



1. Project Details

Proposal Title	Aggregate and Agriculture: Understanding the Impacts of Aggregate Production on Agriculture and Identifying Mitigating Strategies
Short Title	Aggregates and Agriculture: Understanding Impacts
Submission Number	UofG2017-2934
Start Date	01/05/2018
End Date	30/04/2021
Project Duration	36 Months

2. Researcher Response to LOI Invitation Comments

Thank you for your extensive comments on this proposal. As a result of these comments, we have completed significant revisions to enhance this project and its deliverables. These revisions were discussed during a workshop we hosted with representatives from OMAFRA, municipalities, researchers and farmers. We have also secured additional letters of support from the Rural Ontario Municipal Association (ROMA) and the Ministry of Natural Resources and Forestry (MNR).

Comment: The committee would like to see a fuller discussion of the specific priority and research policy questions that this project will address. The deliverables should be linked more specifically to informing OMAFRA policy development. Specific deliverables are indicated in the priorities. The project deliverables should focus on these.

Response: The application is made in response to Section 2.2.12 of the 2017-18 OMAFRA Research Themes Consolidated Priorities as follows:

"2.2.12. Land Use Planning

Policy Objective:

To better understand and develop practical responses to key issues affecting agricultural land use and agricultural viability."

This Research Proposal will address two specific research questions in the OMAFRA Research Priorities.

These questions are as follows:

i. Based on a jurisdictional and research scan and analysis, what are economic, social, and environmental and land use impacts of aggregate extraction operations on adjacent farms livestock and crops?

ii. What are appropriate measures (i.e. setbacks and buffers and other best management practices) to avoid,

minimize and mitigate aggregate extraction impacts (e.g. dust, noise, water) on livestock and animals?"

It is noted that the literature in this area is limited and as a result the research will go beyond a jurisdictional scan to document the actual experience of farmers operating in close proximity to aggregate operations.

Comment: Please explain who the intended users would be of the proposed toolkit.

Response: The proposed toolkits will serve two distinct user groups: municipalities and aggregate operators.

Comment: A full proposal should reflect a balanced perspective that agricultural production and aggregate production are both recognized as important to the Ontario economy and that this importance is reflected in provincial land use policy statements.

Response: We recognize the significant economic impact of both the agricultural and aggregate industries within Ontario. The purpose of this study is to identify areas of potential conflict between these seemingly incompatible land uses so that future conflicts can be avoided and that the approval process more fully recognizes the issues in a way that is supportive of both the aggregate and agricultural industries. Recent Ontario Municipal Board hearings, for example have demonstrated a number of approaches that have improved the compatibility of these land uses. In addition we have confirmation that OMAFRA and MNRF will both participate in the project helping to ensure that the project is about meeting the objective of achieving compatibility, mitigating impacts and finding synergies.

Comment: In addition to representation from OMAFRA, the committee would like to see input from MNRF, farm organizations, the aggregate industry, and either AMO or ROMA. Expertise in crop and livestock production would be useful, since the research will explore effects of aggregate extraction on agricultural operations.

Response: Letters of support have been secured from OMAFRA, ROMA, MNRF, OFA and a number of other groups and agencies (in total 7 letters of support have been provided). We have reached out to representatives of the aggregate industry. There will be an advisory committee created for this project with representatives from OMAFRA, MNRF, ROMA and farm organizations (all confirmed). The aggregate sector has been approached and we anticipate that they will also assist in this capacity. The project director has considerable experience working with both the farm and aggregate industry and it continues to be his goal to bring these two groups together in a way that is respectful of both interests. Consistent with the Provincial Policy Statement (2014), both agriculture and aggregates are recognized as important provincial interests. Consistent with this policy direction, it is important that provincial ministries (ie OMAFRA and MNRF) and the agricultural and aggregate sector establish firm and positive relationships. The goal of this research is to better understand the dynamics between agriculture and aggregates and to offer strategies and best practices that can help to ensure positive outcomes.

Comment: More detail is expected in the discussion of methods at the full proposal stage. Choosing only to conduct interviews among successful cases is potentially problematic. It would be preferable to have "exemplary

cases" and "poor cases" for interviews in order to identify differences in the design and operations of aggregate operations.

Response: We completely agree and the Methods now reflect this.

