the areas of the subject lands that should not be developed or altered as required by the ORCMP; and
- identify the areas of the subject lands that are subject to the design standards specified in relevant sections of the ORMCP.

4.4 STEP 4 – Development Strategy / Design

This step involves the development of a description of the planning, design and construction practices to be employed to meet the requirements of the ORMCP. The following shall be included in this description:

- 4.4.1 the identification of the portions of the site that the proposal will leave undeveloped, and where disturbances to hydrologically sensitive features, key natural heritage features and their minimum vegetation protection zones, and landforms will not occur;
- 4.4.2 the identification of those portions of the site where disturbance to hydrologically sensitive features, key natural heritage features, and landforms could occur;
- 4.4.3 the identification of those portions of the site where impervious surfaces are proposed (see also Section 4.5, paragraph 4.5.8);
- 4.4.4 the identification of buildings, structures, and other development envelopes to identify all areas of disturbance to existing features and landforms;
- 4.4.5 the identification of servicing and stormwater management facilities locations and

methods (see also Section 4.5, paragraph 4.5.9);

- 4.4.6 the identification of construction methods and procedures such as:
- temporary management methods and the locations of stormwater management facilities during this period;
 - construction vehicle storage and fuelling areas;
 - monitoring and maintenance of the construction mitigation measures (e.g. silt fencing), and by whom (i.e. an environmental inspector) during the course of the proposed construction;
 - an outline of all environmental mitigation measures and proponent commitments, including adherence to other MOE Guidelines such as the *Guidelines for Construction Activities Impacting Water Resources* and how commitments will be implemented;
 - details on monitoring and reporting relationships, including utilization of an environmental inspector, and preparation of a post-construction summary to relevant agencies and stakeholders documenting environmental conditions at pre-construction, construction and post-construction stages;
 - an outline of methods to ensure that contractors are aware of all environmental considerations in order that all related procedural standards and comments for both construction and operation work are addressed;
- 4.4.7 the identification of existing tree / other vegetation protective measures;
- 4.4.8 a site plan that contains at a minimum:
- surface grading and drainage at a scale of 1:2000 or larger, with existing and proposed contour intervals of 1 metre or less;
 - location of all roads, driveways, parking lots, buildings, structures, recreational elements (i.e. tees, greens, fairways, cart paths, snow-making ponds, playing fields, etc.) at a scale of 1:2000 or larger;
 - location and type of all proposed vegetation indicating species types;
 - location and extent of all stormwater management facilities and other underground servicing;
- 4.4.9 a recreation plan as outlined in ORMCP Section 38 (2) (see Section 4.5 below);
- 4.4.10 a vegetation management plan as outlined in ORMCP Section 38 (3) (see Section 4.6 below).

4.5 STEP 5 - Recreation Plan (as outlined in Section 38 (2) of the ORMCP)

This step involves the development of a Recreation Plan as outlined in Section 38 (2) of the ORMCP. The following shall be included in this Plan:

- 4.5.1 an estimate of the amount of water that will be used for maintenance and, where applicable, snowmaking purposes, including a description of the conservation measures that will be used to minimize water usage;
- 4.5.2 how the water regimen addresses water management restrictions or requirements contained in a watershed plan, subwatershed plan, water conservation plan, or water

- budget adopted by the municipality;
- 4.5.3 the identification of the areas of the site proposed as grassed, watered and manicured and a description of how the requirements of ORMCP Section 38 (2) (b) have been met;
 - 4.5.4 the identification of stream crossings by pathways, trails and roads, and a description as to how the number of these crossings have been minimized in accordance with the requirements of ORMCP Section 38 (2) (c);
 - 4.5.5 the identification of water conservation technologies that will be used in clubhouses, restaurants, and other recreational buildings as required in ORMCP Section 38 (2) (d);
 - 4.5.6 the identification of water conservation technologies used in watering and irrigation systems as required in ORMCP Section 38 (2) (e);
 - 4.5.7 the identification of drought contingency plans as per the Ontario Low Water Response Program (see also Sewage and Water System Plan as per ORMCP Section 43 and *Stormwater Management and Planning Design Manual*, March 2003, MOE);
 - 4.5.8 the identification of measures to reduce the area of impervious surfaces by minimizing paved surfaces, utilizing porous pavements, and maximizing natural areas retained in an undisturbed state, in accordance with ORM Technical Paper #13, *Subwatersheds (Impervious Surfaces)*;
 - 4.5.9 the description of the design and construction of stormwater management facilities to capture and treat runoff from areas with impervious surfaces in accordance with Oak Ridges Moraine Technical Paper #17, *Stormwater Management*, MOE and as required in ORMCP Section 38 (2) (f), and that the location of these facilities are not within a hydrologically sensitive feature/related minimum vegetation protection zone.

