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ONTARIO ON-SITE WASTEWATER ASSOCIATION NEWSLETTER

InSide

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Impact of Water Softeners on Septic Tanks Research Note

Christopher B. Kinsley, Anna M. Crolla and Doug Joy
Ontario Rural Wastewater Centre, University of Guelph

This study involves a field evaluation of the impact of water softener backwash on the functioning of septic tanks which treat domestic wastewater. The primary objective of the study is to evaluate the impact of sodium chloride addition from water softener backwash on the physical and biological treatment occurring in septic tanks under field conditions.

The study consists of the evaluation of 39 different residential septic tanks – 17 tanks with water softener backwash discharged to the tank, and 22 without. Sludge samples were collected from all tanks; however only 21 of the tanks were sampled for effluent quality. This is because in many cases the second compartment was inaccessible or the tank had only one compartment with a single access port. Samples from the 2 groups of septic tanks were compared using several indicators of system performance: CBOD5, TSS and E.coli outlet concentrations, bacterial populations in the sludge and, sludge and scum accumulation rates. The significance of each indicator was measured using an ANOVA test at a 95% level of significance

The field data was collected by René Goulet of Goulet Septic Tank Pumping. Mr. Goulet operates a septic pumping truck in Eastern Ontario (East of Ottawa between the Quebec and US borders). The size, material and condition of each tank, as well as any signs of leaching bed failure, were documented by Mr. Goulet. The sludge and scum depths were measured using a Sludge Judge®. A 2 L sludge sample was collected from the top 10 cm of sludge in the first compartment of each tank and a 1 L effluent sample was collected from the outlet T of each tank. Samples were stored in a dedicated refrigerator in Mr. Goulet's garage prior to pick-up by ORWC staff and transfer to the University laboratory for analysis.

Significant differences were found in the sodium and chloride concentrations in tank

Table 1. Effect of Water Softener Backwash Discharge on Tank Performance

	Units	Tanks Receiving Water Softener Backwash (Mean ± 1 Standard Dev.)	Tanks Not Receiving Water Softener Backwash (Mean ± 1 Standard Dev.)
$CBOD_5$ (STE)	mg/L	315±101	283±120
TSS (STE)		1048±791	751±795
VSS (sludge)	g/L	31.8±21.2	31.5±12.3
E.coli (STE)	CFU/100mL	43,000	27,000
Sludge and Scum Accumulation Rate	L/person/year	107±75	118±66

continued on page 7

News from the ORWC – September 2005

After a fairly quiet summer, we are getting back into the swing of things at the ORWC. Angela Mason left her position as project coordinator last March in pursuit of new opportunities for herself and her husband in the Ottawa area. Katherine Rentsch has joined us in the past month to fill Angela's shoes. Katherine comes with a background in the on-site industy having worked as a designer at a local consulting firm for the past three and a half years. She is also a graduate of the Environmental Engineering program at Guelph.

We continue to make progress on the Lime Stabilization study undertaken in partnership with the Ministry of Environment and XCG Consultants Limited. We have completed the field trials and have submitted the final report to the project team. We will be delivering our first course at the O.A.S.I.S conference this fall.

We have some new additions at our demonstration site in Arkell. A F.A.S.T. treatment unit has been installed in a 4,500 L concrete septic tank, which we hope to have up and running in time for our fall courses. The F.A.S.T. unit was donated by Pinnacle Environmental Technologies Inc. and the concrete tank was donated by Brooklin Concrete Products Inc. of Newmarket. Thanks to both for their generosity.

We will also be adding a Fralo plastic tank and a Nayadic Aerobic Treatment Unit to our demonstration site very soon. Both items have been donated by Make-Way Plastics Limited. The Nayadic ATU line has been approved as a unit capable of meet secondary effluent quality criteria by the Ontario Building Code since 1993. However, we understand from Make-Way Plastic representatives that this approval is to be upgraded to meet tertiary quality effluent standards as well. Congratulations to the distributors of this product in Ontario. We also hear that Make-Way Plastics has submitted an application to allow for an area bed to be used in conjunction with the Nayadic units – Good Luck to them on the application!

The ORWC course schedule has been set for the Fall and has been posted on our website. In addition to the regular courses, we are offering a new surveying course. This course is intended as an introductory/refresher course to surveying and will go over the basic techniques as well as some hands on training with the equipment.