Comment: The applicant should also make sure to collect relevant intervening variables such as distance, topography and size of landholdings of farmers in the survey. Professor Brady Deaton and a recent MSc graduate in FARE have already compiled extensive data on aggregate sites for Ontario. Please consult with Professor Deaton as you develop your full proposal. It would be good to know more about the magnitude of the effects to be considered, before research is undertaken on mitigation measures.

Response: We agree that data regarding intervening variables such as distance, topography and size of landholdings of farmers will be beneficial to the project and will include these variables in the survey. We have been in communication with Brady Deaton and this discussion was very helpful. His research with an MSc student focussed on only two counties and we have been provided with a copy of the thesis. Brady has also put us in touch with other researchers at Purdue with data regarding GIS locations of aggregate sites. We will work with this information, recognizing that our study is proposed to have an Ontario-wide perspective. We will work with OMAFRA and MNRF to identify appropriate intervening variables.

Comment: What is the extent to which current aggregate production adversely effects livestock and crop production in Ontario? What is known about the value or cost of these effects?

Response: An early component of this research will be a literature review and jurisdictional scan that will help to identify adverse impacts of aggregate operations on livestock and crop production. Our preliminary literature review suggests that this literature is somewhat limited. The actual research and proposed case studies will secure input from farmers in these areas as well. We have consulted with OMAFRA staff on this matter and will continue to seek their input related to the value/cost of these effects.

Comment: And the scope of the proposed project is broader than what is requested in the current priorities. It would seem that GIS expertise might be useful for this type of research. Will the scope of this project be province wide or a more limited area?

Response: We have significant GIS expertise within the School of Environmental Design and Rural Development and will seek a student who can contribute to this aspect of the project. In addition, we will consult with OMAFRA's GIS expertise to ensure appropriate deliverables (we have experience working with OMAFRA GIS on a separate project and will continue to build this relationship).

Comment: The committee would like to see more explanation of the budget in the provided space for notes. The budget request, as it stands, seems excessive.

Response: We have reviewed the budget and reduced the funding request by more than \$40,000. We have



eliminated one MSc student. We have also reviewed all other expenditures and made appropriate reductions. We will look for other operational efficiencies and work with partners to ensure delivery of all components as proposed.

3. Lead Applicant

a. Contact Information

Name	Dr. Wayne Caldwell
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Current Position:	Director and Professor, School of Environmental Design and Rural Development
Website	www.waynecaldwell.ca
Department:	School of Environmental Design and Rural Development
Research Body	University of Guelph
Telephone	519-824-4120

b. CV (Note: The Lead Applicant CV is appended to the end of this document.)

Lead Applicant experience and expertise - (Max 150 words. Please briefly describe your research experience and expertise as it relates to this project.)

My career maintains a balance between academia and professional practice. Much of my career has been spent working in a municipal planning office. My research is also very practically based and focused on rural, environmental, and agricultural topics. My publications are oriented towards the planning profession and frequently published in the Ontario Planning Journal, Plan Canada, and Municipal World. I am constantly in touch with communities through speaking and research opportunities. My most recent project has worked with farmers regarding the impacts of land use policies on the viability of farms in southern Ontario and an additional project is currently exploring the resilience of farmers in northern Ontario. Both projects demonstrate my ability to effectively conduct research with the farm community and interpret the impacts of policies on the economic viability of the agricultural sector. I have also completed two studies documenting severance activity in Ontario and lastly, I have worked on numerous planning applications for aggregate operations and have developed municipal policy related to aggregates.



4. Research Team Members

Name (Email)	Organization	Expertise and responsibilities related to project	Role in Project (FTE Dedicated to this Project)	Affiliation
Dr. Wayne Caldwell (wcaldwel@uoguelph.ca)	University of Guelph		Lead Applicant (0.15)	U of G
Mr. TDBTBD TDBTBD (TDBTBD@uoguelph.ca)	University of Guelph	Expertise in data collection and understanding of planning legislation	UofG Grad Student - master's level (0.50)	Academia/Research Institute
Ms. Michele Doncaster (michele.doncaster@ontario.ca)	OMAFRA	Sound understanding of provincial policies regarding agriculture and aggregates	OMAFRA Staff (0.01)	OMAFRA
Mr. Jeffrey Reichheld (jreichheld@brocku.ca)	University of Guelph	Rural communities, Agriculture, Extension, and Education (Jeffrey has been admitted to the Rural Studies PhD)	UofG Grad Student - doctoral level (0.50)	Academia/Research Institute