Mapping associated with recreation plans shall be at a scale of 1:2000 or larger, with elevation contours of 1 metre intervals or less.

4.6 STEP 6 – Vegetation Management Plan (as outlined in Section 38 (3) of the ORMCP)

Vegetation management plans for major recreational developments are required to ensure that every effort is made at the planning and design stage of development to conserve groundwater resources through reduced water consumption; to limit the use of fertilizers, pesticides, herbicides and fungicides to the maximum extent possible; to keep intermittent stream channels and drainage swales in a free-to-grow, low-maintenance condition; and to eliminate the potential for exotic plants to invade native vegetation communities. Significant environmental damage can result from fugitive, invasive exotic plants that compete with native plants.

Vegetation management plans shall be comprised of the following; and shall address:

- 4.6.1 an inventory (to “vegetation type” level) of the vegetation presently occurring on the development site, identified in accordance with the Ecological Land Classification System - for each vegetation type provide a description of woody and herbaceous plant species;

- 4.6.2 the identification of existing tree and other vegetation protection measures;
- 4.6.3 the identification of all areas of the site that will:
- be maintained, or returned to a natural self-sustaining vegetated state (see Section 4.4.1 above);
 - be maintained as, or returned to a manicured and maintained vegetated surface , i.e. tees, greens, fairways, playing fields, ski runs (see Section 4.4.8 above);
 - be converted to a non-vegetated, impervious surface, i.e. buildings, roads, parking areas, lined ponds (see Sections 4.4.3, 4.4.4 and 4.4.8 above);
- 4.6.4 the proposed manicured and maintained surface vegetation types (see Section 4.4.8 above) including:
- the location and types of vegetation by species, including:
 - seed and grass mixtures requiring minimal upkeep, watering, fertilizing, pesticide, herbicide, and fungicide applications for sports field surfaces, ski runs, golf fairways and roughs;
 - the watering regimen;
 - the biocide and fertilizer application regimen;
 - the management practices for turf areas;
- 4.6.5 the proposed tree and shrub vegetation types (see Section 4.4.8 above and 5.1.7 below) including:
- the location and types of vegetation by species including:
 - species that require minimal upkeep, watering, fertilizing, pesticide, herbicide, and fungicide applications ;
 - species which are native or non-invasive exotics;
 - species which promote connectivity with existing natural areas to promote the continued movement of plants and animals throughout the Moraine;
- 4.6.6 the proposed treatment and buffers from development for areas where site alteration is prohibited, for intermittent stream channels in accordance with ORMCP Table to Part III requirements and treatment of drainage swales that results in free-to-grow, low-maintenance management;
- 4.6.7 the preparation of an Integrated Pesticide Management Plan (IPM) in accordance with the Landscape Ontario IPM practice requirements; i.e. a demonstration of the watering regimen and biocide and fertilizer applications to achieve the objectives of ORMCP Section 38 (3) (a) and (b) including targets for the reduction of water, biocide and fertilizer use and the safe storage and adherence to the *Pesticide Act* requirements;
- 4.6.8 the proposed application of pesticides with respect to areas of application, i.e. prevention of herbicide application in ponds, restriction of the area of application to areas identified in the ORMCP and areas outside of Minimum Vegetation Protection Zones, Minimum Areas of Influence, and vegetation protection zones of Natural Features.

Mapping associated with the vegetation management plan shall be at a scale of 1:2000 or larger, with elevation contours of 1 metre intervals or less.

