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Agricultural Impact Assessment (AIA) Guidance Document

Ontario Ministry of Agriculture, Food and Agribusiness

Ontario

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Front Cover: aerial photo of a southern Ontario landscape illustrating the urban and rural interface, with subdivision development directly abutting active and expansive agricultural lands.

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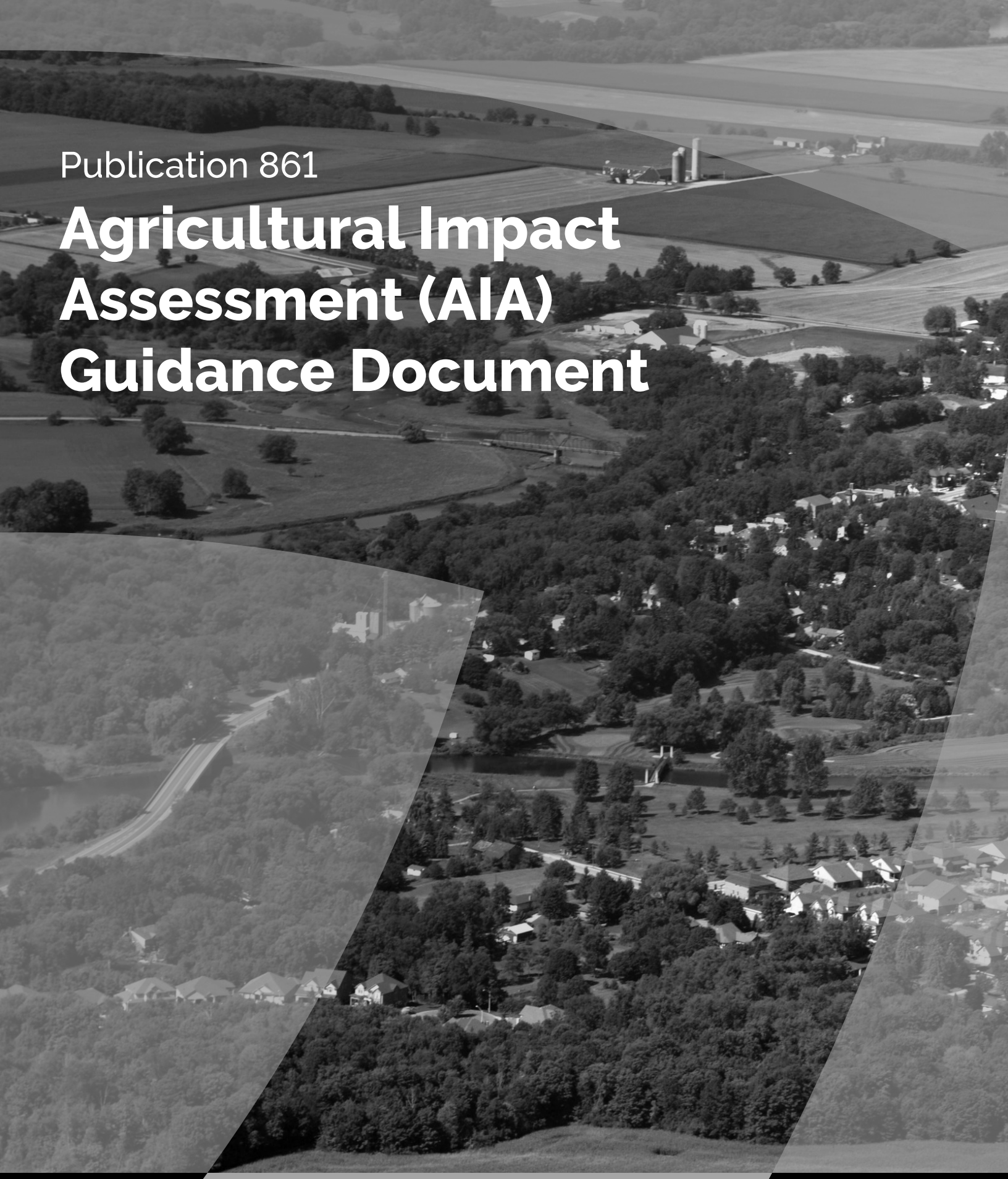

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Food and Agribusiness

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Acronyms

AAFC – Agriculture and Agri-Food Canada

AIA – Agricultural Impact Assessment

ARA – Aggregate Resources Act

EA – Environmental Assessment

GGH – Greater Golden Horseshoe

MDS – Minimum Distance Separation

MECP – Ontario Ministry of the Environment, Conservation and Parks

MMAH – Ontario Ministry of Municipal Affairs and Housing

MNR – Ontario Ministry of Natural Resources

MEM – Ministry of Energy and Mines

MTO – Ontario Ministry of Transportation

NEP – Niagara Escarpment Plan

OEB – Ontario Energy Board

OGS – Ontario Geological Survey

OMAFA – Ontario Ministry of Agriculture, Food and Agribusiness

ORMCP – Oak Ridges Moraine Conservation Plan

OSSGA – Ontario Stone, Sand and Gravel Association

PPS – Provincial Planning Statement

TOARC – The Ontario Aggregate Resources Corporation

1 Introduction

1.1 What is an Agricultural Impact Assessment?

An *Agricultural Impact Assessment*[1] (AIA) is a study that identifies and evaluates the potential impacts of non-agricultural development on the *agricultural system* and recommends ways to **avoid**, or where avoidance is not possible, **minimize** and **mitigate** adverse impacts (see S. 3.4, Table 2). AIAs are a tool to inform where and how proposed *development* may proceed in a manner that supports the success of Ontario's agri-food sector.

> ***Agricultural Impact Assessment***
> Means the evaluation of potential impacts of non-agricultural uses on the *agricultural system.* An assessment recommends ways to avoid or if avoidance is not possible, minimize and mitigate adverse impacts.
>
> Provincial Planning Statement

AIAs help decision-makers understand what potential impacts are expected from a proposed *development.* In turn, AIAs can:

- Minimize the amount of agricultural land taken out of production;
- Promote compatibility between agricultural and non-agricultural uses;
- Support the long-term viability of the agri-food sector by considering agricultural impacts; and
- Result in actionable measures that can be carried forward into the design and implementation stages of project development.

1.2 Purpose and Scope of this Guidance Document

This guidance document aims to provide AIA requesters and reviewers (e.g., municipalities), professionals completing AIAs, *development* or *infrastructure* proponents, landowners, and others with clarity on the process for undertaking an AIA. At its foundation are best practices that can be tailored to different types of *development* and *infrastructure* applications to satisfy provincial and municipal policies, standards and outcomes.

This document includes:

- a definition and description of an AIA, rationale for completing AIAs, land use planning and regulatory context and roles and responsibilities (Section 1);
- an outline of AIA content to achieve a consistent standard (Section 2);
- a suite of measures that can be used to avoid, minimize, and mitigate impacts to the *agricultural system*[2] (Section 3);

[1] Italicized terms, other than the titles of legislation and other documents, refer to land use planning terms that are defined in the *Provincial Planning Statement* (PPS) and/or the provincial plans. In most cases, definitions are consistent across provincial documents. If there are exceptions, please refer to the definition in the applicable provincial plan.

[2] See section 1.3 for the *agricultural system* definition.

- a checklist of AIA study components (Appendix A);
- a list of resources for completing AIAs (Appendix B);
- a case study illustrating AIA analysis (Appendix C);
- an explanation of how to rehabilitate land to an *agricultural condition* (Appendix D);
- an overview of edge planning (Appendix E).

To complete an AIA, direction should be taken from this guidance document as well as all applicable legislation, policies, regulations, and standards.

There may be requirements outside of Ontario's land use planning system (e.g., *Environmental Assessment Act, Aggregate Resources Act*, etc.) and processes such as procurements or other circumstances where an AIA is requested. This guidance can be adapted to support these scenarios.

AIA requirements may be met through other analyses such as Environmental Assessments for *infrastructure* projects such as water and wastewater treatment systems and transportation systems, or the Ontario Energy Board's Environmental Guidelines for the Location, Construction and Operation of Hydrocarbon Pipelines and Facilities in Ontario for oil and gas pipelines.

In this document, "provincial plans" refers to the land use plans issued by the Province for specific geographic areas in Ontario, including:

- Greenbelt Plan (GBP)
- Oak Ridges Moraine Conservation Plan (ORMCP)
- Niagara Escarpment Plan (NEP)

Where information pertains to specific types of non-agricultural uses, it is contained in a colour-coded text box. Uncoloured text boxes are used to highlight key information that may help in the preparation or review of AIA.

Applies to *Settlement Area* Boundary Expansions

Applies to *Mineral Aggregate Operations*

Applies to *Infrastructure*

Applies to other non-agricultural uses

Highlights key information

1.3 AIAs and the Agricultural System

The *agricultural system* is an economic cornerstone to the province's prosperity. Healthy and productive farmland is the foundation for agriculture and is essential to grow the crops and raise the livestock that maintain the province's supply of food, fuel, and fibre. To keep our agri-food sector and supply chain strong, we must balance the needs for community development with the protection of farmland. Planning authorities are encouraged to support local food and foster a robust *agri-food network* to realize the economic, environmental, and social benefits potential that farmland provides.

AIA and *agricultural system* policies were introduced in 2017 first through the provincial plans, followed by the Provincial Policy Statement, to support farmland protection, minimize land fragmentation, and achieve compatibility between agricultural and non-agricultural uses, all vital to the long-term viability and prosperity of the *agricultural system*. An *agricultural system* approach was implemented to recognize the importance of protecting a continuous agricultural land base across municipal boundaries.

Agricultural system policies in the Provincial Planning Statement (PPS) and provincial plans ensure a complete *agri-food network* to enable the sector to thrive and grow.

The PPS requires planning authorities to use an *agricultural system* approach province-wide to support and foster a thriving agri-food sector.

> ***Agricultural System***
>
> Means a system comprised of a group of inter-connected elements that collectively create a viable, thriving agri-food sector. It has two components:
>
> a) An agricultural land base comprised of *prime agricultural areas*, including *specialty crop areas*. It may also include *rural lands* that help to create a continuous productive land base for agriculture; and
>
> b) An *agri-food network* which includes agricultural operations, *infrastructure,* services, and assets important to the viability of the agri-food sector.
>
> *Prime Agricultural Areas*
>
> Means areas where prime agricultural lands predominate. This includes areas of prime agricultural lands and associated Canada Land Inventory Class 4 through 7 lands, and additional areas with a local concentration of farms which exhibit characteristics of ongoing agriculture. Prime agricultural areas may be identified by a planning authority based on provincial guidance or informed by mapping obtained from the Ontario Ministry of Agriculture, Food and Agribusiness and the Ontario Ministry of Rural Affairs or any successor to those ministries.
>
> Provincial Planning Statement

When implementing an *agricultural system* approach, an AIA considers impacts to the agri-food sector as a whole rather than strictly focusing on the impact to the land base (*prime agricultural areas*). In-effect mapping of *prime agricultural areas* is needed to support AIA work. *Rural lands* that help to create a continuous productive land base for agriculture may also be identified and included in agricultural land base mapping. *Prime agricultural areas* may be identified by a planning authority based on provincial guidance or informed by mapping obtained from OMAFA. *Agri-food network* mapping can be based on OMAFA's Agricultural Systems Portal plus local data and knowledge from business directories, advice from agricultural advisory committees, etc.

Mapping of the *agri-food network* can be used to visualize the agri-food supply chain, evaluate alternative locations where applicable, and identify potential impacts to the *agricultural system.* OMAFA's agricultural system webpage provides easy access to mapping and land use planning and economic development tools to implement the *agricultural system*. OMAFA's Implementation Procedures for the Agricultural System is an additional guidance resource to understand the key components of the *agricultural system.*

Municipalities should look for opportunities to support and enhance the *agricultural system* through agri-food strategies, business attraction and retention, consideration of the *infrastructure* needs of the sector, and when implementing local food or community improvement programs, for example. Options are presented in the Implementation Procedures for the Agricultural System and through the Ministry of Rural Affairs Agricultural Economic Development program.

1.4 When is an AIA Required?

The need for an AIA depends on applicable legislation, regulations, policies and standards at provincial and municipal levels. Provincial policies are contained in the PPS and provincial plans. The PPS and provincial plans are to be read in their entirety and all relevant policies are to be applied to each situation. The *Planning Act, The Aggregate Resources Act, Environmental Assessment Act* and *Ontario Energy Board Act* also set expectations regarding the consideration of impacts to agriculture.

1.4.1 Provincial Policies, Plans and Legislations

1.4.1.1 *Planning Act*

The *Planning Act* is provincial legislation that sets the ground rules for land use planning in Ontario and describes how land uses may be controlled. Requirements under the *Planning Act* must be met where they apply. The PPS is issued under the *Planning Act* to guide municipal planning. The protection of agricultural resources is identified as a 'matter of provincial interest' under section 2 (b) of the *Planning Act.*

1.4.1.1.1 Provincial Planning Statement

The PPS generally applies province-wide and provides overall policy direction on matters of provincial interest related to municipal land use planning and *development*. The PPS requires province-wide adoption of the *agricultural system* approach as well as completion of AIAs for proposed non-agricultural uses in *prime agricultural areas*. These non-agricultural use proposals include *settlement area* boundary expansions, new or expanding mineral aggregate operations and other non-agricultural uses (e.g., golf courses, institutional uses).

The PPS requires alternative locations to be evaluated and impacts on agricultural operations to be mitigated to the extent feasible for proposed *settlement area* expansions and other proposed non-agricultural uses in *prime agricultural areas.* Section 2.2.1 below further discusses how to evaluate alternative locations.

Extraction of *mineral aggregate resources* is considered an interim use and rehabilitation to accommodate subsequent land uses is required by the PPS. Within *prime agricultural areas,* on *prime agricultural land,* PPS policy requires sites to be rehabilitated back to an *agricultural condition,* with certain exceptions.

1.4.1.1.2 Provincial Plans

The province issues legislation and provincial plans to guide growth and protect the environment. The Greenbelt Plan and ORMCP are provincial plans issued under their enabling legislation and implemented primarily by municipalities and MMAH through *Planning Act* processes. The NEP is issued under the *Niagara Escarpment Planning and Development Act* and is implemented primarily by the Niagara Escarpment Commission.

Each provincial plan outlines, either directly or through policies from other documents incorporated by reference, when AIAs are required for proposed non-agricultural uses in *prime agricultural areas* and when AIAs are not required. To understand these policies, please refer to the relevant provincial plans, legislation, or processes (e.g., government-led energy procurements).

On *rural lands*, the Greenbelt Plan also includes policies that recommend an AIA be considered for proposed non-agricultural uses, except for *mineral aggregate operations*. While an AIA is not required, it could help to meet policy outcomes.

1.4.1.2 *Aggregate Resources Act* (ARA)

The Ministry of Natural Resources (MNR) regulates the operations of pits and quarries under the *Aggregate Resources Act*. This includes activities such as issuing licences, permits and changes to existing approvals; inspecting aggregate operations and responding to complaints; enforcing compliance; and ensuring rehabilitation is carried out.

Most of Ontario's *mineral aggregate operations* are regulated primarily under the ARA and its associated regulation, standards and policies. The ARA requires that possible effects on agricultural resources be considered when determining whether a license should be issued. The PPS and provincial plans require AIAs be submitted in support of applications for new or expanding *mineral aggregate operations* in *prime agricultural areas*. Where an AIA is not triggered (e.g., new or expanding aggregate operation proposed on *rural lands*), applicants can use this AIA Guidance Document as a resource to help address other PPS policies (e.g., mitigation of impacts, promotion of land use compatibility, rehabilitation to an *agricultural condition*).

1.4.1.3 *Environmental Assessment Act* (EA Act) and *Ontario Energy Board Act*

Many types of *infrastructure* projects are subject to the EA Act and its associated regulations as well as Class EA documents. Since "environment" is defined broadly in the EA Act and includes the natural, social, economic, cultural and built environments, it is possible for impacts to agriculture to be assessed through an EA where the analysis is equivalent to an AIA. More information can be found on the Ontario government's EA webpage.

In addition, the Greenbelt Plan, ORMCP and NEP require an AIA or equivalent analysis as part of an EA as a policy requirement for proposed *infrastructure* in *prime agricultural areas*.

Hydrocarbon pipelines and facilities are regulated by the *Ontario Energy Board Act* and are subject to Ontario Energy Board guidelines on location, operation and construction. The act requires consideration of the public interest including impacts to agriculture. The public and stakeholders are engaged through a process similar to the EA process that involves identification of the study area, alternatives, impact identification and mitigation. Agricultural issues can be satisfied through an AIA-type analysis. Pipelines that cross provincial boundaries or the Canada-U.S. border are regulated federally by the Canada Energy Regulator using a process under the *Canadian Environmental Assessment Act*. This AIA guidance can be a reference in that process.

1.4.2 Agricultural, Agriculture-Related and On-Farm Diversified Uses

For land use planning matters under the *Planning Act*, an AIA is not required for proposed *agricultural uses* in *prime agricultural areas*, including associated on-farm buildings and structures. These uses are promoted and protected in *prime agricultural areas*.

Proposed *agriculture-related uses* and *on-farm diversified uses* are also permitted in *prime agricultural areas* if they are "compatible with, and shall not hinder, surrounding agricultural operations" and meet other criteria. AIAs are not required for these uses, however, approval authorities may require proponents to demonstrate consistency with provincial policy through the preparation of a scoped AIA or equivalent analysis. Compatibility is addressed in the Guidelines on Permitted Uses in Ontario's Prime Agricultural Areas. Additionally, this AIA guidance document provides ideas on how uses can achieve compatibility by avoiding, minimizing, and mitigating impacts to the *agricultural system* (e.g., Table 2, Section 3).

Subject to approval authority discretion, elements of an AIA can be scoped to be proportional to the type, complexity and scale of a proposed *agriculture-related use* or *on-farm diversified use,* as well as the anticipated degree or magnitude of impacts from the project. An approval authority may choose to exclude the following elements of an AIA:

- An evaluation of alternative locations if the proposed use is inextricably linked to agricultural production in the area. (e.g., a scoped AIA may focus on measures to minimize and mitigate impacts to surrounding agricultural use instead);
- Soil sampling if there is no policy direction or intention to restore the lands back to an *agricultural condition*;
- The application of minimum distance separation (MDS) setbacks, in accordance with OMAFA's *Minimum Distance Separation Formulae*.

1.4.3 Drainage Works including Municipal Drains

AIAs are not required for works constructed under the *Drainage Act*, including municipal drains. They are explicitly exempt from the definition of *development* in the PPS and Greenbelt Plan.

Summary: When are AIAs not required

An AIA is not required for permitted uses in *prime agricultural areas*: *agricultural*, *agriculture-related* and *on-farm diversified uses.* Nor are they required for municipal drains subject to the *Drainage Act*.

1.5 Balancing Provincial Priorities

Agricultural resources are one of many provincial land use planning interests that must be considered when making land use planning decisions. The PPS indicates that "when more than one policy is relevant, a decision-maker should consider all of the relevant policies to understand how they work together." For example, it may be necessary to also consider provincial interests related to the creation of complete communities, efficient servicing, cultural heritage, natural heritage, the protection of municipal drinking water sources, *mineral aggregate resources* and watershed planning. Together with information on other provincial interests, an AIA will help approval authorities consider the merits of proposed non-agricultural uses.

To avoid duplication, it is important to coordinate AIA work with other studies required to support an application for a proposed non-agricultural use, cross-referencing relevant sections that deal with *agricultural system* impacts. If changes are made to technical studies that pertain to the *agricultural system*, these changes should be carried forward into the AIA.

Proponents are encouraged to consult with the municipality or provincial ministries with approval authority (e.g., MECP, MNR and MMAH) to clarify study requirements, scope options, and discuss roles and responsibilities[3]. This will help to ensure expectations are understood and studies are coordinated.

