Consultation Plan

Lovesick Lake Trailer Park Expansion

3340 Stricker Lane
Township of Selwyn
County of Peterborough

D.M. Wills Project No. 19-10844

D.M. Wills Associates Limited
Partners in Engineering, Planning and
Environmental Services
Peterborough

December 2023

Prepared for:
County of Peterborough and
Township of Selwyn

Table of Contents

Appendices

1.0 Introduction

D.M. Wills Associates Limited (Wills) has been retained by Lovesick Lake Beach Ltd. (LSL) (Owner) to assist with obtaining planning approvals to permit an expansion to the existing trailer park development located at 4738 Highway 28. A consent for a lot addition (consent) application is also required in order to facilitate access to the proposed development from the adjacent roadway. The lands subject to these applications are located at 3340 Strickers Lane and legally described as Part of Lots 43 and 44, Concession 16 (Subject Property), in the Township of Selwyn (Township), County of Peterborough (County). Refer to **Appendix A** for a Key Map.

Lovesick Lake Trailer Park services clients throughout the County and City of Peterborough, surrounding areas such as Northumberland County and the City of Kawartha Lakes as well as tourist travelling from the GTA. The exiting trailer park offers a variety of trailers and cabins for occupancy to seasonal permanent residents and the vacationing public. Due to increased demand for recreational trailers, the owners are proposing to expand the existing trailer park to include an additional 40 trailers sites.

The following Consultation Plan (Plan) was created to outline engagement activities with stakeholders including government, relevant non-government organizations and the adjacent landowners.

This Plan includes a technically and legislatively responsible approach to consultation and disclosure for LSL operations. This Plan, when implemented, will ensure that the public and review agencies have the information available to them so that they understand the decision-making process for the overall project. The Plan will ensure that the distribution of information is provided in a transparent fashion and in a timely manner, to alleviate any concerns about the project from stakeholders and review agencies. Active participation through consultation with stakeholders also ensures an open and fair process and is critical to the decision-making process. In creating this Plan, consideration has been given to ensure that public notice/consultation meets at a minimum, any consultation required as part of the applicable legislation under the Planning Act R.S.O 1990.

Included within this Plan is a list of government and non-government organizations that have been, or should be, on the project distribution list, and how these groups will be and have been consulted. A protocol is included that describes how communications will be handled and tracked, and how notices will be/have been prepared. Finally, details on the Open House are provided, including descriptions of materials that will be made available to all attendees.

2.0 Project Team

The Project Team consists of the owners of LSL, as well as the consulting Project Manager, and Principal Planner from Wills. The project contacts are listed below:

Affiliation	Name	Role	Contact Information
Lovesick Lake Beach Ltd.	Steve and Scott Purvis	Proponent/Owners	Phone: (705) 654-3587 E-mail: steve@lovesicklakepark.ca scott@lovesicklakepark.ca
D.M. Wills Associates Limited	Diana Keay, MCIP RPP	Project Manager and Senior Land Use Planner	Phone: (705)742-2297 ext. 245 Email: dikeay@dmwills.com

3.0 Objectives

The objectives of the Consultation Plan are as follows:

1. Ensure stakeholders have an opportunity to understand the current operation on site and provide feedback through:
    a) Communicating the process and key messages
    b) Providing accurate and consistent responses to stakeholder feedback
2. Identify key stakeholders that will be impacted by the project and/or are able to influence the project and its activities. Communicate the interests and meet the process needs of the identified stakeholders.
3. Track and document communications between the Project Team and interested stakeholders and identify how they have been incorporated into the planning and decision-making process.
4. To meet the applicable regulatory and legislative consultation requirements of the Planning Act.

4.0 Stakeholder Identification

The list of Stakeholders will include all relevant agencies and adjacent landowners as well as other interested parties. Consultation will be facilitated with a wide range of stakeholders, including:

- Property owners within the immediate vicinity of the Subject Property
- Landowners with property abutting the Subject Property

- Representatives of all relevant agencies
- Municipal representatives and planners
- All First Nations and Indigenous communities in the area

The stakeholder contact list has been prepared and attached as **Appendix B**.

5.0 Stakeholder Engagement

The stakeholder consultation process will be facilitated and managed by Wills. Consultation will be open and transparent, and all stakeholders will be given sufficient opportunity to provide comments. All communication with stakeholders and agencies will be maintained in hard copy (printed email, copy of facsimile or letter, telephone record), as well as documented in a tracking table maintained by Wills' communication database.

The communication database will capture all relevant information regarding each communication, such as: name, date, contact information, agency affiliation, type of communication, issues and concerns raised, follow-up actions, and person responsible for follow-up.

Information will be collected in accordance with the Freedom of Information and Protection Act. With the exception of personal information, all comments will become part of the public record. Comments will be addressed as part of the Planning Justification Report.

5.1 Tracking of Consultation

All stakeholders will be encouraged to submit comments to Wills' Project Manager. This will help to ensure all comments are tracked and a response provided within a timely manner (within 5 business days).

5.2 Consultation Event Notification

On May 3, 2023, the Project Team along with the project consultants, hosted a Public Open House to engage with members of the community, garner feedback on the project, and offer an opportunity for interested stakeholders to ask questions and learn more about the project. Notices were sent to adjacent property owners, interested members of the public that commented on the application submission, First Nation communities, County and Township officials, planning department personnel and agencies. The Notice was sent via regular mail and email no less than 7 days prior to the consultation event date. The Notice included a local contact number and an email address to allow interested parties to contact Wills for additional information. The Notice was also advertised in a local newspaper, the Lakefield Herald, to reach local residents. A copy of the Notice and newspaper advertisement is attached as **Appendix C.**

5.3 Consultation Event

LSL and its representatives hosted one informal consultation event in the form of an Open House. The Open House format facilitated informal discussions about the applications and the proposed development. The objective of the Open House was to allow interested parties to ask questions, raise concerns and engage in discussions regarding the amendment applications and operation. At the request of the attendees, the session turned into a formal Q&A to which the Project Team and consultants made every effort to address questions and comments. As the Open House format was not set up for formal presentation and discussion, the comments and questions received were documented as best as possible and grouped into themes of concern in order to provide a streamlined response. A copy of the documented comments and responses is attached as **Appendix D**.

The following materials were used and available at the Open House:

- Sign-in sheet
- Display boards
- Information packages
- Comment/question sheets

The Open House took place on May 3, 2023, at the Burleigh Falls Inn from 4:00 pm to 7:00 pm. Copies of the Open House Material are provided in **Appendix E**.

5.3.1 Public Meetings

As prescribed under the Planning Act R.S.O 1990, the County and Township are required to host a Statutory Public Meeting. Once scheduled, LSL and its representatives will also attend the prescribed public meetings as part of the application and public consultation process. Invitation to public meetings will be included as part of public notices and newspaper articles prepared by the County/Township. The date and time of the formal public meetings will be confirmed by the County/Township.

5.3.2 Follow-up Consultation with Agencies and Stakeholders

In addition to existing consultation, further engagement with specific agencies will be undertaken to allow for further discussion on specific points of concern. The following list includes suggested provincial and municipal agencies for additional consultation:

- Ministry of the Environment, Conservation and Parks
- Alderville First Nation
- Hiawatha First Nation
- Curve Lake First Nation

6.0 Closing

This document outlines the proposed Consultation Plan in support of Official Plan and Zoning By-law Amendments to permit an expansion to the existing trailer park development located at 4738 Highway 28 within in the Township. Consultation is an ongoing process and will be updated throughout the application process. If you have any questions or concerns, please do not hesitate to contact the undersigned.

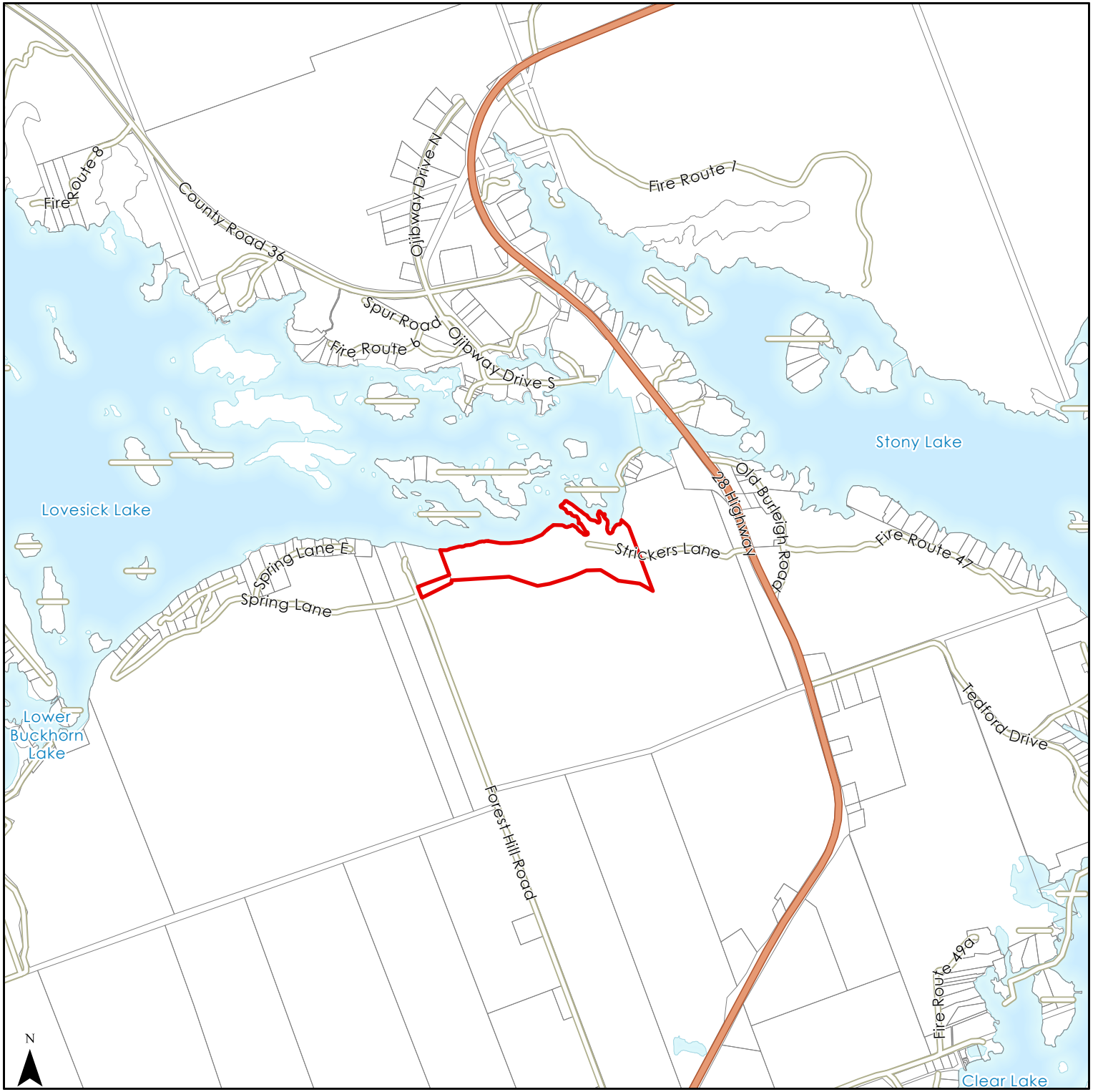
Respectfully submitted,

Diana Keay, MCIP RPP
Senior Planner

DK/jh

Appendix A

Key Map



KEY MAP
LOVESICK LAKE TRAILER PARK

3340 Strickers Lane
Part of Lots 43 & 44, Concession 16
Township of Selwyn
County of Peterborough

Legend

Subject Property

Scale: 1:20,000

0 125 250 500 750 1,000

Meters

NAD83 CSRS98 UTM zone 17N

Created In:	ArcGIS Pro
Drawn By:	JW
Checked By:	DK
Map Date:	December, 2023
Project Number:	10844

Data Sources

County of Peterborough Public GIS: https://ptbocounty.geocortex.com/html5viewer/index.html?viewer=PeterboroughPublic

WILLS

D.M. Wills Associates Limited
150 Jameson Drive
Peterborough, Ontario
K9J 0B9

P. 705.742.2297
F. 705.748.9944
E. wills@dmwills.com

Appendix B

Stakeholder Contact List

Name	Company	Position	Address	Phone	email
Iain Mudd	County of Peterborough	Manager of Planning	470 Water Street Peterborough, ON K9H 3M3	705-743-0380 ext. 2401	IMudd@ptbocounty.ca
Keziah Holden	County of Peterborough	Senior Planner	471 Water Street Peterborough, ON K9H 3M3	705-743-0380 x 2402	Kholden@ptbocounty.ca
Per Lundberg	Township of Selwyn	Planner	1310 Centre Line Selwyn, ON K9J 6X5	705-292-9507 x 220	plundberg@selwyntownship.ca
Fiona Parfill	MTO	Planning Intern	1355 John Counter Blvd Kingston, ON K7K 0E5	613-484-3571	CorridorEast@ontario.ca
Casey O'Neil	Enbridge	Sr Analyst, Municipal Planning	500 Consumers Road North York, ON M2J1P8	416-495-5180	municipalplanning@enbridge.com
Jeannette Thompson	Kawartha Pine Ridge District School Board	Manager, Planning Services	1994 Fisher Drive Peterborough, ON K9J 6X6	705-742-9773 x 2169	jeannette_thompson@kprdsb.ca
Neil MacFarlane	Otonabee Region Conservation Authority	Engineering Technologist	250 Milroy Drive Peterborough, ON K9H 7M9	705-745-5791 x 228	nmacfarlane@otonabeeconservation.com
Jasmine Gibson	Otonabee Region Conservation Authority	Planning Ecologist	251 Milroy Drive Peterborough, ON K9H 7M9	705-745-5791 x 233	jgibson@otonabeeconservation.com
Don Allin	Otonabee Region Conservation Authority	Manager, Plan Review and Permitting Services	252 Milroy Drive Peterborough, ON K9H 7M9	705-745-5791 x 225	dallin@otonabeeconservation.com
Jon Orpana	Ministry of the Environment	Environmental Planner & Environmental Assessment Coordinator	1259 Gardiners Road PO Box 22032 Kingston, ON K7M 8S5	613-548-6918	jon.orpana@ontario.ca
Alanna Boulton	Parks Canada Ontario Waterways, Trent-Severn Waterway	Real Property Officer	2155 Ashburnham Drive PO BOX 567 Peterborough, ON K9J 6Z6	705-750-4516	alanna.boulton@pc.gc.ca

Names listed below were obtained as per the sign in sheet from the May 3, 2023, Open House. The list of attendees is indicated below:

Name	Company	Position	Address	Phone	email
Kari Lie					
Jane McLean					
Suzanne Coros					
Maria Johnson					
Nadas Buckemierovic					
Jeff Chalmers					
Susan Weston					
Dana Slone					
John and Ann Ambler					
Kris Nahrgang					
Lois Walllace					
Tina Warren					
John McGregor					
Sam McLean					
Gary Weston					
Doug Barrett					
Shannon Dar					
Gloria Dunford					

Name	Company	Position	Address	Phone	email
Brenda Rown					
David Kabica					
Gayle Peters					
Rick and Dian Owlers					
Cathy Webb					
Alex Aucome					
Greg Oxenham					
S. Reinier					
Nodin Webb					
Carolyn and Murray Miskin					
Lois Napier					
Doug Moffatt					
Jim Miller					
Peter Tasse					
Christopher Hancock					
Pat Bourne					

Appendix C

Notice of Open House

NOTICE

NEIGHBOURHOOD OPEN HOUSE

Lovesick Lake Beach Resort – Proposed Trailer Park Expansion

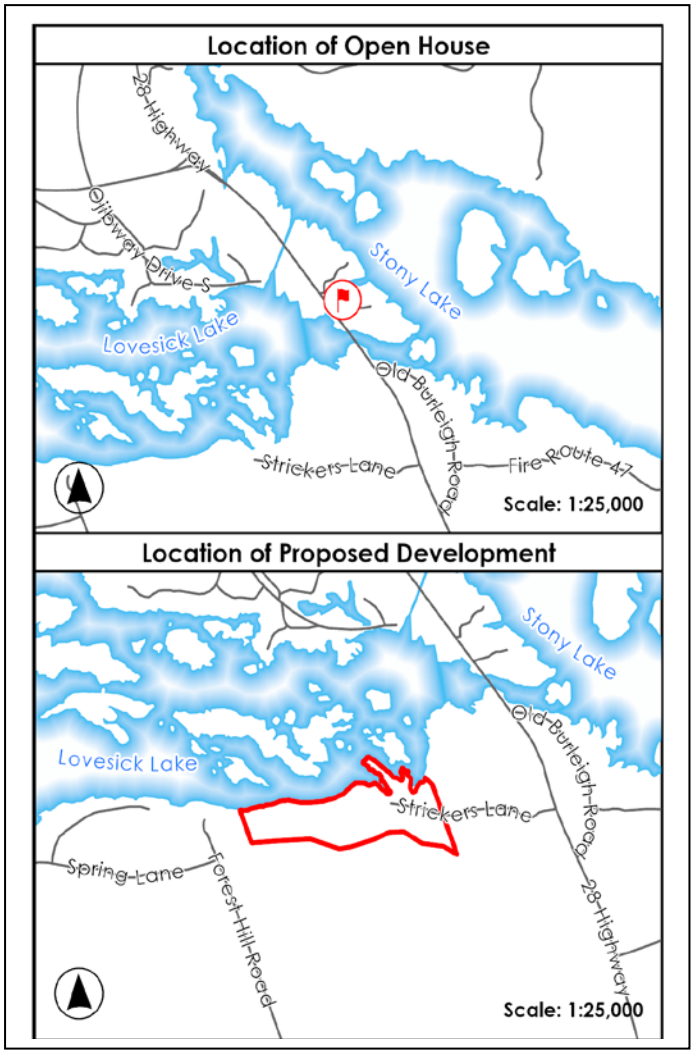
Wednesday May 3, 2023, from 4:00PM – 7:00PM
Burleigh Falls Inn located at 4791 Highway 28
North Kawartha, ON

D.M. Wills Associates Limited on behalf of Lovesick Lake Beach Resort announces the scheduling of a public neighbourhood open house to present the proposed development to nearby residents and answer any questions in advance of the Statutory Public Meeting.

Please join us on **May 3, 2023, from 4:00 pm to 7:00 pm at Burleigh Falls Inn located at 4791 Highway 28, North Kawartha, ON** for an opportunity to review the proposed development and to speak to technical experts about any questions you may have. **Refreshments will be provided.**

Information on the Official Plan and Zoning By-law Amendment applications will be displayed for public viewing and provide an opportunity for members of the public to ask questions.

Please submit comments by email to dikeay@dmwills.com, or by mail or in person to D.M. Wills Associates Limited, 150 Jameson Drive, Peterborough, ON, K9J 0B9. Comment cards will also be made available at the meeting for those who prefer to make written statements.



