Grand River Source Protection Area

ASSESSMENT REPORT

Chapter 27: References

Chapter 28: Map References

April 1, 2025

TABLE OF CONTENTS

27.0	REFERENCES	
28.0	0 MAP REFERENCES	28-1
	APPENDIX A Written Notice from Director Classifying Intakes per Technical Rule 55.1 Requests for Approval of Alternative Approach	A-1
	APPENDIX B Correspondence Regarding Excavation that Breaches the Aquitard	B-1

April 1, 2025 TOC-2

27.0 REFERENCES

- Acres and Associated (A&A), 2002. Hydrogeological Study / Source Water Characterization Assessment, Final Report for the City of Guelph.
- American Water Services Ltd. 2009. Water Systems Report for the Township of Perth East.
- Anderson GeoLogic Limited. 2002. Hydrogeological Investigation Dundalk Test Well D4
- AquaResource. Inc. 2005. A Method for Assessing Water Use in Ontario Watersheds. Report to the Ontario Ministry of Environment.
- AquaResource Inc. 2007b. Source Water Protection Project Groundwater Study. Prepared for City of Guelph.
- AquaResource Inc. 2007c. Source Water Protection Project Surface Water Study. Prepared for City of Guelph.
- AquaResource Inc. 2009a. Integrated Water Budget Report, Grand River Watershed: Final Report, June 2009.
- AquaResource Inc. 2009b. Tier 2 Subwatershed Stress Assessment for the Grand River Watershed. Report to the Grand River Conservation Authority, December 2009.
- AquaResource Inc., 2009c. SPC Accepted Draft Integrated Water Budget Report Tier 2 CreditValley Source Protection Area. Prepared for Credit Valley Conservation, July 2009.
- AquaResource Inc. 2010. City of Guelph Source Protection Project Final Surface Water and Groundwater Vulnerability Report. Prepared for the City of Guelph.
- AquaResource Inc., 2010. Region of Waterloo Capture Zone Delineation Study Final Report, September 2010.
- AquaResource Inc. 2011. Orangeville, Mono and Amaranth Tier Three Water Budget and Local Area Risk Assessment, Final Report for the CTC Source Water Protection Region and Ministry of Natural Resources, January 2011.
- AquaResource Inc., Stantec Consulting Ltd. (Stantec), S.S. Papadopulous & Associates (SSPA). 2007a. Source Water Protection Project Groundwater Study, City of Guelph, March 2007.
- AquaResource Inc. and Stantec. 2010. City of Guelph Source Protection Project Water Quality Threats Assessment Report. Prepared for the City of Guelph.
- AquaResource Inc. In progress. City of Guelph Tier Three Local Area Risk Assessment. Report in progress for the City of Guelph.

- ARI. 2009b. Groundwater Intrinsic Susceptibility Index Assessment: Regional Municipality of Waterloo. Kitchener, ON.
- ARI. 2010. Region of Waterloo Capture Zone Delineation Study. Prepared for the Regional Municipality of Waterloo.
- ARI. 2010b. Technical Memorandum: Additional Capture Zones, Region of Waterloo. Prepared for the Regional Municipality of Waterloo.
- Armstrong, D. K., & Carter, T. R. 2010. The subsurface Paleozoic stratigraphy of southern Ontario; *Ontario Geological Survey*. Special Volume 7, 301p.
- Bajc, A. F., Karrow, P. F., Jasinski, P., & Warner, B. G. 2009. New occurrences of sub-till organic deposits in southwestern Ontario: are they really all that rare. *Eos, Transactions, American Geophysical Union*, *90*, GA71A-02.
- Barnett, P.J. 1992. Geology of Ontario, Ontario Geological Survey, Special Volume 4, Part 2, p. 1011-1088.
- Barnett, T., J. Adam, and D. Lettenmaier. 2005. Potential impacts of a warming climate on water availability in snow-dominated regions. *Nature*, 438: 303-309.
- Bellamy, S. and Wong, A. 2005. Long Point Region Water Use Study
- Blackport Hydrogeology Inc. 2002a. Groundwater Management and Protection Strategies, Groundwater Management Study, Township of Centre Wellington
- Blackport Hydrogeology Inc. 2002c. Fergus Water Supply System, Wells F1 and F2 GUDI Assessment, Township of Centre Wellington
- Blackport Hydrogeology Inc. 2003. Fergus Water Supply System, Additional GUDI Assessment, Municipal Well F1, Township of Centre Wellington
- Blackport Hydrogeology Inc. 2005. Town of Fergus Municipal Well F2, Well Integrity Testing and Pumping Test Data Assessment, Township of Centre Wellington
- Blackport Hydrogeology Inc. and Triton Engineering Services Limited, 2008. Township of Centre Wellington Threats Assessment and Issues Evaluation
- Blackport Hydrogeology Inc., 2002b. Water Resources Characterization, Groundwater Management Study, Township of Centre Wellington
- Bocaniov, S. A., Scavia, D., and Van Cappellen, P. 2023. Long-term phosphorus mass-balance of Lake Erie (Canada-USA) reveals a major contribution of in-lake phosphorus loading. Ecological Informatics, 77: 102131.
- Bolton, T. E. 1957. Silurian Stratigraphy and Palaeontology of the Niagara Escarpment in Ontario; *Geological Survey of Canada*, Memoir 289, 145p.

- Bosch, N.S. 2008. The influence of impoundments on riverine nutrient transport: An evaluation using the Soil and Water Assessment Tool. Journal of Hydrology 355, 131-147.
- Brett, C. E., Tepper, D. H., Goodman, W. M., LoDuca, S. T., & Eckert, B. Y. 1995. Revised stratigraphy and correlations of the Niagaran Provincial Series (Medina, Clinton, and Lockport Groups) in the type area of western New York (Vol. 2086). *US Government Printing Office*.
- Brintnell, C. 2012. Architecture and stratigraphy of the Lower Silurian Guelph Formation, Lockport Group, Southern Ontario and Michigan. Unpublished Master's Thesis, University of Western Ontario, 247p.
- Brklacich, M. 1990. Climatic Warming and potential demands for irrigation water in southwest Ontario, in *Climate Change: Implications for Water and Ecological Resources*. ed. by G. Wall and M. Sanderson. pp. 269-274. Department of Geography Publication Series, Occasional Paper no. 11 Waterloo, ON: Department of Geography, University of Waterloo.
- Bruce, J., I. Burton, H. Martin, B. Mills, and L. Mortsch. 2000. *Water Sector: Vulnerability and Adaptation to Climate Change*. Climate Change Impacts and Adaptation Program. Final Report submitted to Natural Resources Canada Ottawa, ON: Natural Resources Canada. 144 p.
- Bruce, J., W. Dickinson, and D. Lean. 2006. Planning for Extremes: Adapting to Impacts on Soil and Water from Higher Intensity Rains with Climate Change in the Great Lakes Basin, in *Planning for Extremes Workshop*. pp. 69. Milwaukee, Wisconsin: Ontario Chapter of the Soil and Water Conservation Society. [online] Available from: http://www.swcs.org/documents/filelibrary/PFE_Canada.pdf. (Accessed 15 October 2009).
- Brunton, F.R. 2008. Project Unit 08-004. Preliminary Revisions to the Early Silurian Stratigraphy of Niagara Escarpment: Integration of Sequence Stratigraphy, Sedimentology and Hydrogeology to Delineate Hydrogeologic Units. Ontario Geological Survey, Open File Report 6226, p.31-1 to 31-18.
- Brunton, F.R. 2009. Update of revisions to Early Silurian stratigraphy of the Niagara Escarpment: integration of sequence stratigraphy, sedimentology and hydrogeology to delineate hydrogeologic units; in Summary of Field Work and Other Activities 2009, Ontario Geological Survey, Open File Report 6240, p.25-1 to 25-20.
- Burnside & Associates Ltd. (Burnside). 2009a. Rockwood Well #3 (Bernardi) 2008 Annual PTTW Monitoring Report, Township of Guelph-Eramosa. R.J. Burnside & Associates Limited, March 2009.
- Burnside & Associates Ltd. (Burnside). 2010a. Vulnerability Analysis, Issues Evaluation and Threats Assessment, Township of East Garafraxa, May 2010.
- Burnside & Associates Ltd. (Burnside). 2010b. Vulnerability Analysis, Issues Evaluation and Threats Assessment, Township of East Luther Grand Valley, June 2010.

