

APPENDIX 1

Natural Environment Review





Oxford County 2024 Water and Wastewater Master Plan

Natural Environment Review

Oxford County

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RVA 216063

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**Oxford County 2024 Water and Wastewater Master Plan
Natural Environment Review**

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1.0 INTRODUCTION

Oxford County (the County) has retained R.V. Anderson Associates Limited (RVA) to undertake the 2024 Water and Wastewater Master Plan (WWMP) in accordance with the Municipal Class Environmental Assessment (EA) process. To inform the development of the WWMP and evaluation of potential solutions, a high-level Natural Environment Review (NER) has been prepared to identify and characterize the significance and sensitivity of natural heritage and hydrological features within Oxford County. This NER documents the methodology and results of a desktop review of available federal and provincial databases and is intended to provide a general framework of environmental constraints for future water/wastewater projects within the County.

2.0 STUDY AREA AND METHODOLOGY

Oxford County is in southwestern Ontario with a land area of approximately 2,039 km². For this desktop NER, the whole of Oxford County is considered the Study Area. The Study Area is comprised of three major Urban Centres: The City of Woodstock, the Town of Ingersoll, and the Town of Tillsonburg, and five Rural Townships: Blandford-Blenheim, Norwich, Zorra, East Zorra-Tavistock, and South-West Oxford. These Rural Townships are further broken down into Area Municipalities and communities that are identified as being serviced by Drinking Water Systems (DWS) and Wastewater Treatment Systems (WWTS). Within the Study Area there are 17 drinking water distribution systems serving 19 communities, and nine wastewater treatment plants and 11 wastewater collection systems currently servicing 11 communities. These communities are delineated as Service Boundaries for the purposes of this report and mapping.

Land use within the Study Area is dominated by Agricultural Reserve, with interspersed Settlement, Open Space, and Environmental Protection Areas. A higher density of Open Space and Environmental Protection areas are present within the Township of Blandford-Blenheim, located in the northeastern corner of the Study Area boundary.

2.1 Methodology – Background Review

A desktop review of background sources was completed to describe the existing natural environment conditions of the Study Area. The following sources were reviewed for information related to natural heritage and hydrological features and components, associated policy, and physiology within the Study Area:

- Natural Heritage Information Centre (NHIC) Make A Map Application;
- Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) – AgMaps;

- Upper Thames River Conservation Authority (UTRCA) Watershed Report Card;
- Grand River Conservation Authority (GRCA) Watershed Report Card;
- Long Point Region Conservation Authority (LPRCA) Watershed Report Card;
- Oxford County Natural Heritage Systems Study (2016);
- Geology Ontario; and
- Physiography of Southern Ontario; Ontario Geological Survey – Chapman and Putnam (1972).

2.2 Methodology – Field Investigations

Field work was not a component of this existing natural environment characterization document. Prior to any future works, a site-specific field investigation program should be planned and implemented, subject to the extent of work proposed, through discussions with the County of Oxford and other relevant agency staff.

3.0 ENVIRONMENTAL PLANNING AND POLICY REVIEW

The following planning and policy documents are applicable to the natural environment features identified within the Study Area.

3.1 Provincial Legislation

3.1.1 Provincial Policy Statement (2020)

The Provincial Policy Statement (PPS, Ministry of Municipal Affairs and Housing (MMAH) 2020) sets the policy direction for regulating development and land use planning in the province. Both provincial and local land-use planning decisions build on the PPS and its relevant policies. This report deals specifically with the policies contained in Part V, Section 2.1 (Natural Heritage) of the PPS which is directed at protection and management of natural heritage systems and features. In the PPS, natural heritage features include significant wetlands, significant woodlands, significant valleylands, significant wildlife habitat, significant areas of natural and scientific interest, and coastal wetlands. Additionally, Section 2.2 (Water) of the PPS describes the requirement to protect, improve and restore the quality and quantity of water at a watershed scale.

