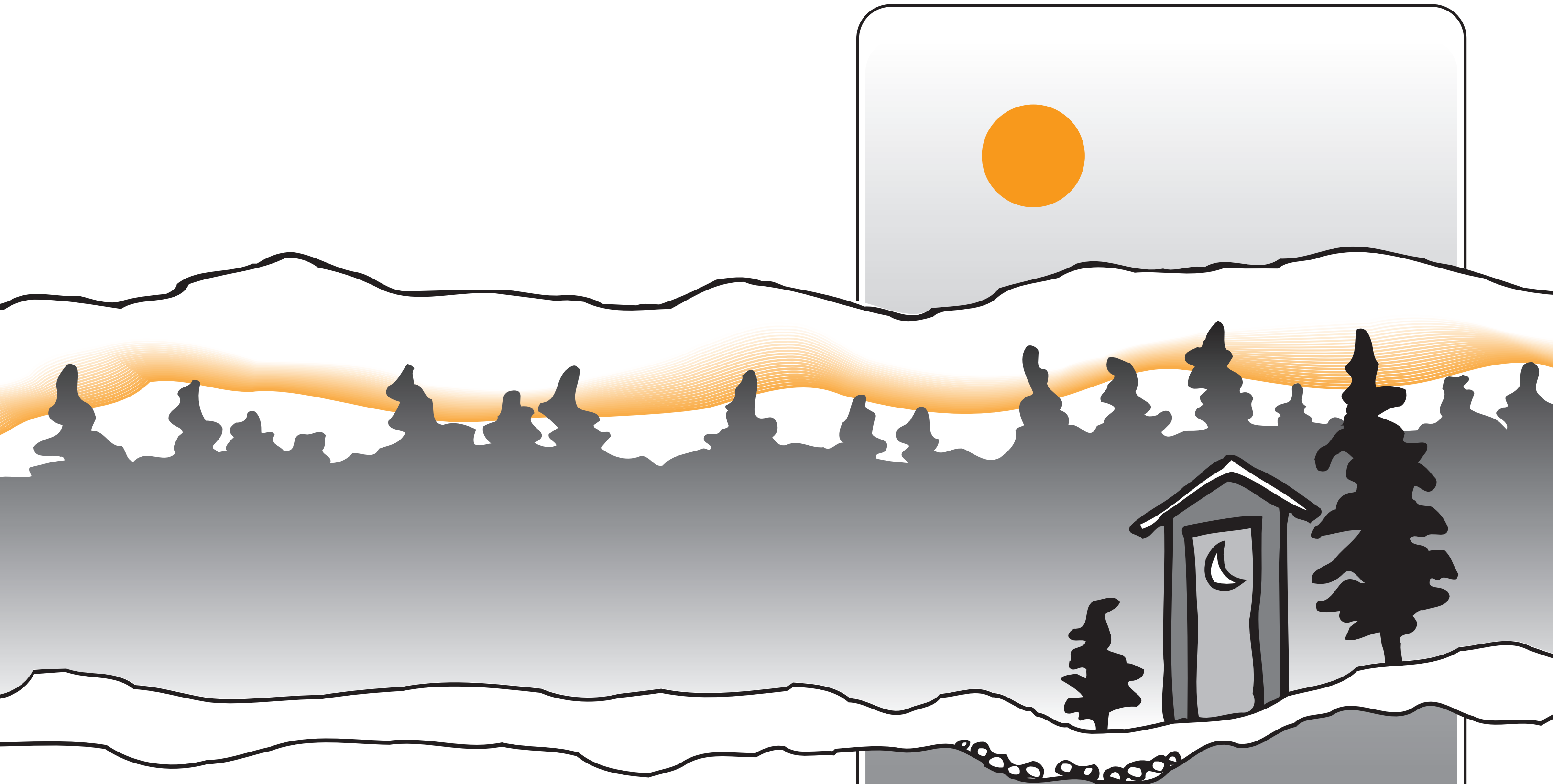

Design Specifications for Sewage Disposal Systems

A Guide to their Design and Maintenance

This document provides a single consolidated design criteria for the following documents referenced in the *Sewage Disposal Systems Regulation:*

- *Septic Systems in the Yukon, Design Specifications for the Septic Tank and Soil Absorption System,* Section 21; and
- *Sewage Holding Tank Standards,* Section 22.

No person shall construct, install, enlarge, rebuild, substantially repair, or connect to an existing system, any sewage disposal system or any part thereof, or cause the same to be done, without first obtaining a written permit from a health officer.

9(1) Sewage Disposal Systems Regulation

Design Specifications for Sewage Disposal Systems

MAY 2014

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Septic Tanks and Sewage Holding Tanks

1. WASTEWATER – Septic tanks and sewage holding tanks **shall** receive **all wastewater** (black and grey water), from toilets, baths, showers, wash basins, sinks and washing machines. Water that **must be excluded**, includes run-off water from roofs, yards, foundation drains, and other sources not considered to be wastewater (industrial processes).

2. CONSTRUCTION – The construction of septic tanks and sewage holding tanks **shall** be in accordance with the most current version of *CAN/CSA-B66 Design, material, and manufacturing requirements for prefabricated septic tanks and sewage holding tanks.* Verification that this requirement has been met **shall be provided**. Verification may be in the form of:

   - Photograph of the CSA certification stamp on the tank
   - Copy of the CSA certification document specific to that tank
   - Report from an Engineer that verifies the above construction
   - Report from an Engineer that the certification is equivalent to CAN/CSA-B66

3. TANK BEDDING AND BURIAL – Septic tanks and sewage holding tanks **should** be buried to provide at least **1.2 m (4 ft)** of earth cover. Where this depth requirement is not met, septic tanks and sewage holding tanks **shall** be insulated with a minimum of 50 mm (2 in) of sprayed on polyurethane insulation and **shall** have a minimum of **0.6 m (2 ft)** of soil cover. All tanks shall be installed as per specific warranty related standards (depth limitations, bedding materials, anchoring, etc). Failure to meet manufacturer's specifications for installation may void warranty and may preclude the Health Officer's ability to grant permission to use the system. Also, see # 7 "wet hole" installations.

4. SET-BACK DISTANCES (Appendix D, page 33) – Septic tanks and sewage holding tanks shall not be less than:

   - **1.5 m (5 ft)** from a parcel boundary or from any building;
   - **5.0 m (16 ft)** from the edge of any road or driveway;
   - **15.0 m (50 ft)** from any source of potable water, or natural boundary or high water level of any surface water body;
   - **9.0 m (30 ft)** from a buried water storage tank; and
   - **60.0 m (200 ft)** from any community well.

5. LOCATION – Septic tanks and sewage holding tanks **shall** be located so as to be readily accessible for the pumping out of liquid sewage and sludge (eduction).

6. BUILDING CONNECTION – A flexible coupling **shall** be used on the inlet pipe to septic tanks and sewage holding tanks and **shall** be installed near the entrance to the tank. For septic tanks, a flexible coupling **shall** also be used on the outlet pipe.

7. "WET HOLE" INSTALLATIONS – Where the septic tank or sewage holding tank may be subject to buoyancy effects caused by high water table or seasonal flooding, the tank **shall** be anchored in accordance with manufacturer's requirements. Where no such requirements exist, the installation **shall** be done in a manner that will not damage the tank or invalidate its warranty

8. SEWAGE HOLDING TANKS **ONLY** – The installation of a sewage holding tank **may be permitted** when onsite conditions prevent the installation of a conventional sewage disposal system, consisting of a septic tank and soil absorption system. Sewage holding tanks may also be installed in other situations where a Health Officer is consulted and the proposal evaluated prior to the permit being issued.

- Location – Sewage holding tanks **should** be outside the building and strategically located so as to minimize heat loss, prevent structural damage, and protect the building from contamination. Sewage holding tanks **may** be located inside a building when required by local climatic conditions (e.g., long periods of below 0°C outside temperatures; permafrost).

- Pump-Out Access – **Where, under limited circumstances and with pre-authorization from a Health Officer to do so**, a building is serviced by an indoor sewage holding tank and water holding tank, the sewage pump-out line **should** be on a different wall face than the water fill line. Where they are on the same wall face, there **shall** be a separation distance between the two connectors of at least **3 m (10 ft)**, with the sewage connector being located at least **300 mm (1 ft)** lower in elevation than the water connector. Both the pump-out line and water fill line **should** be clearly labelled so that they can be distinguished from one another.

- High Level Alarm & Automatic Water Shut-Off – Sewage holding tanks **shall** have a functional audible or visual **alarm** that warns when the tank should be emptied (e.g., 75 per cent full), and both a warning light and an automatic shut-off which activates when the tank is 90 per cent full and turns off the water system to the building so as to prevent the tank from overflowing or backing-up into the building.

- Minimum Volume – The minimum volume for any sewage holding tank is recommended as **4,500 litres (1,000 imperial gallons)**.

- **For final approval of sewage holding tank, the Health Officer must receive the Septic Tank/Sewage Holding Tank Installation Declaration form along with photographs of installation, written proof from a qualified electrical contractor or a certified electrician that all relevant electrical components have been installed as specified and function accordingly, and the Notification of Installation and Undertaking to Maintain a Sewage Holding Tank. See Getting your System Approved on page 40.**

9. SEPTIC TANKS **ONLY** – There are several types and styles of septic tanks in regards to their ability to discharge sewage. Namely trickle tanks, siphon tanks and pumping chamber units (pump-up systems). **Only siphon style septic tanks are to be used** unless it is demonstrated to the Health Officer that a siphon system is not possible. In such a case the Health Officer may consider an alternate design.