HQP: Highly Qualified Personnel

Supported by UofG HQP Program	
Ph. D.	
Masters	
All other HQP	
Post-Doc	
Ph. D.	1



Masters	1
Summer Students	

5. **Research Theme(s) Addressed:**

Theme	%
Agricultural and Rural Policy	100

Research Themes Priorities:

Theme	Priority
Agricultural and Rural Policy	Rural Policy Research Priorities

6. **Abstract (Max 150 words).** Please note the abstract will be shown to third parties in order to find reviewers who are not in conflict of interest with the proposal.

Across Ontario, aggregate extraction provides economic stimulus for many rural locales. Such operations often occur on agricultural land or within close proximity to productive farmland. Aggregate operations significantly alter the landscape and are often considered a nuisance to adjacent land owners. While research regarding the social impacts of aggregate extraction on rural residents has been conducted, little is known regarding the social, economic, environmental and land use impacts on farms in close proximity. This research seeks to identify the impacts on crop and livestock production along with corresponding best practices that can be utilized to mitigate these impacts. The goal is to see these best practices utilized early in the planning process to avoid conflict and negative impacts on agricultural production from future aggregate operations. This research will involve a jurisdictional scan to identify social, economic, environmental and land use impacts. In addition, both quantitative and qualitative methods will be utilized to identify impacts on agriculture (such as dust, noise and water) and promising practices that aggregate operators and municipal planners could use to limit these impacts. The goal of this project is to achieve compatibility, mitigate impacts and find synergies between the agriculture and aggregate sectors.

7. **Benefits (Max 350 words per theme).** Describe the benefits of the research to Ontario's agri-food and rural sectors. Identify who will gain from the research and how they will gain

Theme 1 - Agricultural and Rural Policy

The impacts of aggregate operations on farms in Ontario is currently unknown. Given the disruptive nature of aggregate extraction, it is important to understand their impacts on nearby farms so that measures to mitigate these impacts can be developed and implemented. Research is needed that understands the social, economic,



environmental and land use impacts of aggregate operations so that adjacent agricultural operations are protected from this competing and often conflicting land use. Considering this, many diverse groups will benefit from this research.

Farmers

Farmers will benefit from a clearer understanding of the broad and often negative impacts of nearby aggregate extraction. From their involvement in this study, measures to limit and protect agricultural operations, such as land use planning policies, will be provided. These measures, once implemented will further protect agricultural endeavours from this competing land use, thus providing greater stability and resilience for individual farmers and a more viable agricultural industry in general.

Aggregate Operators

The identification of impacts associated with aggregate operations will be useful to aggregate operators as they will be better informed of best practices for future operations and measures they should implement to improve existing situations.

Rural Communities

Rural communities will benefit from the outcomes of this research through the creation of policies that mitigate the impacts of aggregate operations. They will also benefit from a more robust agricultural sector as a result of implementing measures to limit the negative impacts of aggregate operations economically, socially and environmentally on adjacent farmland. In addition, the implementation of these measures will also help mitigate community unrest when new extractive operations are initiated, given more stringent and proactive policies to limit or avoid potential sources of conflict.

Policy Makers/Decision Makers/Planners

These diverse stakeholders will benefit from this research through the identification of promising practices and appropriate measures to limit the impacts of aggregate extraction on farmland. This research will also help establish appropriate criteria for inclusion in an Agricultural Impact Assessment.

8. **Rationale for the research (Max 500 words).** Explain why the research is needed and the research priority(ies) being met e.g. the problem the research will tackle, or the gap in current knowledge that will be addressed)

The application is made in response to Section 2.2.12 of the 2017-18 OMAFRA Research Themes Consolidated Priorities as follows:

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This Research will address two specific research questions in the OMAFRA Research Priorities. These questions are as follows:

- "- Based on a jurisdictional and research scan and analysis, what are economic, social, and environmental and land use impacts of aggregate extraction operations on adjacent farms livestock and crops?
- What are appropriate measures (i.e. setbacks and buffers and other best management practices) to avoid, minimize and mitigate aggregate extraction impacts (e.g. dust, noise, water) on livestock and animals?"