3.2 Municipal Legislation

3.2.1 Oxford County Official Plan (consolidated 2021)

The Oxford County Official Plan is the policy document that establishes the overall land use strategy for both the County and the eight area municipalities that comprise the County (Oxford County 2021). Schedule C-1 of the Plan shows Environmental Features

including locally and provincially significant features in the County. Land use within Oxford County is further sub-categorized by individual Schedules for each Township and Urban Centre.

3.2.2 Conservation Authorities Act

Section 28(1) of the *Conservation Authorities Act* (Government of Ontario 1990b) empowers Conservation Authorities with the ability to make regulations governing development that can have an impact on watercourses and waterbodies, including wetlands. The Study Area is located within the Upper Thames River Conservation Authority (UTRCA), Grand River Conservation Authority (GRCA), Long Point Region Conservation Authority (LPRCA), and Catfish Creek Conservation Authority (CCCA) watersheds, with areas regulated under the Regulation of Development, Interference with Wetlands and Alterations to Shorelines and Watercourses, Ontario Regulations (O. Reg.) 157/06, 150/06, 178/06, and 146/06 respectively.

4.0 EXISTING CONDITIONS

The existing conditions of the overall Study Area are discussed in the following sections, beginning with the broad environmental setting, followed by scoped evaluations of the natural heritage and hydrological features found in the eight area municipalities within the Study Area.

4.1 Oxford County Physiography

The Study Area is underlain by Precambrian bedrock. From west to east, the upper layer of bedrock within the Study Area changes from Dundee Formation (limestone), Lucas Formation (limestone), Amherstburg Formation (limestone and dolomite), Bois-Blanc (limestone, chert, or flint), Bass Island (dolomite), and Salina Formation (shale, dolomite, and gypsum). Physiographic regions within the Study Area include the Ingersoll Moraine and the St. Thomas, Norwich, and Tillsonburg Recessional Moraines. Additional physiographic regions within the County include the Norfolk Sand Plain and Oxford Till Plain (Chapman and Putnam 1984).

4.2 Oxford County Watersheds

The Study Area is located, in part, within the Upper Thames River, the Grand River (Upper Grand River and Lower Grand River), and Long Point Region watersheds. These watersheds are further subdivided into 15 quaternary watersheds. The Study Area is located within the regulatory jurisdictions of the UTRCA, GRCA, LPRCA, and CCCA.

4.2.1 Upper Thames River Watershed

The Upper Thames River watershed drains approximately 3,420 km² of land from London, Woodstock, and Stratford. Downstream of the watershed, the Thames River flows past Chatham-Kent and outlets to Lake St. Clair. Major watercourses within the watershed include the North Thames River, Middle Thames River, Thames River, and Mud Creek.

4.2.2 Grand River Watershed

The Grand River watershed drains approximately 6,800 km² of land from major urban centres including Kitchener, Waterloo, Guelph, Cambridge, and Brantford. The Grand River watershed originates in Dufferin County and outlets into Lake Erie. The overall erosion rate in the watershed is compounded by the fact that 70 percent of the watershed lands are in agricultural use.

4.2.3 Long Point Region Watershed

The Long Point Region watershed drains approximately 2,900 km² from Port Burwell on the western extent of the watershed through and beyond Port Dover to the east. The Long Point Region is a collection of several major streams each with their own watershed and characteristics, but all draining to Lake Erie. The Big Otter Creek watershed is located within the Study Area. The watershed encompasses a region that is comprised of areas ranging from active agriculture, urban areas, and open space.

4.3 Oxford County Forest Region

The Study Area is within the Niagara Section of the Great Lakes-St. Lawrence Lowlands Forest Region (Rowe 1972). Forested communities within the Niagara Section are primarily dominated by broad leaved trees. Tree species that are characteristic of the Niagara Section sub-region are Sugar Maple (*Acer saccharum*), American Beech (*Fagus grandifolia*), Basswood (*Tili americana*), Red Maple (*Acer rubrum*), Red Oak (*Quercus rubra*), White Oak (*Quercus alba*), and Bur Oak (*Quercus macrocarpa*). Also within this region are main distributions of Black Walnut (*Juglans nigra*), American Sycamore (*Platanus occidentalis*), Shagbark Hickory (*Carya ovata*), Bitternut Hickory (*Carya cordiformis*), Rock Elm (*Ulmus thomasi*), and Blue Beech (*Carpinus caroliniana*) (Rowe 1972).