4.7 Additional Requirements and Review of Requirements

It is recognized that municipalities and other agencies and government ministries may have requirements additional to those identified in this Technical Paper. For example, municipal Site Plan requirements and agency and government permit approval processes may call for additional and/or more detailed information beyond that which is required by the ORMCP. Without limiting the range of issues that municipalities may wish to consider in reviewing recreational plans and vegetation management plans, municipalities may wish to review their current requirements and the requirements of agencies and government ministries such as the Ministry of the Environment (MOE), taking into account the issues outlined in this technical paper.

Approvals under the *Ontario Water Resources Act* for large-scale recreation processes are often required. MOE requirements that should be considered include the following:

- The *Pesticides Act* and *Regulation 914* requirements for pesticides application and use - a Pesticides Permit is a typical approval associated with major recreational uses such as golf courses and for controls of nuisance species of plants and pests.
- The *Ontario Water Resources Act* “Permit to Take Water and Sewage Works Approvals” - a permit to take water for recreational uses where no services are present is a typical requirement of the MOE. Information submitted in support of a “Permit to Take Water” shall consider the potential for adverse effects on existing users, ecological features, biodiversity, and natural functions of the ecosystem. If water is to be provided for human consumption and other domestic users, it shall be ensured that the water is suitable for those purposes. Early planning for proposals that will require a “Permit to Take Water” shall identify potential impacts on nearby wells, the influence of nearby agricultural operations, possible effects on ecosystem features including fish habitat and wetland water levels. In addition, appropriate contingencies for water supply for nearby users and triggers for implementing water supply contingencies shall be incorporated or referenced in the management plan.
- A Certificate of Approval may also be required from MOE at later stages of the planning process regarding the proposed sewage servicing facilities and proposed stormwater management facilities. A “Reasonable Use Assessment” shall be prepared in support of an application for a Certificate of Approval for a large subsurface sewage disposal system. The inclusion of information on proposed servicing at the earliest possible opportunity should be encouraged in order to reduce the potential for adverse effects. Determination of locations of large subsurface sewage disposal systems and stormwater management systems based on reasonable use assessments and consideration of potential impacts shall be undertaken (see Technical Papers on Sewage and Water System Plans and Stormwater Management Plans).

Authorization for stream crossings under the *Federal Fisheries Act*, and alterations to waterways under the *Conservation Authorities Act* may also be required.

5. MAJOR RECREATION-PLANNING, DESIGN AND MANAGEMENT TECHNIQUES

Recreation planning, design and management techniques apply to all major recreational uses

listed in Section 38 (1) of the ORMCP. The objectives of the ORMCP can be largely realized through planning, design and management that are sensitive to those objectives and ecologically sound in their application. In contrast, some traditional, long-standing planning, design and management techniques and methods can contribute to waste, loss of ecological function, misuse and over-use of water resources, and damage to natural environmental features. The techniques listed below are not necessarily all-inclusive and proponents are encouraged to monitor and make use of new planning, design and management techniques and technologies as they become known or available.

5.1 Planning and Design Techniques

Recreation planning and design techniques can be employed to reduce water consumption by as much as 50% over traditional designs. Design techniques that are proven successful without negatively affecting the quality of the development or the recreational experience include:

- 5.1.1 design concepts that minimize the number of areas maintained with grasses that require considerable water use, i.e. “links” style golf courses with minimized closely mowed turf; ski runs utilizing native, low to no maintenance ground covers; play and picnic areas with low maintenance turf;
- 5.1.2 earth shaping, grading and drainage designs that minimize alteration of the natural landform and incorporate depressions/storage ponds to collect storm runoff water that can be utilized for irrigation and/or snow-making purposes and provide desired eventual infiltration to groundwater systems;
- 5.1.3 design concepts that minimize paved vehicular and pedestrian surfaces and/or use porous pavement designs to promote infiltration;
- 5.1.4 designs that incorporate state-of-the-art irrigation systems and snow-making systems that promote water conservation;
- 5.1.5 designs that promote the use of alternative water sources that reduce or eliminate the use of potable water, i.e. re-use of water such as stormwater runoff, effluent that has undergone a tertiary treatment process;
- 5.1.6 designs that utilize new varieties of turfgrass that use less water or can tolerate poor-quality water;
- 5.1.7 designs that incorporate and are limited to, where appropriate; native and non-invasive exotic species of shrubs, trees and ground covers.