- Burnside & Associates Ltd. (Burnside). 2010c. Vulnerability Analysis, Issues Evaluation and Threats Assessment, Township of Guelph Eramosa, R.J. Burnside & Associates Limited, April 2010.
- Burnside & Associates Ltd. (Burnside). 2010d. Vulnerability Analysis, Issues Evaluation and Threats Assessment, Township of Mapleton, R.J. Burnside & Associates Limited, February 2010.
- Burnside & Associates Ltd. (Burnside). 2021. PW5 Threats Assessment Grand Valley Water Supply System, Town of Grand Valley, February 2021.
- Burnside and Waterloo Hydrogeologic, Inc. 2001. Township of Amaranth Municipal Groundwater Study. Report to the Township of Amaranth, Dufferin County.
- Burnside. 2000. Engineering Report for the Township of East Garafraxa, Marsville Water Supply System, R.J. Burnside and Associates Ltd. 2000.
- Burnside. 2001a. Engineering Report for the Village of Grand Valley, Grand Valley Water Supply System, R.J. Burnside and Associates Ltd. 2001.
- Burnside. 2001b. Engineer Report for the Township of Guelph-Eramosa. Ricenberg Water Supply System. R.J. Burnside & Associates Limited, January 2001.
- Burnside. 2001c. Engineering Report for the Township of Mapleton, Drayton Water Supply System, R.J. Burnside and Associates Ltd. March 2001.
- Burnside. 2001d. Township of East Garafaxa Groundwater Management Study, August 2001.
- Burnside. 2001e. Township of East Luther Grand Valley Groundwater Management Study, October 2001.
- Burnside. 2002a. Hydrogeological Investigation, Village of Moorefield, Burnside Environmental, September 2002.
- Burnside. 2002b. Town of Rockwood Hydrogeology Study to Examine Groundwater Sources Potentially Under Direct Influence of Surface Water. Burnside Environmental, March 2002.
- Burnside. 2002c. Rockwood Environmental Assessment Hydrogeological Report Construction and Testing of TW3/02 Proposed Rockwood Well 3, Township of Guelph Eramosa, R.J. Burnside & Associates Limited, August 2002.
- Burnside. 2005. Water System Performance Report, Township of East Luther Grand Valley, R. J. Burnside & Associates Limited, February 2005.
- Burnside. 2008. Rockwood Microbial Contaminant Control Plan, Township of Guelph-Eramosa, R.J. Burnside & Associates Limited, September 2008.

- Burnside. 2009a. Village of Drayton Wells 1 & 2, 2008 Annual Monitoring Report, Permit to Take Water No. 85-P-2004, Township of Mapleton, R.J. Burnside & Associates Limited, March 2009.
- Burnside. 2009b. Village of Moorefield Wells 1 & 2, 2008 Annual Monitoring Report, Permit to Take Water No. 4651-6JTS55, Township of Mapleton, R.J. Burnside & Associates Limited. March 2009.
- Burnside. 2009c. Wastewater Treatment Capacity, 2009 Update Rockwood, Township of Guelph-Eramosa, November 2009.
- Burnside. 2009d. Schedule B Raw Water Assessment, Water Systems QMS Operational Plans, Township of Guelph Eramosa, R.J. Burnside & Associates Limited, March 2009.
- Burt, A.K, Rainsford, D.R.B. and Bajc, A.F. 2011. Aquifer or drain? The southern Ontario Rockwood buried-bedrock valley; 2011 Geological Society of America Annual Meeting, Paper No. 62-4, Minneapolis, MN.
- Canadian Water and Wastewater Association (CWWA) website in the 'Directory of Contaminants Database' (http://www.cwwa.ca/Contaminants/Search.asp), last updated September 24, 2004.
- CH2M Hill. 2002. Hydrogeological Study to Evaluate the GUDI status of the Manheim West, Manheim East, and Peaking Well Fields. Kitchener, ON.
- Chapman, L.J. and Putnam D.F., 1984. The Physiography of Southern Ontario; Ontario Geological Survey, Special Volume Accompanied by Map P.2715, scale 1:600,000.
- Chiotti, Q., and B. Lavender. 2008. Ontario, in *From Impacts to Adaptation: Canada in a Changing Climate 2007*. ed. by D.S. Lemmen, F.J. Warren, J. Lacroix and E. Bush. pp. 227-274. Ottawa, ON: Government of Canada.
- City of Guelph, 2006. City of Guelph Official Plan, 2001. Consolidated November 2006.
- City of Guelph, 2008. Guelph's Local Growth Management Strategy Recommendations in Response to the Growth Plan for the Greater Golder Horseshoe Sustainable Population Threshold to 2031 and City Official Plan Preferred Urban From Elements.
- City of Hamilton, 2018: Drinking-Water Systems Regulation O.Reg 170/03 Section 11 Annual Report, January 1, 2017 December 31, 2017.
- City of Madison, Wisconsin. 2006. Road Salt Use and Recommendations. Report prepared by the Salt Use Subcommittee for the Commission on the Environment. December 11, 2006.
- Cole, J., Coniglio, M., & Gautrey, S. 2009. The role of buried bedrock valleys on the development of karstic aquifers in flat-lying carbonate bedrock: insights from Guelph, Ontario, Canada. *Hydrogeology journal*, *17*(6), 1411-1425.

- Conestoga Rovers & Associates (CRA). 1987. TCE Source Investigation, Regional Municipality of Waterloo.
- Conestoga Rovers & Associates (CRA). 2007. 2005-2006 Groundwater Technical Study, Saugeen Valley-Grey Sauble-Northern Bruce Peninsula Source Protection Region. Conestoga-Rovers & Associates. November 2007.
- Conestoga Rovers & Associates (CRA). 2009. Round 2 Groundwater Technical Study Groundwater Vulnerability Assessment for the Municipalities of West Grey and Northern Bruce Peninsula Saugeen, Grey-Sauble, Northern Bruce Peninsula Source Protection Region. .August 2009.
- County of Oxford. 1995. County of Oxford Official Plan, December 13, 1995.
- County of Oxford. 2004. County of Oxford Groundwater Protection Pilot Project, Land Use and Chemical Occurrence Inventory, July, 2004.
- County of Oxford. 2007. County of Oxford On-line. (2002) www.cooloxford.ca.
- County of Oxford. 2009a. 2009 Annual Drinking Water System Report: Plattsville Water System.
- County of Oxford. 2009b. 2009 Annual Drinking Water System Report: Drumbo Water System.
- County of Oxford. 2009e. Source Water Protection Drinking Water Systems Issues Evaluation, October 2009.
- County of Oxford. 2017. 2017 Annual Drinking Water System Report: Bright Water System.
- County of Wellington. 1999. Wellington County Official Plan, May 19, 1999 (Revised August 15, 2019).
- Cowan, W.R. 1972. Pleistocene geology of the Brantford Area, southern Ontario; Ontario Dept. Mines and Northern Affairs, IMR 37, 66 p.
- Cunderlik, J. M., and S. P. Simonovic. 2004. Inverse Modeling of Water Resources Risk and Vulnerability to Changing Climatic Conditions, in *57th Canadian Water Resources Association Annual Congress*. Montreal, QC., June 16-18, 2004. pp. 1-6. Montreal, QC: Canadian Water Resources Association.
- Credit Valley Conservation Authority. 2015. Approved Updated Assessment Report: Credit Valley Source Protection Area, 2015.
- de Loë, R., and A. Berg. 2006. Mainstreaming Climate Change in drinking water source protection in Ontario. Ottawa, ON: Pollution Probe and the Canadian Water Resources Association (Ontario Branch). 51 p.
- de Loë, R., and R. Kreutzwiser. 2000. Climate variability, climate change and water resource management in the Great Lakes. *Climatic Change*, 45(1): 163-179.

