Agriculture et Agroalimentaire Canada | Agriculture and Agri-Food Canada

ecoAgriculture Biofuels Capital Initiative

Environmental Assessment Guidelines for Screening Level Assessments of Ethanol Projects under the *Canadian Environmental Assessment Act*

Prepared by Agriculture and Agri-Food Canada
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Canada

DISCLAIMER

The objective of this document is to help proponents prepare an Environmental Assessment Report for the screening of ethanol projects under the ecoAgriculture Biofuels Capital Initiative. These guidelines are distributed for information purposes only and proponents are encouraged to consult the *Canadian Environmental Assessment Act*, any amendments to it and any related regulations to obtain the actual text of the legislation.

Proponents should note that there may be provincial environmental requirements for ethanol projects. Proponents should contact provincial agencies directly to determine these. It is possible that the Environmental Assessment Report referred to in these guidelines can also be used to fulfill some provincial environmental requirements.

Canada

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I. Background

The *Canadian Environmental Assessment Act* (CEAA) is the legal basis for the federal Environmental Assessment (EA) process. The CEAA outlines the responsibilities, requirements and procedures for the Environmental Assessment of projects and establishes a process for assessing the potential environmental effects of projects for which the Government of Canada has a decision-making responsibility. Environmental Assessments should be conducted as early as possible in the planning and proposal stages of a project so as to adequately incorporate appropriate mitigation into design. All proponents should obtain a copy of the CEAA and related regulations from the Canadian Environmental Assessment Agency at www.ceaa.gc.ca.

A guiding principle of the CEAA is public participation. To help promote public participation, Federal Authorities must establish a public registry for every project that requires an EA, in which information on the EA of the project is placed and made available to the public. However, confidential information disclosed through the EA process can be protected under the Access to Information Act and Privacy Act (ATIP). Proponents would be wise not to submit confidential information or to submit it under separate cover marked "confidential information". If this information is confirmed to be protected information under the ATIP, it will not be disclosed to the public and thus would not be placed in the public registry.

The financial incentives provided under the ecoAgriculture Biofuels Capital Initiative (ecoABC) to a biofuel energy producer or developer who is building an ethanol plant triggers the need for a federal EA under the CEAA. Agriculture and Agri-Food Canada (AAFC) is the Federal Authority that is required to ensure an EA is conducted for projects funded under the ecoABC Initiative. AAFC must ensure that an EA is carried out in accordance with the CEAA and must consider the EA findings before a decision is made to provide an incentive for a project. A proponent's information on a project will be circulated to other federal departments in accordance with the Federal Coordination Regulations under CEAA. This process will determine whether other departments also have a decision-making role or can provide expert advice on the project in question.

To help proponents write an EA report, AAFC has prepared these guidelines specifically for an environmental assessment of ethanol plants under the ecoABC Initiative. **Proponents should obtain professional consulting assistance and should follow the structure of this document when writing an EA report in order to reduce the potential for delays, especially during the Federal Coordination process**. The proponent must sign the EA report and provide ten hard copies and one electronic version on CD of the report and its appendices to AAFC at the following address:

ecoAgriculture Biofuels Capital Initiative
Environmental Assessment Component
Environmental Services
Agriculture and Agri-Food Canada
8th Floor BOM Building

c/o 408 – 1800 Hamilton Street
Regina, Saskatchewan, S4P 4L2

Names of AAFC Environmental Specialists who manage Environmental Assessments for this program can be obtained by contacting ecoabc@agr.gc.ca .

Proponents should note that if a project includes an activity that is listed on the Comprehensive Study List Regulations (see CEAA Web site), then it would trigger a comprehensive study level of assessment. In such cases, these guidelines would not apply. It is advisable that proponents consult AAFC as early as possible to determine the level of assessment required for a particular project.

Appendix A provides a list of acronyms and definitions of terms used in these guidelines.

II. CEAA Requirements

SCOPE OF THE PROJECT
While the proponent decides on the size, capacity, and design of the proposed project, AAFC (in consultation with other departments who have a CEAA responsibility) must, according to the CEAA, determine the scope of the project/components that should be considered in the EA. It is also AAFC's responsibility to determine which undertakings and activities fall within the scope of a project. Nevertheless, the scope is generally based on the proponent's project description.

Although AAFC will determine the scope of each individual project component following a review of the project description, typically the scope of a project should include, but may not necessarily be limited to, the following:

• construction (pre-construction activities, site preparation, excavation, facility construction), utility connection, transportation connections (rail, road) site remediation (if required) and demobilization of construction works;
• operation and maintenance of the facility, including waste and effluent management; and
• decommissioning of the facility and site remediation.

The above aspects of a project should be evaluated in an EA report (Section 3 of these guidelines). Should AAFC determine that the scope of the project is broader than the typical case, they will request additional information from the proponent.

SCOPE OF THE ASSESSMENT
The scope of the assessment includes a determination of the environmental components likely to be affected by the project and focuses the assessment on relevant issues and concerns.

For ethanol plants, the scope of the assessment typically encompasses effects on the biophysical environment (atmosphere, soil, ground and surface water quality and quantity, terrestrial vegetation and wildlife including mammals, fish, birds, etc.) and the

related socio-economic environment (cultural and heritage resources, noise, odour, and safety related to construction and/or operation) and any positive impacts as well. The environmental components and related information requirements are discussed in more detail in Section 4 of these guidelines.

FACTORS TO BE CONSIDERED
Under section 16(1) of the CEAA, every screening shall consider the following factors:

• environmental effects of the project, including the environmental impact of malfunctions or accidents that may occur in connection with the project, and any cumulative environmental effects that are likely to result from the project in combination with other projects or activities that have been or will be carried out;
• the significance of the effects listed in the previous paragraph;
• comments from the public that are received in accordance with the CEAA and regulations;
• measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project; and
• any other matter relevant to the screening, such as the need for alternatives to the project, that the RA may be required to consider.

In summary, for each environmental component, the environmental assessment report must address the factors listed above for each of the following activities:

• construction;
• operation;
• modification; and
• decommissioning/abandonment.

It shall also include:

• cumulative effects for each of these activities; and
• the effects of malfunctions and accidents.

III. Next Steps

Based on the information provided in the proponent's EA report and any comments received from the public and from other government authorities, AAFC will determine whether the EA report for the proposed project meets the EA requirements under the CEAA. AAFC will then use the EA Report and comments from other Federal Authorities to prepare a screening report that will summarize actions that the proponent will need to take, if any, to mitigate the adverse environmental effects of the proposed activities and provide an evaluation of the significance of effects. The screening report will then be provided to the proponent and made available for Canadians who request it via the public registry.

IV. Environmental Assessment Report

Proponents are encouraged to follow the structure presented in this guide when preparing their EA report.

Cover Page

The cover page of the EA report should contain the following information:
• name of project and, if available, the ecoABC project number;
• location of the site (nearest town and province/territory);
• size of the project (in millions of litres per year);
• name of the proponent;
• name of the consultant who prepared the report (when different from the proponent); and
• date of the report.

Section 1- Project Summary

This section provides a summary of the project (detailed information about the project should be provided in section 2).

1.1. PROJECT PROPONENT
• Name (person responsible for project):
• Company:
• Address:
• Telephone/Fax:
• E-mail:

1.2. TITLE OF PROJECT
• Name of project:

1.3. PROJECT LOCATION
• Geographic positioning (include a map):
• Exact location of ethanol facility (latitude and longitude, and/or Legal Land Description):
• Brief rationale for site selection:

1.4. SUMMARY OF PROJECT
Provide a short description of the project with the following details:
• General overview of site area (include a facility layout schematic):
• Description of present land use:
• Brief description of the biofuel facility:
• Millions of litres of fuel ethanol produced:

• Tonnes of Distillers Dried Grain with Solubles produced:
• Brief summary of how wastes/by-products will be managed and/or treated:

1.5. CONSTRUCTION SCHEDULE
• Preliminary engineering:
• Start of construction:
• Start of production:

1.6. AAFC'S INVOLVEMENT IN THE PROJECT
• Give total ecoABC funding that has been or is expected to be requested.

1.7. OTHER FEDERAL AUTHORITIES
Federal authorities other than AAFC may have funding, land or regulatory responsibilities in relation to the project. The nature and status of all federal involvement/permitting/approval processes should be presented in this section, if the proponent is aware of these. For example, the following legislation may be relevant depending on the project, its location and/or related environmental characteristics:
• Canadian Environmental Protection Act (CEPA); National Pollutant Release Inventory
• Species at Risk Act (SARA)
• Fisheries Act
• Navigable Waters Protection Act
• Migratory Birds Convention Act
• Canada Wildlife Act

1.8 PROVINCIAL/TERRITORIAL DEPARTMENTS/AGENCIES
Ethanol plants and/or their ancillary works may also trigger a provincial/territorial EA in some jurisdictions. Proponents should indicate if the EA report has already been sent to provincial/territorial departments and the stage of provincial/territorial review (e.g. EA review complete/ongoing/not required, subsequent environmental permitting initiated/complete) and related contact names. If the proponent has not done so already, AAFC may request the proponent to send copies to the province/territory or will refer the project to the appropriate provincial/territorial authorities and will review the project cooperatively as per existing *Federal-Provincial Agreements on Environmental Assessment Cooperation*, where required. (Note that provincial/territorial processes will likely require additional copies of the EA report.)

1.9. AUTHOR OF ENVIRONMENTAL ASSESSMENT REPORT
EA Report completed by (if different than under section 1.1):

• Name (person responsible for report):
• Company:
• Address:
• Telephone/Fax:
• E-mail:

Section 2 - Detailed Project Description

A clear and detailed project description will assist AAFC in assessing the EA report. All project components and activities must be identified and clearly explained (the how, when, where and what of the project). A detailed project description will ensure that AAFC clearly understands the project and its interaction with the environment, and reduces the risk that other Federal and Provincial/Territorial Authorities will require additional information. Proponents are to assume that no information is too obvious to require a detailed explanation. What is obvious to the proponent may not necessarily be obvious to the general public that wants to review the EA report and participate in the EA process.

2.1. PROJECT PROPONENT

• Provide information about the proponent and its partners.

2.2. BACKGROUND OF PROJECT

• Provide information on the project's history.
• Describe regional and national political and economic context for the project.