4.4 Township of Norwich

4.4.1 Areas of Natural and Scientific Interest

The Zenda Tract Life Science Area of Natural and Scientific Interest (ANSI – regionally significant) is identified within the Township of Norwich limits (**Appendix A – Map 1**)

4.4.2 Wetlands

There are nine Provincially Significant Wetland (PSW) complexes within the Township of Norwich limits. In addition, there are 11 wetland communities identified as Unevaluated-Other within the Township (**Appendix A – Map 1**). The wetland communities range in size and community composition (swamp, marsh, etc.). No additional wetland communities identified through background review are present within the Township.

4.4.3 Woodlands

Significant Woodlands are present within the Township of Norwich (**Appendix A – Map 1**). The percent area of woodland coverage within the Township is detailed in **Table 5.1**.

4.4.4 Major Watercourses

Big Otter Creek and Otter Creek flow south and southwest through the southern limit of the Township of Norwich. Big Otter Creek flows through Otterville, into Tillsonburg, and outlets to Lake Erie outside of the Study Area limits. These two creeks have several tributaries that flow into them across the Study Area.

4.4.5 Valleylands

There are significant valleylands identified within the Township of Norwich associated with the larger creek systems (Big Otter Creek and Otter Creek) present within the Study Area (**Appendix A – Map 1**).

4.4.6 Source Water Protection Areas

The Township of Norwich is situated within the Grand River Source Water Protection Area (SPA), Upper Thames River SPA, and Long Point SPA (**Appendix A – Map 2**).

4.4.7 Wellhead Protection Areas

There are six Wellhead Protection Area's (WHPA) identified within the Township of Norwich. The identified WHPA's are present at varying degrees of vulnerability (**Appendix A – Map 2**).

4.5 Township of South-West Oxford

4.5.1 Areas of Natural and Scientific Interest

The Salford Woods (regionally significant), Karn's Sugar Maple Forest (regionally significant), and Trillium Woods (provincially significant) Life Science ANSI's are identified within the Township of South-West Oxford. In addition to these features, the Steel Company of Canada Earth Science ANSI (regionally significant) is identified within the Township (**Appendix A – Map 3**).

4.5.2 Wetlands

There are 11 PSW complexes within the Township of South-West Oxford limits. There are five additional wetland communities that are identified as Evaluated-Other within the Township (**Appendix A – Map 3**). These wetland communities range in size and community composition (swamp, marsh, etc.). No additional wetland communities from those previously noted were identified through background review.

4.5.3 Woodlands

Significant Woodlands are present within the Township of South-West Oxford (**Appendix A – Map 3**). The percent area of woodland coverage within the Township is detailed in **Table 5.1**.

4.5.4 Major Watercourses

The Thames River flows west through and adjacent to the northern extent of the Township of South-West Oxford. In addition, Big Otter Creek flows west along the southern limit of the Township. Additional smaller creek systems within the Township include Stony Creek, Spittler Creek, Reynolds Creek, and Deer Creek.

4.5.5 Valleylands

There are significant valleylands identified within the Township of South-West Oxford associated with the larger river and creek systems (Thames River and Big Otter Creek) present within the Township.

4.5.6 Source Water Protection Areas

The Township of South-West Oxford is situated within the Upper Thames River SPA, Catfish Creek SPA, and Long Point SPA (**Appendix A – Map 4**).

4.5.7 Wellhead Protection Areas

There are 17 WHPA's identified within the Township of South-West Oxford. The identified WHPA's are present at varying degrees of vulnerability and concentrations (**Appendix A – Map 4**).