AIAs in perspective

- Where possible, AIAs should be coordinated with and refer to other studies that address impacts to agriculture (e.g., noise, traffic, hydrogeology) and not duplicate work.
- AIA content may be incorporated into other reports (e.g., planning justification report) or equivalent analysis (e.g., Environmental Assessment).
- When decisions are made on *development* applications, *agricultural system* considerations need to be considered along with other priorities.
- An AIA should be designed to simultaneously satisfy land use and other requirements (e.g., ARA, *EA Act*), as applicable.

[3] There are additional provincial guidelines that support assessment of compatible land uses, including MECP's D-Series Guidelines, which addresses compatibility between major facilities (including industrial facilities) and sensitive land uses.

1.6 AIA Roles and Responsibilities

AIAs are submitted in support of applications for non-agricultural uses. For example, for applications for *settlement area* boundary expansions or *mineral aggregate operations*, an AIA could be submitted as part of a complete application for an official plan amendment. The municipality would assess whether the AIA is sufficiently complete to support the application (the checklist in Appendix A can help with this assessment) and the municipality may require implementation of AIA recommendations as part of the approval of the official plan amendment.[4] Likewise, for other types of *development* or *infrastructure* applications, AIAs would be evaluated by reviewers/approval authorities in terms of whether legislative requirements are met and policy is satisfied. Where required as part of aggregate applications, AIA recommendations may be rolled into site plans for implementation. If a stakeholder disagrees with AIA findings, they can advise the approval authority to take their differing perspectives into consideration.

The following provides examples of roles and responsibilities for different types of proposed non-agricultural uses.

OMAFA's Role

OMAFA is not an approver of AIAs. Ministry staff may, however, provide technical support to the approval authority of development applications, to facilitate a clear, consistent approach to completion of AIAs that is appropriate to the application.

Where the province is the approval authority, for example, for official plans, OMAFA will review the AIA and will provide comments to MMAH as part of the One-Window Planning System.

***Settlement Area* Boundary Expansions**

For *settlement area* boundary expansions where provincial approval is required, the relevant municipality would undertake an *AIA* as one component of the work to support an expansion. AIAs may be completed in-house or by consultants retained by the municipality and submitted to MMAH for review as part of the provincial One-Window Planning Service.

For *settlement area* boundary expansions where provincial approval is not required, the relevant municipality is responsible for determining if an *AIA* has been satisfactorily completed and for ensuring that assessment recommendations are given due consideration. For example, the approval authority, as a best practice, should ensure that any recommendations in the AIA (e.g., mitigation or monitoring measures) are addressed in future planning processes (e.g., site plan control, plan of subdivision or zoning by-law amendment), as applicable.

[4] Some municipalities have their own AIA guidelines. However, use of this provincial AIA guidance will make it easier for proponents to ensure consistency with provincial policy which may have changed since the municipal guidelines were issued and will also support a consistent approach across municipalities. Municipalities may wish to update their policies referring to AIAs and their complete application list to refer to the PPS requirements and provincial guidance.

***Mineral Aggregate Operation* Applications**

Planning Act Approvals

For land use planning applications related to proposed *mineral aggregate operations*, if an AIA is required or requested, it should be submitted to the approval authority (typically the municipality) responsible for considering *Planning Act* applications. If the province is the approval authority, the AIA would be sent to MMAH who would lead the provincial one-window process. The approval authority is responsible for assessing whether the AIA meets their requirements and whether any required *Planning Act* approvals are granted.

ARA Approvals

AIAs are to be submitted to MNR if an AIA is required by Aggregate Resources of Ontario: Technical Reports and Information Standards. Any applicable technical recommendations from the AIA should be incorporated on the site plans, as appropriate. Details on Aggregate Resources, along with MNR's Circulation Standards are available online.

Municipalities within which a proposed site is located are prescribed commenting agencies of license applications under the ARA. As a best practice, municipal comments on the ARA application should reflect recommendations made in the AIA (e.g., mitigation or monitoring measures, rehabilitation plans).

***Infrastructure* Projects**

For *infrastructure* projects requiring an EA (e.g., electricity transmission, Provincial highways, transit, waste management, new water and wastewater treatment facilities, resource management and flood protection projects), an AIA or equivalent analysis can be carried out as part of the EA process.

For comprehensive EAs that may affect agricultural operations or *prime agricultural areas*, OMAFA is on MECP's government review team list. OMAFA will review these EAs and any AIAs or equivalent analyses carried out as part of the EA process. MECP reviews and makes recommendations on comprehensive EAs for the minister's decision.

Certain undertakings are subject to streamlined processes including regulations and different Class EAs. An AIA or equivalent analysis can be completed as part of those processes. Proponents follow a self-assessment and decision-making process and are responsible for meeting the requirements of the respective process (e.g., Class EA for Provincial Transportation Facilities and Municipal Expressways process).

In addition, energy pipeline projects require an environmental study under the Ontario Energy Board's Environmental Guidelines for the Location, Construction and Operation of Hydrocarbon Pipelines and Facilities in Ontario. While an AIA is not explicitly required, there is a requirement to minimize the disruption to farmland by pipelines and related facilities. An AIA would satisfy this requirement.

The proponent and municipality, as a best practice, should ensure that AIA (or equivalent) recommendations are addressed in future planning processes, as applicable.

Other Non-Agricultural Uses

Municipalities are typically the approval authority responsible for ensuring AIA or AIA-type analyses are satisfactorily completed to support proposals for other non-agricultural uses in *prime agricultural areas* (e.g., cemeteries, golf courses, highway commercial development). The intention is to ensure that any impacts on the *agricultural system* are mitigated to the extent feasible. For non-agricultural uses requiring an official plan amendment where the province is the approval authority, the municipality submits an AIA or AIA-type analyses as part of the One-Window Planning Service approval process to support the proposed non-agricultural use.

The approval authority, as a best practice, should also ensure that any recommendations (e.g., mitigation and monitoring measures) are addressed in future planning processes (e.g., site plan control or zoning by-law amendment), as applicable. In situations where the province is the approval authority, the municipality would assume this responsibility.

1.6.1 Professionals Knowledgeable in Ontario's Agri-food Sector

Professionals involved in the development of an AIA should have experience and credentials corresponding with the scale and complexity of the proposal. Typically, AIAs should be undertaken by professionals with knowledge, training, and experience in:

- Ontario agri-business, agricultural supply chains, rural/agricultural economic development;
- rural and agricultural land use planning;
- Canada Land Inventory (CLI) classification system for assessing agricultural land[5], and where necessary, soil science and soil mapping procedures;
- *Minimum distance separation formulae* and biosecurity practices and protocols;
- reviewing technical information from non-agricultural disciplines (e.g., hydrology, hydrogeology, geotechnical and transportation reports) and assessing their relevance and utility in identifying potential agricultural impacts;
- identifying, assessing, and evaluating the potential measures to avoid, minimize and mitigate impacts to the *agricultural system;* and
- providing expert testimony in Ontario.

A university or college degree(s) in one or more of the following is usually needed: land use planning, agriculture, soil science, geoscience, landscape architecture, resource management related disciplines, environmental related disciplines, or agricultural engineering. Other expertise may also be needed or would be beneficial for certain applications: climatology, hydrogeology, ecology and economics. A team approach is recommended for complex proposals.

Municipalities with in-house capacity and expertise may undertake AIAs or can hire professionals to prepare or contribute to AIAs.

[5] Based on OMAFA, 2023.

In addition to the knowledge, training and/or expertise noted above, professionals contributing to an AIA should have a relevant academic base, experience in Ontario's land use planning system and provincial planning policies, and preferably membership in a professional organization with a code of ethics and ongoing professional development requirements, for example:

- registered professional planner (RPP) who is a full member of the Ontario Professional Planners Institute;
- professional agrologist (P.Ag.) registered with the Ontario Institute of Agrologists;
- professional geoscientist (P. Geo.) who is a practicing member of the Association of Professional Geoscientists of Ontario;
- professional engineer (P.Eng.) licensed by Professional Engineers Ontario; and
- landscape architect who is a full member of the Ontario Association of Landscape Architects.

1.6.2 Peer Review

Where an AIA is undertaken to meet municipal planning, EA or other requirements, at the discretion of the requester, the AIA can be peer reviewed by professionals knowledgeable of Ontario's agri-food sector, or by the municipality where in-house capacity exists. An external peer review is generally recommended when a municipality is responsible for undertaking an AIA and also has the authority to accept the AIA as part of a complete application.

AIA peer reviews should be completed by professionals with appropriate credentials, qualifications, knowledge, and experience in Ontario's agri-food sector, in the type of non-agricultural use proposed, and in the completion of AIAs, including identification of effective measures to avoid, minimize and mitigate impacts to the *agricultural system*. Knowledge of Ontario's land use planning system and provincial planning policies is also necessary, as is experience in EAs or other environmental guidelines if an AIA is undertaken as an equivalent analysis.

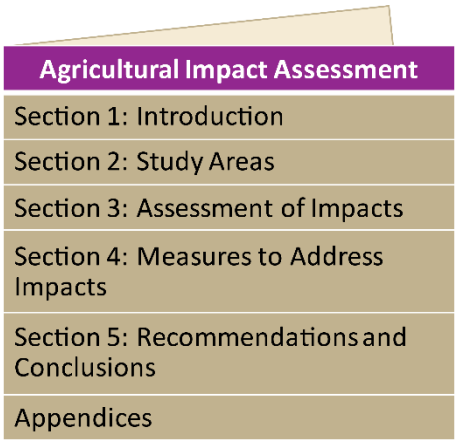
As part of their reporting, peer reviewers should confirm that they are fully qualified to complete the AIA peer review, that they are objective and that they have no perceived or actual conflicts of interest associated with the AIA. If appropriate, peer review findings and recommendations should be considered as conditions on *development* approval.

To assist in identifying reviewers, as a best practice, it is recommended that municipalities keep a list of consultants who have satisfactorily completed AIAs in their area.

It is important that the approval authority be satisfied that the AIA and peer review provides the information they need to make a decision about an application.

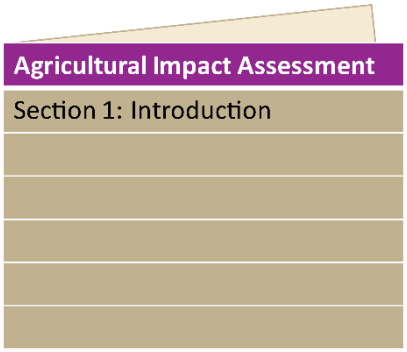
2 AIA Content

This section provides the recommended structure and content of an AIA. The checklist in Appendix A will also assist with completing an AIA. Although the amount of detail included in an AIA may vary depending on the type, scale, and complexity of the proposed non-agricultural use, each of the sections outlined below should be included.



2.1 Section 1: Introduction

The introduction of an AIA should describe the following:



1. Type, size, purpose, and rationale for the proposed non-agricultural use
2. Provincial and municipal policies or requirements the AIA is intended to satisfy:
    - Applicable provincial policies or requirements as set out in the *Planning Act*, *EA Act*, ARA, PPS, and/or the provincial plans, or other processes (e.g., procurements).
    - Applicable municipal policies or requirements including those set out in the official plan, zoning by-law, site plan control and complete application checklist.
    - Rationale for the scope of the AIA depending on these policy or process requirements (e.g., analysis of impacts to the *agricultural system*).
3. Methodology for satisfying the provincial and municipal requirements:
    - Background materials (e.g., studies, data, and mapping; see list of potential information sources in Appendix B); including complete references provided as an appendix of the AIA. To prepare for more detailed investigations or to characterize cropping systems when studies are not undertaken during the growing season, analyzing AAFC's annual crop inventory over several years is a good starting point.
    - Windshield (drive-by) surveys required to characterize the *agricultural system* in the area and identify potential impacts.
    - Field investigations to verify background information or obtain the details required to understand existing conditions and identify potential impacts.[6]
    - Any separate technical studies (e.g., noise, dust, traffic, hydrogeology) that address impacts to agriculture.

[6] When access to private land is required, authorization from the landowner is required and biosecurity protocols must be followed. If authorization is not obtained, the assessor may need to rely on information from windshield surveys and background information.

4. Consultation process
    - Pre-consultation is a common best practice to get input into the AIA terms of reference, scope, content, study areas, consultation plan and timelines. Pre-consultation can reduce burden by helping to ensure the process is clear, information is exchanged, the study team is coordinated, and the approval authority is satisfied with the project approach.
    - Where consultation is required to meet *Planning Act* and other requirements (e.g., ARA), consultation processes can be combined, where possible, to avoid duplication.
    - If the municipality is not the proponent, information from municipal staff (e.g., land use planners and economic developers) related to local land use, economic development, historical and property ownership, as well as mapping, may inform an AIA.
    - Consultation with a broad range of stakeholders is a best practice for AIAs. This can include meetings with local Indigenous Communities, local agricultural advisory committees[7], source protection authorities/committees, agricultural and commodity organizations, as well as residents and businesses in the area. Direct notification of organizations and potentially affected farmers and businesses is encouraged.
    - Consultation with the agricultural community should be timed to avoid conflicts with critical farming activities (e.g., planting, harvesting, livestock cycles), depending on the type of agriculture in the area.
5. AIA Logistics
    - The proponent of the non-agricultural use.
    - Contributions and qualifications of professionals engaged in AIA preparation (e.g., consultants, technical specialists, and peer reviewers where applicable); curricula vitae and links to previous relevant work should be included in an appendix.
    - Time period over which the AIA was completed, including the timing of any field investigations (which should be completed during the growing season if possible) and justification for the selected time period based on the type, complexity and scale of proposed non-agricultural use.

***Settlement Area* Boundary Expansions**

In addition to the AIA content noted above (1-5), the following should be summarized or cross-referenced to a planning report:

- The need for and size of the proposed *settlement area* expansion.
- A summary of the process for identifying and evaluating alternative location(s), including the rationale for selecting, and a description of the preferred location(s) (more detail to be provided under Study Areas, see Section 2.2).

Note that the level of assessment should correspond with the complexity and scale of the *settlement area* boundary expansion proposal.

It is advisable for upper-tier municipalities to collaborate with lower-tier municipalities, where applicable.

[7] Agricultural advisory committees are typically established and administered by municipalities. Municipal staff may request their committee's input on an AIA.

Mineral Aggregate Operation Applications

In addition to the AIA content noted above (1-5), the following should be summarized or cross-referenced to other technical studies:

- A description of the proposed *mineral aggregate operation* including identifying the site address and legal description; proposed aggregate license boundary and extraction limits, including identification of the area and size of both; type of operation (e.g., pit, quarry, above/below water table extraction), quality and quantity of resources to be extracted; maximum extraction rate (tonnes/year); number of trucks and proposed haul routes, etc.
- The proposed after use and its justification. Applicable land use policies need to be reviewed to determine whether the land is required to be rehabilitated back to an *agricultural condition*. If the site is required to be rehabilitated to an *agricultural condition*, then a description and detailed site plan mapping should be provided that show the existing *agricultural condition* as well as the proposed sequencing and phasing of the operation, and the areas to be progressively rehabilitated. This should include a pre-development soil survey in *prime agricultural areas*, on *prime agricultural lands*, to document baseline soil conditions to support future rehabilitation, where return to an agricultural after-use is required or being considered. See Appendix D for more information.

***Infrastructure* Projects**

The following should be included in addition to the above (1-5), with a focus on agricultural information:

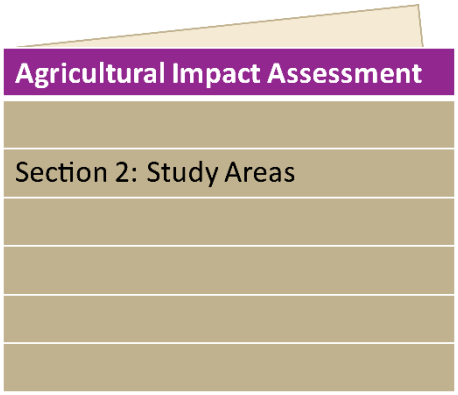
- A description of the *infrastructure* project and details of the proposed *infrastructure* location and its size and extent, including details on any alternative options or locations considered.
- Details of any applicable EA, Class EA or environmental guidelines (e.g., for hydrocarbon pipelines) and how the environmental and agricultural assessments are being coordinated.

Other Non-Agricultural Uses

Similar information should be provided as outlined above under *settlement area* boundary expansions. The level of detail included in an AIA should correspond with the type, scale, and complexity of the proposed non-agricultural use.

2.2 Section 2: Study Areas

This section of an AIA explains and provides the rationale for the primary study area(s) (area(s) considered for the non-agricultural use) and secondary study areas (areas that may be impacted by the proposed use) and describes them in the level of detail appropriate to each application. Ideally, the primary and secondary study areas should be confirmed during the pre-consultation (Section 2.1) with those reviewing the AIA, based on provincial and municipal requirements.



The size of study areas will vary depending on the proposed use and the potential for adverse impacts.

2.2.1 Evaluating Alternative Locations

Under some conditions and for some types of non-agricultural uses, provincial policy requires the evaluation of location alternatives, such as *rural lands* and /or lower priority agricultural lands. The goal of this requirement is to select sites that avoid or minimize impacts to agriculture and achieve compatibility between different uses. *Prime agricultural areas* are intended to be areas where all types, sizes and intensities of *agricultural uses* and *normal farm practices* are promoted and protected. This ensures that *prime agricultural areas* are locations where agricultural operations can thrive with limited impairment or inconvenience, while pursuing *normal farm practices*.

When comparing location alternatives, the priority should be protection of *prime agricultural areas* and essential elements of the *agri-food network*.

In-effect *prime agricultural area* mapping and mapping of the *agri-food network* are starting points for the identification and comparison of location alternatives. The factors discussed in Section 2.2.4 in this guidance document should also be considered but at a more cursory level than the detailed analysis required for the preferred location/s.

While net impacts need to be considered after the preferred location is selected and impacts have been analyzed (see section 2.4.3), net impacts should also be considered when comparing alternative locations, at a level of detail that would allow for the comparison of alternatives. Rationale and justification for the selection of the preferred location should be documented in the AIA.

Where location alternatives need to be considered, the proponent initially identifies project location options. An assessment of these alternatives is then undertaken at a level of detail that allows for the comparison of location alternatives in terms of potential impacts. At times, it may be warranted that this assessment be done at a regional scale (e.g., *settlement area* boundary expansions). Once the preferred project location is selected, a deeper assessment is undertaken to analyze potential impacts and allow for identification of measures to avoid, minimize, and mitigate impacts. Evaluating alternative locations is a central part of ensuring efforts to avoid impacts to the *agricultural system*. More details on additional considerations for avoidance of impacts can be found in Section 3.1 of this guidance document.

The need to evaluate location alternatives depends on the type of non-agricultural use, as explained below.

Hierarchy of location alternatives for *settlement area* expansions and other non-agricultural uses

In a hierarchy of location preferences, *settlement areas* are at the top as the most suitable focus for growth and *development* due to their existing *infrastructure* and services and minimized impact on the *agricultural system*.

If *development* in *settlement areas* is not feasible, the next level of preference shifts to *rural lands*, provided they are not used for agriculture.

Finally, as a last resort, if avoidance of farmland is not possible, preference should be given to *rural lands* or lower priority agricultural lands within *prime agricultural areas,* under strict criteria to ensure minimal disruption to the system.

Municipalities shall consider if it is appropriate to allow *settlement area* boundary expansions in a *specialty crop area* given these lands have the highest priority for protection in the PPS. In addition, lands abutting *specialty crop areas* should also be avoided, if possible, to reduce potential compatibility issues.

OMAFA has resources to help evaluate alternative locations. The Guidelines on Permitted Uses in Ontario's Prime Agricultural Areas (OMAFA, 2016) discuss how to identify lower priority agricultural lands. OMAFA's GIS StoryMap on *Evaluating Alternative Locations for Non-Agricultural Uses* is another resource that outlines how to satisfy policy requirements to evaluate locations within *prime agricultural areas*. See Appendix B for other relevant resources.