2.3. PURPOSE OF PROJECT

• Provide a justification for the project.
• Describe the project objectives and the benefits to society

2.4. LOCATION OF PROJECT

• Present the location of the project, the longitude and latitude of the site, and the detailed location of all project components and activities. Provide maps that indicate the layout of project components and activities.
• Provide a map that shows the geographical context of the site and the environmental features that could be affected by the project.
• Identify the proximity to designated environmental or cultural sites, such as national parks, heritage sites, historic sites and other protected or sensitive areas.
• Identify the proximity of First Nations reserves and lands that are currently used for traditional purposes by Aboriginal people.
• Provide site plans/sketches/photos with project location, features and activities identified on maps (when necessary to clarify points).

Note that good site selection can minimize many potential environmental effects of ethanol plants. Factors that should be considered in siting might include:
• the proximity of ethanol plants to municipal wastewater facilities;
• the proximity of plants to large livestock feeding operations such that the "distillers dried grain with solubles" can be pumped to livestock operations;
• proximity to a water supply of sufficient volume to supply plant without impacting other water users or environmental components;
• proximity to input resources and biofuel markets (to reduce emissions resulting from transportation)

2.5. DETAILED PROJECT ACTIVITIES

Provide detailed information concerning the construction, operation and decommissioning phases of the project. Include the timing and scheduling of each phase. Describe in detail the project components, including any permanent and/or temporary structures, associated infrastructures and associated construction work and list the type of equipment used at each location. Also provide the capacity and the size of the various components. AAFC would suggest providing a project Gantt chart (a graphical representation of the tasks and related schedule or timeline for completion of tasks).

2.5.1. Construction Phase

2.5.1.1. Land Clearing and Site Preparation
(including surveying activities, archaeological assessments, and geotechnical investigations)
2.5.1.2. Road/Rail Construction/Modification
2.5.1.3. Temporary Storage Facilities
2.5.1.4. Foundation Construction
(including excavation and fill requirements)
2.5.1.5. Facility Construction and Installation
(including all building, storage facilities, loading areas, gates and fencing, parking lots)
2.5.1.6. Waste Management Systems
(including effluent/waste water containment structures and runoff control structures)
2.5.1.7. Utility Connections
(including trenching and stream crossing requirements)

2.5.2. Operation Phase

Describe how all aspects of the facility will operate (see Appendix B for an example of a project description). Include the quantity, source, and transportation requirements of raw materials; water and energy requirements; quantity, quality, type, recycling and disposal of wastes produced for each operation activity; an estimate of the volume and characteristics of by-products produced and how these will be handled; description of air emissions generated from relevant components of the project, including the volume and source of steam and a description of the type of boiler being used and the related fuel source and emissions. Include a mass and energy balance quantifying major raw material/ energy inputs and outputs. A process flow diagram(s) may also be beneficial in describing the air, water, and soil waste characteristics of the project. An example of a process flow diagram for typical air emissions can be found in Appendix C.

2.5.2.1. Grain Receiving, Cleaning and Storage
2.5.2.2. Milling
2.5.2.3. Steam Generation
2.5.2.4. Mash Production
2.5.2.5. Cooling Tower (Mash Cooling)
2.5.2.6. Fermentation
2.5.2.7. Distillation and Dehydration
2.5.2.8. Ethanol Treatment and Storage
2.5.2.9. Ethanol Outloading and Transportation
2.5.2.10. Distillers Dried Grain with Solubles Production, Storage, Use and Transport

2.5.2.11. Storage of Additives and Chemicals Used in Production
2.5.2.12. Wastewater Storage and Maintenance
2.5.2.13. Maintenance Activities

Within the relevant sections of this description, proponents should ensure that they provide the details and status of any contracts with third parties who plan to receive wet and dry stillage and other by-products from the operation. In addition, back-up plans should be described that will show how the proponent will deal with stillage if such contracts are discontinued (e.g. back-up receivers, alternate uses, disposal). Any arrangements where municipal governments receive any component of the waste water should be presented along with a detailed analysis of the expected effluent quality and volumes to be released to the municipal system and the capability of the municipal system to accept and treat such volumes and effluent.

2.5.3. Decommissioning Phase
Include expected lifetime of the facility and how decommissioning is expected to ultimately take place.

2.5.3.1. Removal of Buildings, Infrastructure and Waste
2.5.3.2. Site Remediation

2.5.4. Future Phases of Project
Describe future development phases, if any.

Section 3 - Scope of Project and Assessment

Section II of these guidelines lays out the general principles of scoping the project and assessment including the typical scope for an ethanol plant. Please refer to Section II and present a brief summary of the scope of the project here (e.g. pre-construction, construction, operation and decommissioning).

The proponent should also identify the boundaries of the area being assessed. This area must be sufficiently large to cover all anticipated activities of the project. The proponent must be able to show the direct and indirect effects that these activities will have on identified environmental components at or near the site of the project.

Section 4 - Environmental Characteristics

This section should describe the existing environmental characteristics of the site and surrounding areas. Please give a general description of the environment and then focus on the environmental components that may be affected by the project. Note that the proponent should provide a rationale for considering certain environmental components and not others in the EA report.

Although much information will be available from existing sources, it is likely that fieldwork will be required to obtain some site-specific information. Methodologies used to collect data (e.g. survey techniques, field/lab testing protocols) should be described where field work is required.

The EA report should, as a general rule, describe the following environmental components:

4.1. GEOPHYSICAL ENVIRONMENT

4.1.1. Physiography and Topography

The physiography and/or topography of the project site should be described and mapped. An example of this description could be regional ground slope focusing surface drainage away from or towards a water body.

4.1.2. Soil Quality

Information on soils should be provided including the type, agricultural capability, and distribution of soils. This data should be presented as maps and logs. Use the Canadian Soil Classification System to identify soil type(s).

4.1.3. Geology

Where geological formations or features are expected to enhance or mitigate the effects of the project, those components should be evaluated and described. Evaluation of the geological setting will be particularly important if settling or evaporation ponds are to be constructed.

4.1.4. Seismicity

Where seismic hazards exist, the frequency and magnitude of historical and potential earthquakes should be evaluated with respect to possible effects on environmental releases, project construction or project operation.

4.1.5. Groundwater and Hydrogeology

Where groundwater will be used as a water source, the volume and availability should be identified, and allocation/licensing issues discussed. Where contaminant spills could impact groundwater resources, groundwater should be evaluated with respect to presence or absence of aquifers (footprint and down gradient), static depth, flow direction, flow volume, current use (e.g. domestic or irrigation water) and existing water quality data. Wells or springs down-gradient of the project site should also be mapped and tested prior to construction. Where hydrogeologic structures or characteristics could affect the penetration of hydrocarbon or other spills, those characteristics should also be described and mapped. If settling or evaporation ponds are to be constructed, aquifers underlying the project site should be characterized with respect to their vulnerability to contamination using drill core data. This drill core data may be from existing water wells, provided the wells are appropriately located, adequately deep, and logged in sufficient detail to adequately characterize the local hydrogeology, otherwise new boreholes should be drilled.

4.2. AQUATIC ENVIRONMENT

4.2.1. Aquatic Habitats

The proximity of the project to surface water bodies should be identified. If surface water bodies will be utilized or affected by any aspect of the project (e.g. as a water source, for discharge, potentially impacted by erosion, spills, etc.), include a description of the water body (ies) and, if fish-bearing, provide a map of the fish communities and habitat that are present. Determine if the water bodies are used to support a recreational, commercial, or aboriginal food fishery. Identify areas used for spawning, rearing, nursery, feeding, migration or over wintering. Include the common names, life stages utilizing these areas and habitat requirements for these species. Characterize riparian habitat and function with respect to aquatic life. Any critical habitat as defined under the Federal Species at Risk Act should also be identified, and the known distribution of the species under consideration mapped.

4.2.2. Aquatic Fauna

If any aspect of the project is expected to have an impact on aquatic fauna, those fauna should be identified and inventoried by common and Latin name, and their distribution within the water body (ies) should be mapped, including rare and endangered species (both provincial lists and species listed by the Federal Species at Risk Act – see 4.3.3).

4.2.3. Aquatic Vegetation

Any aquatic vegetation that may be affected by the project should be identified and inventoried, including Latin and common names and their distribution within the water body (ies) mapped, including rare and endangered species (both provincial lists and species listed by the Federal Species at Risk Act – see 4.3.3).

4.2.4. Surface Hydrology

If surface water may be impacted either by use in the project or potential emissions from the project, the flow regime or level of rivers or lakes should be described, particularly with respect to potential impacts to other related environmental components. Related environmental components may include (but are not limited to) groundwater, and aquatic flora or fauna. Effects considered should include potential alterations to summer and winter hydrologic regimes, including flow (discharge), level, and ice conditions. Where large volumes of surface water are proposed for use, baseline information about the watershed should be provided that would support a watershed-based effects assessment including impacts to other users and environmental components within the watershed.

4.2.5. Surface Water Quality

If the project is expected to affect surface waters through water use, wastewater or other discharges, the existing quality of surface waters should be assessed with respect to standard water quality measures (i.e. CCME and provincial water quality guidelines). Particular reference should be made to other water uses downstream that may be impacted (e.g. domestic, waterworks, recreation, irrigation, and livestock watering), and aquatic life protection.

4.2.6. Wetlands

The location of any wetlands in and around the project site should be provided on a site map. Information on how wetlands were avoided in selecting the project site and related utility site(s) should also be provided. Note that the federal government has adopted a wetland policy that promotes the conservation of wetlands.

4.3. TERRESTRIAL ENVIRONMENT

4.3.1. Flora

A general description of the flora at the project site should be provided (and ideally supported by aerial photos). Where the project is expected to impact native or other vegetation of value, the vegetation should be identified and inventoried, including both common and Latin names, and a map provided that shows the distribution in the area, including rare and endangered species (both provincial lists and species listed by the Federal Species at Risk Act – see 4.3.3).

4.3.2. Fauna

Where impacts are expected to animals, including birds, the species impacted should be identified and inventoried, including Latin and common names. A map should also be provided that shows their distribution in the area, including rare and endangered species (both provincial lists and species listed by the Federal Species at Risk Act – see 4.3.3). This map should also show migration paths, watering and feeding areas, nesting areas, calving areas or any other areas of special importance. Further, measures that will be taken to avoid impacts to migratory birds, their eggs, nests and young should be identified. Information should also be provided on measures taken to avoid loss of mature and interior forest habitat, where present.