This research seeks to understand the social, economic, environmental and land use impacts of aggregate extraction on adjacent farms. In particular, it will analyze both new and established aggregate operations within southern Ontario and farms in close proximity to these sites. Understanding the impacts of aggregate operations is important, as measures can be developed to mitigate or halt such issues, thus providing greater agricultural resilience and farm viability.

Aggregate extraction serves as an economic stimulus for many rural communities. Many of these communities also have expansive agricultural operations that are negatively impacted by aggregate extraction. These two land uses are often located in close proximity and given current land uses planning policies, this adjacency will continue. The economic benefits of both industries cannot be understated and aggregate extraction in some communities is actively encouraged.

The impacts of aggregate operations on agriculture, however, have not been thoroughly studied and rural communities, policy makers and other stakeholders lack the necessary information for making informed decisions regarding the siting of new aggregate operations. As such, it is imperative that farmers currently working in close proximity to aggregate operations be included in a study that explores the impacts of these operations. These impacts potentially include economic, environmental and social dimensions that can significantly impact farm viability. These three aspects must be analyzed together to achieve holistic understanding of the impacts of aggregate extraction on agriculture. In particular, the impacts of aggregate operations in terms of noise, dust and water will be explored. It is also necessary to explore the land use impacts of aggregate extraction and the policies that permit their location and operation. This data will be collected through a jurisdictional scan of policies domestically and internationally and through a questionnaire and interviews with farmers and aggregate operators. From this assessment, promising practices can be identified to mitigate existing issues and avoid potential issues with future operations.

9. **Objectives (Max 150 words).** Describe the purpose/main goals of the research project - what the research is intended to accomplish.

The overall goal of this project is to achieve compatibility, mitigate impacts and find synergies between the agriculture and aggregate sectors.



The main objective is to understand the broad impacts of aggregate operations on agriculture land. As part of this objective, several specific goals exist:

- 1-Understanding the impacts of new and existing aggregate operations on nearby agricultural land, such as dust, noise and water and their impacts on crop and livestock production
- 2-Identifying the social, economic and environmental impacts of new and existing aggregate operations on farmers and farms in close proximity
- 3-A jurisdictional scan of land use policies across Canada and other international locations in order to identify best practices regarding the siting of aggregate operations in close proximity to agricultural land. These best practices would be recommended for future aggregate operations in order to avoid conflicts
- 4-To contribute to an understanding of appropriate content for agricultural impact studies

10. Milestones

Milestone	Description of Activities	Completion Date
Establish advisory committee	Including representatives from the Ministry of Agriculture, Food and Rural Affairs, the Ministry of Natural Resources and Forestry, ROMA, farmers and aggregate operators, among others	2018-06-30
A literature review and jurisdictional scan	The literature review will consider the social, economic and environmental impacts of aggregate extraction on livestock and crop production. It will consider the broader impacts on rural communities. The Jurisdictional Scan will build on this and will consider Canadian and International examples of best practices related to land use planning policies for aggregate operations in proximity to agriculture	2018-12-31
Select Case Studies	5-8 counties/regions within southern Ontario will be selected and 8 to 10 aggregate operations will be identified in each to serve as case studies. We will work with MNRF and the Ontario Stone, Sand & Gravel Association in selecting these case studies.	2018-12-31
Conduct Survey of Aggregate Operators	As part of the Case Studies (5-8 counties and 8-10 aggregate sites) a survey of aggregate operators will be completed regarding operational characteristics and their perceptions of the impacts on agricultural land, and proactive measures they utilize to mitigate these impacts. In addition to a mailed survey a subset of 8-10 aggregate operators will be identified for a more detailed interview.	2019-06-30
Conduct Survey of farms (Questionnaire)	As part of the Case Studies 8-10 farms in close proximity to each aggregate operation will be identified to participate in a questionnaire regarding the impacts of aggregate operations. It is anticipated that 500-1,000 questionnaires will be distributed. (These mailing lists will be identified in association with Municipal Officials using the Property Assessment data base (which is publicly available). This involves a 2 step process of identifying the farms to be	2019-12-31