***Settlement Area* Boundary Expansions**

The primary study area is the area or areas considered for re-designation to *settlement area*.

The PPS and provincial plans require that alternative locations be evaluated with the goal of avoiding *prime agricultural areas.* Provincial plans may provide further additional requirements for *settlement area* boundary expansions. If there are no reasonable alternatives which avoid *prime agricultural areas*, then lower priority agricultural lands may be used in *prime agricultural areas*. Appendix C provides a case study illustrating the concept of assessing alternative locations.

Each alternative location considered for *settlement area* expansion is identified as a primary study area (e.g., one study area for potential westward expansion, another for southerly expansion and another for northward expansion). Potential *agricultural system* impacts associated with the proposed *development* would need to be considered in all locations so that the impacts to the *agricultural system* can be compared. The level of detail for this analysis should be consistent with the scale and complexity of the proposed expansion area(s).

Where AIAs are required, AIA results need to be considered in conjunction with other applicable land use policies and requirements. While the ideal location from an agricultural perspective would be where impacts on the agricultural land base and the *agri-food network* would be lowest, other considerations (e.g., servicing, natural heritage features, source water protection) also need to be factored in. Where impacts to the *agricultural system* cannot be avoided, they need to be minimized and mitigated.

Mineral Aggregate Operation Applications

The primary study area is the area proposed to be licensed for aggregate extraction.

The PPS and provincial plan policies have varying requirements regarding the need to consider alternative sites, so the applicable policies need to be reviewed.

For example, in the Greenbelt, the maintenance or improvement of the connectivity of the *agricultural system* must be sought where possible. In addition, the Greenbelt Plan contains specific requirements regarding extraction in *specialty crop areas*. If rehabilitation to an *agricultural condition* is not possible, the applicant is to consider alternative locations. Please refer to the Greenbelt Plan for more detail.

***Infrastructure* Projects**

Sites or corridors for *infrastructure* and associated works, as applicable, are the primary study area. For example, for transportation corridors, the primary study area is the existing and proposed right-of-way plus any specified access roads, detours, staging and storage areas, and areas of other works and activities associated with the construction.

Alternative sites or corridors and associated study areas may need to be considered under any applicable EA or Ontario Energy Board processes. Please refer to the applicable process for details.

Other Non-Agricultural Uses

The site proposed for a non-agricultural use is the primary study area.

The provincial plans and PPS require alternative sites to be considered for other non-agricultural uses in *prime agricultural areas*. Site alternatives should be considered within the market or service area of the proposed non-agricultural use, as explained in the Guidelines on Permitted Uses in Ontario's Prime Agricultural Areas. The analysis required depends on the type, complexity, and scale of the proposed non-agricultural use.

2.2.2 Identification of Primary Study Area(s) (Subject Lands)

Primary study area(s) are the areas considered for the proposed *development* or *infrastructure*. Primary study area(s) will include the project site or parcel/s that will be directly impacted by the proposed non-agricultural use.

For primary study area(s), documenting baseline conditions (e.g., soil conditions) supports the identification of measures to avoid, minimize and mitigate impacts to the *agricultural system*.

2.2.3 Identification of Secondary Study Area(s)

Secondary study area(s) are areas beyond the primary study area(s) that may be impacted by the proposed *development* or *infrastructure* project. At a minimum, the secondary study area(s) should include lands adjacent to the primary study area(s) but also extend beyond those lands to fully assess the potential impact from the proposed non-agricultural use. It is important that the secondary study area encompass enough area to allow for the assessment of different types of impacts (e.g., agricultural, *agri-food network*, source water protection *designated vulnerable areas*, hydrogeological, noise, transportation). Potential areas of influence, or areas to be studied as they may be impacted, vary depending on the type of impact (e.g., different areas of influence for hydrogeology and noise for a proposed quarry). In addition to considerations based on the type of impact, local factors such as road configuration and the types of *agricultural uses* in the area must be considered.

Impacts to elements of the *agri-food network* may be localized or regional in scale. For example, a key *agri-food network* asset such as a food processor may be located beyond a typical secondary study area but should be recognized in an AIA if it is important to agriculture within the study area. In another area where there is no evidence of farming activity or *agri-food network* elements, the secondary study area could be reduced. The extent of the secondary study area(s) should be defined and justified in an AIA.

Pre-consultation, supported by a broad-scale scan of agricultural land uses and the *agri-food network* in the area can help with the identification of preliminary secondary study area(s). Secondary study area(s) should also be defined in accordance with any applicable legislation and regulations and corresponding standards and policies. Soil sampling is not typically required for secondary study areas given the soils are unlikely to be disturbed by activities taking place in primary study area(s).

The text boxes below provide a starting point for defining secondary study area(s). The case study in Appendix C provides a simplified example of evaluating alternative locations for a *settlement area* boundary expansion.

> ***Settlement Area* Boundary Expansions**
>
> A 1.5 km radius around the primary study area is a recommended starting point for the secondary study area(s) (Figure1) for *settlement area* boundary expansions. This would be the area within which localized impacts would be considered. This aligns with what is recommended in OMAFA's Minimum Distance Separation (MDS) Formulae and Guidelines and Guidelines on Permitted Uses in Ontario's Prime Agricultural Areas.

Evaluation of Alternative Locations

Local Knowledge and Input: Farmers/landowners and other agricultural representatives could provide appropriate information and data to help describe agriculture in the area

- **1. Primary Study Area** Prime Agricultural Areas
- **2. Primary Study Area** Prime Agricultural Areas
- **3. Primary Study Area** Rural Lands
- Secondary study area
- prime agricultural areas
- rural lands
- existing settlement area

Elements of the agri-food network:

4. farm implement dealership
5. cold storage and distribution facility
6. food processor
7. food processor
8. abattoir
9. grain dryer
10. veterinary clinic

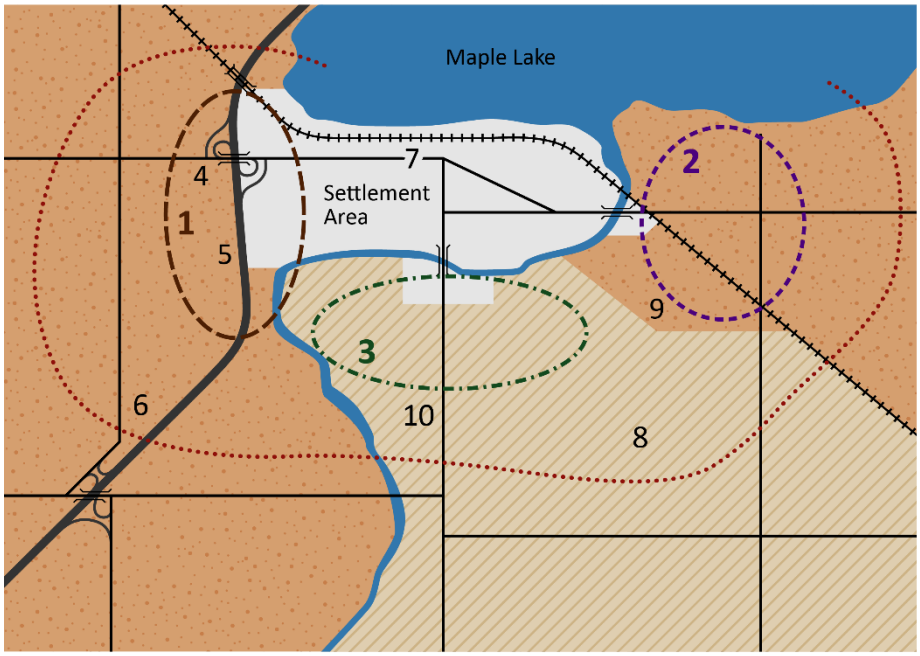


Figure 1: Study area concept for a proposed *settlement area* boundary expansion. Please see Appendix C for a simplified case study based on this illustration.

Mineral Aggregate Operation **Applications**

The extent of the secondary study area will vary depending on the type and scale of the proposed *mineral aggregate operation* and the characteristics and sensitivity of agriculture within the surrounding area. For example, for a small gravel pit, with no below the water table extraction, it may be sufficient to assess impacts on adjacent properties only (or based on any alternative legislative requirements) unless there are cumulative impact considerations. However, the secondary study area for a large limestone quarry with rock blasting and dewatering would potentially require consideration of impacts in a much larger area. Factors such as noise, dust or vibration from blasting, excavation and truck traffic, and potential changes to groundwater quality and supply should be considered based on the scale of the proposed use.

The haul route for a proposed aggregate operation may be considered in a traffic study. Potential impacts to agriculture should be addressed as vibration, noise and dust may impact agricultural production, movement of farm vehicles on local roads and agri-tourism businesses, for example.

Potential impacts on the *agri-food network* should also be considered to determine if the proposed *mineral aggregate operation* could impact surrounding *infrastructure*, services, or assets within the *agri-food network*.

***Infrastructure* Projects**

Secondary study areas should be determined based on the information provided above under primary study area and in accordance with any applicable EA or pipeline approval processes. Where an EA is being used as an equivalent analysis, it will be important that the *agricultural system* be considered, and that this guidance document be referred to when identifying study areas and assessing impacts.

Other Non-Agricultural Uses

For other non-agricultural uses, the secondary study area will vary. The extent of the area should be confirmed during pre-consultation with AIA reviewers/approvers. The Agricultural System Portal, along with local data and knowledge, may help inform the extent of the secondary study area (e.g., if there is key *infrastructure*, agri-food assets and services that will be impacted by the non-agricultural use, these components should be included in the secondary study area).

2.2.4 Analysis of the Primary and Secondary Study Areas

AIAs should describe the study areas, as applicable, in terms of general land use in the area, transportation, the *agricultural system*, hydrology, hydrogeology and drainage, as well as the economic, community and environmental contributions of agriculture. The methodology and sources discussed in Section 1 of the AIA (Section 2.1 of this guidance document) and Appendix B should be used as applicable. Consultation with municipal staff, Agricultural Advisory Committees (where they exist), farm organizations and landowners, plus surveys (studies, windshield), may supplement those information sources.

Where location alternatives need to be considered, the detailed analysis described below would pertain to the preferred location/s.

2.2.4.1 Land Use Overview

The AIA should include a description and maps of general land uses in the primary and secondary study areas (e.g., residential, commercial, industrial, agricultural, *natural heritage features and areas*[8], source water protection *designated vulnerable areas*, easements, roads, and other *infrastructure*). The following may help to describe the area within and around the proposed non-agricultural use:

- aerial imagery
- official plan land use schedules
- zoning maps
- source water protection maps (showing *designated vulnerable areas*)

[8] For some proposed uses, a natural heritage study will be required. The AIA could refer to it and summarize relevant information.

2.2.4.2 Transportation

The AIA should include a description and mapping of the transportation system[9] in the primary and secondary study areas addressing:

- traffic patterns and volumes including use by slow-moving/oversized farm vehicles such as tractors, combines, hay wagons, horse trailers and horse-drawn carriages; and
- other components of the transportation system such as rail, inter-modal stations and airports that may be part of the *agri-food network.*

2.2.4.3 *Agricultural System*

The following should be documented in the AIA to describe both primary and secondary study areas, where applicable and relevant:

- Designated *prime agricultural areas* and *rural lands* where they have been identified by municipalities as part of the agricultural land base.
- Soil types based on the Ontario Soil Survey Complex data, which provides updated county soil survey data, available from AgMaps and the Ontario GeoHub, and more up-to-date sources if available. Mapping of soil types should be included.
- Canada Land Inventory (CLI) soil capability for agriculture ratings and any limitations for common field crop production. This includes CLI ratings and limitations for all soils within a polygon, not simply the dominant soil. A map should be included showing CLI classes and associated limitations within the study areas. An example of this can be viewed by accessing the Soil Capability for Agriculture layer in AgMaps.
- Agricultural resources including:
    - farmsteads (i.e., clusters of farm buildings with and without dwellings);
    - area in crop production, crop type (e.g., pasture, hay, field crops, horticultural crops); specialty crops; AAFC's annual crop inventory (over several years) and other sources may be used;
    - area in livestock production, farm types, sizes, and capacity of livestock facilities; and,
    - elements of the *agri-food network* relied on by farms in the area which may be beyond typical secondary study areas (e.g., suppliers of inputs such as seed and fertilizer, equipment dealerships, agricultural services, farmers markets, grain dryers, primary food processors, distributers, cold storage facilities) and their service area (local, regional).
- Fragmentation of the land base and area in agricultural production.[10]
- Information on operational relationships / dependencies between the primary and secondary study areas.

In addition, detail on the primary study area may include**:**

- A detailed soil survey if there is a requirement to return the lands to an *agricultural condition*;
- Crop yield information;

[9] Some applications will include a traffic study that could be referred to and summarized in the AIA.

[10] Area in agriculture and fragmentation are commonly used in Land Evaluation and Area Reviews to assess the land base for agriculture as they can have a significant bearing on the efficiency of farm operations, their ability to adapt to changing market conditions, and the likelihood of the land remaining in *agricultural uses* over the long-term. Parcel size and non-agricultural uses in the area may be indicators, noting that parcel sizes can depend on type of crop and applicable policy.

- Type and condition of improvements (e.g., farm-related buildings and structures, irrigation systems, tile drainage, land forming such as levelling or berms, fencing, recent land clearing or stone removal, investments into plant stock, wind machines to reduce risk of frost);
- Farm operation linkages (e.g., home farm and other contiguous and non-contiguous properties, whether owned or rented; supply chain linkages) and the roads used to link parcels and businesses.
- Historical *agricultural uses* on the property;
- Municipal drains constructed under the *Drainage Act*;
- Other land uses and features (e.g., fencerows, roadways, ditches, riparian areas, rough land areas, forests, wetlands, etc.);
- Historic severance activity on the property;
- Points of access to farm operations and fields; and
- Proximity to *settlement area* boundaries and any associated considerations.

Some of this information may be obtained from landowners, farmers, local farm organizations, or the municipal Agricultural Advisory Committee, where one exists.

Detailed soil survey

If sites are to be returned to an *agricultural condition* (e.g., *mineral aggregate operations*, pipeline corridors), a detailed soil survey is needed to document baseline conditions of the preferred site. The soil survey will provide baseline conditions which will serve as a measurable standard for rehabilitation. Proposals for non-agricultural uses that permanently convert agricultural land to a non-agricultural use (e.g., *settlement area* expansion) may also need to be accompanied with a soil survey, but detailed soil surveys may not be essential for all AIAs.

2.2.4.3.1 Soil Surveys

Where soil surveys are required in primary study areas to support the AIA, proponents must adhere to the Guidelines for Detailed Soil Surveys for Agricultural Land Use Planning document. The soil survey report should be included in an appendix of the AIA and include at a minimum:

- Inspection locations (GPS coordinates) and detailed soil profile description data.
- Correlation of soil inspections with soils classified in the published soil survey map and report for the county or municipality.
- Agricultural capability for common field crops should be interpreted using the document Soil capability for agriculture in Ontario.
- If the subject area lies within or adjacent to a larger area of specialty crop production, then its soil suitability for specialty crops needs to be evaluated.
- Maps for the primary study area including soil inspection map, soil map, CLI map and specialty crop suitability map (if required).

Soil surveys should refine county-level soil mapping to a scale suitable to the application (i.e., 1:5,000 to 1:10,000). At a minimum, this will require a soil profile inspection density of one inspection for every two hectares. For example, on a 40-hectare site, the minimum number of inspection locations would be 20. Site topography should be considered when planning a field survey, making sure samples are taken to account for variations in elevation and terrain.

A qualified person with a strong background in pedology needs to determine the number and depth of samples needed and describing the soil profile on-site. The methods used to describe the soil should be consistent with Characterizing Sites, Soils & Substrates in Ontario: Volume 1 Field Description Manual (Heck et al, 2017), using taxonomic conventions consistent with the Canadian System of Soil Classification (Agriculture and Agri-Food Canada, 1998).

For lands that are to be returned to an *agricultural condition*, additional investigation sites may be required to account for soil spatial variability and the variations in major soil horizons (A, B and C). Representative samples of the topsoil, subsoil and parent material should be collected and, at a minimum, analyzed as follows for baseline information by an accredited laboratory:

Analyses	**Topsoil**	**Subsoil Horizons**	**Parent Material**
Particle size analysis	Yes	Yes	Yes
Soil fertility (e.g., phosphorous and potassium)	Yes	No	No
Soil organic carbon (SOC)	Yes	No	No
Soil pH	Yes	Yes	Yes
Calcium carbonate ($CaCO_3$) Equivalent (CCE)	Maybe	Maybe	Yes
Bulk Density	Yes	Yes	If possible

Soil density measurements can be taken using soil cores, a penetrometer, nuclear moisture/density gauge or other suitable methods. If soil cores are to be collected, a minimum of three cores from each horizon should be collected and analyzed to obtain statistically relevant results.

Measuring the microbial biomass of the soil with samples collected at depths of 0 – 10 cm, 10 – 20 cm and 20 – 30 cm should also be considered. Soil microbial biomass is a measure of the mass of the living component of soil organic matter and is important to the release of essential plant nutrients and the maintenance of good soil structure.

***Mineral Aggregate Operation* Applications**

Since aggregate extraction is an interim use, the ARA, PPS, and provincial plans require pits and quarries to be rehabilitated. Rehabilitation needs to occur progressively over the life of a site and when aggregate extraction is completed. ARA site plans, including the operations and rehabilitation plans, address soil management (e.g., stockpiling), establishment of vegetation, grades, and slopes, etc.

The PPS encourages comprehensive rehabilitation planning where there is a concentration of mineral aggregate operations. The goal of this is for operators of nearby sites to identify and work collaboratively towards rehabilitation outcomes that best serve the area/community.

Recommendations from the AIA related to site design, operations, and rehabilitation of sites (that are required to be returned to an *agricultural condition*) must be incorporated into the ARA site plans (see Appendix D). Pre-extraction baseline conditions need to be understood (e.g., horizon depths and soil types). A soil budget[11] should be prepared to confirm there is sufficient material onsite for rehabilitation. Within *specialty crop areas*, microclimatic conditions also need to be understood to ensure these conditions are restored.

Depending on the depth of the subsoil overlying the parent material, the depth to the aggregate resource and the type of aggregate resource (i.e., sand and gravel or bedrock), additional samples may be required from within the soil profile to obtain accurate bulk density measurements throughout the soil profile. Soil bulk density information is also needed to gauge the effectiveness of measures to alleviate compaction.

***Infrastructure* Projects**

Proposals for pipelines, for example, may also require collection of detailed baseline information in anticipation of protective and mitigative measures to reduce impacts to agriculture, including rehabilitation to an *agricultural condition*.

2.2.4.3.2 Soil Suitability and Climate

When an AIA is required for a non-agricultural use in a *specialty crop area*, then soil and climatic information is required to be gathered. In *specialty crop areas*, soil suitability ratings for specialty crop types historically grown in the primary and secondary study areas should be assessed. The soil suitability ratings should be consistent with the ratings assigned by OMAFA to the soil series identified on site in the relevant soil survey report. For example, if the study areas fall within the Niagara soil survey, the Niagara Soil Survey Report should be consulted. The more recent soil survey reports (Brant, Elgin, Haldimand-Norfolk, Middlesex, and Niagara) include ratings for soil suitability for some specialty crops. The ratings published in these reports may also guide the interpretation of reasonably correlated soils in adjacent counties whose soil reports contain no such specialty crop interpretations. In addition, the publication "A Compilation of Soil, Water and Climatic Requirements for Selected Horticultural Crops in

[11] A soil budget is a tool to confirm there is enough soil stored on site (typically stored in perimeter berms) to rehabilitate the lands to an *agricultural condition*. In projects where excess soil is to be received or removed, O. Reg. 244/97: General under the ARA and O.Reg. 406/19: On-Site and Excess Soil Management under the *Environmental Protection Act* apply. Among other things, the regulations and associated documents entitled Rules for Soil Management and Excess Soil Quality Standards include requirements related to the appropriate quality of excess soil (including topsoil) that may be received at agricultural properties.