Also a reminder to all designers and inspectors that the January 1, 2006 deadline for obtaining a license to practise the Ontario Building Code is fast approaching. We will be offering the 5 day MMAH course twice this fall in Guelph – if you haven't yet written your exams, this is a great refresher course!

We also have exciting news from Alfred. The ORWC, through the Collège d'Alfred, has obtained a significant project to develop training programs for rural wastewater treatment and reuse in Morocco. Along with our Moroccan partner institution, l'Institut Agro-Veterinaire Hassan II, ORWC staff will help develop a water resources specialisation in the Rural Engineering program, implement research and demonstration projects and deliver short courses to rural communities related to onsite wastewater management. This 6 year $1M project is funded by the Canadian International Development Agency through the Association of Universities and Colleges of Canada.

Please visit our website at www.orwc.uoguelph.ca or call (519) 824 4120 x 54687 to say Hi to Katherine!

Part-time: Manager/Communication Officer Ontario Onsite Wastewater Association

Duties: Develop and produce communication and marketing pieces for Association members. Conduct research and analysis of industry developments for distribution in newsletters. Key responsibilities include: Recruitment of members, identification of potential new members, organize Association meetings including Board of Directors and Subcommittees, organize newsletter, promote OOWA at various events, organize annual conference and explore opportunities for increasing member benefits.

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Is the soil saturated?

If you know how to recognize and deal with saturated soil layers, you can ensure the effectiveness of soil absorption areas.

Taken from: "Installer" author, Jim Anderson Ph.D and David Gustafson, P.E.

A few months ago, we highlighted the KIDD (Keep It Dry D_) Principle as a key to making sure the soil treatment system will accept effluent as intended. There, the focus was on excavating the soil only when it is dry enough to avoid smearing and compaction. But you can also look at the KIDD principle as making sure that onsite systems are installed with the proper separation distance from the bottom of the excavation to any soil layer that is permanently or seasonally saturated with water.

First one might ask: Why is it important that I be able to recognize features that indicate there may be seasonal wetness or saturation in the soil? The answer lies again in our desire to install systems in soils so that they perform the functions of dispersing the home's septic tank effluent into the soil and, just as important, treating that effluent before it enters ground or surface waters.

Causes of failure

Lack of separation between saturated soil and the bottom of the soil treatment area can cause premature system failure.

In fine sandy or silty soils, if the soil is saturate, the soil itself can flow into rock, pipe or chambers, effectively clogging the entire system. Saturated soil also promotes the formation of a more resistant biomat. This means the system will accept less effluent than the design value, which in turn can result in effluent surfacing or in sewage backing up into the house. Finally, when soil is saturated, it does not treat the effluent.

There are different kinds of water tables or saturated soil conditions. There is not enough room here to explain them all, but we can help you recognize that all of these conditions have the potential to affect systems in the ways described above.

Where the saturation in the soil is connected directly to water tables that feed streams, lakes and wetlands, or where soil is saturated during wet times of the year, it is relatively easy to identify the saturated soil.

continued on next page

In our discussions with installers, we say that if your backhoe bucket goes splash, you are probably excavating where you shouldn't! In all seriousness, in those conditions, if you make an excavation or a borehole into a saturated zone, you will see that water begins to seep into the hole. Given time, it ultimately will rise to a level in the hole even with the water elevation in the soil.

We need to stay our proper separation distance above this level as specified in the state and local codes for installation of the soil treatment area. We should also recognize that if the soil is saturated, that means taking additional precautions to prevent floating if we are excavating the septic tank.

Seasonal Zones

The seasonal water tables or zones of saturation are more difficult to identify, especially during prolonged dry periods or even normal dry periods of the year. Here, we must recognize differences in soil colour that related to alternating periods of wetting and drying of the soil profile.

Typically in soils where these conditions are occurring, the soil colours have a mottled appearance in various shades of gray, red, brown and yellow. Of course, soils can exhibit mottling for reasons other than periodic saturation. Therefore, soil scientists specifically classify features that indicate wetting and drying- they call then redoximorphic features.

Briefly, redoximorphic features are caused by the transportation of iron. When all the soil pores are filled with water- the soil is saturated- the iron dissolves in the water. The iron then moves in the soil profile, relocating and concentrating as the water level recedes. When the soil is no longer saturated and oxygen is present in the pores, the areas where iron concentrated appear very bright red or brown. Areas from which the iron has moved appear gray or whitish. This creates the mottled appearance.

