Ausable Bayfield Maitland Source Protection Region
Peer Review Comment Record

Reports Reviewed:
"Surface Water Vulnerability Analysis for Goderich Intake" (August 14, 2007)
"Surface Water Vulnerability Analysis for Goderich Intake – Addendum: Numerical Modelling in Support of IPZ-2 Delineation" (June 22, 2009)

No.	Comment	Response
	Surface Water Vulnerability Analysis for Goderich Intake (August 14, 2007)	Comments addressed by Baird May 21, 2010.
1	Figure 2.3 does indicate that the directional distribution of winds from the Goderich Airport is generally consistent with the directional distribution of winds from the POM data set, but the wind speeds presented in the POM data appear to be significantly higher than those presented in the Airport data. While the Airport data would be expected to be a good local representation, the differences should be addressed in the report.	As explained on pg. 6, the Goderich Airport data presented in Figure 2.3 is the raw measured data from the airport. It represents over land wind, while the POM data is over water. We would expect to see lower wind speeds over land.
2	Section 2.3 indicates that the currents at the offshore ADCP are stronger than the nearshore ADCP. This is counter intuitive given that wind stress would be expected to produce higher currents in the shallow water areas. Can some discussion of this discrepancy be provided?	The currents at the nearshore site are complex and are affected by the harbor structures and the river. The model results indicate that there are eddies in this area. Wind stress near shore may also be influenced by land. The data appeared to be reasonable and we did not have a reason to reject it.
3	Figures 2.6 and 2.7 present the data in support of the statement questioned above. Figure 2.7 indicates a significant difference in current direction (almost opposing) between the offshore and inshore ADCPs. Was any consideration given to the data quality as indicated by the raw ADCP output. It would also be useful to know the wind condition which is responsible for the reproduced ADCP conditions shown in Figure 2.7.	Figure 2.7 shows one snapshot in time. The data was checked and the depths recorded by the ADCP agreed with the depths on the chart. The data also seemed reasonable considering location. The data was screened for missing data. The wind condition could be added to the figure at additional cost.
4	The discrepancy between Environment Canada and MVCA flow data (Figure 2.8) is significant. The report should confirm that this is not an issue of concern with respect to uncertainty, or a data gap, and justify.	It appears that the Env. Canada data missed the high flow event in Feb. 2004, possibly due to a malfunction. We have pointed out the discrepancy and used the more conservative data as stated in the report. The discrepancy has now been noted in Section 6.2, Uncertainty.

5	The 2 year flood is typically selected for IPZ delineations, as it reflects the bank-full condition, and likely the most conservative with regard to the travel times within the watercourse. Is there any consideration as to the effects of larger events in the Maitland River in this case vs. the influence of the 2 year flood on nearshore velocities and travel time to the intake? Is it possible that a larger flow condition may generate a shorter travel time to the river mouth, and more significant upstream extent of the IPZ-2?	It is certainly possible that a more extreme event in the Maitland River would generate higher current speeds and possibly a larger IPZ-2. However, we followed MOE guidance in using the 2 year return period event for flow. The IPZ-3 allows for more extreme events.
6	Table 2.3 does not indicate the sample frequency of the PWQMN Data nor the ODWSP Data.	The frequency is stated in Section 2.5, above Table 2.3.
7	It would be useful to represent the location of the intake in Figure 2.10.	The location of intake has been added to Figure 2.10.
8	Section 3.1 - The discrepancy between reported intake depths is significant. The report should comment on the expected significance of this uncertainty in terms of local velocities in the particle tracking.	It is difficult to comment on the significance of this uncertainty on local velocity since the currents are complex as discussed in the report. The depth should be confirmed in the field as noted in Section 8.0 - Data Gaps. This has also been considered in assigning the uncertainty rating for IPZ delineation and vulnerability scoring.
9	Section 3.2 - The report notes that ships turning in the vicinity of the intake have affected raw water quality. It is expected that the typical commercial navigation approach would not bring ships within the vicinity of the intake. Can the report elaborate on such conditions?	Section 3.2 provides a summary of the Operator Interview – the comments were received from the Operator. If a ship stirred up bottom sediment, it could be transported to the intake by currents. The harbor is within several hundred metres of the intake.
10	Section 3.2 - Ice jamming is noted as an issue of concern. Is it expected that ice conditions may generate a more critical hydrodynamic condition at any point during the year?	In general, ice jamming can result in high flows. However the specifics were not analyzed for this study.
11	Section 3.2 – the report should be more specific with regard to the discussion of conditions that make raw water difficult to treat if such information is available.	The list and paragraph that precede this statement indicate conditions that make treatment difficult.
12	Section 3.5 (pg 19) – was the existing groyne located south of the intake considered with respect to impacts on the local hydrodynamics? It would seem that the structure may direct	The groyne was not considered. Although the groyne would divert nearshore currents offshore, it is relatively short and is not expected to