Municipalities are strongly encouraged to include these techniques as conditions of approval of the project.

5.2 Management Techniques

Management techniques, founded on sound ecologically based designs, can contribute to essential water conservation in a major way. Techniques range from educational programs for staff to maintenance of turf, and include:

- 5.2.1 programs to educate grounds superintendents, staff and other water users about

- opportunities for ongoing water conservation;
- 5.2.2 reducing turf stress by adjusting mowing heights to ideal levels depending on species and seasonal water-use characteristics, minimizing traffic on turf areas, etc.;
 - 5.2.3 regularly testing plant tissue and soil of turf areas for nutrient levels, toxins, etc.;
 - 5.2.4 providing adequate levels of nutrients to turf and plants, including a balance of potassium and nitrogen, while avoiding excessive levels of nitrogen;
 - 5.2.5 using slow-release, organic fertilizers;
 - 5.2.6 setting reasonable threshold levels for disease, insect, and weed problems;
 - 5.2.7 choosing least-toxic pest controls, and using biological controls when possible;
 - 5.2.8 applying pesticides on a curative rather than preventative basis whenever possible;
 - 5.2.9 using mulches in tree, shrub and flower beds to reduce water-evaporation losses;
 - 5.2.10 using soil-cultivation techniques such as spiking, slicing and core aerification to improve water infiltration and minimize runoff during irrigation and rainfall;
 - 5.2.11 cycling irrigation sessions to ensure good infiltration and minimize runoff;
 - 5.2.12 improving drainage where needed to produce healthier turf with better root systems that can draw moisture from a larger volume of soil;
 - 5.2.13 pruning roots of trees near critical turf areas to prevent tree roots from competing with turf for moisture and nutrients;
 - 5.2.14 monitoring and making use of new management technologies as they become available;
 - 5.2.15 establishing conservation targets with the intent of reducing water, fertilizer, pesticide needs and monitoring use and applications of these.

6. MONITORING

A monitoring program will enable decision-makers to gather information in order to determine compliance with Section 38 of the ORMCP. Monitoring for Recreation Plans and Vegetation Management Plans occurs at the compliance scale.

7. REFERENCES / LIST OF RESOURCES

Guidance is available on specific aspects of recreation planning and design as it relates to issues associated with water conservation, limiting the use of fertilizers, pesticides, herbicides and fungicides, using grass mixtures that require minimal watering and upkeep, golf course design that limits manicured areas, and the potential for invasive exotic plants to invade native vegetation communities.

Many of the references cited below are considered “grey literature” (publications issued by government, academia, business, and industry, not controlled by commercial publishing interests), nonetheless, they can be very valuable in gaining an understanding of the issues and in finding alternative ways to plan, design and manage recreational lands. It is important to be aware of the most recent literature, especially with respect to technical references, as research in these matters is ongoing.

7.1 Water Conservation in Recreation Planning, Design, and Management

1. Conservation Ontario. 2003. Enhancing Natural Water Storage on the Landscape. Prepared by Norfolk County Public Works and Environmental Services drainage superintendents, Norfolk Land Stewardship Council, Ministry of Natural Resources, Aylmer District and Ministry of Agriculture and Food. <http://www.conservation-ontario.on.ca/projects/projects.htm>
2. Conservation Ontario. 2003. Phosphorus Management and Water Quality: Economic Incentives and Multi-Stakeholder Watershed Management. Prepared by South Nation Conservation Authority and Lake Simcoe Region Conservation Authority. <http://www.conservation-ontario.on.ca/projects/projects.htm>
3. Conservation Ontario, December. 2003. Watershed Management in Ontario: Lesson Learned and Best Practices in Watershed Planning, Implementation and Monitoring in the CVC, GRCA, and TRCA. Prepared by Credit Valley Conservation Authority, Grand River Conservation Authority, Toronto and Region Conservation Authority. <http://www.conservation-ontario.on.ca/>
4. Enhancing Local Capacity for Groundwater Source Protection in Ontario, A Practitioner’s Guide to Best Practices. Ontario Ministry of the Environment. Prepared by: IER Planning, Research and Management and MDA Consulting Ltd. in association with Rob de Loë and Reid Kreutzwiser. July 2002.
5. Ontario Ministry of Natural Resources and Watershed Science Centre. 2002. Adaptive management of stream corridors in Ontario. [Computer file]. Document prepared through a collaborative effort from the staff of the Ontario Ministry of Natural Resources and others. Peterborough, Ontario, Trent University, Watershed Science Centre. One compact disc.
6. Ontario Ministry of Natural Resources. ELC Manual, “Lee *et. al.* 1988, Ecological Land Classification for Southern Ontario: First Approximation and its Application. Ontario Ministry of Natural Resources, Southcentral Science Section Development