- Diersch, H.-J. G., 2006: FEFLOW 5.3 Finite Element Subsurface Flow and Transport Simulation System, User's Manual, WASY GmbH, Berlin, Germany.
- Drinking Water Source Protection, 2014. Module 2: Understanding Where Policies Apply. Implementation Resource Guide. 06/05/2014.
- Drinking Water Standards, Objectives and Guidelines. June 2006.
- Drinking Water System Regulation 170/03. 2003. Part III, Form 2, Section 11, Annual Report for Drayton Water Supply System, 2003
- Drinking Water System Regulation 170/03. 2003. Part III, Form 2, Section 11, Annual Report for Rockwood Water Supply System, 2003.
- Drinking Water System Regulation 170/03. 2004. Part III, Form 2, Section 11, Annual Report for Drumbo Water Supply System, 2004.
- Drinking Water System Regulation 170/03. 2004. Part III, Form 2, Section 11, Annual Report for Plattsville Water Supply System, 2004.
- Drinking Water System Regulation 170/03. 2017. Annual Report for County of Brant, Paris Water Supply System, 2017.
- Drinking Water System Regulation 170/03. 2017. Annual Report for County of Brant, Airport Well Water Supply System, 2017
- Drinking Water System Regulation 170/03. 2017. Annual Report for County of Brant, Mt. Pleasant Well Water Supply System, 2017
- Drinking Water System Regulation 170/03. 2017. Annual Report for County of Brant, St. George Well Water Supply System, 2017
- Drinking Water System Regulation 170/03. 2017. Annual Report for City of Hamilton, Lynden Communal Well Water Supply System, 2017
- Drinking Water System Regulation 170/03. 2009-2017. Annual Report for Southgate, Dundalk Waterworks, 2009-2017.
- Drinking Water System Regulation 170/03. 2005. Part III, Form 2, Section 11, Annual Report for Marsville Water Supply System, 2005.
- Drinking Water System Regulation 170/03. 2005. Part III, Form 2, Section 11, Annual Report for Grand Valley Water Supply System, 2005.
- Drinking Water System Regulation 170/03. 2005. Part III, Form 2, Section 11, Annual Report for Rockwood Water Supply System, 2005.
- Drinking Water System Regulation 170/03. 2006. Part III, Form 2, Section 11, Annual Report for Rockwood Water Supply System, 2006.

- Drinking Water System Regulation 170/03. 2006. Part III, Form 2, Section 11, Annual Report for Drayton Water Supply System, 2006.
- Drinking Water System Regulation 170/03. 2006. Part III, Form 2, Section 11, Annual Report for Moorefield Water Supply System, 2006.
- Drinking Water System Regulation 170/03. 2007. Part III, Form 2, Section 11, Annual Report for Rockwood Water Supply System, 2007.
- Drinking Water System Regulation 170/03. 2007a. Part III, Form 2, Section 11, Annual Report for Drayton Water Supply System, 2007.
- Drinking Water System Regulation 170/03. 2007b. Part III, Form 2, Section 11, Annual Report for Milverton Well Supply System, 2007.
- Drinking Water System Regulation 170/03. 2007c. Part III, Form 2, Section 11, Annual Report for Moorefield Water Supply System, 2007.
- Drinking Water System Regulation 170/03. 2008a. Part III, Form 2, Section 11, Annual Report for Drayton Water Supply System, 2008.
- Drinking Water System Regulation 170/03. 2008c. Part III, Form 2, Section 11, Annual Report for Marsville Water Supply System, 2008.
- Drinking Water System Regulation 170/03. 2008d. Part III, Form 2, Section 11, Annual Report for Moorefield Water Supply System, 2008.
- Drinking Water System Regulation 170/03. 2008e. Part III, Form 2, Section 11, Annual Report for Rockwood Water Supply System, 2008.
- Drinking Water System Regulation 170/03. 2009a. Part III, Form 2, Section 11, Annual Report for Arthur Well Supply System, 2009. Accessed here: http://www.wellington-north.com/file.aspx?id=2960784d-8a36-4799-99a4-9a6c161bcba6
- Drinking Water System Regulation 170/03. 2017. Part III, Form 2, Section 11, Annual Report for Lynden Drinking Water System FDL01 2017.
- Dufferin Water Co. Ltd. (DWCo Ltd.) 2009. Grand Valley Water Supply System Schedule 22 Summary Report. Prepared for the Township of East Luther Grand Valley.
- Dufferin Water Co. Ltd. (DWCo Ltd.). 2010a. Grand Valley Water Supply System Schedule 22 Summary Report. Prepared for the Township of East Luther Grand Valley.
- Dufferin Water Co. Ltd. (DWCo Ltd.) 2010b. Marsville Water Supply System Schedule 22 Summary Report. Prepared for the Township of East Garafraxa.
- Dufferin Water Co. Ltd. (DWCo Ltd.) 2010c. Waldemar Heights Water Supply System Schedule 22 Summary Report. Prepared for the Township of Amaranth

- DWCo. Ltd. 2008. Marsville Water Supply System, C of A Condition 9.3 Summary Report -2007, Dufferin Water Co. Ltd. 2008.
- DWCo. Ltd. 2009. Marsville Water Supply System Summary Report -2008, Dufferin Water Co. Ltd, 2009.
- DWCo. Ltd. 2009. Township of East Luther Grand Valley Water Supply System Permit to Take Water Monitoring Report, PTTW Number 93-P-211, PTTW 00-P-2661, 2008. Dufferin Water Co. Ltd. March, 2009.
- Earth Tech Canada Inc, Lura Consulting, Lotowater Geoscience Consultants Ltd., C.N. Watson and Associates Ltd., 2006. City of Guelph Water Supply Master Plan. Draft Final Report. Report to the City of Guelph.
- Earthfx Inc. 2008. Aquifer Vulnerability Mapping for Norfolk County, County of Brant, Catfish Creek and Kettle Creek Watersheds, Lake Erie Source Protection Region, Earthfx Incorporated, December 2008.
- Earthfx Inc. 2010. Vulnerability Assessment and Scoring of Well Head Protection Areas, City of Hamilton.
- Earthfx Inc. 2017. Wellhead Protection Area Delineation and Vulnerability Scoring for the Airport Wellfield, County of Brant, Ontario. Lake Erie Source Protection Region, September 2017.
- Earthfx Inc. 2018a. Wellhead Protection Area Delineation and Vulnerability Scoring for the Mt. Pleasant Wellfield, County of Brant, Ontario. Lake Erie Source Protection Region, August 2018.
- Earthfx Inc. 2018b. Wellhead Protection Area Delineation and Vulnerability Scoring for the Bethel Road Wellfield, County of Brant, Ontario. Lake Erie Source Protection Region, September 2018.
- Earthfx Inc. 2018c. Whitemans Creek Tier Three Local Area Water Budget and Risk Assessment Model Development and Calibration Report. Lake Erie Source Protection Region, March 2018.
- Earthfx Inc. 2018d. Wellhead Protection Area Delineation, Vulnerability Scoring and Threats Assessment for the St. George and Lynden Municipal Water Supply Wells, Lake Erie Source Protection Region, May 2018.
- Earthfx Inc. 2022. Updated Wellhead Protection Area Delineation and Vulnerability Scoring and Threats Assessment for the Town of Shelburne, Ontario. Lake Erie Source Protection Region, August 2022.
- EcoLogERIS, 2006a. EcoLog ERIS Report: Grand Valley, ON, EcoLog Environmental Risk Information Services Ltd, June 13, 2006.

- EcoLogERIS, 2006a. EcoLog ERIS Report: Marsville Pumping Well, Marsville, ON, EcoLog Environmental Risk Information Services Ltd, June 13, 2006.
- EcoLogERIS, 2006b. EcoLog ERIS Report: Moorefield Well, Mapleton Township, EcoLog Environmental Risk Information Services Ltd, June 13, 2006.
- EcoLogERIS, 2006c. EcoLog ERIS Report: Rockwood Capture Zone, Rockwood ON, EcoLog Environmental Risk Information Services Ltd, June 12, 2006 and August 21, 2006.
- EcoLogERIS, 2006d. EcoLog ERIS Report: Cross Creek and Huntington, Guelph-Eramosa, EcoLog Environmental Risk Information Services Ltd, June 14, 2006.
- EcoLogERIS, 2006e. EcoLog ERIS Report: Drayton Capture Zone, Mapleton Township, EcoLog Environmental Risk Information Services Ltd, June 13, 2006.
- EcoLogERIS, 2006f. EcoLog ERIS Report: Melody Homes Wells 1 & 2, Grand Valley ON,
- Ellis, J. 2010. Township of Southgate Dundalk Waterworks 2009 Annual Report. Accessed here:

 http://southgate.fileprosite.com/FileStorage/70DBBBEA6F224BA29A3C5D77CAF90D78-2009%20Annual%20Waterworks%20Report.pdf
- Environment Canada (EC) 1999. Priority Substances List Assessment Report: Road Salts. < http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/contaminants/psl2-lsp2/road_salt_sels_voirie-eng.pdf>
- Environment Canada, 2004a. Canada-Ontario Agreement (COA) Respecting the Great Lakes Basin Ecosystem, 2007. Retrieved October 19, 2009
- Environment Canada. 2004b. *Threats to Water Availability in Canada*. NWRI Scientific Assessment Report Series No. 3. Burlington: National Water Research Institute. 128 p. [online] Available from: http://www.ec.gc.ca/inre-nwri/default.asp?lang=En&n=0CD66675-1.
- Fetter, C.W., 2001. Applied Hydrogeology (4th ed.), Prentice-Hall, Upper Saddle River, New Jersey, 598p.
- Francis, D., and H. Hengeveld. 1998. *Extreme Weather and Climate Change*. Minister of Supply and Services Canada, Ottawa.
- Freeze, R.A. and Cherry, J.A. 1979. Groundwater. Upper Saddle River, New Jersey: Prentice-Hall Inc. 604p.
- Frontline Environmental and Earth FX. 2000. Flow and Capture Zone Modelling of the River Wells, Kitchener, Kitchener, ON.
- Gao, C. 2011. Buried bedrock valleys and glacial and subglacial meltwater erosion in southern Ontario, Canada. *Canadian Journal of Earth Sciences*, *48*(5), 801-818.