	nearshore flows towards the intake.	have a large influence on the overall IPZ-2. The IPZ-2 was extended to shore. The grid would have to be refined to consider the groyne.
13	Figure 3.1 does not include a scale on the time axis.	Figure has been updated.
14	Section 3.6 – Was temperature considered in relation to other water quality parameters or forcing parameters in order to assist in the interpretation of processes? No discussion is provided.	Elevated Alkalinity and Turbidity were used as indicator parameters for checking the potential for interaction between the Maitland River and storm sewer discharges and the WTP Intake. Daily raw water temperatures were examined for 2003 to the fall of 2006. Temperature was plotted against both Alkalinity and Turbidity. Given that we could not see a definite relationship between Alkalinity and E.coli or Turbidity and E.coli (Section 3.6.2), we did not see the value in investigating a relationship between Temperature and E.coli. A comment has been added at the end of Section 3.6.2.
15	Section 3.6 – It is noted that E.coli was considered against other water quality parameters, but no data is presented. It would be beneficial to provide such data.	See discussion below Figure 3.2.
16	Figure 3.10 should note the period that the data is drawn from.	Data is from 2003-2006. Date has been added to caption under Figure 3.10.
17	Section 3.6 – there is no mention of harbour water quality. It would be useful to include some discussion in this regard (and data if available).	BMR is not aware of any water quality data.
18	Section 4.2.1 – it is noted that upwelling and downwelling events are observed in the data. It would be useful to present supporting ADCP data if available to show the relative significance of the events. This phenomena is not mentioned in the section on characterization of the intake.	Supporting ADCP data will require additional effort – it can be done. A comment has been added to Section 3.3.
19	Section 4.2.1 – the importance of wave induced currents is discussed in this section, but is not discussed further in the report. Were wave influences considered? If not, some justification, or discussion of expected	Wave induced currents were not considered in the model. A comment was added to Section 4.5 Model Limitations and to the uncertainty section.

	consequence of ignoring waves should be included in the documentation.	
20	Section 4.2.1 - The use of a "trial" license may suggest to some readers that the license has specific limitations which may restrict the application of the model. If this is the case, any such restrictions should be noted, or alternatively, it should be confirmed that the license conditions provided all necessary capabilities for the model application to this study.	There were no restrictions on the license capability. A comment has been added to the text in Section 4.2.2.
21	Section 4.3.1 – 4th paragraph notes a comparison of modelled and measured currents near the Goderich intake in Figure 4.3, while the Figure title indicates that the data is for Kincardine area. Clarification is required.	The paragraph describes a comparison of modeled currents using two different boundary conditions – not a comparison of modeled and measured currents. The work was completed for SVCA source water studies but is relevant to this project and was therefore included. Clarification has been provided in Seciton 4.3.1, par. 4.
22	Figure 4.2 does not cover the area of interest at Goderich.	See previous explanation.
23	Figure 4.2 – the figure legend should identify the boundary methods.	A caption has been added under the figure title.
24	Figure 4.4 – the ultimate IPZ-2 is considerably larger towards the south, while the model domain appears to cater the northern portion of the regional lakeshore. It would be beneficial to present the nested domain within the context of the ELHM as well as assurance that southerly conditions are adequately represented and boundary conditions are sufficiently removed from the area of interest should be included in the documentation.	A figure 4.11a has been added, showing the nested Goderich model grid in the ELHM. The south boundary of the nested model is 13 km away from the south boundary of the regional ELHM. This should be adequate to ensure that the boundary conditions are sufficiently removed from the area of interest.
25	Figure 4.11 – It would be beneficial to show the resolution near the intake and harbour within the inset image.	A new figure could be developed if required at additional cost.
26	Section 4.4.2 - Figure 4.18 should include wind direction.	A new figure could be developed if required at additional cost, however, because the figure shows over a year of data, it will be difficult to see the directions (considering the scale).
27	Section 4.4.2 – were tracking particles placed through the depth of water at the intake?	Particles were released at the surface and at the bottom. A comment has been added to Section 4.4.2, par. 1.
28	Section 4.4.2 – It does not appear that the	See response to Comment 12.