For more information or to provide comments contact:

Diana Keay (Consulting Project Manager) at dikeay@dmwills.com or (705) 742-2297 ext. 245

Lakefield Herald

Classified Ads

55. Public Notice

55. Public Notice

55. Public Notice

TOWNSHIP OF DOURO-DUMMER

Township of Douro-Dummer
Water Lot Lease Tenders

Tender Closes: **Friday, May 5, 2023 at 12 noon.**

Land Component #1	Lot 32, Concession 8, Part 1 Reference Plan 45R11073 Dummer Ward Crowes Landing
Land Component #2	Lot 32, Concession 8, Part 3 Reference Plan 45R11073 Dummer Ward Crowes Landing

Tenders are to be submitted in sealed envelopes marked **Water Lot Lease Tender 2023** to:

Martina Chait-Hartwig, Acting Clerk
894 South Street, P.O. Box 92
Warsaw, ON K0L 3A0

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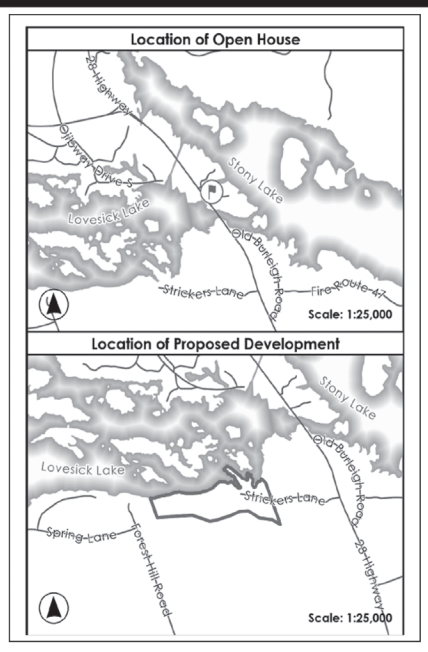

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WILLS

36 General Services

36 General Services

36 General Services

36 General Services

30. Auctions

30. Auctions

36 General Services

DUMPRUNNERS - Moving? Cleaning out the house or cottage? Yard waste? We will load and take to the dump. Call Jim 705-652-1150.

16 Items Wanted

Looking to buy: I buy vinyl records. Bill McCleave. Please call: 705-304-3321

55. Public Notice

55. Public Notice

55. Public Notice

THE CORPORATION OF THE MUNICIPALITY OF TRENT LAKES

IN THE MATTER OF THE MUNICIPAL ACT, 2001 S.O. 2001, Chapter 25;

AND IN THE MATTER OF a proposed by-law of The Corporation of the Municipality of Trent Lakes to stop up, to close and to sell to the abutting land owners or their respective nominees, those lands and premises more particularly described in Schedule "A" annexed hereto.

PUBLIC NOTICE

TAKE NOTICE that the Council of The Corporation of the Municipality of Trent Lakes

proposes to enact a by-law to stop up, to close and to sell to the abutting land owner those lands and premises more particularly described in Schedule "A" annexed hereto.

The proposed by-law will come before the said Council for consideration at its regular meeting being held electronically on Tuesday, the 2nd day of May, 2023, at 1:00 in the afternoon and at that time the Council will hear in person or by his counsel, solicitor or agent, any person who claims that his land will be prejudicially affected and who applies to be heard.

DATED at the Municipality of Trent Lakes, Ontario, this 11th day of April, 2023.

JESSIE CLARK,
Director of Corporate Services / Clerk
The Corporation of the Municipality
of Trent Lakes
760 County Road 36
Trent Lakes, Ontario
K0M 1A0

Schedule 'A' Series 36

In the Municipality of Trent Lakes, in the County of Peterborough, Province of Ontario, more particularly described as follows:

FIRSTLY

Part of the road allowance in front of Lot 22, Concession 2, Cavendish being Part 1 on Plan 45R17433– Catchacoma Narrows

(Being part of PIN 28328-0351 LT)

Appendix D

Public Open House Comment Matrix

Comment / Action	Status / Response
1. Phosphorus loading and Impacts to lake - overall degradation. Examples of past wastewater treatments facilities using the proposed technology was requested.	Please find attached two supporting documents that were provided by the manufacturer of the wastewater treatment technology, Premier Tech Aqua. They refer to a study of phosphorous removal via infiltration of the treated effluent (which has been referred to in the ECA design brief): - Project Report - Field Performance Assessment of Premier Tech Ecoflo Wastewater Treatment Systems in Virginia by A. Robert Rubin (Project Report A. Robert Ruben 2007.05.16) - Power point presentation given by Roger Lacasse, previously Vice-President Scientific & Technical Direction here at Premier Tech Water & Environment, on Dr. A Robert Rubin's study (R.Lacasse 2008 OOWA_Phosphorous removal PP) This study applies to this project as we are infiltrating directly underneath the Ecoflo units; therefore, phosphorous removal will be continuing even further than with the primary phosphorous removal step mentioned above. Finally, it should noted that using chemical addition to remove phosphorous from wastewater is a widely known concept. It is addressed in wastewater textbooks, papers, articles, etc. therefore for further information on the concept and how it works, we suggest searching wastewater phosphorous removal on an internet search engine which will yield a wealth of information about the subject. The wastewater treatment for the site has been approved by the Ministry of the Environment, Conservation and Parks (MECP). Please see approved Environmental Compliance Approval (ECA), attached. An ECA is a legal document that is available to the public, that meets all applicable laws which relate to wastewater treatment from various operations in the province of Ontario. A phosphorus removal system has been included as part of the system. See details on page 2 of approved ECA#7209-CPBUMM. The ECA also has Monitoring and Recording requirements (Section 5, page 6) Reporting requirements (section 8, page 9-10) and Effluent and Groundwater limits (Section 6, page 8 and Schedule B page 14). The limits were determined by Surface and Groundwater Specialists from the MECP. Every year, the owners will provide the MECP with a performance report, which will then be reviewed by their specialists. There is also a requirement in the ECA to report any exceedance of the sampling parameters. Total Phosphorus is one of these parameters, with an effluent limit of 3 mg/L within any of the groundwater monitoring wells which will be installed on the property. The limits were determined by the specialists to ensure that no additional phosphorus is added to the lake. Therefore, this new, advanced wastewater treatment system is designed to ensure the there is no additional phosphorus in the lake, and in the event that samples fail to meet, discharge to the system will be stopped until measures can be taken to ensure the compliant effluent can be produced by the system.
2. Boat Traffic	The proposed trailer sites will have access to the lake via the existing beach; however, no new boat slips or docks are proposed to accommodate the additional sites. New residents will be required to access the lake via the existing public boat launch. The public boat launch is open to anyone for use.

Comment / Action	Status / Response
3. Stability and monitoring of septic system - fail safe	The wastewater treatment for the site has been approved by the MECP. Please see approved ECA, attached. An ECA is a legal document that is available to the public that meets all applicable laws which relate to wastewater treatment from various operations in the province of Ontario. A phosphorus removal system has been included as part of the system. See details on page 2 of approved ECA#7209-CPBUMM. The ECA also has Monitoring and Recording requirements (Section 5, page 6) Reporting requirements (section 8, page 9-10) and Effluent and Groundwater limits (Section 6, page 8 and Schedule B page 14). The limits were determined by Surface and Groundwater Specialists from the MECP. Every year, the owners will provide the MECP with a performance report, which will then be reviewed by their specialists. There is also a requirement in the ECA to report any exceedance of the sampling parameters. Total Phosphorus is one of these parameters, with an effluent limit of 3 mg/L within any of the groundwater monitoring wells which will be installed on the property. The limits were determined by the specialists to ensure that no additional phosphorus is added to the lake. Therefore, this new, advanced wastewater treatment system is designed to ensure the there is no additional phosphorus in the lake, and in the event that samples fail to meet, discharge to the system will be stopped until measures can be taken to ensure the compliant effluent can be produced by the system.
4. Effluent in the lake	The wastewater treatment for the site has been approved by the MECP. Please see approved ECA, attached. An ECA is a legal document that is available to the public that meets all applicable laws which relate to wastewater treatment from various operations in the province of Ontario. A phosphorus removal system has been included as part of the system. See details on page 2 of approved ECA#7209-CPBUMM. The ECA also has Monitoring and Recording requirements (Section 5, page 6) Reporting requirements (section 8, page 9-10) and Effluent and Groundwater limits (Section 6, page 8 and Schedule B page 14). The limits were determined by Surface and Groundwater Specialists from the MECP. Every year, the owners will provide the MECP with a performance report, which will then be reviewed by their specialists. There is also a requirement in the ECA to report any exceedance of the sampling parameters. Total Phosphorus is one of these parameters, with an effluent limit of 3 mg/L within any of the groundwater monitoring wells which will be installed on the property. The limits were determined by the specialists to ensure that no additional phosphorus is added to the lake. Therefore, this new, advanced wastewater treatment system is designed to ensure the there is no additional phosphorus in the lake, and in the event that samples fail to meet, discharge to the system will be stopped until measures can be taken to ensure the compliant effluent can be produced by the system.

Comment / Action	Status / Response
5. Tree canopy and vegetation	A participant noted concerns with the loss of forest cover and potential impacts to the environment (generally) and impact on climate change. The Provincial vegetation classification system (Ecological Land Classification System for Southern Ontario) defines forest communities as treed areas with 60% or greater tree canopy cover, which is the basis for the 60% canopy cover threshold recommended for this site. As presented in the EIS, care is being taken by the proponent to maintain canopy cover across the Site at >60%, through selective harvest of trees. There is flexibility in the exact placement of the trailers. The EIS recommends that larger healthy trees along the perimeter of the sites be maintained. Further, the EIS addendum recommends that high quality wildlife trees be flagged for preservation by an ecologist no more than 6 months prior to site preparation. A Tree Inventory and Preservation Plan will be prepared at the detailed design stage that identifies all trees that should be preserved in place, and protection measures for these trees to ensure that they are not impacted during the construction process. Considering that the forest is composed of a relatively homogenous mid-aged stand of deciduous trees with younger trees in the sub-canopy, it is expected that the selective tree removal will result in increased light infiltration to the sub-canopy. Existing trees will naturally fill these canopy gaps to benefit from the increased light infiltration. This natural process will cause the canopy gaps created by the selective tree removal to naturally close over time. Monitoring is recommended at 3 years post-development to ensure that canopy cover has been maintained at the target 60% or greater. If the target is not met, additional plantings are required to bring the canopy cover to the minimum 60% target. With the combination of these measures (i.e., tree inventory/preservation plan, selective removal, natural canopy infill, monitoring to maintain 60% target, planting if necessary to achieve the target), any changes to the function of the forest feature are expected to be temporary and minimal. It should also be noted that the forest community present on the development area is not virgin or old-growth forest. Based on the known history of the regional area, lands near the Trent Severn Waterway were largely deforested in the early period following the opening of the waterway. The exception to this includes difficult to access lands, such as the escarpment face on the property, where older trees remain present.
6. Traffic and road conditions - upgrades and who is responsible	The Project team understands that Forest Hill Road requires some upgrades. These upgrades are a result of existing conditions and not created by the proposed development. Although any work on public roads is responsibility of local municipalities, the proponent has agreed to discuss contributions to any future road upgrades with the Township through this process.
7. Docks	The existing trailer park includes 82 docks to be used by the residents. No new docks are proposed to accommodate the additional sites.
8.Increase lake users and property standards	With the existing public boat launch, Lovesick Lake and all surrounding connecting lakes can be accessed by members of the public and not just local property owners. The impacts of the proposed additional sites are discussed in the supporting reports with respect to stormwater management, slope stability and on site servicing (i.e. septic system). An Environmental Compliance Approval is required for the sewage system through the MECP to ensure the development meets provincial standards and regulations. Property standards are regulated under By-law 2016-043 through the Township. For any concerns with respect to property standards, please contact the Township for further direction on enforcement.

Comment / Action	Status / Response
9. Numbers of cars and people on site - control of numbers	Traffic impacts have been assessed in the August 2023 Traffic Impact Study. The study concludes that no impacts are anticipated as a result of the proposed development. The site plan includes parking areas for site visitors and each site has sufficient space to support occupant vehicles. Managing internal parking and on-site visitors is the responsibility of the property owner and will be managed by the park owners and facility operators.
10. Consultation process - lack of consultation	Based on the correspondence provided in the project file and through discussions with Township and County staff, consultation has been undertaken in accordance with the Planning Act. Notice of the applications was prepared by County staff and sent to assessed owners within 120 metres of the subject property. Project information is provided on the County's website. An open house, although not required under the Planning Act, was held with two weeks' notice to those who provided their contact information to the County requesting to be notified about the project. Consultation efforts will continue throughout the duration of the project to ensure questions and comments are addressed and considered as the team moves forward in the process. For anyone who would like to be directly notified of upcoming consultation events and the impending mandatory statutory meeting(s) (to be scheduled and held by the Township and County), please provide your contact information. Regarding First Nation consultation, based on the project correspondence, communication has been sent to the solicitor of the Kawartha Nishnawbe First Nation (KNFN) in March of 2022 introducing the project and providing access to requested information. A meeting was also scheduled on November 17, 2021, with Curve Lake First Nation (CLFN). The Project team has continued to reach out to the KNFN solicitor to discuss concerns; however, we have been unsuccessful in securing a meeting date. In addition, the Lovesick Lake Beach Resort Inc. has retained legal counsel to address KNFN comments regarding consultation and the Project team will be working through counsel to ensure it is meeting consultation expectations. We will continue consultation efforts with KNFN's solicitor and will continue to reach out to CLFN to provides project updates and inquire of any questions on the project.
11. Function and reliability of the septic system and Hydrogeological requirements (MECP understood the direction of the effluent and looked for discussion on surface water)	The wastewater treatment for the site has been approved by the MECP. Please see approved ECA, attached. An ECA is a legal document that is available to the public that meets all applicable laws which relate to wastewater treatment from various operations in the province of Ontario. A phosphorus removal system has been included as part of the system. See details on page 2 of approved ECA#7209-CPBUMM. The ECA also has Monitoring and Recording requirements (Section 5, page 6) Reporting requirements (section 8, page 9-10) and Effluent and Groundwater limits (Section 6, page 8 and Schedule B page 14). The limits were determined by Surface and Groundwater Specialists from the MECP. Every year, the owners will provide the MECP with a performance report, which will then be reviewed by their specialists. There is also a requirement in the ECA to report any exceedance of the sampling parameters. Total Phosphorus is one of these parameters, with an effluent limit of 3 mg/L within any of the groundwater monitoring wells which will be installed on the property. The limits were determined by the specialists to ensure that no additional phosphorus is added to the lake. Therefore, this new, advanced wastewater treatment system is designed to ensure the there is no additional phosphorus in the lake, and in the event that samples fail to meet, discharge to the system will be stopped until measures can be taken to ensure the compliant effluent can be produced by the system.

Comment / Action	Status / Response
12. Archaeological assessment - process taken and need to address questions on report	Lovesick Lake Beach Resort Ltd. retained Northeastern Archaeology to review the existing Archaeological Assessment work as well as to complete further field investigations on site. The additional field investigations assessed the balance of lands impacted by development but not investigated by Earthworks. The additional investigation did not find any material of archaeological significance. Earthworks' Archaeological Assessment and the supplemental letter prepared by Northeastern Archaeology have been submitted to the Ministry of Citizenship and Multiculturalism for review and recommended the site for clearance.
13. Intensity of development	The development of any site must conform to provincial and local municipal policy and meet the provisions of the local zoning by-law. Regarding the intensity of development, there are no density requirements for this type of use in the provincial and municipal (official plan) documents. There are however a number of policies that impact the size and scale of development. This includes but is not limited to, adequacy of vehicular access, adequacy of water supply and sewage facilities, setbacks from natural heritage and hazard features, i.e., the lake and the escarpment and meeting setbacks as established in the zoning by-law. The site plan proposes 40 sites with varying site sizes ranging from a minimum of 286.4 m^2 to a maximum of 668.99 m^2 and a 6 m vegetative buffer between all sites. The zoning by-law provides general zoning provisions for lot area, coverage, number of sites per area and setbacks for which the site cannot exceed. The proposed development meets these requirements and therefore, the site is being developed at a scale considered appropriate in the zoning by-law. In addition, the number of proposed sites will also be determined through the recommendations in the supporting studies submitted for the project. These studies were required by the Township, County and applicable agency staff to address the development policies as established through the local official plan, i.e., adequacy of water and sewage services. The studies have been peer reviewed and updated based on peer review comments. The original application submitted to the Township and County in 2018 requested 46 sites. Based on comments received by the MECP, the number of sites has been reduced to 40 to accommodate a reserve area for a sewage system. The subject property can support the development of a 40 site trailer park expansion.

FIELD PERFORMANCE ASSESSMENT OF PREMIER TECH ECOFLO® WASTEWATER TREATMENT SYSTEMS IN VIRGINIA

SUBMITTED IN SUPPORT OF GMP 118 REQUIREMENTS

BY

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Project Report
Field Performance Assessment
Premier Tech Peat Based Bio-filter Wastewater Systems

CONTENTS

ABSTRACT

The performance of 21 Premier Tech ECOFLO® Model ST-650 or STB-650 wastewater treatment systems was evaluated at residential facilities installed in Type 1, 2, 3, and 4 soils (sand to clay) in Virginia. The 18 systems installed in Type 1, 2 and 3 soils were each monitored for a period of 18 months. Currently the 2 systems installed in Type 4 soil has been tested for 16 and 8 months respectively and testing is ongoing according to the protocol. One system was eliminated because of very low and unrepresentative flow. Monitoring was performed in accordance with provisions contained in Premier Tech Environment study, 21 July, 2003. The monitoring was staggered indicating the varying time at which a system entered into the testing. Over 5700 data points comprise the data set for this study.

All systems assessed met the treatment standard imposed by the test protocol (date of study approval). The treatment unit/soil mantle provided wastewater renovation meeting or exceeding the standards imposed in the protocol. The monitored parameters, five (5) day Carbonaceous Biochemical Oxygen Demand ($CBOD_5$), total suspended solids (TSS), nitrogen series and Coliform bacteria levels established in the protocol were consistently achieved at the treatment boundary imposed in the approved test protocols. Those target performance levels listed in the project test protocols were: BOD_5 of 30 mg/l at a depth of 12 inches below the infiltrative surface in the test systems and at the discharge from the ECOFLO® ST(B)-650 treatment systems and a coliform level of less than 10 CFU/100 ml with no Coliform sample exhibiting a count greater than 200 CFU/100 ml at any site at any time.

SUMMARY

The Commonwealth of Virginia, like many neighboring states, is experiencing tremendous growth in both sewered and unsewered areas. All growth necessitates use of approved wastewater treatment facilities and in unsewered areas of the Commonwealth, onsite wastewater systems are required. All onsite options utilized within the border of the Commonwealth must be approved by appropriate agencies in accordance with GMP 118. This testing was developed to comply with provisions contained in this GMP.

The primary objective of this study was to assess field performance of ECOFLO® wastewater treatment units used in conjunction with soil as a receiver for treated wastewater. This field assessment and collection of performance data is necessary to determine whether to classify the ECOFLO®/soil treatment system as "generally approved" throughout the Commonwealth. Treatment standards were established for BOD_5 and Fecal Coliform bacteria at specified compliance boundaries. The researcher also wished to assess phosphorus removal potential of the system.

