

# Wastewater

Wastewater, also known as sewage, can be harmful to humans as it is capable of spreading diseases and polluting surface and groundwater sources.

The Environmental Public Health Program identifies existing and potential hazards associated with wastewater disposal in order to reduce and prevent public health risks.

Program activities focus on community wastewater treatment plants as well as on-site sewage disposal systems.



# Wastewater

- Wastewater is used water which is contaminated with human waste, food wastes, and chemical wastes.
- Also referred to as sewage



# Disposal of Wastewater

Proper disposal of wastewater is beneficial to the community in numerous ways:

- Protection of river, streams & lakes from pollution
  - Sewage can carry excessive nutrients such as nitrogen and phosphorus to a water body. The excessive nutrients can lead to decreased levels of dissolved oxygen, the fish suffocate.
  - Sewage also contributes to increased total solids , including fecal coliform, as well as increased water temperature.

# Composition of Wastewater

- Mainly composed of water
  - Toilets, showers, sinks, dishwasher, washing machine, etc.
- Small amounts of solid waste products
  - Primarily composed of organic material of animal and vegetable origin
  - Because they are organic, the solid waste products will eventually decompose
  - This organic material needs to be converted to a form which will not cause the spread of disease or pollute water



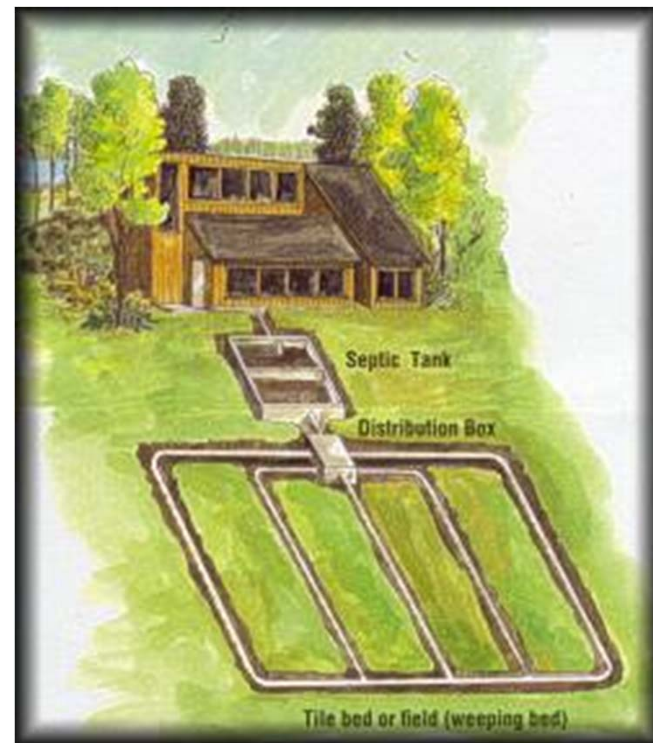
# Composition of Wastewater

- Also contains many bacteria – billions!!
- Some may be pathogenic (or disease causing)
- Most are harmless or non-pathogenic
  - Are useful because they decompose the organic material in the wastewater
  - Form the basis of any biological treatment

# Types of Wastewater Systems

## Individual Systems

- Sewage system or also called an onsite sewage/septic system
- Onsite treatment units that eliminate the need for municipal sewers
- Comprised of a tank, a network of pipes and billions of organisms that process the waste