Southern Ontario" (Ontario Institute of Pedology Publication, 1989) outlines general landscape and moisture needs for more than forty different tree fruit, small fruit and vegetable crops.

Climatic conditions such as crop heat units, first and last frost days, number of frost-free days and climatic patterns in the area should be provided. In addition, microclimatic conditions particular to the area should be described (e.g., elevation, slope, slope aspect, air drainage, lake effect) which enable specialty crop production.

***Mineral Aggregate Operation* Applications**

Where the primary study area is within a *specialty crop area* that needs to be rehabilitated back to an *agricultural condition*, additional information is required to inform rehabilitation, e.g.,

- Climate and micro-climate data from Environment Canada;
- Current and historical crop production data and mapping (e.g., location and yields), as available;
- Mapping of provincial and municipal *specialty crop areas*;
- Aspects such as slope and cold air drainage; and
- Information from on-site investigations (e.g., soil study, hydrogeological investigations).

Other information (e.g., hydrogeological, horticultural) may also be required depending on the site, such as plans for extraction and nearby aggregate operations (to assess cumulative impacts and plans for rehabilitation).

Potential impacts on *specialty crop areas* within **secondary study areas** may also need to be considered if there is a possibility that the proposed pit or quarry could affect special crop production capability in the area (e.g., if air flow or hydrogeological conditions are impacted).

2.2.4.3.3 Slope and Topography

A general description of slope and topographic features including contour mapping of the **primary and secondary study areas** should be provided. If there are Canada Land Inventory limitations such as topography, slope or stoniness, this information should be reviewed and summarized in the AIA. This information can be accessed through OMAFA's AgMaps.

2.2.4.4 Hydrology, Hydrogeology and Drainage

Changes to the hydrological or hydrogeological conditions in the **primary and secondary study areas** can impact water quality and quantity and affect farm operations. It is therefore necessary to examine and summarize or cross reference relevant information contained in supporting hydrological and hydrogeological studies prepared for the application to understand baseline conditions of water resources.

Surface water drainage and drainage infrastructure in the **primary study area** should be mapped and their condition described, including drains constructed under the *Drainage Act*, tile outlets and field tile (random or systematic). Drainage information can be accessed through OMAFA's AgMaps. Quantity and quality data associated with public and private wells should be documented. Information on municipal drinking water systems may be found in source protection plan assessment reports.

The location and extent of significant groundwater recharge areas and highly vulnerable aquifers, for example, should also be identified to ensure hydrogeological functions are protected.

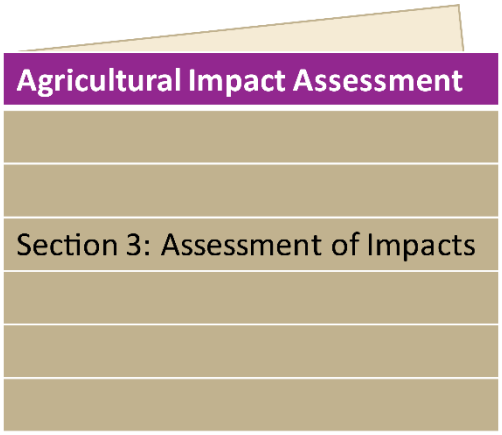
2.2.4.5 Economic, Community and Environmental Contributions of Agriculture

Understanding the economic, community and environmental contributions of agriculture in the **primary and secondary study areas** is important. The AIA should include a general description of the local and regional significance of agriculture from those perspectives. For example, the following may be addressed, as applicable:

- Economic impact of agricultural production and the *agri-food network* in the study areas using census of agriculture (e.g., County profiles) and other data.
- Social and economic benefits of businesses such as local farm markets and agri-tourism operations that contribute jobs and tax revenue to the local economy.
- Environmental assets within *prime agricultural areas*, for example *natural heritage features and areas,* fencerows, woodlots, sensitive water features and their associated *hydrologic functions,* and related ecosystem services such as flood mitigation, carbon storage and biodiversity.

2.3. Section 3: Assessment of Impacts

Fully assessing potential adverse impacts from proposed non-agricultural uses requires a multidisciplinary approach involving land use planning, agriculture, and other disciplines. Applicable findings related to agriculture from other technical studies should be cross-referenced (e.g., water resources, air quality, traffic).



Potential impacts to the *agricultural system* should first be identified in the absence of measures to avoid, minimize, or mitigate impacts. Net impacts are addressed later in the AIA.

Table 1 identifies potential impacts and considerations for assessing the degree of impact. This assessment may be captured in the AIA and/or in other technical studies. The list of potential impacts and considerations is not exhaustive; nor are the impacts applicable to every proposed non-agricultural use in *prime agricultural areas*. However, given the PPS emphasizes the need to protect *prime agricultural areas*, the first three factors are of highest priority. The remaining factors are not prioritized but should also be considered when applicable.

The assessment of impacts should take into consideration whether impacts are short- or long-term, whether they are limited to the proposed site or are more regional in scope, and where they are on the spectrum of severity, from minor to severe.

After considering all potential impacts, it is important to provide a summary of how the *agricultural system* as a whole may be impacted, where applicable.

Table 1: Types of impacts to consider in an AIA

Potential impacts to the *agricultural system*	Considerations for assessing the degree of impact
1. Loss or deterioration of agricultural land	• Permanent versus temporary • Area of impacted land • Impacted area with unique soil or micro-climate • Impact on soil quality (e.g., soil organic carbon, compaction, soil erosion) • Impact on agricultural production in the area in terms of critical mass to meet market demand or ability to access land • Potential to increase pressure to convert other agricultural lands near the proposed site
2. Fragmentation of agricultural operations	• Contiguity of farmland in the area and impact of fragmentation on how agriculture functions (permanent versus temporary) • Impact on the critical mass of production to achieve efficiencies or meet market demand • Impact on the supply chain (e.g., raising of dairy heifers, weaners for feeder hog operations, or day-old chicks for surrounding farms)
3. Change in landform, elevations and slope	• Potential to affect the micro-climate needed to grow specialty crops (e.g., air flow, elevation, temperature), if applicable • Impact on agricultural potential due to proposed changes
4. *Minimum distance separation formulae* conflicts[12]	• Number, type and size of existing affected livestock operations and how they will be impacted (e.g., water access, dust, noise) • Potential constraints such as challenges for new or expanded livestock operations
5. Traffic and safety issues	• Impact on the ability to access farm fields, move farm vehicles from farm to farm or bring commodities to market • Conflict with farm vehicles using local roads (e.g., increased volume and speed of traffic, passing vehicles, road design issues such as roundabouts, bridges, bicycle lanes, curbs)
6. Compatibility issues	• Potential for the proposed non-agricultural use to be incompatible with agriculture (i.e., risk of nuisance complaints over odour, noise, lighting, etc.) • Potential for new source protection plan policies to impact agricultural activities if proposed non-agricultural use creates new/changes existing *designated vulnerable areas*[13]

[12] MDS applies to *settlement area* expansions and other non-agricultural uses in *prime agricultural areas*, but not to *mineral aggregate resources* sites, *infrastructure* or landfills (see implementation guideline #3 in The Minimum Distance Separation (MDS) Document).

[13] *Designated vulnerable areas* could be created/changed if the proposal involves changes to drinking water systems, transport pathways, drainage areas or water taking.

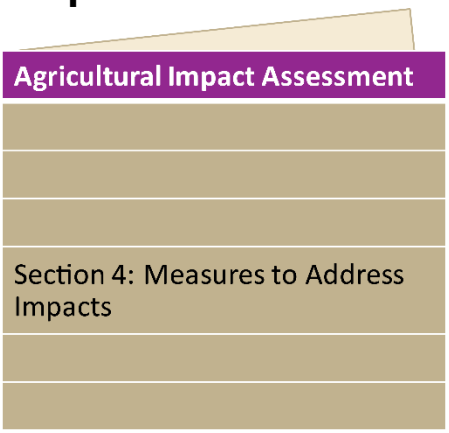
Potential impacts to the *agricultural system*	Considerations for assessing the degree of impact
7. Nuisance impacts (e.g., noise, dust, lighting) associated with the non-agricultural use	• Farms and other agri-food businesses impacted within the study areas • Frequency, timing and intensity of impacts (e.g., during construction versus on-going; weekday/weekend; daytime/nighttime)
8. Trespassing, vandalism, pets at large and litter/garbage disposal	• Financial, safety and biosecurity risks to farm operations near the proposed non-agricultural use
9. Change to ground or surface water quality or quantity	• Impact on water supply (quality and quantity) for drinking, irrigation, livestock watering, wash water processes, and other *agricultural* and *agriculture-related uses* • Changes to groundwater and surface water[14], for example, due to increased imperviousness of land
10. Impact to the *agri-food network* (i.e., agricultural infrastructure, services and assets)	• Potential loss or fragmentation of *agri-food network* elements and functions • Whether the impacts are essential elements of supply chain or critical services that are depended on locally or regionally • Investments made into these agri-food elements that will be lost or reduced • For any elements lost, whether there are alternative sites that could provide comparable service
11. Community impacts	• Importance of the agri-food sector to the local economy and potential impact on jobs, local businesses, tax base, goods (e.g., access to local food and products) and services relied on by the community, culture, heritage, community identity, prosperity, etc.
12. Cumulative impact to the viability of the *agricultural system* in the area	• Potential to weaken the *agricultural system* or limit future growth opportunities • Potential for the proposed use, in combination with existing non-agricultural uses in the area, to undermine long-term agricultural potential

In addition to addressing adverse impacts, in some circumstances an AIA may also demonstrate how a proposed use could result in certain beneficial impacts to the *agricultural system.*

[14] If the study area contains drains constructed under the *Drainage Act*, the local Drainage Superintendent should be consulted to identify potential impacts and how they can be avoided.

2.4 Section 4: Measures to Address Potential Impacts

After identifying potential adverse impacts from the proposed non-agricultural use, an AIA identifies how to address potential impacts to the *agricultural system* within the study areas. Section 3 of this guidance document describes potential measures in further detail.



2.4.1 Hierarchy of Measures

Figure 2 depicts the hierarchy of measures to address potential impacts. This hierarchy is supported by provincial policy (e.g., the PPS, Greenbelt Plan)[15].

Avoidance of impacts to the *agricultural system* is the priority. Avoidance means that impacts are prevented. Site selection through the evaluation of alternative locations provides the greatest opportunity to avoid impacts (see section 3.1). For example, a site could be selected on *rural lands* (outside of *prime agricultural areas*) where there is a lower concentration of *agri-food network* or *minimum distance separation formulae* conflicts.

Minimizing impacts to the *agricultural system* is the next priority if, despite best efforts, impacts cannot be fully avoided but they are kept to a minimum. For example, a site could be selected on lower priority agricultural lands.

Mitigation of impacts means that impacts are further reduced after undertaking steps to avoid and minimize impacts to the *agricultural system*. Mitigation of impacts can range from higher to lower impact, depending on the proposed measure. For example, mitigation measures may include setbacks and fencing or dust control measures.

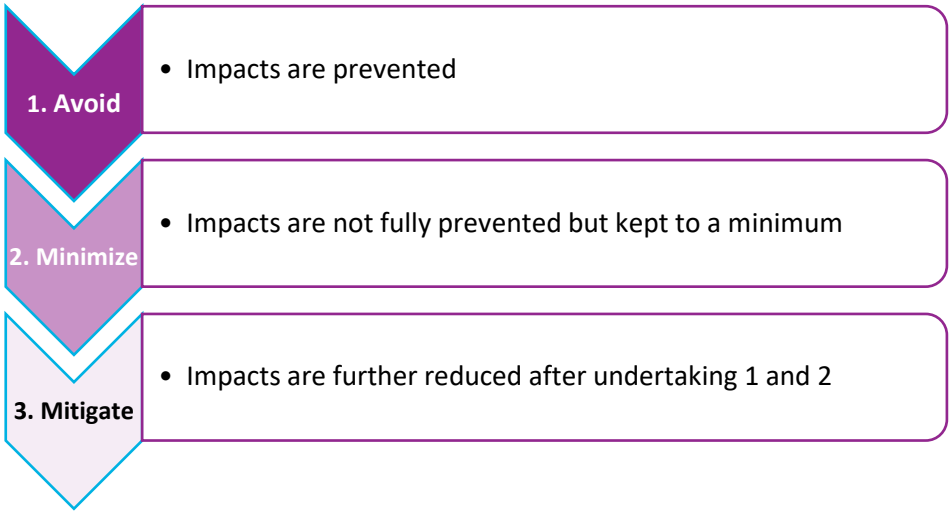


Figure 2: Hierarchy of measures to address potential impacts to the *agricultural system*

[15] OMAFA's StoryMap on Evaluating Alternative Locations for Non-Agricultural Uses provides an overview of the hierarchy to direct non-agricultural uses in *prime agricultural areas* and *rural areas.*

Overall, the purpose of this section of the AIA is to identify measures that will address potential adverse impacts. Each measure should speak to the following, as applicable:

- Recommended implementation instrument for each measure (e.g., Who will implement the measure? What is the timing for implementation?);
- Explain how measures are proportional to potential impacts to ensure the measure is appropriate to the type, scale, and complexity of the proposal;
- Identify any relevant dependencies (e.g., if X measure is implemented, the result will be Y); and,
- Demonstrate how the recommended measure has been incorporated into other permits/approvals, where applicable.

If the site is being restored to an *agricultural condition*, the AIA shall also outline proposed rehabilitation measures (see Appendix D) and explain how these have been incorporated into the relevant implementation instrument (e.g., site plans, zoning by-law, etc.).

2.4.2 Measures to Avoid Impacts

Efforts to avoid impacts to the *agricultural system* need to be documented as part of an AIA. This section can highlight key findings from the evaluation of alternative locations (see Section 2.2.1) and identify measures which demonstrate how impacts have been prevented for the preferred location. For example, if efforts have been made to select lands outside of a *prime agricultural area* or in an area where there is a lower concentration of agricultural operations, this can be documented.

This section can be informed by findings from primary/secondary study area identification and can note how other technical studies informed specific measures to avoid impacts to the *agricultural system*. If the proposed location cannot avoid *prime agricultural areas*, how impacts to elements of the *agri-food network* have been avoided can be documented.

Additional measures to avoid impacts to the *agricultural system* can be found in Table 2.

2.4.3 Measures to Minimize Impacts

This section of the AIA can outline measures that that will support minimizing impacts to the *agricultural system.* Through minimizing, impacts cannot be fully avoided. However, efforts to reduce adverse impacts can be included, with any relevant implementation instrument noted. This may include outlining how the footprint of a project will be kept to the minimum size needed to accommodate the proposed use, or how site design/layout prioritized lower priority agricultural lands.

When compared with measures to mitigate impacts, efforts to minimize adverse impacts are likely larger-scale changes, such as changing site location or site design, as opposed to mitigation efforts that focus more on building compatibility between a proposed non-agricultural use and surrounding agricultural operations.

2.4.4 Measures to Mitigate Impacts

While measures to mitigate impacts are explored further in Section 3, it is worth noting that different mitigation approaches can range in terms of impacts. Higher impact mitigation measures specifically reduce the severity of impacts of the proposed non-agricultural use and should be considered for larger scale or regional proposals. This may include edge planning (see Appendix E) between the proposed non-agricultural use and *prime agricultural areas*, as well as road improvements and dust suppression to

enhance the compatibility of the uses. In comparison, lower impact mitigation measures may be easier (e.g., smaller-scale, lower-cost measures) and further reduce impacts and improve the compatibility of agricultural and non-agricultural uses. Depending on the type, scale, and complexity of the proposed non-agricultural development, both higher and lower impact mitigation measures can be used to more fully address potential adverse impacts to the *agricultural system*.

Lower impact mitigation measures may include education and outreach tools to reduce nuisance complaints related to *normal farm practices*, such as:

- Disclosure statements to notify potential purchasers of property that the land is in a *prime agricultural area* where periods of dust, noise, odour, and other impacts associated with nearby farms are common;
- Signage to inform residents they are in an agricultural area where activities may occur that result in odour, noise, and dust;
- Communicating with surrounding non-farm residents to explain the types of agricultural operations in the area and provide an overview of *normal farm practices;*
- Local farm organizations could provide education opportunities for the public through events such as fall fairs, farm tours and educational events for non-farm neighbours on the realities of operating a farm.

Examples of Practices that Broadly Support the *Agricultural System*

While typically beyond the scope of mitigation measures for a site-specific project in a *prime agricultural area*, below are additional recommended practices for supporting the *agricultural system*.

- Official plan policies that reflect provincial policy on *minimum distance separation formulae*, *normal farm practices* and permitted uses or require/encourage best practices such as edge planning;
- Pre-zoning to attract businesses to fill a supply chain gap or opportunity;
- Efficient public transit system that reduces traffic on roads used by farmers;
- Training to meet the labour needs of the agri-food sector;
- Investments into agricultural infrastructure (e.g., incubator, food hub, regional irrigation system, transportation improvements);
- Agriculture economic development initiatives[16] (e.g., agri-food strategy, business retention and expansion program, marketing program, business supports).

Some of these measures could be implemented through a *municipal comprehensive review* process, studies or plans, the municipal budget process, etc.

Figure 3 provides examples of measures to mitigate impacts to the *agricultural system*. The examples are not exhaustive, nor are they applicable in all situations. The appropriate mitigation measures depend, amongst other things, on the proposed use, site conditions, and potentially affected agricultural operations and *agri-food network* elements. Additional examples of mitigation measures are provided in Section 3, Table 2.

[16] The MRA Agricultural Economic Development Program identifies many activities that could be undertaken to support the viability of the *agricultural system*.

Figure 3 provides examples of measures to mitigate impacts to the *agricultural system*. The examples are not exhaustive, nor are they applicable in all situations. The appropriate mitigation measures depend, amongst other things, on the proposed use, site conditions, and potentially affected agricultural operations and *agri-food network* elements. Additional examples of mitigation measures are provided in Section 3, Table 2.

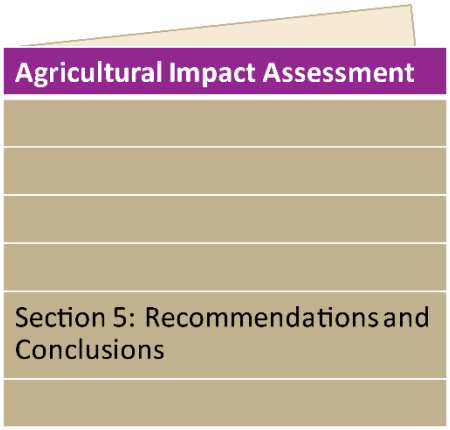
<table>
<tr><th colspan="4">Examples of Higher Impact Mitigation Measures</th></tr>
<tr><td>Vegetative screens and buffers
  </td><td>Setbacks and fencing
  </td><td>Alternative access to farm fields
  </td><td>Rehabilitation to an agricultural condition
  </td></tr>
<tr><td>Dust control
  </td><td>Road/roundabout design
  </td><td>Clear urban - agricultural boundary
  </td><td>No trespassing signage on farm property
  </td></tr>
<tr><th colspan="4">Examples of Lower-Impact Mitigation Measures</th></tr>
<tr><td>Education on normal farm practices
  </td><td>Signage
  </td><td>Community liaison committee
  </td><td>Road safety campaign
  </td></tr>
</table>

Figure 3: Examples of higher and lower impact mitigation (left to right - First row: OMAFA, Hodgson, MTO, OMAFA; 2nd row: Shutterstock, MTO, OMAFA, OFA; 3rd row: OMAFA, Van de Valk, Shutterstock, Geoff Brennan.

2.4.5 Net Impacts

Once measures are identified that could avoid, minimize, or mitigate impacts to the *agricultural system*, the net impacts are identified and documented in the AIA. Net impacts refer to impacts that will still be experienced after measures are put in place. Net impacts should be described in the AIA in quantitative and qualitative terms with respect to their magnitude and extent. Where net impacts depend on specific mitigation and performance measures, these dependencies should be clearly identified.