- 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.
- Gartner Lee Limited. 1999. Jagger Hims Limited and Braun Consulting Engineers. 1999. The City of Guelph Water Supply System Study Resource Evaluation.
- Gartner Lee Limited. 2003. Arkell Spring Grounds Groundwater Supply Investigation. Prepared for City of Guelph.
- Gartner Lee Limited. 2004. Guelph/Eramosa Township Regional Groundwater Characterization and Wellhead Protection Study. Prepared for: The Township of Guelph/Eramosa and the Ontario Ministry of the Environment.
- Geo-Environ, 1989. Test Pumping Report, Village of Grand Valley Part of Lot 30, Concession 11, Formerly the Township of East Luther, Geo-Environ, Limited, October 1989.
- Golder Associates Ltd (Golder). 2001. Phase II Groundwater Protection Study, County of Oxford.
- Golder Associates Ltd (Golder). 2006a. County of Wellington Groundwater Protection Study Final Report. Prepared for the Grand River Conservation Authority.
- Golder Associates Ltd (Golder). 2006b. Guelph-Puslinch Groundwater Protection Study. Prepared for the Grand River Conservation Authority.
- Golder Associates Ltd (Golder). 2006c. Microbial Contamination Control Plan: Carter Wells, Arkell Glen Collector and Arkell Well PW-1. Final Report for the City of Guelph.
- Golder Associates Ltd (Golder). 2008. IUS Groundwater Supply Optimization and Expansion Project, Tasks C4 Hydrogeological Well Assessment, Well W14 Area DRAFT Interim Report.
- Golder Associates Ltd. (Golder). 2010a. Draft Technical Memorandum Review and Refinement of the Grand River Conservation Authority's SAAT Vulnerability Mapping at the Wellhead Protection Area Scale.
- Golder Associates Ltd. (Golder). 2010b. Grand Valley, Waldemar and Marsville Municipal Wells
 Groundwater Model and Capture Zone Development DRAFT, Golder Associates,
 January 2010.
- Golder Associates Ltd. (Golder). 2010e. Township of Southgate, Village of Dundalk: Source Protection Vulnerability, Issues and Threats Assessment, July 2010.
- Golder Associates Ltd. (Golder). 2010d. Township of Centre Wellington: Source Protection Vulnerability, Issues and Threats Assessment, July 2010.
- Golder Associates Ltd. (Golder). 2010e. Updated Threat Assessment Region of Waterloo Threat Inventory and Circumstances Survey (TICS), October 2010.

- Golder Associates Ltd. (Golder). 2010f. County of Brant Source Protection Vulnerability, Issues and Threats Assessment, July 2010.
- Golder Associates, Ltd. (Golder). 2011a. Region of Waterloo Threat Inventory and Circumstance Survey: Threat Assessment Update Report. Prepared for the Regional Municipality of Waterloo. March 2011.
- Golder Associates Ltd. (Golder). 2011b. RMOW TICS Project Alternate Method for Assessment of Road Salt Application Threats. Prepared for the Regional Municipality of Waterloo.
- Golder Associates and Banks Groundwater Engineering. 2013. Long Term Well for Additional Water Supply Project, Environmental Assessment/Environmental Impact Statement: prepared for the Town of Shelburne, September 2013.
- Golder Associates Ltd. (Golder). 2014. Drinking Water Issue (Chloride) Review for the Township of Centre Wellington Municipal Water Supply Wells, dated August 18, 2014. Prepared for the Township of Centre Wellington.
- Golder Associates Ltd. (Golder). 2017a. Mannheim ASR Project, Stage 1 Conceptual Design Report. Prepared for the Regional Municipality of Waterloo.
- Golder Associates Ltd. (Golder). 2017b. Aquifer Storage and Recovery (ASR) Stage 2
 Expansion Project: Phase 1 Hydrogeology Report. July 2017. Submitted to Region of Waterloo.
- Golder Associates Ltd. (Golder). 2017c. Regional Municipality of Waterloo Cambridge East Water Supply Class Environmental Assessment Hydrogeology and Natural Environmental Report. Prepared for The Regional Municipality of Waterloo.
- Golder Associates Ltd. (Golder). 2018. Village of Dundalk, WHPA Delineation and Vulnerability Scoring, dated January 2018. Prepared for the Grand River Conservation Authority.
- Golder Associates Ltd. (Golder). 2018a. Well G4-G4A WHPA-E Delineation. Prepared for the Regional Municipality of Waterloo.
- Golder Associates Ltd. (Golder). 2018b. Updated Wellhead Protection Area Delineation and Vulnerability Scoring Mannheim Aquifer Storage and Recovery Wells. Prepared for the Regional Municipality of Waterloo.
- Golder Associates Ltd. (Golder). 2020a. Vulnerability Scoring for the Pinebush and Clemens Mill Well Fields Environmental Assessment of New Well Scenarios. Prepared for the Region of Waterloo.
- Golder Associates Ltd. (Golder). 2020b. Updated Wellhead Protection Area Delineation and Vulnerability Scoring Mannheim Aquifer Storage and Recovery Well. September 2020. Prepared for the Region of Waterloo.
- Golder Associates Ltd. (Golder). 2020c. Blair Road Well Field Hydrogeologic Assessment: Regional Water System Upgrades in Cambridge and North Dumfries, Regional

- Municipality of Waterloo, Ontario. January 2020. Submitted to GM BluePlan Engineering Ltd.
- Golder Associates Ltd. (Golder). 2022. Updated Source Water Protection Mapping for the Blair Road Well Field. February 2022. Submitted to Eric Hodgins, Region of Waterloo.
- Government of Canada. 2007. Industry Canada. Date Modified October 19, 2009 www.ic.gc.ca.
- Government of Ontario. 2005. Great Lakes St. Lawrence River Basin Sustainable Water Resources Agreement. Retrieved December 13, 2023 from: https://www.ontario.ca/page/great-lakes-st-lawrence-river-basin-sustainable-water-resources-agreement
- Government of Ontario. 2006. Clean Water Act, S.O. 2006, Chapter 22, 2006.
- Government of Ontario. 2007. Clean Water Act, Ontario Regulation 287/07 General, 2007.
- Government of Ontario. 2008. Clean Water Act Ontario Regulation. 385/08 Amending O. Reg 287/07.
- Grand River Conservation Authority (GRCA). 1998. State of the Watershed Report: Background Report on the Health of the Grand River Watershed, 1996-97.
- Grand River Conservation Authority (GRCA). 2002. Grand River Regional Groundwater Study. GRCA
- Grand River Conservation Authority (GRCA). 2004. A Watershed Forest Plan for the Grand River.
- Grand River Conservation Authority (GRCA). 2005. Water Use in the Grand River Watershed.
- Grand River Conservation Authority (GRCA) and Conservation Ontario. 2005. Establishing Environmental Flow Requirements for Selected Streams in the Grand River Watershed. Report to the Ontario Ministry of Environment.
- Grand River Conservation Authority (GRCA). 2009a. Technical Memorandum issued by GRCA for Lake Erie Region Technical Studies, September 17, 2009 (updated September 23, 2009). Livestock Density Census by Consolidated Subdivisions (in Nutrient Units per Acre) in the Lake Erie Region Source Protection Area.
- Grand River Conservation Authority (GRCA). 2009b. Wetlands GIS data.
- Grand River Conservation Authority (GRCA). 2011. Conestogo Lake Conservation Area Fish Die off Response Protocol, July 2011.
- Grand River Conservation Authority (GRCA). 2015. Addendum to Tier 2 Water Quantity Stress Assessment Big Creek Groundwater Assessment Area. Prepared for Lake Erie Source Water Protection Region. June 2013, Updated May 2015.

