Centre Wellington Scoped Tier 3 Water Budget and Local Area Risk Assessment Study
Community Liaison Group Meeting #3

Tuesday, May 15, 2018 | 7:00 – 9:30 pm
Aboyne Hall, Wellington County Museum
0536 Wellington County Rd 18, Fergus

Meeting Summary

Welcome

Martin Keller, Lake Erie Region Source Protection Program Manager, Grand River Conservation Authority (GRCA), welcomed Community Liaison Group (CLG) members and thanked them for attending the meeting. He reminded the CLG that the community engagement process they are a part of is an unique approach to engagement during a Tier 3 technical process.

Agenda Review, Introductions and Roles

Ms. Susan Hall introduced herself as the neutral facilitator from Lura Consulting and also welcomed CLG members to the meeting. Ms. Hall reviewed the meeting purpose, roles and responsibilities, and the meeting agenda. She explained that the purpose of the meeting was to provide a refresh of the study process, scope and key participants, provide an overview of the groundwater flow model, receive feedback on the Groundwater Flow Model Development and Calibration Report, provide an update on the Long Term Water Supply Master Plan, and address any questions about the process overall. Ms. Hall welcomed members of the public as observers and led a round of introductions for all CLG meeting attendants.

The meeting agenda is attached as Appendix A, while a list of the CLG and project team attendees is included as Appendix B. The CLG Terms of Reference is available on the project website.

Presentations

Three presentations were given, including an update on the Tier 3 process, an overview of the development of the Groundwater Flow Model, and an update on the Water Supply Master Plan (WSMP).

(1) Context and Process Review

Martin Keller, Lake Erie Region Source Protection Program Manager

Mr. Keller reviewed the context of the Tier 3 project. He identified that the project is now in its third stage, groundwater flow model development and calibration. Mr. Keller reviewed both the CLG input and peer review feedback cycle to highlight how input has been incorporated into the Tier 3 process. Mr. Keller reviewed the regulatory processes connected to Tier 3 studies, and provided a linkages map to highlight the connections between the Tier 3 and the WSMP process.

(2) Groundwater Flow Modeling Overview

Patricia Meyer, Senior Hydrogeologist, Matrix Solutions Inc.

Ms. Meyer described the model structure, linkages to the physical characterization report, the process of model calibration, and model application. Ms. Meyer began by reviewing the purpose of the model and the inputs into the model, including the data provided by CLG members (i.e.: Water level data provided by Highland Pines/Pine Valley and Nestle Waters Canada and domestic water demand estimates by Save Our Water). She explained that the model is a 3D numeric model, developed to include over 3 million elements. The purpose is to provide insight into where and how much groundwater is flowing through different aquifers. She noted that calibration included over 400 runs to calibrate the model as closely as possible to actual water level data. Water level data was integrated from 48 monitoring points and over 4,100 domestic wells. All available data was used during calibration. Overall, the consultant team and the provincial peer reviewers are confident in the validity of the model and the calibration process.

Ms. Meyer also provided an explanation of the water budget within the study site. Approximately 98% of water entering the system does so through recharge (e.g. precipitation). Approximately 1% of water entering the study area enters through horizontal (i.e., lateral) flow in overburden and upper bedrock aquifers, and another 1% enters through horizontal (i.e., lateral) flow within the lower bedrock aquifer. Permitted pumping captures 4% of the water flow through the study area; the majority of groundwater flow through the area (88%) sustains baseflow to surface water features (i.e., streams / rivers / lakes / wetlands), while the remaining 8% flows to down-gradient regions as groundwater.

Ms. Meyer provided a list of uses for the model, including:

- Evaluating change in water levels due to new water wells
- Evaluating change in water levels due to new land development
- Evaluating change in groundwater flow into rivers and streams due to increase/decrease in pumping rates, etc.

Ms. Meyer explained that the next steps for the model are to work with the project team, Township and AECOM to refine the model, and to understand the range of potential model results as they relate to risk assessment, climate change scenarios, and the Water Supply Master Plan. Ms. Meyer highlighted

that the model is part of an iterative review process and will be updated as new information comes available in the future.