4.3.3. Endangered Species

Endangered flora or fauna indigenous to the area should be identified from the appropriate provincial endangered species database, the Species at Risk Act, and/or the Migratory Bird Regulations. Based on the results of the database search, the potential for at-risk species to be present either at or near the site should be identified along with the habitat ranges of those species. A field inventory should be conducted by a professional biologist within an appropriate radius of the project site to identify the actual species present and their distribution. It is important to note that field inventories must be conducted at the appropriate time of year.

4.4. ATMOSPHERIC ENVIRONMENT

4.4.1. Climate

Climatic normals for the project site should be identified. In addition, factors that influence air quality including the direction and velocity of dominant winds, and the frequency of atmospheric inversions should be described.

4.4.2. Air Quality

Where operations are expected to produce air quality impacts (e.g. dust, other airborne particulates, greenhouse gases, chemical vapours or odours), pre-existing sources of air

contaminants in the local study area should be identified and existing air quality evaluated for concentrations of the pollutants that could potentially be released by project operations. Note that where appropriate, air dispersion modelling may be necessary to evaluate impacts resulting from the project. Note that Environment Canada has a list of regulated Criteria Air Contaminants that should be used as a guide in the assessment of air quality (See Appendix C).

4.5. SOCIO-ECONOMIC CONDITIONS

Environmental effects can be described as either direct or indirect. The environmental components described above may be directly impacted by the construction, operation, and decommissioning of ethanol facilities. An example of a direct effect would be the contamination of a surface water body due to improper waste water management during facility operation.

Section 16.1 of the CEAA requires consideration of the indirect effects of changes to socio-economic conditions caused by project activities. An example of an indirect socio-economic effect would be the loss of a water body for recreational swimming as a result of contamination. However, where appropriate, AAFC recommends the inclusion of direct effects to socio-economic conditions within the EA report. An example would be an increase in vehicular traffic experienced by local residents during construction and operation of the biofuel facility. As such, the following sections should provide baseline information on the socio-economic components that may be affected, both directly and indirectly, by the project.

4.5.1. Population

Human populations surrounding the project site should be identified in terms of their proximity to the site (e.g. population within 1 km, within 10 km, and within 100 km), the demographic profile(s) of nearby communities, and employment levels. A map of the area of the project should be included. This map should clearly indicate any residential areas in the vicinity of the project and all potential high-sensitivity receptors, such as hospitals, seniors' residences, daycares, schools, etc.

4.5.2. Land Use

Current and future land use in the project area should be identified; including current community plans and zoning, existing industrial operations, existing resource extraction operations (e.g. traplines, oil and gas leases, etc.), as well as potential uses in adjacent lands and any conflicts that may arise from competing land uses. The transportation routes (road and rail) that would serve the project should be identified.

4.5.3. Cultural Resources

Existing information on the presence or potential presence of any archaeological, cultural, or heritage resources should be summarized. Depending on the available information and history of site disturbance, an archaeological survey of the project site may be needed. This typically requires input from provincial/territorial heritage departments.

4.5.4. Existing Noise Level

Inventory and summarize existing sources of noise in the study area. Determine the distances from the project site to potential receptors (e.g. residential areas, schools, health care facilities). Where project sites are located close to such receptors the baseline noise levels should be evaluated conducting quantitative field evaluations with appropriate instrumentation.

4.5.5. Recreation Areas

Recreational areas that may be affected should be identified. These areas include tourist destinations, parks, lakes and other common recreational areas.

4.5.6. Land and Resources Used for Traditional Purposes by Aboriginal Persons

Land use or resource conflicts with traditional (e.g. hunting) or licensed (e.g. traplines) aboriginal uses should be identified through consultation with local First Nations.

4.5.7. Safety Issues

Safety issues of concern to local residents should be identified, including those that may involve other environmental components such as traditional land use or recreation. These risks may include traffic accidents, road upgrades, fire, increased demands on local emergency response services or any other issues that may relate to public safety.

4.5.8. Visual Landscape

The visual quality of the project site should be inventoried and evaluated, including scenic values and viewsheds. These evaluations should be undertaken from locations where stakeholders (both residents and visitors) will be most affected, and where appropriate, should include descriptions, photographs, or draftings/drawings of how the project will fit into the visual landscape.

Section 5 - Assessment of Environmental Effects, Mitigation Requirements and Residual Effects

In this section, the proponent/consultant will describe the likely effects of the project on the environment, the cumulative environmental effects, the potential for accidents and malfunctions, and the effects of the environment on the project, which include climatic fluctuations and extreme events.

5.1 EVALUTION OF PROJECT EFFECTS, MITIGATION AND RELATED RESIDUAL EFFECTS

The following process ensures that the interactions between the project components (activities described in Section 2.5) and the environment (environmental components identified in Section 4) are adequately described, that the likely environmental effects are identified and properly assessed, and that the importance of any residual effect is determined:

For each environmental component (see Section 4) that exists within the project boundaries, this section should describe the effect of the project on the environment and identify the mitigation measures that would reduce or eliminate the effect. This section should further estimate the residual effects (those effects remaining after mitigation measures have been applied).

A. Description of Impacts Associated with Each Environmental Component
As per the general requirements of the *Canadian Environmental Assessment Act (CEAA)*, both potential positive and negative environmental effects on environmental components should be identified when describing impacts. Potential positive impacts are those that would enhance environmental quality, natural resources, features, or existing land use within the study area. Potential negative impacts would be those impacts that could typically diminish environmental quality, natural resources or features, or diminish the existing, or potential land use within a study area.

The relative significance of environmental effects on each environmental component should be evaluated using the following criteria (CEAA, 1995):

- ***Nature/Direction of Effect*** - Positive or negative impact or direct or indirect effect.
- ***Magnitude*** - The typical effects of the impact (low, medium or high impact) on the environment/community.
- ***Spatial Extent*** - Area or volume covered (immediate, local or regional area).
- ***Timing*** - Construction, operation, decommissioning.
- ***Duration of Impacts*** –Short term, long term, intermittent, continuous.
- ***Reversibility / Irreversibility*** – An estimate of whether or not an effect, once it has been stopped, can return to its pre-existing situation.
- ***Likelihood of Occurrence Without Mitigation*** An estimate of whether the effect is likely to occur if mitigation options are not implemented (likely, not likely).

B. Description of Mitigation Measures
Mitigation is defined by the *Canadian Environmental Assessment Act* as "the elimination, reduction or control of the adverse environmental effects of the Project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means" (CEAA ss.2(1)). The proponent should include a specific breakdown of the mitigation measure that can and will be done to:

i. **Eliminate** the threat/risk to environmental components completely (alternate approaches, different chemical/material used etc.);
ii. **Prevent /reduce** impacts of the threat/risk to environmental components (berms, training, pollution prevention equipment/technologies, etc.);
iii. **Respond** to threat/risks to environmental components when it occurs (emergency response, clean up, etc.).

Each component of the project that may produce effects should be evaluated. Where monitoring is required to ensure proper operation and minimize potential negative effects, this should also be identified.

C. Determination of Residual Effects

The proponent should identify the expected residual environmental effects that would result after mitigation measures are in effect. "Levels of Residual Effects" are defined in the following Table and this table should be used as a reference to quantify the expected level of residual effect associated with each mitigation measure or option.

Table 1. Level of Residual Effect after Mitigation Measures

Level	Definition
High	Potential effect could threaten sustainability of the resource and should be considered a management concern. Research, monitoring and/or recovery initiatives should be considered.
Medium	Potential effect could result in a decline in resource to lower-than-baseline but stable levels in the study area after project closure and into the foreseeable future. Regional management actions such as research, monitoring and/or recovery initiatives may be required.
Low	Potential effect may result in a slight decline in resource in study area during the life of the project. Research, monitoring and/or recovery initiatives would not normally be required.
Minimal	Potential effect may result in a slight decline in resource in study area during construction phase, but the resource should return to baseline levels.

The table below provides an example of how the EA Report should use the steps described in Subsections A, B and C above to summarize the effects, mitigation measures and residual effects that will result from project components. Note that two scenarios are used in this example table to describe the "characteristics and magnitude of the effects" (column 2), whereas the actual EA report will only evaluate one scenario – that which is found at the project site. When the proponent/consultant prepares the report, detailed TEXT describing the effects and mitigation measures should be presented in association with each table. For the proponent's reference, Appendix B provides a series of tables that outline an array of potential environmental components/scenarios that may be encountered/affected at project sites. The project description in Appendix B describes some of the potential negative effects associated with biofuel projects.

Proponents should note however, that tables in this document are provided as templates which illustrate possible impacts to various environmental components that may exist at biofuel processing sites, and present possible mitigation measures that could be used to reduce them. These tables are not exhaustive, and specific mitigation for individual projects will depend on the design of the facility and the characteristics of the environment in which the project is located.

Example (Table 3 from Appendix B)

Potential Effects and Mitigation for Groundwater Protection – Ethanol Production.

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction and Operation - Spills of process or machine fluids, including fuels, hydraulic fluids, ethanol, and anhydrous ammonia. Effects include potential contamination of drinking or irrigation water aquifers and contamination of basements with vapours.	Effects and impacts assuming: Good natural groundwater protection/limited natural groundwater protection*. Nature: Negative Magnitude: Low/Medium* Spatial: Immediate/Local* Timing: Construction and Operation Duration: Intermittent Reversibility: High/Medium* Likelihood: Low/Medium*	• Place/construct impermeable containment pans/pads at loading/transfer points. • Construct secondary containment berms around storage vessels. • Undertake regular inspection of equipment and storage vessels for leaks or wear. • Ensure appropriate spill response plan, training and equipment is available on-site and near transfer and storage points. • Excavate contaminated soil promptly if spills occur, and dispose of it appropriately. • Contain used or contaminated fluids and dispose of them at appropriate disposal facilities.	With mitigation, residual effects are expected to be Low to Medium.
Construction - Utility installation via directional drilling. Fluids used during drilling may enter aquifers regardless of degree of groundwater protection.	Effects are expected to be the same regardless of the degree of groundwater protection. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction Duration: Short Term Reversibility: Medium Likelihood: Medium	• Use water rather than mud as drilling fluid. • Drill during times of low groundwater flow as identified during Groundwater analysis.	With mitigation, residual effects are expected to be Low.