- Grand River Conservation Authority (GRCA). 2017. Natural Heritage Characterization Report: Lower Grand River Subwatershed, Version 1. July 14, 2017.
- Grand River Conservation Authority (GRCA). 2017. Natural Heritage Characterization Report: Lower Middle Grand River Subwatershed, Version 1. July 14, 2017.
- Grand River Conservation Authority (GRCA). 2017. Natural Heritage Characterization Report: Whitemans Creek Subwatershed, Version 1. July 14, 2017.
- Grand River Conservation Authority (GRCA). 2017. Management Committee Board: Water Quality Conditions Report GM-02-17-24. February 24, 2017.
- Grand River Conservation Authority (GRCA). *In progress*. Natural Heritage Characterization Report: Speed River Subwatershed, Version 1. August 29, 2018.
- Grand River Conservation Authority (GRCA). *In progress*. Natural Heritage Characterization Report: Conestogo River Subwatershed, Version 1. August 29, 2018.
- Grand River Conservation Authority (GRCA). 2018. Technical Memorandum: Summary of Population Statistics for the Grand River Watershed. August 2018.
- Grand River Fisheries Manage Plan Implementation Committee. 2005.
- GRFMPIC. 1998a. The Grand River Fisheries Management Plan. Grand River Fisheries Management Plan Implementation Committee, Cambridge.
- GRFMPIC. 1998b. Technical background report for the Grand River Fisheries Management Plan. Grand River Fisheries Management Plan Implementation Committee, Cambridge.
- GRFMPIC. 2005. A community-based Approach to Fisheries Management in the Grand River watershed. Cambridge, ON. CD
- GSP Group Inc. 2010. Grand River, Long Point Region, Catfish Creek and Kettle Creek Watershed Areas: Population Forecasts.

 http://www.sourcewater.ca/swp_watersheds_Grand/PopReport_Jan2010.pdf
- Guelph Waterworks Division. 2018. Ontario Regulation 170/03 Annual Summary Report for the Period of January 1, 2017 to December 31, 2017 for the Guelph Water Supply and the Gazer Mooney Subdivision Water Distribution System. Accessed here: https://guelph.ca/wp-content/uploads/2017-Annual-Summary-Water-Services-Report.pdf
- Holysh, S., J. Pitcher, and D. Boyd. 2001. Grand River Regional Groundwater Study. Grand River Conservation Authority.
- Hunter, P. 2003. Climate change and waterborne and vector-borne disease. Journal of Applied Microbiology, 94: 37-46.
- IPCC-TGICA. 2007. General Guidelines on the Use of Scenario Data for Climate Impact and Adaptation Assessment, in Version 2. Prepared by T.R. Carter. pp. 66. Helsinki, Finland: Intergovernmental Panel on Climate Change, Task Group on Data and Scenario Support

- for Impact and Climate Assessment.
- Isidoro, D., Quílez, D., Aragüés. 2003. Water Balance and Irrigation Performance Analysis: La Violada Irrigation District (Spain) As a Case Study. Agricultural Water Management 64 (2004). p. 123-142.
- Jagger Hims Limited, 1995. Aquifer Performance Evaluation, Northeast Quadrant, City of Guelph, Volume 1.
- Jagger Hims Limited, 1998a. Aquifer Performance Evaluation, Northwest Quadrant, City of Guelph, Volume 1.
- Jagger Hims Limited, 1998b. Aquifer Performance Evaluation, Southwest Quadrant, City of Guelph, Volume 1.
- Jagger Hims Limited, 1998c. Aquifer Performance Evaluation, Southeast Quadrant, City of Guelph, Volume 1.
- Janzen, B., 2018. Geology of the Grand River Watershed An Overview of Recent Bedrock and Quaternary Geological Interpretations in the Grand River Watershed, December 2018.
- Jarvie, H.P., Neal, C., and Withers, P.J.A. 2006. Sewage-effluent phosphorus: A greater risk to river eutrophication than agricultural phosphorus. Science of the Total Environment 360, 246-253
- Johnson, M. D., Armstrong, D. K., Sanford, B. V., Telford, P. G., & Rutka, M. A. (1992). Paleozoic and Mesozoic geology of Ontario. *Geology of Ontario, Ontario Geological Survey, Special*, *4* (Part 2), 907-1008.
- Jones, M. L., Y. Zhao, J. D. Stockwell, and B. J. Shuter. 2006. Forecasting effects of climate change on Great Lakes fisheries: Models that link habitat supply to population dynamics can help. *Canadian Journal of Fisheries and Aquatic Sciences*, 63(2): 457-468.
- Jyrkama, M. I., and J. F. Sykes. 2007. The impact of climate change on spatially varying groundwater recharge in the Grand River watershed (Ontario). *Journal of Hydrology*, 338(3): 237-250.
- Karrow, P.F. 1973. The Waterloo kame-moraine; a discussion. Zeit. Fur. Geom., vol. 17, p126-
- Karrow, P.F. 1987. Quaternary geology of the Hamilton Cambridge area, southern Ontario; Ontario Geological Survey, Report 255.
- Karrow, P.F. 1993. Quaternary Geology, Stratford-Conestogo Area; Ontario Geological Survey, Report 283, 104p.
- Kling, G. et al. 2003. Confronting Climate Change in the Great Lakes Region: Impacts on Our Communities and Ecosystems. Washington, D.C.: Cambridge, Massachusetts: Union of Concerned Scientists.

- Kreutzwiser, R. and R. de Loë. 1999. Agricultural and Rural Water Use in Ontario. A Report to the Agricultural Adaptation Council under the National Soil and Water Conservation Program. Revised August 31. Guelph: Rural Water Management Group, Department of Geography, University of Guelph. 43p.
- Kunkel, K. E., L. Ensor, M. Palecki, D. Easterling, D. Robinson, K. G. Hubbard, and K. Redmond. 2009. A new look at lake-effect snowfall trends in the Laurentian Great Lakes using a temporally homogeneous data set. *Journal of Great Lakes Research*, 35(1): 23-29.
- Kunkel, K. E., N. E. Westcott, and D. A. R. Kristovich. 2002. Assessment of potential effects of climate change on heavy lake-effect snowstorms near Lake Erie. *Journal of Great Lakes Research*, 28(4): 521-536.
- Lake Erie Source Protection Region Technical Team. 2008, Grand River Conservation Authority Watershed Characterization Report.
- Lake Erie Source Protection Region Technical Team. 2010, Long Point Region Draft Assessment Report.
- Lenters, J. D. 2001. Long-term trends in the seasonal cycle of Great Lakes water levels. *Journal of Great Lakes Research*, 27(3): 342-353.
- Lofgren, B. 2006. Land surface roughness effects on lake effect precipitation. *Journal of Great Lakes Research*, 32(4): 839-851.
- Lofgren, B. M., F. H. Quinn, A. H. Clites, R. A. Assel, A. J. Eberhardt, and C. L. Luukkonen. 2002. Evaluation of potential impacts on Great Lakes water resources based on climate scenarios of two GCMs. *Journal of Great Lakes Research*, 28(4): 537-554.
- Loomer, Heather and Cooke, Sandra. 2003-2008. *Water Quality in the Grand River Watershed:*Current Conditions and Trends.
- Lotowater. 1997a. Grand River Reservoir and Pumping Station, Forwell and Pompeii Well. Kitchener, ON.
- Lotowater. 2004. Assessment of Groundwater Availability, Part 1, Water Servicing Review Southwest Paris and Airport Areas.
- Marich, A. S., Priebe, E. H., Bajc, A. F., Rainsford, D. R. B., & Zwiers, W. G. (2011). A geological and hydrogeological investigation of the Dundas buried bedrock valley, southern Ontario. *Ontario Geological Survey, Groundwater Resources Study*, *12*, 248.
- Matrix Solutions (Matrix). 2015. Regional and Cambridge Model Updates following the Region of Waterloo Tier Three Water Budget and Local Area Risk Assessment. March 1, 2015. Memorandum prepared for the Region of Waterloo.
- Matrix Solutions (Matrix). 2017. WHPA Delineation for the Cambridge East Well Fields in Support of the Cambridge East Environmental Assessment. April 2017. Prepared for the Region of Waterloo.