- Septic Tank Volumes – The volume of septic tanks is dependent on the size and type of the building(s) to which it will be connected:

  - Residential (Less Than 6 Bedrooms) – The volumes of septic tanks required for residences are outlined in Table 1 (below):

TABLE 1
Septic Tank Sizes for Residences

# of Bedrooms	Minimum Liquid Capacity (not including siphon chamber) Litres	Imp. Gallons
2 or less	2747	(600)
3	3409	(750)
4	4091	(900)
5	4773	(1050)
6	5455	(1200)

* Actual size may vary depending on the make and model of the septic tank.

- **Residential (more than 6 bedrooms) and Non-residential** - For larger systems (over six bedrooms), or systems other than residential (e.g., work camps), the tank is to be sized using the following formula:

  a. V (in litres) = 0.75 x Q (in litres) + 5100

  b. Where: V = minimum liquid capacity (not including siphon chamber); and

  Q = estimated sewage flow per day (see Appendix A) page 31.

  Example: The septic tank for a 50-person work camp would be calculated as follows:

  V = 0.75 Q + 5,100 L where Q = 50 x 190 L = 9,500 L

  V = 0.75 x 9,500 L = 7125 L + 5,100 L = 12,225 L

  V = 12,225 L = 2,690 gallon septic tank **(exclusive of siphon)**

Soil Absorption Systems

1. SITE INVESTIGATION – Several physical characteristics and uses of the land where soil absorption systems are to be located may affect the suitability of the site. These include:

   Slope of the land – The slope of the land where a soil absorption system is to be located cannot be too steep. The effect of a steep slope depends on the type of system to be installed. For absorption beds, too steep a slope can have a significant effect during installation, one end or side will be very deep, while the other will be very shallow. Trenches can only be installed across the face of the slope.

   For both types of systems, slope can affect the way sewage travels through the subsurface soil. Instead of moving down (vertically), sewage instead moves both down and sideways (laterally). If the slope is too steep, sewage can come to the surface (break-out) and create a risk to human health through accidental exposure.

   The **maximum** allowable ground slope for absorption beds is **10 per cent**; and in trenches is **25 per cent**.

   Impervious layers – Beneath the surface of the ground, there may be impervious layers of bedrock, permafrost, or clay. In some cases, there may be features on the ground surface which may indicate the presence of an impervious layer:

   - **Rock outcrops** may indicate areas of land where bedrock is close to the surface and soil cover is limited;

   - Densely packed spruce trees in an area which is mostly shaded from direct sunlight may indicate the presence of **permafrost**; and

   - In some cases there may be an impervious layer of **clay**.

   If an impervious layer is present, there **must** be at least **1.2 m (4 ft)** of suitable receiving soils from the bottom of the soil absorption system to the impervious layer.

   Vegetation – Vegetation cover on the ground surface may give a preliminary indication of the type of soil beneath, or the presence of ground water. As mentioned above, densely packed spruce trees may indicate the presence of permafrost. Black spruce trees, Labrador tea, peat moss, reeds and sedges may indicate the presence of ground water. If any of these indicators are present, the site may be **unsuitable** for the installation of a soil absorption system.

Vehicular traffic – Soil absorption systems should be situated where there will never be any possibility of future vehicular traffic. Driveways, parking or storage areas, snowmobile or bike trails should never pass over any part of a sewage disposal system. Undisturbed snow cover reduces heat loss and helps to prevent sewage disposal systems from freezing during winter. Vehicular traffic can also cause vibration within the soil, or cause soils to settle unevenly.

2. SET-BACK DISTANCES – (See Appendix D, page 33). A soil absorption system **shall** not be less than:
   - **30.0 m (100 ft)** from any source of potable water (e.g., drinking water well);
   - **30.0 m (100 ft)** from any the natural boundary or high water level of any surface water body (e.g., pond, lake, stream, river);
   - **9.0 m (30 ft)** from a buried drinking water holding tank;
   - **60.0 m (200 ft)** from any community well; and
   - **1.2 m (4 ft)** from the seasonal high ground water level.

3. TYPES OF SOIL ABSORPTION SYSTEMS – There are three types of soil absorption systems which are generally used. The absorption bed, the absorption trench (wide or deep) and chamber systems. All have different characteristics and applications, see below for more detail.

   Pumps can also be used to lift sewage from a lower elevation where the septic tank is located, to a higher elevation where the soil absorption system is located. Pump-up systems are discussed on page 21.

   Once a potentially suitable site for the future soil absorption system has been chosen, a soils investigation and percolation test **must** be performed in accordance with the criteria laid out in the *Guidelines for Soils Investigation and Percolation Tests* section on page 34.

PLEASE NOTE: site specific characteristics may require or allow for the minimum requirements detailed in this document to be varied. The overriding consideration for varying a requirement is the protection of human health and the application of sound environmental health principles. The decision for varying a minimum requirement rests with an Environmental Health Officer.

Specifications That Apply To All Soil Absorption Systems

Refer to diagrams in the addendum: ***Septic Systems in the Yukon***, on page 41.

1. A soil absorption system shall be located not less than 5 m (16 ft) from a parcel boundary and any road or driveway; 6 m (20 ft) from any building; 9 m (30 ft) from a buried water storage tank; 30 m (100 ft) from any source of potable water, or natural boundary or high water level of any water body; and 60 m (200 ft) from any community well.

2. Minimum soil cover over system is 1.2 m (4 ft) without insulation. With a minimum of 50 mm (2 in) of approved rigid insulation, soil cover may be reduced to a minimum of 0.6 m (2 ft).

3. There **must** be a minimum of 1.2 m (4 ft) of vertical separation between the bottom of a bed and the seasonally high groundwater table and/or impervious layer such as bedrock, fractured or weathered bedrock, clay or permafrost.

4. Drainrock **must** be clean with no more than 3 per cent fines (0.080 mm screen) residual after screening, and be between 20 to 65 mm (3/4 to 2-1/2 in) in size. Drainrock is to cover the entire absorption area, and surround the perforated pipes with a minimum of 2 inches placed over the pipe. To calculate the amount of drainrock required, refer to "DETERMINING THE QUANTITY OF DRAINROCK" on page 12.

5. Perforated pipe must be installed level or to a maximum slope of 0.3 per cent with perforation holes at 4 and 8 o'clock. One additional 13 mm (½ in) hole should be drilled through the bottom section of each pipe length to allow for complete drainage of the pipes.
6. All piping and fittings must meet appropriate CSA standards (e.g., 4-inch PVC solid and perforated pipes).
7. **Maximum length of perforated pipe runs is 20 m (66 ft)**. This is a maximum length and it is recommended that for a more uniform and equal distribution of effluent a length of 12 m (40 ft) be used.
8. **Base Preparation**: In receiving soils with a percolation rate slower than 10 min./25 mm, the base should be scarified with a rake to help prevent smearing of the soil surface, and a 75 mm (3 in) thick layer of clean sand (less than 3 per cent fines) **may** be placed on the base prior to placing the pipe. The main purpose of the sand is to allow the biomat to develop in the sand layer rather than in the tighter soils at the infiltrative surface, which will enhance the system efficiency.
9. The sewage disposal system shall be so designed and constructed as to promote even distribution of effluent throughout the soil absorption area. An uneven number of perforated pipe runs requires a "double header" type connection.
10. Monitoring standpipes should be installed and are to extend to the bottom of the bed, and be detached from the rest of the system. This pipe is to be a minimum of 100 mm (4 in) in diameter with holes drilled in part of pipe embedded in the drainrock, extend above the ground surface, and be capped.
11. Cleanout standpipes are to be a minimum of 100 mm (4 in) in diameter, extend above the surface, and be capped. These pipes extend vertically up from the closed-system of lateral pipes used in transporting the sewage effluent throughout the field.
12. A silt barrier (geotextile or ridged insulation) must be installed between the top of the drainrock and the native soil backfill in order to keep the drainrock free of fines.
13. Bottom of the excavation must be level throughout.
14. The finished grade over the bed must be mounded to prevent the formation of a depression after settling, and allow for the run off of surface water. The area around the system should be graded to divert all surface runoff.

Absorption Beds Only

1. Maximum allowable ground slope in area of bed is 10 per cent.
2. Drainrock depth below pipe must be a minimum 150 mm (6 in).
3. Distance between runs of perforated pipes is 1.8 m (6 ft). The edge distance between the outside pipe and the edge of the bed must be one-half the pipe spacing or 0.9 m (3 ft).
4. At least one monitoring stand pipe should be installed and located near the centre of the bed.
5. Two cleanout standpipes are to be located diagonally on the absorption bed system (on opposite and far corners of one another), which also will aid in determining the location of the bed.
6. Only the bottom area of a bed may be considered in determining the total absorption area.
7. The bottom of a bed should be scarified or raked before placement of drainrock.

Wide Trench Only

See Specifications 1 to 14 listed in this booklet on pages 6-7 as they also apply to aspects of trench installations.