and Transfer Branch. SCSS Field Guide GF-02”.

7.2 Environmental Principles - Conservation in Golf Course Planning, Design, and Management

(with application to other major recreational development design and management)

7. *An Environmental Approach to Golf Course Development*. 1992. American Society of Golf Course Architects, 221 N. LaSalle St., Chicago, IL 60601.
8. Audubon Cooperative Sanctuary Program For Golf Courses, a cooperative effort between the United States Golf Association (USGA) and Audubon International. Retrieved July 2, 2003 from http://www.usga.org/green/environment/audubon_program.html
9. *Best Management Practices for Golf Course Development and Operation*. 1993. contact: King County Water and Land Resources Division, 700 5th Ave., Suite 2200, Seattle, WA 98104 (Attn: Bonni Thompson). Tel. (206) 296-8332.
10. *Environmental Principles for Golf Courses in the United States*. “Voluntary Principles for Planning and Siting, Design, Construction, Management, Facility Operations, and What Golfers Can Do to Help” Center for Resource Management, 1104 E. Ashton Ave., #210, Salt Lake City, UT 84106, Tel. (801) 466-3600. Retrieved July 2, 2003 from <http://services.golfweb.com/env/pinehurst/index.html>
<http://www.epa.gov/owow/wetlands/resources/information.html>
11. *Final Report: 1999 Westchester County Golf Course IPM Demonstration Project*. Project Leaders: Todd Schongalla, Horticulture Program Director and James Lee, Horticulture Educator, CCE of Westchester County; Gary Couch, Southeast Area IPM Educator, NY State IPM Program, Dr. Patricia Vittum, Associate Professor of Entomology, University of Massachusetts.

(The Westchester County Golf Course IPM Project seeks to demonstrate the efficacy of regular monitoring, spot treatment, biocontrols, less toxic insecticides and other techniques of integrated pest management on county golf courses characterized by high traffic and low budgets.)

(Visit Cornell Web site for additional scientific papers at <http://www.nysipm.cornell.edu>)
12. *Guidance Manual for Design and Maintenance of Environmentally Sensitive Golf Courses in New Jersey*. 1993. New Jersey Dept. Of Environmental Protection and Energy, Office of Environmental Planning, Dr. Phillip Liu, 401 E. State St. (CN-418) NJDEP, Trenton, NJ 08625.
13. Grant, Jennifer A. Evaluation of Golf Turf Management Systems with Reduced Chemical Pesticide Inputs. 2001, NYS IPM Program, Dept. of Horticulture, Cornell University, Ithaca, NY.

(Visit Cornell Web site for additional scientific papers at <http://www.nysipm.cornell.edu>)

14. *Natural Resource Protection Strategy for Michigan Golf Courses*. 1995. Michigan Dept.

of Natural Resources, Surface Water Quality Division, PO Box 30028, Lansing, MI 48909.

15. Resource Inventory & Environmental Plan, Audubon Cooperative Sanctuary Program for Golf Courses, Audubon Cooperative Sanctuary System of Canada, 115 First Street, Suite #116, Collingwood, ON L9Y 1A5 (705) 429-2277 e-mail: acss@cois.on.ca.
16. Schumann, Gail L., Patricia J. Vittum, Monica L. Elliott, Patricia P. Cobb. *IPM Handbook for Golf Courses*, ISBN: 1-57504-065-4 July 2002, John Wiley & Sons Canada Ltd., Etobicoke, ON.
17. USGA 1996 Turfgrass and Environmental Research Summary. 1996. The United States Golf Association, Golf House, Far Hills, NJ 07931.

