

# Okanagan FARM WATER USE PLANNING Pilot Project

Summary Report (February 2018)

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## ACKNOWLEDGEMENTS

We would like to thank the sixteen agricultural producers for participating in this pilot project and for providing their feedback. We would also like to thank the Okanagan Adaptation Working Group for providing strategic guidance during the project development phase and the Project Oversight Committee for providing guidance throughout the project and for reviewing and improving the pilot materials. And finally, we would like to thank the BC Fruit Growers' Association for administering the project.

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Funding for this project has been provided by the Governments of Canada and British Columbia through the Investment Agriculture Foundation of BC under *Growing Forward 2*, a federal-provincial territorial initiative. The program is delivered by the BC Agriculture & Food Climate Action Initiative.

The Governments of Canada and British Columbia are committed to working with industry partners. Opinions expressed in this document are those of the authors and not necessarily those of AAFC, the Ministry of Agriculture or the Investment Agriculture Foundation.



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# 1. Introduction

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## *Project rationale*

As Okanagan summers become warmer and drier and as precipitation patterns change – including more winter precipitation falling as rain (rather than snow) – producers will be required to adapt their water management practices to suit the changing conditions.

Completed in the winter of 2016, the *Okanagan Adaptation Strategies* planning process brought together Okanagan producers and sector specialists and local and provincial government representatives, to review and prioritize climate change impacts for the region's agriculture sector and to identify suitable adaptation strategies and actions. During the planning process, producer participants highlighted the need to enhance the available water management tools and information, with a particular emphasis on individualized planning and decision support.

Through an earlier pilot project, an Integrated Farm Water Planning Toolkit was developed in the Cowichan region. The toolkit was intended to be applicable to many farm types, to address a broad spectrum of water management issues (including considerations regarding climate change), and to result in an individual farm plan for water management.

This project was undertaken both to test and further refine the Toolkit in a second region of BC, and to evaluate its potential to provide the direct and individualized support that Okanagan producers identified as important.

## *Project objectives*

- To provide individualized water management planning support to agricultural producers in the Okanagan
- To assess the level of interest in water management planning – and specific water management needs – amongst Okanagan producers
- To adapt and further refine the Farm Water Planning Toolkit (originally developed in the Cowichan region) for the Okanagan context

## *Project activities*

The primary project activities included:

- Refining of the Toolkit
- Recruiting pilot participants
- Conducting farm visits
- Developing individualized Farm Water plans
- Sharing back Farm Water plans via farm visits (or other means)
- Producing a summary report with findings and lessons learned

## *Report content and structure*

This summary report describes the methodology of the various project activities and shares the findings associated with the sixteen farm visits in the Okanagan, including the primary water issues encountered, the recommendations provided to producers and a summary of the feedback

received from producer participants.

The report also summarizes recommendations on refining the toolkit format and content (within the scope of this project) as well as considerations for future toolkit refinement and delivery.

## 2. Project methodology

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### *Toolkit refinement*

The toolkit refinement was undertaken by Kerr Wood Leidal, with input from Ted van der Gulik and from the project delivery team (Pete Spencer, Bruce Naka and Lee Hesketh). The refinement was done in two stages, at the beginning of the project to ensure that any identified gaps or necessary refinements were addressed prior to pilot delivery, and at the end of the project to further improve the toolkit based on final feedback from the project delivery team.

The first phase of toolkit refinement took place between April and May 2017 and included a joint training session and a small number of “sample” farm visits (to test and evaluate the toolkit). Changes were then made to the toolkit to fill in gaps and address issues identified during the training session. An additional element of the toolkit refinement was the inclusion of some questions specific to wine-grape growers to assess the potential for integration of the self-assessment process offered through Sustainable Winegrowing B.C.

A second phase of toolkit refinement took place in February 2018. This phase integrated any final recommendations – based on the experiences from the pilot project – from the project delivery team. This input is summarized in the *Recommendations for Toolkit Refinement* section below.

### *Recruiting pilot participants*

The original project description indicated that the opportunity to participate in the pilot project would be broadly promoted through Okanagan project partners and agricultural organizations. This step was intended to assist in evaluating the level of producer interest in undertaking a Farm Water Plan.

However, once the project delivery team was in place and initial dialogue had occurred with the Project Oversight Committee, it became apparent that targeted outreach was a more desirable method to recruit suitable pilot participants. To assess the function of the Toolkit it was deemed important for the pilot to cover as wide a variety of commodities, water sources, water delivery systems, and potential issues as possible. The project delivery team was best able to ensure this ‘diversity’ objective was achieved by approaching producers directly, most of whom they had some prior knowledge of. All of the producers that were approached agreed to participate in the process. Consequently, it was not possible to assess the level of interest within the broader producer population within the parameters of this pilot project.

### *Conducting farm visits, developing and sharing back Farm Water Plans*

A total of 16 farm visits were undertaken by the project delivery team between May 25<sup>th</sup> and December 18<sup>th</sup>, 2018. These visits involved a conversation with the producer, a farm walk through,

an explanation of the maps & information collected during the pre-visit preparations, collection of any on-farm information needed complete the necessary calculations and potentially some follow-up to cover any information gaps. Most farm visits were undertaken by one project team member and the visits (along with travel time and the pre-visit prep) took an average of 12 hours. The completion of each Farm Water Use Plan report took an average of 20 hours, and the follow-up with producers generally occurred either through an in-person visit or a phone-call. Producers were also asked to complete an evaluation of the pilot process and 14 of the 16 producers participated (results are summarized in *Summary of Producer Feedback* starting on page 8).

### 3. Pilot Project Findings

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#### *Plan Sample characteristics*

The 16 farms that had a Farm Water Plan developed for them were comprised of a total of approximately 726 hectares with 327 hectares or 45% of the total area under irrigation. These operations spanned a large geographical area starting from Bridesville and Oliver in the south up to Darfield in the north. Most operations only had a single significant commodity, but three operations had more than one commodity.