1. Maximum allowable ground slope in area of a trench is 25 per cent.
2. Absorption trench must be installed parallel to the slope contour.
3. Trench width must be 0.9 to 1.5 m (3, 4, or 5 ft) wide (Table 2, page 10) unless otherwise approved by a Health Officer.
4. When two or more trenches are being used, the horizontal distance between the trench walls must be three times the depth of drainrock below the perforated pipe or 3 m (10 ft), whichever is greater.
5. The depth of drainrock below the perforated pipe must be not less than 0.3 m (1 ft) or greater than 1.2 m (4 ft).
6. A monitoring standpipe should be installed near the end of each trench. It is to be separate from the rest of the distribution pipes.
7. A cleanout standpipe is to be installed at the end of each run of perforated pipe.
8. The bottom and sides of a wide trench must be scarified or raked before placement of drainrock.
9. The side wall and bottom area of the trench will be used in determining the absorption area. A reduction factor (see Table 2, page 10) to the total area will apply.

Deep Trench Only

See Specifications 1 to 14 listed in this booklet on pages 6-7 as they will apply to aspects of trench installations.

1. Maximum allowable ground slope in area of trench is 25 per cent.
2. Trench must be installed parallel to the slope contour.
3. Depth of drainrock below pipe must be a minimum 1.0 m (3.3 ft).
4. A monitoring standpipe should be installed near the end of each lateral trench, unattached from the rest of the system.
5. A cleanout standpipe is to be installed at the end of each run of perforated pipe.
6. The sides of the trench walls must be scarified or raked before placement of drainrock.
7. The absorbing soil strata must be a least 1.2 m (4 ft) thick.
8. Only the sidewall area of a deep trench may be considered in determining the total absorption area. The bottom of the trench shall also be within acceptable percolation rates.
9. The maximum allowable depth of a deep trench is 4 m (13 ft).
10. When two or more trenches are being used, the horizontal distance between the trench walls must be three times the depth of drainrock below the perforated pipe or 3.7 m (12 ft), whichever is greater.

Sizing your Absorption Bed or Trench

After the average percolation rate (GUIDELINES for SOILS INVESTIGATION and PERCOLATION TESTS, page 34) has been calculated and the type of soil absorption system has been determined, the minimum surface area required for your sewage disposal system can be obtained by using Appendix B, page 31. This area is based on the number of bedrooms in a standard household, assuming a water usage of 570 litres per bedroom (125 Imperial gallons per bedroom). Pages 13-20 cover Chamber Systems.

If you have used Appendix A to determine the estimated volume of sewage flow in a 24-hour period, divide by 570 L (125 imp. gal.) to obtain the bedroom equivalence.

TOTAL AREA REQUIRED = AREA FOR ONE BEDROOM x # OF BEDROOMS
(from Appendix B)

Absorption Bed

Example 1

For a 1 bedroom dwelling with a 10 min./25 mm percolation (perc.) rate, the minimum total area required for an absorption bed system would be 23 m^2 or 248 ft^2 (refer to Appendix B).

Then, divide the desired width into the total area required to determine the length of the absorption bed, given,

1 run	of perforated pipe requires a width of	1.8 m	(6 ft)
2 runs	of perforated pipe requires a width of	3.6 m	(12 ft)
4 runs	of perforated pipe requires a width of	7.3 m	(24 ft)

For more lateral runs of perforated pipe, use multiple of 6 ft.

If 1 run was chosen, then,

23.0 m^2 (248 ft^2) ÷ **1.8** m (6 ft) = **12.8** m (42 ft)
Total Area Width Length

Example 2

Given the same perc. rate with a dwelling having three bedrooms, then, multiply the total area required for 1 bedroom by 3.

i.e., **23.0** m^2 (248 ft^2) per bedroom **x 3** bedrooms = **69** m^2 (744 ft^2)

If four runs were chosen, then,

69 m^2 (744 ft^2) ÷ **7.3** m (24 ft) = **9.5** m (31 ft)
Total Area Width Length

To determine the length of the perforated pipe required for each run, subtract 1.8 m (6 ft) from the total length, as the pipes commence and end 0.9 m (3 ft) from the edge of the absorption bed.

To determine the length of the solid footer and header pipes required, subtract 1.8 m (6 ft).

Wide Trench

Given that the bottom and sidewall area of the trench will be used in determining the total absorption area, then a reduction factor (see Table 2) is applied.

TABLE 2 Length Reduction Factors (RF) for Wide Absorption Trenches				
Depth of Drainrock below Pipe		**Trench Width**		
mm	inches	0.9 m (3 ft)	1.2 m (4 ft)	1.5 m (5 ft)
300	12	0.83	0.86	0.87
450	18	0.71	0.75	0.78
600	24	0.62	0.66	0.70
750	30	0.55	0.60	0.64
900	36	0.50	0.54	0.58
1060	42	0.45	0.50	0.54
1200	48	0.41	0.46	0.50

Example 1

For a 1 bedroom dwelling with a 10 min./25 mm percolation rate, the minimum total area required for a wide trench system would be 15.3 m^2 or 165 ft^2 (refer to Appendix B, page 31).

If 600 mm (24 in) of drainrock below the pipe and a width of 1.5 m (5 ft) was chosen, then a reduction factor (RF) of .70 would be applied.

15.3 m^2 (165 ft^2) x .70 = 10.7 m^2 (115.5 ft^2)
Area Required (from Appendix B) RF Adjusted Total Area Required

Then, divide the chosen width (1500 mm or 5 ft) into the total area required to determine the length of the trench.

10.7 m^2 (115.5 ft^2) ÷ 1.5 m (5 ft) = 7.1 m (23 ft)
Total Area Width Length

Example 2

Given the same percolation rate (10 min./25 mm), depth of drainrock (24 in) and width of trench (5 ft) with a dwelling having four bedrooms, times the total area required for one bedroom by four.

10.7 m^2 (115.5 ft^2) per bedroom x 4 bedrooms = 42.8 m^2 (462 ft^2)
42.8 m^2 (462 ft^2) ÷ 1.5 m (5 ft) = 28.5 m (92.4 ft)
Total Area Width Length

Length of pipe is determined by subtracting 1.8 m (6 ft) from the length of the trench.

As the length of the pipe exceeds 20 m (66 ft) then the total area required is to be evenly divided into two, the length of each trench will then be 14.25 m (46.2 ft). The edge of each trench will have minimum of 3 m (10 ft) distance between them.

Deep Trench

Since only the side walls of the soil absorption area are taken into consideration the following formula applies:

$$\frac{\text{Total Area Required x No. of Bedrooms (from Appendix B)}}{\text{2 x Depth of Drainrock Below Pipe}} = \text{Length of Trench}$$

Example 1

For a one-bedroom dwelling with a 10 min./25 mm percolation rate, the minimum total absorption area required for a deep trench system would be 15.3 m^2 or 165 ft^2 (refer to Appendix B, page 31).

If 1.2 m (4 ft) of drain rock was placed below the pipe, then,

$$\frac{15.3\ m^2\ (165\ ft^2) \text{ x 1 bedroom}}{2 \text{ x } 4\ ft} = 6.3\ m\ (20.6\ ft)$$

Example 2

Given the same percolation rate, and depth of drainrock with a dwelling having four bedrooms, then, times the total area required for one bedroom by four.

$$\frac{15.3\ m^2\ (165\ ft^2) \text{ x 4 bedrooms}}{2 \text{ x } 4\ ft} = 25.5\ m\ (82.5\ ft)$$

Length of pipe is determined by subtracting 1.8 m (6 ft) from the length of the trench.

As the length of the pipe exceeds 20 m (66 ft) then the total area required is to be evenly divided into two. The length of each trench will then be 12.75 m (42 ft). The edge of each trench will have minimum of 3.7 m (12 ft) distance between them.

Determining the Quantity of Drainrock

To determine the amount of drainrock needed for a soil absorption system, the following formula (imperial measure only) may be used:

$$\frac{\text{length (ft) x width (ft) x depth (ft) of area to be filled with drainrock}}{27} = \text{amount in cubic yards}$$

One truck load is approximately 12 cubic yards.

Example 1

The size of the absorption bed is 7.3 m (24 ft) x 14 m (46 ft) and depth of drainrock required (including pipe cover) is 0.3 m (1 ft), then the calculation would be:

$$\frac{\text{24 ft x 46 ft x 1 ft}}{27} = \begin{array}{l}\text{40.8 cubic yards} \\ \text{Approximately 3½ truck loads}\end{array}$$

Example 2

The length of each 1.5 m (5 ft) wide trench is 14 m (46 ft) and depth of drainrock required (including pipe cover) is 0.76 m (2.5 ft), then the calculation would be:

$$\frac{\text{46 ft x 5 ft x 2.5 ft}}{27} \text{ x 2 trenches} = \begin{array}{l}\text{42.5 cubic yards} \\ \text{Approximately 3½ truck loads}\end{array}$$

Chamber Guidelines

General:

1. All chambers shall be certified by the International Association of Plumbing and Mechanical Officials (IAPMO) under PS-63-2005 or the most recent versions of the standard. Chambers that may be subjected to vehicle loads shall meet or exceed the requirements of the American Association of State Highway and Transportation Officials (AASHTO) H-20 rating, as defined in PS-63-2005. The AASHTO H-10 rating, as defined in PS-63-2005, is adequate for systems that will not be subject to vehicles or other similar heavy loadings.

2. **Manufacturer's Instructions:** Chamber systems shall be installed in accordance with the manufacturer's instructions, except that in the event of a conflict with these guidelines, the requirements of the guidelines shall apply.