Operation - Ethanol Production - Wastewater disposal. Effects include contamination of drinking or irrigation water aquifers, however most waste constituents readily evaporate or biodegrade.	Effects and impacts with: Good groundwater protection/limited groundwater protection*. Nature: Negative Magnitude: Low/Medium* Spatial: Immediate Timing: Operation Duration: Intermittent Reversibility: High/Medium* Likelihood: Low	• Use appropriate treatment system to render wastewater safe, either for release to surface water, or municipal Waste Water Treatment (WWT) system as applicable. • Verify the adequacy of capacity and capability, and ensure appropriate disposal agreements are in place with the WWT system operator if wastewater is to be disposed of in a municipal WWT system. • Monitor treatment efficacy where on-site treatment is used to ensure waste water meets disposal standards (municipal or surface water quality). • Monitor waste water quality where on-site water treatment is not required to ensure that off-spec water is not entering the municipal WWT system. • Ensure appropriate spill response plan, training and equipment is available on-site and near transfer and storage points.	With mitigation, residual effects are expected to be Low.

Summit Environmental Consultants Ltd. and Dillon Consultants Ltd. 2007

5.2. EFFECTS OF MALFUNCTIONS AND ACCIDENTS

This section should describe possible accidents or malfunctions, their probable and potential effects on the environment, and the implementation of any mitigation measures or contingency plans. The proponent must demonstrate a commitment to having an Environmental Protection Plan that would address potential accidents and malfunctions. For example, experience with other ethanol plants indicates that the proper handling and treatment of all by-products and effluents from the operation will be important to the long-term viability of the plant. If contracts for stillage are cancelled, this can be a very significant issue for the operation, and contingency plans should be identified early so that problems do not result. Further, if municipal systems are utilized as part of the waste management component, their capacity to handle and adequately treat off-spec wastewater should be evaluated. Monitoring of effluent characteristics and the need for training of both facility operators and municipal operators to ensure that effluent quality does not compromise municipal systems should be considered in this section. Contingency plans to deal with spills, off-spec waste water and other possible occurrences should also be included.

5.3. EFFECTS OF THE ENVIRONMENT ON THE PROJECT

5.3.1. Climatic Fluctuations

This section should assess the potential of climatic fluctuations (snowfall, rainfall, long term climate change) at the site of the project and describe the effects those fluctuations may have on the project.

5.3.2. Extreme Events

This section should describe the potential effects of extreme events such as hail, ice storms, fire, floods (earthquakes in certain areas of the country) on the project and show any measures taken, including engineering and operational designs, that would mitigate these effects.

5.4. CUMULATIVE EFFECTS

Cumulative effects are the combination of the residual effects of the project in conjunction with the environmental effects of past, present and future projects or activities. Cumulative effects can also result from the combination of different individual environmental effects of the project acting on the same environmental component. Cumulative effects should be presented in this section of the EA Report.

When looking at past, present and future projects or activities, the proponent must include all projects and activities in the area, not just other biofuel projects. For example, other projects or activities could include industrial developments, oil and gas activity, hydro dams, roads, agricultural activity, transmission lines, and recreational or tourism activities.

Should it be determined that there are no other activities that have an impact on the environmental component, this should be explained in the assessment.

Guidance on how to consider cumulative environmental effects in an EA is provided in the reference guide entitled *Cumulative Effects Assessment Practitioners Guide*, Canadian Environmental Assessment Agency, February 1999, available at www.ceaa.gc.ca.

To facilitate this assessment, the following table of examples may provide some guidance on how to undertake Cumulative Impact Assessment for ethanol facilities. The EA report should present the potential impacts that could occur in the study area based on the specific land uses/facilities in the vicinity of the project. Cumulative impacts would not necessarily be limited to this list.

Table 2. Summary of Cumulative Effects for Ethanol Production

Environmental Component	Description of Project Activity	Other Activities	Assessment of Cumulative Effects	Level of Cumulative Effect
Terrestrial Flora	Land Clearing and Site Preparation	Previous land use for agricultural purposes	• The land or portions thereof have been previously used for agricultural applications • Re-vegetate area with native species after construction is complete • Mitigation may actually improve the state of the land	None
Fauna	New road or rail construction	Existing township and/or range roads	• Existing development has affected mobility of species and reduced the size and quality of habitat • Mitigation measures include usage of existing roads, avoidance of critical habitat and creation of underpasses for wildlife to avoid roadways • Minor cumulative effects expected with mitigation measures	Low
Fish Habitat	Potential for leaks and spills	Exiting impacts to surface water quality from run-off from other operations or activities	• Existing pollution may have the potential to affect fish habitat • Mitigation measures include storage of fluids away from surface water and having an emergency spill kit on site in case of fluid leaks or spills. • No cumulative effects expected with mitigation measures	Minimal
Air Quality	Release of dust from milling process during ethanol production	Adjacent farming activities release dust into the air	• Ethanol plant will add to regional emissions affecting regional air quality • Mitigation measures, such as a baghouse and CO_2 scrubber will be installed to lower emission levels • Cumulative effects expected even with mitigation measures	Medium

Summit Environmental Consultants Ltd. and Dillon Consultants Ltd., 2007

Section 6 - Follow-up Programs and Monitoring

This section should summarize the proponent's follow-up measures and monitoring programs that may be required to ensure proper operation of the project and to meet provincial, federal or municipal water quality or air emission requirements.

Note that "Follow-up Programs" in the CEAA are defined as Programs put in place to verify the accuracy of the Environmental Assessment of a project and/or to determine the effectiveness of any measures taken to mitigate the adverse environmental effects of the project. The purpose of this section is to describe the need for, and scope of, a project-specific follow-up program that meets the definition under the Act.

Where the EA has identified the potential for a project-induced negative effect on any environmental component, the need for a follow-up program should be considered based on factors such as the following:

- Does the project involve a new or unproven technology?
- Does the project involve new or uncertain mitigation measures?
- Is the project proposed for an environmentally sensitive ecosystem?
- Is the assessment's analysis based on a new assessment technique or model?
- Are there any impacts for which considerable public concern has been raised?

If a follow-up program is warranted, its description should include the following (note that the details may vary for different follow-up program components if the program involves more than one EA issue):

- Whether the monitoring required for the follow-up program is addressed within any other federal, provincial or municipal regulatory requirements;
- The predicted effect(s) and related mitigation measure(s) that will be tested;
- The criteria that will be used for accepting the EA prediction or hypothesis;
- Methods, timing and duration for the monitoring component of the program; and,
- Any actions that can be taken as a result of the follow-up to ensure EA conclusions and commitments are respected.

Information on the follow-up program will be posted via the Canadian Environmental Assessment Registry by AAFC.

Where monitoring of air quality, water quality/quantity or any other environmental component is necessary to ensure proper operation of the facility, to minimize negative effects or to meet federal, provincial/territorial or municipal requirements, these should also be summarized in this section.

Section 7 - Public Consultation

It may be beneficial for the proponent to hold information session(s), open houses, etc., to inform members of the public about the project and to provide the public with the opportunity to show support and/or identify concerns in regard to the effects of the project. In some cases, sessions may have already been held as a requirement of municipal or provincial government-approval processes.

Any public consultation process must be well documented in the EA report. A summary of the session(s) and/or key events associated with public consultation should be presented in this section, including the comments received from participants and how the concerns are addressed in the EA report. If sessions have not yet been held, AAFC should be informed of the dates and times of the sessions that are planned to occur.

AAFC will determine, on a project-specific basis, whether additional public participation is appropriate in the circumstances, as per subsection 18(3) of the CEAA. AAFC may conduct consultations themselves or may delegate the delivery of a public participation program to the proponent. At a minimum under subsection 18(3) of the CEAA, AAFC will post information on the Canadian Environmental Assessment Registry's Internet site. Furthermore, both the screening report and the comments received on the assessment must be considered by AAFC in arriving at its environmental assessment decision.

Section 8 - First Nations Consultation

In general, proponents must consult with officials from Aboriginal communities if a proposed project is located near an Aboriginal community and/or if the effects of any environmental change arising from a project have the potential to impact current use of lands and resources for traditional purposes by Aboriginal peoples. As with all public consultation, the Aboriginal engagement process needs to be well documented in the EA report. Concerns raised by Aboriginal participants must be reported and addressed. A summary of any session(s) and/or key events associated with the Aboriginal engagement should be presented in this section.

AAFC may have further responsibilities to consult any potentially affected Aboriginal communities in circumstances involving impacts to established or potential Aboriginal or treaty rights, settled or unsettled land claims, or self-government agreements.

Section 9 - Conclusion

The EA report should provide an opinion on the overall importance of the residual environmental effects that may result from the project. It will be AAFC's responsibility to formulate a Final Decision on the significance of the residual effects associated the project.

Section 10 - List of Supporting Documents

This section should list all supporting documents used to prepare the EA. Important excerpts should be attached in an appendix.

Section 11 - Signature

The EA Report should include the following:

EA Report Conducted by:
Name of proponent_____
Date_____
Signature_____
Name of consultant_____

Date_____

Note: The proponent is responsible for the report's content and any commitments made therein (especially those related to the implementation of mitigation measures).Therefore, the proponent must sign off on the report even if external consultants were used.

Section 12 - Attachments

Supporting maps, drill logs, x-sections, schematics, mass balances, raw data, analyses and other documents when/where applicable should be included in this section or in appendices.

Appendix A: Glossary and References

ACRONYMS AND ABBREVIATIONS USED IN THE GUIDELINES

CEAA
Canadian Environmental Assessment Act
EA
Environmental Assessment
ecoABC
ecoAgriculture Biofuels Capital Initiative
AAFC
Agriculture and Agri-Food Canada

DEFINITIONS FROM THE CEAA AND TERMS USED IN THE GUIDELINES

Appropriate disposal facilities:
are those sites capable of accepting a particular type of waste. Allowable disposal sites will vary by region or jurisdiction, and are dependant on the chemical(s) involved, the volumes, and the concentrations – not all sites will be able to take all waste products. Local regulations and the capabilities of potential disposal sites must therefore be considered. When disposing of waste materials by irrigation, composting or other similar methods, the required permits must be obtained and the method proven safe prior to disposal.
Appropriate spill response plans:
contaminant-specific plans detailing the correct methods for spill containment, clean-up and mitigation of environmental damage.
Appropriate treatment:
treatment of wastewater that ensures that contaminant levels fall within the required limits for the type of disposal employed. If wastewater is to be released directly to the environment, this means it must be treated to meet all legal requirements for surface water discharge. If wastewater is being disposed of in a municipal wastewater treatment (WWT) system, it must be treated to meet or exceed minimum treatable levels as defined for the particular system in which it is being disposed.
Comprehensive study:
an environmental assessment that is conducted pursuant to section 21 of the CEAA and that includes a consideration of the factors under subsections 16(1) and (2) of the Act.
Comprehensive study list:
a list of all projects or classes of projects that have been prescribed pursuant to regulations made under paragraph 59(d) of the CEAA.
Cumulative effects:
a project's effect on the environment combined with the effects of projects and activities (past, existing or imminent). These may occur over a certain period of time or distance.