4.6 Township of Blandford-Blenheim

4.6.1 Areas of Natural and Scientific Interest

The Chesney Bog and Trotter's Lake Life Science ANSI's (provincially significant) are identified within the Township of Blandford-Blenheim. In addition, the regionally significant Plattsville Flats, Benwall Swamp, Fowler's Pond, Pine Pond, and Buck Pond Life Science ANSI's are present within the Township. The Ingersoll Moraine Earth Science ANSI (provincially significant) is also present within the Township of Blandford-Blenheim (**Appendix A – Map 5**).

4.6.2 Wetlands

There are seven PSW complexes within the Township of Blandford-Blenheim limits. There are three additional wetland complexes that are identified as Evaluated-Other within the Township (**Appendix A – Map 5**). These wetland communities range in size and community composition (swamp, marsh, etc.). No additional wetland communities from those listed were identified through background review.

4.6.3 Woodlands

Significant Woodlands are present within the Township of Blandford-Blenheim (**Appendix A – Map 5**). The percent area of woodland coverage within the Township is detailed in **Table 5.1**.

4.6.4 Major Watercourses

Wilmot Creek and Nith River flow southeast through the Township of Blandford-Blenheim along the eastern boundary of the Township. The Thames River is located along the western limit of the Township and flows southwest. Additional smaller creek systems within the Township include Horner Creek, Black Creek, and Whiteman's Creek.

4.6.5 Valleylands

There are significant valleylands identified within the Township of Blandford-Blenheim associated with the larger river and creek systems (Wilmot Creek, Nith River, and Thames River) present within the Township.

4.6.6 Source Water Protection Areas

The Township of Blandford-Blenheim is situated within the Upper Thames River SPA and Grand River SPA (**Appendix A – Map 6**).

4.6.7 Wellhead Protection Areas

There are five WHPA's identified within the Township of Blandford-Blenheim. The identified WHPA's are present at varying degrees of vulnerability and concentrations (**Appendix A – Map 6**).

4.7 Township of Zorra

4.7.1 Areas of Natural and Scientific Interest

The Embro-Upland Forest and Lakeside Swamp Life Science ANSI's (provincially significant) are identified within the Township of Zorra. In addition, the Cobble Hills Life Science ANSI (regionally significant) is present within the Township. The Thamesford Meltwater Channel, Brooksdale Glacial Complex, and Wildwood Silts Earth Science ANSI's (provincially significant) are also present within the Township of Zorra (**Appendix A – Map 7**).

4.7.2 Wetlands

There are seven PSW complexes within the Township of Zorra limits. There are six additional wetland complexes that are identified as Evaluated-Other within the Township (**Appendix A – Map 7**). These wetlands range in size and community composition (swamp, marsh, etc.). No additional wetland communities from those listed were identified through background review.

4.7.3 Woodlands

Significant Woodlands are present within the Township of Zorra (**Appendix A – Map 7**). The percent area of woodland coverage within the Township is detailed in **Table 5.1**.

4.7.4 Major Watercourses

Mud Creek flows west through the Township of Zorra and becomes the Middle Thames River west of Embro. The Thames River is located along the southern extent of the Township and flows westwards. Additional smaller creek systems within the Township include Trout Creek, Wabuno Creek, and Nissouri Creek.

4.7.5 Valleylands

There are significant valleylands identified within the Township of Zorra associated with the larger river and creek systems present within the Township.

4.7.6 Source Water Protection Areas

The Township of Zorra is situated within the Upper Thames River SPA (**Appendix A – Map 8**).

4.7.7 Wellhead Protection Areas

There are eight WHPA's identified within the Township of Zorra. The identified WHPA's are present at varying degrees of vulnerability and concentrations within the Township (**Appendix A – Map 8**).

4.8 Township of East Zorra-Tavistock

4.8.1 Areas of Natural and Scientific Interest

The Mud Creek, Braemer Outwash, and Innerkip Quarry Earth Science ANSI's (provincially significant) are present within the Township of East Zorra-Tavistock (**Appendix A – Map 9**).