The study was initiated in October 2003 and was completed in December 2006. A total of 21 systems were initially enrolled in the study. One was eliminated because of very low and unrepresentative flow. Eighteen (18) systems were installed in Type 1 (very sandy), 2, 3 soils and 2 systems in Type 4 (clayey). Wastewater treatment systems were monitored for 18 months (Type 1, 2 and 3 soils) and monitoring is ongoing according to the protocol for the 2 systems installed in Type 4 soil. Systems selected for inclusion in the study were selected based upon: soil type, requirement for compressed footprint system, homeowner agreement to participate, and requirement that the system was treating domestic wastewater.

The study was developed to document concentrations of biochemical oxygen demand and fecal coliform levels at a depth of 12 inches below the infiltrative surface separating the ECOFLO® system from the underlying soil. The performance standard established in the test protocol (Premier Tech Environment, 21 July, 2003) required a Fecal Coliform concentration of less than 10 CFU/100 ml with no sample exceeding 200 CFU/100 ml and a BOD_5 of less than 30 mg/l at this designated performance boundary. Testing was required to monitor nitrate nitrogen at this boundary, but no performance standard was established. In addition, the study coordinator and field supervisor requested measures of the concentration of Total Kjeldahl Nitrogen (TKN) at this performance boundary. This request follows from knowledge that TKN (the sum of organic nitrogen and ammonium nitrogen) convert to nitrate in aerobic environments.

Each test system was monitored monthly for required parameters and quarterly for additional parameters. Over 5000 data points represent the test information collected. Water quality testing was performed by an independent certified laboratory. Sample holding times were assessed closely to assure validity of data. Sample data and sample point locations are provided in the report.

The ECOFLO® treatment system/underlying soil system consistently provided effluent meeting performance standards established in the approved test protocol. The average or mean, median, standard deviation and 90 % confidence limit for parameters measured are presented in tables which are included in the body of the report. Test results show the mean BOD_5 in all samples tested at the treatment unit compliance boundary for the ECOFLO® unit was 8 mg/l. Test results show mean Coliform levels at the 12 inch compliance boundary was 2 CFU/100 ml or less for all samples. Median and 90 % confidence values confirm the robustness of the treatment system. At this time the results are complete for Type 1, 2 and 3 soils. For Type 4 soil, interim information is provided and monitoring is ongoing according to the protocol.

1 INTRODUCTION

Properly sited, sized, installed, operated and maintained onsite wastewater treatment facilities are essential for millions of residents in rural and urban fringe areas of the Canada, the U.S., Asia, Australia, or any area with water carry plumbing. Onsite wastewater facilities have been utilized effectively for over a century. Onsite wastewater systems were initially developed to provide wastewater treatment systems in unsewered rural areas – especially farmsteads. Today, onsite wastewater systems are utilized in sensitive receiver environments and the level of treatment technology utilized prior to dispersal into the soil and the levels of technology associated with dispersal technology have advanced dramatically in the last 25 years. These advancements have been associated with utilization of onsite wastewater systems in receiver environments that pose some limitation on the ability of natural soil to adequately treat and assimilate the constituents in a wastestream. These advanced treatment and dispersal systems require a higher level of commitment to service than a traditional system. Nonetheless, these advanced systems function well and perform well when specified and developed along with being properly managed comprehensively.

Many issues continue to plague the onsite wastewater industry. Most of these refer to poor understanding of the many relevant issues pertaining to a sustainable onsite wastewater management program. The misunderstandings occur throughout the regulated and regulatory community, the consulting community, and the manufacturing community.

The ECOFLO® wastewater treatment systems are manufactured by Premier Tech Environment in Rivière–du-Loup (Quebec) Canada. The system consists of a down-flow peat filter system, an absorption bed, and an associated soil to serve as a receiver for treated wastewater.

My understanding of the issue involved with the use of the ECOFLO® Peat Filter in conjunction with soil based wastewater treatment and reclamation facilities in Virginia involve the:

1. Appropriate hydraulic loading rate to land
2. Vertical separation requirements between the zone of waste application and watertable or restrictive layer, and
3. The level of treatment associated with the peat filter system.

The proprietary ECOFLO® wastewater treatment units are utilized as alternatives to the non-proprietary sand filter system and other approved proprietary and non-proprietary wastewater treatment devices (home aerobic treatment units or media filters) in the Commonwealth. The sand filter system as a pretreatment unit appeared in onsite wastewater literature in the mid 1970's based on Chowdry's work with sand filters accomplished in the late 1960's through the early 1970's and Hines and Favreau's work with recirculating sand filters in the early 1970's. Review of the monitoring data from operating treatment systems (aeration systems and sand filter systems) and review of monitoring data from the ECOFLO® peat filter suggest that this proprietary treatment facility performs more reliably that the sand filter system and selected aerobic treatment units. Data on removal of bacteria and removal of organic matter as BOD_5 appear more substantial from these proprietary peat-based units than from the sand filters. Further, the sand filter may be installed as an unmanaged option while the proprietary facilities have associated with the sale, a long term management contract. The review of performance monitoring data from the contract managed proprietary facilities (ECOFLO®) suggests a degree of reliable performance associated with a wide range of input conditions.

Monitoring data from the Massachusetts Test Center, from the Virginia test sites and from facilities in North Carolina suggest managed ECOFLO® treatment systems perform more reliably and achieve higher levels of pollutant removal than those from unmanaged systems. The management system is an essential element for developing long term sustainability in the wastewater management efforts throughout the Commonwealth.

Background

Converse and Tyler (1991) report Coliform levels below soil absorption systems receiving septic tank effluent (STE) at a distance of 1 foot from the infiltrative surface of between 290 and 1140 counts per gram dry soil. Using the conversions provided by Converse and Tyler this coliform count is equivalent to over 100,000 counts/100 ml at a depth of 1 ft below the zone of waste application for a site receiving septic tank effluent. Penninger and Hoover (1998) report Coliform levels at a maximum Coliform count of 230 counts/ml at a distance of 3 feet from a soil based system receiving sand filter effluent. Converse and Tyler (1998) report that coliform levels fall to below detection levels where influent applied to soil contains 10 E +4 Coliform bacteria or less following flow through 1 ft (30 cm) soil. Clearly, there exists ample evidence that soil systems remove significant levels of bacteria. Typical levels of removal suggest a 2 to 3 log reduction (99 %to 99.9 %) removal following migration through 1 foot of soil. Higher levels of removal are typically associated with finer textured soil as the receiver.

2 DESCRIPTION OF ECOFLO® TREATMENT SYSTEM

The ECOFLO® treatment system approved for testing under this protocol consists of a primary treatment tank (a septic tank) followed by a PSA 240 pump tank with discharge to the ECOFLO® treatment unit or an alternative direct discharge from septic tank to the ECOFLO® treatment unit. These ECOFLO® devices are designed to discharge into a permeable mantle and final dispersal into the underlying soil. The critical treatment system boundaries can be described as: top of peat filter receiving septic tank effluent, base of peat filter, base of mantle, natural soil 12 inches below infiltrative surface, natural soil 10 feet from system and the ultimate boundary at adjacent surface water or underlying groundwater (this ultimate boundary was not monitored in this study).

Wastewater from the facility enters the septic tank for primary settling and initial clarification. This primary treatment device provided the initial treatment separating floatable and solids from the wastewater requiring treatment in the adjacent receiver environment. Liquid enters the ECOFLO® down-flow filter through a tipping bucket that facilitates uniform dispersal of liquid onto corrugated plates which distribute liquid over the peat material in the container. Peat provides the medium where physical, chemical, and biological treatment processes reduce concentrations of pollutants in the liquid and render that residential wastewater suitable for absorption into the soil. Liquid from the peat filter enters a mantle over soil where final treatment in the designed system is realized.

3 STUDY OBJECTIVES

The Virginia Department of Health approved installation of the ECOFLO® treatment devices to demonstrate performance of units in a defined footprint mode. The approval was granted under GMP 118 which includes a monitoring program designed to gather performance data in order to verify that ECOFLO® technology meets the standards set by the Virginia Department of Health. The treatment or performance standard specified in the GMP was BOD_5 of 30 mg/l and Coliform of 10 CFU/100 ml or less at the performance boundary. This boundary was located at a depth of 12 inches below the infiltrative surface and in the foot print of the treatment system. The general location of the monitoring points is provided in Figures 1a and 1b.

In addition, an up-gradient lysimeter was installed to assess the quality of the shallow soil moisture in the area immediately up-gradient of the treatment system. This background is critical when assessing levels of nitrate in soil systems. An additional treatment boundary was defined as the base of the ECOFLO® peat filter. Liquid samples collected at this boundary reflect the quality of the treated wastewater introduced to the soil component of the ECOFLO® treatment system.

Suction lysimeters were installed at this performance boundary and at a down-gradient boundary to assess overall performance of the treatment system. In addition, a sampling point was specified at the base of the ECOFLO® treatment unit to assess BOD_5, Nitrogen, coliform bacteria and chloride (and an occasional phosphorus test) in the liquid entering the soil system from the ECOFLO® treatment device. The primary objectives of this testing were to:

1. Assess BOD_5 and Coliform levels at the prescribed performance boundary defined in the test protocol.
2. Monitor nitrogen levels in soil moisture at a depth of 12 inches below the infiltrative surface separating the created environment from the natural soil environment.

4 PROCEDURES

4.1 Site Selection Procedures

Sites selected for inclusion in the test protocol were selected to represent installations in the various soil resource groups identified in Virginia Rule (groups 1, 2, 3, and 4). Sites were selected through a partnership between Delmarva Septic Solutions (the Premier Tech representatives in Virginia) and the research team (Rubin and King). Test sites were selected to represent domestic or residential wastewater systems. Sites were selected to insure that the various soil resource groups represented in Virginia were included in the study.

Homeowners were required to sign a document stating their willingness to participate and to grant access to their property to accomplish required monthly and quarterly sampling. As an aside, the homeowners expressed interest in the study and were very willing to open their property to the testing. Sites were selected to insure sufficient sampling data would be collected during the test period. One of the homes initially enrolled was subsequently removed from the testing due to inadequate volume of wastewater for treatment and dispersal. The home was a three bedroom facility and the owner did not generate sufficient volume of wastewater to stress the treatment system.

4.2 Field Monitoring Procedures

Figures 1a and 1b show typical ECOFLO® system installations with all monitoring devices located. Figure 1a shows a typical open bottom installation and Figure 1b shows a typical trench system. The soil moisture/shallow groundwater testing was accomplished using High Flow Porous Ceramic Cup Suction Lysimeter model 1920F1-B01M3. These are used in many groundwater sampling activities. The 1920F1 Pressure/Vacuum Soil Water Sampler consisted of a PVC body with a ceramic cup epoxy bonded at the distal end and a suction line at the proximal end. The porous

ceramic cup had an outside diameter of 1.9″ and is 2.0″ in length. The B01M3 ceramic cup consists of a 1 bar high flow porous ceramic cup capable of transmitting bacteria from soil solution to the sample collection lysimeter. Nylon compression fittings were threaded into the top cap and were used to attach lengths of polyethylene tubing for surface access. The specified lysimeters were manufactured by Soil Moisture Inc.

Suction lysimeters were installed at the desired depth and these remained in the soil receiver at each of the sites through the entire testing period. This allowed required periodic sampling to occur with a minimal disturbance to the site and soil. The samplers consisted of a porous ceramic cup and a sample collection tube. A vacuum pump was used to create a vacuum in the sampler, which allowed water from the soil to be drawn through the ceramic cup and into the sampler. The water sample was then removed from the collection tube, placed in sample bottle; the bottles were placed in a cooler and transported to the certified laboratory for analysis. Chain of custody paperwork procedures were followed. All details regarding monitoring procedures are described in the "*Sampling Protocol for Field Testing, Sampling and Evaluation Premier Tech ECOFLO® Sewage Treatment System"* prepared by Premier Tech Environment and Delmarva Septic Solutions Inc. and approved by the Virginia Department of Health in July 2003.

4.3 Samples

After the filter bed had been in use for a period of at least four weeks, the sampling program for each site was initiated. Systems numbered 1 through 19 were sampled monthly for 18 consecutive months. Systems 20 and 21 were sampled for 8 and 16 months (monitoring is ongoing according to protocol).

Four samples were collected at each test site. These were:

- Influent of the peat filter (correspond to the septic tank effluent).
- Treated effluent from the peat bed (interface of peat bed bottom and absorption area).
- Treated effluent at a depth of 12″ below the bottom of the absorption field (measured directly below the outside footprint of the ECOFLO®).
- Treated effluent at a depth of 12″ below the bottom of absorption trenches, if utilized; and within the first 10 feet of the trench.
- Background soil moisture at a depth of 12″ below the bottom of the absorption field, at a site outside the designated absorption area. (To analyze for background contamination)

4.4 Monitoring Program

The Table 1, below indicates the testing and analysis performed on each site and the frequency for each sample collected in support of this protocol. The value in parenthesis

indicates the total number of samples projected by site at the end of the sampling program. Since all systems were not monitored for 18 months, the total number of data points is slightly below the target.

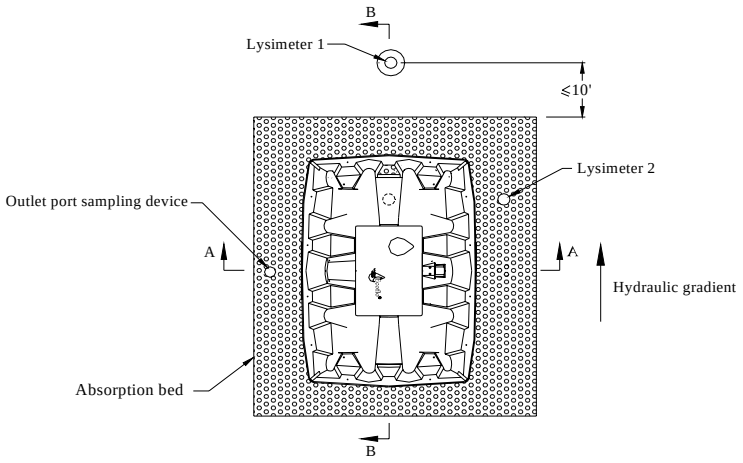
Table 1: Testing and analysis

PARAMETER	INFLUENT OF THE PEAT BED (SEPTIC TANK EFFLUENT) ECOFLO® INLET PIPE	EFFLUENT OF THE PEAT BED SAMPLING DEVICE UNDERNEATH THE ECOFLO® UNIT	UNSATURATED SOIL BENEATH THE ECOFLO® FOOT PRINT 12 in. BELOW THE INFILTRATIVE SURFACE	UNSATURATED SOIL 12 IN. BELOW THE INFILTRATIVE SURFACE AND 10 FEET BESIDE THE ECOFLO® FOOT PRINT
BOD_5	1/month (18)	1/month (18)	-	-
TSS	1/3 months (6)	1/month (18)	-	-
Fecal Coliform	1/6 month (3)	1/month (18)	1/month (18)	1/month (18)
Chloride[1]	-	1	1	1/month (18)
Nitrate	Hach[3]	1/6 months (3)[2]	1/6 months (3)[2]	1/6 months (3)[2]
TKN	1/6 months (3)[4]	1/6 months (3)[2]	1/6 months (3)[2]	1/6 months (3)[2]

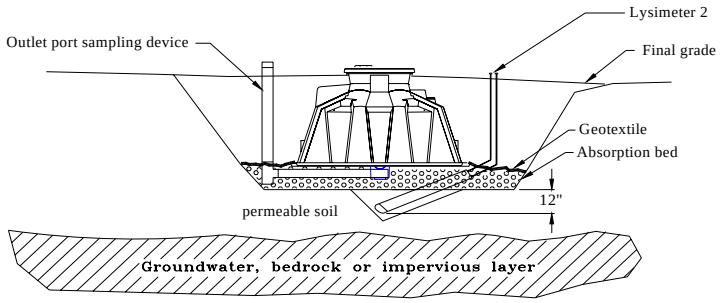
Note:

1. The tap water at each site was analyzed for the chloride one time at the beginning of the sampling program.
2. This analysis was performed only if the volume of the sample collected was sufficient for testing.
3. Qualitative field method (HACH® test strips for nitrate Cat. 27454-25 or equivalent).
4. Nitrate and TKN of septic tank effluent were analyzed only once other effluent parameters were performed (if sufficient sample volume was available at effluent).

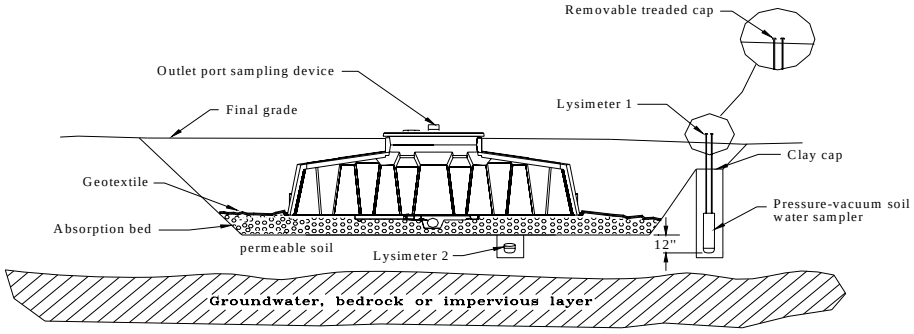
Figure 1a – Typical ECOFLO® installation with monitoring components
Bottomless system (ST-650)



Plan view

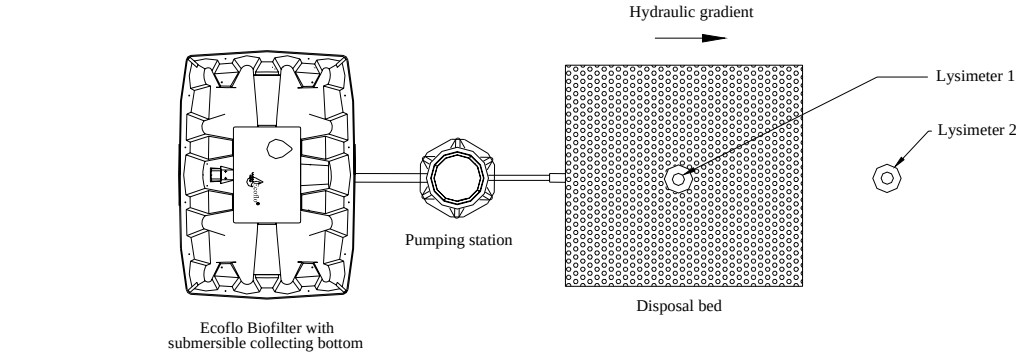


Section A-A

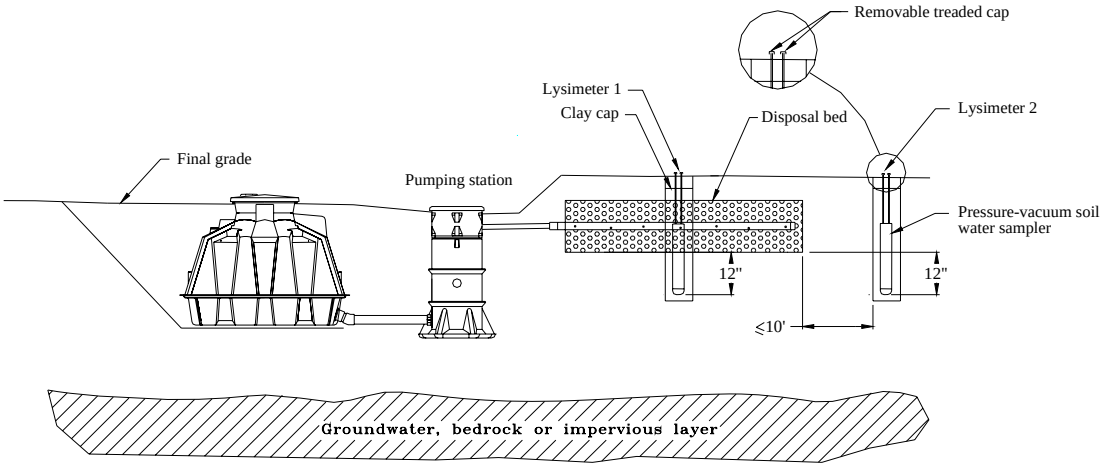


Section B-B

Figure 1b – Typical ECOFLO® installation with monitoring components
System with bottom (STB-650)



Plan view



Section view

All the samples were delivered to an Independent Laboratory duly certified by the Virginia Department of Health. The only exception was the nitrate from the septic tank effluent, which was completed in the field. Generally, septic tank effluent does not have any nitrate, and this was verified by a field qualitative method (HACH® test strips for nitrate Cat. 27454-25 or equivalent). Should nitrate have been detected, that may indicate groundwater intrusion into the septic tank or the line between the tank and the treatment unit.