#### *Water management practices*

The crops under irrigation included tree fruits, grapes, grains for human consumption, vegetables, turf grass, corn, and various forages harvested as hay or silage, and areas used for pasture. The forage produced was fed to beef and dairy animals.

Water was delivered to the crops by flood irrigation, sprinkler and micro sprinkler systems, and drip. Many of the operations had more than one delivery system with various levels of application efficiency. As would be expected, there were various sources for the irrigation water ranging from purveyed water, to ground water wells and points of diversion from surface water.

There was very little water stored in constructed structures other than the dams constructed to store water in streams or lakes. Six of the operations sourced their water from wells but only one of those wells was licensed at the time of the farm visit. In addition, two of the operations with purveyed water were charged by total irrigated area, so it was impossible to quantify the total amount of water the sixteen operations were allotted or licensed for. The nine operations with allotments or licences were allowed a total of 968A/F or 1,193,544 cubic meters of water.

#### *Information sources and uncertainty*

Only four operations had water meters installed on their irrigation systems, and on one property the readings were not yet available to the producer. One property was a recent purchase and no historical meter readings were available. Consequently, accurate metered annual water use was only available for 12.5% of the completed plans. Of the ten farms that pumped their water from wells or watercourses, only two had complete enough records via hydro bills or pump data to allow an annual water use calculation by that method.

The balance of the operations (87.5%) had their annual water use calculated through manual calculations. Information used to complete the manual water use calculation was based on the pre-visit screening questions. Increasing the number of screening questions (as suggested later in this document in the Recommendations for Toolkit Refinement section) would likely improve the information available at the time of the farm visit and help to provide a more accurate estimate.

Using the best available online soils mapping tools, a soils map was generated for each property. The farm operators were interested in the maps and commented on their accuracy, or lack thereof, but no ground proofing was done to increase the accuracy of the soil information. When using the Agricultural Water Calculator the landowners' opinions on the soil types were used.

### *Summary of key on-farm water issues\**

- Seven of the operations experienced some form of flooding or drainage issue but it was a significant problem on only one of the operations.
- Four of the operations have significant production limiting issues based on quantity of water available from their current supply systems, two in the latter part of the irrigation season, and two all season long.
- Four of the operations had water quality issues; two as a result of excess minerals, one due to chlorination, and one was a possible human health issue.

(\* Please see Appendix #1 for the detailed summary of farm statistics and key water issues)

### *Recommendations to producers in the Farm Water Plans*

There were 13 different recommendations made to the 16 producers, the list that follows starts with the most common recommendation.

<b>Rank</b>	<b>Recommendations</b>	<b>Frequency</b>
1	Look into developing an additional source of water and/or enhancing an existing one such as a well, point of diversion (POD), storage, or connecting to a purveyor's system	13 out of 16 (81%)
2	Install moisture sensors	12 out of 16 (75%)
3	Complete a detailed irrigation system assessment	11 out of 16 (69%)
4	Look into improving irrigation water delivery system. This could be going from sprinkler to drip, installing a low pressure pivot, modifying the zones to match soil types or system output, converting from an open ditch delivery system to a buried pipe.	11 out of 16 (69%)
5	Install some form of water volume measurement	10 out of 16 (63%)
6	Apply mulch to increase soil moisture retention	7 out of 16 (44%)
7	Develop a drought management plan	6 out of 16 (38%)
8	If necessary, install some form of field drainage system (possibly emptying into a water storage structure)	6 out of 16 (38%)

9	Automate irrigation system to improve scheduling	4 out of 16 (25%)
10	Address water quality issues	4 out of 16 (25%)
11	Check irrigation for leaks	1 out 16 (6%)
12	Test well to determine its current flow capacity	1 out 16 (6%)
13	Install a high flow water shut off sensor	1 out 16 (6%)

(\* Please see Appendix #2 for the detailed summary of recommendations to producers)

### *Summary of producer feedback*

A three-page evaluation questionnaire with thirteen questions was distributed to each of the 16 farm operators and at the time of writing, fourteen responses were received. What follows is a summary of the responses.

(\* Please see Appendix #3 for the summary of feedback from producers)

### *Overall usefulness of the farm water management planning process*

#### **1. What did you find useful about the Farm Water Management planning process/content of your Farm Water Plan?**

All of the (14) farms commented and thirteen were positive. The most common theme was that the plan would be valuable to refer to in the future because it provided all of the water related data, issues, and recommendations in one document at one time. For one producer the plan showed potential for improved water/time savings and for another there was value in a discussion with someone from outside their operation and being able to compare their own water use calculations with those done through the plan. For one producer the process did not include any information they didn't already have.

#### **2. Was there anything about the Farm Water Management planning process/Farm Water Plan that was not useful or was redundant?**

Nine of the (14) farms answered no to this question. Of the five producers who answered yes, one producer felt that much of the information was redundant; for others the process included issues they weren't concerned about (e.g. domestic water use, drainage issues which weren't of concern).

#### **3. Do you have any water management issues/concerns that were not addressed by the Farm Water Plan?**

Eleven of the (14) farms answered no to this question and two added comments. One producer noted that the plan didn't provide an estimate of the cost of recommendations or information on any cost/share or grant funding that might be available. Another producer wanted more accurate soil type information and another would like to be able to continue to discuss issues.



#### **4. Did you learn anything about your farm's water supply that surprised you?**

Six of the (14) farms answered yes to this question. The comments ranged from surprise about how much they under-irrigated (compared to what their source could supply), to the extent of their over usage compared to recommended amounts or how much they were allocated compared to what they actually needed.