4.8.2 Wetlands

There are two PSW complexes within the Township of East Zorra-Tavistock limits. There are nine additional wetland complexes that are identified as Evaluated-Other within the Township (**Appendix A – Map 9**). These wetlands range in size and community composition (swamp, marsh, etc.). No additional wetland communities from those listed were identified through background review.

4.8.3 Woodlands

Significant Woodlands are present within the Township of East Zorra-Tavistock (**Appendix A – Map 9**). The percent area of woodland coverage within the Township is detailed in **Table 5.1**.

4.8.4 Major Watercourses

Mud Creek is centrally located within the Township of East Zorra-Tavistock and flows west through the Township. The Thames River is located along the eastern and southern extent of the Township, flowing westwards. Additional smaller creek systems within the Township include Phelan Creek, Horner Creek, and North Branch Creek.

4.8.5 Valleylands

There are significant valleylands identified within the Township of East Zorra-Tavistock associated with the larger river and creek systems present within the Township.

4.8.6 Source Water Protection Areas

The Township of East Zorra-Tavistock is situated within the Upper Thames River SPA and Grand River SPA (**Appendix A – Map 10**).

4.8.7 Wellhead Protection Areas

There are three WHPA's identified within the Township of East Zorra-Tavistock. The identified WHPA's are present at varying degrees of vulnerability and concentrations within the Township (**Appendix A – Map 10**).

4.9 Town of Ingersoll

4.9.1 Areas of Natural and Scientific Interest

There are no Life Science or Earth Science ANSI's within the Town of Ingersoll limits (**Appendix A – Map 11**).

4.9.2 Wetlands

Part of the Five Points Woods PSW complex is identified within the Town of Ingersoll limits. In addition, part of the Heslop Swamp Wetland (Evaluated-Other) is present within the Town of Ingersoll (**Appendix A – Map 11**). These wetland complexes range in size and community composition (swamp, marsh, etc.). No additional wetland communities were identified through background review within the Town of Ingersoll.

4.9.3 Woodlands

Significant Woodlands are present within the Town of Ingersoll (**Appendix A – Map 11**). The percent area of woodland coverage within the Town of Ingersoll is detailed in **Table 5.1**.

4.9.4 Major Watercourses

The Thames River is centrally located within the Town of Ingersoll and flows westwards towards London. No additional large watercourses are located within the Town. Additional municipal drainage features including Whittings Creek Drain and Halls Creek Drain are located within the Town that outlet to the Thames River.

4.9.5 Valleylands

There is a significant valleyland system identified within the Town of Ingersoll associated with the Thames River.

4.9.6 Source Water Protection Areas

The Town of Ingersoll is situated within the Upper Thames River SPA (**Appendix A – Map 12**).

4.9.7 Wellhead Protection Areas

Six WHPA's are identified within the Town of Ingersoll limits. The identified WHPA's are present at varying degrees of vulnerability (**Appendix A – Map 12**).

4.10 Town of Tillsonburg

4.10.1 Areas of Natural and Scientific Interest

Part of the Big Otter Creek Life Science ANSI (provincially significant) is present within the Town of Tillsonburg limits (**Appendix A – Map 13**).

4.10.2 Wetlands

There are no PSW's or locally significant wetlands within the Town of Tillsonburg (**Appendix A – Map 13**).

4.10.3 Woodlands

Significant Woodlands are present within the Town of Tillsonburg (**Appendix A – Map 13**). The percent area of woodland coverage within the Town of Tillsonburg is detailed in **Table 5.1**.

4.10.4 Major Watercourses

Big Otter Creek and Stony Creek are centrally located within the Town of Tillsonburg and flow southwest out of the Town outletting into Lake Erie. No additional large watercourses are located within the Town. Additional municipal drainage features are located within the Town that outlet to Big Otter Creek.

