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28.0 MAP REFERENCES

These maps are for information purposes only and the Grand River Conservation Authority takes no responsibility for, nor guarantees, the accuracy of all the information contained within these maps.

The following references apply to all maps, unless otherwise noted:

Additional references for specific maps are given in the table below:

Map Number	Description	Reference
Map 2-5:	Population and Population Density in Watershed by Municipality and Reserve	Grand River Conservation Authority, August 2018. Summary of Population Statistics for Grand River Watershed.
Map 2-7:	Physiography of Grand River Watershed Area	Physiography of Southern Ontario Geological Survey dataset MRD228, Chapman, L.J. and Putnam, D.F. 2007. Ministry of Northern Development and Mines, Copyright © Queen's Printer, 2010.
Map 2-8:	Hummocky Topography	Various Authors, 1967-1993, Quaternary and Pleistocene Geology, Southern Ontario, Ontario Geological Survey. Ministry of Northern Development and Mines, Copyright © Queen's Printer, 2003.
Map 2-10:	Bedrock Topography	Gao, C., Shirota, J., Kelly, R.I., Brunton, F.R. and van Haaften, S. 2006. Bedrock topography and overburden thickness mapping, southern Ontario; Ontario Geological Survey, Miscellaneous Release—Data 207.
Map 2-11:	Bedrock Geology	Paleozoic Geology of Southern Ontario, Ontario Geological Survey dataset MRD219, Armstrong, D.K., Dodge, J.E.P., 2007. Ministry of Northern Development and Mines, Copyright © Queen's Printer, 2010.
Map 2-12:	Quaternary (Surficial) Geology	Various Authors, 1967-1993, Quaternary and Pleistocene Geology, Southern Ontario, Ontario

Map Number	Description	Reference
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Map 2-13:	Overburden Thickness	Holysh, S., Pitcher, J., and Boyd, D. 2001. *Grand River Regional Groundwater Study.* Grand River Conservation Authority, Cambridge, ON.
Map 2-14:	Water Table Surface of the Grand River Watershed	AquaResource Inc. 2009a. Integrated Water Budget Report, Grand River Watershed: Final Report, June 2009.
Map 2-15:	Potentiometric Surface of the Grand River Watershed	AquaResource Inc. 2009a. Integrated Water Budget Report, Grand River Watershed: Final Report, June 2009.
Map 2-17:	Groundwater Discharge Map	Groundwater Discharge derived from Figure 70 (page 169) of: AquaResource Inc., June 2009. Final GRCA Integrated Water Budget Report.
Map 2-18:	Average Annual Temperature	Based on Environment and Climate Change Canada data. Produced using information under License with the Grand River Conservation Authority © Grand River Conservation Authority, 2019.
Map 2-19:	Average Annual Precipitation	Based on Environment and Climate Change Canada data. Produced using information under License with the Grand River Conservation Authority © Grand River Conservation Authority, 2019.
Map 18-2:	Groundwater Discharge Map in the Grand River Watershed	Groundwater Discharge derived from Figure 70 (page 169) of: AquaResource Inc., June 2009. Final GRCA Integrated Water Budget Report.
Map 18-4:	Water Quantity Stress Levels by Groundwater Assessment Area within the Grand River Watershed	Adapted from AquaResource Inc. 2009. Tier 2 Water Quantity Stress Assessment Report: Grand River Watershed, Final Report December 2009. AquaResource Inc., Breslau, ON.
Maps 19-1 to 19-12:	Region of Waterloo Tier 3 Water Budget and Risk Assessment	Matrix Solutions Inc. 2014. Region of Waterloo Tier Three Water Budget and Local Area Risk Assessment. Matrix Solutions Inc., Waterloo, ON.
Maps 20-1 to 20-12:	Whitemans Creek Tier 3 Water Budget and Risk Assessment	Earthfx Inc., 2018. Whitemans Creek Tier Three Local Area Water Budget and Risk Assessment: Risk Assessment Report.
Maps 22-1 to 22-8:	Centre Wellington Tier 3 Water Budget and Risk Assessment	Matrix Solutions Inc. 2020. Centre Wellington Tier Three Water Budget Final Risk Assessment Report. Matrix Solutions Inc., Guelph, ON.