In addition, in order to measure the potential for background contamination, an additional suction lysimeter was installed at selected sites up-gradient of the ECOFLO treatment unit. Sampling frequency to measure the potential background contamination was determined as a function of the first sample results. If nitrate levels were high in test samples, up-gradient testing of the groundwater was initiated to assess relative contribution from wastewater as compared to background. The goal of the treatment was to insure nitrate levels in shallow groundwater did not increase by over 10 mg/l above background.

The methods specified for analysis of each test parameter are presented in the Table 2, below.

Table 2: Standard Test Methods

PARAMETERS	ANALYSIS METHOD
BOD_5	SM 5210B
TSS	SM 2540D
TKN	SM 4500NorgC
Fecal Coliform	SM 9221C
Nitrate	SM 4500NO3 D
Chloride	SM 4500C1 C

Note: SM = Standard Methods for the Examination of Water & Wastewater, 18th Edition

Finally, all sites were equipped with an event counter that counted the number of tipping bucket events of the ECOFLO® distribution system. This will allow the analysis to include evaluation of the total volume of wastewater that is treated by the ECOFLO® unit and discharged into the soil.

Referencing the ECOFLO® provisional approval, Table 3, below describes the target treatment standards (performance standards) for each site examined and included in this testing protocol.

Table 3: Performance Requirements for ECOFLO® Treatment System (Filter and Soil)

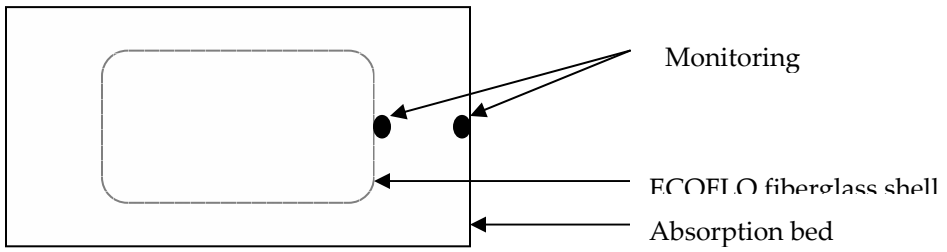
PARAMETERS	INFLUENT	EFFLUENT (PEAT MEDIA)	SOIL WATER (12″ BELOW THE BOTTOM OF THE ABSORPTION FIELD)
TSS	-	-	< 30 mg/L (1)
BOD_5	>100 and <300 (for any individual samples) > 150 mg/L (average)	-	< 30 mg/L (1)
Fecal Coliform	-	-	< 10 CFU/100 ml (geometric mean) <200 CFU/100 ml (single sample)
Nitrate	No standard is established. But results may be used to demonstrate the performance.		
Chlorides	Increase compared to tap water.		

1. The TSS and BOD_5 were not analyzed in the samples collected by the lysimeters but at the effluent discharge from the peat bed. The research team assumed that if the 30 mg/L standard was achieved at the effluent from the peat bed, it was certainly less than that everywhere in the absorption bed which followed.

4.5 Ponding

Two monitoring ports were installed at each site. One just at the limit of the ECOFLO® fiberglass shell and the other at the outer limit or extent of the hydrologic boundary associated with the absorption bed. During each sampling event, the ponding depths were monitored at these two ports. Figure 2 below shows an overhead view plan with the location of the two monitoring ports.

Figure 2: Monitoring ports



5 RESULTS AND DISCUSSION

A total of 21 systems were sampled through this approved test protocol**.** Systems installed in Type 1, 2 and 3 soils were tested for the requisite 18 months; however the two systems installed in Type 4 soil were enrolled in the protocol late and were tested only 8 to 16 times. The testing involved assessment of the peat treatment unit and the soil environment. Measures of the quality of the liquid generated from the ECOFLO® treatment unit were collected to determine BOD, nitrogen, and bacteria generated from the treatment unit. Measures of concentrations of soluble nutrients and coliform bacteria in the soil receiver environment immediately below the infiltrative surface and at defined system boundaries were collected to assess potential environmental and health impacts of the total system. Data summarizing results for the testing are provided in the table presented in Appendix A. This table provides summary data for all systems, types of soils and results from individual sampling events.

Standard methods as listed in the approved protocol were used for all testing and analysis. Holding times were maintained properly between sampling events and testing. Sample preservation was in accordance with standard field protocol (cooling for microbiological tests and preservation for others). All samples were transported from the site to the laboratory in a cooler with adequate ice to maintain proper temperature through the transportation process.

The summary table provides a broad summary of the testing from all systems. The mean and median values from the testing, the standard deviation of the measure, and the 90% confidence level are provided. Inclusion of the mean and median value is important when examining a long time series test. The median values have been included in reports by Tyler and Converse (1997), Hoover and Groves (2005), and these median values may be more representative of performance than the mean. In addition, the 90% confidence level indicates the values to which systems can perform under stress because of flow variation, temperature and climatic variations, changing wastewater inflow characteristics, or other influences on system performance.

5.1 ECOFLO® Peat Filter Treatment Unit Performance

BOD_5: Data summarizing the treatment efficiency for the ECOFLO treatment systems is presented in Table 4 below. These data summarize the treatment achieved in all systems enrolled in the study. Specific site data is contained in the table presented in Appendix A, previously mentioned.

Table 4: Mean, Median, Standard Deviation, 90 % Confidence Limits and Per Cent for BOD_5 in Influent to and Effluent from ECOFLO® Peat Filter at Sites in Virginia (as mg/l), N = 332

	Influent	Effluent	% Removal
Mean BOD_5 and (SD)	186 (113)	8 (8)	96
Median BOD_5	170	6	96
90% Confidence Limit	343	16	95

The mean and median BOD_5 values observed in all samples from the ECOFLO® treatment unit were 8 mg/l and 7 mg/l respectively. The value below which 90% of the BOD_5 values fell was 16 mg/l. Based on these test data, the BOD_5 removal exceeds the required performance level established in the test protocol. Examination of all data indicates the maximum BOD_5 values observed through all testing were encountered at the Pride of Virginia facility. This facility is a somewhat atypical residential facility with migrant labor providing services to a seafood processing operation. Nonetheless, the mean and median values of BOD_5 from this facility met the standards imposed through the approved test protocol. The 90% confidence limit of testing from this facility was 30 mg/l. and that is the standard imposed through the protocol. Even under conditions of duress, the ECOFLO® unit treated liquid to the required standard.

The maximum BOD_5 observed through the testing were detected at the Palmer residence, the Stevens – Jeff residence and at Pride of Virginia (A). The high values do not seem correlated with anticipated low temperature, high rainfall, or other conditions that would facilitate an increase in BOD_5. The values associated with these excursions can not be explained by data assessment only. The high values experienced at the Stevens residence do seem to occur during a cool season, but not all high values are represented in the cool season only. The ponding height at the central support is also not an indicator of the high BOD_5 potential. Systems exhibiting significantly higher ponding height achieve high levels of BOD_5 removal. Further, wastewater flow to the systems is not excessive during periods where these excursions in BOD_5 were observed.

In contrast to these maximum values, minimum values observed through the testing were 2 to 3 mg/l and the frequency of these low values was greater than the frequency of the higher values. This suggests that the curve representing all data is skewed toward the higher levels of treatment observed in the bulk of the data represented. The ECOFLO® treatment unit does meet the conditions imposed for effluent BOD_5 concentration through the test protocol.

Coliform: The treatment standard imposed on the ECOFLO® treatment system required a coliform level of 10 CFU/100 ml following flow through 12 inches of soil below the

treatment unit. Data collected during the testing at the base of the treatment unit suggests that the peat treatment unit itself was capable of achieving a 1.5 to 2 log reduction (95% to 99%) in coliform counts following flow through the filter only. This was achieved without disinfection. Performance data regarding the filter only are presented in Table 5, below.

Table 5: Mean, Median, and 90 % Confidence Limits for Coliform Bacteria in Influent to and Effluent from ECOFLO® Peat Filter at Sites in Virginia (as CFU/100 ml), N = 301

	Influent	Effluent	Removal (log)
Mean E. Coli	34,262	1,029	1.5
Median E. Coli	57,900	920	1.8
90% Confidence Limit	240,200	34,300	0.8

This is an impressive reduction in bacteria count, but does not meet the standard imposed for the entire process. Consequently, without UV or Chlorine disinfection, the peat filter effluent does not meet standards and the soil system is required to provide the additional treatment required to meet performance standards imposed through this protocol. See additional results from 12 inches of soil treatment where performance boundaries need to be and are met.

TSS: total suspended solids represent a good measure of the potential solids content in liquid applied to soils. High levels of solids in effluent tend to facilitate clogging of fine pores in soil and this results in some reductions in permeability. The peat filter affords excellent removal of TSS. Influent concentrations to the filter surface were measured as a mean of 34 mg/l. Effluent generated from the peat treatment unit contained a TSS level of mean value TSS of 6 mg/l and a median TSS of 4 mg/l. This skewness in the curve suggests that the peat filter typically generates a TSS value of 4 mg/l or less. This is critical when potential for soil clogging is considered. These low TSS values facilitate long term successful operation of the land based component of the system. No performance standard was established for Total Suspended Solids.

Nitrogen (as TKN and nitrate): The Total Kjeldahl Nitrogen (TKN) represents the sum of organic nitrogen and ammonium nitrogen in a sample. These forms of nitrogen convert to nitrate nitrogen when soil conditions are aerobic. Since aerobic soil conditions are a condition associated with siting an on-site wastewater system on a property, the organic nitrogen and ammonium contained in a sample will convert to nitrate. Treatment efficiency indicating the level of nitrogen transformation and potential removal for the peat filter is presented in Table 6, below.

Table 6: Median, Standard Deviation, and 90 % Confidence Limits for TKN and Nitrate in Influent to and Effluent from ECOFLO Peat Filter at Sites in Virginia (as mg/l), N = 80

	Influent	Effluent
Mean TKN and (SD)	51 (42)	10 (14)
Median TKN	42	4
90% Confidence	83	25
Mean NO_3 and (SD)	1 (1)	22 (17)
Median NO_3	1	21
90% confidence	1	48

The levels of nitrogen present in the treated effluent generated by the peat filter suggest significant nitrogen removal through the peat filter during the test period.

No nitrate nitrogen is expected in septic tank effluent. A detectable nitrate level in liquid applied to the filter would suggest intrusion of groundwater into the system. No evidence of elevated nitrate was observed in the testing. The elevated nitrate present in the peat filter effluent indicates that the filter is functioning as an aerobic treatment system. The conversion of the organic and inorganic nitrogen (as ammonium) to nitrate is expected in a properly functioning aerobic filter. The average nitrogen in the effluent is the combination of TKN and nitrate, the sum of these is the total nitrogen. The mean total nitrogen in the peat filter effluent was 32 mg/l and this represents a 38.5 % reduction in total nitrogen through the filter component of the system. This is a significant reduction in the nitrogen present in the liquid to be applied to the soil.

5.2 Soil Treatment System Performance

The ECOFLO® treatment system consists of a peat filter to condition liquid prior to discharge to the soil system. The soil serves as the final receiver for the liquid generated at the residential facilities examined in this study. The soil serves as a buffer between shallow groundwater and adjacent surface water. These elements of the aquatic environment constitute the final receiver for materials applied to land, but performance standards must be imposed where property owners can be held accountable for maintaining a mandated level of system performance.

The test protocol approved in 2003 established performance standards at a location 12 inches below the infiltrative surface separating the natural soil system from the ECOFLO® peat filter component. The filter system consisted of a fiberglass enclosure containing the peat filter media and a permeable infiltration bed placed on the soil surface. The compliance boundary for the treatment system was the soil solution 12

inches below the footprint of the ECOFLO® treatment unit. This performance allowed flow through only 12 inches of naturally unsaturated soil before compliance was imposed. Compliance at this boundary assures compliance further down gradient. A second sampling point was established 120 inches (10 feet) from this initial compliance boundary. This second sampling location was established to assure no potential for contamination down gradient from the system because of deep flow which may migrate below the initial compliance boundary and rise toward the soil surface down gradient of the system.

Samples of soil moisture were extracted from the sites utilizing suction lysimeters. These are standard monitoring devices for assessing performance of land based waste treatment systems. Parameters assessed to assure compliance at this treatment boundary were BOD_5 and Fecal Coliform Bacteria, Nitrate was established as a "monitor only" parameter.

BOD_5: The sample protocol required a BOD_5 of 30 mg/l at 12 inches below the infiltrative surface. In lieu of testing soil moisture levels where confounding parameters may skew results, the research team chose to sample effluent entering the soil system. The samples were collected at the discharge from the peat filter. The mean, median, and 90% confidence values for BOD_5 indicate that the performance standard was achieved over 90% of the time at the peat filter system boundary. The research team inferred that compliance at the filter discharge would result in compliance at the specified performance boundary. This performance level of 30 mg/l in the ECOFLO® peat filter effluent was achieved over 90% of the time during this study. The performance of the filter was discussed in the previous section.

Nitrate: Nitrate nitrogen levels of 10 mg/l or higher in groundwater violate the primary drinking water standard. Since untreated groundwater can be used as a source of drinking water, regulatory agencies have established the 10 mg/l level as a typical compliance value for land based wastewater treatment systems. Nitrate is formed as ammonium nitrogen which is biologically oxidized to nitrate. This biological conversion occurs in aerobic soil. The soil into which land based wastewater systems is placed must be aerobic in and around the zone of wastewater application. These aerobic conditions encourage formation of nitrogen.

Background nitrate levels were assessed at all facilities. These background levels represent the nitrate levels in areas uninfluenced by the wastewater system; areas located up-slope from the treatment system. Water flows along gravity gradients and

the liquid from these up-gradient wells will migrate toward the wastewater treatment system.

Nitrate and TKN concentrations in the shallow groundwater indicate excellent removal for nitrogen through the treatment process. Table 7, below summarizes the nitrogen levels in treatment units by soil resource group.

Table 7: Mean, Median, Standard Deviation and 90% Confidence Level for TKN and Nitrate in Lysimeters Installed in ECOFLO® Absorption Field (as mg/l) by Soil Resource Type

	L1	L2	L3 (Background)
Type 1 TKN Mean	3 (7)	4 (11)	2 (3)
Type 1 TKN Median	1	1	1
Type 1 TKN 90%	5	8	4
Type 2 TKN Mean	1 (2)	0.9 (1.2)	0.5 (0.6)
Type 2 TKN Median	1	0.3	0.3
Type 2 TKN 90%	3	3	1
Type 3 TKN Mean	6 (9)	3 (10)	1.0(1.4)
Type 3 TKN Median	1	1	0.4
Type 3 TKN 90%	21	2	3
Type 1 NO_3 Mean	7 (10)	3 (6)	4 (5)
Type 1 NO_3 Median	2	1	4
Type 1 NO_3 90%	21	13	10
Type 2 NO_3 Mean	6 (8)	4 (6)	2 (3)
Type 2 NO_3 Median	3	1	1
Type 2 NO_3 90%	19	10	6
Type 3 NO_3 Mean	2 (2)	1 (1)	2 (3)
Type 3 NO_3 Median	1	0.5	1
Type 3 NO_3 90%	6	3	3

The mean and median background nitrate levels from systems tested are 3 mg/l and 1 mg/l respectively. Peak nitrate values in selected residences are detected at levels as high as 20 mg/l. These background values violate the standards imposed in the testing. Assessment of the high nitrate levels associated with individual treatment systems correlate well with the high background levels observed for nitrate in selected systems. For example, the 21 mg/l nitrate levels observed in the Beatley system monitoring wells are located in an area with a background nitrate of 14.4 mg/l. Similarly, high background levels are associated with other excursions. This is discussed below.

Testing accomplished at the 12 inch compliance boundary indicates that the systems tested achieved this treatment standard. The mean and median nitrate nitrogen levels for all systems tested were 5 mg/l and 2 mg/l respectively. The 90% confidence limit was 19 mg/l. This suggests that, although the systems met the 10 mg/l limit imposed, the curve is skewed toward the higher levels. The higher levels of nitrate detected appear correlated slightly with the coarse textured sandy and loamy soils. This is consistent with potential for rapid movement of air into the soil profile to create air rich environments encouraging nitrification. The finer textured soils (clay loams and clays) do transmit air at slower rates and there is potential for denitrification in these finer textured soils. Consequently, the nitrate levels appear slightly lower in the heavier textured soils than the coarser textured materials.

Testing in the boundary located 120 inches (10 feet) down-gradient indicates that nitrate levels fall significantly. Mean and median nitrate levels in these down-gradient wells are 3 mg/l and 1 mg/l respectively. These levels are well within property boundaries and compliance is assured at property lines.

Levels of nitrate in the system monitoring wells at the Beatley residence, Pittman residence, Stephen Ford residence and Reed residence are associated with abnormally high levels of nitrate in the shallow groundwater up-gradient from the on-lot wastewater treatment systems. Adjusting the system monitoring levels by removing the background nitrate concentration results in compliance with treatment system standards at the Beatley residence, but not at others. Clearly, background nitrate does influence system performance and compliance.

Correlation between nitrate levels in shallow soil moisture samples does not appear correlated with ponding in the soil at the fringe of the system boundary. Examination of the nitrate levels and ponding depth does not appear to demonstrate a correlation between saturated soil and nitrate concentrations.

Statistical sampling suggests compliance with the nitrate requirement for groundwater. Mean and median values for nitrate are below the drinking water standard at the compliance boundary. Since nitrate was a “monitor only” parameter, no compliance with a performance standard is required, only compliance with federally mandated groundwater standards at groundwater.

Fecal Coliform Bacteria: Fecal Coliform bacteria are indicators of human fecal contamination. Levels of fecal coliform bacteria at the established compliance boundary located 12 inches below the infiltrative surface indicate excellent removal of this public

health indicator. The standard required a geometric mean of 10 CFU/100 ml and no single sample containing a coliform count in excess of 200 CFU/100 ml.