(3) Centre Wellington Water Supply Master Plan (WSMP)
Patricia Quackenbush, AECOM and Matthew Alexander, AECOM

Ms. Quackenbush and Mr. Alexander began by providing a process overview of the WSMP and explaining how the WSMP follows the Municipal Class Environmental Assessment process. She outlined that the Township is planning for the anticipated growth in Centre Wellington to 2041, to ensure the provision of safe and reliable water to all residential, industrial, commercial and institutional customers in urban areas. This requires the WSMP to identify and evaluate alternatives for meeting projected water supply needs (including water conservation and demand management), and develop preferred long-term solutions for meeting water needs. Currently, the WSMP is in Phase 2 of the Class EA process, where water supply alternatives are being developed. The WSMP has completed a draft preliminary assessment of existing water supply capacity, projected average and maximum daily demands to 2041, and estimated water surplus and deficit over time (based on current supply capacity and projected demand).

Ms. Quackenbush and Mr. Alexander explained that model outputs will inform the WSMP about available groundwater capacity to meet future demands and potential locations for future supply wells to minimize potential impacts to the municipal supply system, natural environment, and social environment. The groundwater model will also provide direction to future groundwater exploration programs and proposed Class EA undertakings.

Ms. Quackenbush outlined WSMP next steps and provided a timeline for future public engagement consultation opportunities.

A combined copy of all three presentations is available on the project website.

Facilitated Discussion

Questions of Clarification

A summary of the questions of clarification is provided below. Questions are noted with **Q**, responses are noted by **A**, and comments are noted by **C**. Responses with text in italics include further clarification provided by the project team after the meeting. Please note this is not a verbatim summary.

Facilitated Discussion #1 – Groundwater Flow Model

CLG members were given the opportunity to ask questions and share comments or concerns relating to the model (or report).

Q. Regarding accuracy, the terms "good", "reasonable", "suitably well" etc. are used to address situations that contain uncertainty and data gaps through the report. On a scale of 1 to 5 what is the goodness of fit rating?

A. The model replicates the data well, but your point is taken that throughout the report, "very good" and "reasonable" are used. These words were used to convey that we feel confident about the data and the report. Regarding certainty around calibration, once you can replicate water levels through the domain (*model*) it brings good confidence that you can represent how water is moving through the groundwater system. This builds overall confidence in using the model moving forward. Additionally, the 6-week pumping test is a very good indicator that the model is reliable. Provincial peer reviewers also look at calibration of the model and they agreed with and support Matrix's work.

C. You've done different Tier 3 studies, and each has different data available, so my question is more about the uncertainty.

A. We are always interpreting what is happening between available subsurface monitoring points. The points tell us what the general material in between those two points needs to be. This lets us understand how water flows through the system. The 6-week pumping test provides very valuable data that gives us confidence in model parameters. That pumping data, which systematically stresses the aquifer system, is not available for all other municipal systems where we have completed Tier 3 studies, but it is very valuable to understanding groundwater parameters for this Tier 3 study. Consequently, the uncertainty in this Tier 3 study is not greater than in other Tier 3 studies.

Q. The test is 3 days on 3 days off, in different areas throughout the modeled zone, including Elora?

A. Yes, we wanted to capture the data all at once. We didn't want to just look at Fergus, or just Elora, we wanted to take a holistic approach.

Q. How accurate is that data to extrapolate to 365 days?

A. We have long-term and short-term data available. We have well data that records water level data that reflects long-term pumping of the municipal wells; this gives us the long-term data. The short-term data comes from the 6-week pumping test; it allows for a refinement of the regional features of the model in the vicinity of the municipal pumping wells.

Q. For Table 5, the Middlebrook Well, when looking at comparisons between estimated observed drawdown and simulated drawdown, does "during" mean at the end or the beginning of the test? When was the drawdown?

A. At the end. That was the greatest drawdown before the recovery.

Q. Is well DDH5 an Ontario Geological Survey (OGS) well, and was it looked at?

A. The data was requested from that well as recently as 3 weeks ago, however it is still unavailable. The OGS was collecting water levels at several points along the well, however this data is being collected outside of traditional methods, which is leading to the delay in data processing.