### *Mechanics of farm water management planning process*

#### **5. How easy/difficult was it to interpret your personalized Farm Water Management Plan?**

Nine of the (14) farms answered that it was easy to interpret their plan. Four farms would have liked to be able to choose between the use of imperial & metric units in the final report. [Addressed through final adjustments to the toolkit].

#### **6. The planning process required multiple contacts with the farm water planning advisor, do you feel this was a good process and good use of your time?**

Thirteen of the (14) farms answered yes to this question.

#### **7. How easy or difficult was it to pull together the materials for the farm water use planning advisor in advance of your first meeting (well license, farm map, etc.)?**

Twelve of the (14) farms answered that it was not difficult. One farm responded that he was a new owner and the former owners didn't retain any records (so answering the question was difficult) and another had difficulty due to the farm ownership and management arrangement. Neither of these responses reflect on the way the process is set up.

#### **8. Do you have any suggestions to improve the 'process' of undertaking a farm water use planning?**

Six of the (14) farms answered yes to this question and one producer commented that the process could be improved by supplying a questionnaire to allow people to prepare their information before anyone visits. [Addressed through final adjustments to the toolkit].

#### **9. Do you have any suggestions to improve the format/content of the Farm Water Plan individualized report?**

Five of the (14) farms answered yes to this question. The most common comment from producers that were sent an electronic copy of their final plan was that the hyperlinks either didn't work, or that they directed them to a very large document which made it difficult to find the part of the document that pertained to the recommended action.

One producer suggested that it would be beneficial to consolidate the available information (e.g. maps, consumption estimates and recommended crop flow rates) on a website. This would not only help for the assessment, but also later on when implementation of the plan is underway. Due to their financial constraints it would take a number of years to implement the whole plan, and it would be an ongoing project. For this reason, it would be helpful to be able to access the latest applicable data at the time the change was being made.

Another suggestion was that it would be beneficial for the final report to include a summary of results and recommendations and perhaps a rating scale comparing their system to an optimal system. One person wanted a list of area-specific contacts for suppliers and consultants to be able to assist them in implementing the recommendations.

#### **10. Have you completed an EFP for you farm?**

Eight of the 16 farms had completed an EFP and one other operator had done an EFP in the past but not on that property.

#### *Summary of current & future issues and possible solutions identified in the Farm Water Plan*

#### **11. Will you implement any of the recommendations in your Farm Water Plan?**

Ten of the (14) farms answered yes and three answered possibly. One producer felt that the majority of recommendations had already been considered or were not necessary.

#### **12. If you answered yes in question #11 and there was more than one recommendation, please identify the priority of the recommendations you would implement.**

Some farms had their priorities grouped together; for instance, different things that could logically be done at the same time were often all given the same priority. For example, for a producer who was considering upgrading their delivery system, installing a drip system and a controller with moisture sensors connected, those actions would all receive the same priority rating.

The most common response was changing/upgrading the irrigation water delivery system and this was the number one priority for three of the seven operations that had this as an identified priority. Installing water meters was next on the list with five of the six producers who received this recommendation placing it as their top priority.

The installation of soil moisture sensors had the same number of responses as water meters and it was the top priority in two of the six responses. Developing some form of water storage was third on the list with four responses, one of which rated it as their first priority. Two of the storages were for irrigation water and the other two would probably only be for emergency use such as fire response.

Drilling a new well or hooking up to an existing well and looking for system leaks both had two responses. Hooking up to an existing well was the top priority on one operation and looking for leaks was the top priority in both cases.

The rest of the responses to this question all had one action identified and in only one was the action the top priority.

(\* Please see Appendix #4 for additional information)

### 13. What would be the reason(s) that you would choose not to implement any of the recommendations?

**(A) Financial (B) Feasibility on your property (C) Time constraints (D) Regulatory difficulties (E) Other reasons**

Not surprisingly, 13 of the (14) producers responded that financial issues were the number one reason they wouldn't implement the plan recommendations. Eight responded that time constraints was the second reason, and one identifying time constraints as the primary reason. Two producers said regulatory difficulties was the third reason and one said it was the second reason. One said that feasibility of the project on their property was the second reason they wouldn't implement the recommendations.

(\* Please see Appendix #5 for additional details)

#### *Additional comments from the evaluation questionnaires*

Seven farms provided an additional comment. Some of these additional comments and responses to the questionnaire were out of the purview of this project and some were the same as suggestions included in earlier questions. The one comment that stood out was that it may be beneficial to share this information with water purveyors and water boards.

## 4. Recommendations for Toolkit Refinement

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### *Toolkit format - ease of use*

When on-farm going through the tool-kit with the operator, the process would flow better if questions and the answer options available (where appropriate) followed a similar structure to the EFP Planning Workbook with boxes for Yes, No, ?, and NA, after the question.

It would also improve the toolkit if all the questions and the page numbers were numbered sequentially. The first 12 questions in the existing toolkit are the screening questions, the next page with the heading **Current Situations- Water Supply Module** starts back at 1 again and has two questions which could be numbered 13&14.

The following page the **Current Situations- Water Supply Module Reg/Mun -Water System** has under the heading the statement- **Complete this page if you use water from a Reg/Mun -Water**

**System**, and instead it is suggested that the words “If not go to question #18” be added allowing the reviewer to pass over questions 15-17. Question 18 has a line over it stating **Complete this page if you have groundwater well**, add the words: “If not go to question #26.” If this numbering system were to be carried on through the toolkit it would reduce confusion and speed the process.

An additional benefit of a sequential numbering system is that if the farm operator, or the consultant working with the operator, makes a note of the number of the question(s) that needed more work or were especially important it would be easier to go back to them later. When going through the Strategies section and when taking the process to the next step by developing the Farm Water Plan the ability to easily refer back to specific questions should make the process quicker and more complete.