A performance standard was specified for Fecal Coliform bacteria in the shallow soil moisture. Table 8, below presents results from the Coliform testing by soil resource group.

Table 8: Mean, Median, Standard deviation and 90% Confidence Level for Coliform Bacteria in Lysimeters Installed in ECOFLO® Absorption Field (as CFU/100 ml) by Soil Resource Group

	L1	L2	L3 (background)
Type 1 Coli Mean	2	2	2
Type 1 Coli Median	2	2	2
Type 1 Coli 95%	2	2	2
Type 2 Coli Mean	2	2	2
Type 2 Coli Median	2	2	2
Type 2 Coli 95%	2	2	2
Type 3 Coli Mean	2	1	1
Type 3 Coli Median	2	1	2
Type 3 Coli 95%	2	2	2
Type 4 Coli Mean	1	1	2
Type 4 Coli Median	1	1	2
Type 4 Coli 90%	2	2	2

Examination of the monitoring data indicates most samples contain a Coliform level of 1 CFU/100 ml to 2 CFU/100 ml. The highest level detected reliably was 170 CFU/100 ml. Coliform counts reported in excess of the target performance standard are associated with sampling or laboratory problems (field collection notes are available upon request). Re-sampling at those residential facilities where excursions from the Coliform standard were present indicate compliance.

Soil systems are effective in removing coliform bacteria. The processes critical to coliform bacteria attenuation ongoing in the soil environment include physical separation or filtering which separate bacteria from the soil solution. This facilitates the biological processes required for attenuation of bacteria and includes natural die-off, predation, and consumption. Bacteria and other microorganisms present in human waste and potentially threats to public health and environmental quality are most suited for survival in the human host. Moisture levels, temperature, food supply, and lack of predators render the human digestive system an ideal host for these

microorganisms. When discharged into the environment, bacteria and other microorganisms that populate the human gut encounter conditions very hostile for their survival. The soil system typically provides a 2 to 3 log reduction in bacteria count per foot of soil material through which wastewater moves. The reductions encountered at the 12 inch level are comparable to those achieved as septic tank effluent moves through an equivalent of 2 to 3 feet. The ECOFLO® treatment system serves as a surrogate for soil where high levels of bacterial attenuation are required and limited soil exists to provide this desired result.

Bacteria levels in the septic tank effluent tested in this study ranged widely through the study. Bacteria levels as low as 280 counts/100 ml were reported in the septic tank effluent testing. These low values are atypical of domestic wastewater. Higher values reported as 200,000 to 1,000,000 counts/100 ml are more representative of domestic wastewater. The peat treatment unit reduced these bacteria levels by 90% to 99% (1 to 2 log reduction). The soil system reduced these bacteria concentrations by an additional 99.9%. This is equivalent to a 5 or 6 log reduction in bacteria levels through the ECOFLO®/soil system. The system is defined as the peat filter unit, a permeable infiltration layer below the filter, and 12 inches of natural soil. This combination results in excellent treatment. The performance standard imposed at commencement of this study was achieved at the designated performance boundary. Coliform bacteria removal was demonstrated successfully at the 20 systems tested in Virginia.

Process indicator assessments: process indicators include measures that can be taken instantly at a site. These represent real time indicators for system performance. The most common of the process indicators assessed are flow, pH, dissolved oxygen (D.O.), and conductivity. Wastewater flow from each of the facilities was measured with a metered tipping bucket. The mean and median wastewater flows to the systems tested were 156 and 127 gallons per day respectively. These are generally low flows for residential facilities. The skewness of the data suggests that the flows tend to be more conservative than typically utilized for design of residential wastewater systems.

The wastewater flows at Pride of Virginia (B) are higher than design. These high wastewater flows may account for the deviations in treatment efficiencies noted at this facility. The BOD_5 levels in several of the monitoring events reflect values higher than collected at facilities with lower flows. This process indicator could be used as a surrogate to assess system performance. When flows are in excess of those planned, treatment efficiency often declines.

Supplemental Monitoring – Phosphorus: phosphorus is a parameter of emerging environmental concern. Samples from selected systems were collected quarterly for the

first year to measure total phosphorus levels in liquid discharged to the filter, the peat filter effluent, and the shallow soil solution**.** Phosphorus levels detected in the septic tank effluent applied to the peat treatment units ranged from 2.8 mg/l to 5.5 mg/l. The peat filter reduced these influent concentrations to 2.3 mg/l to 5.0 mg/l. This is approximately a 10 % reduction through the peat filter. Samples of the soil moisture removed at lysimeter 1 typically contained a total phosphorus level of between 0.3 and 0.6 mg/l. This indicates that the soil system is an excellent medium for attenuating phosphorus. This phosphorus attenuation potential will become more critical if eutrophication of surface waters becomes an issue of local concern.

The highest level of phosphorus attenuation was achieved in the loamy (Type 2) and finer textured (Type 3 and 4) soils. Significant phosphorus attenuation was achieved as clay content increased. Phosphorus removal in the Type 2, 3, and 4 soils was typically 90%. The sandy group 1 soils exhibited less potential to remove phosphorus. Data from the Beatley site indicated a phosphorus level of 3.6 mg/l in the liquid applied to the filter, a phosphorus level of 3.3 in the peat filter effluent suggesting a reduction of 8% through the filter and a level of 0.6 mg/l in the soil solution. This is equivalent to a reduction in phosphorus of 83.3 % through the ECOFLO/soil system. The Beatley site was the only group 1 site tested. Results from all sites are presented as an attachment to this report (Appendix B).

6 CONCLUSIONS

Performance standards were imposed on the ECOFLO® treatment system for Biochemical Oxygen Demand and Fecal Coliform bacteria. Monitoring data indicates that the systems assessed met the treatment standards imposed over 90% of the time. No reliability was imposed in the protocol and the 90% confidence level is generally considered stringent.

The performance level imposed for BOD_5 at the interface between the man-made environment and the soil infiltrative surface was established as 30 mg/l. This treatment level was achieved. This parameter was measured at the discharge from the peat filter.

The limit for coliform bacteria established at a depth of 12 inches below the infiltrative surface was 10 counts or colony forming units (CFU)/100 ml with no sample exceeding 200 CFU/100 ml. This treatment level was achieved.

A "monitor only" standard was imposed for the nitrogen series as TKN and NO_3. An additional nutrient parameter was added by the researcher. Shallow groundwater monitoring indicates that nitrogen removal achieved shallow groundwater levels of nitrate and TKN near 2 mg/l. This meets drinking water standards. Supplemental monitoring indicated excellent removal for phosphorus. Total phosphorus levels in shallow groundwater samples never exceeded 0.6 mg/l.

Based on a review of the data collected, the systems installed in Type 1, 2 and 3 soils achieved the performance levels established in the test protocol. For Type 4 soil, monitoring is ongoing according to protocol.

Respectfully Submitted;

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Biological and Agricultural Engineering
North Carolina State University

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APPENDICES

A – Data table
B – Phosphorus results table

2008 OOWA Conference

New technology/approach for phosphorus removal

Roger Lacasse, PE, M.A.Sc.

Huntsville, 2008 March 3rd

Premier Tech Environment

PRESENTATION PLAN

- Introduction
- Description of the study done with Ecoflo® Biofilter
- Summary of the results
- Discussion
- Conclusion

INTRODUCTION

Phosphorus is emerging as a water quality concern in many freshwater systems

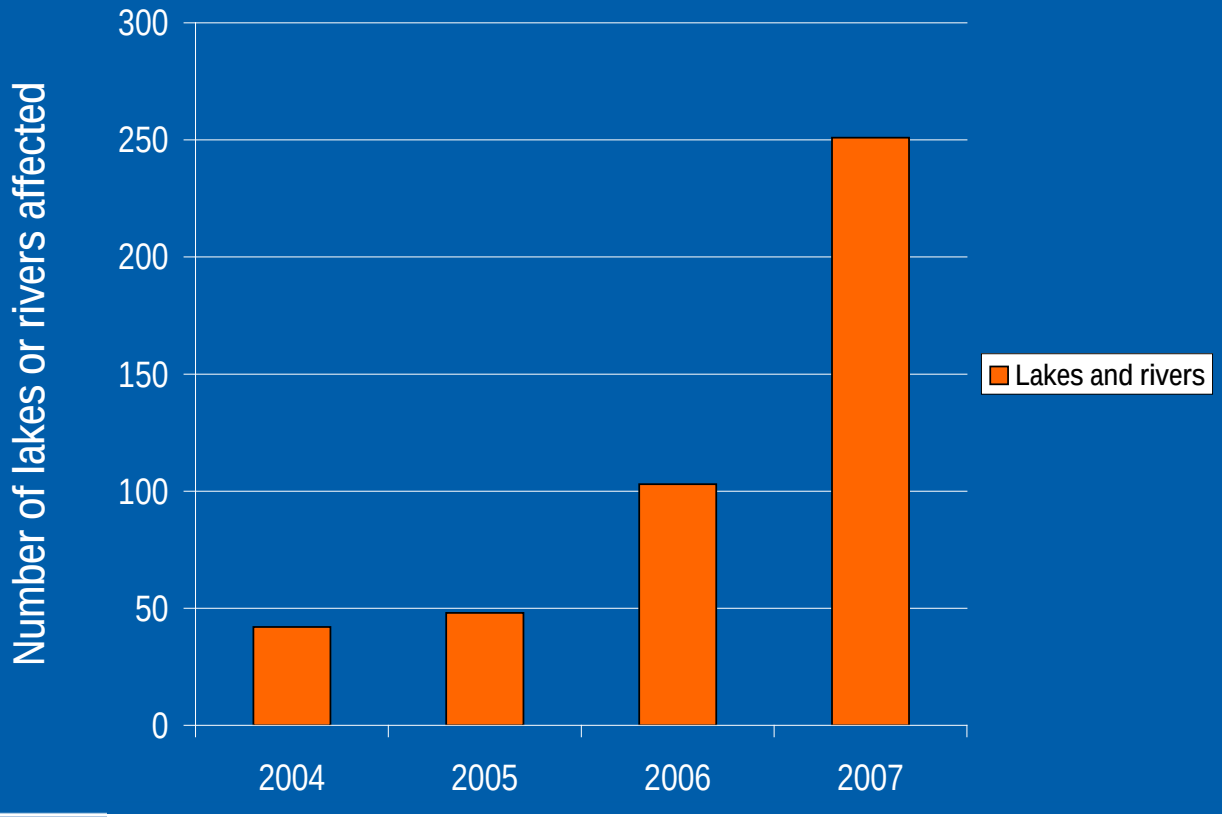
Eutrophication of surface waters becomes an issue

More and more lakes are affected by blue algae bloom (cyanobacteria)

INTRODUCTION

The blue algae problem is growing fast in many locations

Province of Quebec



Premier Tech Environment

INTRODUCTION

There are many causes for observed increase of blue algae problem. The main ones are:

- Growing population around lakes and along rivers (increase of phosphorus discharge)
- Agriculture activities and Golf courses (application of fertilizers contaminating surface and groundwater)
- Failed septic systems

INTRODUCTION

- Septic systems represent only a part of the Phosphorus problematic associated to blue algae
- But reduction of Phosphorus from septic system is important:
  - easier to have at short term a positive impact on water quality of lakes compare to the agriculture problematic
- Since 2003 we evaluated the potential of Ecoflo® Biofilter combined with native soil for Phosphorus removal

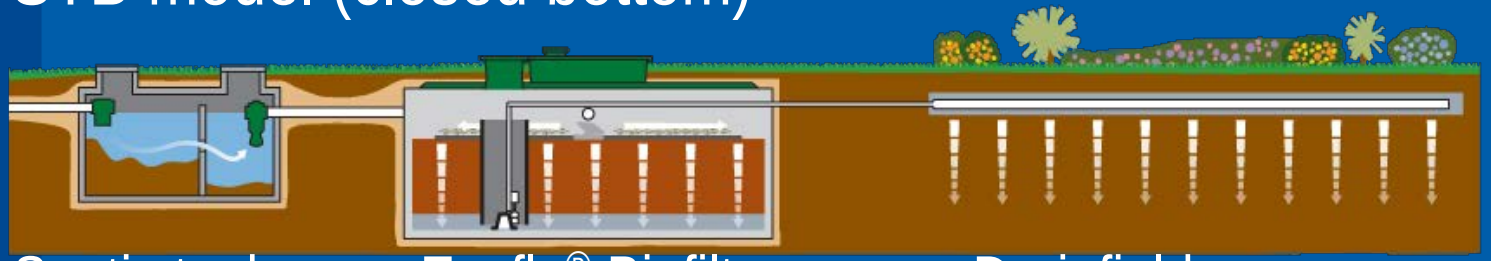
STUDY DESCRIPTION

- Third party study performed in Virginia from 2003 to 2007 to evaluate the performance of the Ecoflo® Biofilter combined with 30 cm of native unsaturated soil
- Study protocol developed for the approval process of Ecoflo® technology in Virginia
- Study conducted by Dr A. Robert Rubin, professor emeritus of North Carolina State University

STUDY DESCRIPTION

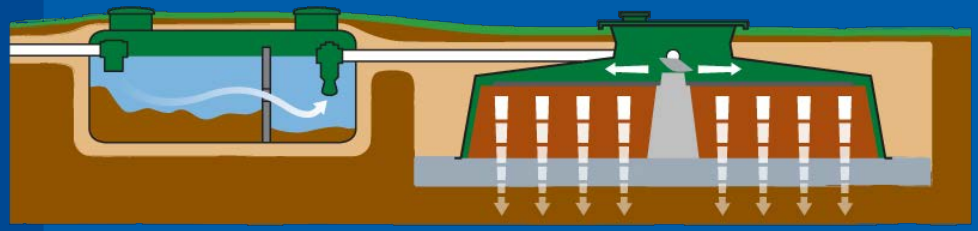
Ecoflo® technology

STB model (closed bottom)



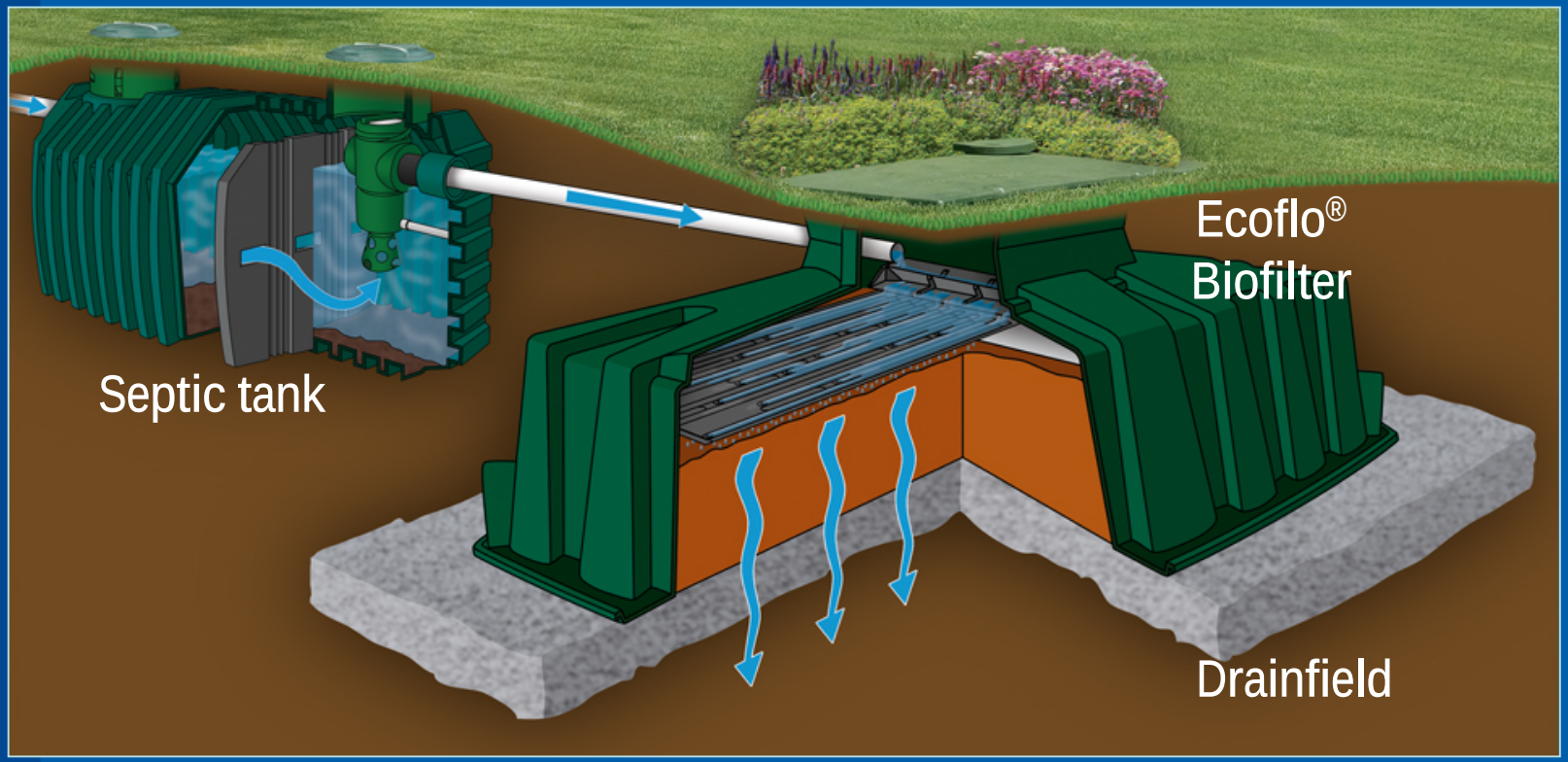
Septic tank ➔ Ecoflo® Biofilter ➔ Drainfield

ST model (open bottom)