	surveyed followed by the actual distribution of the questionnaire.	
Farmer Interviews	A selection of farmers (20-25) in close proximity to exemplary and problematic sites will be invited to participate in an interview to gain a more detailed understanding of how they have been impacted, areas of improvement and proactive measures they have observed.	2020-04-30
Interviews Municipal, OMAFRA, MNRF Staff	Municipal planning staff and representatives of OMAFRA and MNRF will be interviewed regarding potential measures/policies/etc. that could help mitigate or avoid negative impacts on farmland. Municipal staff will also be consulted regarding conflict during the planning process and the identification of new policies to mitigate these conflicts and reduce or eliminate impacts on agricultural land. It is anticipated that 20-25 interviews will occur.	2020-10-31
Tool Kit Development - Draft	A toolkit / manual will be created based on the findings of this study. The toolkit will include best practices for future sites and opportunities to mitigate existing issues. It will benefit aggregate producers and municipalities. It will include best practices to minimize conflict, and it will present proactive measures that can be utilized throughout the approval process and community engagement strategies to keep adjacent land owners informed. Content for the toolkit will be developed throughout the research beginning with the literature review and jurisdictional scan.	2020-12-31
Tool Kit Development final	The Draft Toolkit will be reviewed with key stakeholders in a workshop format with key stakeholders (OMAFRA, MNRF, aggregate operators, farmers and planners). Revisions will follow with the completion of the toolkit coincident with the completion of the project.	2021-04-30
Final Report	A Final Report that consolidates all aspects of the research will be completed in 2 phases. Individual components will be completed with each of the Milestones throughout the project. The consolidation into a final report will conclude the project.	2021-04-30

11. Literature Review (2 pages maximum): Provide a summary literature review describing background and supporting rationale for the proposed research.

Aggregate extraction is a major industry in Southern Ontario, with an approximate value of \$6.1 billion in 2016 (Grant, 2017, p.2), as it is a core resource in the development of municipal and transportation infrastructure. With a predicted population of 15-20 million in Ontario by 2036 (Binstock & Carter-Whitney, 2011, p. 6) the built environment must be correspondingly increased, necessitating the expansion of existing, and the development of new, extraction sites. Due to the nature of aggregate as a resource, it is necessary that these sites are located close by the development projects, as transportation is a major factor in overall cost (Yundt, 1995). As the greatest part of population expansion will occur in and around the GTA, the required aggregate will necessarily come from Southern Ontario (Chambers and Sandberg, 2007; Stewart, 1998). However, this leads to a significant issue, because the aggregate resources are often located on or adjacent to the best agricultural lands, placing extraction operations in direct contact and competition with agriculture. While there is a great deal

of research on certain aspects of aggregate extraction, such as its environmental and economic impact, its social status, and the need and nature of rehabilitation, its impact on active farming has seen little, if any, focused study. The competition between aggregate extraction and agricultural practice and the increasing interest around food production by a motivated and politicised population necessitates a closer examination of these potential conflicts.

It is a truth that aggregate, as with all natural resources, can only be extracted where it occurs (ex. Bloodworth, Scott & McEvoy, 2009; Corry, et al., 2008); quarrying is therefore limited to the locations where the materials are either at or near enough to the surface to be easily accessed (Corry, et al., 2008; Yundt, 1995). The common need of transportation infrastructure and distance to market influences the specific location of the extraction sites, often placing them directly adjacent to, or on top of prime agricultural land. This conflict is not unnoticed in the research; however, aggregate extraction is often prioritised, as the economic value of the resource is considered to be greater than the agricultural production value of the land, and there is a general consensus that rehabilitation can restore the land to its prior productivity (Yundt, 1995; MNR, 2010; Corry, Laforteza & Brown, 2010; OSSGA, 2017; TOARC, 2016). While most Impact Analyses address their potential relationships with local residents, the potential impact on farms and agricultural practice is minimised (see Hardy, Stevenson and Associates, 2013 and MHBC, 2009). For example, the “Dufferin Aggregates Acton Quarry extension Agricultural Impact Analysis,” justifies the extension of the Acton Quarry pit, in part, because “Mineral aggregate operations are typically found located adjacent to or in close proximity to agricultural operations. These land uses are both legitimate rural land uses and have historically co-existed in proximity to the Acton Quarry for over 50 years” (MHBC, 2009, p. 18).