The Sustainable Winegrowing BC questions in the toolkit are excellent and including some or all of them in the final version of the toolkit would improve the final product. However, it is suggested that *only* those questions relevant to all commodities remain in the toolkit OR that a separate section of content be developed to enable the reviewer to ensure these questions are asked of wine grape operations,

### *Toolkit content*

It could potentially save a considerable amount of time during the farm visits, and the amount of time spent contacting or revisiting the operations, if the following series of additional questions were added in to the screening section of the toolkit.

It may also be beneficial to have the screening questions available as a Word document to mail or email to the producer prior to the farm visit for more complex operations.

In the **Farm Locations** box have an area where the landowner can designate:

1. The location & acreage he or she would like to focus on.
2. The general location on the focus lot of any points of diversion, wells, or the point of connection if connected to a water purveyor.

In the **Drainage** section between questions #4 & #5 add the question:  
Approximately what percentage of your land floods?

For question #7 make the wording:

**Note any major runoff/drainage issues & how much of the farm is affected**

In the **Water Use** section, provide a box in which the farm operator can choose whether they would prefer to have calculations done in imperial or metric units.

Between questions #9 & #10 add the questions-

1. Crops & the acreage of each crop \_\_\_\_\_  
\_\_\_\_\_
2. Type of irrigation system(s) used \_\_\_\_\_  
\_\_\_\_\_
3. When do you start irrigating \_\_\_\_\_ stop Irrigating \_\_\_\_\_

4. How long do you irrigate each section? \_\_\_\_\_
5. How many times a year do you irrigate each section? \_\_\_\_\_
6. Do you have a water meter on this system \_\_\_\_\_
7. Is the water is pumped? \_\_\_\_\_, or gravity fed? \_\_\_\_\_
8. If the water is pumped how many pumps are used? \_\_\_\_\_  
Horsepower? \_\_\_\_\_ Phase? \_\_\_\_\_ Voltage? \_\_\_\_\_  
Amperage? \_\_\_\_\_
9. Do you have the pump specifications (GPM @ PSI) \_\_\_\_\_
10. Can you supply separate power bill specific to just these pumps  
\_\_\_\_\_
11. Do you have a well Log? \_\_\_\_\_
12. If you have livestock how many of each do you have?  
Dairy cows \_\_\_\_\_  
Beef cows \_\_\_\_\_  
Calves \_\_\_\_\_  
Bulls \_\_\_\_\_  
Other (List) \_\_\_\_\_
13. How many months do you supply water to the animals from your farm water system? (not from surface water) \_\_\_\_\_ and what is the supply? \_\_\_\_\_
14. How many dwellings? \_\_\_\_\_ How many residents? \_\_\_\_\_ and what is the supply? \_\_\_\_\_

### *Future toolkit and farm plan refinements*

A number of additional improvements could be made to the toolkit and the associated Farm Plan “product” that is delivered to the producer. These refinements – based on the project delivery team’s experience and producer feedback - are beyond the scope of this project but are worthy of consideration for future delivery.

1. Provide a simplified summary at the end of the report listing results and recommendations.
2. A valuable addition to the Farm Water Plan would be to share with producers “where they stand” as far as over or under application of irrigation water compared to the calculated requirement of the crop(s) grown. This could be done by stating a percentage (+) or (-). For producers paying for their water by the volume used (or if they are pumping the water) a cost/savings estimate could be provided. If the Tool shows a producer the potential monetary value of decreasing their cost of production or increasing their overall production, it might spark some interest in making changes.  
\* See the short testimonial in *Additional Considerations* section of this document.
3. Include a summary of available cost/share funding for any of the projects recommended in the Farm Water Plan.
4. Create a form or forms to aid producers in collecting the necessary component prices and labour estimates to calculate the cost of upgrades. An example of this would be the worksheets included in the Ministry of Agriculture fencing manual.
5. Send an electronic copy of the plan as this relatively simple and could be done in all cases.
6. There was a request for a website with all of the information sources used to develop the Plan such as maps and guides to different calculations. This could be valuable addition but

- it should be noted that iMap BC – while an excellent and extensive source of a information – is not really user friendly for a casual user in its basic form. A link to a version of iMap prefilled with the layers used in the plan and a simplified tutorial could be included.
7. The links in the current toolkit Appendices need to be reviewed (to ensure they are functioning) and in some cases there is the need for additional instructions to help guide users to the pertinent area in a large document.
  8. Giving the producer the choice of having the calculation results stated in imperial or metric terms was suggested earlier in the previous section of this document. However, to ensure all operators understand the content of their Farm Plan, the language used should be self-explanatory. An example would be instead of the word demand use calculated crop requirement.

## 5. Considerations for Future Toolkit Delivery

### *Integration with the Environmental Farm Plan program*

It is important that the agriculture sector continue to improve water management practices in order to adapt to the many potential challenges resulting from climate change. However, to create a tool that will work for all commodities and that easily and (cost effectively) engages the majority of operators will be a challenge. One option – which would take advantage of the established Environmental Farm Plan Program structure – would be to have climate change adaptation as an additional planning module of the EFP Program.

The EFP program has proven successful in reaching a large number of producers and already has a user-friendly system in place and a number of documents such as their Reference Manual that, with some changes, would work with a climate change module.

Depending on how the toolkit is ultimately delivered, some reduction of cost/effort could occur by utilizing the EFP “worksheet” approach. In the EFP process there are worksheets that are designed to be filled out at the time of the farm visit. It might be valuable to investigate the possibility of creating an EFP Workbook to be filled out on the farm. The necessary calculation sheets could be filled out manually or have the necessary Excel formulas embedded in them (if being done electronically).

The Planning Advisors could easily complete an EFP that had wording changes or additional questions a once the reason for the changes were explained to them. The EFP is an established program with trained delivery agents with an active promotional program, there should be very limited extra expense to promote increased additional adaptation elements.