## Environmental Public Health Assessment – Individual Systems

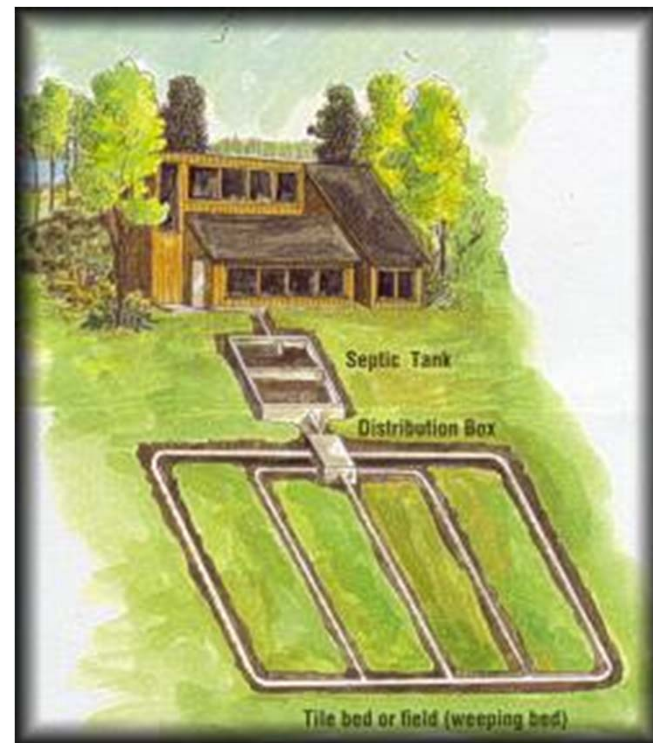
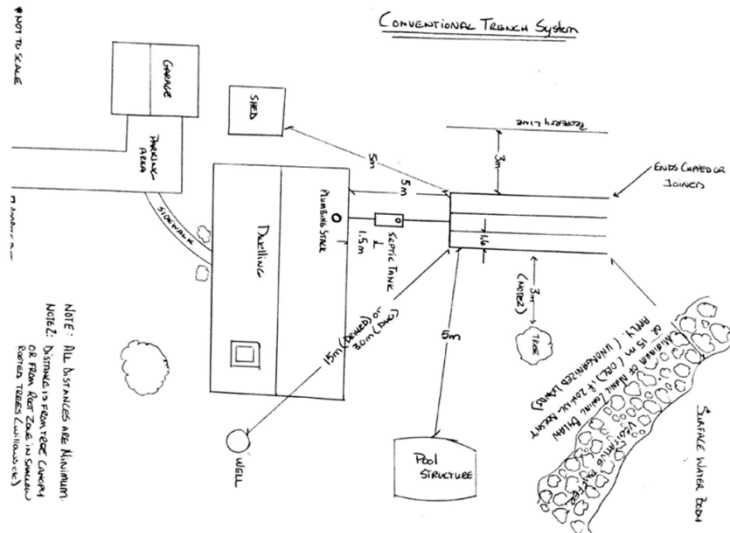
- Provide site and installation inspections for new and expanded on-site sewage (wastewater) disposal systems.
- Provide advice, guidance and recommendations related to on-site sewage disposal systems, including information on appropriate decommissioning of sites.
- Respond to complaints by providing public health inspections of existing on-site sewage disposal systems when appropriate.
- Review plans for new and upgraded on-site sewage disposal systems from a public health perspective.





# Environmental Public Health Assessment – Individual Systems

- Recommend compliance with
  - Part 8 of the Ontario Building Code
- Licenced Installer with BCIN #
- Review of site plans and applications for homes or other community buildings