Resource extraction is a contentious issue, with a great deal of focus placed on the impacts that it has on the surrounding community. However, most research defines this impact in terms of its economic effect, quantified in terms of hedonic values, or in terms of real estate values at resale (Grant, 2017; Garrod & Willis, 2000; Altus Group, 2015; Secchi, 2007). The perception that industries like aggregate extraction and landfill (often related sequentially) affect one’s ability to enjoy property often forms public opinion surrounding the development of new and expanded sites (Grant, 2017; Garrod & Willis, 2000). Arguments take the shape of perceived economic effects and changes to the use-value of properties effected by the development of these quarries, often generating a discourse that pits the production companies against the local residents (ex Garrod & Willis, 2000; Chambers & Sandberg, 2007; Patano & Sandberg, 2005; Lu, 2011; Rayner, 2009) in which corporate actions are portrayed as negatively impacting the property owners’ enjoyment of and financial gain from the property, and often in terms of potential effects on their own or their family members’ health.

Similar research attention is paid to the environmental effects of aggregate extraction, often described in terms of returning it to a pristine or near pre-settlement state, generating a landscape that supports enhanced wildlife habitat or recreational opportunities, or reclaiming active agricultural lands consumed by extraction activities (ex. Corry et al. 2008; Bloodworth, Scott & McEvoy, 2009; Corry, Laforteza & Brown, 2010; OSSGA, 2017). While rehabilitation of extraction sites is a relatively recent obligation in Ontario, being legislated in 1990, it has

become a significant part of the relationship between the aggregate industry and local residents. Corry, Laforteza & Brown, (2010) examine the potential benefits accrued from the kinds of rehabilitation, such as economic: redeveloping the site for public use and development; biodiversity: restoration and enhancement of natural habitat; and compromise: a balance between economic and biodiversity rehabilitations. Public interest in the outcome of aggregate extraction has resulted in projects like MAAP (Management of Abandoned Aggregate Properties program), which mediate public attitudes toward historic negligence (Anderson, 2012; Raftis, 2013) by rehabilitating extraction sites abandoned prior to the 1990 legislation (TOARC 2016).

While the effects on agriculture have not been wholly ignored in the literature, research has focused primarily on issues such as land take (Geneletti, Biasioli, & Morrison-Saunders, 2017; Bloodworth, Scott & McAvoy, 2009), the removal of land from active agricultural production to be used for extraction. This is, however, often justified by the caveat that these sites can be returned to active use through the rehabilitation methods mentioned above, and the fact that the take is only a miniscule percentage of prime agricultural land (MHBC, 2009).

However, this leaves significant issues surrounding extraction activity unaddressed:

- effects on livestock and crop production (blasting, other noise, dust, water availability, etc.)
- effects on cost of production of livestock and/or crops (increased transportation costs, buffering, etc.)
- effects on water availability (changes to water table level, containment, runoff, volume).
- effects on local infrastructure (increased traffic, changes to roadways, etc.)
- effects on quality of soil/water.
- effects on perceived quality of life (enjoyment of property, economic effects).

There is currently a significant gap in the literature that needs to be addressed, as the effects of aggregate extraction on local agricultural production are largely unknown. Megaprojects, such as the proposed (but since cancelled) quarry in Melancthon Township that would have ultimately encompassed 937 hectares (Rayner, 2009; CBC, 2012), will have significant impacts on the surrounding countryside, fundamentally altering the landscape, and potentially affecting agricultural production aside from the removal of all or part of the project area from active production. As of 2008, there were 5,300 active extraction sites in Ontario, with a working area of approximately 70 square kilometers (Corry, et al., 2008, p. 120) located primarily on or beside active agricultural land, with the potential for significant interaction between agriculture and extraction activities. Understanding the nature of these interactions will help to develop evidence based best practices for the mitigation of these effects, leading to improved relationships between agriculture and aggregate extraction and the potential of enhanced outcomes for the farms surrounding aggregate extraction operations.

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12. **Methods (Max 750 words per theme).** For each Research Theme: Describe your experimental plan for accomplishing the research objectives.

Theme 1 - Agricultural and Rural Policy

This project will utilize a variety of methods,

1-At the outset, an advisory committee will be established. This will include representatives from the Ministry of Agriculture, Food and Rural Affairs, the Ministry of Natural Resources and Forestry, ROMA, farmers and aggregate operators, among others.