- Matrix Solutions (Matrix). 2017a. Region of Waterloo Wellhead Protection Area Delineation Study. Prepared for the Regional Municipality of Waterloo.
- Matrix Solutions (Matrix). 2017b. Groundwater Vulnerability Assessment for the Region of Waterloo Using a Modified Intrinsic Susceptibility Approach. Prepared for the Regional Municipality of Waterloo.
- Matrix Solutions (Matrix). 2017c. Transport Pathways Assessment and Vulnerability Scoring for an Updated Assessment Report in the Region of Waterloo. Prepared for the Regional Municipality of Waterloo.
- Matrix Solutions (Matrix). 2018a. Township of Guelph/Eramosa Wellhead Protection Area Delineation, Vulnerability Scoring, and Transport Pathway Assessment Report. Prepared for the GRCA, City of Guelph and Guelph/ Eramosa Township. November 2018.
- Matrix Solutions (Matrix). 2018b. Township of Centre Wellington Wellhead Protection Area Delineation, Issue Contributing Area Delineation, and Vulnerability Scoring Report. Prepared for the GRCA and Township of Centre Wellington. November 2018.
- Matrix Solutions (Matrix). 2018c. Updates to the Wellhead Protection Area Delineation, Vulnerability Scoring, and Transport Pathways for Wells K72 to K75 and Well G9. Prepared for the Regional Municipality of Waterloo.
- Matrix Solutions (Matrix). 2018d. Percent Managed Lands, Livestock Density, and Impervious Cover Within Wellhead Protection Area. Prepared for the Regional Municipality of Waterloo.
- Matrix Solutions (Matrix). 2018e. Updates to Transport Pathways and Vulnerability Scoring for Woolner Wellfield (Wells K80 to K82). Prepared for the Regional Municipality of Waterloo.
- Matrix Solutions (Matrix). 2018f. Updates to Wellhead Protection Areas, Vulnerability Scoring, Percent Managed Lands, Livestock Density, and Impervious Cover for Parkway and Pinebush Well Fields: Data Transfer Letter Report. November 2018. Prepared for Region of Waterloo.
- Matrix Solutions (Matrix). 2024. William Street Wellfield Wellhead Protection Areas Delineation and Vulnerability Update. January 2024. Prepared for the Region of Waterloo.
- McBean, E., and H. Motiee. 2008. Assessment of impact of climate change on water resources: A long term analysis of the Great Lakes of North America. *Hydrology and Earth System Sciences*, 12(1): 239-255.
- McDonald, M.G., and Harbaugh, A.W., 1988, A modular three-dimensional finite-difference ground-water flow model: Techniques of Water-Resources Investigations of the United States Geological Survey, Book 6, Chapter A1, 586 p.
- McLaren, R., and E. Sudicky. 1993. The Impact of Climate Change on Groundwater, in *The Impact of Climate Change on Water in the Grand River Basin, Ontario.* ed. by M.

- Sanderson. pp. 53-67. Publication Series No. 40 Waterloo, ON: Department of Geography, University of Waterloo.
- Meridian. 2004. Official Plan for the Township of East Garafraxa, Meridian Planning Consultants Inc. December, 2004.
- Meridian. 2006. Official Plan for the Township of East Luther / Grand Valley, Meridian Planning Consultants Inc. February 2006
- MHBC. 2007. Township of Guelph-Eramosa Township Consolidated Zoning By-Law 57/1999, Consolidated March 2007, MacNaughton Hermsen Britton Clarkson (MHBC) Planning Limited.
- Millerd, F. 2006. Possible locations for adaptation to climate change by Canadian commercial navigation on the great lakes. 2006 IEEE EIC Climate Change Technology Conference.
- Ministry of Natural Resources (MNR). 2009. Base Map, © Queen's Printer for Ontario, 2009.
- Ministry of Natural Resources (MNR). 2009. Base Map, © Queen's Printer for Ontario, 2018.
- Ministry of Natural Resources (MNR). 1995. 1992 Land Cover for Grand River Watershed.

 Queen's Printers for Ontario
- Ministry of the Environment (MOE). 2001a. Groundwater Studies (2001/2002) Technical Terms of Reference. ISBN 0-7794-2398-4. PIBS 4197e.
- Ministry of the Environment (MOE). 2001b. Terms of Reference: Hydrogeological Study to Examine Groundwater Sources Potentially Under Direct Influence of Surface Water. PIBS 4167.
- Ministry of the Environment, (MOE). 2006a. ASSESSMENT REPORT: Draft Guidance Module 3, Groundwater Vulnerability Analysis, October, 2006.
- Ministry of the Environment, (MOE). 2006b. ASSESSMENT REPORT: Draft Guidance Module 4, Surface Water Vulnerability Analysis, October, 2006.
- Ministry of the Environment (MOE). 2006c. ASSESSMENT REPORT: Draft Guidance Module 5, Issues Evaluation and Threats Inventory, October, 2006.
- Ministry of the Environment, (MOE). 2006d. Ontario Ministry of Environment. Technical Support Document for Ontario Drinking Water Standards, Objectives and Guidelines. June 2006.
- Ministry of the Environment, (MOE). 2007. Ontario Ministry of the Environment, May 25, 2007, Assessment Report Outputs: Data Specifications V. 4.1
- Ministry of the Environment, (MOE). 2008a. Proposal for Amending Ontario Regulation 153/04, Brownfield Record of Site Condition (EBR Registry Number 010-4642), October 2008.

- Ministry of the Environment, (MOE). 2008b. Ontario Ministry of the Environment, Amended Certificate of Approval, Municipal and Private Sewage Works, Number 4150-7JDP55, September 24, 2008.
- Ministry of the Environment, (MOE). 2009a. Rockwood Well Supply, Drinking Water Systems Inspection Report, Ontario Ministry of the Environment, February 2009.
- Ministry of the Environment (MOE). 2009b. Technical Rules: Assessment Report, Clean Water Act, 2006, November 16, 2009.
- Ministry of the Environment, (MOE). 2009c. Technical Bulletin: Proposed Methodology for Calculating Percentage of Managed Lands and Livestock Density for Land Application of Agricultural Source material, Non-Agricultural Source Material and Commercial Fertilizers. Ontario Ministry of the Environment, December 2009.
- Ministry of the Environment, (MOE). 2009d. Ontario Ministry of the Environment, Threats EBR Lookups Drinking Water Quality Threats Physical Lookup Tables Data Model, Data Dictionary and Queries, February 26, 2009.
- Ministry of the Environment, (MOE). 2011, Soil Groundwater Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act, July 1, 2011.
- Ministry of the Environment and Climate Change (MOECC). 2017. 2017 Technical Rules under the Clean Water Act, June 13, 2017. Available from: https://www.ontario.ca/page/2017-technical-rules-under-clean-water-act
- Ministry of the Environment and Climate Change (MOECC). 2017. Water Well Information System Database.
- Ministry of the Environment, Conservation and Parks (MECP). 2021. 2021 Technical Rules under the Clean Water Act, December 3, 2021. Available from: https://www.ontario.ca/page/2021-technical-rules-under-clean-water-act#section-11
- Mortsch, L. 2006. Great Lakes coastal wetland communities: vulnerabilities to climate change and response to adaptation strategies. Ottawa, ON: Environment Canada.
- Mortsch, L., H. Hengeveld, M. Lister, B. Lofgren, F. Quinn, M. Slivitzky, and L. Wenger. 2000. Climate Change Impacts on the Hydrology of the Great Lakes-St. Lawrence System. *Canadian Water Resources Journal*, 25(2): 153-180.
- NAICS Association (2007). NAICS Association. 1998-2009 www.naics.com.
- Naylor Engineering and Associates Ltd. 2001. Township of Mapleton Groundwater Management Study Draft Summary Report,
- OGS. 2003. Surficial Geology of Southern Ontario, Ontario Geological Survey, Miscellaneous Release Data 128.