3. **Side Openings:** Each chamber unit shall have a louvered sidewall open area not less than 35 per cent of the bottom infiltrative area. The sidewall openings shall be designed to restrict the entry of soils into the chamber area. The louvered area shall have a height of at least 150 mm (6 inches).

4. **Absorption Bed:** The effective infiltrative area provided by the chambers in an absorption bed shall be calculated considering the interior area at the base of the chamber where the sewage effluent contacts the soil. **See Appendix B, page 31 - absorption bed column** as the total absorption area will be the same as with existing design specifications.

5. **Absorption Trench:** The effective infiltrative area provided by the chambers in an absorption trench shall be calculated considering the interior area at the base of the chamber and a portion of the trench side walls to the height of the chamber louvers. **See Table 3, page 20 for trench calculations**.

6. **Sand Filter:** A 600 mm (24 in) thick sand filter is required beneath chambers where the soil has a percolation rate faster than 5 min./25 mm. In such cases, **only absorption beds** will be permitted. Absorption trenches are not permitted in fast-perc. soils because the trench sidewalls will not have the required sand filter protection.

7. **Depth of Cover:** The chambers must be rated for the depth of soil cover over the units. Failure to adhere to manufacturer's burial limits may void warranty and preclude ability to receive Health Officer approval.

8. **Chamber Dimensions:** Chambers shall be a minimum of 600 mm (24 in) wide and a maximum of 900 mm (36 in) wide.

9. **Spacing of Chambers:** In absorption beds, chambers shall be spaced no greater than 150 mm (6 in) apart (i.e., from the outside edge to outside edge) and may be placed edge-to-edge. In trenches, adjacent trenches shall be a minimum of 2 m (6 ft) from sidewall to sidewall.

10. **Base Preparation:** In receiving soils with a percolation rate slower than 10 min./25 mm, the base should be scarified with a rake to help prevent smearing of the soil surface, and a 75-mm (3 in) thick layer of clean sand (less than 3 per cent fines) may be placed on the base prior to placing the chambers. The main purpose of the sand is to allow the biomat to develop in the sand layer rather than in the tighter soils at the infiltrative surface, which will enhance the system efficiency. The sand can also be used as a levelling course to ensure that the chambers are laid onto a level surface and as such the long term performance of the system may be enhanced.

11. **Installation Notes:** Care must be taken not to "impact" load the chambers when backfilling. This can occur from machinery dumping fill from high elevations. Backfill should be "ladled" and placed on the chambers and then spread by hand to fill in the voids between each row of chambers in a field, or between the chambers and earth walls in a trench. Consult the manufacturer's product installation instructions regarding the operation of machinery over the chamber.

12. **Perforated Piping within Chambers:** Although not mandatory, perforated piping may be installed within the chambers to enhance the distribution of effluent along the trench or within a field. When installed, the piping should be supported above the ground surface at least 25 mm (1 in) using PWF lumber or other suitable materials, at intervals that will not result in the pipe sagging when distributing effluent. The extra 12 mm (½ in) dia. hole in the bottom of the perforated piping should only be installed in the last length of pipe in a run, to allow more effluent to continue to the end of the pipe run and allow for better distribution within the drain-field. The perforated piping should be laid a maximum slope of 0.5 per cent to allow for distribution of effluent to the end of each run.

13. **Inspection Port:** An inspection port or monitoring standpipe shall be installed at the end of each trench and in each corner of an absorption bed. It shall consist of a 100 mm (4 in) dia. PVC pipe connected to the top of the chamber and extending to 300 mm (12 in) above ground, and capped. *This allows for monitoring of system performance.*

14. **Prevention of Soil Erosion:** In order to dissipate the hydraulic energy of the effluent discharging into the end of the chamber and to minimize soil erosion, protection shall be provided, which may consist of:
    - The product-specific splash plate that is compatible with the chamber end cap system and is capable of extending to a point below the influent entry point.
    - GEOTEXTILE covering the base area of the chamber and extending at least 1.5 m (4 ft) from the beginning of the chamber, or
    - A 50 MM (2 IN) THICK LAYER OF GRAVEL extending at least 1.5 m (4 ft) from the beginning of the chamber,
      or
    - OTHER SUITABLE MEANS to dissipate the hydraulic energy and prevent erosion to the satisfaction of the Health Officer.

15. **Length of Chamber Run:** The maximum allowable length of chamber run is 20 m (66 ft). This is a maximum length and it is recommended that for a more uniform and equal distribution of effluent a length of 12 m (40 ft) be used.

16. **Depth of Cover:** The **minimum** allowable depth of earth cover over the top of the chambers without styrofoam board insulation is **1.2 m (4 ft)**. Soil cover may be reduced to a minimum of 0.6 m (2ft) when the system is covered with 50 mm (2 in) of approved rigid styrofoam type insulation.

17. **Pump-Up Systems:** Pump-up systems with gravity discharge will normally provide for improved distribution of effluent within the chambers. The *Sewage Pump-Up Systems Guidelines* shall be followed, pages 21-29.

18. **Pressure Distribution:** In a pressure distribution system, effluent is pumped under pressure to laterals within the chambers where it is evenly distributed to the soil from small diameter orifices in the lateral piping. A properly designed pressure system will provide equal distribution of effluent throughout the chamber system during each pump cycle. With this type of system, the laterals shall be suspended and fastened near the top of the chambers with the effluent being discharged upward to the top of the chamber, allowing it to deflect and be evenly distributed to the soils at the base of the chamber. All pressure distribution systems must be designed by an engineer registered in the Yukon Territory, with the engineer's seal affixed to the design plans and report.

Examples of System Designs Using Leaching Chambers

Example 1

Given: 3-bedroom home
Soil percolation rate: 9 min/25 mm (1 in)
Chamber width: **864 mm (34 in)**
Design a system using trenches.

From Table 3, page 20, the trench length/bedroom in soil with a 9 min./25 mm (1 in) percolation rate is 13.6 m (45 ft) for 864 mm (34 in) wide chambers.

Total trench length required = 3 x 13.6 m (45 ft)
= 40.8 m (135 ft)

Since 20 m (66 ft) is the maximum trench length allowed, three trenches will be required.
Each trench will then be 13.6 m (45 ft) long.

$$\frac{40.8}{3} = 13.6 \text{ m (45 ft)}$$

Example 2

Given: 2-bedroom home
Soil percolation rate: 20 min./25 mm (1 in)
Chamber width: **559 mm (22 in)**
Design a system using trenches.

From Table 3, page 20, the trench length/bedroom in soil with a 20 min./25 mm (1 in) percolation rate is 29.9 m (98 ft) for 559 mm (22 in) wide chambers.

Total trench length required = 2 x 29.9 m (98 ft)
= 59.8 m (196 ft)

Three trenches would be required so that each trench length is less than the maximum allowed length of 20 m (66 ft)

$$\frac{59.8}{3} = 19.9 \text{ m (65 ft)}$$

However, in order to ensure equal distribution of effluent from the header, an even number of trenches should be provided.

$$\frac{59.8}{4} = 15 \text{ m (49 ft)}$$

As such, four trenches should be used, each being 15 m (49 ft) long.

Example 3

Given: 3-bedroom home

Soil percolation rate: 25 min./25 mm (1 in)

Chamber width: **864 mm (34 in)**

Design a system using chambers in an absorption bed.

From Appendix B, page 31, the absorption bed area required per bedroom in soil with a 25 min./25 mm (1 in) percolation rate is 32.4 m^2 (348 ft^2).

Therefore the total area required = 32.4 (348) x 3 = 97.2 m^2 (1,044 ft^2)

With the chambers spaced 152 mm (6 in) apart, the centre-to-centre spacing in the absorption bed will be 1,016 mm = 1.016 m (3.33 ft).

As such, the total length of chambers in the bed will be

$$\frac{97.2\ (1{,}044)}{1.016\ (3.33\ \text{ft})} = 95.7\ \text{m}\ (314\ \text{ft})$$

This will be divided into runs, each having a maximum length of 20 m (66 ft).

The minimum number of runs require =

$$\frac{95.7\ \text{m}}{20.0\ \text{m}} = \text{approximately 5 runs}$$

However, an even number of runs provides better distribution from the header and as such, six runs should be used. This results in a bed length of:

$$\frac{97.2\ \text{m}^2}{6 \times 1.016\ \text{m}} = 15.9\ \text{m}\ (52\ \text{ft}) = \text{chamber run length}$$

As such, the absorption bed would be 15.9 m (52 ft) long x 6.1 (6 x 1.016) m (20 ft) wide and will contain six runs of chambers spaced 152 mm (6 in) apart.

An alternative design, which would shorten the chamber run length and improve performance, would be to increase the number of runs to eight.

$$\frac{97.2\ \text{m}^2}{8 \times 1.016\ \text{m}} = 12\ \text{m}\ (39\ \text{ft}) = \text{chamber run length}$$

In this case, the absorption bed size would be 12 m (39 ft) long x 8.1 m (27 ft) wide and contain eight runs of chambers spaced 152 mm (6 in) apart.

Example 4

Given: 3-bedroom home
Soil percolation rate: 15 min./25 mm (1 in)
Chamber width: **559 mm (22 in)**

Design a system using chambers in an absorption bed.

From Appendix B, page 31, the absorption bed area required per bedroom in soil with a 15 min./25 mm (1 in) percolation rate is 26.4 m^2 (285 ft^2).