STUDY DESCRIPTION

Ecoflo® technology



STUDY DESCRIPTION

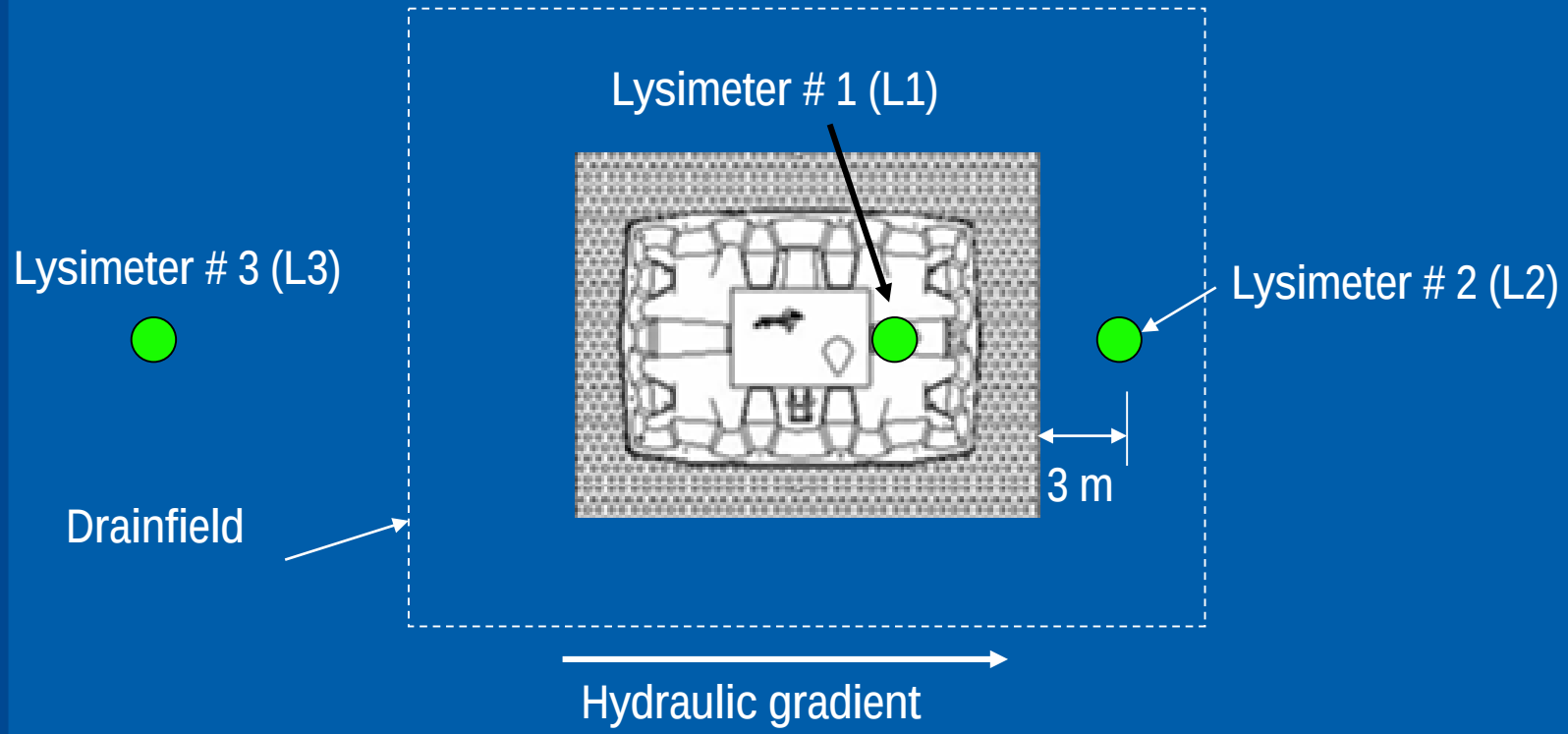
- Performance evaluation of 20 ST or STB-650 Ecoflo® models at residential facilities installed in Type I, II, III and IV soils

Soil type	Permeability (min/cm)
I	≤ 6
II	> 6 et ≤ 18
III	> 18 et ≤ 35
IV	> 35 et ≤ 47

- 18 systems installed in Type I, II and III soils were each monitored for a period of 18 months
- 2 systems installed in Type IV soil were monitored for 16 and 8 months and testing is ongoing

STUDY DESCRIPTION

- Testing setup at each residential facility
- 3 suction lysimeters installed at 30 cm deep in native soil



STUDY DESCRIPTION

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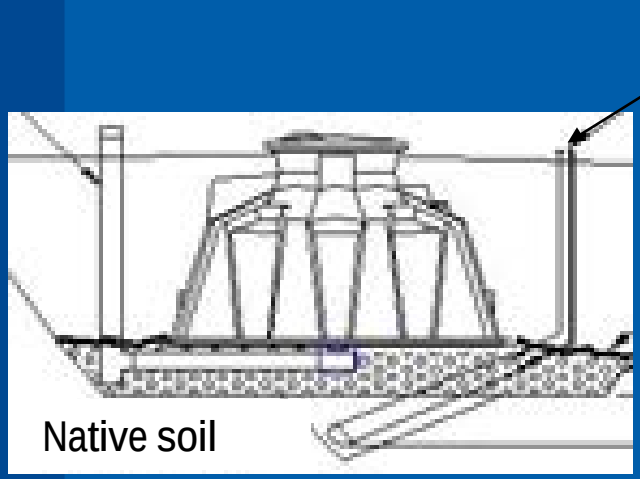
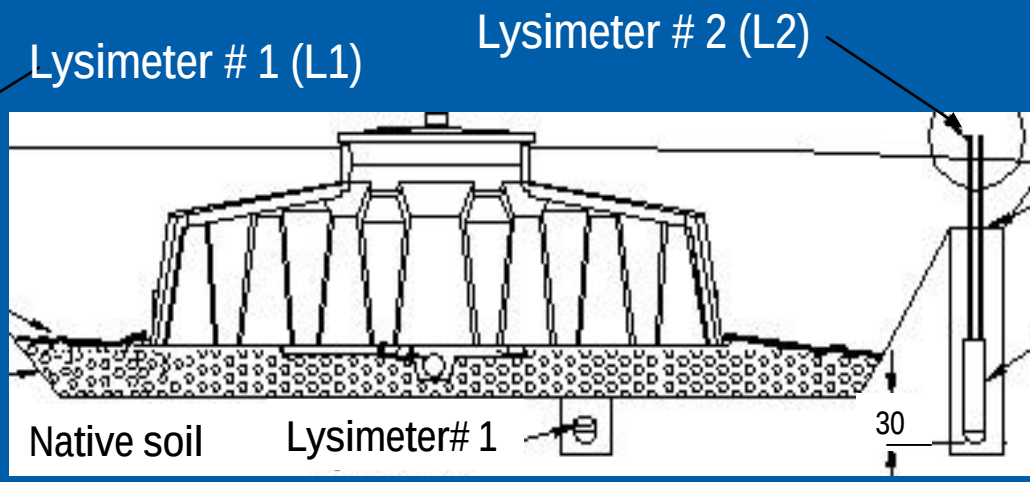
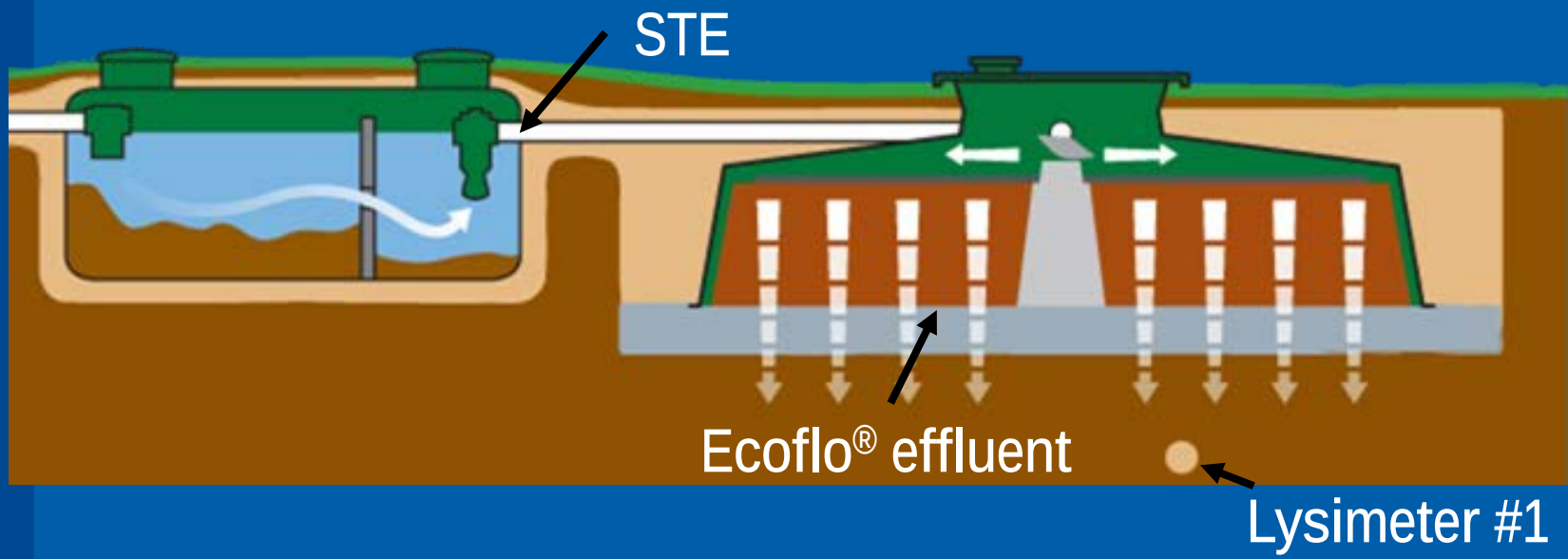




Side View

STUDY DESCRIPTION

Main sampling points



- Monthly sampling at each site
- TSS, BOD_5, TKN, NO_2-NO_3, Fecal Coliform and TP
- No TSS and BOD_5 analysis at Lysimeter #1

RESULTS

Daily flow rate

- Average flow rate of 590 L/d (equivalent to flow produced by the average family size in Canada: 2,3 pers. x 270 L/pers-d)
- 90% of daily flow rate measured ≤ 940 L/d
- Some systems were abused with daily flow rates up to 3000 L/d (ST or STB-650 Ecoflo® model design flow rate of 2000 L/d)

RESULTS

TSS and BOD_5

Virginie (n = 337)

Parameter	STE	Ecoflo® effluent
TSS (mg/L)	34 ± 23	6 ± 7
BOD_5 (mg/L)	186 ± 113	8 ± 8

Other results – Ecoflo® Effluent (n = 40 to 163)

Parameter	PTE (11 years)	CSTB	BNQ	NSF
TSS (mg/L)	4 ± 3	5 ± 4	2 ± 0,2	2 ± 0,7
BOD_5 (mg/L)	5 ± 5	3 ± 2	2 ± 0,4	2 ± 0,3

RESULTS

Total Nitrogen, Phosphorus and Fecal Coliform

Parameter	STE	Ecoflo® Effluent	L1	Reduction
Total N (mg/L)	45 ± 24	32 ± 18	7 ± 9	84%
Total P (mg/L)	**5,9 ± 0,9**	**5,2 ± 0,9**	**0,12 ± 0,04**	**98%**
F.C. (CFU/100 mL)	34 262	1 029	< 2	4,2 log

n = 76 for Total N, 15 pour Total P and 336 for F.C.

Background (L3): Total N = 4 ± 4 mg/L

F.C. during BNQ testing: 1,6 x 10^6 at inlet and 1250 at Ecoflo® treated effluent

DISCUSSION

Impact of results

- Ecoflo® Biofilter combined with 30 cm of native soil provides high quality treated effluent for all parameters
- Points out the importance to reserve the native soil for polishing high quality effluent (Tchobanouglos, 2003)
- How can we explain the « Ecoflo® Biofilter + 30 cm of soil » performance?
- What are the conditions to assure long term performance?

DISCUSSION

Phosphorus removal

- Based on existing literature, phosphorus is mainly retained in the soil by P adsorption on Fe et Al naturally existing in soil

- Pellerin et al. (2006), demonstrated that native soil (first 70 to 80 cm from the surface) can be grouped in 3 classes regarding their capacity to retain P:
  - low capacity: 1,46 gP/kg of soil
  - medium capacity: 3,04 gP/kg of soil
  - high capacity: 5,66 gP/kg of soil

  Based on 275 soil samples covering 75 different series of soil

DISCUSSION

Phosphorus removal

- Pellerin et al. (2006), establish the following equation to evaluate the soil capacity for Phosphorus removal

$$C_P = \alpha_m \times (Fe_{ox} + Al_{ox})$$

α_m correspond to 0,5

$Fe_{ox} + Al_{ox}$ = concentrations of Fe and Al (oxalate)

- The soil capacity to retain P is not related to permeability
- Virginia study results showed the soil had an average capacity to retain P of 3 gP/lkg of soil

DISCUSSION

Phosphorus removal

- To use this soil capacity to retain Phosphorus, there are some specific conditions to maintain:

  - infiltration of high quality treated effluent with low variation to avoid soil clogging
  - maintain high redox potential in the soil (aerobic conditions) to assure stable reaction with Fe
  - avoid saturation of infiltration zone in all conditions (high seasonal water table, hydraulic peak)

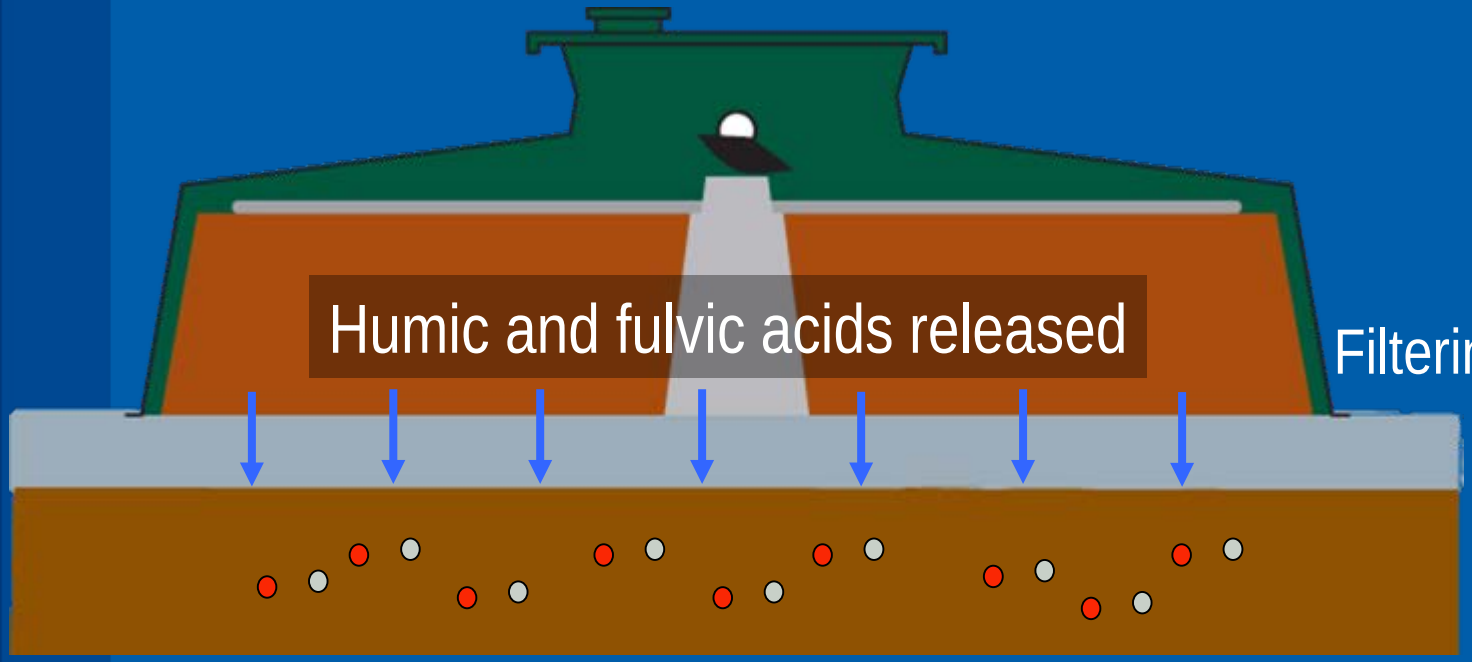
DISCUSSION

Phosphorus removal

The Ecoflo® effluent characteristics contributes to the high performance observed

1- The Ecoflo® filtering media is based on peat. Similar to soil humus, water percolating through the peat bed gradually leaches some components which increase the Fe and Al availability in the soil to react with Phosphorus

DISCUSSION



Effects on soil to increase Fe and Al availability to react with phosphorus

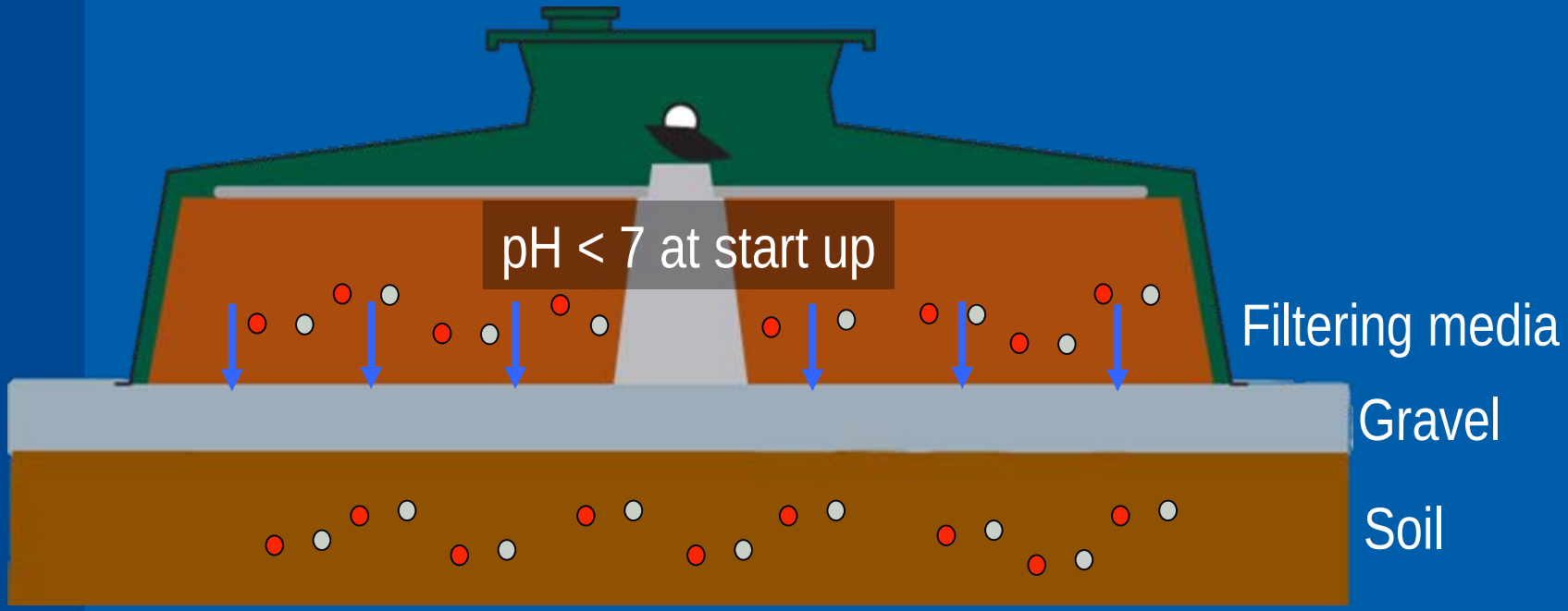
DISCUSSION

Phosphorus removal

The Ecoflo® effluent characteristics contributes to the high performance observed

2- Like all natural soils, peat contains naturally Fe and Al which are released in the Ecoflo treated effluent contributing in this manner to increase Fe and Al concentration in native soil to react with phosphorus

DISCUSSION



Iron and Aluminium addition in the soil increase soil capacity to retain Phosphorus