Q. Can we plug in this data to the model once we get it?

A. The ease of incorporating that data into the model depends on the data we are provided. Our focus was on the municipal wells for calibration. We would treat OGS data as verification data and ensure things aren't dramatically different than what we've modeled.

Q. Are there any indications that the Gasport Formation thins as it approaches Fergus?
A. We would have to look at the data and get back to you. Thinness throughout the model was determined by the high-quality data we have. It is important to note that there are also some oil and gas wells by Belwood Reservoir, and some north of Grand Valley. All the points to constrain the thickness of Gasport are cited in the report, but I can look for the thickness and get back to you.
[Post meeting response: After reviewing the data, the Gasport Formation does not thin as it approaches Fergus. Based on borehole information, it is locally thicker in the Fergus area, ranging from approximately 14 m to 22 m in thickness.]

Q. Were you able to meet with the group at the University of Guelph doing research relevant to the Tier 3? Did they share data with you?
A. We did meet with the G360 group, and they have shared their data with us. We discussed the bedrock valley location and their findings are consistent with the information we have. The work they have completed in the past resulted in municipal monitoring wells (i.e., multi-level wells); that data is already included in our calibration data set. G360 are also undertaking a geological survey using electromagnetic waves to measure various levels of sediment. From what we saw of that information, it is consistent with the interpretation we have.

Q. In the Report, it states that baseflow estimates are measured at Irvine Creek. What was the input from that particular estimate? How important was the estimate from that baseflow?
A: Baseflow refers to the groundwater contribution to a stream that sustains it during dry periods. This varies throughout the year. There is a GRCA gauge on the creek, and it monitors the water level. Stream flow is estimated from the water level data, that is a continuous estimate. To get the baseflow, hydrograph separation techniques are used to estimate how much is contributed from stormwater or overland flow and how much was contributed from groundwater.

Q. Would the test be run at more than just the Irvine site? What happens if you get zero reading at Irvine Creek? Sometimes there is no water flowing through that gauge.
A: We wouldn't get zero reading as there is constantly a groundwater flow, even if the recharge is low. More gauges were put in place during the Tier 2 study. Irvine Creek is used as a calibration point.

Q. You use the baseline from Irvine Creek throughout the model, but if that flow is exceptionally low, then if that data is extrapolated, is it a reasonable measure to use? Would other areas have higher baseflow?
A. The baseflow at Irvine Creek is representative of the geography. While this is the only baseflow calibration point within the flow model, it reflects the low amount of recharge in this part of the study area, which is the primary recharge area that provides flow beneath Fergus and Elora. The recharge we

applied comes from the Tier 2 study, which was calibrated to many more gauges, not just confined to that one gauge.

Q. This report states that the upper Guelph Formation is an important barrier. Karstic rock covers much of the surface around the upper Guelph Formation. I am concerned that there are many cracks and fissures, and that this area may not be as competent as described. Is there a tight aquitard in the upper Guelph Formation? Is that a change in characterization from one report to the other?
A. When there is an interface from overburden to bedrock, there are often very fractured areas of weathered bedrock present; that is how water in the area finds its way into the Grand River. The difference between the heads in the shallow and lower bedrock (i.e., across the Guelph Goat Island Formations), is about 20-25m, with the majority of that head-change occurring across the upper portion of the Guelph Formation (as evident from the available multi-level data). We know in Shelburne and in Cambridge, similar lower hydraulic conductivity conditions are also present in the Guelph Formation. Combining that data and using multi-well data, we can identify that in the upper Guelph unit, and throughout the region, there is a tight aquitard. While this makes it harder for water to get though, water still does eventually infiltrate, just at a slower rate. There is a well drilled in the south, as part of Guelph Tier 3 study, showing 6 metres of head loss. This may be a reflection of how the different layers thicken and thin.