2.5 Section 5: Recommendations and Conclusions



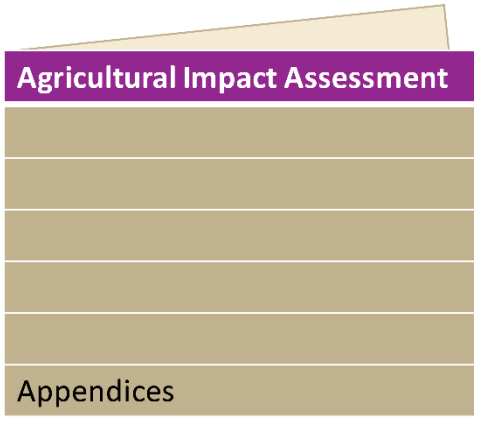
This section of the AIA provides an overview of the key recommendations specific to the proposed *settlement area* boundary expansion, *mineral aggregate operation, infrastructure,* or other non-agricultural use in terms of how to avoid, or where avoidance is not possible, how to minimize and mitigate impacts from the proposed land use. Approval authorities may:

- include AIA recommendations as conditions of approval for permits/processes (e.g., *Planning Act* approvals);
- incorporate AIA recommendations into zoning by-laws or site plan approval, where appropriate;
- incorporate AIA recommendations into municipal secondary plans or similar processes for *settlement area* boundary expansions;
- for *mineral aggregate operations*, incorporate AIA recommendations into the ARA site plan, where appropriate.

An AIA concludes by explaining how the objectives of the AIA have been fulfilled (i.e., how provincial and municipal requirements/expectations are satisfied) and summarizes key recommendations that will be implemented to address adverse impacts to the *agricultural system*. If applicable, this section shall:

- Summarize net impacts of the proposed non-agricultural use (e.g., quantity of land that will be removed from agricultural use);
- Identify any linkages to technical studies; and,
- Explain how recommendations will be incorporated into relevant permits/approvals (e.g., *Planning Act* approvals, ARA site plan, etc.).

2.6 AIA Appendices



Recommended appendices to support the AIA include:

- Curricula vitae of the study team (AIA authors and field staff) with hyperlinks to relevant work;
- Full references for all background information sources;
- A description of survey techniques employed, such as field studies and associated data (e.g., soil sampling techniques and data including soil profile descriptions and slope measurements);
- A print-out from *minimum distance separation formulae* calculation/s from AgriSuite, with personal information removed; and
- Individuals and groups engaged during pre-consultation and consultation.

3 Suite of Measures to Avoid, Minimize and Mitigate Impacts

This section elaborates on the hierarchy of measures previously described in Section 2.4 of this guidance document by providing some additional information and examples of the suite of measures to avoid, minimize and mitigate adverse impacts to the *agricultural system* (in Table 2). Recommended measures to address adverse impacts to the *agricultural system* need to be tailored to local and regional circumstances.

3.1 Avoiding Impacts

Avoiding impacts does not mean that a non-agricultural use cannot proceed. It means that locations are considered at the outset with the goal of avoiding impacts. It is necessary to demonstrate that avoiding impacts to the *agricultural system* has been considered as the priority. Where avoidance is not possible, the next step is to minimize impacts, followed by implementing measures to mitigate adverse impacts.

Avoidance is typically addressed through the alternative site evaluation section of an AIA (see section 2.2.1 above). However, there are additional examples that can be included. Table 2 provides examples of how to integrate avoiding impacts from a non-agricultural use on the *agricultural system* into an AIA. Examples include preventing fragmentation of the agricultural land base, meeting minimum distance separation setbacks, and giving preference to options that avoid traffic and safety impacts for the farming community.

3.2 Minimizing Impacts

Where impacts are unavoidable, minimizing impacts is the next priority to reduce the overall impact from a non-agricultural use. Minimizing impacts can be achieved in a number of ways, including proactive planning to remove impacts through site design. When it comes to evaluating alternative locations, evaluating lower priority agricultural lands is an example of minimizing impacts. Other examples include phasing a *development* to ensure agriculture can continue to exist for as long as possible, and salvaging topsoil for re-use.

3.3 Mitigating Impacts

After avoiding and minimizing adverse impacts to the *agricultural system*, the next priority is mitigation to help further reduce impacts and work towards compatibility. Measures may be done before or during *development* and may involve ongoing education and raising awareness about agriculture in the area.

The suitability of measures to address potential impacts depends on the type, scale, and complexity of the proposed non-agricultural use, the degree of impact and the risk associated with the impact.

Measures should be proportional to the potential impact or risk to the *agricultural system* and may be implemented pre- during- and post-construction. For example, to mitigate concerns related to trespassing onto adjoining farms, installing fencing and signage along property lines may be reasonable mitigation for *development*, whereas building a five-metre-high brick wall may not be. Similarly, creating a suitable underpass to allow farm vehicles and equipment to safely access farm properties on the opposite side of a busy road may be feasible, whereas constructing an overpass or another road to serve the new non-agricultural use may not be.

Multiple measures may be needed to address impacts. Consultation and/or negotiation with affected farm and agri-food business owners is recommended to ensure consideration of satisfactory measures.

***Mineral Aggregate Operation* Application**

Examples of Mitigation

Potential impacts from *mineral aggregate operations* can be effectively avoided, minimized, and mitigated through site design, operations, and rehabilitation, where required. Ideally, these actions will benefit and improve agricultural resources over the long-term. For example, agricultural capability could be improved by creating aquaculture or irrigation opportunities, or levelling fields. Best practices include consultation with local farmers and business owners to understand potential *agricultural system* impacts and determine what steps could be taken to avoid, minimize and mitigate these impacts. Potential measures could include:

- Mitigation of dust, noise, and vibration (higher impact)
  - Ensure provincial standards for dust control, noise/blasting are met and that studies prepared for the *mineral aggregate operation* application consider all affected farm operations.
- Rehabilitation (higher impact)
  - If *mineral aggregate operations* in *prime agricultural areas* are required to be returned to an *agricultural condition*, an effort should be made to enhance the continuity of the *agricultural system*. Appendix D provides information on steps to take pre-, during and post-extraction. Although this information is focused on mineral aggregate resource extraction sites, it includes practices that could be applied to other types of *development* sites that are or could be rehabilitated to an *agricultural condition*.
- Protocol for addressing issues (lower impact).
  - Establishment of a protocol for farmers to contact the aggregate operator if concerns arise regarding impacts to the *agricultural system* so that operational adjustments may be considered (e.g., adjusting blasting schedules). The protocol could also indicate how issues will be dealt with. This may be part of a community liaison committee that deals with a variety of issues of importance to the community.

3.4 Suite of Measures to Avoid, Minimize and Mitigate Impacts

Table 2 identifies common types of impacts to the *agricultural system* and possible measures to avoid, minimize and mitigate those impacts. Note that the measures identified are not exhaustive and may not be appropriate or feasible in every instance. Measures may fit under more than one type of impact and are intended to be used in combination where possible. Many are best management practices to support a thriving *agricultural system*.

Table 2: Examples of measures to address potential impacts

Potential impacts to the *agricultural system*	Avoid	Minimize	Mitigate
1. Loss or deterioration of agricultural land	• Ensure the use and its scale are justified • Evaluate alternative locations and give preference to locations that avoid *prime agricultural areas* including *specialty crop areas* and other agricultural areas on *rural lands* that are part of the agricultural land base	• Give preference to locations on lower priority agricultural lands • Minimize scale of proposed use • Phase *development* to allow agriculture to continue for as long as possible • Maximize on-site reuse of soil to reduce excess soil leaving project site • Separate the topsoil and subsoil for topsoil salvaging • Minimize soil compaction	• Edge planning (see Appendix E) • For *mineral aggregate operations* that are required to be rehabilitated to an *agricultural condition*, phase the extraction and progressively rehabilitate the site • Education on the need to protect farmland
2. Fragmentation of agricultural operations	• Give preference to locations that do not fragment or split farms and farm operations • Maintain and enhance farmland continuity	• Give preference to locations that minimize fragmentation or splitting of farms and farm operations (e.g., if alignment with property lines cannot be achieved, align with fence lines or field boundaries)	• See #5 traffic and safety for mitigation of road impacts associated with fragmentation • Investment into agricultural improvements benefitting the agricultural area
3. Change in landform, elevations, and slope	• Maintain pre-development site contours	• Minimize change in contours that may impact agriculture	• If required, rehabilitate site to pre-development condition or better
4. *Minimum distance separation formulae* (MDS) conflicts	• Select a location that meets MDS	• OMAFA would generally not support a reduction in MDS setbacks except in limited site-specific circumstances that meet the intent of MDS Guidance (e.g., circumstances that mitigate environmental or public health and safety impacts, or avoid natural or human-made hazards)	• Vegetated buffers • Provide investment in manure management systems that reduce odour potential • OMAFA would generally not support a reduction in MDS setbacks except in limited site-specific circumstances that meet the intent of MDS Guidance (e.g., circumstances that mitigate environmental or public health and safety impacts, or avoid natural or human-made hazards)

Potential impacts to the *agricultural system*	Avoid	Minimize	Mitigate
5. Traffic and safety issues	• Give preference to options that avoid traffic and safety impacts (e.g., ability to access fields and farm properties) • Select haul routes that avoid active agricultural areas (e.g., for aggregate resources)	• Give preference to options with minimal traffic and safety impacts • Design roads to minimize impacts • Situate access points to non-agricultural uses away from farm properties to minimize conflicts and congestion along roads used by farm equipment • Ensure haul routes minimize impacts to agriculture	• If access to farm buildings, fields or transportation routes is affected, provide acceptable alternative routes and access points (e.g., tunnel or over-pass) • Mitigate conflicts between slow-moving farm vehicles and traffic • by providing alternative routes, where possible, considering the purpose of the road, design speed limit, and ability for other vehicles to safely pass. Despite best efforts, farm vehicles may sometimes have to use arterial or collector roads • Ensure road signs are installed in accordance with policies to increase road user awareness of the presence of farm vehicles and equipment • Incorporate the needs of farm vehicles when designing/upgrading roads, intersections, or roundabouts (e.g., road width, surface material, shoulders, detours) • Road safety training for truck drivers going to the site • Road safety awareness campaign for farmers and non-farmers

Potential impacts to the *agricultural system*	Avoid	Minimize	Mitigate
6. Compatibility issues	• Give preference to locations away from agricultural operations	• Give preference to locations that are separated from agricultural areas where possible.	• Best practices for road salt management • Edge planning (see Appendix E) • Warning clauses in *development* agreements (e.g., plans of subdivision resulting from *settlement area* expansions) • Public education to increase agricultural awareness of and promote local agriculture (e.g., notice or disclosure statement to purchasers of land in agricultural areas on *normal farm practices)*
7. Nuisance impacts (e.g., noise, dust, lighting) associated with the non-agricultural use	• Give preference to locations distant from agricultural operations	• Locate non-agricultural operations that may result in adverse impacts as far as possible away from agricultural operations	• Modify hours of operation and practices occurring onsite to reduce impacts on the *agricultural system* • Edge planning (see Appendix E) • Minimize noise, dust and odour conflicts through design and operations (e.g., dust suppression during and after construction)
8. Trespassing, vandalism, pets at large and litter/garbage disposal	• Give preference to locations that are not in or around *prime agricultural areas*	• Give preference to locations that only minimally impact lower priority agricultural lands	• Provide for installation of no trespassing signage on surrounding farm properties • Fencing • Garbage bins • Fines • Commitment to repair damage should it occur • Education on trespass issues including biosecurity risks (based on the *Security from Trespass and Protecting Food Safety Act, 2020*)

Potential impacts to the *agricultural system*	Avoid	Minimize	Mitigate
9. Change to ground or surface water quality or quantity	• Avoid locations that may impact water systems the *agricultural system* depends on • Maintain and enhance water supplies, as well drainage patterns and systems and irrigation infrastructure (e.g., avoid sensitive areas)	• Minimize impermeable surfaces • Repair any damage associated with the non-agricultural use *(*e.g., restore tile drains) • Consult with the local Drainage Superintendent to account for any modifications to drains constructed under the *Drainage Act* and to ensure *Drainage A*ct requirements are met	• Protect water supplies through effective storm water management, protection of wetlands, plantings, etc. • Provide acceptable alternative water supply for livestock watering, sanitation, irrigation, etc. • Seek improvements/ maintenance of existing drains constructed under the *Drainage Act* • For *settlement area* boundary expansions, master servicing plans and stormwater management plans • Have a process in place for reporting and responding to landowner concerns • Implement a water monitoring program
10. Impact to the *agri-food network* (i.e., agricultural infrastructure, services and assets)	• Select locations where impacts to agricultural infrastructure, services and agri-food assets are avoided	• Select locations where impacts are minor or can be mitigated • Restore or reconstruct impacted elements • Improve vehicle and equipment access points	• If a key asset is impacted (e.g., a grain dryer or abattoir), identify whether comparable services are available elsewhere • If yes, outline opportunities to support farmers to use these new locations (e.g., road improvements) • Create a directory of *agri-food network* facilities or an agri-food strategy
11. Community impacts	• Avoid uses that would have negative community impacts such as loss of jobs, businesses, services	• Minimize uses that would have negative community impacts such as loss of jobs, businesses, and services	• Local job recruitment • Retraining • Support agricultural economic development initiatives
12. Cumulative impact to the viability of the *agricultural system* in the area	• Select locations that avoid increasing existing threats to the viability of the *agricultural system*	• Select locations where threats to the viability of the *agricultural system* are only minimally increased	• Mitigate impacts addressed above • Support agricultural economic development initiatives

Appendix A – Checklist of AIA Study Components

This is a summary checklist to help assess whether an AIA is complete. Section 2 of this guidance document elaborates on this checklist. It needs to be explained in the AIA if the authors have consulted with the approval authority and the agricultural community and have concluded that some items in the checklist are not applicable to the application. Note that other studies (e.g., planning, noise, traffic, hydrogeology) may be cross-referenced to avoid duplication.

1. Introduction

- □ Project overview (i.e., what is being proposed by whom and why).
- □ Purpose of study (e.g., explanation of why an AIA is being completed and how requirements are satisfied in the AIA).
- □ Study methods (e.g., how was data collected, and how were impacts identified).
- □ Information sources (e.g., references for data mapping, etc.).
- □ Consultation process (e.g., describe statutory and informal consultation process including outreach and communication methods, interaction with municipal and provincial staff as well as the local community, including agricultural advisory committee, farmers, Indigenous communities, and agri-food businesses, as applicable).
- □ Coordination with other studies/approvals that may address impacts to the *agricultural system* (e.g., noise, traffic, etc.).
- □ Study time period, including the timing of any field investigations.

2. Study Areas

- □ If location alternatives are required,
  - Comparison of study area alternatives in terms of impacts to the *agricultural system*.
  - Selection and rationale for the preferred primary and secondary study area locations, including:
    - why alternative locations were deemed unsuitable;
    - rationale for size and configuration of the primary study area;
    - rationale for chosen buffer distance for secondary study area.
  - Description of the primary and secondary study areas including:
    - identification of study area(s) using map(s) delineating extent of both primary and secondary study areas;
    - land use (e.g., lot and concession, aerial imagery, official plan designations and zoning);
    - transportation (e.g., traffic patterns and volumes, use by farm vehicles, modes);
    - agriculture (e.g., designated *prime agricultural areas;* soil type; CLI; parcel fabric; agricultural uses [i.e., crop types, livestock uses], farm buildings and structures, *agri-food network* elements, their connections and importance; *specialty crop area* potential; slope and topography; hydrology, hydrogeology, and drainage [including use of water for agriculture]);
    - general overview of economic, community and environmental contributions of agriculture;

- Additional description of the study area(s) in terms of *minimum distance separation formulae*, type and condition of farm improvements, other land uses and features, historic severance activity, access points to farm operations and fields, proximity to *settlement areas* and associated considerations.

□ If location alternatives are not required,
- Identification, description, and rationale for primary study area (as per above).
- Identification, description, and rationale for secondary study area (as per above).

□ If land is to be rehabilitated back to an *agricultural condition*, detailed pre-*development* (baseline) information on the primary study area (e.g., soil survey, soil budget, crop yields, drainage, and, in *specialty crop areas*, soil suitability for specialty crops, microclimatic conditions, and the potential to grow specialty crops).

□ Demonstration that the AIA was coordinated with the preparation of supporting materials for ARA approvals, if applicable.

□ Explanation of how consultation influenced the identification of study areas.

3. Assessment of Impacts

□ Consideration of potential impacts and the degree of impact in the absence of measures to avoid, minimize or mitigate impacts, taking into considerations the impacts identified in Table 1 where applicable, plus any additional applicable impacts. Where applicable, assessment of impacts should consider:
- Temporal implications (e.g., how much farmland will be removed from agricultural production, both over short-term and long-term);
- Spatial impacts (e.g., identify differences in impacts such as higher-level impacts in secondary study area or broader regional impacts on the *agri-food network);*
- Cumulative impacts (e.g., are proposed changes contributing to cumulative changes given other non-agricultural uses in the area?).

□ References to where impacts to agriculture are being considered through other studies, while ensuring those studies incorporate an agricultural lens as appropriate.

□ An explanation of how consultation influenced the assessment of impacts.

4. Measures to Address Potential Impacts

□ Recommendations that demonstrate how potential impacts will be avoided, minimized, or mitigated (according to Table 2 as applicable) including, where applicable:
- Recommended implementation plans for each measure to avoid, minimize, and mitigate impacts (e.g., addressing who will implement the measure, how effectiveness will be determined, contingencies, and implementation timing);
- Explanation of how measures are proportional to potential impact or risk;
- Dependencies are clearly identified (e.g., if X measure is implemented, the result will be Y);
- Demonstration that AIA recommendations have been incorporated into the other permits/approvals, where applicable (e.g., *Planning Act* approvals);
- Description of how site will be rehabilitated to an *agricultural condition*, if required, and where applicable any conditions added to site plans for pre-and-post extraction soil surveys;
- An operational plan to outline ongoing maintenance and access impacts (e.g., who can neighbouring landowners contact about issues?).

□ Summary of net impacts (i.e., impacts that will still be experienced after measures to address potential impacts are identified) are documented, along with their magnitude and extent. □ Description of how consultation influenced the identification of measures to address potential impacts.
5. Recommendations and Conclusions
□ Explanation of how the objectives of the AIA have been fulfilled (i.e., how provincial and municipal requirements/expectations are satisfied). □ Summary of key recommendations that will be implemented to address adverse impacts to the *agricultural system*. If applicable, this section should include: • Summary of net impacts; • Recommended implementation plan(s); • Monitoring plan and performance measures pertaining to sites to be rehabilitated to an *agricultural condition;* and • Overview of how recommendations will be incorporated into relevant approvals (e.g., *Planning Act* approvals, ARA site plan, etc.).
Appendices
□ Curricula vitae of the study team. Listing of study authors and contributors, as applicable, and their qualifications and experience, demonstrating knowledge of Ontario agriculture. □ References for all background information sources. □ Data collected from fieldwork (e.g., soil survey). □ *MDS formulae* calculation forms (personal information can be removed). □ Record of consultation (with personal information redacted).

Appendix B – AIA Resources and Additional Information

This list of sources of information may not be complete or applicable to all proposals. Contact OMAFA staff for additional information or resources, if needed.