- OGS (Marich, A.S., Priebe, E.H., Bajc, A.F., Rainsford, D.R.B. and Zwiers, W.G.). 2011. A geological and hydrogeological investigation of the Dundas buried bedrock valley, southern Ontario; Ontario Geological Survey, Groundwater Resources Study 12.
- Oil, Gas and Salt Resource Library (OGSR). 2016. Oil and Gas petroleum well data. Accessed by the Regional Municipality of Waterloo.
- Ontario Clean Water Agency (OCWA). 2003a. Annual Summary Reports Guelph Water Distribution System, Ontario Clean Water Agency (OCWA), 2003.
- Ontario Clean Water Agency (OCWA). 2003b. Annual Summary Reports Rockwood Distribution System, Ontario Clean Water Agency (OCWA), 2003.
- Ontario Clean Water Agency (OCWA). 2007. Annual Summary Reports Guelph Water Distribution System, Ontario Clean Water Agency (OCWA), 2007.
- Ontario Clean Water Agency (OCWA). 2009a. 2008 Annual Summary Report Hamilton Drive Water Supply System, Ontario Clean Water Agency (OCWA), March 2009.
- Ontario Clean Water Agency (OCWA). 2009b. 2008 Annual Summary Report Rockwood Drive Water Supply System, Ontario Clean Water Agency (OCWA), March 2009.
- Ontario Clean Water Agency (OCWA), 2017. 2016 Annual Report for the Shelburne Water System Water Works #220004965 as per Ontario Regulation 170/03. Prepared for the Town of Shelburne
- Ontario Clean Water Agency (OCWA), 2018. 2017 Annual Report for the Shelburne Water System Water Works #220004965 as per Ontario Regulation 170/03. Prepared for the Town of Shelburne
- Ontario Clean Water Agency (OCWA), 2019. 2018 Annual Report for the Shelburne Water System Water Works #220004965 as per Ontario Regulation 170/03. Prepared for the Town of Shelburne
- Ontario Clean Water Agency (OCWA), 2021. 2020 Annual Report for the Shelburne Water System Water Works #220004965 as per Ontario Regulation 170/03. Prepared for the Town of Shelburne
- Ontario Ministry of Agriculture and Rural Affairs (OMAFRA). Preliminary Technical Memorandum
- Pollock, D.W. 1989, Documentation of computer programs to compute and display pathlines using results from the U.S. Geological Survey modular three-dimensional finite-difference groundwater flow model: U.S. Geological Survey Open File Report 89-381, 188 p.
- Pollock, D.W. 1994, User's guide for MODPATH/MODPATH-PLOT, version 3: A particle-tracking post-processing package for MODFLOW, the U.S. Geological Survey finite-

- difference ground-water flow model: U.S. Geological Survey Open-File Report 94–464, 249 p.
- R.J. Burnside & Associates Limited MSA 105070.0000 10507.0 Vulnerability, Issues, Threats Report.doc 24/02/2010 4:32 PM
- R.J. Burnside and Associates. 2009. 2008 Annual Monitoring Report, Wilmot Centre Monitoring Program, Region of Waterloo Wilmot Centre.
- Regional Municipality of Waterloo, 2009. Water Quality Database (Supply Wells), in-house database. Regional Municipality of Waterloo.
- Regional Municipality of Waterloo, 2010. Clean Water Act Issues Assessment- Revised Final Report, October 2012.
- Regional Municipality of Waterloo. 2016b. Aerial Imagery of Region of Waterloo. Regional Municipality of Waterloo.
- Regional Municipality of Waterloo. 2016b. Building Footprints, GIS data. Regional Municipality of Waterloo.
- Regional Municipality of Waterloo. 2017. Waterloo Resources Analysis System (WRAS+). Regional Municipality of Waterloo.
- Regional Municipality of Waterloo. 2017. Underground Services GIS data. Regional Municipality of Waterloo.
- Regional Municipality of Waterloo. 2017. Wastewater Service Areas GIS data. Regional Municipality of Waterloo.
- Regional Municipality of Waterloo. 2017. Region of Waterloo's Assessment Parcel Shape file. Regional Municipality of Waterloo.
- Resource Management Strategies, Inc., 2009. City of Guelph Water Conservation and Efficiency Strategy Update.
- Root, S., & Onasch, C. M. (1999). Structure and tectonic evolution of the transitional region between the central Appalachian foreland and interior cratonic basins. *Tectonophysics*, 305 (1-3), 205-223 Ross, B.M., 2000b. Township of Wellington North Arthur Water Works Engineer's Report. B.M. Ross and Associates Limited. Mount Forest, ON. January 2001.
- Sanderson, M. 1998. The Grand Climate: Weather and Water in the Grand River Basin, Grand River Foundation.
- Sanford, B.V. 1961. Subsurface stratigraphy of Ordovician rocks in southwestern Ontario. Geological Survey of Canada Paper, 60-65. 54 p.Sanford, B.V. 1969. Geology of the Toronto-Windsor Area, Ontario; Geological Survey of Canada, Map 1263A.

- Sassan, D. And S. Kahl. 2007. Salt Loading Due to Private Winter Maintenance Practices: Beaver Brook / Policy Brook I-93 Chloride TMDL. Plymouth State University, Centre for the Environment.
- Schlumberger Water Services (Canada) Inc., 2010a. Draft Technical Memorandum Issues
 Assessment Perth County Municipal Drinking Water Systems. March 2010. Prepared for the Upper Thames River Conservation Authority.
- Schlumberger Water Services (Canada) Inc., 2010b. Draft Threats Assessment Milverton and Shakespeare Municipal Drinking Water Systems. May 2010. Prepared for the Upper Thames River Conservation Authority.
- Schlumberger Water Services (Canada) Inc., 2010c. Vulnerability Assessment- Perth County Municipal Drinking Water Systems. March 2010. Prepared for the Upper Thames River Conservation Authority
- Schlumberger. 2008. Regional Municipality of Waterloo Groundwater Model Calibration Results.
- Schroeter & Associates. 2004. GAWSER: Guelph All-Weather Sequential-Events Runoff Model, Version 6.5, Training Guide and Reference Manual. Submitted to the Ontario Ministry of Natural Resources and the Grand River Conservation Authority.
- Schroeter, H.O., D.K. Boyd, and H.R. Whiteley. 2000. Filling in Gaps in Meteorological Data Sets Used for Long-Term Watershed Modelling.
- Sharif, M., and D. H. Burn. 2006. Simulating climate change scenarios using an improved K-nearest neighbor model. *Journal of Hydrology*, 325(1-4): 179-196.
- Shifflett, S.J. 2007. Status Report on Municipal Long Term Water Supply Strategies: Part 1-Future Demand Estimations and Current Capacity Evaluations. Prepared for the Lake Erie Source Water Protection Region.
- Sibul, U., Walmsley, D. and Szudy, R. 1980. Groundwater resources in the Grand River basin; Technical Report 10 of the Grand River Basin Water Management Study, Hydrology and Monitoring Section, Water Resources Branch, Ontario Ministry of the Environment.
- S.S. Papadopulos & Associates, Inc. 2020. Grand Valley PW5: Analysis of groundwater flow and WHPA delineation. Prepared for: R.J Burnside & Associates Limited. November 2020.
- Stantec. 2002a. Groundwater Under the Direct Influence of Surface Water Assessment Waterloo North Well Field Production Well W10 CCofA No. 0970-537QT4. Kitchener, ON.
- Stantec. 2002b. Groundwater Under the Direct Influence of Surface Water Assessment Woolner Flats Well Field Production Wells K80, K81 and K82 (CCofA No. 0970-537QT4). Kitchener, ON.