7.3 Invasive Exotic Plants and Native Vegetation Communities

18. *Invasive Plants of Natural Habitats in Canada*. 1993, Habitat Conservation Branch of the Canadian Wildlife Service, Environment Canada, Ottawa K1A 0H3.
19. *Sustaining Biodiversity - A Strategic Plan for Managing Invasive Plants in Southern Ontario*. Document is available for download from the Society for Ecological Restoration at: <http://www.serontario.org/pdfs/sustain.pdf>.

7.4 Stormwater Management and Erosion Control Measures

20. Ontario Ministry of Environment. Guideline for Evaluating Construction Activities Impacting on Water Resources Last Revision Date: January, 1995. Retrieved October 6, 2003 from www.ene.gov.on.ca via the publications link).
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For more information on pest management / pesticides, contact: Technical Services Section, Standards Development Branch, MOE, 2 St. Clair Avenue West, 12th floor, Toronto, 416 327-8220, fax: 416 327-9187.

Appendix A

Work Sheet

Six Step Process: Implementation of the Requirements

STEP 1 Land Use Designation	<ul style="list-style-type: none"> • Ascertain that the proposal site falls within the Countryside Area of the ORM Conservation Plan.
STEP 2 Obtain Background Information	<ul style="list-style-type: none"> • Determine if the subject lands are located within Landform Conservation Area - Category 1 or Category 2.
	<ul style="list-style-type: none"> • Determine if the subject lands contain Key Natural Heritage Features, Hydrologically Sensitive Features, Vegetative Protection Zones and Minimum Areas of Influence.
	<ul style="list-style-type: none"> • Review Technical Papers: <i>Supporting Connectivity within the Oak Ridges Moraine, Identification of Key Natural Heritage Features, and Natural Heritage Evaluation.</i>
	<ul style="list-style-type: none"> • Consult Technical Paper #13 – <i>Subwatersheds (Impervious Surfaces)</i>
	<ul style="list-style-type: none"> • Consult Technical Paper #17 - <i>Stormwater Management Plans</i> towards the preparation of site specific Stormwater Management Plan objectives and a Stormwater Management Plan.
STEP 3 Planning, Design and Construction Standards and Targets	<ul style="list-style-type: none"> • Identify the areas of the subject lands that may not be developed or altered as required by the ORCMP.
	<ul style="list-style-type: none"> • Identify the areas of the subject lands that are subject to the design standards specified in relevant sections of the ORMCP.
STEP 4 Development Strategy / Design	<ul style="list-style-type: none"> • Identify the portions of the site that the proposal will leave in an undeveloped character and where disturbances to hydrologically sensitive features, to key natural heritage features, and to landforms will not occur and where they will occur.
	<ul style="list-style-type: none"> • Identify those portions of the site where impervious surfaces are proposed.
	<ul style="list-style-type: none"> • Identify buildings / structures / other development envelopes to include all areas of disturbance to existing features and landforms.
	<ul style="list-style-type: none"> • Identify servicing and stormwater management facilities locations and methods.
	<ul style="list-style-type: none"> • Identify construction methods and procedures
	<ul style="list-style-type: none"> • Identify existing tree / other vegetation protective measures.

	<ul style="list-style-type: none"> • 	<p>Prepare a Site Plan with necessary supportive documents such as:</p> <ul style="list-style-type: none"> • Water Budget and Water Conservation Plan; • a study demonstrating that an adequate water supply is available for the development without compromising the ecological integrity of the Plan Area; • hydrological evaluation(s); • a Sewage and Water System Plan; • a Stormwater Management Plan; • a Landform Conservation Plan; • a Natural Heritage Evaluation.
<p>STEP 5 Recreation Plan</p>	<ul style="list-style-type: none"> • 	<p>Prepare a Recreation Plan</p>
<p>STEP 6 Vegetation Management Plan</p>	<ul style="list-style-type: none"> • 	<p>Prepare a Vegetation Management Plan.</p>