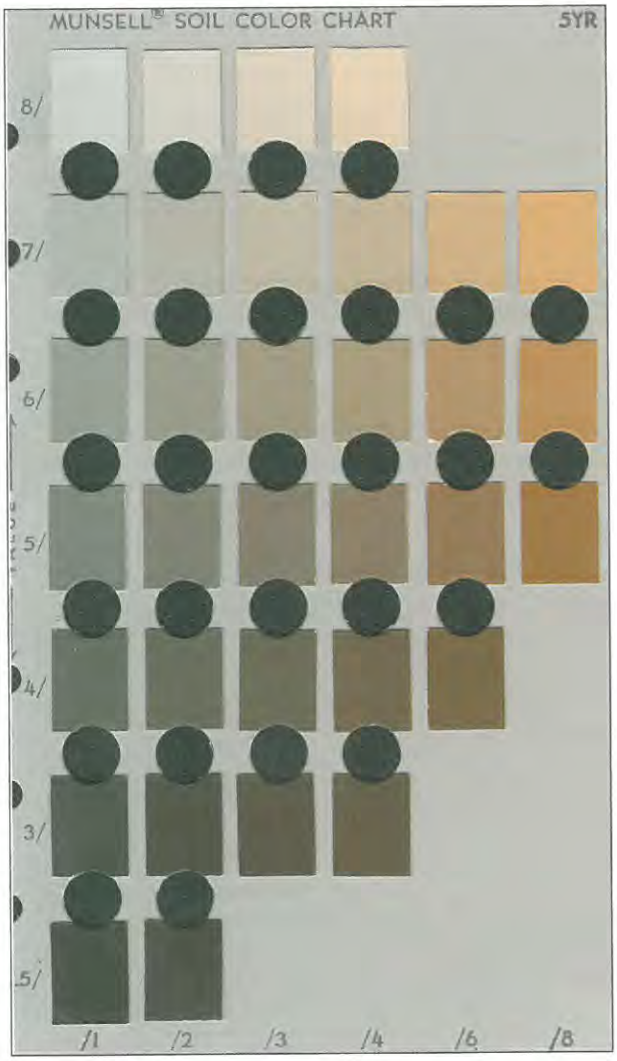
In areas where the soil is saturated throughout the year, or in soils that do not drain well, the iron is still dissolved under saturated conditions, but it does not move because the water is stagnant. So, in addition to observing free water on these sites, you will see bluish or even greenish colours in the soil as it is excavated.

Over time, as the soil dries out on the spoil pile, the iron becomes exposed to oxygen, and the browns and reds appear. These colours typically would be associated with wetlands and depressions, areas we should stay away from in our installations.

Practical Applications

If you are installing a system according to plans provided by someone else who has done the site evaluation, and if you see these conditions closer than the specified separation distances, it is time to call the designer back and discuss why this is the case. To proceed with such an installation is to invite system failure in the future and the dreaded call-back to explain why the system isn't working and it is not in compliance with the code.

If you do your own site evaluations and designs, then you should become much more skillful in identifying saturation. This will probably require some specific soils training. Soil scientists and site evaluators use a standard colour notation known as the Munsell colour system. The chart for soil colour consists of about 175 different coloured chips, systematically arranged on nine cards. There are several suppliers of these charts. Check with suppliers of testing equipment or visit the University of Minnesota website septic.umn.edu.



Soil Color Chart

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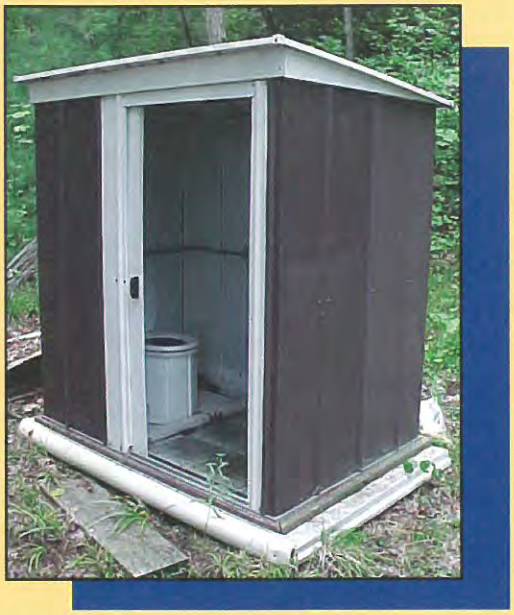