- Stantec. 2002c. Road Salt Management and Chloride Reduction Study Phase 1: Road Salt Management Study Final. Prepared for the Regional Municipality of Waterloo.
- Stantec. 2005. Road Salt Management and Chloride Reduction Study Phase 2: Evaluation of Chloride Reduction Options Revised Final. Prepared for the Regional Municipality of Waterloo.
- Stantec. 2007. Middleton Water Supply Study Hydrogeologic Assessment. Kitchener, ON.
- Stantec. 2009a. Tier 3 Water Budget and Water Quantity Risk Assessment- Strange Street Well Field Characterization Study, Draft Report. Prepared for the Regional Municipality of Waterloo.
- Stantec. 2009b. Intake Protection Zone Delineation Grand River Hidden Valley Intake. Kitchener, ON
- Stantec. 2009b. Delineation of Wellhead Protection Area 'E' for GUDI Well. Prepared for the Regional Municipality of Waterloo.
- Stantec. 2009c. Vulnerability Scoring of Well Head Protection Areas Regional Municipality of Waterloo. Kitchener, ON.
- Stantec. 2009d. Greenbrook Well Field Supplementary GUDI Investigation. Kitchener, ON.
- Stantec. 2009e. Middleton Street Wellfield Supplementary In Situ Filtration Assessment. Prepared for the Regional Municipality of Waterloo.
- Stantec. 2010a. Vulnerability Scoring Amendments at Select Well Fields for Inclusion in the Amended Assessment Report . Prepared for the Regional Municipality of Waterloo.
- Stantec. 2010b. Wellhead Protection Area "E" Delineation and Vulnerability Scoring Municipal Supply Well G15. Prepared for the Regional Municipality of Waterloo.
- Stantec. 2010b. Wellhead Protection Area "E' Delineation and Vulnerability Scoring Municipal Supply Well F2, Township of Centre Wellington. Stantec Consulting Limited. January 28, 2010.
- Stantec. 2011. Verification of Threats Inventory and Circumstances Study Results Mannheim West Well Field. Prepared for the Regional Municipality of Waterloo.
- Stantec. 2011b. Transport Pathways Geodatabase. Regional Municipality of Waterloo.
- Stantec. 2015. Water Supply and Distribution Operations Master Plan Final Report. Prepared for the Regional Municipality of Waterloo. February 2015.
- Staple, T. 1993. Climate Change and Long Point Bay: A Preliminary Analysis with Some Implications. ed. by J. Gordon Nelson and Patrick L. Lawrence. Long Point Environmental Folio Publication Series, Working Paper 2. Waterloo, ON: Heritage Resource Centre, University of Waterloo. 20 p.

- Statistics Canada. 2002. 2001 Community Profiles. Released June 27, 2002. Last modified: 2005-11-30. Statistics Canada Catalogue no. 93F0053XIE. <http://www12.statcan.ca/english/Profil01/CP01/Index.cfm?Lang=E (accessed May 25, 2009).
- Statistics Canada. 2018. 2016 Census Population. http://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/index.cfm?Lang=E.
- Sun, S. 2018. Stratigraphy of the Upper Silurian to Middle Devonian, Southwestern Ontario. *Electronic Thesis and Dissertation Repository.* 5230. https://ir.lib.uwo.ca/etd/5230
- Telford, P.G. 1976. Paleozoic Geology of the Guelph ARa, Southern Ontario; Ontario Division of Mines, Map 2342.
- Telford, P.G. 1979. Paleozoic Geology of the Brantford Area, Southern Ontario; Ontario Geological Survey, Preliminary Map p. 1984.
- Telford, P.G. and Tarrant, G.A. 1975. Paleozoic Geology of the Dunnville Area, Southern Ontario; Ontario Division of Mines, Preliminary Map p988.
- Thames, Sydenham & Region Source Protection Region. 2009. Proposed Approach to consideration of Transport Pathways in the Vulnerability Assessment of Groundwater Based Vulnerable Areas, May 10, 2009.
- Thurston, P. C. 1991. Geology of Ontario: introduction. *Geology of Ontario, Ontario Geological Survey, Special, 4*(Part 1), 3-25.
- Todd, D.K. 1980. Groundwater Hydrology, 2nd Edition. 535p. New York: John Wiley and Sons. 552p.
- Totten Sims Hubicki, 1997. Torrance Creek Subwatershed Study Phase I. Final Characterization Report submitted to the City of Guelph and Grand River Conservation Authority.
- Town of Erin, 2007. The Corporation of the Town of Erin Zoning By-Law No. 07-67, Town of Erin, December 2007 (Amended July 2009).
- Town of Milton Official Plan, 1997. Consolidated August 2008.
- Township of Centre Wellington, 2009. Township of Centre Wellington Comprehensive Zoning By-Law No. 2009-045, July 2009.
- Township of EL-GV, 2009. Township of East Luther Grand Valley Zoning By-Law BL 09-10, October, 2009.
- TransGlobe Property Management Services. October 2009. Personal Communication.

- Triton Engineering Services Limited, Blackport Hydrogeology Inc. and Waterloo Hydrogeologic Inc., 2007. Groundwater Flow Model Update and Groundwater Vulnerability and Threats Assessment Dundalk Municipal Wells
- Triton Engineering Services Limited. 2009a. Personal Communication
- Triton Engineering Services Limited. 2009b. Dundalk Well D3 Rehabilitation Memorandum
- Triton Engineering Services Limited. 2010. Email from Triton Engineering Services to Golder Associates
- Trowbridge, P., et al. 2010. Relating Road Salt to Exceedances of the Water Quality Standard for Chloride in New Hampshire Streams. Environmental Science and Technology. 44: 4903-4909.
- United States Environmental Protection Agency. 2006. Lake Erie Lakewide Management Plan (LaMP) 2000. Retrieved March 18, 2010 from http://www.epa.gov/glnpo/lakeerie/lamp2000/index.html.
- United States Environmental Protection Agency. 2010. Lake Erie Lakewide Management Plan Draft Annual Report 2010.
- US Army Corps of Engineers (USACE), Hydrologic Engineering Center, 2002. HEC-RAS River Analysis System User Manual.
- Vandierendonck, M., and B. Mitchell. 1997. Water Use Information for Sustainable Water Management: Building Blocks and the Ontario Situation. Canadian Water Resources Journal, 22(4): 395-415.
- Water and Earth Science Associates Ltd (WESA). 2011. Verification of Threat Inventory and Circumstances Survey Wilmot Centre and Baden Wellfields Preliminary Draft Report. Prepared for the Regional Municipality of Waterloo.
- Water and Earth Science Associates Ltd (WESA). 2013. De-icing and Road Salt Report
- Waterloo Hydrogeologic Inc. (WHI). 2003a. Grey and Bruce Counties Groundwater Study
- Waterloo Hydrogeologic Inc. (WHI). 2003b. Norfolk Municipal Groundwater Study. Report to Norfolk County.
- Waterloo Hydrogeologic Inc. (WHI). 2003c. Perth County Groundwater Study Final Report. Project No. 302036.
- Waterloo Hydrogeologic Inc. (WHI). 2005b. Technical Memorandum AEMOT Study Results And Grey and Bruce Counties Karst Mapping.
- Waterloo Hydrogeologic Inc. (WHI). 2005a. Grand River Watershed Geological and Hydrogeological Model Report. Report to the Grand River Conservation Authority.

- Waterloo Numerical Modelling Corp (WNMC). 2011. Paris Groundwater Modelling and Wellhead Protection Area Delineation, Brant County. Cambridge: Prepared for the Grand River Conservation Authority.
- Wellington County, 1999. Wellington County Official Plan, May 1999, (Last revised January 2009).
- Wellington Source Water Protection, 2020. Memorandum: Rationale for Identification of Trichloroethylene (TCE) Issue for Municipal Well F1, Fergus, Township of Centre Wellington. April 20, 2022.
- Wong, A.W. 2011. Water Use Inventory Report for the Grand River Watershed, Report for the Grand River Water Management Plan Steering Committee, Cambridge, Ontario.
- WRIP. 2009. Threats Look-up Table Database v. 7.1.2, Water Resources Information Program (WRIP), Ministry of Natural Resources, December, 2009.
- WRIP. 2009. Threats Look-up Table Database v. 7.1.2, Water Resources Information Program (WRIP), Ministry of Natural Resources, December, 2009.
- XCG Consultants Ltd. (XCG). 2016. William Street and Strange Street Water Supply Systems Class Environmental Assessment Environmental Study Report. Prepared for Regional Municipality of Waterloo. Oakville, Ontario. September 15, 2016.
- Yellow Pages. 2007. Yellow Pages. Date Modified 2009 www.yellowpages.ca.
- Zhang, X., L. Vincent, W. Hogg, and A. Niitsoo. 2000. Temperature and precipitation trends in Canada during the 20th century. *Atmosphere Ocean*, 38: 395-429

28.0 MAP REFERENCES

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

Map #	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 #	Description	Reference
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 #	Description	Reference
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 Geological Survey. Ministry of Northern Development and Mines, Copyright © Queen's Printer, 2010.
Map 2-13:	Overburden Thickness	Holysh, S., Pitcher, J., and Boyd, D. 2001. <i>Grand River Regional Groundwater Study</i> . 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 #	Description	Reference
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

April 1, 2025 Appendix A-1

APPENDIX B

Correspondence Regarding Excavation that Breaches the Aquitard

April 1, 2025 Appendix B-1