4.10.5 Valleylands

There is a significant valleyland system identified within the Town of Tillsonburg associated with Big Otter Creek.

4.10.6 Source Water Protection Areas

The Town of Ingersoll is situated within the Long Point SPA (**Appendix A – Map 14**).

4.10.7 Wellhead Protection Areas

Three WHPA's are identified within the Town of Tillsonburg limits. The identified WHPA's are present at varying degrees of vulnerability (**Appendix A – Map 14**).

4.11 City of Woodstock

4.11.1 Areas of Natural and Scientific Interest

Part of the Karn's Sugar Maple Forest Life Science ANSI (regionally significant) is identified within the City of Woodstock limits (**Appendix A – Map 15**).

4.11.2 Wetlands

There are eight PSW complexes identified, in part, within the City of Woodstock limits. In addition, part of the Duffy Drain Wetland complex (Evaluated-Other) is present within the City of Woodstock (**Appendix A – Map 15**). These wetland complexes range in size and community composition (swamp, marsh, etc.). No additional wetland communities were identified through background review within the City of Woodstock.

4.11.3 Woodlands

Significant Woodlands are present within the City of Woodstock (**Appendix A – Map 15**). The percent area of woodland coverage within the City of Woodstock is detailed in **Table 5.1**.

4.11.4 Major Watercourses

The Thames River is centrally located within the City of Woodstock and flows west towards the Town of Ingersoll. No additional large watercourses are located within the City. Additional municipal drainage features are located within the City of Woodstock that outlet to the Thames River.

4.11.5 Valleylands

There is a significant valleyland system identified within the City of Woodstock associated with the Thames River.

4.11.6 Source Water Protection Areas

The City of Woodstock is situated within the Grand River SPA and the Upper Thames River SPA (**Appendix A – Map 16**).

4.11.7 Wellhead Protection Areas

Three WHPA's are identified within the City of Woodstock. The identified WHPA's are present at varying degrees of vulnerability (**Appendix A – Map 16**).

5.0 SUMMARY AND RECOMMENDATIONS

Several natural heritage and hydrological features were identified across Oxford County within the Townships and Urban Centres that comprise the overall Study Area. The identified natural features are summarized below in **Table 5.1** and include the percent of land cover for each feature within each Township and Urban Centre.

Table 5.1 – Natural Features and Percent of Land Cover within the Study Area

Geographic Area	Percent Land Cover by Area (%)				
	Significant Wetlands	Significant Woodlands	ANSI (Life Science)	ANSI (Earth Science)	Significant Valleyland
Township of Norwich	2.07	12.25	0.44	0	6.62
Township of South-West Oxford	2.57	10.05	0.37	0.01	4.19
Township of Zorra	1.52	13.22	0.34	1.05	10.06
Township of Blandford-Blenheim	10.18	18.99	4.82	1.93	13.97
Township of East Zorra-Tavistock	0.41	8.45	0	0.94	3.97
Town of Ingersoll	0.64	13.46	0	0	18.35
Town of Tillsonburg	0	19.25	6.53	0	25.56
City of Woodstock	4.87	11.04	0.38	0	9.6

The high-level analysis of natural environment features described in this report will assist with future water and wastewater infrastructure projects and guide alternatives that will minimize impacts to identified natural features. Additional natural heritage screening will be required once alternatives for water and wastewater infrastructure have been determined and as project scopes are refined. Additional natural heritage and hydrological investigations should include (but are not limited to):

- Potential habitat for endangered and threatened species;

- Sensitivity of receiving or nearby watercourses (aquatic community and habitat);
- Tree inventories;
- Potential Significant Wildlife Habitat (SWH);
- Site specific hydrogeological investigations; and
- Long-term hydrological modelling surveys.

It is recommended that future water and wastewater infrastructure projects implement alternatives to avoid the natural and hydrological features within the Study Area. Avoidance of natural features will need to consider minimum vegetation protection zones (VPZ) buffers described in provincial and municipal policy and minimum areas of influence for hydrological features.

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