Agricultural Land Base

- Ag Maps (interactive "make a map" application with layers on drainage, soil, CLI, etc.) (OMAFA)
- Agricultural System Portal (OMAFA)
- Annual crop inventory mapping (Agriculture and Agri-Food Canada)
- Ontario GeoHub – topography/elevation, orthoimagery, soil, tile and constructed drainage, controlled drainage, seed zones, natural heritage features (Government of Ontario)
- Ontario Soil Survey reports (Government of Canada)
- Specialty crop area mapping and information – Greenbelt Plan, Grey County Official Plan, County of Lambton Official Plan
- Topographic mapping with effective user scale of 1:10,000 or larger where needed (MNR)

Agri-Food Network

- Agricultural System Portal primarily focused on the GGH but many data layers extend beyond the GGH (OMAFA)
- Agri-Food Initiatives Ontario Directory (Ontario Federation of Agriculture)
- ConnectON asset mapping database - municipalities contributing data have access (Golden Horseshoe Food & Farming Alliance)
- Resources to Support Agriculture in your Community – e.g., economic development strategies and plans (Ontario Federation of Agriculture)

Edge Planning

- Edge Planning Report: A Review of Implemented Practices to Address Planning on the Rural-Urban Fringe (Peel Region)
- Guide to Edge Planning; Promoting Compatibility Along Agricultural-Urban Edges (British Columbia Ministry of Agriculture and Food)
- Vegetative Buffers for Intensive Agricultural Operations in British Columbia (British Columbia Ministry of Agriculture and Food)
- Planning Subdivisions near Agriculture (British Columbia Ministry of Agriculture and Food and Provincial Agricultural Land Commission)
- Subdivision Near Agriculture, a Guide for Approving Officers (British Columbia Ministry of Agriculture and Food)
- Urban-Rural Edge Area Nuisance Mitigation Strategies in Kings County, Nova Scotia (McGinnis)

Environmental Assessment

- General Environmental Assessment information (MECP)

Excess Soil

- Handling Excess Soil (MECP's general excess soil webpage, which includes O. Reg. 406/19: On-Site and Excess Soil Management and additional resources) (MECP)
- Management of Excess Soil - A Guide for Best Management Practices (MECP)
- Importation of Soil onto Agricultural Land (OMAFA)

Hydrocarbon Pipelines and Facilities

- *Canadian Environmental Assessment Act* (Canada Energy Regulator process for federal pipelines)
- Environmental Guidelines for the Location, Construction and Operation of Hydrocarbon Pipelines and Facilities in Ontario (Ontario Energy Board)

Mineral Aggregate Resources

- Aggregates and Agriculture Municipal Toolkit (Wayne Caldwell, University of Guelph)
- Aggregate Resources of Ontario Site Plan Standards (MNR)
- Aggregate Resources of Ontario Technical Reports and Information Standards (MNR)
- Aggregate Resources of Ontario Amendment Standards (MNR)
- Aggregate Resources of Ontario Circulation Standards (MNR)
- Aggregate resources in Ontario – how to apply to operate a pit or quarry (MNR)
- Agriculture and the Aggregate Industry (TOARC)
- Controlled Blasting at Quarries (OSSGA)
- From Aggregates to Agriculture (TOARC)
- The Pits and Quarries Online Tool (MNR)
- Rehabilitation of Pits and Quarries (OSSGA)
- Rehabilitation of Sand and Gravel Pits for Fruit Production in Ontario (MNR)
- The State of the Aggregate Resource in Ontario Study, Consolidated Reports (MNR)
- Study of Aggregate Site Rehabilitation in Ontario – 1971-2009, Part 1 (OSSGA)
- Study of Aggregate Site Rehabilitation in Ontario, Bruce County, Dufferin County, Grey County & Simcoe County, 2014, Part II Addendum (OSSGA)
- Bradshaw, A. & N. Coppin. (1982). A Guide to Quarry Reclamation.
- Bransden, B.E. (1991). Soil protection as a component of gravel raising. Soil use and management, 7(3), pp.139-144.
- Larney, F.J. and Angers, D.A. (2012). The role of organic amendments in soil reclamation: A review. Canadian Journal of Soil Science, 92(1), pp.19-38.

- McLellan, A.G. (1985). Government regulatory control of surface mining operations—new performance guideline models for progressive rehabilitation. Landscape Planning, 12(1), pp.15-28.
- Ohsowski, B.M., Klironomos, J.N., Dunfield, K.E. and Hart, M.M. (2012). The potential of soil amendments for restoring severely disturbed grasslands. Applied Soil Ecology, 60, pp.77-83.

Municipal Resources

- Agri-tourism and farm fresh materials (e.g., agricultural economic development plans and strategies, promotional materials)
- Land evaluation and area review (LEAR) studies
- Mapping of public works (e.g., treatment plants) or legal instruments such as utility easements and rights-of-ways
- Municipal Agricultural Advisory Committee
- Municipal Property Assessment Corporation parcel mapping, tax class, property ownership/tenancy information for farm parcels, identification of farm parcel linkages (e.g., multiple parcels owned or rented by one farm operator), identification of the headquarters/home base of farm operations based on mailing address, etc.
- Municipal by-laws such as noise and topsoil
- Official plans and land use schedules
    - Agricultural land base, *prime agricultural areas* including *specialty crop areas*
    - Non-agricultural land uses
- Road network, other forms of transportation, transportation studies
- Source protection plans and water well records (public and private)
- Growing Agriculture in your Community (Ontario Federation of Agriculture)
- Watershed and subwatershed plans
- Zoning by-laws

OMAFA Guidance Material / Fact Sheets / Resources

- Agricultural System
- Agronomy Guide to Field Crops
- Canada Land Inventory (Use of soil and CLI information for agricultural land use planning in Ontario)
- Economic Development Tools
- GIS StoryMap on evaluating alternative locations for non-agricultural uses
- Guidelines for Detailed Soil Surveys
- Minimum Distance Separation (MDS) Formulae and Guidelines
- Nutrient Management
- Permitted Uses in Prime Agricultural Areas

- Rural and North: Information about Northern Ontario, agriculture and local food
- Soil Capability for agriculture in Ontario

Provincial Legislation, Policy and Supporting Information

- Environmental land use planning guides, e.g., Land Use and Compatibility Guidelines (MECP)
- Ontario Provincial Standards (MTO)
- Niagara Escarpment Plan (NEC)
- Provincial land use plans and policy documents led by MMAH (e.g., PPS, Greenbelt Plan, ORMCP)
- *Farming and Food Production Protection Act* (OMAFA)
- *Security from Trespass and Protecting Food Safety Act* (OMAFA)
- Provincial legislation e.g., ARA*, EA Act*, *Planning Act, Clean Water Act* (Ontario government)

Qualified Personnel

- Certified Crop Advisors (CCA)
- Ontario Professional Planners Institute Consultant Directory (OPPI)
- Registered Agrologist Member Search (OIA)

Statistics

- Analyst Tool (includes input/ output data) (OMAFA)
- OMAFA's Agricultural and Business County Profiles (OMAFA)
- Statistics Canada's agricultural census and other statistics to characterize agriculture, current and historical (OMAFA)

Other

- Technical reports prepared to support the application (e.g., planning, hydrological, hydrogeological, noise, vibration, blasting, odour, dust, traffic, economic, social, cultural, etc.)

Appendix C – Case Study on Avoiding, Minimizing and Mitigating Impacts

Please refer to the AIA guidance sections noted below for the complete AIA process. Highlights are provided below for illustration purposes only.

Simplified Case Study

A single-tier municipality has found that it needs to expand its *settlement area* by 200 hectares. To do so, the municipality requires an AIA to be completed.

Pre-consultation would occur to provide an opportunity for the municipality to obtain input into AIA scope, content, study areas, coordination with other studies, consultation plan and timelines.

Amongst other things, the AIA would determine the best location for the *settlement area* boundary expansion to avoid, and where avoidance is not possible, minimize and mitigate impacts to the *agricultural system*.

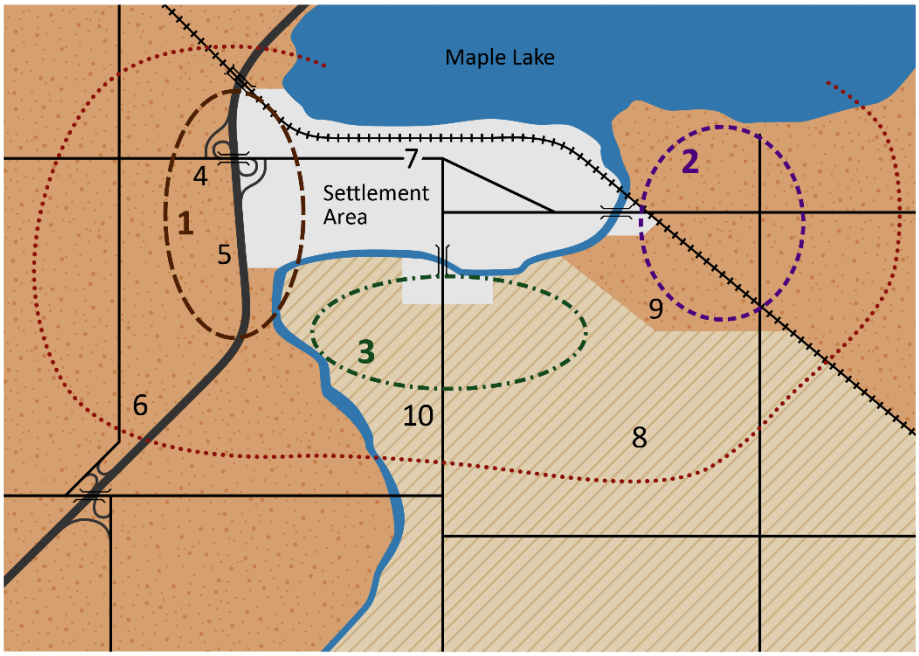
Evaluation of Alternative Locations

Local Knowledge and Input: Farmers/landowners and other agricultural representatives could provide appropriate information and data to help describe agriculture in the area

- **1. Primary Study Area** Prime Agricultural Areas
- **2. Primary Study Area** Prime Agricultural Areas
- **3. Primary Study Area** Rural Lands
- Secondary study area
- prime agricultural areas
- rural lands
- existing settlement area

Elements of the agri-food network:

4. farm implement dealership
5. cold storage and distribution facility
6. food processor
7. food processor
8. abattoir
9. grain dryer
10. veterinary clinic



Identification of Primary Study Areas for Settlement Area Boundary Expansion

In this case study, the *settlement area* boundary expansion could potentially occur in three different directions: west (1), east (2) or south (3) of the existing *settlement area*. Study areas in each direction would be identified for the evaluation of location alternatives. They could initially encompass more than the required 200 hectares with the objective of scaling back the study areas as more becomes known about the areas and opportunities to avoid impacts to the *agricultural system*. Secondary study areas would also be identified so that consideration could be given to lands that may be impacted by the proposed *settlement area* boundary expansion.

To compare location alternatives, the study areas would be examined in terms of:

- Whether area is designated *specialty crop area* or *prime agricultural area*.
- The quantity and quality of farmland based on area in different CLI classes (including dominant, secondary, and tertiary soils).
- The number of farms and investments made into farm infrastructure (e.g., storage facilities, and farm types - crop types and type of livestock operations).
- Whether fragmentation of the agricultural land base would result (considering, for example, area in agricultural production, presence of non-agricultural uses, lot sizes).
- The presence and significance of *agri-food network* elements to agriculture in the local area and beyond.
- Whether the new or expanded *settlement area* options comply with the *minimum distance separation formulae* and/or limit future agricultural expansion opportunities.

Ideally, input would be provided by the agricultural advisory committee, where one exists, local farm organizations, and municipal staff.

Below are simplified descriptions of *agricultural uses* and the *agri-food network* in the three study areas to illustrate the type of information to consider.

Area #1 (West)

- Area entirely designated *prime agricultural area* in the official plan, with 100% CLI classes 1-3 lands.
- 30 farms, predominantly in vegetable production.
- Agricultural land base is largely continuous but the highway on the east side makes movement of farm vehicles challenging.
- Area has a long history of vegetable production, a network of farmers and agri-food supply chain including a cold storage and distribution facility serving the region, farm implement dealership serving the local area, and a food processor that utilizes vegetables grown in the area.

Area #2 (East)

- Area entirely designated *prime agricultural area* with 100% CLI classes 1-3 lands.
- 15 farms: land area is 70% in field crops and 30% used for vegetable production.
- Large investments made into drainage infrastructure for both field crop and vegetable fields.
- The vegetable farms send vegetables for processing to the two local food processors.
- While the area is impacted by recreational and residential uses along the waterfront, the rest of the area is mostly in agriculture.
- The grain dryer located to the south serves a large area, beyond the municipality. There are no alternative grain dryers within the service area.

Area #3 (South)

- Area is entirely designated *rural lands* but pockets of CLI 1-3 land exist, interspersed amongst the classes 4 and 5 lands.
- Eight livestock farms, five of which have their headquarters within the area, including the home farm, manure storage, barns, and other outbuildings.
- Hay is the predominant crop.
- The *agri-food network* includes a small abattoir and veterinary clinic, both serving the local area.

Once the study areas are identified and described, they would be scaled down to match the area required for the non-agricultural use, which in this case, is 200 hectares.

Comparison of location alternatives:

- In this case study*, settlement area* expansion can't avoid the agricultural land base but can avoid *prime agricultural areas*. The PPS gives priority for protection to *prime agricultural areas*. From this perspective, Area #3 would be preferred. However, *minimum distance separation formulae* setbacks would need to be an important consideration when identifying the primary study area. In addition, it would be important to avoid *agri-food network* elements such as the grain dryer, especially because of its substantial service area and importance to the regional supply chain.
- Some livestock operations could be displaced to accommodate the *development* and nearby agricultural areas (secondary study area) may be impacted by fragmentation of agricultural lands and operations, traffic and safety issues, and potential conflicts over nuisance issues (e.g., odour).

The impact analysis of the preferred primary study area would be more comprehensive, considering land use, hydrology, hydrogeology, and drainage, as well as economic, community and environmental considerations, not to mention ability to provide servicing in an efficient manner and opportunity to create complete communities.

Then measures to avoid, minimize, and mitigate impacts would be identified. In this case study, measures could include:

- Staging the *development* such that *agricultural uses* would be more likely to continue for longer than they would without staging.
- Edge planning including subdivision design, setbacks, landscaping, and fencing.
- Roads used by farmers designed with their needs in mind, including cautionary signage and speed limits, as well as avoidance of curbs.
- Education of the community on *normal farm practices*.

Appendix D – Rehabilitation of Land to an Agricultural Condition

This appendix provides recommended steps and best practices where land is to be returned to an *agricultural condition* (as defined in the PPS) at the end of the life of the non-agricultural use. As stressed throughout this guidance document, avoiding, and minimizing use of *prime agricultural areas* for non-agricultural uses are priorities, where possible and supported by provincial land use policies. Mitigation is necessary where avoidance is not achievable or required. Rehabilitation of land back to an *agricultural condition* is a form of mitigation.

While focused on *mineral aggregate operations*, the steps and best practices outlined in this appendix can also be adapted to other non-agricultural uses in the *prime agricultural area* that have reached the end of their useful life (e.g., golf course, renewable energy project, landfill site), given that these limited non-agricultural uses are intended to remain part of the *prime agricultural area*. In addition, the information in this appendix could be useful for projects that only temporarily disturb agricultural areas (e.g., pipelines).

The rehabilitation steps described below are commonly applicable; however, variations may be warranted based on site specific considerations from pre-*development* investigations, ongoing monitoring, and rehabilitation objectives.

Please refer to the applicable legislation and policies (e.g., *Planning Act*, ARA and provincial plans) to determine if land is required to return to *an agricultural condition*. Given that *mineral aggregate operations* are interim uses, the PPS for example, requires that sites in *prime agricultural areas*, on *prime agricultural land*, be rehabilitated to an *agricultural condition*, subject to certain exceptions.

A 10-step summary of practices for successful rehabilitation to an *agricultural condition* for aggregate extraction sites is provided below. Additional detail follows on key aspects of rehabilitation. Some of the practices and steps discussed may represent provincial standards under the ARA and some are best management practices. The practices and steps to rehabilitate a *mineral aggregate operation* to an *agricultural condition* should be included in the ARA site plan.

10-Step Summary of Best Management Practices for Successful Rehabilitation to an *Agricultural Condition* of Aggregate Extraction Sites

Step 1: Complete your AIA

- Document soil and other baseline conditions and identify measures to avoid, minimize and mitigate impacts to the *agricultural system*.
- Where soil surveys are required in primary study areas to support the AIA, proponents must adhere to the Guidelines for Detailed Soil Surveys in Ontario for Agricultural Land Use Planning document.
- Pre-extraction soil sampling is needed to ensure baseline conditions are documented to support post-extraction rehabilitation.

Step 2: Planning and Progressive Rehabilitation

- Implement recommendations from the AIA in the ARA site plan (e.g., establish a monitoring program to support rehabilitation).
- Determine directions of extraction, depths and benching and start/end points based on multiple site-specific considerations. Account for required processing and accessory use areas.
- Determine topsoil, subsoil, and overburden availability (based on site-specific AIA) through preparation of a soil budget. Determine perimeter berm requirements (e.g., height, length, slope/form & footprint) and timing.
- Develop plan for final landform: slopes, floor elevations and grades, and outlets for surface waters and air flow.
- Work out phases of extraction and determine area to be rehabilitated annually. Identify whether the soil resource volumes required for proposed annual rehabilitation are available, and if not, provide for importation of soil for rehabilitation. Understand the sources of soil material and movements to minimize storage and maximize direct movement for use in progressive rehabilitation to an *agricultural condition*, following Ontario's excess soil regulation and O. Reg. 244/97 under the *Aggregate Resources Act* for the management of excess soil during this and other steps, if applicable. In some cases, perimeter berms are needed for the life of the pit or quarry. Excess soil could be used for these berms rather than better quality soil such as topsoil, provided that the reuse requirements in the excess soil regulation are met. In particular, the excess soil regulation has reuse requirements including that the quality and quantity of excess soil being brought to the reuse site must align with the intended beneficial use.

Step 3: Strip and Handle Soil Resources Separately

- Know the depths of topsoil, subsoil, and overburden (provided in soil budget prepared in the AIA for your application).
- Carefully monitor depths of soil being removed during stripping.
- Maximize volume of topsoil and subsoil salvaged without significantly mixing.
- Strip soils only during dry conditions (not saturated).
- Soil removal during frozen conditions is not recommended.
- Minimize area being stripped; don't exceed area to be extracted in one operational season, if possible. Strip area well back from anticipated excavation faces.
- Establish a vegetation cover well in advance of stripping to minimize erosion, loss of important soil resources, and degradation of soil structure and to increase soil organic matter content. If the lands are in corn production, for example, and some or all of the area is to be stripped the following year, planting a cover crop after the corn is harvested would help to minimize erosion and add organic matter to the soil like green manure.
- Remove woody vegetation (roots, stumps, branches, etc.), stone piles, fencing and any deleterious materials prior to stripping.
- If possible, minimize use of herbicides and pesticides in the years prior to stripping.

Step 4: Retain all Topsoil and Subsoil for Rehabilitation

- Avoid or minimize soil storage by moving stripped soil directly to rehabilitation areas. Develop progressive rehabilitation plans to avoid substantial storage volumes and duration, where possible.
- To preserve as much topsoil as possible for rehabilitation, consider using subsoil and parent material as much as possible for long-term perimeter berming.

- Create lower profile (e.g., 1 metre) topsoil stockpiles of short duration, when possible, to help preserve favourable biologic conditions beneficial for plant growth. Staking or silt fencing could be used to identify and protect temporary topsoil storage areas.
- Implement erosion protection including establishment of vegetation, silt fencing, irrigation and/or mulch.

Step 5: Create an Appropriate Post Extraction Landform

- Non-agricultural side slopes should reflect required slopes (pits 3:1; quarries 2:1) or steeper (if justified and approved to minimize side slope area) or reduced and incorporated into rehabilitated agricultural areas:
    - For forage crops (hay & pasture) maximum grade for side slopes should not exceed 15:1 (6.7%).
    - For tree fruit and grape production maximum side slopes should not exceed 8.3:1 (12%) and 16.6:1 (6%), respectively.
- Reduce use of soil resources on non-agricultural side slopes, while still ensuring a healthy and vigorous vegetative cover can be established (e.g., 15 cm topsoil for a grass/legume mix).
- Grade and contour floor with no irregular undulations or depressions.
- Grade floor slope to promote surface runoff and cold air drainage. Slopes of 50:1 (2%) to 20:1 (5%) are preferred.
- To the extent possible, create large regularly shaped fields.
- In addition to these best practices, the depth of extraction will be determined based on the geological formation and the depth of the water table.