If the decision is to keep to the current approach of using the toolkit questions to gather information, some time could be saved writing up the Farm Water Plan by combining the Future Scenarios & Analysis section and including a summary of the five different topics they include. Another option would be to turn the Strategies & Next Steps section into an action plan populated from a list Beneficial Management Practices similar to, but much shorter than, the one used in the EFP program Biodiversity Plan.

### *The EFP process*

Once a producer decides they want to complete an EFP for their operation, and has been in contact with a Planning Advisor (PA), the PA collects their property information and conducts a search to find as much information as possible about the property and any environmental risks that could be associated with it.

This information package includes a suite of maps of the property, location of aquifers, wells, water licences, basic soils information, topography, watercourses and whether they are fish bearing, and species at risk. They also search out well logs, classification of aquifers that may be present, and the volume of water that is allowed to be diverted by water licences. This package – which becomes part of the EFP – is left with the producer. The package contains all of the basic data that is collected for background information to complete the toolkit and the map package included in the Farm Water Plan.

The next step is the farm visit where the PA and farm operator tour the operation looking at, among other things (and similar to the toolkit) any wells on the operation, irrigation water delivery infrastructure and equipment and, if appropriate, the irrigation point diversion with motor and pump.

Once the PA is satisfied they understand the management of the operation and has collected enough data, the next step is to explain the information in the mapping package to the operator and to fill in the Planning Workbook. The EFP Planning Workbook covers 34 different topics each with a number of questions to allow it to encompass all commodities. The answers to the questions that pertain to the operation being assessed lead to the development of an Action Plan to potentially mitigate any environmental issues on the farm.

Of the 34 different topics the EFP planning workbook address, 23 have water-based questions. Topics in the EFP workbook already include Water Supply, Irrigation, Drainage, Runoff, Water Conflicts, and Climate Change. These sections would have to be reviewed in detail, but it is quite possible that with wording changes and/or the addition of some questions, the EFP planning workbook could encompass all of the issues covered in the Toolkit.

Once all the questions in the planning workbook are answered – and the Action Plan is filled out – the EFP is complete. The Action Plan could take the place of the Strategies and Next Steps section of the Farm Water Plan, and trigger any additional planning required to apply for BMP funding.

### *Limitations within the EFP program in relation to Farm Water Plan delivery*

1. The responses from the Farm Water Plan questionnaire indicated that producers would like to have a simplified summary at the end of the report listing results and recommendations, along with a way to estimate the cost of recommended improvements. The EFP program currently has no provision to deliver those items.
2. The EFP program funds additional planning, such as the development of an Irrigation Management Plan. These types of plans will have to be altered to capture things like soil moisture holding capacity and include ways to fund the collection of the additional information.

### *Alternative EFP delivery option*

The Toolkit portion of the Okanagan Farm Water Management Project could be delivered directly by the EFP program with the Farm Water Plan being triggered out of the EFP Action Plan as an additional planning document.

If this were the preferred option, there would likely have to be some form of information transfer. This is where things could get complicated unless the Farm Water Plan only dealt with irrigation and was structured to be part of a Certified Irrigation Plan. This would likely work in the interior where water issues are almost exclusively based around irrigation but I'm not sure how that would fit in the coastal areas. The issue would be that the EFP Action plan could conceivably trigger more than one type of additional management plan or individual BMP. Some of the EFP PAs would have the skill set to develop a Drainage Management Plan but I doubt that any have the credentials to develop a Certified Irrigation Plan.

### *Current (2017/2018) BMP cost-share supports*

The EFP program had in its 2017/2018 operating year the following cost share opportunities for Beneficial Management Practices (BMPs) that could conceivably address the issues covered in this project.

*\* It should be noted that the BMP funding list for the 2018/2019 operating year has not yet been set and may be different from the 2017/2018 operating list. It should also be noted that the EFP program BMP funding is depleted very quickly and so if there were a high demand for 'Farm Water Plan' projects it is unlikely many of the projects would be approved.*

### **Farmstead Areas- Runoff/Storage**

1. **Farmyard Runoff Control/Storm Water Management**- Practice Code 0501, cost/ share 50% with a project cap of \$40K of program funds covering- Upstream diversion around outdoor confined livestock areas or downstream protection of stewardship areas. Projects could include catch basins, retention ponds, in field diversion works, or constructed wetlands.
2. **Farmyard Runoff Control/Storm Water Management** Practice Code 0502, cost/ share 50% with a project cap of \$20K of program funds covering- Engineering or technical design work (Mandatory). Catch basins and retention ponds could have a secondary function to provide limited amounts of water for irrigation or fire control.

### **Riparian Areas- Storage**

3. **Riparian Area Management/Alternate Watering Systems to Manage Livestock**- Practice Code 1001, cost/ share 60% with a project cap of \$70K of program funds. When combined with fencing a riparian off to exclude livestock the practice code could include the installation of some type of water storage facility.
4. **Riparian Area Management/ Erosion Control Structures (Riparian)**- Practice Code 1101, cost/ share 60% with a project cap of \$70K of program funds. Projects could include- Constructed Works- Retention ponds and erosion control dams. These works if appropriate could be used for livestock water, fire control, or irrigation. (May have to be licensed) Practice Code 0502, cost/ share 100% of the first \$5K with a project cap of \$20K of program funds covering- Engineering or technical design work (Mandatory).