Therefore the total area required = 26.4 (285) x 3 = 79.2 m^2 (855 ft^2)

With the chambers spaced 152 mm (6 in) apart, the centre-to-centre spacing in the absorption bed will be 711 mm = 0.71 m (2.33 ft).

As such, the total length of chambers in the bed will be

$$\frac{79.2\ (855)}{0.71\ (2.33)} = 111.5 \text{ m } (367 \text{ ft})$$

This will be divided into runs, each having a maximum length of 20 m (66 ft).

The minimum number of runs require = $\frac{111.5 \text{ m}}{20.0 \text{ m}}$ = approximately 6 runs

This results in a bed length of $\frac{79.2 \text{ m}^2}{6 \times 0.71 \text{ m}}$ = 18.6 m (61 ft) = chamber run length

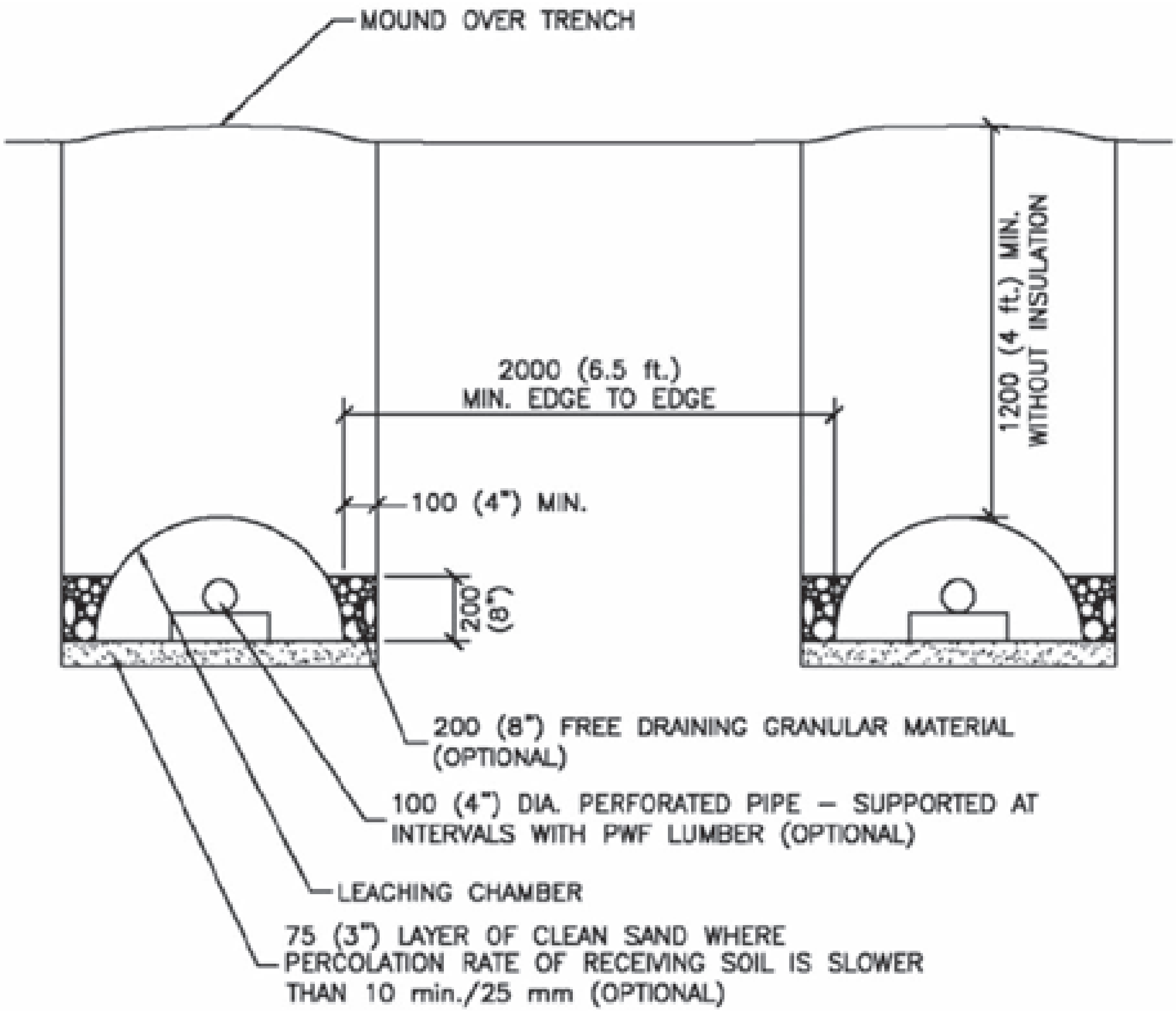
As such, the absorption bed would be 18.6 m (61 ft) long x 4.26 (6 x 0.71) m (14 ft) wide and will contain six runs of chambers spaced 152 mm (6 in) apart.

An alternative design, which would shorten the chamber run length and improve performance, would be to increase the number of runs to eight.

Chamber run length = $\frac{79.2 \text{ m}^2}{8 \times 0.71 \text{ m}}$ = 14 m (46 ft)

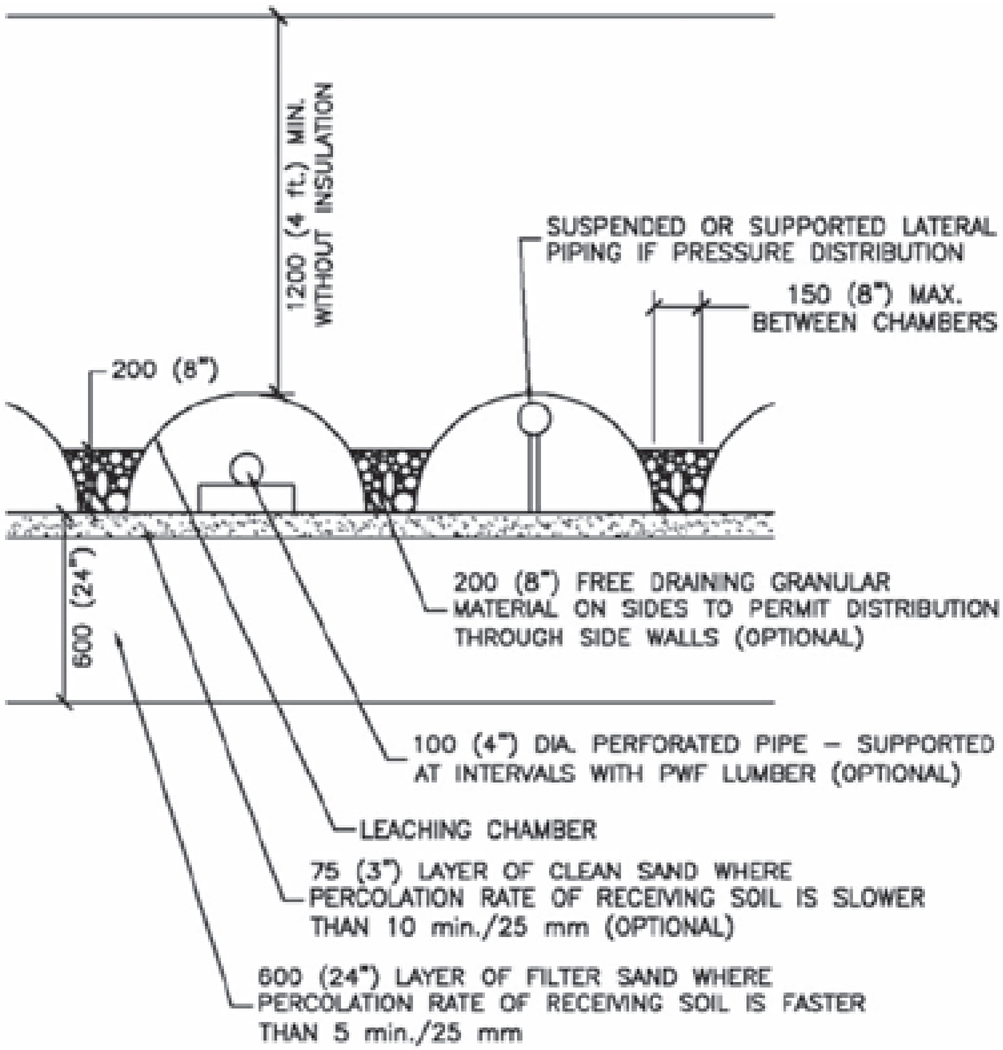
In this case, the absorption bed size would be 14 m (46 ft) long x 5.7 m (19 ft) wide and contain eight runs of chambers spaced 152 mm (6 in) apart.