	exsiting groyne to the south of the intake is modelled. This should be clarified.	
29	Section 4.4.2 - Figures 4.13 to 4.15 – it appears at some nodes that there is a pair of vectors, in some cases at 90 degrees to each other. Clarification is requested.	Figures 4.13 to 4.15 have been corrected.
30	Section 4.4.2 - Figures 4.13 to 4.15 - Are the vectors all representing surface currents?	Figures 4.13 to 4.15 show surface currents – this has been clarified in the figure captions.
31	Section 4.4.2 – Figure 4.16 – the intermittent high velocity areas in the Maitland River do not appear to be consistent with the statement that the river is represented by a uniform cross section.	The water depth along the river is uniform but the river width was digitized from the air photo. The current speeds vary with the river width.
32	Section 4.4.2 – Figure 4.19c – the IPZ is extended up the Maitland River a short distance, due to a single particle which appears to have originated in the inner harbour. Clarification is requested.	The particle is actually in the river – there is a small discrepancy between model grid and air photo. The IPZ was extended up the river due to this particle.
33	General – there is no discussion of shoreline connection considerations.	The approach to shoreline connection evolved during the source water projects. A comment has been added to the Phase 2 report, as it supersedes the delineation presented in the Phase 1 report.
34	General – the IPZ-1 and IPZ-2 appear to extend beyond the 120 m setback on-land	This was a preliminary delineation and it was updated in the Phase 2 report.
35	Section 6.1.1: While the factors noted in the report (transport pathways and surface runoff potential) are to be considered in the assignment of the area vulnerability factor, specific recommendation of 9 as a zone (area) vulnerability factor is not provided in the Technical Rules. Some minor wording changes are recommended for this sentence	The Phase 2 report supersedes the Phase 1 report for vulnerability scoring. The rules have changed several times since this report was written.
36	Section 7.1.1 – there is note of raw sewage discharge to the lake on occasion, but E.coli data is given little attention in the report. It would be beneficial to consider the hydrodynamic conditions associated with such discharge conditions for comparison with identified raw water quality data and anecdotal evidence.	This could be done at additional cost and would certainly be relevant for the IPZ-3 analysis. This could result in the WWTP being identified as a significant issue, depending upon outcome of contaminant specific modeling.
37	Section 7.1.1 – the consideration of harbour activities in terms of threats would benefit from some discussion of harbour hydrodynamics.	It would be appropriate to look at this in more detail, using site specific contaminant modeling to determine if

		a spill in the inner harbor could compromise the drinking water (in which case it could be designated as a significant threat under Rule 130).
38	Table 7.1 – the "Locational Accuracy" column should indicate the units, and the "Contaminants Relative to Property Limits" is not clear	Information within this column was taken from Assessment Report Outputs: Data Specifications Version 3.0, dated October 24, 2006. Contaminants relative to property line provides the estimated distance from the contaminant source to the property line.
39	Figure 7.1 requires a legend.	Legend has been added.
40	It is recommended that the Data Gaps be prioritized, as some relate to immediate needs IPZ-2 needs (zone delineations) while others appear to relate to short term and long-term vulnerability assessment needs.	Done.
41	The data gaps analysis does not appear to present gaps that would justify the Addendum report of June 22, 2009. It would be expected that the addendum has been prepared to address high priority data gaps.	Data gaps section has been updated.
	Surface Water Vulnerability Analysis for Goderich Intake – Addendum: Numerical Modelling in Support of IPZ-2 Delineation (June 22, 2009)	
1	Figure 2.3 - The direction of velocities is very important to the assessment of model performance, on an event by event basis. The direction should be provided in the figures.	Figures have been added showing direction (2.2b and 2.3b).
2	Discussion supporting Table 2.1 – If the ADCP has sampled in 1 m depth bins, then the measured data would be expected to be averaged over the top 1 m of depth, and therefore and would be expected to be comparable to the modelled conditions (at least at ADCP 3501). ADCP values for the surface bin should be reviewed carefully to ensure that they are representative, and are not influenced by irregularities at the air-water interface.	The ADCP data provides currents at specific depths through the profile. It is not an average.
3	Figure 2.4 shows "theoretical" vs modelled velocity profile, as the "measured" profile is represented by a finite number of depth bins.	Agree.
4	Section 2.0 (page 6) – Since the IPZ-2 is based on events, the comparison of average currents is	Comparison of measured and modeled current speed and direction is provided