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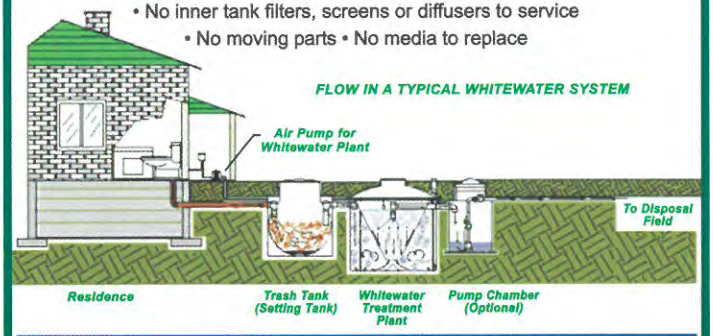

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Rob's World By Robert A. Passmore, B.Eng.

Vacation's Over People

While recently browsing through a US Onsite industry product magazine, I was startled by the incredible number of advertisements for advanced onsite wastewater equipment and state of the art installation methods being sold all over North America. Given that technology has been evolving at near exponential rates in virtually every aspect of our lives over the past decade or so, it would be incredibly naïve to think the same phenomenon would not hit the Onsite industry as well. Unfortunately for our industry, these technological advances are creating a situation that may have catastrophic effects on the Onsite industry for many years to come.

As technology evolves, and new wastewater treatment devices become available, there is a tendency for the entrepreneurs among us to step up and quickly embrace the new technology because they can see the future profits that such technology may bring them. The more cautious among the Onsite industry will, typically, wait out new technologies to see if problems arise before taking the plunge.

Although these two groups have fundamentally different mind sets, they share a common flaw: neither group attempts to understand the technology and learn new methods of installation and maintenance necessary to ensure its long term viability.

So this is the problem. We've passed through the waiting period and now even the most cautious among us are quickly moving to install advanced wastewater treatment devices. The distributors are quick to sell treatment units to needy installers and the installers are quick to install the units and get their money. At the end of the day, the only one getting the "wet end of the sludge judge" is the property owner who now, not only has little to no understanding of wastewater treatment, but has little idea how the sewage system is to be operated and maintained as well as potential legal requirements. Unfortunately for our industry, this situation is the norm, not the exception and we have no one to blame but ourselves for letting things get this bad.

As always, I have prepared below a few thoughts on what needs to be done to stem the tide of irresponsible conduct. These thoughts build upon some of the excellent work being done by a handful of distributors, installers and regulators across Ontario (you know who you are)

Many of us have openly called for an education program that directly targets the Onsite wastewater industry. It is now time to demand an industry wide training program that encompasses all of the key players.

Distributors need to establish comprehensive training programs intended to provide a new installer with the necessary information on the design, function, installation and maintenance of an advanced treatment unit.

Installers, regulators and designers need to be instructed on the fundamentals of wastewater treatment and in the methods for proper sewage system design. Courses covering surveying, contract preparation and customer service should also be made available.

Homeowners need to have courses in the fundamentals of sewage systems and be instructed in the proper care and maintenance and legal obligations (homeowner courses should be mandatory).

This having been stated, it is now time to point out that we have had many courses available through the Ontario Rural Wastewater Centre for some time now. Participation has largely been disappointing and somewhat disheartening to the instructors. Summer vacation is over boys and girls, lets hit the books!

Can you guess what type of septic is under this garden? First response wins an OOWA hat.

Please send answers to: admin@oowa.org.

Hey, did you know?

Parts per million (ppm) is a measurement describing the amount of a particular substance per unit volume of water, it can also be described as milligrams per litre (mg/L). To give some idea of what a part per million would look like, picture a 55 gallon barrel filled with water. If you added four drops of ink into the barrel it would have a concentration of 1 ppm. Although this is very little ink, it could be, depending on the substance placed in the water, harmful to either human beings or their surrounding environment. Parts per billion (ppb) is another common term used in the discussing the amount of substance per unit volume of water. However, it will not be discussed here as it is not generally used in the Ontario Building Code, it would be found in legislation for more harmful or toxic chemicals. ppm and ppb are used in risk assessments, hazardous substance identification as well as it exposure standards. Found in Table 8.6.2.2 of the OBC, ppm's help set guidelines for the health of both people and the environment.

continued from page 1

Impact of Water Softeners on Septic Tanks Research Note

sludges with mean chloride concentrations increasing from 146 to 1537 mg/L and mean sodium concentrations increasing from 233 to 586 mg/L in tanks receiving water softener backwash. However, no significant differences were found for indicators of tank performance including: septic tank effluent CBOD5, TSS and E.coli, sludge volatile suspended solids (VSS) and sludge and scum accumulation rate, as described below in Table 1.