## Environmental Public Health Assessment – Individual Systems

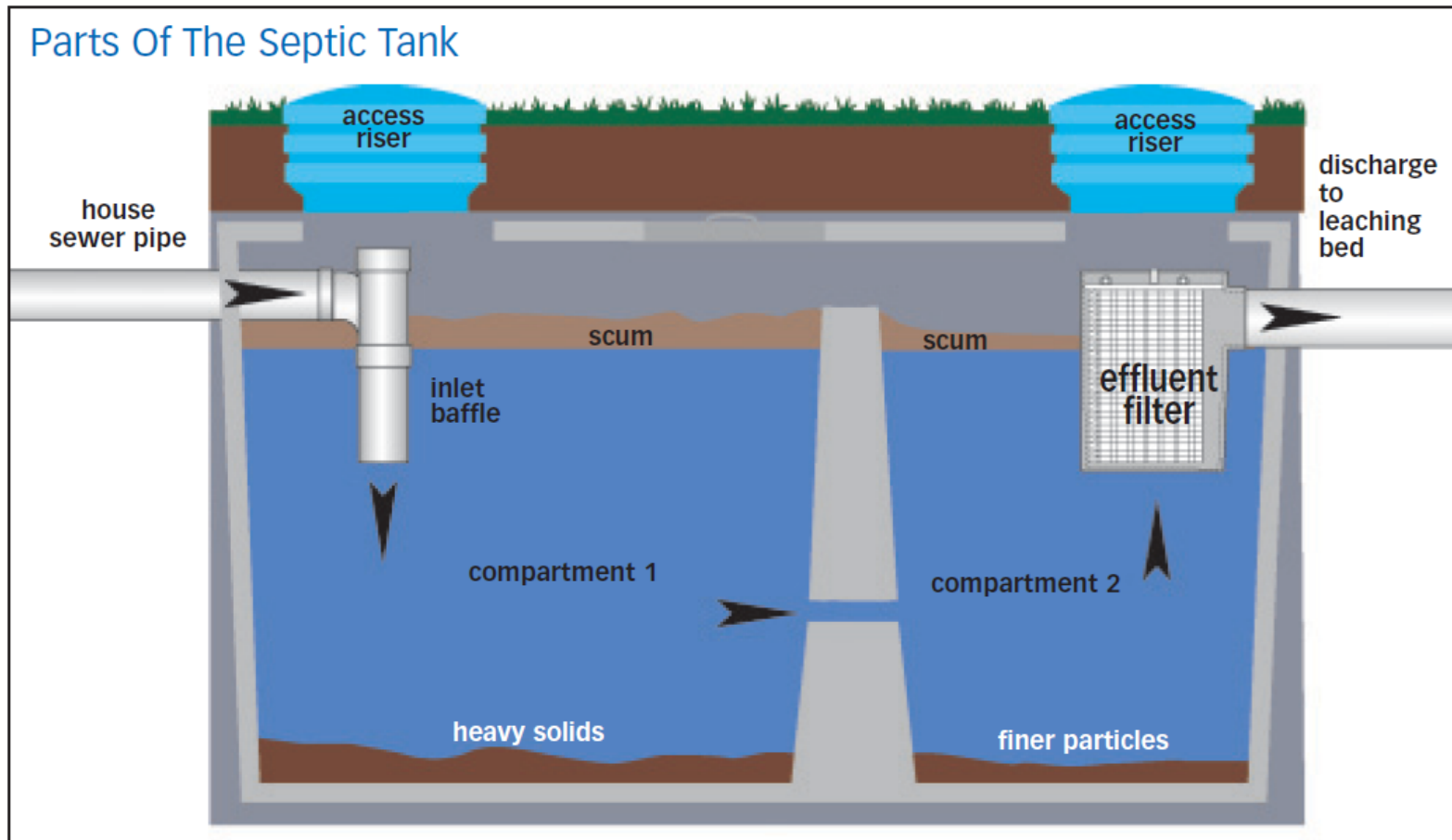
- On-site assessment is completed
  - Test pits
  - Percolation tests
  - Soil analysis
  - Ensuring separation distances
- Review of site plan/application
  - Provide recommendations prior to installation
  - Work with community and contractor
  - Report to Chief and Council
- Inspection of each individual system to ensure proper installation as per the OBC
  - While system is open
  - Observe components
- Final Inspection and Report
  - After system is covered and seeded/sodded



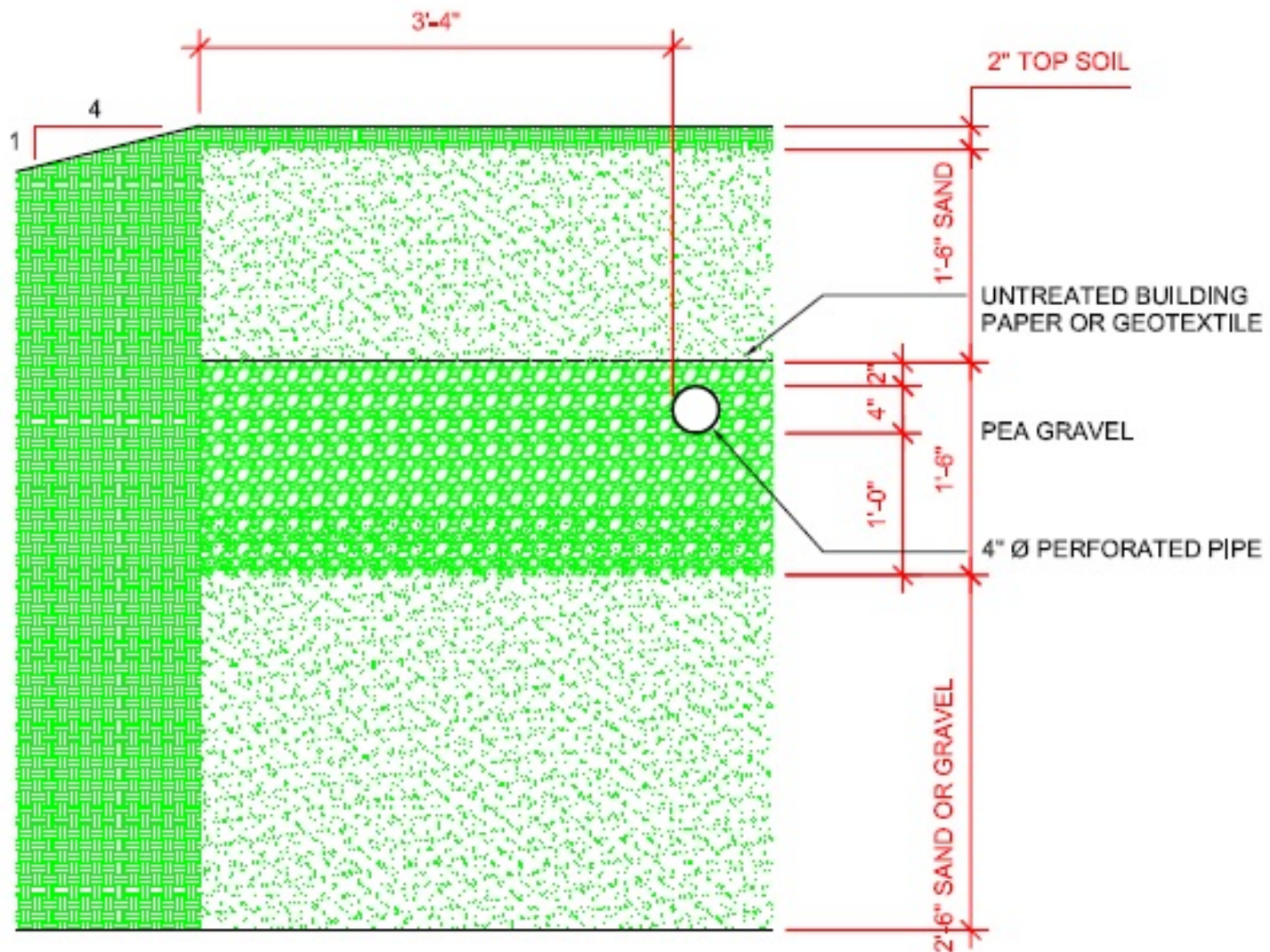
## Environmental Public Health Assessment – Individual Systems