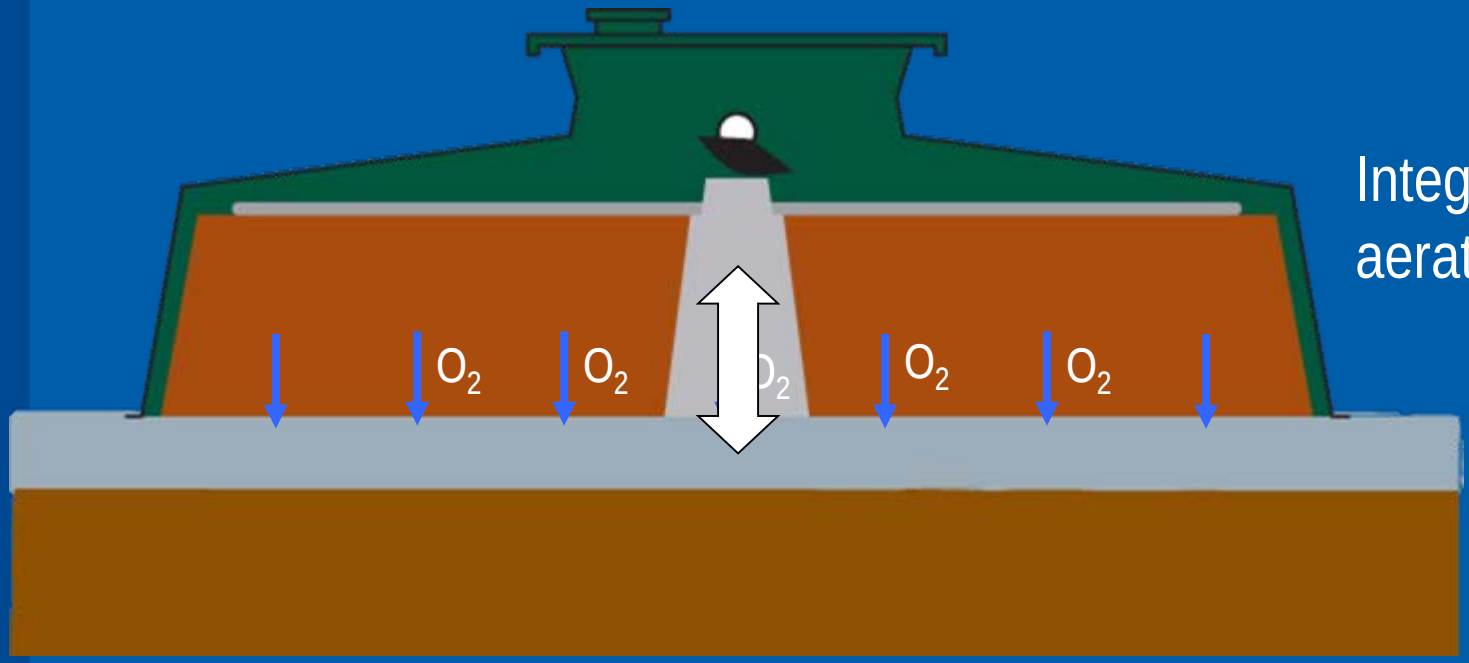
DISCUSSION

Phosphorus removal

The Ecoflo® effluent characteristics contributes to the high performance observed

3- The peat has a high capacity to retain water (like a sponge) that contributes to regulate the treated effluent flow rate applied on the soil (avoids soil saturation and allows aeration)

DISCUSSION



Integrated aeration

Application of treated effluent on soil by pulse wetting / draining cycle → soil aeration

DISCUSSION

Phosphorus removal

The Ecoflo® effluent characteristics contributes to the high performance observed

4- High stability of Ecoflo® Biofilter performance in any conditions to avoid premature soil clogging and assure long term soil performance

- *Secondary home (used 2-3 days per week)*
- *Cottage*
- *High occupancy (permanent and secondary homes)*

DISCUSSION

The high stability of Ecoflo® Biofilter performance is demonstrated

- *Veolia Water have been testing in France 8 different onsite wastewater treatment technologies since 2006*

- *Some technologies are based on filter or biofilter including Ecoflo® and others do not include filter*

DISCUSSION

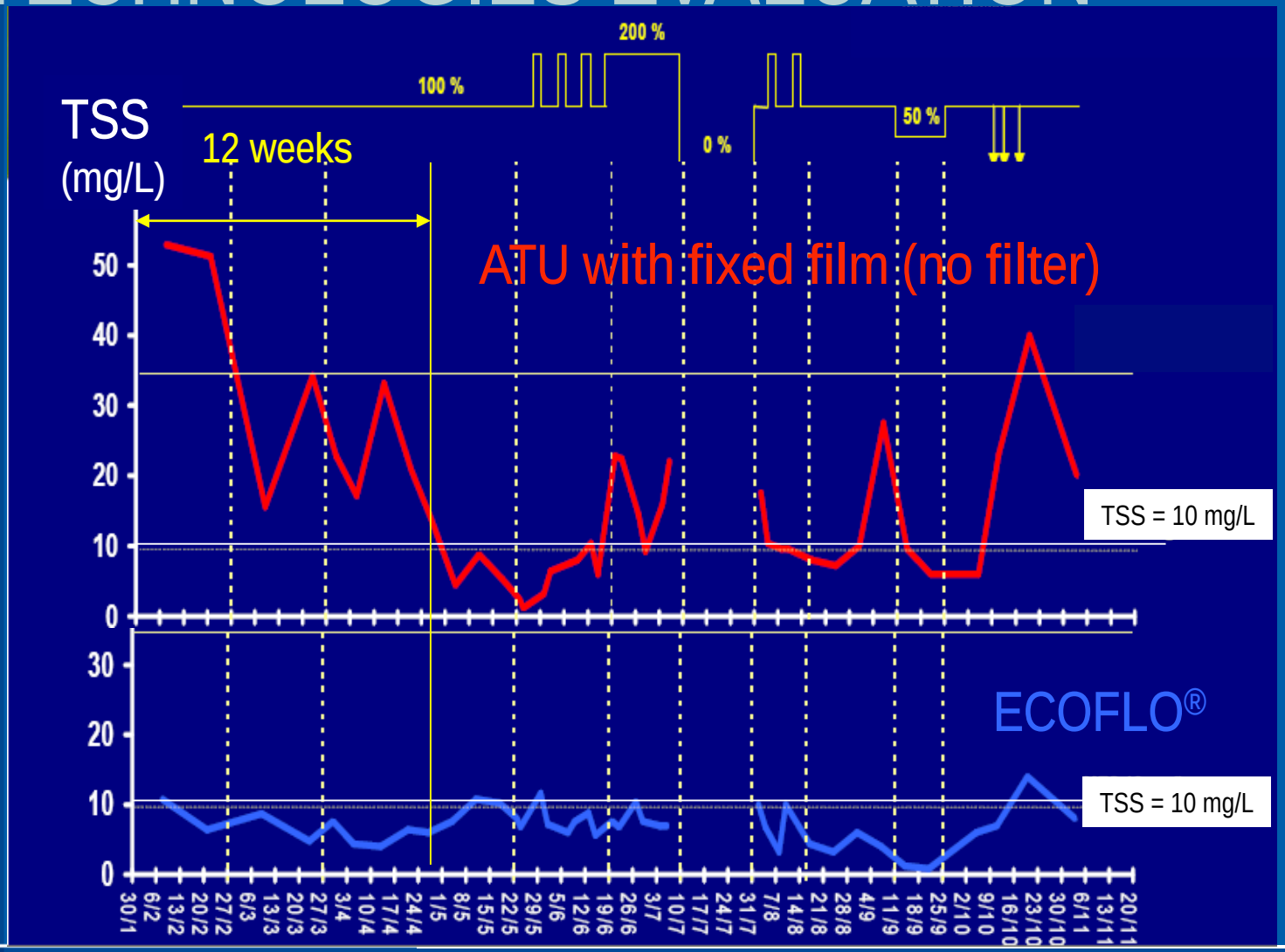
- The Veolia Water testing protocol (40 weeks) takes into account variations observed in secondary home, cottage and more in more in permanent home:

  - 5 weeks of high occupancy during week end (3d)
  - 3 weeks of vacation
  - high occupancy for 3 weeks (holiday at cottage)
  - 2 weeks of low occupancy (50%)
  - 3 power failure days (system fed during shutdown)

TECHNOLOGIES EVALUATION

Technologies	TSS (mg/L)	BOD_5 (mg/L)
Ecoflo® Biofilter	**7 ± 3**	**5 ± 3**
Sand Filter	7 ± 6	6 ± 4
Textile Filter	13 ± 11	8 ± 3
Zeolith Filter	14 ± 9	11 ± 5
Reduced sand filter size with gravelless distribution system	15 ± 10	13 ± 9
Aerobic treatment system with submerged fixed film	16 ± 12	19 ± 9
Aerobic treatment unit without fixed film media	40 ± 30	45 ± 33
Constructed Wetland	36 ± 10	60 ± 23

TECHNOLOGIES EVALUATION



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DISCUSSION

- The previous results clearly demonstrate that the Ecoflo® Biofilter assure soil protection from clogging with low TSS variations at treated effluent in all conditions (high occupancy, intermittent flow, power failure)

Wastewater treatment system based on FILTER = protection of soil for long term phosphorus removal

DISCUSSION

How long the soil can remove phosphorus?

Evaluation of phosphorus contained in treated effluent:

- Home occupancy: based on Canada Census 91% of family count 5 persons or less
- Residence type : permanent, secondary or seasonal home
- Based on USEPA the average daily production of Phosphorus corresponds to 1,5 g/person (including impact of phosphate free soap)

DISCUSSION

Soil capacity:

- amount of soil used (infiltration surface x soil thickness)
- soil class: 1,5 to 5,7 g P/kg of soil

Based on actual configuration of Ecoflo® Biofilter and taking into account the previous factors:

Soil can retain Phosphorus for a minimum of 20 years in most of the applications without considering the contribution of peat filtering media (soil conditioning and Fe / Al release in soil)

CONCLUSION

- The Virginia and Veolia studies indicate a very positive potential of « Ecoflo® Biofilter combined with 30 cm of soil » to remove Phosphorus on a long term basis and to reduce Nitrogen and Fecal Coliform below the usual discharge criteria
- The Veolia results clearly demonstrate the performance stability of a treatment system based on a FILTER like Ecoflo® Biofilter which allows for soil protection in all conditions
- R&D projects are continuing to test & optimize the approach

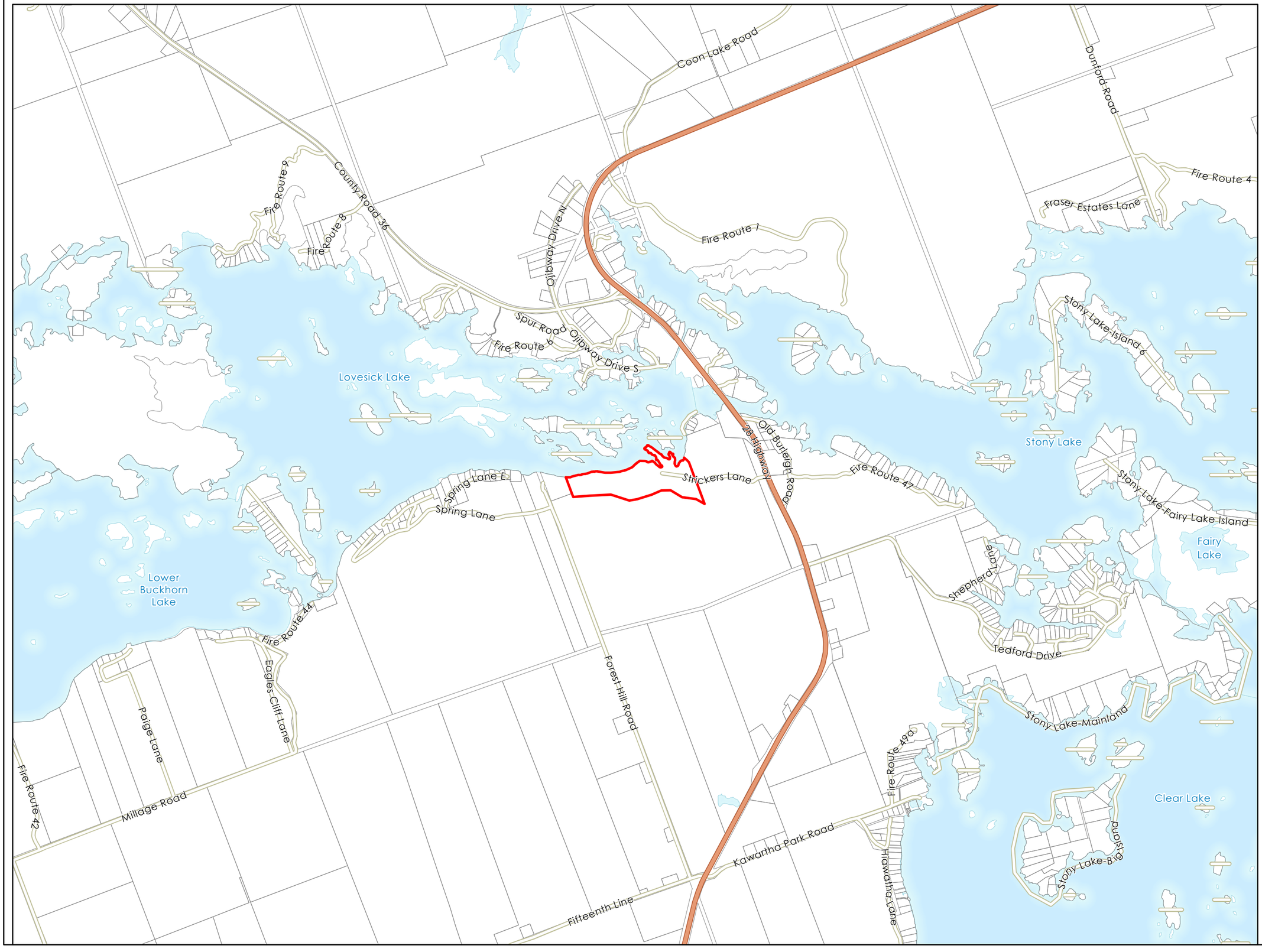
Questions ?

1-800-6ECOFLO

www.ptenv.com

Appendix E

Public Open House Material



LOCATION MAP

3340 Strickers Lane, Burleigh Falls
Part of Lots 43 & 44,
Concession 16 (Smith)
Township of Selwyn
County of Peterborough

Legend

Subject Property

Kilometers

0 0.25 0.5 1

NAD83 CSRS98 UTM zone 17N 1:20,000

Data Sources

County of Peterborough Public Online GIS: https://www.ptbocounty.ca/en/living/let-me-map.aspx

Created In:	ArcMap 10.7
Drawn By:	JW
Checked By:	AT/DK
Map Date:	5/02/23
Project Number:	10844
Map File Number	Number

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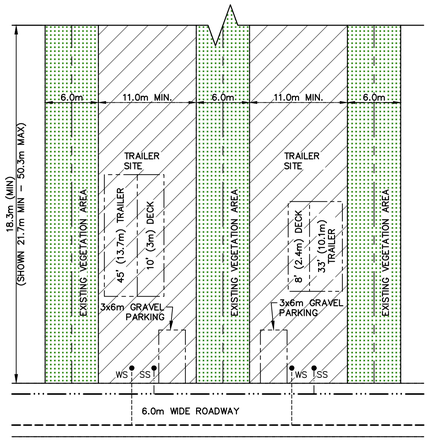
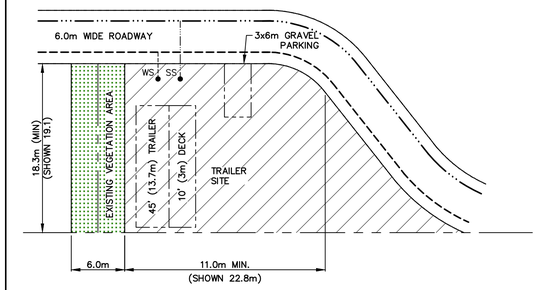
E. wills@dmwills.com



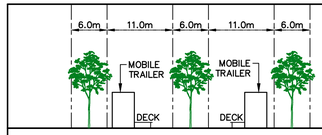
TYPICAL LOT AREAS		
LOT SUMMARY	DIMENSIONS	AREA
MINIMUM LOT BY ZONING	11m x 18.3m	201.3m²
MINIMUM LOT PROVIDED	13.2m x 21.7m	286.4m²
MAXIMUM LOT PROVIDED	13.3m x 50.3m	668.99m²

TYPICAL FRONT LOT – PLAN

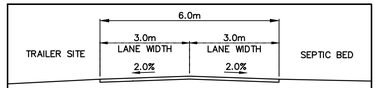


LOT AREA		
LOT SUMMARY	DIMENSIONS	AREA
MINIMUM LOT BY ZONING	11m x 18.3m	201.3m²
LOT PROVIDED	19.1m x 22.8m	533m²

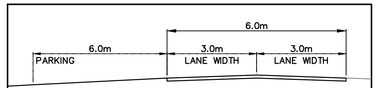
TYPICAL REAR LOT (40) – PLAN



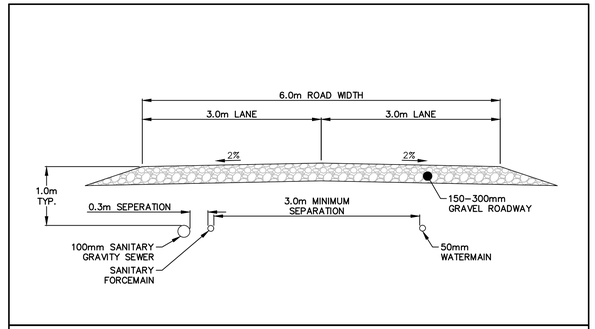
TYPICAL LOT – SECTION



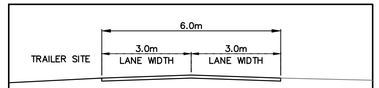
SECTION A–A



SECTION B–B

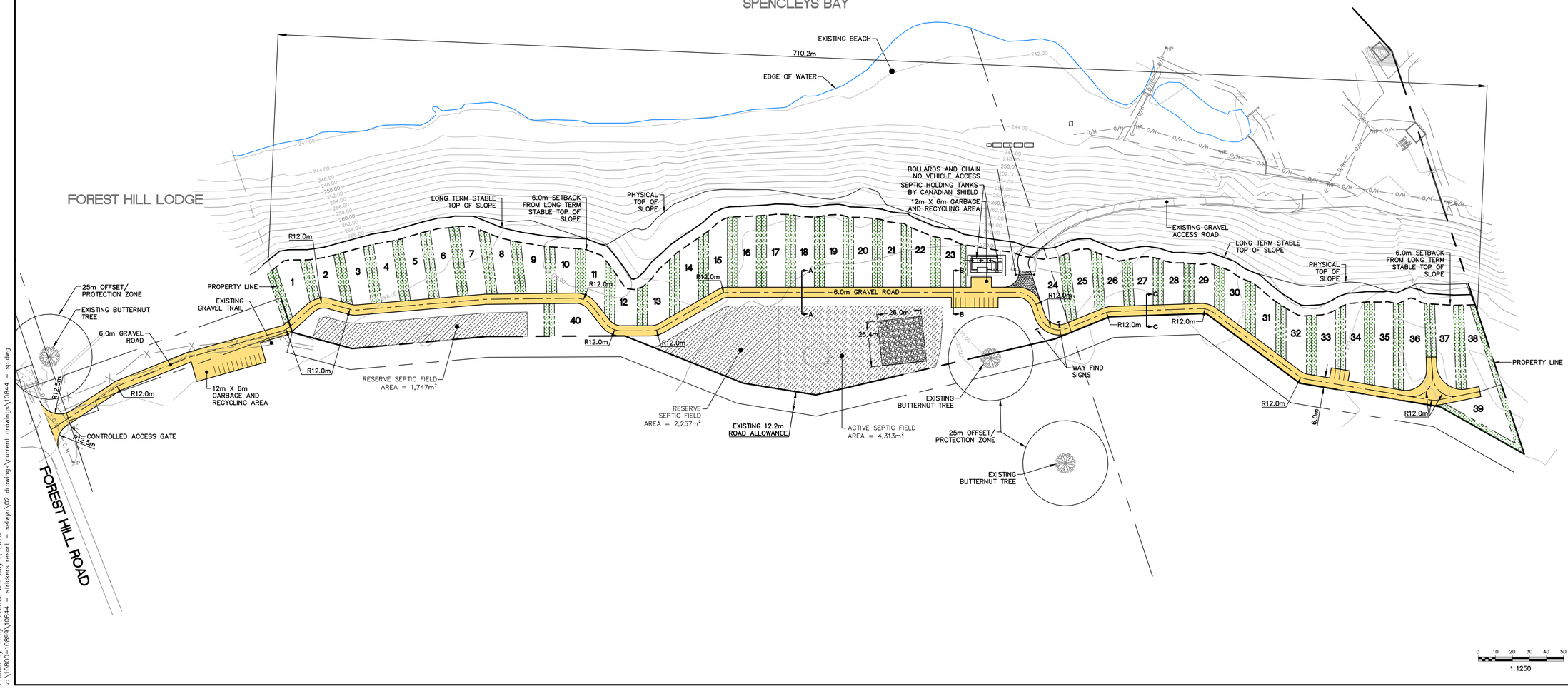


TYPICAL ROAD CROSS SECTION



SECTION C–C

SPENCLEYS BAY



0 10 20 30 40 50
1:1250

TRUE NORTH

KEY PLAN

REVISIONS

No.	Description	Date
1	ISSUED TO MECP	04/26/23

METRIC — Dimensions are in METRES and/or MILLIMETRES unless otherwise shown

LEGEND — TO BE READ IN CONJUNCTION WITH OPSD 100 SERIES

- PROPOSED GRAVEL ROAD
- PROPOSED ACTIVE SEPTIC FIELD
- PROPOSED RESERVE SEPTIC FIELD
- SERVICE ACCESS ROAD
- EXISTING VEGETATION AREAS
- PR. ROAD CL
- PR EDGE OF ROAD
- EX R.O.W/PROPERTY BOUNDARY
- PR. LOT LINE
- LONG TERM STABLE EDGE OF SLOPE
- 6.0m SETBACK FROM LONG TERM STABLE EDGE OF SLOPE
- TOP OF SLOPE