### Irrigation- Water use

5. **Irrigation Management Planning-** Practice Code 2901, cost/ share 100% with a project cap up to \$1K of program funds. Consultative services of a certified designer to produce an irrigation management plan including recommendations that include a certified design layout, materials list and maintenance requirements.
6. **Irrigation Management Planning /Water Management Planning-** Practice Code 2902, cost/ share 100% with a project cap up to \$2K of program funds. Consultative services for water management planning to deal with issues arising from excess water.
7. **Irrigation Management- Weather stations or improved irrigation management-** Practice Code 1801, cost/ share 50% with a project cap up to \$5K of program funds. This BMP covers weather stations, irrigation scheduling equipment, soil moisture sensors and moisture meters, and irrigation controllers.
8. **Irrigation Management- Irrigation Infrastructure Improvement Forage-** Practice Code 1804, cost/ share 60% with a project cap up to \$15K of program funds. Targeted at forage and vegetable growers in the interior with an existing irrigation in place. Replacement of metal mainlines with buried PVC mainlines, nozzles, gaskets, sprinklers, suction screen, and intake pipes if identified in the plan covered in 2901.
9. **Irrigation Management- Irrigation Infrastructure Improvement extensive systems-** Practice Code 1805, cost/ share 30% with a project cap up to \$20K of program funds. This category is intended to convert existing lower efficiency systems such as stationary and traveling guns, hand and wheel move systems and flood irrigation with a high efficiency pivot system. It also will upgrade sprinklers on an existing pivot system to drop tube rotors.  
\* Proof of an existing water licence and use of the licence in the previous year must be provided.
10. **Irrigation Management- Irrigation Infrastructure Improvement-Conveyance Ditch** Practice Code 1806, cost/ share 50% with a project cap up to \$10K of program funds. This BMP is solely for replacing a ditched irrigation supply authorized by a water licence to a piped supply.

### Nitrous Oxide

11. **Nitrous Oxide Reduction** - Practice Code 3201, cost/ share 50% with a project cap up to \$10K of program funds. Improved drainage on forage corn and forage grass fields as proposed by a water management plan
12. **Nitrous Oxide Reduction** Practice Code 2902. Additions, cleaning, and repair to subsurface drainage systems.

*\* This BMP is only potentially available in the southern interior if accepted as part of a Group EFP so there is a very low likelihood of being able to use it.*

## **Carbon Dioxide**

13. **Carbon Dioxide Emission Reduction-** Consultative services for an on-farm energy assessment- Practice Code 3201, cost/ share 50% with a project cap up to \$10K of program funds.
14. **Carbon Dioxide Emission Reduction- Replacement of fossil-fuel driven motors with electrical motors-** Practice Code 3302-1, cost/ share 30% with a project cap up to \$10K of program funds. High efficiency motors & pumping systems. If the project includes a pump it must have been specified in both Practice code 3201 and 2901 plans.
15. **Carbon Dioxide Emission Reduction- Power line extension for replacement of fossil-fuel driven motors with electrical motors-** Practice Code 3302-2, cost/ share 30% with a project cap up to \$30K of program funds.

### *Gaps in cost-share funding support*

The most common recommendation to producers (across 81% of plans) was to develop new water sources or enhance existing ones. Six of the 14 operations that responded to the evaluation questionnaire identified this as something they would like to do. Currently there is no cost/share category within the EFP program to address this. In the past there was a program called the Canada-British Columbia Water Supply Expansion Program that assisted agricultural producers plan and develop projects to develop and enhance long-term sustainable agricultural water supplies. If a program like this were to be offered again, it would be helpful.

The second most common recommendation to producers (69%) was to upgrade their irrigation water delivery systems; this was also the most common issue that producers wanted to address. As identified above (*Current BMP Cost-share Supports*) there is cost/share funding for a limited number of upgrades in the EFP program and these would only apply to some commodities.

In the past, the EFP program funded conversions from sprinkler to micro-sprinkler or drip systems, this category was dropped a number of years ago. The tree fruit, grape, turf and small-scale ground crop operations would benefit from having this category reinstated.

There is also lack of information on the soil moisture holding capacity of the soils for the operations included in the pilot and, while there are options for obtaining information, they can be expensive. If the value of having accurate soil moisture holding capacity information was emphasized and partnered with an option to reduce the cost of obtaining this information, it would be very useful. This information could be used when designing new or upgraded irrigation systems intended to apply the correct amount of water at the appropriate time to the root zone of the crop grown. This would lead to more efficient water use and more uniform crop production. This could benefit many different commodities including grapes, tree fruits, ground crops and even the installation of centre pivot systems equipped to deliver variable rate application.

For 63% of the plans, the installation of a water metering system was recommended and this was also the number one improvement that producers wanted to implement. The installation of water meters in puryeved systems is becoming more common but there is no opportunity for assistance to install a metering system in non-puryeved systems.

In 38% of the plans there were situations where currently, or in the future, the installation of a drainage system could be beneficial; however only one producer identified this as a potential project and it was at the end of his priority list. As identified in the section above (*Current BMP Cost-share Supports*), the cost-share funding for drainage projects is only available in a limited number of situations in the Okanagan.

In 25% of the plans, water quality was identified as an issue and only one operator identified this as something they would be interested in addressing. There is currently no funding assistance available for addressing excess minerals in irrigation water or for purifying domestic on-farm water.

Testing current maximum well flow capacity/drawdown was recommended to one farm and the installation of a high flow water sensor shutoff was suggested to one other farm. Only the farm that had the high flow cut-off system recommended to it responded positively. There is a general lack of knowledge of what the actual current maximum output of existing wells or if their static level is remaining constant within the study area. Having some funding available to test and monitor wells will be more important as time goes on.

The EFP program has a process that allows proponents to suggest new BMP categories or expanded interpretation of the existing ones; this could be an avenue to get more climate change options onto the EFP BMP list. An example would be that currently the EFP BMP program cost/share funds a percentage of the purchase of specialty equipment to spread compost or manure in orchards and vineyards tied to recommendations in a Nutrient Management Plan. It may be possible to justify the purchase of the same type of equipment based on recommendation contained in an Irrigation Management Plan if the plan recommends the application of mulch to increase the soil moisture holding capacity.

### *Additional considerations*

In addition to the Environmental Farm Plan Program, there are several other possible opportunities or linkages for the future of the Farm Water Plan process.