Figure 1:



LEACHING CHAMBERS IN TRENCHES

Figure 2:



LEACHING CHAMBERS IN AN ABSORPTION BED

Table 3
Trench Lengths for Chambers

Percolation Rate min./in (25 mm)	LENGTH OF TRENCH / BEDROOM			
	METRIC Chamber Width		IMPERIAL Chamber Width	
	864 mm	559 mm	34 in	22 in
	m	m	feet	feet
5	10.8	16.6	35	55
6	11.6	18.0	38	59
7	12.3	19.0	40	62
8	13.0	20.1	43	66
9	13.6	21.0	45	69
10	14.2	21.9	47	72
11	14.6	22.6	48	74
12	15.1	23.3	49	76
13	15.5	23.9	51	78
14	15.9	24.6	52	81
15	16.3	25.3	54	83
16	17.2	26.6	56	87
17	17.7	27.4	58	90
18	18.2	28.2	60	92
19	18.9	29.3	62	96
20	19.4	29.9	63	98
21	19.9	30.7	65	101
22	20.4	31.5	67	103
23	20.9	32.3	69	106
24	21.5	33.3	71	109
25	22.0	34.0	72	112
26	22.5	34.8	74	114
27	23.0	35.6	76	117
28	23.7	36.6	78	120
29	24.2	37.4	79	123
30	24.7	38.2	81	125
31	25.2	39.0	83	128
32	25.7	39.8	84	130
33	26.3	40.7	86	133
34	26.8	41.5	88	136
35	27.3	42.3	90	139
36	27.9	43.1	91	141
37	28.5	44.0	93	144
38	29.0	44.8	95	147
39	29.5	45.6	97	150
40	30.0	46.4	98	152
41	30.5	47.2	100	155
42	31.2	48.3	102	158
43	31.6	48.9	104	160
44	32.2	49.7	105	163
45	32.7	50.5	107	166
46	33.2	51.3	109	168
47	33.6	52.0	110	170
48	34.1	52.8	112	173
49	34.7	53.6	114	176
50	35.0	54.1	115	177
51	35.3	54.7	116	179
52	35.7	55.2	117	181
53	36.0	55.7	118	183
54	36.5	56.4	120	185
55	36.7	56.8	120	186
56	37.1	57.3	122	188
57	37.3	57.7	122	189
58	37.7	58.3	124	191
59	37.9	58.7	124	192
60	38.3	59.2	125	194

Sewage Pump-up Systems Guidelines

General

Following are general guidelines for the design and installation of sewage pump-up systems. The types of systems include those that are intended to pump septic tank effluent through a forcemain and into an absorption system for ground treatment and disposal. A sewage pump-up system would typically be required when the effluent must be pumped to a soil stratum at a higher elevation which is more suitable for absorption. (see Figure 7, page 29).

It may also be required where, due to building lot characteristics, house location and topography, the sewage must be pumped to a higher elevation for on-site disposal.

The guidelines are primarily focused on residential applications, but may also be applied to institutional or commercial systems such as for schools, lodges, camps, etc. They are intended to be used as a general guide for contractors and designers and will be used to assist Environmental Health Services when assessing applications received for such systems. They are intended to help ensure that public health and safety issues are adequately addressed and to provide general consistency in the design of key system components.

Sewage Pump-Up Systems

There are three main components to a sewage pump-up system, namely:

- **Pump Chamber** (receives and holds septic tank effluent)
- **Pump and Controls** (pumps liquid from the tank within liquid level ranges as required)
- **Forcemain** (conveys the effluent under pressure to the soil absorption system where it flows by gravity into the perforated piping system for treatment and disposal)

Two typical arrangements are depicted in Figure 3 (page 26). These two configurations show the pumping chamber as a compartment within the tank or as a separate stand alone chamber. There are also situations where a lift system precedes the septic tank and is situated in the home basement. In such a case, the pump must be suited to handle raw sewage. Basement-type systems are not specifically reviewed in this document. However, the design principles are similar. The main components of a typical sewage pump-up system are individually discussed as follows.

Pump Chamber

The pump chamber can be a compartment of a septic tank or a self-contained separate tank as shown in Figures 3 and 4 (pages 26-27). Consideration should be given to the use of three compartments, the last of which will house the pump so as to improve the quality of effluent entering the soil absorption system. The following design features shall be adhered to:

- The tank must be structurally sound, watertight and of a material that is non-corrosive or subject to decay. Acceptable materials are fiberglass, polyethylene and concrete and must comply with the most current version of CSA B66.

- The tank must be of sufficient size to store the required volume of sewage for each pump cycle, plus a 15 per cent daily flow reserve capacity above the alarm level in order to prevent sewage backup in the event of pump failure. The reserve capacity should allow for collection of all drainage wastes from the building which is stored (i.e., toilet flush tanks) and under pressure within the system. This assumes that, when the alarm level is reached, the water service pump within the building is automatically shut down.

- A man-way must be provided in order that the pump and controls can be readily accessed and serviced at any time. The man-way should be at least 600 mm (24 in) in diameter and extend 300 mm (12 in) minimum above grade. (see Figure 4, page 27).

- A frost lid or other suitable method should be provided to prevent loss of heat from the pump chamber during winter. The access man-way can also be insulated with spray-on polyurethane. (see Figure 4, page 27).

- The access lid must be watertight and secured to prevent unauthorized entry.

- After installation, the lift system should be tested for proper operation and the owner provided with an operations and maintenance manual for the system. The O&M manual should include all product specifications for all materials and equipment, plus instructions on operation and maintenance of the system.

Pump and Controls

Pump Selection

There are many types of pumps on the market that are suitable for handling sewage. The most common type used in on-site sewage systems is a submersible centrifugal pump, designed to handle either raw domestic waste or septic tank effluent. The pump must comply with CSA and UL Standards and have a noncorrosive impeller. The pump should be selected based on the following parameters:

- Design pumping rate

- Total Dynamic Head (TDH)

The **pumping rate** should be sufficient to move the liquid through the forcemain without resulting in any settling of solids within the pipe. The recommended minimum allowable pipe velocity is 0.6 m/s (2 ft/sec). If a 38 mm (1.5 in) forcemain is used, then a flow rate of about 0.8 lps (13 US gpm) would be required to maintain the required 0.6 m/s.

A 0.9 m/s (3 ft/sec.) velocity would require a flow rate of 1.2 lps (19.5 US gpm).

The **total dynamic head (TDH)** is the sum of the static and friction head that the pump must overcome. The static head is the vertical distance between the low liquid level (shut-off level) in the pump chamber and the pipe discharge level at the absorption bed. The friction head is directly related to the type of pipe used, its diameter, the length of forcemain, and the number and type of fittings used in the line. Published tables can be referenced to determine the head loss for fittings (bends and valves, etc.). However, since these losses are relatively small for this type of system, it is generally acceptable to add 25 per cent to the total pipe length for fitting losses for calculation purposes. A pipe friction loss table is then used to determine the equivalent head loss for various flow rates.

A system head curve is generated by plotting the total dynamic head for various flow rates. This system head curve is applied to a pump performance curve. The pump will perform at any point on the pump performance curve. The intersection of the system head curve with the pump curve is the exact place where this pump will perform under the design conditions in terms of flow rate and total dynamic head. As such, by taking a few simple measurements and making a few calculations, it is possible to select the pump that will best meet the requirements of the system.

Pump Controls

Level control switches are used for pump start, stop and for the high-level alarm.

- The shut-off level should be set above the pump so that it is kept cool at all times while pumping.
- The pump start level should be set based on the desired volume of effluent to be pumped to the absorption system for each pump cycle. Typically, this volume should be 75 per cent of the volume of the perforated piping in the absorption system or a minimum of 340 litres (75 Igal). This is to provide sufficient volume of liquid during each cycle to inundate all of the perforated pipe system and therefore allow for even distribution of effluent into the receiving soil. As an example, with a 1.5 lps pumping rate and a pump-out volume of 340 litres, the pump will operate for about 3.8 minutes during each cycle. It is desirable to maintain pump cycles to 3-5 per day.
- The high-level alarm should be set at about 75 mm (3 in) above the start level.
- Ensure that the float switches are not restricted from free movement in any way.

Other guidelines pertaining to the pump and controls are as follows:

- Float switches must have a dedicated power supply and be mounted on a separate bracket of float tree so that they can be easily replaced and/or adjusted without removing the pump.
- The high-level switch must activate the alarm and also a weatherproof warning light at the pump up station and an audible alarm.
- The high level switch must also automatically shut off the power to the water supply pump in the building.
- A light should be provided which is activated during the time the sewage pump is running. This can be mounted on the control box and should be easily visible.
- The high-level alarm must be wired separately from the pump and able to be heard within a 30-m radius. The alarm should be placed in a conspicuous location.
- Provide a quick-release coupling on the discharge piping so the pump can be readily removed for servicing. A pump removal assembly must be designed to remove the pump efficiently and safely without having to enter the chamber. Use corrosive resistant fittings.
- It may be advantageous to install a valve on the discharge line so that the discharge flow rate can be adjusted if necessary by throttling.
- The pump must be capable of allowing for drain-back of the forcemain into the pump station after each cycle.
- The pump must be raised from the bottom of the station by at least 200 mm (8 in) to allow for sludge settlement. Concrete blocks or a plastic box may be used for this purpose.
- The electrical controls, relay switches, etc., must be housed within an approved weatherproof enclosure and comply with the Canadian Electrical Code for wet and corrosive locations. It should be positioned outside the pump chamber and allow for easy access for maintenance and adjustment requirements.
- Junction box to be NEMA 4X or equivalent.
- The control box is to be built and certified by an authorized manufacturer.
- The power supply entry through the tank must be gas-tight and watertight.
- **All wiring must be carried out by a certified electrician who shall provide written certification that all electrical work has been completed in accordance with the Electrical Code of Canada.**

Figure 4 (page 27), is a conceptual plan of a typical sewage pump-up station.