Step 6: Address Soil Compaction – Minimize and Remediate

- Following grading and contouring, alleviate compaction on the floor by ripping or other means prior to replacing subsoil.
- Rip side slopes horizontally to alleviate compaction as required.
- Minimize compaction by handling soils under dry conditions using wide track equipment or other equipment designed to minimize compaction and minimize travel over soils and rehabilitated areas to the extent possible.
- Remediate soil compaction after spreading each soil layer. Limit depth of ripping to avoid mixing of materials, i.e., do not rip below the upper most (latest applied) soil horizon.

Step 7: Replace Soil Separately and in Reverse Order

- Replace and handle topsoil, subsoil and overburden separately.
- Handle when dry (non-saturated).
- Pay attention to soil depths being replaced on slopes versus the floor and ensure balance between total soils available and required.

Step 8: Condition the Soil

- Remove stones, debris and deleterious materials.
- Do final grading and prepare seed bed.
- Analyze fertility and fertilize.
- Consider soil amendments to increase organic matter.

Step 9: Establish Cover Crops

- Establish grass-legume cover crop as part of the soil conditioning phase or other crops that serve the same function. Maintain up to five years for best results.
- At the end of the conditioning phase, plough vegetative cover under as a green manure.
- Overseed if persistence of certain species diminishes.
- Eliminate areas dominated by weed growth and reseed grass-legume mix.

Step 10: Monitor and Manage

- Monitor and report on the relevant stages of the rehabilitation process, as outlined in the monitoring program, to determine the effectiveness of returning the site to an *agricultural condition*.
- Have soil tested by a qualified professional and implement recommendations from the monitoring report to improve rehabilitation (e.g., conditioning and plantings).
- As appropriate, incorporated findings of the monitoring report into the annual compliance reporting required by the ARA.
- Complete final report that documents how returning the site to an *agricultural condition* has been achieved.

Development of the Site Plan

The site plan process involves consideration of multiple objectives and findings from technical studies completed as part of ARA approvals. One such objective is to mitigate agricultural impacts. Based on the existing *agricultural condition*, plans are made for soil management, extraction activities, conservation of land and rehabilitation. The site plan covers both progressive and final rehabilitation, the objective being to ensure orderly extraction and restoration according to a comprehensive plan. The operator uses the site plan to determine how best to use machinery and labour to maximize extraction and return the site to an *agricultural condition*.

Progressive rehabilitation addresses:

- The sequence and direction of progressive rehabilitation to enable agriculture to continue for as long as possible;
- Details on how the overburden and topsoil will be used to facilitate progressive and final rehabilitation, including a soil budget to demonstrate there is enough materials stored on site to be used in proposed rehabilitation;
- The location, design, and type of vegetation (e.g., grasses, legumes, shrubs and trees, etc.) that will be established on the site;
- Details on how the side slopes and excavation floor elevations and grades will be established;
- If imported materials are proposed to be used to achieve objectives and maximize agricultural opportunities, details on its sources, quality and use to achieve rehabilitation requirements. If possible, these should be described in the site plan; and
- How rehabilitation will be monitored.

Final rehabilitation addresses:

- If proposed to improve rehabilitation to agriculture, details on the importation of topsoil or inert material;
- Details on how the final slopes will be established on all excavation faces and the pit or quarry floor.

- The location, design, and type of vegetation (e.g., grasses, legumes, shrubs and trees, etc.) that will be established on the site during final rehabilitation;
- Any building(s) or structure(s) to remain on the site;
- Any internal haul roads that will remain on the site;
- Final surface water drainage and drainage facilities on the site; and
- Final contours of the rehabilitated areas of the site illustrated by a one or two metre contour interval, expressed as metres above mean sea level.

Soil Stripping

In most cases, all topsoil and subsoil must be retained on site and used for rehabilitation purposes. There may be limited exceptions where there are surplus soils that could be removed from the site which could be dealt with as exceptions through site plan variations. If a variance is granted, it is preferable for topsoil deemed surplus to be used to support agriculture or off-site rehabilitation given it is a valuable, finite resource.

Removing and replacing the topsoil is the most important aspect of the overall success of rehabilitation. Maintaining the topsoil's organic content, fertility and structural integrity is important to the successful restoration of soil capability. The appropriate use of subsoil to re-establish a soil profile is also recommended whenever feasible as it is an important soil resource for plant growth and will contribute to the success of rehabilitation efforts.

The depths of the topsoil and subsoil to be stripped across the site should be known prior to the start of the stripping process. This information, as well as detailed descriptions of the important soil characteristics and an overall soil budget developed to determine the volumes available for rehabilitation, should be included in the pre-extraction soil investigations and as part of documenting the *agricultural condition*. Soil profile and depth information need to be referred to in order to properly plan this stage of operations.

Topsoil, subsoil and overburden must be stripped and handled separately where possible. The depth and uniformity of the major soil horizons (A, B and C) can vary significantly across a site due to changes in soil type, topography, and cultivation practices. The depth of soils being removed should be carefully monitored and adjusted based on variability across the area being stripped. The objective is to maximize the volumes of topsoil and subsoil that are retained for rehabilitation without significantly mixing the two resources together or with the underlying parent material.

Soil layers are usually readily identifiable. The darker topsoil usually corresponds to the cultivated portion of the soil profile on agricultural lands. Subsoil is the weathered portion of the soil profile lying below the topsoil and above the unweathered parent material or overburden. Where the soil is derived from or includes significant quantities of limestone, dolostone and shale material, the subsoil and parent material can be easily distinguished from each other by applying a weak solution of hydrochloric acid (HCl) to the soil. If no reaction is observed, it is likely that the material is subsoil. If a reaction is observed, the material is likely to be the unweathered parent material or overburden.

Other pedological characteristics, such as changes to soil texture, soil structure, density, colour, coarse fragment content, will also help distinguish between the subsoil from overburden. In steeply sloping areas with a history of annual cultivation, erosion may substantially modify the soil horizons. In some cases, the B horizon may be absent with cultivation (ploughing) resulting in mixing of the topsoil with the calcareous C horizon. In such cases, care should be taken to avoid mixing this topsoil with topsoil from non-eroded locations. Topsoil from eroded areas may be better suited to storage in perimeter berms or for use on side slopes.

Heavy equipment that is often required to strip the soil resources can damage soil structure as it is moved and as a result of compaction and rutting. The soils become more susceptible to compaction and rutting when they are at or near the saturation point. Soil materials should only be handled under dry (not saturated) conditions and a wet weather shutdown procedure should be put in place to deal with soil moisture conditions during stripping operations.

In some cases, stripping may occur when the soil is frozen. This is generally not recommended as it becomes more difficult to strip the topsoil from the subsoil. The potential for mixing of topsoil and subsoil increases, which is undesirable.

The areas being stripped should be small and not exceed the area that would be extracted in an operational season. This will help to retain as much land in agricultural production as possible, reducing the area disturbed and exposed to wind and water erosion, minimizing the loss of biological activity, and decreasing the need for interim storage and double handling. The area being stripped should be large enough that there will be no interference with the excavation and operation of the aggregate operation. A recommended best management practice for a suitable setback from the extraction face (e.g., 5 m) will also minimize the potential for the loss or degradation of the important soil resources.

Vegetation cover over the area to be stripped should be considered. Where the lands to be stripped are in a perennial cover (such as a hay field) the area may need to be mowed and the vegetation removed prior to stripping and incorporating the sod into the topsoil.

In cases where the soil is bare or crop residue is minimal (e.g., a harvested corn field), planting the area with a perennial cover crop well in advance of stripping may be beneficial. It will add organic matter to the soil, improve soil structure, minimize the potential for erosion, and in some cases, improve the soil moisture conditions through evapotranspiration.

Where stripping incorporates wooded areas and hedgerows, these areas should be dug up to clear away large woody vegetation prior to stripping. Stones large enough to interfere with cultivation should also be removed from the site prior to and during stripping. Roots, stumps, and stones encountered during stripping should be removed from the topsoil that is stockpiled or used directly in progressive rehabilitation. The woody material and stones should be removed from the areas that are to be rehabilitated to an *agricultural condition*. The use of herbicides and pesticides should be minimized and only considered in specific circumstance (e.g., noxious weed control).

Soil Storage

Soils are typically stored in stockpiles or in perimeter berms. It is a best practice to avoid or minimize soil storage by moving stripped soil directly to areas being rehabilitated. However, this is not always possible for all stages of the operation, and the need for some soil storage may be inevitable for most operations. By employing progressive rehabilitation procedures, operators will be able to avoid substantial storage of topsoil and minimize storage of subsoil.

Soil storage affects soil quality particularly for topsoil through the degradation of soil structure as a result of compaction and a reduction in the soil fertility through the loss of organic matter and by creating anaerobic conditions that are not favourable for beneficial aerobic microbial activity. There is also a greater chance of losing valuable soil as a result of erosion and transportation of the soil to and from stockpiles. As a result, soil stored for long periods will require longer to recover and be productive.

Soil stockpiles that are lower in profile and less compacted by the pressure of the weight of the soil are more favourable storage conditions. Research suggests that stockpile heights of a metre or less will minimize the potential negative impacts associated with soil storage. However, there may be practical limitations for such a stockpile height due to space restrictions and perimeter berm height requirements for sound attenuation. In such cases, an operator should try to minimize the time the material is placed in storage. Whenever feasible, berms required for long-term purposes should be constructed of overburden materials, with vegetation to prevent erosion.

Stockpiles and berms should be immediately treated for erosion protection. Silt fencing or equivalent erosion protection measures should be used along the base of the stockpile/berm to minimize the loss of the material by erosion. Materials that are to be stored for a month or more during the growing season should be vegetated with a suitable seed mix to stabilize the soil and control weed growth. Hydroseeding may be used with an appropriate binder. Irrigating the stockpile during the heat of summer may be necessary to promote germination and seedling growth.

Material placed in stockpiles and berms outside of the growing season should be stabilized by applying a straw mulch with a tackifier, or other methods to protect the soil from erosion until it can be seeded in the spring.

Site Preparation and Landform

Once the topsoil, subsoil and, in some cases, overburden are stripped from the surface and aggregate material has been extracted to the approved depth/limit(s), the progressive rehabilitation process can be initiated as the new landform begins to take shape. The landform will consist of two main components: perimeter side slopes and the base or floor of the aggregate operation. The latter will constitute most of the site and in many cases, the only area that will be rehabilitated to an *agricultural condition*. As noted, more information on perimeter side slopes and base or floor of pit operations or quarries is available in the ARA or associated regulations, standards, and policies.

Specialty Crop Areas

Additional considerations are required for aggregate applications proposed in *specialty crop areas*. The landform created should minimize obstacles to the down slope flow, eliminate or avoid any depressions where cold air can pond on the site, and avoid across-slope constrictions along the flow pathway. There should be a pathway for cold air to drain from the site. The rehabilitated pit or quarry floor and surrounding terrain should be graded to achieve air drainage benefits.

For orchard purposes, slopes in the range of 10:1 (10%) are generally the maximum that is satisfactory for mechanized harvesting. The desirability of grading rehabilitated slopes to 10:1 (10%) must be assessed against site characteristics. For grape production, the mechanized equipment used to harvest most grapes crops in Ontario restrict slope grades to approximately 6% (17:1).

It is important to verify any minimum requirements for soil above the water table for fruit tree production. Two metres is recommended for optimal production.

Hydrogeology

The provincial standards for above water aggregate operations need to be confirmed and implemented to limit the depth of extraction appropriately. Groundwater tables fluctuate depending on precipitation and are generally established based on a monitored seasonally high condition considering long-term precipitation trends.

Separation between the water table and rehabilitated agricultural land will be additionally increased by the amount of overburden, subsoil and topsoil that is replaced on top of the pit or quarry floor. By following the provincial standards which restricts the depth of extraction and by replacing overburden and soils on the pit or quarry floor, an adequate separation will be established between rehabilitated agricultural land and the water table.

The hydrogeological report prepared for the aggregate operation should be reviewed to understand the expected extent of seasonal fluctuation and duration of the water table. This will provide the information necessary to determine the thickness and volume of material needed to achieve the required buffer.

Minimizing and Alleviating Compaction

Compaction is a common concern in agricultural rehabilitation given the amount and type of heavy equipment operating on the floor during the operation as well as the equipment used in the rehabilitation itself. Compacted soil layers can restrict drainage and root penetration, impeding agricultural operations and soil capability.

It is important to handle (strip and replace) soils under dry conditions to reduce the extent of compaction. When soil is in a dry condition it can sustain higher axle loads and higher contact pressures with fewer adverse effects than when the soils are at or above field capacity (i.e., the amount of water a certain volume of soil can hold).

Additionally, it is recommended that wide track equipment be used, as opposed to rubber-tired vehicles, as the weight of the vehicle is dispersed more evenly across the soil limiting the amount of compaction. The pressure (pascal/pounds per square inch) exerted on the soil by tracked vehicles is often less than the pressure exerted by tired vehicles. When it is necessary to use vehicles with tires (e.g., when subsoiling), the following options are recommended:

- Reduce tire pressure using manufacturer tire charts. Low speed operation is preferred as this will allow for lower tire pressures;
- Use high volume tires suitable for the tire load of the equipment to allow for lower air pressure and low speed operations; and
- Use direct-axle dual wheels.

As a best practice, the amount of equipment moving over the site should be minimized as much as possible. Traffic should be restricted to temporary access ways through the rehabilitation area.

In most rehabilitation projects, soils will be compacted through the handling and replacement process. In some operations, the overburden will be significantly compacted due to the movement, transport and stockpiling of aggregate resources upon which the subsoil and topsoil are to be placed. Remediation is a straightforward mechanical process that needs to be completed in stages. Where possible, each of the primary soil horizons (A, B and C) need to be treated individually. Methods to reduce compaction include the use of equipment referred to as rippers, subsoilers, paraploughs or deep tillage cultivators. The effectiveness of efforts to minimize compaction depends on several factors including the soil's moisture content, texture, stoniness, and bulk density (i.e., the extent of compaction), along with the type and configuration of the equipment used, the soil conditions and the speed of which the equipment is pulled through the soil.

No single piece of equipment or specific configuration works best to alleviate compaction in all situations or soil conditions. On a site-by-site basis, some trial and error may be required before an effective method and choice of equipment is settled upon and some adjustments will likely be required throughout the rehabilitation process. The equipment manufacturers' specifications should be confirmed to determine the appropriate speed at which the subsoiler or similar implement should be pulled to maximize its effectiveness.

As with handling of soil resources, alleviating compaction should be done under relatively dry conditions. If the soil is too wet, the shanks smear the sides of the soil (particularly in finer textured soils) and will not relieve compaction. Conversely, under very dry conditions and for certain soil types, pulling a subsoiler through the soil can be very difficult, and create large clods that are difficult to breakup.

Prior to the placement of subsoil on the overburden, compaction in the overburden should be relieved. Shank spacing should range between 0.75 to 1 m. The overburden should be ripped diagonally across the site and if necessary repeated in the opposite direction to form a cross hatch. The shanks should reach depths of up to 0.6 m (2 ft). Large stones in the overburden that may interfere with ripping should be removed prior to ripping and once again afterwards. Levelling or smoothing the surface of the soil to some extent prior to placing the next layer of soil is a good practice.

Following replacement of subsoil, the floor should be ripped or deep chisel plowed using a multi-shank subsoiler to a maximum depth equal to the depth of the subsoil. Ripping should not extend to the depth of the overburden to avoid mixing of the two materials. It is important that compaction be relieved in this horizon to promote root penetration, infiltration, and development of soil structure. The subsoil should be frequently probed to ensure that compaction is relieved and to identify areas where further treatment is necessary or whether changes to the equipment or configuration are necessary. The subsoil surface should be worked to break up large lumps, roughly level any ridges and ensure there are no depressions. Any large stones should also be removed at this time.

Once the subsoil has been prepared, the topsoil can be reapplied. As with soil removal, it is important to avoid mixing the topsoil layer and underlying subsoil. Generally, compaction in the topsoil can be alleviated with the use of a chisel plough or similar piece of equipment. To avoid compacting the subsoil, it is important not to be overly concerned with breaking up compaction in the topsoil unless it is significant. Any residual compaction in the topsoil will be further alleviated because of seed bed preparation, plant roots and normal biological activity, and through the freeze-thaw process. Activity in the topsoil layer is much more dynamic than in the underlying soil horizons and is therefore better able to overcome compaction during the soil conditioning phase of the rehabilitation process.

Soil Replacement

Topsoil, subsoil and where necessary, overburden, should be handled and replaced in the opposite sequence in which they were stripped. When replacing these soil resources, the same provisions to minimize and alleviate damage from handling and compaction apply (e.g., handle dry soils, use wide tracked equipment, minimize travel, etc.).

It is necessary to pay attention to the soil depths being spread and relating this back to the pre-extraction soil depths and soil budget provided in the AIA to ensure that the right balance is achieved. Spreading soil too deeply in the early stages of progressive rehabilitation will result in shortfalls of available soils during the final stages.

When assessing the volumes of the soil resources and the redistribution of resources to areas to be rehabilitated, the operator should aim for a 90% recovery rate of materials. An operator can expect a certain amount of loss of topsoil and subsoil because of:

- erosion (wind and water) of stockpiled material and where soil remains in an unvegetated state;
- soil mixing during the stripping process; and
- incomplete recovery of materials from storage areas.

The total volume of material available for rehabilitation after the 10% loss should give the operator a conservative estimate of the amount of material available for replacement. It is important to ensure that the more valuable soil resources (topsoil and subsoil) are replaced at recommended depths on the floor of the aggregate operation.

There will be circumstances where the areas being rehabilitated are not equal to the areas being extracted (e.g., where a portion of the site is extracted below water (a surplus soil situation) or where there are adjacent legacy aggregate sites requiring rehabilitation and there is insufficient available/retained soil). In these cases, there will need to be a volume calculation and a plan developed for achieving rehabilitation outcomes. This should be assessed through the AIA.

Post-Rehabilitation Management

While the replacement of the soil resources represents a significant milestone in the rehabilitation process, there remains important soil remediation and management stages to be completed before the land can be considered rehabilitated and soils restored to the same average capability or better, where feasible. Post rehabilitation management should include the following three main components:

- soil conditioning phase;
- cropping phase; and
- post-extraction monitoring and reporting component.

Soil Conditioning Phase

It takes time to restore soil structure and porosity (i.e., permeability), organic matter content, fertility levels and conditions suitable for biologic activity, and to alleviate residual compaction using non-mechanical methods to the same average soil capability or better, based on a comparison of pre-extraction and post rehabilitation soil conditions. Yield information can be helpful in demonstrating that soil conditions have been restored.

Most of the tasks involved in the soil conditioning phase should be completed by someone with the experience and suitable equipment such as a local farmer. In many situations, the aggregate operator may enter into a long-term lease with a farmer to manage the lands as per the post-rehabilitation management plan developed for the site.

The following sections describe the tasks that should be completed as part of the soil conditioning phase. It is important to remember that these tasks should only be completed when the soils are in a dry condition and that suitably sized and equipped machinery be used to minimize potential for compaction.

Removal of Stones, Debris and Deleterious Materials

It is not uncommon for there to be a high coarse fragment content in the replaced soil. For some sand and gravel deposits, a high proportion of stones (>250 mm) and/or cobbles (75-250mm) in the topsoil can interfere with the formation of a good seedbed and limit the productivity of the soil.