Environment:
the components of the earth including (a) land, water and air, including all layers of the atmosphere; (b) all organic and inorganic matter and living organisms; and (c) the interacting natural systems that include components referred to in (a) and (b).
Environmental Assessment:
with respect to a project, an assessment of the environmental effects of the project that is conducted in accordance with the CEAA and its regulations.
Environmental component:
a fundamental element of the natural and human environment, such as air, water, soil, terrain, vegetation, wildlife, fish, avifauna and land use.
Environmental effect:
with respect to a project, any change that the project may cause in the environment, including any effect of any such change on health and socio-economic conditions, physical and cultural heritage, and current land and resources used for traditional purposes by Aboriginal persons. Also included are changes to any structure or site that is of historical, archaeological, paleontological or architectural significance, and any change to the project that may be caused by the environment.
Federal Authority:
(a) a Minister of the Crown in right of Canada;
(b) an agency of the Government of Canada or other body established by or pursuant to a Act of Parliament that is ultimately accountable through a Minister of the Crown in right of Canada to Parliament for the conduct of its affairs;
(c) any department or departmental corporation set out in Schedule I or II of the *Financial Administration Act*; and
(d) any other body that is prescribed pursuant to regulations made under paragraph 59(e) of the CEAA, but that does not include
• the Commissioner in Council or an agency or body of the Yukon Territory, the Northwest Territories or Nunavut,
• the council of a band within the meaning of the *Indian Act*,
• the Hamilton Harbour Commissioners constituted pursuant to the *Hamilton Harbour Commissioners Act*,
• the Toronto Harbour Commissioners constituted pursuant to the *Toronto Harbour Commissioners Act, 1911*,
• a harbour commission established pursuant to the *Harbour Commissions Act*,
• a Crown corporation within the meaning of the *Financial Administration Act*, or
• a not-for-profit corporation that enters into an agreement under subsection 80(5) of the *Canada Marine Act* or a port authority established under that Act.
Follow-up program:
a program put in place to verify the accuracy of the Environmental Assessment of a project and/or to determine the effectiveness of any measures taken to mitigate the adverse environmental effects of the project.
Mitigation:
with respect to a project, the elimination, reduction or control of adverse environmental effects, including restitution through replacement, restoration, compensation or any other means for any damage to the environment caused by such effects.

Monitoring:
a continuing assessment of conditions at and surrounding the actions taken with respect to a project. Monitoring determines whether effects occur as predicted, operations remain within acceptable limits and if mitigation measures are as effective as expected. Monitoring must be undertaken by qualified personnel. The authority of the "monitor" to stop work harmful to the environment should be clearly established.

Physical work:
any proposed construction that is fixed and permanent.

Project:
(a) in relation to a physical work, any proposed construction, operation, modification, decommissioning, abandonment or other undertaking, or
(b) any proposed physical activity not relating to a physical work that is prescribed or is within a class of physical activities that is prescribed pursuant to regulations made under paragraph 59(b) of the CEAA.

Proponent:
with respect to a project, any person, body, business, government or federal authority that proposes the project.

Public registry:
a system for providing convenient public access to documents relating to an Environmental Assessment.

Residual effects:
effects that remain after mitigation measures have been applied.

Secondary containment:
is typically prescribed by provincial laws, and may vary from region to region, however secondary containment is typically required to accommodate a percentage of the fluid stored in a tank or some duration of flow for a pipeline. The containment should also be resistant to the chemicals it is expected to come into contact with, and be sufficiently resilient to withstand mechanical or other stresses typical of the environment in which it is constructed.

Scope of the assessment:
a determination of the environmental effects to be addressed, the scope of the environmental effects to be assessed, and the effects to be considered in making decisions regarding the project.

Scope of the project:
those components of the proposed development that should be considered part of the project for the purposes of the Environmental Assessment.

Scoping:
a process by which all relevant issues and concerns related to the proposed project and assessment are identified and prioritized.

Screening:
an Environmental Assessment that is conducted pursuant to section 18 of the CEAA and that includes a consideration of the factors set out in subsection 16(1) of the CEAA.

Screening report:
a report that summarizes the results of a screening.

Waste water disposal:
disposal of effluent undertaken according to the applicable regulations. If disposed of in a municipal waste water treatment (WWT) plant, it must be verified that the WWT plant has the necessary capacity, and expects to have that capacity for the expected lifetime of the facility. It must also be ensured that the waste component in the waste water is able to be treated in the WWT plant, and that concentrations do not exceed allowable levels. If wastewater is released directly to the environment, it must meet all relevant environmental regulations, and discharges must be monitored to ensure contaminant levels remain within those limits

REFERENCES

Environment Canada, Departmental Communications, April 2007.

Environment Canada, *What Does Toxic Mean?*
http://www.ec.gc.ca/CEPARegistry/gene_info/cepa_toxic.cfm

Natural Resources Canada, 2003. Wind Power Production Incentive - Environmental Impact Statement Guidelines for Screenings of Inland Wind Farms Under the Canadian Environmental Assessment Act.

Ontario Ministry of the Environment, *Notice of Proposal For Policy, Proposed Revisions to Odour-based Ambient Air Quality Criteria and Development of an Odour Policy Framework*, Queen's Printer for Ontario, 2005

Summit Environmental Consultants Ltd. and Dillon Consulting Ltd., March, 2007. Biofuel Plant Environmental Assessment Guidelines. Prepared for Agriculture and Agri-Food Canada. Reference # 3000297469

Appendix B: Examples of Environmental Effects and Related Tables

The following description has been developed based on a report prepared by Summit Environmental Consultants Ltd. and Dillon Consultants Ltd., 2007. This description presents "textbook" information about the process used in ethanol plants, but several other variants to this process may be in industrial use. The description also presents related environmental issues. Following this description, Tables 3 to 15 present the typical mitigation measures and related potential residual effects associated with ethanol facilities. These tables are provided as references and are not exhaustive or applicable in all cases. Issues, impacts and mitigation will change depending on the environment in which the project is placed. Detailed descriptions of effects and mitigation measures associated with each environmental component must be included in EA Reports and should precede any tables, such that reviewers and the public clearly understand how mitigation measures will be designed to reduce or eliminate potential effects of the project.

Proponents must be prepared to fund and implement any mitigation measures they identify in their EA reports as these mitigation measures will likely become conditions of funding.

A. Example of Project Components and related Effects Associated with an Ethanol Plant

Construction Activities
Construction of an ethanol facility carries many of the same environmental considerations as the construction of any other industrial facility:

1. *Site access road construction*
2. *Site clearing*
3. *Excavation for foundations*
4. *Trenching or directional drilling for utilities installation*
5. *Concrete pouring*
6. *Superstructure construction*
7. *Yard paving (if necessary)*
8. *Clean-up and landscaping*

The major potential impact from construction is spillage of hydrocarbons or other industrial fluids from on-site fuelling/fuel storage locations, equipment, and vehicles. A secondary potential impact, although one that is also significant is the movement of sediment and its associated constituents from cleared or excavated areas into water bodies. This can be from rain or snow runoff, excavation dewatering or frac-outs during directional drilling, and can be exacerbated by compaction and the associated decrease in infiltration caused by heavy equipment traffic. There is also the potential for drilling fluids from directional drilling to directly enter groundwater aquifers during the drilling

process. Finally, there are transient noise, dust, and traffic problems associated with construction. These may be a nuisance to neighbours or wildlife, but are temporary and not expected to have any lasting impacts. Possible mitigation measures to address the above issues are presented in Tables 3 through 15 of this section.

Ethanol Production

Process inputs and outputs discussed in the following sections are based on common elements of a generic ethanol production process, and as such are approximations only. Other processes may be different and are not presented here.

Feedstock (typically grain) is received in trucks and/or rail cars and is weighed on a scale in the feedstock receiving area and unloaded into storage bins. Hopper-bottom trucks (or rail cars) discharge the feedstock into a pit fitted with a conveyor belt that feeds the feedstock into the storage elevator. The elevators transfer the feedstock to the silos, passing it through a scalper which removes stones and other larger foreign material from the feedstock. Feedstock receiving could create noise in the surrounding area, and also has the potential to result in air emissions including volatile organic compounds from the burning of fuel and particulate matter (dust). Most trucks have diesel engines that would produce nitrogen oxides, sulphur dioxides, particulate matter and a number of other contaminants that impact the quality of the environment.

Bin bottom conveyors transfer the feedstock from the storage area by a bucket elevator, which in turn discharges to a conveyor that transports the grain to a surge bin in the Milling and Mashing Building. The flow is controlled out of the surge bin by a weigh feeder, which moves the grain through a magnetic separator into one of the three hammermills. The magnetic separator catches and removes any iron contamination from the feedstock flow and helps prevent machinery damage. The hammermills grind the feedstock to the required particle size. Milling can produce significant quantities of particulate matter. Each hammermill should be fitted with its own baghouse or cyclone to control dust and particulate matter release into the atmosphere.

The milled grain (called meal) is conveyed to the mash mingler where it is mixed with process water containing recycled stillage and the enzyme alpha-amylase is added to begin converting starches into sugars and lower viscosity. From there, it is discharged into the mash mix tank, which provides surge capacity in the cooking system, and allows for pre-liquefaction of the starch. When necessary, ammonia is added to control pH. Mash from the mix tank is then pumped to the jet cooker, where the temperature of the mixture is raised to between 120 ^{o} C and 150 ^{o} C by steam injection, in order to gelatinize the starches and sterilize the mixture prior to fermentation. Note the fuel used to generate the steam will typically produce emissions and wastes (e.g. CO_2, ash).

Mash leaving the cooker enters the liquefaction tank and is cooled by flashing in the upper section of the vessel. The flash vapour is recovered as a source of energy for stillage evaporation. In the liquefaction tank, more starch (gluco-amylase) is added to the mash to complete the conversion into fermentable sugar (dextrose). pH is controlled during this stage using anhydrous ammonia. After liquefaction, backset (recycled stillage) is added to the mash to lower the pH. If the pH of the backset is not low enough, it may be adjusted by mixing it with sulphuric acid. The mash is pumped from the base of

the liquefaction tank through mash coolers, which cool the mixture to approximately 32^{o} C prior to fermentation. The mash coolers are in turn cooled by water, which is cooled in a cooling tower and recycled for further use in the mash coolers. The cooling tower works by passing dry, cool air past a stream of the cooling water from the mash coolers. This evaporates a small amount of the water, cooling it and raising the humidity of the air flow, which is then discharged to the atmosphere.