Forcemain

- The recommended material for the forcemain is high-density polyethylene (HDPE).
- The class of pipe chosen must be compatible with the anticipated pressures to be encountered with a minimum class of DR 17.
- The pipe diameter should allow for pipe velocities of at least 0.6 m/s (2 ft/sec). For a typical threebedroom household, the desired pump discharge rate would be in the 1.5 lps (24 USgpm) rate. Using a 38 mm (1.5 in) I.D. pipe, the velocity will be about 1.1 m/s (3.8 ft/sec), which is acceptable.
- The forcemain shall be insulated to help guard against freezing.
- The forcemain should be properly bedded and backfilled. A recommended trenching, bedding and backfilling detail is shown in Figure 6 (page 28).
- The forcemain must be sloped to completely drain the pipe from the discharge point back to the pump chamber after each pumping cycle. The recommended minimum pipe slope is 2 per cent.
- The forcemain connection to the header pipe must be made secured with clamp. Both the forcemain and header should be bedded in gravel or sand (See Figure 5, page 28).
- The forcemain should enter the header pipe from above and be provided with a vacuum breaker to prevent back-siphoning should the drain field ever become full. The higher section of the forcemain should be provided with additional freeze protection, with board insulation over the pipe and/or with insulation around the pipe (See Figure 6, page 28) .

Operation and Maintenance

- Monitoring, inspection and maintenance should be performed by a qualified person.

- The access manhole and pump chamber must be entered only by persons properly trained in confined space entry and following the requirements as laid out in the General Safety Regulations on Confined Spaces as per the *Yukon Occupational Health and Safety Act*.

- Periodic checks should be made of the pumping system to ensure that the pump is operating satisfactorily, that the cycling length and frequency are as intended, and that it is functioning as intended.

- Inspect all electrical connections. The level controls should be checked from time to time and the high-level switch should be triggered to ensure that the alarm and light are functioning and that the water pump shut-off is working.

- Inspect all plumbing fittings and connections.

- Routine pump maintenance should be carried out as recommended by the pump manufacturer.

Raised Bed/Pump Up System Details (Refer to Figure 7)

The natural on-site soils will be considered the receiving soils for which the system sizing must be designed. Percolation test(s) must be performed in this soil strata for the design considerations. See details on percolation test guidelines and Figure 7, and textural properties of soil (Table 4). Ensure that the percolation test is performed and soils are described at the appropriate receiving soils depth (depths will vary according to location of impervious or limiting layer). Keep in mind the required elevation distance between the bottom of the absorption system to the impervious/limiting layer of 1.2m (4 ft).

Filter sand (see Appendix C) must be placed throughout the entire area below the pipes or chambers. See above for sizing of system. (As above, it is not the filter sand that the percolation test rate is calculated at, it is the natural receiving soil below the sand.

To protect against effluent "break-out" there must be adequate receiving soils all around the system to ensure proper treatment. Refer to Figure 7 where there are details of the 3:1 slope requirement whereby for every foot above grade (natural ground level) that the receiving system (pipes or chambers) lays there must be three feet of horizontal material cover from the outside edges of the treatment boundary (this will be the outer edge of outside chambers or to outer edges of the drain rock as it lies above the pipes).

Further to this is the insulation requirement of 1.2 m (4 ft) of soil depth cover above the system to protect against freezing.

Backfill material should be tight silty soil that will allow for water run-off. Owner/installer is obligated to protect the system accordingly.

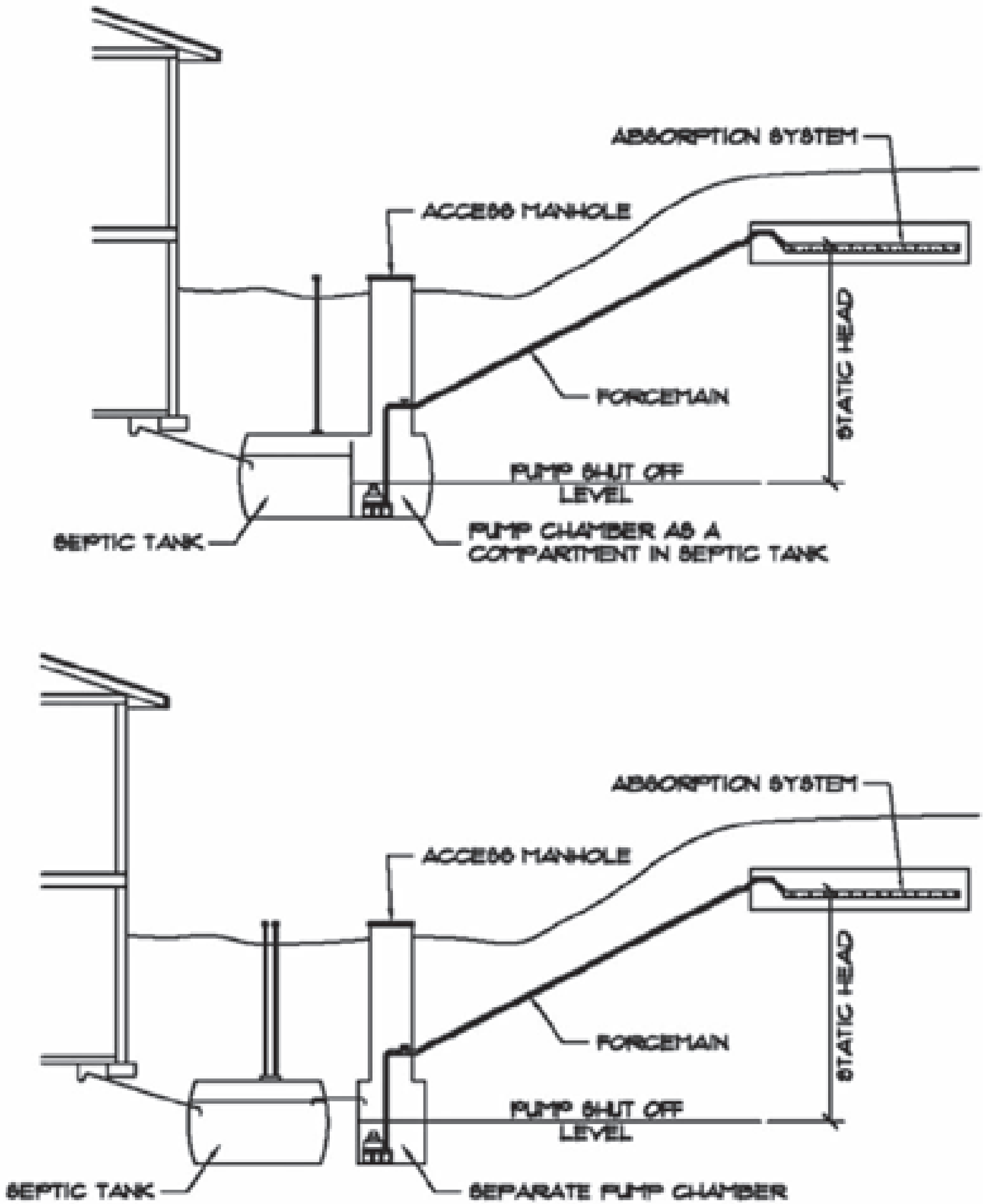
Please ensure clear legible submission of detailed sketch of this proposal for EHS consideration.

Alternate Sewage System Designs may be approved by a Health Officer. These systems may require plans which have an engineer's seal before approval will be considered.

Further information on the design and sizing of your sewage system is available from:

Environmental Health Services
#2 Hospital Road
Whitehorse, Yukon Y1A 3H8
Phone: (867) 667-8391
Toll-free (within Yukon) 1-800-661-0408, ext. 8391
Fax: (867) 667-8322
E-mail: environmental.health@gov.yk.ca