Prior to preparing the seedbed for the initial crop selected for the site, all stones and cobbles more than 150 mm should be removed as they could damage farm equipment. Depending on the site conditions, stone removal may be required again following cultivation practices. Where there is a very high proportion of cobbles in the soil, it may be necessary to remove all coarse fragments greater than 75 mm to create a seedbed. Mechanical stone pickers can remove coarse fragments up to 50 mm in size if soil is very dry. Caution should be taken to ensure that the load generated by the stone picking equipment does not cause soil compaction.

In addition to naturally occurring coarse fragments, large roots and woody debris should be removed from the soil. It is also not uncommon to encounter farm-related debris such as fencing, drainage tile and plastics in the soil. This debris can interfere with the formation of a good seedbed and damage farm machinery and should also be removed.

The replacement of the overburden, subsoil and topsoil will not always result in a soil with a consistent bulk density throughout the soil profile and some subsidence may occur.

Final Grading and Cultivation

Activities such as stone removal and subsequent prescribed subsoiling to deal with residual compaction can create an uneven surface that requires final grading to level the surface, smooth out uneven areas and fill small depressional areas. Where final rehabilitation is occurring immediately adjacent to lands previously rehabilitated, the new rehabilitated surface should be graded to form a consistent boundary between the two areas.

Once the site has been properly graded, and stones and debris have been removed, the site should be tilled to prepare a seed bed. Soils can be tilled using various equipment including a mouldboard plow, chisel plow or disk harrows. The choice of equipment should depend on soil conditions (texture, moisture content, depth of topsoil, stoniness, etc.) and which method will require the least number of passes across the site (to reduce the potential for compaction). Tillage should also occur across the slope to minimize the potential for erosion.

Fertility

It is recommended that the lands initially be planted with a grass-legume mix. Depending on the time of year, a nurse or temporary crop may need to be planted (e.g., a late season crop that stabilizes the soil).

To ensure the selected seed mix successfully germinates and effectively covers the soil, soil fertility levels should support germination and seedling growth. Soil samples should be collected for the newly rehabilitated surface (i.e., the topsoil) using methods consistent with OMAFA's Agronomy Guide for Field Crops - Soil Fertility and Nutrient Use guidelines.

The fertility analysis should include all the soil parameters sampled and analyzed at the pre-extraction stage. At a minimum, soils should be analyzed for primary and secondary nutrients, pH, $CaCO_3$ and soil organic matter (SOM).

The samples should be sent to an accredited laboratory to obtain a complete analysis of soil fertility levels and recommendations for fertilizer applications. To promote seed germination and vigorous seedling growth, it is recommended for most soils that a triple super phosphate be used (this is less important if the land is being returned to perennial woody crops). It is also recommended that a band-seeder be used to apply the fertilizer and the seed mix to the soil.

In addition to ensuring the soil fertility can support the selected seed mix, it is important to ensure that the SOM content is adequate. Low levels of SOM often lead to lower organic carbon levels and a reduction in biologic activity. This in turn can result in the breakdown of soil structure, a decrease in the water-holding capacity of the soil, an increase in the susceptibility to erosion and a reduction in soil fertility; all of which can ultimately result in lower crop yields. To offset this, measures (e.g., tillage practices, application of manure and other organic matter to the soil) should be taken to restore depleted soil organic carbon levels. This process can take several seasons of careful management, ensuring ground and surface water is not impacted. Nutrient application rates should not exceed recommendations provided in the soil fertility analyses completed by an accredited laboratory.

In most cases, there will be a need to increase the SOM content of the soil on most rehabilitated sites to improve soil fertility, soil structure and drainage. The use of animal manure and/or compost has the added benefit of improving microbial activity and levels of certain nutrients (calcium (Ca), magnesium (Mg), cation exchange capacity (CEC), SOM content and total carbon (C) compared to soils where synthetic fertilizer was applied (Bulluck et al, 2002).

Improved fertility is just one of the expected benefits of an increase in organic matter content. Other important benefits include an improvement in aggregation (stabilization of soil particles), moisture holding capacity and resistance to erosion. The extensive root systems of grasses and legumes improve soil structure and will help to break up any residual compaction in the soil.

Other potential soil amendments include:

- Inoculating soil with arbuscular mycorrhizal fungi (AMF) may improve crop growth on rehabilitated land, due to a lack of an existing AMF community;
- Spreading non-agricultural source materials (NASM) and incorporate the materials into the soil; and
- Using agricultural lime to raise soil pH where acidity is a problem. Agricultural lime can be used to establish a cover crop or an initial planting or to correct acidity caused by organic matter.

There are several matters to consider before selecting the appropriate soil amendment such as site attributes, location and legislative requirements.

Cropping Phase

Seed mixes may need to be adapted to seed availability, rehabilitation plans, etc. Regardless, site plans should include a note on general seed mix to achieve desired outcomes.

Grass-Legume Mix

It is recommended that the seed mix selected will persist over the soil conditioning phase of the rehabilitation plan. The soil conditioning phase is important because once established, a vegetative cover comprised of grasses and legumes will have several positive effects on the soil's chemical (fertility) and physical conditions. These positive effects will ultimately improve the suitability of the soil for continued crop production (both common field crop production and specialty crop production).

To be most effective, a self-sustaining vegetative crop should be in place post- soil replacement. By establishing a vegetative cover, several pedological benefits can be achieved. For example, the levels of the availability of macronutrients for plants will increase as the biomass generated annually at the surface (e.g., thatch) and within the soil (i.e., roots) dies off, decomposes, and becomes incorporated into to the soil. The decomposing organic matter becomes food for soil biota beneficial to plants. It is expected that the populations of these soil microbes will increase as organic matter content increases. The soil fauna and flora include microorganisms that help to transform the organic material into products that are usable by plants. The establishment of a vegetative cover over the rehabilitated soil is expected to improve the conditions for soil fauna. Improved conditions will lead to an increase in abundance and diversity of soil biota, such as earthworms and bacteria. This in turn will lead to an improvement in soil fertility over the long term. As a result, it is expected that the soil's physical, chemical, and biologic properties will improve considerably.

Establishing a vegetative cover will minimize the potential for droughty site conditions, improve the internal drainage of the soil and decrease the potential for soil crusting and sheet erosion.

The optimum seeding period for planting in Southern Ontario is in the spring up to mid-May and up to mid-June in Northern Ontario. A seeding technique known as “band-seeding” is recommended for seeding the pit/quarry floor. Band seeding enhances seed germination and establishment of a thick vigorous crop by placing the seed and fertilizer in the optimum position in the soil.

The site should be seeded as soon as possible to stabilize the soil and reduce the potential for erosion. The seed mix selected depends on the time of year that the soil replacement procedures take place. It is recommended that a grass-legume mix be used throughout the soil conditioning phase of the rehabilitation process.

In the summer during hot and dry conditions, seeding may need to be delayed until soil moisture content returns to more suitable levels. In the fall, it may be necessary to use a quick germinating seed such as annual rye grass and reseed with the selected grass-legume mix when conditions are more appropriate in the spring. The annual rye grass will be tilled into the soil as a green manure.

The seed mix can be used both on the agricultural area and on the side slopes. On the side slopes it is important to monitor conditions frequently to be sure that the seed mix is well established to protect against erosion and suppress weeds. Spot applications of the seed mix may be necessary from time to time.

Legumes

The proposed seed mix should include at least one legume (e.g., red or white clover, Birdsfoot trefoil, alfalfa, etc.). In addition to being deep rooting, legumes are nitrogen fixers. Properly inoculated legumes host microorganisms, such as Rhizobium bacteria, in root nodules. These bacteria convert atmospheric nitrogen (N2) into nitrogen compounds that can be used by plants. Using legumes in a crop rotation can increase nitrogen levels in the soil. Adding a legume in the seed mix will provide the grass species with enough nitrogen to sustain the vegetative cover crop and provide a nitrogen source for use by bacteria and other microorganisms that are part of a healthy soil profile.

Grasses

Grasses have fine, fibrous root systems that help to develop a granular structure in the topsoil and are sod forming. Grass roots are generally shallower than the roots of legumes but are important because the roots help to bind soil particles together, add organic matter and improve soil structure. The seed mix should include species of both bunch grasses and spreading grasses. Bunch grasses typically have simple fibrous root systems that support the plant, whereas spreading grasses have rhizomes or stolons that spread by sending out new shoots, allowing the grass to spread. These grasses tend to form good sod layers.

Once established, most suitable grass species are fast growing and relatively persistent. Some species are relatively slow to establish but are good soil builders that should be part of the seed mix. To compensate for the slow establishment of some species, fast establishing options should also be included in the seed mix.

The root system is important because it helps to hold soil in place and reduce the potential for erosion. Grass species are not nitrogen fixers like legumes, but they accumulate large quantities of nitrogen produced from the legumes in the soil which is released to the soil once the plant dies and decomposes.

Seed Mixes

It is important that the anticipated soil conditions be considered when choosing a seed mix as one recipe may be appropriate for one site but not another due to the differences in soil texture, drainage, geographic location, time of year, etc. Two examples of suitable seed mixes are provided below.

Seed mix for rehabilitated lands (i.e., pit or quarry floor):

- 16.8 kg/ha Birdsfoot trefoil (15lbs/ac)
- 2.2 kg/ha timothy (2 lbs/ac)
- 11.2 kg/ha Canada blue (10 lbs/ac)
- 5.6 kg/ha creeping red fescue (5 lbs/ac)
- 2.2-5.6 kg/ha red clover (2-5 lbs/ac)

Seed mix for controlling erosion on the steep side slopes:

- 5.6 kg/ha Kentucky bluegrass (5 lbs/ac)
- 5.6 kg/ha creeping red fescue (5 lbs/ac)
- 7.8 kg/ha meadow fescue (7 lbs/ac)
- 5.6 kg/ha chewings fescue (5 lbs/ac)
- 7.8 kg/ha turf type perennial rye (7 lbs/ac)
- 4.5 kg/ha white Dutch clover (4 lbs/ac)
- 2.2 kg/ha Birdsfoot trefoil (2 lbs/ac)

Monitoring and Reporting Component

Monitoring is a best practice that serves to inform and improve the ongoing site-specific management of rehabilitated areas and upcoming stages of progressive and final rehabilitation.

Monitoring allows for a comparison of pre- and post-extraction characteristics of a site. This comparison is important to ensure the desired policy outcomes are achieved regarding rehabilitation of a site to an *agricultural condition* post-extraction. Monitoring is also beneficial as it may lead to innovative ways to enhance agricultural rehabilitation, and can inform future policy reviews, research and revisions to best practice guidelines.

The AIA should provide recommendations that direct how progressive and final rehabilitation will be monitored on the site (i.e., monitoring program and reporting). These recommendations should be included on the site plans where appropriate. The development of a monitoring program, prepared by a qualified professional, should include reporting during all relevant stages of the rehabilitation progress, to determine the effectiveness of returning the site to an *agricultural condition*. Depending on the proposed operations of the site, the monitoring program and reporting may include:

- An overview of current operations and stage of rehabilitation;
- The frequency and timing of monitoring reports;
- A description and evaluation of the annual soil removal and storage;
- A description and evaluation of development of the rehabilitated landform;

- Documentation of soil compaction, drainage provisions and hydrogeology;
- A description and evaluation of soil replacement;
- A review of post-rehabilitation management activities and field conditions;
- A report of soil test results;
- A report of crop yields;
- A report with feedback from the farmer;
- An evaluation of the rehabilitated *agricultural condition* and soil capability, relative to baseline soil conditions documented in the AIA; and
- Recommendations on future rehabilitation activities and adjustments to best management practices.

Monitoring reports should be submitted to the MNR. These reports may also help to inform the completion of annual compliance reporting required under the ARA and any documentation that may be required by the MNR to support the surrender of a license. The MNR may consult with OMAFA on matters related to the *agricultural condition* when necessary.

Typical Operational Sequence or Phasing Plan

1. **Start Up:** establishment of initial extraction area and processing areas with associated perimeter berming requirements or soil storage areas. During this stage of operation, soils will be placed in perimeter berms or temporary storage until there are sufficient depleted areas ready for rehabilitation. Information on soil depth and distribution is used to develop a soil budget which will inform what the interim storage requirements might be or what shortfalls may exist. The direction and sequence of extraction should strive to reach limits of extraction (depth and area) in order to reach the point where rehabilitated side slopes can be established and opportunities for progressive rehabilitation are created. During these initial stages of operation, the disturbed (unrehabilitated) areas will be increasing.

2. **Ongoing Operations:** once there are depleted areas of the operation that are no longer required for extraction or associated uses, progressive rehabilitation can start. Soils from areas being prepared for extraction can be moved directly into areas that are ready for rehabilitation. In some cases, sites may require subsequent stages of berm construction that will have to be taken into account. Operational phases do not represent any specific time period and one phase may represent several years of extraction. However, a best practice for effective progressive rehabilitation is to limit stripping to the area that is required for an operational season, if possible. Where depth of soil being removed is the same depth of soil being replaced, the stripped and rehabilitated areas are approximately equal. During these stages of rehabilitation, the area being stripped or added to the disturbed areas should be approximately offset by equivalent areas being rehabilitated so that the total disturbed area remains fairly constant as regular progressive rehabilitation continues. However, there may be other operational considerations that govern the stripping to rehabilitation ratio.

3. **Final Rehabilitation:** as the resource becomes depleted and extraction rates decline, the areas required for extraction and production generally decline and the rate of rehabilitation can usually be accelerated. Pit or quarry infrastructure and product inventory are removed. Soils that were stored in interim berms or storage areas are made available to complete rehabilitation. During these stages, there is no, or minimal, new extraction areas being disturbed, and rehabilitation exceeds new disturbance so that the total disturbed area declines and eventually reaches zero.

References

Agriculture and Agri-Food Canada. 1998. Canadian System of Soil Classification. Ottawa, ON.

British Columbia Ministry of Agriculture and Lands. 2009. Guide to Edge Planning,

Promoting Compatibility Along Urban-Agricultural Edges.

British Columbia Agricultural Land Commission. 1993. Landscaped Buffer Specifications. Burnaby, B.C.

Bulluck L.R, M. Brosius, G.K. Evanylo, J.B. Ristaaino. 2002. Organic and synthetic fertility amendments influence soil microbial, physical and chemical properties on organic and conventional farms. Applied Soil Ecology: 19 147-160.

Denholm, K.A. 1993. Field Manual for Describing Soils in Ontario. Ontario Centre for Soil Resources Evaluation, University of Guelph. Guelph, ON.

Government of Ontario. 2020. Security from Trespass and Protecting Food Safety Act, 2020.

Government of Ontario. 2019. O. Reg. 406/19: On-Site and Excess Soil Management. Under the Environmental Protection Act.

Heck, R.J. et al. 2017. Characterizing Sites, Soils & Substrates in Ontario. Department of Land Resource Science, University of Guelph. Guelph, ON.

MHBC Planning. 2015. Edge Planning Report: A Review of Implemented Practices to Address Planning on the Rural-Urban Fringe. For Region of Peel and Town of Caledon. Barrie, ON.

MacNaughton Hermsen Britten Clarkson Planning Limited (MHBC) and Colville Consulting Inc. 2016. Rehabilitation Plan Guidelines – Aggregate Extraction on Agricultural Lands. For Ontario Ministry of Agriculture, Food and Rural Affairs. Guelph, ON.

MacNaughton Hermsen Britten Clarkson Planning Limited (MHBC) and Colville Consulting Inc. 2016. Resource Guide - Aggregate Extraction on Agricultural Lands. For Ontario Ministry of Agriculture, Food and Rural Affairs. Guelph, ON.

OMAFA, 2019 (1). Adapted from Statistics Canada. Guelph, ON.

OMAFA, 2019 (2). Based on Statistics Canada's Survey of Employment, Payrolls and Hours and Labour Force Survey. Guelph, ON.

OMAFA. 2018. Agriculture Economic Development: A Resource Guide for Communities. Guelph, ON.

OMAFA. 2018. (unpublished) GIS analysis using MPAC and SOLRIS data. Guelph, ON.

OMAFA. 2016. Guidelines on Permitted Uses in Ontario's Prime Agricultural Areas. Queen's Printer for Ontario. Toronto, Ontario.

OMAFA. 2016. The Minimum Distance Separation (MDS) Document. Queen's Printer for Ontario. Toronto, Ontario.

OMAFA. 2024. Soil Capability for agriculture in Ontario.

Queensland Department of Natural Resources. 1997. Planning Guidelines: Separating Agricultural and Residential Land Uses. Scientific Publishing. Queensland, Australia.

Statistics Canada. 2019. Survey of Employment, Payrolls and Hours (SEPH). Ottawa, ON.

Statistics Canada. 2019. Labour Force Survey (LFS). Ottawa, ON.

Statistics Canada. 2016. Census of Agriculture. Ottawa, ON.

Appendix E – Edge Planning

Edge Planning

Municipalities should try to avoid approving non-agricultural uses that are likely to conflict with certain farming activities in or nearby *prime agricultural areas*. Where this proximity cannot be avoided, edge planning can improve compatibility between uses. For example, edge planning can help to reduce issues related to trespassing and vandalism, noise, dust, lighting, spread of weeds, pests, spray drift and odour. Edge planning is most frequently associated with the interface between residential and *agricultural uses* but could also be used for other non-agricultural uses in or adjacent to *prime agricultural areas*.

There are two main categories of ways to implement edge planning: site design and buffers. The most effective edge planning combines both if justified based on the proposed use and the potential for compatibility issues.

Site Design

Development sites can be designed to avoid, minimize and mitigate potential impacts to the *agricultural system*. This can be done on a site-specific basis or for a subdivision, for example.

Secondary plans guide *development* in more detail than in the municipal official plan. Along with including policies and maps related to land use, *infrastructure*, transportation, design, and natural heritage, secondary plans may incorporate recommendations made in an AIA. For example, parcel size, configuration, building setbacks, road patterns, location of parks and school sites, drainage patterns and location of sewer and water lines or stormwater management ponds can be designed in ways that minimize impacts to farm operations and maximize opportunities to create buffers.

Subdivisions in the interface area can be designed to incorporate the following, as appropriate:

- Roads designed to direct traffic away from agricultural areas;
- Use of road rights-of-way and low sensitivity uses (e.g., natural heritage features, public open spaces, purpose-designed buffer areas)[17] to separate agricultural and non-agricultural uses; and
- Minimization of impermeable surfaces and maximization of vegetated areas to maintain water infiltration, amongst other benefits.

Buffers

Buffers are areas of land separating adjacent land uses to improve the compatibility of these land uses. They can form physical and visual barriers between uses to minimise both the cause and the perception of nuisances such as noise, light, and dust. Buffers can also prevent trespassing and associated problems such as litter, vandalism, and pets at large.

Buffer design should be appropriate to its location and function. Simple, vegetative screens may be suitable for low impact situations, while a buffer incorporating berms, fencing and plantings may be more appropriate for higher impact situations. British Columbia Ministry of Agriculture's Vegetative Buffers document (2020) provides further guidance on buffer design.

[17] where possible, implemented in a manner that ensures such features are permanent should future expansions be required.

If agriculture is the existing use adjacent to a proposed non-agricultural use, buffer areas should be located within the area being developed and be implemented by the proponent to minimize impacts to agriculture. The goal is to enable non-agricultural uses and *agricultural uses* to co-exist under acceptable conditions.

Mitigation measures should be incorporated as part of the non-agricultural uses, as appropriate, within the area being developed.

The British Columbia Agricultural Land Commission's Guide to Edge Planning (2015) recommends the following setback and buffer design criteria but recognize that they should be adapted to the situation:

- Total minimum vegetation buffer of three- to 15-meters with or without additional separation between a residential *development* and abutting farmland.
- Finished height of six meters to create a visual barrier (seeing the source of a nuisance may heighten the perception of that nuisance).
- Comprised of mixed deciduous and coniferous plants with foliage from base to crown to mitigate against dust and spray drift.
- Crown density of 50 to 75 per cent to allow adequate airflow.
- Two-meter separation between the vegetative buffer and agricultural land to reduce shading, improve air circulation and enable farm equipment to manoeuvre.