2-A literature review and jurisdictional scan will be completed. The Jurisdictional Scan will look at examples from across Canada and other international locations. It will identify best practices related to land use planning policies for aggregate operations in proximity to agriculture. This will include topics such as buffering, setback distances and measures to reduce noise and dust, among others.

3-Working with the advisory committee, 5-8 counties/regions within southern Ontario will be identified. Within each of these counties/regions, 8 to 10 aggregate operations located in agricultural areas will be identified for case studies. We will look for case studies of aggregate operations with an exemplary record and we will look for case studies where significant problems have been noted. The aggregate operators at each site will be invited to participate in a survey regarding the impacts on agricultural land, and proactive measures they utilize to mitigate these impacts. Equally we will ask them to identify challenges they may have faced. (With this aspect of the research we will (as suggested by MNR) work with the Ontario Stone, Sand & Gravel Association).

4-For each aggregate operation, 8-10 farms in close proximity will be identified to participate in a questionnaire regarding the impacts of aggregate operations. It is anticipated that 500-1,000 questionnaires will be distributed. (These mailing lists will be identified in association with Municipal Officials using the Property Assessment data base (which is publicly available)).

5- When identifying case studies, aggregate operations that demonstrate exemplary measures to limit their impacts on agricultural land will be identified and operators will be invited to participate in interviews. Equally those that have encountered problems will be included. In particular, issues related to problem mediation will be explored and opportunities for improved cooperation and coordination within the planning process will be discussed. These interviews will be utilized for the identification of best practices for a manual for aggregate operators.

6- Farmers in close proximity to the exemplary and problematic sites will be invited to participate in an interview to understand how they have been impacted, areas of improvement and proactive measures they supported.

7-Municipal planning staff and representatives of OMAFRA and MNR will also be invited to participate in interviews regarding the existing process for aggregate operation approvals and measures/policies/etc. that could be implemented to mitigate or avoid negative impacts on farmland. Further, municipal staff will be consulted regarding conflict during the planning process and the identification of new policies to mitigate these conflicts and reduce or eliminate impacts on agricultural land. As aggregate policies vary by county and region, these interviews are necessary to gain a thorough and accurate understanding of the planning process in relation to aggregates. It is anticipated that 50 to 100 interviews will occur (this number includes aggregate



operators, farmers and public sector employees).

8- A toolkit / manual will be created based on the findings of this study. The toolkit will include best practices for future sites and opportunities to mitigate existing issues. It will benefit aggregate producers and municipalities. It will include best practices to minimize conflict, and it will present proactive measures that can be utilized throughout the approval process and community engagement strategies to keep adjacent land owners informed.

13. Deliverables (Max 100 words). Give tangible and measurable outcomes expected from your project such as a new product, methodology or process.

This project has five deliverables

1-A jurisdictional scan of Canadian and international literature regarding the social, economic, environmental and land use impacts of aggregate operations in close proximity to agricultural land

2-The identification of best practices that will benefit agriculture when aggregate operations are located in close proximity

3-A toolkit to assist decision makers when approving applications for aggregate operations (e.g. separation distances/buffers/etc.)

4-A manual for aggregate operators with proactive measures and strategies to mitigate existing issues and/or avoid future impacts on adjacent agricultural land

5-A better understanding of what should be included in an agricultural impact assessment

14. Knowledge Translation and Transfer

Q1. User Audience - Who will use this research? Name the main audiences (no more than 3) that may benefit from your research.

The research and related toolkit will be used by aggregate producers and those involved in the approval of aggregate operations. This will include municipalities as part of their approval process and the province as part of theirs.

Farmers, aggregate operators and policy makers/planners will benefit from this research as it will help them to make more informed decisions leading to better outcomes.

Q2. KTT Audience Engagement Point - Will members of the identified audience(s) be integrated in the research process or will they be informed of outcomes at the end of the project? Explain your rationale.

Farmers adjacent to aggregate operations will be engaged throughout the research project as they will provide the most significant data for the project. Policy makers/planners and aggregate operators will be engaged



during data collection and informed of the outcomes of the project as they will be impacted by the best management practices that arise from the data collection. All three target audiences will be included in the advisory committee and therefore will be actively engaged throughout the research project.

In terms of timing, please see the listing of milestones which identifies each of these groups and the stage at which they will be involved.