APPENDIX A
Written Notice from Director Classifying Intakes per Technical Rule 55.1 Requests for Approval of Alternative Approach

Ministry of the Environment

Source Protection Programs Branch

14th Floor
40 St. Clair Ave. West
Toronto ON M4V 1M2

Ministère de l'Environnement

Direction des programmes de protection des sources

14e étage
40, avenue St. Clair Ouest
Toronto (Ontario) M4V 1M2

Ontario

Log: ENV1174IT-2010-243

November 26, 2010

Mr. Martin Keller.
Source Protection Program Manager
Grand River Conservation Authority
400 Clyde Road
Cambridge ON N1R 5W6

Dear Mr. Keller:

I am responding to your October 18 and 22, 2010 e-mails regarding the classification of intakes under Rule 55.1 of the Director's Technical Rules (Rules) and to use a number of alternate methods under Rule 15.1 of the Director's Rules for the completion of the assessment report under the *Clean Water Act* (CWA) for the Grand River source protection area.

1. Classifying Intakes as per Rule 55.1 for Region of Waterloo Hidden Valley Intake, City of Guelph Eramosa River Intake and City of Brantford Holmedale Canal Intake

The intakes above are located in Inland Rivers and are located behind hydraulic structures, i.e. overflow weir, where the flow velocity downstream of the structure is affected. Based on this, the system is classified as a Type D intake as per Rule 55. Based on information provided to my office, the flow downstream of the hydraulic structures is not affected and the flow velocity change is very minimal, i.e. no significant change in the flow velocity. Based on this and in accordance with my authority under Rule 55.1, I am classifying the above referenced intakes as Type C intakes.

The rationale demonstrating that the flow direction and flow velocity are not affected by the hydraulic structures, for the intakes mentioned above, must be included in the assessment report and supported by evidence such as data or measurements or model results along with a copy of this letter.

2. Variation from Rules 62, 65(1) and 68(2) - Setback on Land

A request to use the setback of 120m instead of the setback of the Conservation Authority Regulation Limit in delineating intake protection zones at onshore areas for the Brantford Water intakes is being requested under Rule 15.1.

The Brantford water intakes are located in a canal, Holmedale Canal, which is a branch of the Grand River. The rationale submitted for this request, by email, is that the structure of the canal, the dykes location along the canal at the eastern side of the intake, and the flat topography of land at the western side lead to conditions where the regulation limit is not representative of the area contributing to this canal. Given the rationale provided, using a setback of 120m on land is appropriate for the delineation of the intake protection zones for Brantford surface water intakes in the Grand River source protection area.

In accordance with my authority under Rule 15.1, I hereby provide Director's approval for the source protection committee to use this alternate method for the Brantford Water intakes in the Grand River source protection area.

3. Variation from Rule 17 – Impervious Surface Calculations

As set out in your correspondence, the proposal is to use an alternative method to calculate the impervious surface area for all IPZs and WHPAs in the Region of Waterloo.

Rather than using a 1 km^2 grid, the percent impervious area was calculated for each vulnerable area in a similar manner as for livestock density and percent managed land, except the WHPA-A and WHPA-B zones, where these zones were combined into a single zone for impervious calculation given the small size of the WHPA-A zone (0.03 km^2).

The determination of the impervious surface area based on the sub area in a vulnerable area is not consistent with or better than the method required in the technical rules. In its current form, the method of calculating the percent impervious creates areas of lower percent impervious area than would occur if the grid approach was used.

In accordance with my authority under Rule 15.1, I hereby deny the use of this alternate for the IPZs and WHPAs in the Region of Waterloo in the Grand River source protection area.

4. Variation from Rule 17 – Impervious Surface Calculations

As set out in your correspondence, the proposal is to use an alternative method to calculate the impervious surface area for the WPHAs in Brant County, Centre Wellington, and the Township of Southgate.

Rather than using a 1 km^2 grid, the percent impervious surface was calculated for each vulnerable area in a similar manner as for livestock density and percent managed land, except the WHPA-A and WHPA-B zones where it was combined into a single zone for impervious calculation given the relatively small size of these zones. A calculation was completed for the entire WHPA-D zone regardless of whether the vulnerability score was greater than or equal to 6. The percent impervious surface areas were therefore calculated for each of WHPA-A/B, WHPA-C and WHPA-D. The calculations were completed for areas within the WHPA and did not include portions of parcels that lie outside a source protection area boundary.

The determination of the impervious surface area based on the sub area in a vulnerable area is not consistent with or better than the method required in the technical rules. In its current form, the method of calculating the percent impervious area may create areas of lower percent impervious area than would occur if the grid approach was used.

In accordance with my authority under Rule 15.1, I hereby deny the use of this alternate methodology for the WPHAs in Brant County, Centre Wellington, and the Township of Southgate in the Grand River source protection area.

5. Variation from Rule 17 – Impervious Surface Calculations

As set out in your correspondence, the proposal is to use an alternative method to calculate the impervious surface area for the WHPAs in Wellington North and Perth east (Milverton).