- All household wastewater exits your home through an underground pipe that leads to the buried septic tank.
- The waste flows to the first compartment of the tank where the heavy solids settle and the lighter materials (fats, oils and grease) float to the top as scum.
- Baffles and screens keep this scum layer from escaping the tank and flowing to the leaching bed. This scum is removed when the tank is pumped during regular maintenance
- In the second compartment of the tank, finer particles settle to the bottom. Organic materials break down in the tank.
- On newer systems, any remaining organic material is trapped and decomposes on a screen called the effluent filter located at the outlet of the tank.
  - As of January 2007, effluent filters became mandatory in Ontario

## Environmental Public Health Assessment – Individual Systems



# Environmental Public Health Assessment – Individual Systems



**TYPICAL CROSS SECTION**  
 $\frac{1}{2}" = 1'-0"$

## Environmental Public Health Assessment – Individual Systems

- From the tank, the effluent moves to a leaching bed made up of a network of perforated polyvinyl chloride (PVC) drain pipes.
- Stone and a layer of unsaturated native soil or imported sand surround these pipes.
- The effluent flows to the leaching bed either by gravity or a pump depending on site conditions.
- The leaching bed's perforated PVC drain pipes disperse the effluent, allowing the liquid to seep into the ground where bacteria and other organisms process the wastewater further.
- Soils below the stone in the trench bottom act as a biological, chemical, and physical filter to remove most remaining organic and biological contaminants.

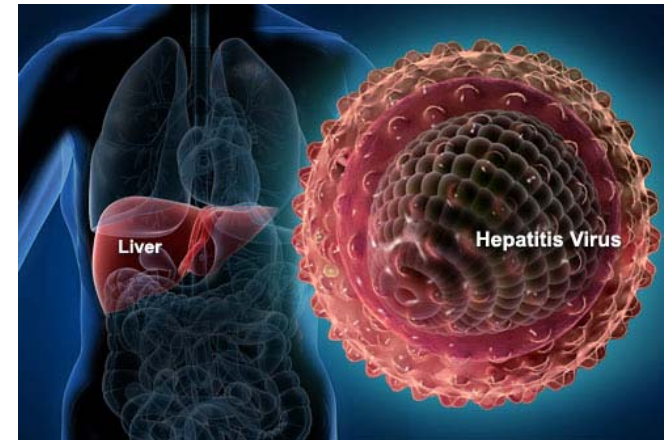


### Did You Know?

The soil under the stone in the trench bottom of a properly working system can remove 99 percent of the *E.coli* for every 30 centimetres (12 inches) of unsaturated soil.