Cooling towers lose a significant amount of water to evaporation, which concentrates minerals and chemicals in the remaining water. The evaporated water must be replaced on an ongoing basis, and portions of the total cooling water volume must be removed and replaced during operation to prevent over-concentration of solutes, which can lead to scaling and corrosion in the cooling tower systems. This used process water is referred to as blow down water. In addition to high levels of dissolved solids, the cooling water may also contain high levels of other chemicals (the identity of which will vary with the chemistry of the supply water) that are concentrated from low levels in the water supply, as well as industrial agents aimed at prolonging the life of the cooling system. These industrial agents include sulphuric, hydrochloric and phosphoric acids; as well as chlorine bleach and clay. Blow down water is typically evaporated in open ponds due to the large volumes produced. Enzymes used in this process are naturally occurring, and pose no environmental risk, particularly in the small quantities required. The use of ammonia could result in the venting of some ammonia to the atmosphere, or spillage from storage facilities. Because ammonia is naturally occurring, and can be consumed by many microorganisms (including the yeast used in fermentation) it has a short half life, lasting about a day in soil, and less than a week in the atmosphere. Regardless of these half lives, containment is still required.

Cooked mash and yeast slurry are pumped into the fermentation vessel, which has an independent cooler, agitator, and a duct for CO_2 removal. In this process, yeast converts dextrose into ethanol, releasing CO_2 in the process. Circulating mash through individual fermenter coolers controls the fermenter temperature and maximizes the efficiency of the yeast. The fermentation cycle typically takes 40 to 50 hours to complete, resulting in 'beer' with an alcohol content of between 10 and 15 %. The fermented mash is then pumped to a distillation feed tank or beer well, which delivers beer to the distillation system.

Beer is pumped continuously from the beer well to the top of the distillation column, while being heated with steam. Because ethanol has a lower boiling point than the water in the beer, it travels up the column as a vapour, while the stillage flows down and out of the column. The vaporized ethanol is approximately 93-95% pure at the top of the column and is pumped through a vaporizer/superheater and volatilized into a molecular sieve system. This molecular sieve system removes all remaining water from the ethanol commonly using zeolite, a natural or synthetic mineral that dehydrates ethanol gas. During the fermentation cycle CO_2 *is generated. The use of a wet scrubber would remove any traces of alcohol in the* CO_2*. After scrubbing the* CO_2 *may be vented, scrubbed out or compressed for utilization by other industries. A small amount of ethanol vapour may be released during distillation, but this may be mitigated by transferring emissions to an ethanol absorption column.*

The pure ethanol recovered from the distillation system is then pumped into storage tanks, where it is denatured by the addition of 5 percent unleaded gasoline. This is done to render the ethanol unfit for human consumption and ensure it does not attract liquor taxes. Prior to shipment a corrosion inhibitor additive is added to reduce the corrosive properties of the fuel. Ethanol is readily soluble in water, and biodegrades rapidly in air or soil. If spilled in surface waters, it would be expected to dilute rapidly to non-toxic levels, and ultimately biodegrade with a half-life of less then one day. However, spills of denatured ethanol or blends will not act like "pure" ethanol. Blended fuels pose a greater risk and challenge because the solubility of ethanol "drags" petroleum contaminants (sp. BTEX fractions) deeper into both the soil profile and the water table more quickly than a pure petroleum fuel spill. Storage and transfer facilities for pure and denatured ethanol require containment.

Once the ethanol is removed by distillation the remaining stillage is used to produce Distillers Dried Grain with Solubles (DDGS), which is useful as cattle feed due to the large amounts of protein, minerals and vitamins within it. Production of DDGS begins with the stillage from the distillation system being pumped into a surge tank. From there it is fed into centrifuges that remove the majority of the water, creating Wet Distillers Grain (WDG). WDG is also useful as feedstock, but spoils quickly due to the high water content. After the stillage is centrifuged, the WDG is then mixed with a syrup produced by partially dehydrating the water removed from the mash during distillation. This syrup contains large amounts of protein and other nutrients that dissolved into the process water during cooking. The DDGS and syrup is then dried to about 10% moisture content, which increases its storage life and therefore makes it easier to ship long distances.

Many advanced plants have the ability to completely reuse wastewater from plant processes, which means that under normal operating conditions, these plants would not discharge any wastewater that has been in contact with corn, mash, cleaning systems or any process water. Alternatively, wastewater may be disposed of in a variety of ways. Wastewater from ethanol/DDGS production has high Biological Oxygen Demand (BOD), and typically cannot be discharged to surface waters without treatment, although because it primarily contains organic material its toxicity to the environment is very low. Applicable on-site treatments include anaerobic digestion or septic fields. Alternatively, ethanol/DDGS wastewater may also be sent to a municipal wastewater treatment facility (WWT). Blow down and cooling water, which often has high concentrations of dissolved solids and a variety of chemicals in it, is typically not recovered, but rather, evaporated in open ponds on the plant property. DDGS is a good food source for livestock operations and is typically marketed. However, if there is lack of demand (from feedlots, etc.), resulting in the waste stream becoming more concentrated and containing large amounts of solids, this waste stream would likely not be treatable in a WWT, and may be composted, landfilled or burned to produce heat for production processes.

B. Effects and Mitigation Tables (Examples of Tables to be included in EA Report)

The following tables illustrate possible mitigation measures that could be used to reduce impacts to various environmental components that may exist at facility sites (see Section 5). Notes and definitions for terms used in the tables are included in the Glossary

(Appendix A). The tables and related issues and evaluations are not exhaustive or applicable to all circumstances. Specific effects and mitigation for individual projects will depend on the design of the facility and the characteristics of the environment in which the project is located, and therefore the following mitigation and related analyses may not always apply. However, where the following environmental components are present and proponents choose not to incorporate the mitigation into design, they must identify how impacts/effects will otherwise be reduced/eliminated and provide supporting documentation, analyses and evidence to ensure that significant impacts will not occur. In general, proponents should ensure that all components of their project (see Section 2.5 for project components) are evaluated in association with each relevant environmental characteristic of the site (see Section 4). Although not all project components are included in the following tables, Section 5 of the EA Report should include effects related to all project components including maintenance and decommissioning. Tables presented in the EA report (following appropriate descriptive text) should be similar in format to the following tables.

(Note: In determining the level of residual effects, proponents should refer to the Table included in Section 5.1.3 point C)

Table 3. Potential Effects and Mitigation for Groundwater Protection – Ethanol Production.

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction and Operation - Spills of process or machine fluids, including fuels, hydraulic fluids, ethanol, and anhydrous ammonia. Effects include potential contamination of drinking or irrigation water aquifers and contamination of basements with vapours.	Effects and impacts assuming: Good natural groundwater protection/limited natural groundwater protection*. Nature: Negative Magnitude: Low/Medium* Spatial: Immediate/Local* Timing: Construction and Operation Duration: Intermittent Reversibility: High/Medium* Likelihood: Low/Medium*	• Place/construct impermeable containment pans/pads at loading/transfer points. • Construct secondary containment berms around storage vessels. • Undertake regular inspection of equipment and storage vessels for leaks or wear. • Ensure appropriate spill response plan, training and equipment is available on-site and near transfer and storage points. • Excavate contaminated soil promptly if spills occur, and dispose of it appropriately. • Contain used or contaminated fluids and dispose of them at appropriate disposal facilities.	With mitigation, residual effects are expected to be Low to Medium.

Construction - Utility installation via directional drilling. Fluids used during drilling may enter aquifers regardless of degree of groundwater protection.	Effects are expected to be the same regardless of the degree of groundwater protection. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction Duration: Short Term Reversibility: Medium Likelihood: Medium	• Use water rather than mud as drilling fluid. • Drill during times of low groundwater flow as identified during Groundwater analysis.	With mitigation, residual effects are expected to be Low.
Operation - Ethanol Production - Wastewater disposal. Effects include contamination of drinking or irrigation water aquifers, however most waste constituents readily evaporate or biodegrade.	Effects and impacts with: Good groundwater protection/limited groundwater protection*. Nature: Negative Magnitude: Low/Medium* Spatial: Immediate Timing: Operation Duration: Intermittent Reversibility: High/Medium* Likelihood: Low	• Use appropriate treatment system to render wastewater safe, either for release to surface water, or municipal Waste Water Treatment (WWT) system as applicable. • Verify the adequacy of capacity and capability, and ensure appropriate disposal agreements are in place with the WWT system operator if wastewater is to be disposed of in a municipal WWT system. • Monitor treatment efficacy where on-site treatment is used to ensure waste water meets disposal standards (municipal or surface water quality). • Monitor waste water quality where on-site water treatment is not required to ensure that off-spec water is not entering the municipal WWT system. • Ensure appropriate spill response plan, training and equipment is available on-site and near transfer and storage points.	With mitigation, residual effects are expected to be Low.

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Table 4. Potential Effects and Mitigation for Soils – Ethanol Production.

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction and Operation - Spills of process or machine fluids, including fuels, hydraulic fluids, ethanol, and anhydrous ammonia. Potential effects include contamination of soils.	Effects and impacts on virgin soil/previously disturbed soil*. Nature: Negative Magnitude: Medium/Low* Spatial: Local/Immediate* Timing: Construction and Operation Duration: Intermittent Reversibility: Medium/High* Likelihood: Medium/Low*	• Place/construct impermeable containment pans/pads at loading/transfer points. • Construct secondary containment berms around storage vessels. • Undertake regular inspection of equipment and storage vessels for leaks or wear. • Ensure appropriate spill response plan, training and equipment is available on-site and near transfer and storage points. • Excavate contaminated soil promptly if spills occur, and dispose of it appropriately. • Contain used or contaminated fluids and dispose of them at appropriate disposal facilities.	With mitigation, residual effects are expected to be Minimal to Low.
Construction - Excavation and vegetation clearing. Potential effects include soil erosion and compaction.	Effects and impacts on virgin soil/previously disturbed soil*. Nature: Negative Magnitude: Medium/Low* Spatial: Local Timing: Construction Duration: Short Term Reversibility: Low/Medium* Likelihood: Medium	• Avoid working in excessively wet or muddy conditions. • Use appropriate erosion control measures including silt fences, hay bales, and geotextiles. • Work in dry season or winter if possible to minimize compaction and rutting. • Use low-impact equipment if operating in sensitive areas.	With mitigation, residual effects are expected to be Minimal to Medium.