Q3. Goal Identification - Identify your KTT goal for each audience identified in Q2. Goals may include, but are not limited to, one of the following options: Dissemination: Share knowledge, experience, or tools developed through this research with your target audience. Policy, program or practice change: Inform decision making; influence policy; facilitate practice change. Behaviour Change: generate behaviour change; change attitudes; change practice. Commercialization: Get a product, prototype or idea to your target audience with the end goal of commercializing your research output.

KTT Goals

Farmers: Awareness of impacts of aggregate operations and best practices that can be implemented to improve this relationship. A more informed farm community will more effectively engage in the approval processes (planning and licensing) required to establish new aggregate operations (Official plans/ zoning by-laws/ site plan approval).

Policy Makers (Planners, Provincial staff): Inform decision making, influence policy and facilitate practice change. The research will provide policy makers with a greater awareness of the impacts of aggregate operations on agriculture and the best practices that can be implemented to improve this relationship. The result will be more effective decisions that help to mitigate potential impacts on agriculture.

Aggregate Operators: Aggregate operators want positive relationships with their neighbours including farmers. This research will identify best practices that they can use that will help to minimize potential and actual impacts on farms which in turn will lead to more positive relationships. In this context the research will help to generate behaviour change, change attitudes and change practices.



15. Knowledge Translation and Transfer Plan

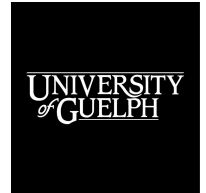
Target Audiences	KTT Activity	Activity Description	Target Completion Date
Farmers, Aggregate Operators, Municipal staff, Provincial staff (MNRF, OMAFRA)	a7.workshops	Draft Toolkit will be workshopped to verify content and identify potential changes.	2021-02-28
Farmers, Aggregate Operators, Municipal staff, Provincial staff (MNRF, OMAFRA)	a2.consultations with stakeholder groups or government agencies	Advisory Committee (meets throughout project)	2018-06-30
Farmers, Aggregate Operators, Municipal staff, Provincial staff (MNRF, OMAFRA)	a9.toolkit	Toolkit will be developed, profiled and promoted.	2021-04-30
General Public	a5.media interviews	We will be available for media interviews throughout the project.	2021-04-30
General Public, Farm groups	a8.seminars beyond an academic audience	We will be available for public presentations throughout the project (The P.I. has a track record of reaching out to community groups throughout his career).	2021-04-30
Farmers, Aggregate	B----PRESENTATIONS AT	We will be available for public presentations	2021-04-30

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Operators, Municipal staff, Provincial staff (MNRF, OMAFRA)	STAKEHOLDER/INDUSTRY/PUBLIC MEETINGS ETC.	throughout the project (The P.I. has a track record of reaching out to community groups throughout his career).	
Decision Makers	C---PRESENTATIONS AT SCIENTIFIC CONFERENCES	We will present at a number of conferences. Historically the PI has regularly presented at ROMA, AMO, OPPI, CIP and Latonnell. This will occur throughout the project. Presentations will occur at least at 4 conferences.	2021-04-30
Farmers, Aggregate Operators, Municipal staff, Provincial staff (MNRF, OMAFRA)	D---COMMITTEES INCLUDING RESEARCH, ADVISORY AND EXPERT CAPACITY	Advisory Committee	2018-06-30
General Public	f1.Print	We will be available for media interviews (print, radio, television) throughout (and after) the project.	2021-04-30
General Public, Farmers, Aggregate Operators, Municipal staff, Provincial staff (MNRF, OMAFRA)	h4.Website	Research Projects will be profiled on the PI's website and they will be posted as they become available. This website has been active for twenty years.	2021-04-30
General Public, Farmers, Aggregate Operators, Municipal	i1.Social media	We will use Social Media as appropriate to make audiences aware of research results (throughout the project)	2021-04-30

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staff, Provincial staff (MNR, OMAFRA)			
Decision Makers	a1.extension publications	The PI frequently publishes in the Ontario Planning Journal and Municipal World. The distribution of these two magazines/ Journals reaches virtually every land use planner and municipal politician within Ontario. At least 2 articles will be submitted connected to this research.	2021-04-30

16. Previous Funding

Project Number	Funding Source	Funding Value	Term of Funding
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