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F. 705.748.9944
E. wills@dmwills.com

Project Name/Location

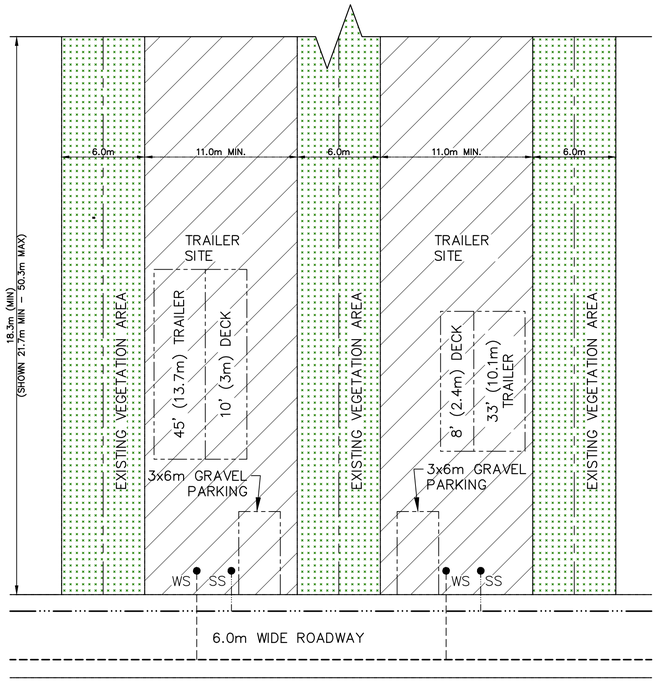
LOVESICK LAKE TRAILER PARK

BURLEIGH FALLS, ONTARIO

Drawing Title

OVERALL SITE PLAN

Drawn By: SER	SCALE: Horz. 1:1250 Vert. –		
Designed By: SER	Plot Date: May 2, 2023		
Checked By: JDF	Project No.: 19–10844	Sht. No.:	
Engineer: –––	Dwg File No.: 10844 – SP	1	



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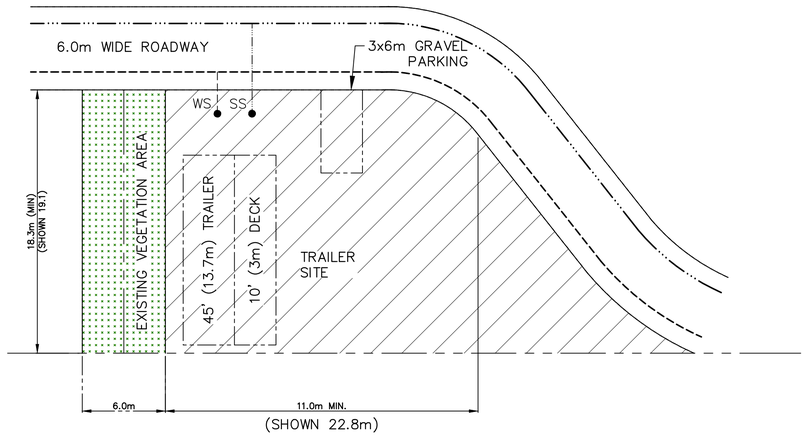
TYPICAL FRONT LOT – PLAN



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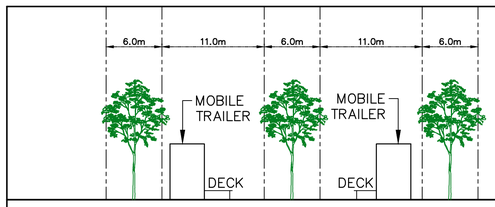
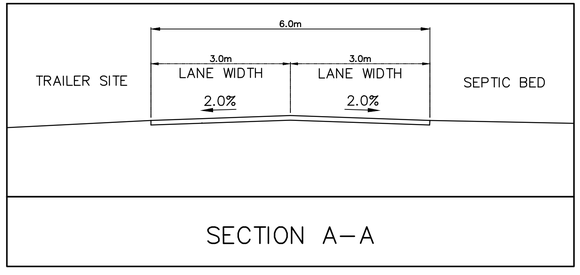
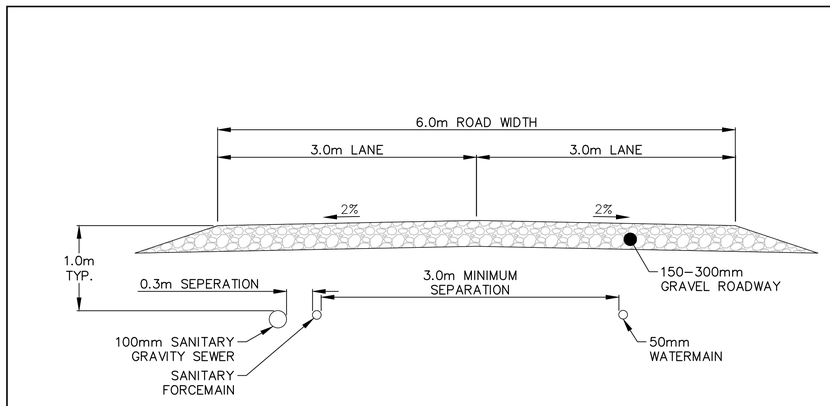
TYPICAL REAR LOT (40) – PLAN



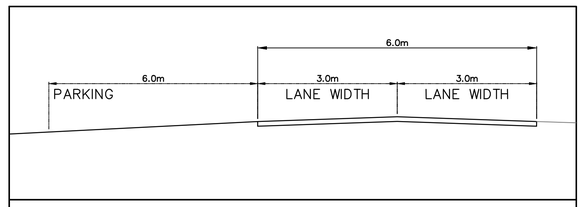
TYPICAL LOT – SECTION



SECTION A–A



TYPICAL ROAD CROSS SECTION



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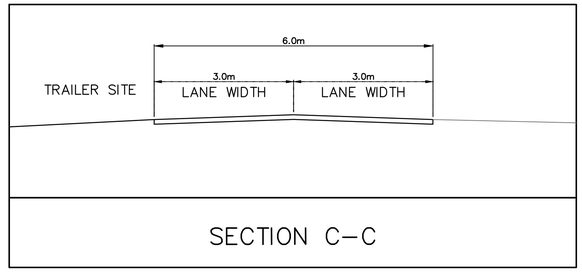

SECTION C–C

TRUE NORTH

KEY PLAN

REVISIONS

No.	Description	Date
1	ISSUED TO MECP	04/26/23

METRIC Dimensions are in METRES and/or MILLIMETRES unless otherwise shown

LEGEND TO BE READ IN CONJUNCTION WITH OPSD 100 SERIES

- EXISTING VEGETATION AREAS
- HABITABLE TRAILER LOT AREA
- PR. ROAD CL
- PR EDGE OF ROAD
- EX R.O.W./PROPERTY BOUNDARY
- PR. LOT LINE
- PR. SANITARY SEWER
- PR. DOMESTIC WATER PIPE
- WS — DOMESTIC WATER SERVICE
- SS — SANITARY SERVICE

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Canada K9J 0B9

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F. 705.748.9944
E. wills@dmwills.com

Project Name/Location

LOVESICK LAKE TRAILER PARK

BURLEIGH FALLS, ONTARIO

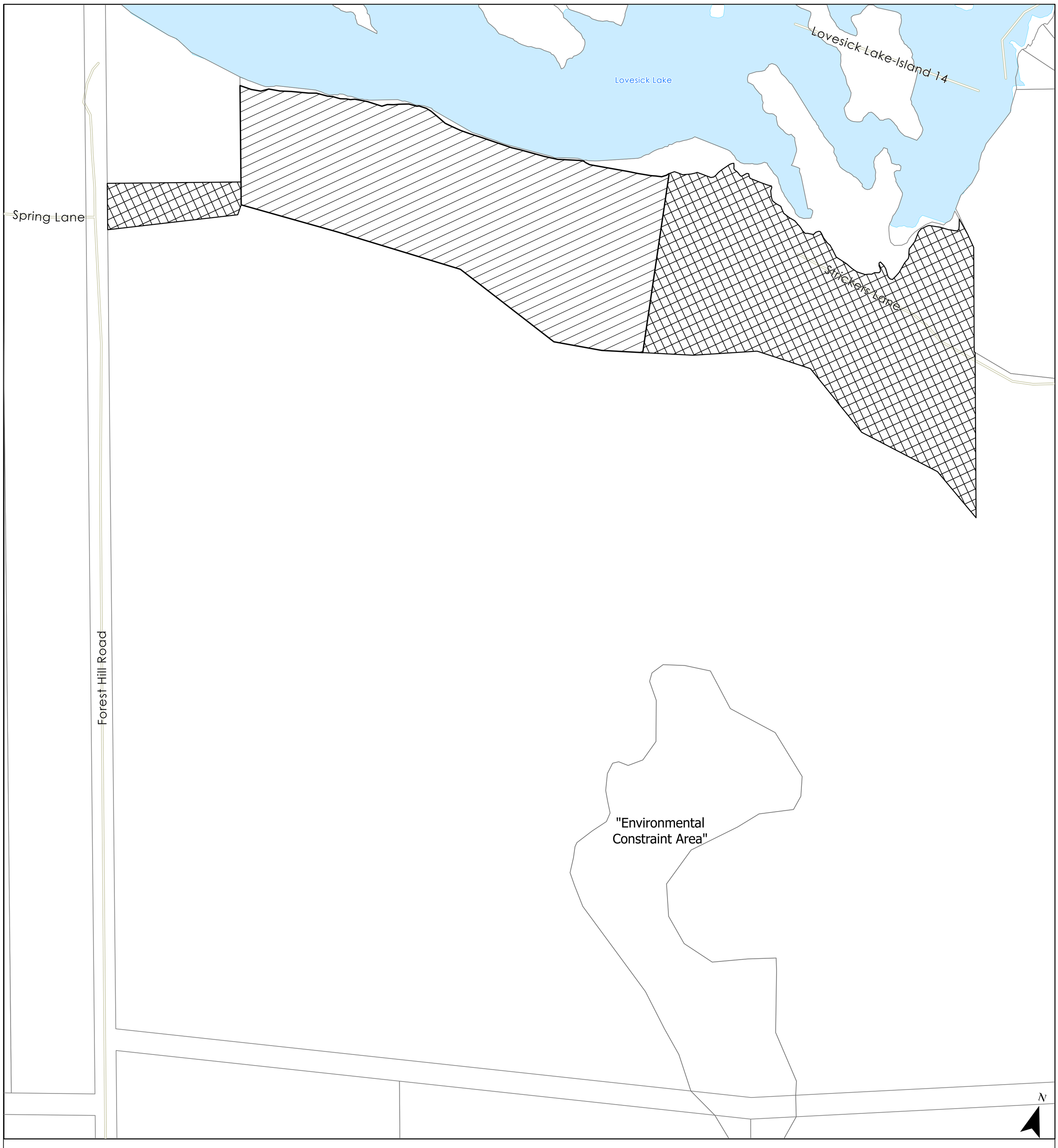
Drawing Title

TYPICAL LOT LAYOUT AND SECTIONS

Drawn By: SER	SCALE: Horz. N.T.S. Vert. –	
Designed By: SER	Plot Date: May 2, 2023	
Checked By: JDF	Project No.: 19–10844	Sht. No.:
Engineer: ---	Dwg File No.: 10844 – LL	1

SCHEDULE 'A' TO AMENDMENT No. ___

TO THE TOWNSHIP OF SELWYN OFFICIAL PLAN



Legend

Lands to be re-designated from "Rural" to "Trailer Park"

Lands to be re-designated from "Seasonal Residential" to "Trailer Park"

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LOVESICK LAKE TRAILER PARK

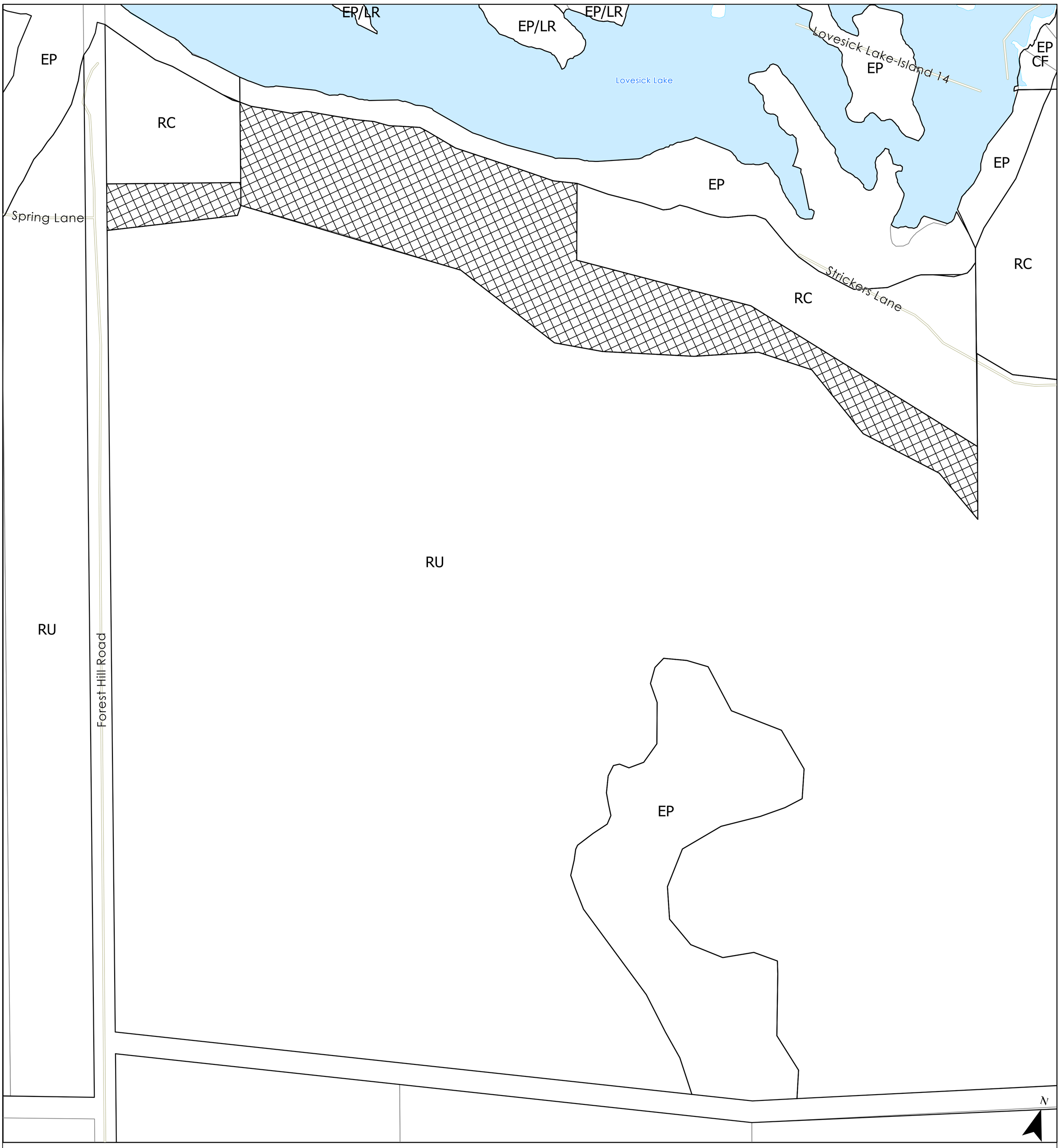
3340 Strickers Lane, Burleigh Falls
Part of Lots 43 & 44, Concession 16
Township of Selwyn
County of Peterborough

Scale: 1:1,750

0 55 110 220 Meters

May, 2023

SCHEDULE 'A' TO
BY-LAW 23-__



Legend

Lands to be rezoned from "Rural (RU)" zone to "Recreational Commercial (RC)' zone

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Part of Lots 43 & 44, Concession 16
Township of Selwyn
County of Peterborough

Scale: 1:1,750

0 55 110 220 Meters

May, 2023

Lovesick Lake Beach Resort
Neighbourhood Open House
May 3, 2023
Comment Sheet

Comments:

NAME:_____ **TELEPHONE:**_____

ADDRESS:_____ **E-MAIL:**_____

Please fill out this comment card and leave at the sign in desk. Alternatively, comments can be submitted by email to Diana Keay at dikeay@dmwills.com.

D.M. Wills Associates Ltd.
150 Jameson Drive
Peterborough, ON · K9J 0B9
Tel: (705) 742-2297
Fax: (705) 748-9944

Lovesick Lake Beach Resort

Neighbourhood Open House

May 3, 2023

SIGN IN SHEET

NAME	ADDRESS	PHONE	EMAIL