1. Water purveyors and entities such as the Okanagan Basin Water Board may see the value of incenting adaptation to climate change that also improves water use efficiency.
2. If the Water Use Plans (or EFPs) detailed the financial advantage of more efficient water use, financial institutions might be more willing to finance projects.
3. A Water Use Plan that detailed the level of efficiency of an operation's water use, as well as providing information about whether there are any flooding or runoff issues, would be a definite asset if the property was being sold or purchased.
4. If additional cost/share financial help is not available, the other option that could trigger climate change adaptation would be to show the producers how they can reduce costs, and/or increase production to improve their bottom line.

The following is a short testimonial that was included in the comments section of the evaluation questionnaires. The producer was successful in applying to the EFP Beneficial Management Practice Program to convert a field they were irrigating with a wheel-line and hand lines to a centre pivot system and through this process lowered their pumping and fuel costs while increasing production and leaving more water in the creek. Although the cost-share support was provided

through EFP (and not through this pilot project), it does illustrate the power of financial incentives in encouraging and supporting producers to undertake projects that support climate change adaptation.

*The 40 acre field that we installed a pivot on a now produces 120 loads of silage where we used to get about 45 of the same sized loads. We now only irrigate the field three to four days a week instead of seven with the old system using the same pump. The .7 acre pond we pump from was created by damming a small creek, we used to lower the level of the pond when irrigating, now the stream flow keeps the pond at a level constant. We also picked up efficiencies while chopping silage, we now use less fuel harvesting because the crop is more uniform.*

With a bit of research there are undoubtedly more stories like this out there. Examples like this could help to incent change and promote a climate change adaptation program.

## Appendices

### Appendix 1 – Summary statistics for participating farms

Appendix 1 summarize key statistics (e.g. total farm area, area under irrigation, water delivery systems, etc.) for farms who participated in the Farm Water Planning pilot project.

Background Details	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16		
Plan number	Vernon	Kelowna	Armstrong	Armstrong	Lake County	Summerland	Oliver	Kelowna	Lavington	Bridesville	Silvercreek	Spallumcheen	Oliver	Peachland	Darfield	Mara		
Area	8.8	33.3	148.4	21.9	3.9	4.1	5.5	33.8	11.2	188.7	30.8	33.4	34.9	2.4	113.5	51.6	726.2	
Commodity(s)	TF	Grapes	Grain	TF	TF	TF	TF	TF/V/B/C/C	Turf	B/C/C	TF	TF	TF	Grapes	B/C/C	Dairy	#	%
Total Area (ha)	7.3	23.6	40.3	17.2	3.1	3.5	5.3	31.6	10.6	36.4	12.1	30.5	13.4	1.1	44.5	47	327.5	45%
Irrigated Area (ha)																		
Water Source(s)	Purveyed	Well	Well	Well	Purveyed	Purveyed	Purveyed	POD/well	Purveyed	POD	Well	Wells	Well	Purveyed	POD	POD		
Delivery System(s)	Sp/drip	Spr/drip	Pivot/spr	Msp,drip,gun	Spr/drip	Drip	Mspr	Spr/Mspr/F	HL	Spr	Msp/drip	Drip	Mspr	Spr/drip	Spr	TG		
Licence/allotment	32.5A/F	55.3A/F	None	None	No	Area	61.4A/F	170.7A/F	43.9A/F	149.9A/F	None	None	None	6.5A/F	250A/F	200 A/F	967.8	
Metered water	Yes	No	No	No	Yes	Yes	No	No	No	No	No	No	No	Yes	No	No	4	25%
Livestock	No	No	No	No	Yes NC	Yes NC	No	Yes	No	Yes	No	No	No	No	Yes	Yes	6	36%
Floodplain	No	No	No	No	No	No	No	No/diked	No	No	No	No	No	No	Yes	Yes	2	13%
Flooding/drainage	No	No	No	No	No	Yes	Limited	No	No	No	No	Yes	Yes	Yes+L	Yes	Yes	7	44%
Aquifer	No	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes+P	Yes+P	Yes	Yes	Yes	Yes	12	75%
Water storage	No	Limited	Limited	No	No	No	No	No	No	Limited	No	Limited	No	No	Yes	No	4	25%
Water quantity issue	No	No	No	No	No	No	No	No	No	Yes	No	Yes	Yes	No	Yes	No	4	25%
Water quality issue	No	No	No	Yes+I	No	No	No	No	No	No	No	No	Yes+I	Yes+C	Yes+HH	No	4	25%
TF=Tree Fruits																		
B=Beef																		
CC=Cow/calf																		
V=Vegetables																		
HL=Hand lines																		
NC=Non Comercial																		
F=Flood																		
Plus I =Iron																		
Plus H=Chlorine																		
Plus HH= Health																		
Plus P= Partial																		

## Appendix 2 – Summary of suggestions to producers

Appendix 2 summarizes the recommendations made to producers to address current/future farm water-use related challenges and opportunities. There were 13 different recommendations made to the 16 producers, with all farms receiving multiple recommendations. The column on the far-right shows the % of farms that received each recommendation.