The results from this study indicate that water softener backwash discharged to septic tanks has no significant effect upon the biological or physical functioning of the septic tank. However, elevated chloride concentrations from water softener backwash may accelerate the corrosion of reinforced concrete tanks.

We would like to acknowledge the support of the Canadian Mortgage and Housing Corporation in funding this study and the help of René Goulet with sample collection.

For more information on this project please contact Chris Kinsley at the ORWC (ckinsley@alfredc.uoguelph.ca).

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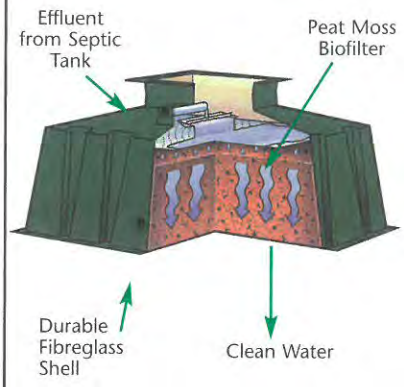

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The Science Corner — Evils of Compaction

Taken from Installer November 2004.Author: David H. Hammonds

Soil structure is an underrated concern in the construction and maintenance of onsite wastewater treatment systems.

Soil is the component that has the most potential for variability (and potentially the most devastating effect) on the operation of onsite wastewater treatment and disposal systems. At least two soil profiles are required for every site evaluation, but sometimes more than two should be performed in order to get a more complete picture of the site.

Currently, the way regulations treat the information we get from the soils, only the seasonal high water table indicators, the soil texture, and the depth of satisfactory soil are considered. What is not considered is the soil structure.

Shape, size, and distinctness of the unit (or "grade") are the basic components of soil structure. The only affirmation of the importance of soil structure, at least in my home state, is found in rule 64E-6.005(6), Florida Administrative Code, which states:

> *To prevent soils smear and excessive soil compaction, drainfields shall not be installed in soils with textures finer than sand, loamy sand, or sandy loam when the soil moisture content is above the point at which the soils changes from semi-solid to plastic.*

Even in this, there is no clear guideline on how we deal with soil structure. What it does mean is that a system cannot be installed where a soil that has a texture finer than sandy loam is moist enough to be able to form a ribbon from the soil when no additional moisture is added. I suggest that all inspectors and septic tank contractors should take note of this requirement, which has been the rule for 20 years.

Causes of Compaction

Soil structure is very important in the onsite sewage treatment and disposal business, as the structure is what determines how effluent filters through the soil. Soil structure can be altered quite easily in certain instances. For example, when a soil wet above the plastic limit, it is easily smeared, changing at least some part of the structure.

This smearing causes the natural pores in the soil to seal off, thereby prohibiting the normal movement of effluent or water through the soil. Smearing of fine-textured soils is basically caused by compaction: the backhoe bucket digging down into the soil compresses the soil structure. Another source of compaction is driving over the drainfield area. When the drainfield is covered, the normal procedure is to drive over it. This causes compaction of the soil. In addition, the stresses from the machine driving over the drainfield can be transferred through the drainfield into the underlying soil, thereby creating potential compaction issues at the absorption surface and sidewalls, not to mention the potential for disruption of the drainfield units themselves. Consider that a backhoe weighing 15,000 pounds and carrying about 5,000 pounds of soil in the loader could in effect weigh 125 pounds per square inch of tire surface (depending on the exact tire surface area in contact with the soil). Compare this to an 185 pound person, which might put only 5 pounds or less per square inch of pressure while walking on the system.

Before and After

Compaction of the drainfield does not happen only when the system is being installed. From the time the initial site evaluation is performed and the permit is approved, to when the treatment and disposal system is installed, the proposed drainfield area could have been driven over hundreds of times by tons of equipment, and soils material could have been removed or added to the area.

If the soil was wet at any time while machinery was driving over it, it would compound the compaction of the soil. This could affect the operation of the system, even if the drainfield is installed at a later date, "according to the permit".

If the soil in the drainfield area has been affected by compaction before installation of the system, but after the initial site evaluation, the evaluator would never have found it, because it wasn't there to begin with. It does not necessarily take much compaction to affect the operation of the system.