# Health Risks and Sewage

- The most serious viral risk is hepatitis – symptoms: sometimes there are no symptoms of hepatitis in the first weeks after infection -- the acute phase. But when they happen, the symptoms of types A, B, and C may include fatigue, nausea, poor appetite, belly pain, a mild fever, or yellow skin or eyes (jaundice).
- Other common but less serious would be:
  - gastroenteritis, characterised by cramping stomach pains, diarrhoea and vomiting;
  - Weil’s disease, a flu-like illness with persistent and severe headache. Damage to liver, kidneys and blood may occur and the condition can be fatal;

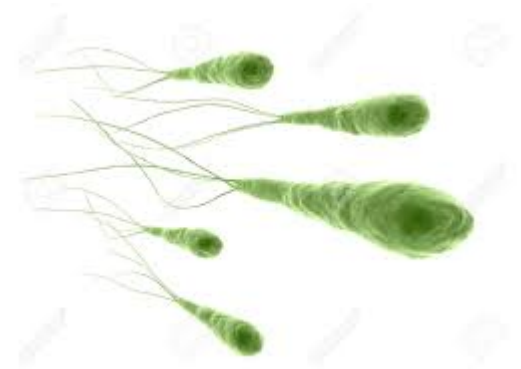


<http://www.webmd.com/hepatitis/ss/slideshow-hepatitis-overview14>



# Health Risks and Sewage

- and the most serious bacterial risk is tetanus – symptoms: stiffness of the neck, jaw, and other muscles, often accompanied by a grotesque, grinning expression, difficulty swallowing, irritability, uncontrollable spasms of the jaw, called lockjaw, and neck muscles.
- Breathing in a suspension of particles is a less common means of exposure but may occur whenever sewage is agitated
  - occupational asthma, resulting in attacks of breathlessness, chest tightness and wheezing, and produced by the inhalation of living or dead organisms;





# Health Risks and Sewage

## How Do Sewage Microorganisms Enter the Body?

- The most common way is by hand-to-mouth contact during eating, drinking and smoking, or by wiping the face with contaminated hands or gloves, or by licking splashes from the skin.
- Skin contact through cuts, scratches, or penetrating wounds
- Aerosols landing on surfaces of the eyes, nose and mouth
- By breathing them in, as either dust aerosol or mist

# Health Risks and Sewage

## Who Is At Risk?

People who may be at risk of exposure are:

- Employees involved in sewer inspection and maintenance work
- Construction workers who repair or replace live sewer lines
- Sewer spill clean up
- Plumbers



# Health Hazards and Sewage

## Chemical Hazards

- Sanitary sewers and similar confined spaces containing sewage can sometimes be deficient in **oxygen**
- They can also contain flammable gases such as methane and toxic gases such as carbon monoxide and hydrogen sulphide.
- Carbon monoxide, carbon dioxide, and other exhaust gases may sometimes be present due to a poorly located gasoline engine or generator exhausting into the confined space.



Work Safe Alberta – Workers Exposure to Sewage Bulletin  
<http://work.alberta.ca/documents/GH017.pdf>

**Health Hazards and Sewage**  
**If you have symptoms don't assume  
anything**

**SEE A DOCTOR!!!**



# Environmental Risks and Sewage

Untreated sewage that gets into water bodies, such as rivers or lakes, creates a human health hazard but can also negatively disrupt the river and lake ecosystems. The sewage contaminates the water, spreads disease, and leads to environmental degradation. Here is a list of effects of untreated sewage disposal into freshwater ecosystems:

- Increased organic matter (from the sewage) breaking down in the water reduces the amount of dissolved oxygen in the water body as the decomposition process uses up the available dissolved oxygen. Fish and other aquatic life need that dissolved oxygen in the water to live.
- Sewage heightens the levels of nutrients, increasing the bioavailability of nutrients, which can increase productivity of plankton near the sewage outfall and increase the chance of algal blooms.

(WQM 2004), (Munawar et al 1993)



# Environmental Risks and Sewage

- Sewage (and stormwater runoff) can introduce pesticides, other chemicals, and heavy metals into the water column. It may also introduce fine sediments, which have the potential to (bio)accumulate within animal tissues and have long-term toxic effects. Sewage and run off may increase acidity, such as from acid sulphate soils which kill fish and crustaceans, cause fish red-spot disease, damage or cause death of oysters, and interact with sediments to release heavy metals.
- Sewage can release water that is either warmer or cooler than the receiving water body. Because aquatic life has optimal temperature ranges within which it lives, too warm or too cool water temperatures can harm the aquatic life.

(WQM 2004), (Munawar et al 1993)



# Environmental Risks and Sewage

- With sewage comes water that has some degree of chlorine or similar agent. The chlorine or other disinfectant react with organic matter (such as what's in sewage) to create different end-products, such as chloroform or haloketons, which can be harmful in either the short or long term.

(WQM 2004), (Munawar et al 1993)