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Table 5. Potential Effects and Mitigation for Native Vegetation – Ethanol Production.

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction - Excavation and vegetation clearing. Effects include "footprint" losses of native vegetation (including rare & endangered plants), vegetation disturbance in temporary construction or staging areas, and spread of invasive weeds by construction vehicles.	Effects and impacts only exist if native vegetation is present. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction Duration: Short Term Reversibility: Medium Likelihood: High	• Use existing trails or roads where possible. • Minimize disturbance within development area(s). • Promptly seed disturbed areas with native seed mix (certified weed free) to prevent invasive species from becoming established. • Use low-impact equipment when operating in sensitive areas. • Identify areas containing noxious weeds and avoid cross-contamination with disturbed areas (consultation with weed specialist may be necessary). • Clean equipment as it enters the site, and at regular intervals thereafter to prevent the spread of noxious weeds. • Identify and avoid areas supporting Species at Risk Act (SARA) or provincially regulated species.	With mitigation, residual effects are expected to be Low.

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Table 6. Potential Effects and Mitigation for Surface Water Quality and Aquatic Habitat – Ethanol Production.

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction and Operation - Spills of process or machine fluids, including fuels, hydraulic fluids, ethanol and anhydrous ammonia. Effects include contamination of water bodies and/or destruction of aquatic habitats.	Effects and impacts only exist if surface waters are present near the site. Nature: Negative Magnitude: Medium Spatial: Regional Timing: Construction and Operation Duration: Intermittent Reversibility: Low Likelihood: Medium	• Place/construct impermeable pans/pads at loading/transfer points. • Construct secondary containment berms around storage vessels. • Undertake regular inspection of equipment and storage vessels for leaks or wear. • Ensure appropriate spill response plan, training and equipment is available on-site and near transfer and storage points. • Excavate contaminated soil promptly if spills occur, and dispose of it appropriately. • Contain used or contaminated fluids and dispose of them at appropriate disposal facilities.	With mitigation, residual effects are expected to be Low.
Construction - Excavation, vegetation clearing and dewatering of excavations. Potential effects include contamination of water bodies with sediment from excavation dewatering, and contamination with surface runoff due to ground disturbance and/or defoliation.	Effects and impacts only exist if surface waters are present near the site. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction Duration: Short Term Reversibility: High Likelihood: High	• Use existing trails or roads where possible. • Keep disturbance within development area(s). • When working in areas with native vegetation, seed disturbed areas with native seed mixture (certified weed-free). • Seed other disturbed areas with fast-growing seed mix (certified weed-free) to minimize erosion in disturbed areas. • Ensure dewatering water flows into well-vegetated area or settling basin. • Use appropriate erosion control measures including silt fences, hay bales, geotextiles and temporary settling ponds.	With mitigation, residual effects are expected to be Minimal.
Construction - Utility installation via directional drilling. Effects include drilling fluids entering water bodies via a fracture in the drill bore (frac-out).	Effects and impacts only exist if surface waters are present near the site. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction Duration: Short Term Reversibility: Medium Likelihood: Medium	• Use water rather than mud as drilling fluid. • Drill during times of low groundwater flow as identified during Groundwater analysis. • Use appropriate monitoring and shut-down procedures in case of frac-out. • Ensure availability of clean-up and containment equipment.	With mitigation, residual effects are expected to be Low.

Operation - Ethanol Production - Wastewater disposal. Effects include contamination of water bodies and discharge of heated effluent (e.g., cooling water), impacting fish.	Effects and impacts only exist if surface waters are present near the site. Nature: Negative Magnitude: Medium Spatial: Immediate Timing: Operation Duration: Intermittent Reversibility: Medium Likelihood: Low Cum. Effects: Minimal	• Use appropriate treatment system to render wastewater safe (e.g. non-deleterious to fish) for release to surface water at the point of discharge, or to municipal WWT system as applicable. • Verify the adequacy of capacity and capability, and ensure appropriate disposal agreements are in place with the WWT system operator if wastewater is to be disposed of in a municipal WWT system. • Monitor treatment efficacy where on-site treatment is used to ensure waste water meets disposal standards (municipal or federal and provincial surface water quality, as appropriate). • Monitor waste water quality where on-site water treatment is not required to ensure that off-spec water is not entering the municipal WWT system. • Ensure appropriate spill response plan, training and equipment is available on-site and near transfer and storage points.	With mitigation, residual effects are expected to be Low.
Construction and Operation - Construction, modification and use of water crossings. Effects include damage to fish habitat or spawning grounds.	Effects and impacts only exist if surface waters are present. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction and Operation Duration: Intermittent Reversibility: High Likelihood: Low	• Work only during acceptable work windows for the species present in the water body. • Avoid instream work whenever possible. • Use appropriate erosion control measures including silt fences, hay bales, and geotextiles. • Grade approach roads so as to limit runoff to water body. • Do not use structures which may present a barrier to fish passage.	With mitigation, residual effects are expected to be Low.

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Table 7. Potential Effects and Mitigation for Wildlife and Habitat – Ethanol Production.

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction - Excavation, vegetation clearing and dewatering. Effects include destruction or fragmentation of habitat, and noise impacts.	Effects and impacts only exist if wildlife or wildlife habitat is present. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction Duration: Short Term Reversibility: Medium Likelihood: Medium	• Use existing trails or roads where possible. • Keep disturbance within development area(s). • Limit activity during breeding windows as identified in Wildlife analysis.	With mitigation, residual effects are expected to be Low.
Construction - Construction or modification of linear features (e.g. roads, rail lines, fences). Effects include destruction or fragmentation of habitat, and noise impacts.	Effects and impacts only exist if wildlife or wildlife habitat is present. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction and Operation Duration: Continuous Reversibility: Medium Likelihood: Medium	• Use existing trails or roads where possible. • Limit the length of fences/size of fenced area(s). • Avoid known migration corridors and other high-use areas as identified in Wildlife analysis. • Recreate habitat in accessible areas.	With mitigation, residual effects are expected to be Medium.

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Table 8. Potential Effects and Mitigation for Air Quality – Ethanol Production.

(In addition to the effects and mitigation outlined in the table, note that Environment Canada has a list of regulated Criteria Air Contaminants that should be used as a guide in the assessment of potential effects to air quality; See Appendix C of this document. Further, a number of additional issues should be added to this table when preparing an EA report: Where ammonia is used in the process, any resultant particulate matter should be considered in this assessment. The emissions from fossil-fuel-fired boilers should be evaluated and mitigation identified. Where water vapour plumes result from cooling towers, the potential to cause visibility restrictions, condensation and freezing and related problems for air and road traffic should be evaluated.)

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction and Operation - Effects include fugitive dust from construction, dust and particulates from ethanol production.	Effects and impacts with: Good air quality/Existing airborne pollutants*. Nature: Negative Magnitude: Medium/Low* Spatial: Local Timing: Construction and Operation Duration: Intermittent Reversibility: High Likelihood: Low	• Use dust mitigation techniques where possible (e.g. water spray). • Design production systems with dust collection equipment (e.g. baghouse, cyclone).	With mitigation, residual effects are expected to be Low to Medium.
Operation - Ethanol Production – Fermentation, distillation and distiller's dried grain production. Effects include reduced air quality due to the potential release of, VOCs and odours into the atmosphere. Long-term effects from releases of CO_2	Effects and impacts with: Good air quality/Existing airborne pollutants*. Nature: Negative Magnitude: Medium Spatial: Regional/Local* Timing: Operation Duration: Continuous Reversibility: Medium/High* Likelihood: High	• Tie vents to low-irrigation, high-efficiency scrubber(s) to reduce CO_2 and/or VOC emissions. • Use high draft, low temperature dryer to reduce VOC emissions and odours.	With mitigation, residual effects are expected to be Low to Medium.
Operation - Ethanol Production - Shipping and Receiving of Raw	Effects and impacts with: Good air quality/Existing airborne pollutants*.	• Ensure transport vehicles are well maintained and have working emissions control equipment. • Use dust control measures on unpaved roadways and parking	With mitigation, residual effects are expected

Materials and Final Products. Effects include increased greenhouse gas emissions from the burning of fossil fuels for transportation purposes and increased particulate matter released into the atmosphere due to increased traffic.	Nature: Negative Magnitude: Medium Spatial: Regional/Local* Timing: Operation Duration: Continuous Reversibility: Medium/High* Likelihood: High	areas.	to be Low to Medium.

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Table 9. Potential Effects and Mitigation for Socio-Economic Effects – Ethanol Production.

(Note: AAFC recommends the inclusion of both indirect and direct effects to socio-economic conditions within the EA report)

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction, Operation and Decommissioning of Plant. Effects include an increase in the number of jobs for the local population.	Effects and impacts with: Low levels of existing industrialization/High levels of existing industrialization *. Nature: Positive Magnitude: Medium Spatial: Local Timing: Construction, Operation and Decommissioning Duration: Continuous Reversibility: Low Likelihood: High	None required.	Residual effects are expected to be Minimal to Medium, depending on size of community and facility.
Operation - Feedstock delivery, increased site usage. Effects include increased traffic and noise.	Effects and impacts with: Low levels of existing industrialization/High levels of existing industrialization *. Nature: Negative Magnitude: Medium/Low * Spatial: Immediate Timing: Operation Duration: Continuous Reversibility: High Likelihood: Medium/Low*	• Limit deliveries to avoid evenings, nights and weekends. • Stagger shifts to minimize traffic and parking concerns. • Face site entrance/exit away from populated areas.	With mitigation, residual effects are expected to be Minimal to Low.
Operation - Ethanol Production. Effects include fumes and odours, as well as hammermill noise.	Effects and impacts with: Low levels of existing industrialization/High levels of existing industrialization *. Nature: Negative Magnitude: Medium Spatial: Local Timing: Operation Duration: Continuous Reversibility: Low Likelihood: High	• Implement odour controls. • Use sound insulation where possible. • Prepare noise impact study and meet government maximum sound levels.	With mitigation, residual effects are expected to be Low to Medium.