So, even though the rules may not directly address it, soil compaction is an important issue, one that industry professionals- installers and regulators alike- have to deal with every day.

Letter to the Editor

Frank Hay, RE: Ontario's Bill 124 & Section 8 of the Ontario Building Code

I would like to present a discussion on what I believe is the problem with the Ontario's Bill 124 and its affect on the onsite wastewater treatment and dispersal industry. Bill 124 attempts to place on non-government individuals certain legal liabilities in the performance of their work when planning, designing, installing or maintaining onsite wastewater systems that are under the jurisdiction of Section 8 of the Ontario Building Code. (OBC).

Section 8 of the OBC outlines precise and detailed requirements for the site assessment and design of all onsite wastewater systems. This is generally referred to as a "prescriptive regulation". Also, the Section sets down the procedure for applying for a permit to construct a system, and, allows for the government's regulator to place conditions on permits to construct and to operate.

In addition, the OBC requires the government to issue Licenses to individuals to construct, repair or maintain onsite wastewater systems. These licenses are renewable and are subject to cancellation.

In summary, the OBC contains the following key provisions:

- Government issues licenses to persons for them to install, repair or maintain onsite wastewater systems.
- Government issues permits to construct and operate an onsite wastewater system.
- Government controls the prescriptive design and construction regulation – Section 8 – OBC.
- Government inspects prior to and during construction to ensure compliance to the prescriptive regulation and any other permit conditions.

The need for the provisions of Bill 124 on individuals working under the Section 8 of the OBC appears unnecessary given that all of the designs are authorized by government through the permit process and that the persons conducting the construction and maintenance of onsite systems are under the direct control and authority of the government.

The role of planners, designers and contractors is restricted, controlled and has government oversight by; the licensing by government of individuals working in the onsite wastewater industry,the government's own prescriptive design requirements as set down in the OBC and authorization issued by the Building Materials Evaluation Commission,the government personnel having direct oversight and control over the design and construction through the permit and onsite inspection process.

The Supreme Court of Canada has issued rulings that may further identify the inappropriateness of Bill 124 for onsite wastewater systems covered under Section 8 of the OBC.

In 1989 the Supreme Court of Canada ruled that "the city, once it made the policy decision to inspect building plans and construction, owed a duty of care to all who it is reasonable to conclude might be injured by the negligent exercise of those powers."

Another Supreme Court of Canada case states "it is reasonable ... to rely on the ... municipality to show reasonable care in inspecting the progress of the construction" and further that one "should be entitled to rely on the city to exercise reasonable care to ensure that all construction is built according to the standards set out in the by-laws."

The Judge further considers "the duties of inspectors to use their powers to ensure that there is compliance with regulations that they are charged with enforcing". The case referred to on this point states "Their role is to detect such negligent omissions before they translate into dangers to health and safety."

The Supreme Court of Canada (1977) approved the principles enunciated by Lord Wilberforce for the House of Lords in England in considering the duties of a local government inspector in England under the Public Health Act 1936. The principle summarized states that a part of the building that comes to be covered up as the building proceeds that may incur a weakness or inadequacy will create a hidden defect. The hidden defect has no means of discovery by whoever acquires the building and may in the future cause damage to the building affecting the safety and health of owners and occupiers. Therefore, the local authority has the right to inspect and to insist on any correction necessary to bring the work into conformity with the bylaws.

I would submit that Bill 124 attempts to stop the freedom of speech by restricting anyone to comment about a designing or planning of an onsite system unless the person is sanctioned by government to do so. This "gag" on the public is inappropriate given that any submitted plan or design for the construction is ultimately authorized by the government. The government is charged with the duty to ensure that the OBC, BMEC and BCC rules and authorization are complied with in the permit to construct. Government is supposed to catch the faulty designs that do not meet the OBC.

continued on next page

Further, I would submit that Bill 124 is inappropriate in that it may have the affect of appearing to transfer legal liability to others when the courts place the duty of care on to the government when the government chooses to create prescriptive regulations, license contractors, issues permits and conduct inspection with the power and authority to demand changes to design and construction.

The duty of care is the sole responsibility of the government and should not be, and in accordance with the Supreme Court of Canada cannot be, transferred to others.

This point is borne out of a 1990 Supreme Court of Canada ruling that "the defendant municipality cannot escape a finding of liability by its reliance upon the seal and certification of the plaintiffs' design engineer".