	not of particular relevance. Comparison of ADCP and modelled velocities should be presented on an event basis, and include a comparison of magnitude and direction.	in Figures 2.2a,b and 2.3a,b.
5	Section 2.0 (page 6) – A comparison of POM and ADCP current data would be beneficial to assess the reliability of the POM Model for boundary forcing and support the claim that there is an inaccuracy introduced by the currents from the POM model.	This can be done at additional cost.
6	Figures 2.5a and 2.5 b do not permit comparison of event-by event conditions. The plot does show general agreement of the overall directional trends, but does not speak to the ability of the model to represent currents generated by specific wind events.	Comparison of measured and modeled current speed and direction is provided in Figures 2.2a,b and 2.3a,b.
7	Section 3.2 – The discussion is not entirely clear with respect to the treatment of the offshore boundary. It is noted that a constant wind speed and direction was used along the entire model boundary (assuming this to mean the surface boundary), but it is not clear what was imposed on the offshore model boundaries if anything.	Mean lake levels were used for the offshore model boundary. A comment has been added to Section 3.2.
8	Figure 3.3 – can any discussion be provided as to why the mid-depth particle tracking extends further south than the surface particle tracking?	The currents are complex and this is no simple explanation. Further analysis would be required.
9	Section 3.3 – last paragraph notes the extension of the IPZ-2 into the Maitland River based on the preliminary zone delineations, and due in part to the limited geometry data. Assuming the single point originating in the Maitland River with the preliminary delineations is appropriate, the lack of relevant river data should highlighted as a data gap in this report.	A comment has been added in Section 5 (Uncertainty).
10	Section 3.4 (page 14) – if the preliminary modelling is being used to define a portion of the IPZ-2, it is recommended that the event associated with that preliminary modelling, especially where it is relevant to the IPZ-2 delineation, is defined in more detail (windspeed and direction) in the addendum report.	Figure 3.5 has been added, showing wind speed for Events A and B from Phase 1.
11	Section 3.5 (page 15) – point 1 notes that southward flowing currents were more accurately predicted than the northward flowing	A comment has been added to Section 2. This is shown in Figure 2.5.

	currents. This is not obvious in previous report discussions.	
12	Section 3.5 (page 15) – point 2 suggests that the boundary condition inaccuracy may be partially to blame for uncertainty. The boundary conditions do not appear to be explicitly discussed in this report and should be provided.	Boundary conditions are discussed in Section 3.2 and in the Phase 1 report.
13	Section 3.5 (page 16) – point 4 provides some discussion of what is not imposed on the model boundary for the matrix runs, but does not explicitly state what is used as a boundary condition, if anything.	See Response to Comment 12.
14	Section 3.5 (page 16) – point 4 notes that previous investigations have shown some differences in model results when the model does not include the entire lake. A summary of these findings in this report would be beneficial.	Some differences were noted as stated in the other study. The differences are specific to that study and a reference is provided.
15	Section 3.5 (page 16) – point 5 notes that wave induced currents would be more significant for intakes located in shallow water. While this is expected to be true, the backtracking does migrate to shallow waters, and it is possible that the increased influence of waves in this shallow water region would result in a larger IPZ-2.	Agree - no wave analysis was done. We will clarify in report.
16	Section 5.1 (page 20) - While the factors noted in the report (transport pathways and surface runoff potential) are to be considered in the assignment of the area vulnerability factor, specific recommendation of 9 as a zone (area) vulnerability factor is not provided in the Technical Rules. Some minor wording changes are recommended for this sentence.	Section 5 has been updated based on the Technical Rules dated Nov. 16, 2009.
17	General – there is no discussion of the potential influence of the existing groyne located south of the intake. This appears to be a relatively significant shoreline feature which could have a relatively significant impact on nearshore velocities.	The groyne was not considered. Although the groyne would divert nearshore currents offshore, it is relatively short and is not expected to have a large influence on the overall IPZ-2. The IPZ-2 was extended to shore. The grid would have to be refined to consider the groyne.
18	General - There is no discussion of the shore-connection of the IPZ-2.	A comment has been added to Section 3.3.
19	General - What water level is used in the matrix analyses?	Mean lake level.
20	General – There is no discussion of data gaps.	Section 6 has been updated based on

	Do the data gaps presented in the August 14th report still stand? Will this addendum report be published together with the original report such that all relevant information is included in one document?	the Technical Rules dated Nov. 16, 2009.
21	General - Why does IPZ-1 extend to include mouth of Maitland River and STP Outfall, but does not include inner harbour?	The IPZ-1 should be reviewed and updated to be consistent with MOE (2009).