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Table 10. Potential Effects and Mitigation for Land Use – Ethanol Production.

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction and Operation - Effects include increased vehicular traffic during construction and operation.	Effects and impacts with: Existing or planned land use adjacent to facility/No existing or planned land use adjacent to facility*. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction or Operation Duration: Intermittent Reversibility: High/Medium* Likelihood: Medium	• Plan and design construction entrance to ensure traffic has the least impact on surrounding land uses. • Schedule construction traffic to avoid interfering with other activities or uses in the area.	With mitigation, residual effects are expected to be Low to Medium.
Operation - Impacts include the potential for decreasing the value of adjacent properties.	Effects and impacts with: Existing or planned land use adjacent to facility/No existing or planned land use adjacent to facility*. Nature: Negative Magnitude: Low/Medium* Spatial: Local Timing: Operation Duration: Continuous Reversibility: High/Medium* Likelihood: Low/Medium*	• Consult with adjacent property owners prior to project initiation. • Conduct independent assessment of the potential impact of development on property values. • Choose site that is compatible with adjacent and nearby land uses.	With mitigation, residual effects are expected to be Low to Medium.

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Table 11. Potential Effects and Mitigation for Cultural, Heritage and Archaeological sites – Ethanol Production.

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction - Excavation and vegetation clearing. Impacts include the potential for loss of heritage or archaeological resources on site.	Effects and impacts only exist if heritage resources exist on site. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction Duration: Short Term Reversibility: Medium Likelihood: Medium	• Consult with the appropriate authorities to ensure no existing cultural, heritage or archaeological resources exist on the site, or to determine the quality and quantity of resources if they do exist. • Plan construction to avoid disruption of resources if possible.	With mitigation, residual effects are expected to be Low to Medium depending on the quality and quantity of resources found.

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Table 12. Potential Effects and Mitigation for Recreation Areas – Ethanol Production.

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction and Operation - Excavation and vegetation clearing. Impacts include the potential for loss of recreation areas on site.	Effects and impacts only exist if recreation areas exist on site. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction and Operation Duration: Continuous Reversibility: Medium Likelihood: Medium	• Consult with community to evaluate perceived recreation value of the site. • Create alternative recreation area off-site. • Avoid recreation areas if possible.	With mitigation, residual effects are expected to be Medium.

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Table 13. Potential Effects and Mitigation for Land Resources used for Traditional Purposes by Aboriginal Persons – Ethanol Production.

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction and Operation - Excavation and vegetation clearing, occupation of the site. Impacts include the potential for loss of Aboriginal land resources on site and wildlife resources in immediate area.	Effects and impacts only exist if First Nations uses occur on site. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction and Operation Duration: Continuous Reversibility: Medium Likelihood: Medium	• Consult with the appropriate authorities and First Nations to ensure no existing heritage or archaeological resources on site and to determine any traditional uses that may be affected. • Contact AAFC such that adequate consultation with First Nations can be undertaken. • Relocate or design such that impacts to traditional resources are minimized.	With mitigation, residual effects are expected to be Medium, depending on the location.

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Table 14. Potential Effects and Mitigation for Safety Issues – Ethanol Production.

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction and Operation - Impacts include potential safety issues during construction or operation of the facility.	Effects and impacts only exist if safety issues exist on site. Nature: Negative Magnitude: Medium Spatial: Local Timing: Construction and Operation Duration: Continuous Reversibility: Medium Likelihood: Low	• Ensure work conforms to government safety standards. • Limit access to the site with fencing. • Post signs explaining any hazards that might be present.	With mitigation, residual effects are expected to be Low to Medium depending on surrounding land use.

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Table 15. Potential Effects and Mitigation for Visual Landscape – Ethanol Production.

Potential Effects	Characteristics and Magnitude (without mitigation)	Mitigation	Residual Effects
Construction and Operation - Impacts include the loss of visual landscape due to the construction and operation of facility.	Effects and impacts with: A pristine visual landscape/Previously disturbed visual landscape*. Nature: Negative Magnitude: Medium/Low* Spatial: Local Timing: Construction and Operation Duration: Continuous Reversibility: Low/High* Likelihood: Medium/Low*	• Design and site the facility as to minimize the loss of visual landscape. • Perform a visual impact assessment to quantify and minimize the visual impact of facility.	With mitigation, residual effects are expected to be Medium.

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Appendix C:

Environment Canada has provided the following table and has indicated that, at a minimum the following pollutants should be evaluated in the EA Report in terms of air quality.

Table 16. Environmental and Health Concerns Related to Pollutant Categories

Pollutant Category	Environmental and Health Concerns
Criteria Air Contaminants (CACs) • Particulate matter total, less than 10 and 2.5 microns (PM_T, PM_{10}, $PM_{2.5}$) • Volatile organic compounds (VOCs) • Oxides of nitrogen (NOx) • Sulphur dioxide (SO_2) • Ammonia (NH_3)	CACs contribute to formation of ground-level ozone formation. Ozone and particulate matter are two key components of smog, which can have significant negative impacts on human health and on the natural environment.[1]
Greenhouse Gases (GHG) • Carbon dioxide (CO_2) • Methane (CH_4) • Nitrous oxide (N_2O) • Hydrofluorocarbons, Perfluorocarbons, Sulphur hexafluoride (HFCs, PFCs, SF_6)	Greenhouse gas emissions from human activities enhance the Earth's natural greenhouse effect, thereby contributing to global climate change.
Hazardous Air Pollutants, CEPA 1999 Toxic Substances[2], Heavy Metals (e.g., mercury, lead, etc.)	HAPs, CEPA 1999 "toxic" substances, and heavy metals can have an immediate or long term harmful effect on the environment and human health.[3]
Odours	Odour is one of the most common observable effects for air pollution and is most often comprised of a mixture of contaminants.[4] Odour can be a major nuisance for local communities.

Source: Environment Canada. http://www.ec.gc.ca/. Ontario MOE: http://www.ene.gov.on.ca/

[1] Environment Canada, Air Quality, What is the issue.
Available at http://www.environmentandresources.gc.ca/default.asp?lang=En&n=411122F2-1
[2] Toxic as defined under the Canadian Environmental Protection Act 1999.
[3] Environment Canada, *What Does Toxic Mean?*
http://www.ec.gc.ca/CEPARegistry/gene_info/cepa_toxic.cfm
[4] Ontario Ministry of the Environment, *Notice of Proposal For Policy, Proposed Revisions to Odour-based Ambient Air Quality Criteria and Development of an Odour Policy Framework*, Queen's Printer for Ontario, 2005

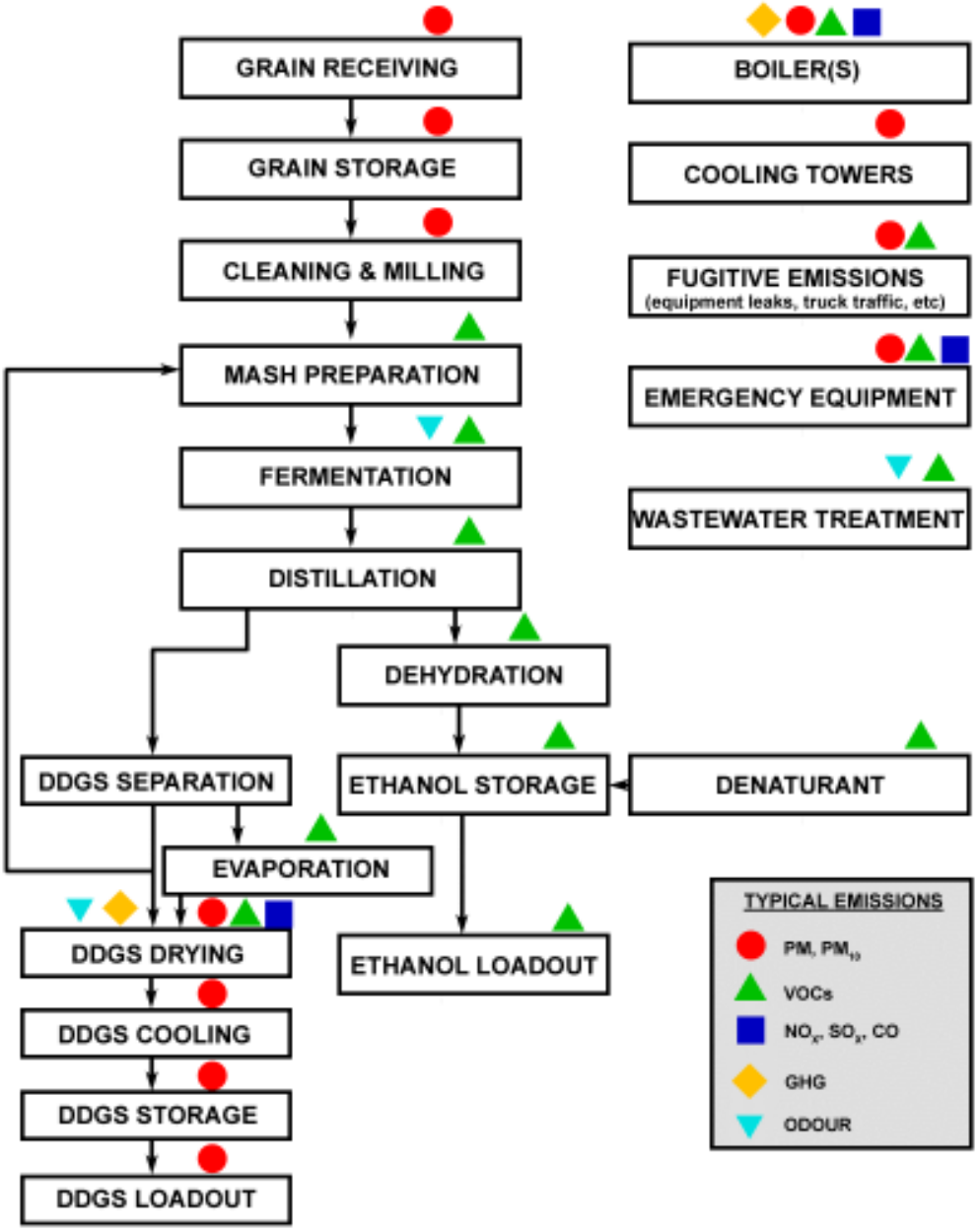

Figure 1. Process Flow Diagram for Typical Air Emissions of Ethanol Facilities (as provided by Environment Canada, Departmental Communications, April 4, 2007).