Suggestions to Producers	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16		
Plan number	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16		
Area	Ver	Kel	Arm	Arm	LC	Sum	Oliver	Kelowna	Lav	Bride	Sil Cr	Spall	Oliver	PL	Dar	Mara		
Commodity(s)	TF	Grape	Grain	TF/V	TF	TF	TF	TF/V/Bc/c	Turf	B/c/c	TF	TF	TF	Grapes	B/c/c	Dairy		
Water Source(s)	Purveyed	Well	Well	Well	Purveyed	Purveyed	Purveyed	POD/well	Purveyed	POD	Well	Wells	Well	Purveyed	POD	POD	#	%
Detailed Irrigation Assessment	yes	yes			yes	yes		yes	yes		yes	yes	yes	yes	yes		11	69%
Drought management plan	yes				yes	yes	yes		yes			yes					6	38%
Develop a well or storage	yes		yes	yes	yes	yes			yes	yes	yes	yes	yes	yes	yes	yes	13	81%
Look for leaks	yes																1	6%
Change delivery method	yes	yes		yes	yes	yes		yes	yes	yes		yes			yes	yes	11	69%
Automate system	yes	yes					yes		yes								4	25%
Install water metering			yes	yes			yes	yes		yes	yes	yes	yes		yes	yes	10	63%
Install moisture sensors	yes	yes	yes	yes		yes	yes	yes		yes	yes	yes			yes	yes	12	75%
Mulch to increase moisture retention	yes	yes		yes		yes		yes			yes			yes			7	44%
Test well for flow capacity			yes														1	6%
Improve system to address water quality				yes									yes	yes	yes		4	25%
Install a high flow water shut off sensor					yes												1	6%
Install some form of drainage/runoff system						yes						yes	yes	yes	yes	yes	6	38%
TF = Tree fruits																		
V = Vegetables																		
B/c/c = Beef cow/calf																		

### Appendix 3 – Summary of feedback from producers

Appendix 3 summarizes which questions (of the 14-question evaluation) were answered by which farms. Cells marked with a *Com* indicate that the producer provided a comment rather than a yes/no answer. A full list of the 13 evaluation questions and a summary of the comments received can be found in the main document (starting on page 8).

Suggestions from Producers																	
	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	
Plan number																	
Area	Ver	Kel	Arm	Arm	LC	Sum	Oliver	Kelowna	Lav	Bride	Sil Cr	Spall	Oliver	PL	Dar	Mara	
# Commodity(s)	TF	Grape	Grain	TF/V	TF	TF	TF	TF/V/Bc/c	Turf	B/c/c	TF	TF	TF	Grapes	B/c/c	Dairy	
1 What did you find useful	Com	Com	Com	Com	Com	Com	Com		Com	Com	Com	Com	Com	Com	Com	All	
2 Anything not useful	No	No	Com	Com	No	No	No		no	Com	No	Com	No	Com	No	9	
3 Concerns not addressed	No	No	No	No	No	No	Com		No+Com	Com	No	Com	No	No	No	11	
4 Did anything surprise you	No	No	No	No	Yes+Com	Yes	no		no	Com	No	No	Com	Yes+Com	Com	8	
5 Easy/difficult to understand	Com	Easy	Com	Easy	Easy	Com	Easy		Easy	Com	Easy	Easy	Easy	Easy	Com	9	
6 Good use of time	Yes	Yes	Com	Yes	Yes	Yes+Com	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	13	
7 Was it hard to prepare for	No	No	No	No	Com	Com	Easy		Easy	Easy	Easy	Easy	Com	Easy	Easy	12	
8 Suggestions to improve process	No	No	Com	Com	No	Com	No		Com	Com	No	Com	No	No	No	8	
9 Suggestions to improve content	No	No	No	Com	Com	No	Com		No	Com	No	No	No	No	Com	9	
10 Have you done an EFP	Yes	Yes	No	Yes	No	Yes	Yes	No	No	Yes	No	No	No	Yes	Yes	No	8
11 Will you implement any suggestions	Possibly	Yes	Yes	Com	Yes	Yes	Yes		Yes	Yes	Yes	Possibly	Possibly	Yes	Yes	10	
12 Which ones	Com	Com	Com	Com	Com	Com	Com		Com	Com	Com	Com	Com	Com	Com	All	
13 What are the barriers to implement	Com	Com	Com	Com	Com	Com	Com		Com	Com	Com	Com	Com	Com	Com	All	
14 Additional comments	No	Com	No	Com	Com	Com	Com		No	Com	Com	No	No	No	No	7	
TF = Tree fruits																	
V = Vegetables																	
B/c/c = Beef cow/calf																	
Com=Comment																	

### Appendix 4 – Order of priority for on-farm adaptation projects

Appendix 4 summarizes which adaptation projects producers indicated that they would be likely to undertake, ranked in order of priority for those who indicated that they would undertake more than one project. Farms are listed in each column, with ‘adaptation projects’ listed in each row. The column on the far right (rank) aggregates priority projects across all farms with *changing water delivery methods* (e.g. making changes to irrigation infrastructure) being the most popular. Please reference Appendix 2 for a summary of which recommendations were made to each farm.

Order of priority of adaption projects	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16					
Plan number	Ver	Kel	Arm	Arm	LC	Sum	Oliver	Kelowna	Lav	Bride	Sil Cr	Spall	Oliver	PL	Dar	Mara					
Commodity(s)	TF	Grape	Grain	TF/V	TF	TF	TF	TF/V/Bc/c	Turf	B/c/c	TF	TF	TF	Grapes	B/c/c	Dairy					
Water Source(s)	Purveyed	Well	Well	Well	Purveyed	Purveyed	Purveyed	POD/well	Purveyed	POD	Well	Wells	Well	Purveyed	POD	POD	#	Rank			
Detailed Irrigation Assessment			1															1	5		
Drought management plan																			0		
Develop a well						3						1							2	4	
Develop storage						4	4				2		1						4	3	
Look for leaks						1	1												2	4	
Change delivery method		1	2			2	3	3		1	1								7	1	
Automate system			2																	1	
Install water metering					1		1	2						1		1	1		6	2	
Install moisture sensors			2				5	1		2					1	3			6	2	
Mulch to increase moisture retention			3																1	5	
Test well for flow capacity																				0	
Improve system to address water quality					2															1	5
Install a high flow water shut off sensor								2												1	5
Instal a drainage system							6													1	5
Put the open ditch water in a pipe																2				1	5
TF = Tree fruits																					
V = Vegetables																					
B/c/c = Beef cow/calf																					