Rather than using a 1 km^2 grid, the percent impervious surface was calculated for WHPA-A, WHPA-B, WHPA-C and WHPA-D.

The determination of the impervious surface area based on the sub area in a vulnerable area is not consistent with or better than the method required in the technical rules. In its current form, the method of calculating the percent impervious area may create areas of lower percent impervious area than would occur if the grid approach was used.

In accordance with my authority under Rule 15.1, I hereby deny the use of this alternate for the WHPAs in Wellington North and Perth east (Milverton) in the Grand River source protection area.

6. Variation from Rule 17 – Impervious Surface Calculations

As set out in your correspondence, your proposal is to use an alternative method to calculate the impervious surface area for the IPZs and WHPAs in Mapletone, Guelph/Eromosa, County of Oxford, and Brantford.

The method used departs from Technical Rule 17 as the grid was centred on the centroid of the vulnerable area (WHPA / IPZ) rather than the source protection area.

As this work was completed prior to the release of the most recent version of the Rules (November 16, 2009), the calculations were performed using a 1 km by 1 km grid centred over each vulnerable area, which is consistent with earlier versions of the Rules (December 12, 2008). The method of centring the grid on the vulnerable area is considered to be an equivalent approach as the size of the area remains the same.

In accordance with my authority under Rule 15.1, I hereby provide Director's approval for the source protection committee to use this alternate for the IPZs and WHPAs in Mapletone, Guelph/Eromosa, County of Oxford, and Brantford in the Grand River source protection area.

7. Variation from Rule 17 – Impervious Surface Calculations

As set out in your correspondence, your proposal is to use an alternative method to calculate the impervious surface area for WHPAs in Guelph.

The method proposed effectively changes the centring of the grid by finding the best fit within each vulnerable area. In terms of the method used to determine the percent impervious surface area within each grid, i.e. using a buffer approach, the rules don't specify how a road is evaluated in terms of impervious area. Therefore, this approach is within the scope of the technical rules.

We concur with your opinion that centring the grid to best fit the vulnerable areas for the Guelph WHPAs and IPZs is considered equivalent or better then the approach outlined in the Rules. In accordance with my authority under Rule 15.1, I hereby provide Director's approval for the source protection committee to use this alternate method for the Guelph WHPAs in the Grand River source protection area.

8. Variation from Rule 83(1)(a) – Groundwater Vulnerability Mapping

As set out in your correspondence, your proposal is to use an alternative method to complete vulnerability mapping in the Bright, Drumbo and Plattsville Wellhead Protection Areas using the AVI method with score thresholds of <24, 24-80, and >80 to identify areas of high, medium and low vulnerability. Technical Rule 38(1)(a) requires that a threshold of <30 be used to identify areas of high vulnerability when using the AVI method.

The Bright, Drumbo and Plattsville WHPAs were completed in advance of the Clean Water Act through the MOE-funded Municipal Groundwater Protection Studies. The WHPAs were reviewed at the time of the report by MOE staff as a component of these groundwater protection studies.

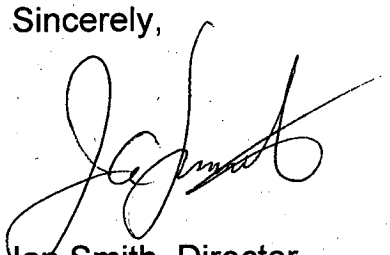
We accept your opinion, subject to recalculation and review, the different threshold will not change the vulnerability and the map showing vulnerability will not change. It is likely, however, that areas of high groundwater vulnerability across the region may be reduced marginally to medium vulnerability with the change from the threshold of 24 to 30. This affect must be accurately documented in both the current and updated Assessment Reports. We acknowledge that work is currently underway to update the vulnerability with the correct threshold and that this will be provided in an amended Assessment Report.

In accordance with my authority under Rule 15.1, I hereby provide Director's approval for the source protection committee to use this alternate method for the Bright, Drumbo, and Plattsville Wellhead Protection Areas in the Grand River source protection area.

Where I have provided approval for the use of an alternative method, your rationale for the use of the alternative methods and how they are being applied must be included in your assessment report.

We thank you for your efforts in completing the technical studies in support of the assessment report under the CWA. If you have any questions or require additional information, please contact our office.

Sincerely,



Ian Smith, Director
Source Protection Programs Branch
Ministry of the Environment

cc: Craig Ashbaugh, Chair, Source Protection Committee
Heather Malcolmson, Manager, Source Protection Planning
Keith Willson, Manager, Source Protection Approvals
Kate Turner, Liaison Officer, Source Protection Implementation