Q. What plans are in place to update the model in the future (e.g. 5-10 years)?
A. The model will be updated as there is an appropriate need, or new information comes available. Within the Source Protection Program, for example, when there is a planned update for the Grand River Source Protection Plan, we will look at what technical studies need to be done to update the plan, and those studies may lead to an update of the model. Similarly, for the Township's Permit to Take Water, they are required to input new data into the model; this could also lead to an update of the model. Additionally, there may be other interrelated processes at various levels of government for various agencies that may require use of the model; this is another route which could lead to an update of the model. We will need to evaluate what new information is available when the model is next used, and identify if new information fits in with the existing model, or if the model requires revision.

C. The concern is these are living models, but the permits and other allowances based off this model are permanent.
A. When a municipal class environmental assessment is completed, or a new Permit to Take Water is issued, that information can go into and inform the model. All sources of information act as a series of cogs that move simultaneously and interrelate to inform our understanding of the larger water system. For example, quality-related Wellhead Protection Areas will be updated using the Tier 3 groundwater flow model. The province also has a re-evaluation plan for Source Protection Plans with set dates, which required gaps in the Plans be identified. This may also influence the model.

Facilitated Discussion #2 – Moving the Process Forward

CLG members were given the opportunity to ask questions relating to the process moving forward.

Q. Within the Report, it states the model is based on a scoped Tier 3, and that therefore, some scenarios cannot be run through the model at this time. This includes some risk scenarios that must be run at a later date. What are the scenarios that cannot be run?

A. The Tier 3 is scoped as the project team does not have all of the information needed from the WSMP to run all the scenarios required for the risk assessment. For example, we do not have all the information from the WSMP about future pumping rates; as this information comes available we will be able to evaluate the risk assessment scenarios which require information related to future water demand.

Q. We also don't know the prescribed density after 2031; is that another uncertainty?

A. The prescribed density is not tied to the year 2031. There is presently a minimum greenfield density target of 40 people and jobs per hectare, as wells as a target for 20% of all new residential dwellings to come within the built boundary (ie. through intensification). This target has been assumed to be in effect for all of the land in the urban centre, for the purposes of the Tier 3 study and the Water Supply Master Plan. The 2017 Growth Plan revises the targets to a possible 80 people and jobs per hectare, and 60% of residential dwellings coming from intensification. But the County can request a lower target through its Official Plan review exercise to conform to the Growth Plan. This has to be done by 2022. In the meantime the current targets (40 people and jobs per hectare and 20% intensification) remain in place and new developments are being planned at that level.

For the Tier 3 study, density is related to the growth footprint. If the growth footprint is smaller because of increased density, this will result in less overall impervious area and therefore less impact to the quantity of recharge entering the groundwater system.

Q. So will you be able to run the growth part of the model that addresses impervious areas past 2031, or will it have to stop there?

A. This is why the project is a scoped Tier 3. Usually future development is evaluated based on growth projections contained within the Official Plan. However, for this project, until we have the preferred solution from the WSMP, future supply requirements are not known. We will need those decisions from the WSMP in order to assess a number of scenarios that are a part of the risk assessment.

Q. The report outlines 155 liters of demand in Fergus, per person, per day. Is that correct?

A. The billing meter data is in the range of about 155-165 litres per capita day, based on residential demand.

Q. How critical is that to what you're doing?

A. Although we are adopting a more conservative approach for estimating future water supply needs by projecting demand based on historical total well production (supply) information, a review of residential

metered data is useful to assess water conservation/ demand management as an alternative. For example, where residential water use is already low, there may be limited opportunities to implement additional water conservation measures.

Q. What happens if the figure is inaccurate or too low?
A. For the WSMP, we are using production data from the wells which captures all consumption and water losses in the system in our future water supply projections. It provides a more conservative estimate and reflects the potential for system loss in the form of leaks, additional demands aside from residential, and the concern around using meter data (as hard water may impact the reliability of the meters).