Accordingly, an official acting under the powers and authority of the OBC is "under a duty to oversee the work of the engineer. In relying on the engineer's certification completely, he failed in that duty."

A judge re-affirmed the 1896 ruling that stated in part; "the powers conferred by the Public Health Act, 1875, on the district council can only be exercised by some person or persons acting under their authority. Those persons may be servants of the council or they may not. The council are not bound in point of law to do the work themselves - i.e., by servants of their own. There is nothing to prevent them from employing a contractor to do their work for them. But the council cannot, by employing a contractor, get rid of their own duty to other people, whatever that duty may be."

Governments may hire outside of their staff to perform work on their behalf. But, such outsourcing of work does not remove the duty of care and the legal liability from the government.

Bill 124 insurance and other provisions are not necessary for the onsite wastewater practitioner as the duty of the regulator issuing a permit is to be checking and catching errors and omissions of design and construction.

The role and duty of the regulator is the "insurance" to the public.

Therefore, in consideration of the above, it is my opinion, that Bill 124 is inappropriate and may even contravene Supreme Court of Canada rulings setting down the duty of care required of government when government sets down prescriptive design regulation, conducts inspections and issues permits, let alone being unjust and unfair to those conducting business under Section 8 of the OBC.

Unless I am missing some crucial consideration or information, it is my opinion that Bill 124 should be set aside and a different approach to resolve whatever problems there are. These solutions should be developed in consultation with the onsite wastewater industry.

2005 OOWA Board of Directors

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Ontario Regulation 236/05

Stakeholders have raised concerns about the ability of certain building officials and designers to meet some of the new requirements by July 1, 2005. To respond to these concerns the Building Code has been further amended, through Ontario Regulation 236/05, to extend the implementation period from some of the new requirements to January 1, 2006.

Ontario Regualtion 236/05 amends the Building Code to extend the implementation period from July 1, 2005-January 1, 2006 for:

- Qualification requirements for building officials and designers
- Registration requirements (i.e. qualified staff and insurance) for designers
- Timeframes for the review of building permit applications by municipalities
- Commencement of the first reporting period for the annual building permit fee report to be prepared by municipalities

The following changes to the Building Code Act, 1992 and Building Code will take effect on July 1, 2005:

- New service delivery options for municipalities through the use of provate inspection bodies, known as registered code agencies (RCAs)
- Mandatory use of provincial building permit application form
- A new list of "applicable law"
- New rules governing building permit fees
- Mandatory notices and inspections at key construction stages
- Roles defined in Act for different building practitioners, including owners, builders, designers, and manufacturers
- New measures to support innovation including binding Minister's interpretations and Minister's rulings
- Mandatory registration and insurance for RCAs
- Mandatory qualification for RCA staff
- A Code of Conduct for building officials

ORWC Fall Courses

Course	Date	Location
Soils 101- Evaluation of Soils for On-site Wastewater Technologies.	October 19, 2005	Guelph
Advanced Design of On-Site Sewage Systems	October 20. 2005	Guelph
Part 8 Ontario Building Code- On-Site Sewage Systems, Installer/Inspector Certification	October 24-28, 2005 December 12-16, 2005	Guelph
Inspection, Troubleshooting and Remediation for On-Site Wastewater Technologies.	November 10, 2005	Guelph
Introduction to Surverying	November 10, 2005	Guelph

The Final Flush

A young preacher was asked by the local funeral director to hold a graveside burial service at a small local cemetery for someone with no family or friends. The preacher started early but quickly got himself lost, making several but wrong turns.

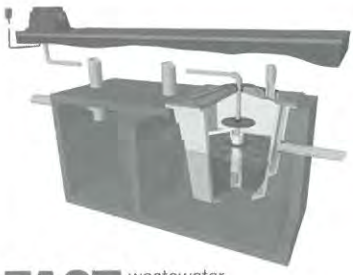
Eventually, a half-hour late, he saw a backhoe and its crew, but the hearse was nowhere in sight, and the workmen were eating lunch.

The diligent young pastor went to the open grave and found the vault lid already in place.

Taking out his book, he read the service. Feeling guilty because of his tardiness, he preached an impassioned and lengthy service, sending the deceased to the great beyond in style.

As he was returning to his car, he overheard one of the workmen say: "I've been putting in septic tanks for 20 years and I ain't never seen anything like that."

Innovative On-site Wastewater Technologies



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