Q. For the climate change risk assessment you are looking at precipitation and temperature, but are you looking at more than those two factors (e.g. the amount of intense rain events)?
A. We look at global circulation models (GCMs) to provide insight on how the climate may change. Along with temperature change, they predict change in precipitation intensity and when and where precipitation will occur. Those models inform how we think groundwater recharge will change. The groundwater recharge piece is what is used as input to the groundwater model. Of the multiple GCM predictions of temperature and precipitation changes available we plan to run about 10. This gives us an idea of the potential variability under climate change that we should expect. We can use that knowledge to understand how climate change may impact the reliability of water levels in municipal wells. Centre Wellington municipal wells are deep, and to a degree, isolated from surface changes. There will be value in seeing how long it takes climate changes at the surface level to impact groundwater levels at these depths. That is what we want the model to help us understand.

Reflection and Next Steps

Mr. Keller provided reflections on the CLG process so far. He highlighted the data contributions from CLG members including the provision of water taking monitoring data, well records, and water demand data from domestic wells. He also highlighted the use of the CLG as a vehicle to provide information to broader groups of stakeholders, as a forum for discussion and question and answer sessions, and to explain the peer review process and share comments.

Mr. Keller confirmed with CLG members that they should provide any additional comments or questions regarding the Groundwater Flow Model and Report by June 5th, 2018. He explained that these comments will be summarized and posted on the project website. Mr. Keller stated that presentations from the meeting will be posted on the project website. Mr. Keller explained that the next steps include the project team beginning the Risk Assessment, documenting results, circulating the results for provincial peer review of the results, updating the results to reflect peer review comments and then sharing the results of the Risk Assessment at the next CLG meeting. The date for the next CLG meeting is to be determined.

Ms. Hall thanked CLG members for contributing to the discussion and adjourned the meeting.

Appendix A – Agenda

Centre Wellington Scoped Tier 3 Water Budget
and Local Area Risk Assessment Study

Community Liaison Group Meeting #3
Tuesday, May 15, 2018
7:00 – 9:30 pm
Boyne Hall, Wellington County Museum

***Meeting Purpose**:*

1) Provide a refresh of the study process, scope and key participants;
2) Provide an overview of the groundwater flow model;
3) Receive feedback on the Groundwater Flow Model Development and Calibration Report;
4) Provide an update on the Township of Wellington Long-term Water Supply Master Plan; and
5) Address any questions about the process overall.

AGENDA

7:00 pm	**Welcome** Martin Keller, Lake Erie Region Source Protection Region Program Manager
7:05 pm	**Agenda Review, Introductions and Roles** Susan Hall, Facilitator, Lura Consulting
7:15 pm	**Context and Process Review** Martin Keller, Lake Erie Region Source Protection Region Program Manager
7:30 pm	**Groundwater Flow Model Overview** Patty Myer and Paul Martin, Matrix Solutions Inc.
8:00 pm	**Small Group Discussion Session 1 – Groundwater Flow Model** • ***What questions, comments or concerns do you have relating to the model (or report)?***
8:30 pm	**Township of Wellington Long-term Water Supply Master Plan** Patty Quackenbush, AECOM
8:45 pm	**Process Moving Forward** Martin Keller, Lake Erie Region Source Protection Region Program Manager
9:00 pm	**Small Group Discussion Session 2 – Groundwater Flow Model** • ***What questions do you have relating to the process going forward?***
9:25 pm	**Wrap up and Next CLG Meeting** Susan Hall and Martin Keller
9:30 pm	**Adjourn**

Appendix B – List of Attendees

A. Community Liaison Group Members

Member	Organization
Andreanne Simard	Nestlé Waters Canada
Dave Blacklock	Wellington Water Watchers
Derek Graham	Chamber of Commerce
Jan Beveridge	Save Our Water

B. Project Team Members

Core Team	Support Team	Organization
Martin Keller Sonja Strynatka	Emily Hayman	Grand River Conservation Authority
Patricia Meyer	Jeff Melchin Paul Martin Christian Gabriel	Matrix Solutions Inc.
Kyle Davis	Emily Vandermeulen	Wellington Source Water Protection
Colin Baker		Township of Centre Wellington
Susan Hall	Alex Lavasidis	Lura Consulting
Patricia Quackenbush	Matthew Alexander	AECOM
Kathryn Baker		Ministry of Environment and Climate Change

In addition to the participants listed above, 8 observers were in attendance at the meeting including members of the public and Lake Erie Source Protection Committee member for the area.