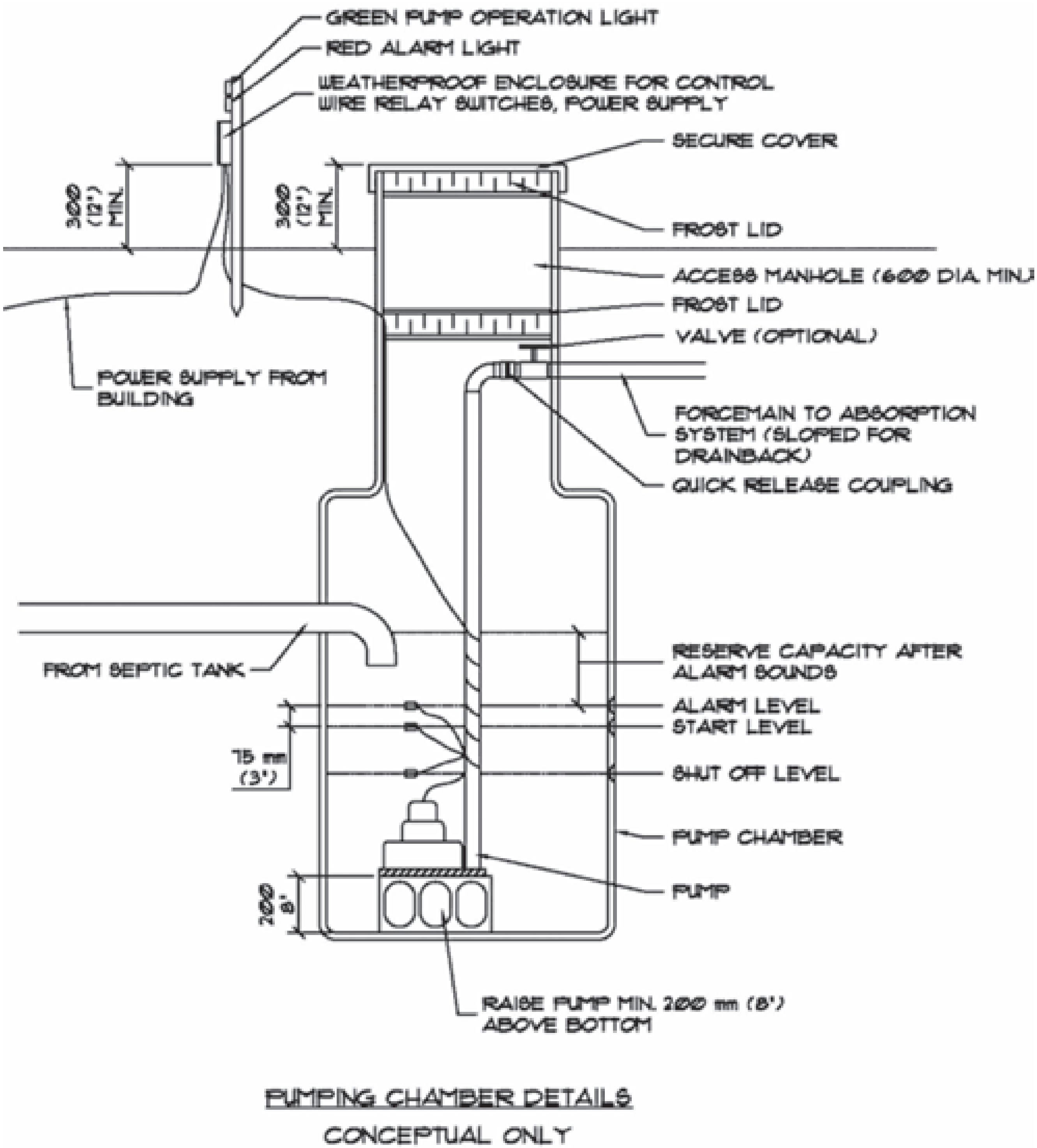
Figure 3:



<u>PUMP UP SYSTEM CONFIGURATIONS</u>

CONCEPTUAL ONLY

Figure 4:



GREEN PUMP OPERATION LIGHT
RED ALARM LIGHT
WEATHERPROOF ENCLOSURE FOR CONTROL
WIRE RELAY SWITCHES, POWER SUPPLY
SECURE COVER
300 (12') MIN.
300 (12') MIN.
FROST LID
ACCESS MANHOLE (600 DIA. MIN.)
FROST LID
VALVE (OPTIONAL)
POWER SUPPLY FROM
BUILDING
FORCEMAIN TO ABSORPTION
SYSTEM (SLOPED FOR
DRAINBACK)
QUICK RELEASE COUPLING
RESERVE CAPACITY AFTER
ALARM SOUNDS
FROM SEPTIC TANK
ALARM LEVEL
START LEVEL
75 mm
(3')
SHUT OFF LEVEL
PUMP CHAMBER
200
8'
PUMP
RAISE PUMP MIN. 200 mm (8')
ABOVE BOTTOM
PUMPING CHAMBER DETAILS
CONCEPTUAL ONLY

Figure 5:

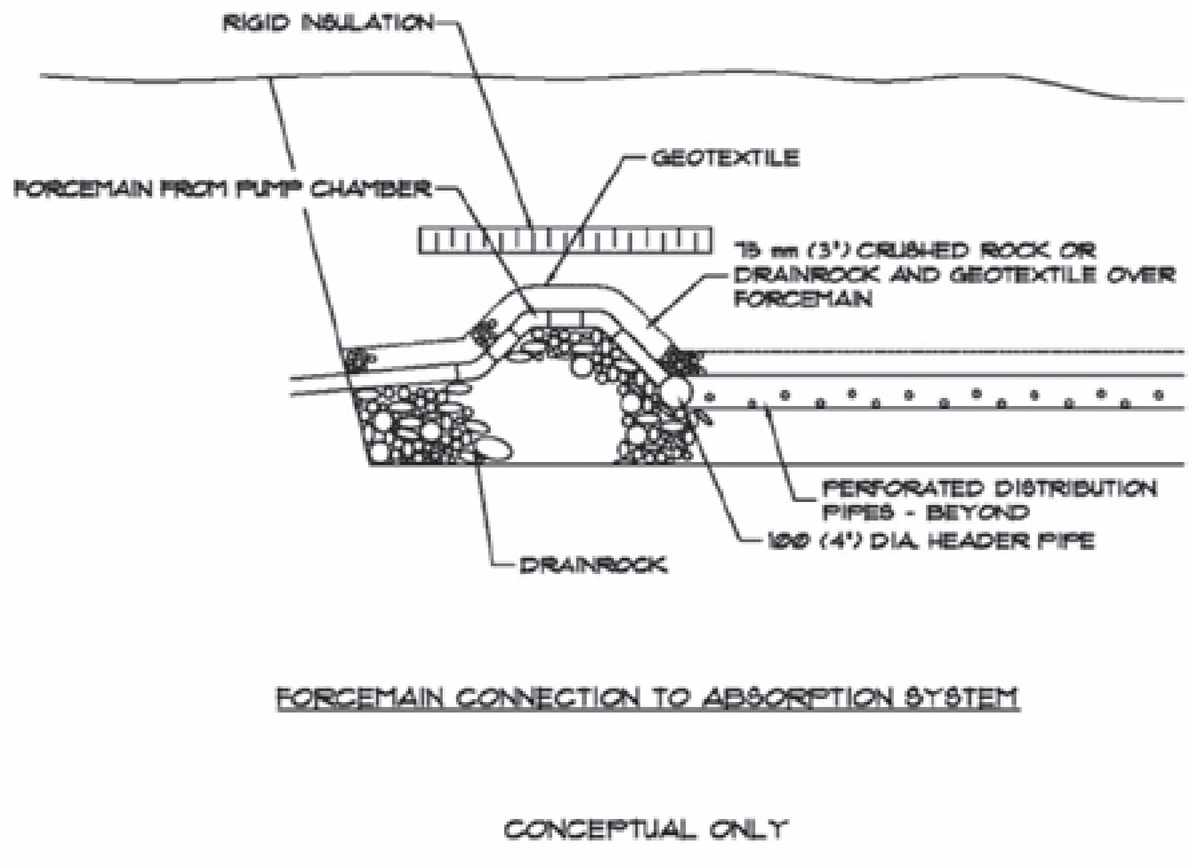


Figure 6:

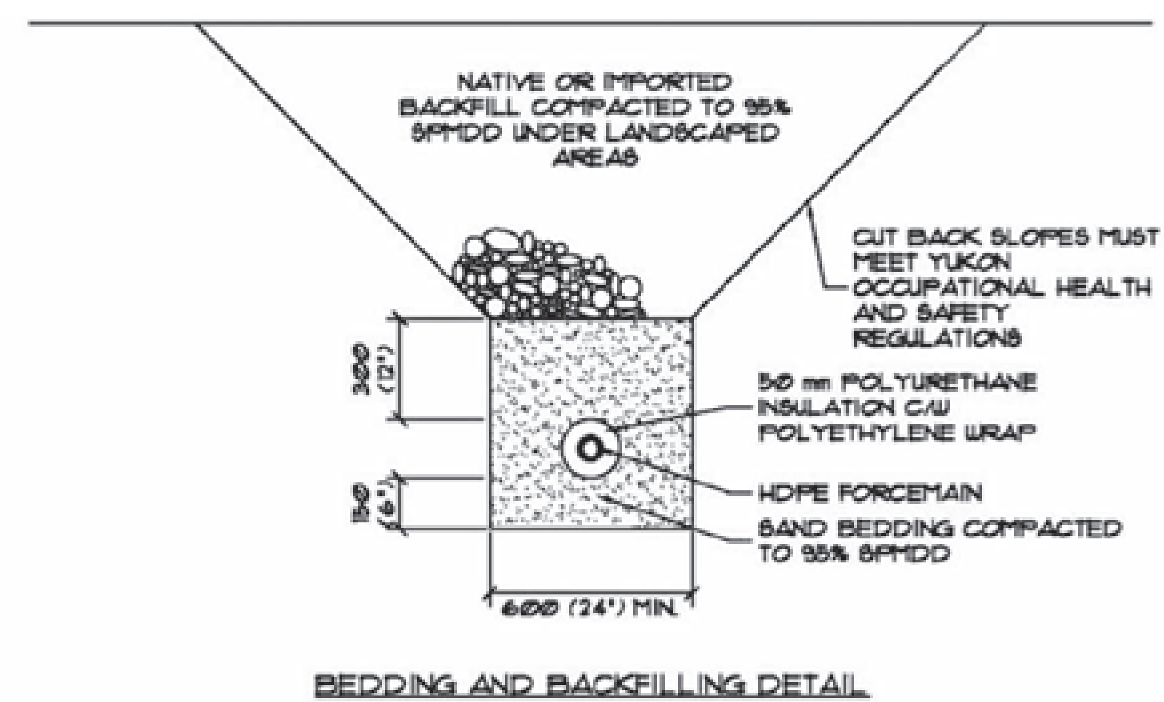
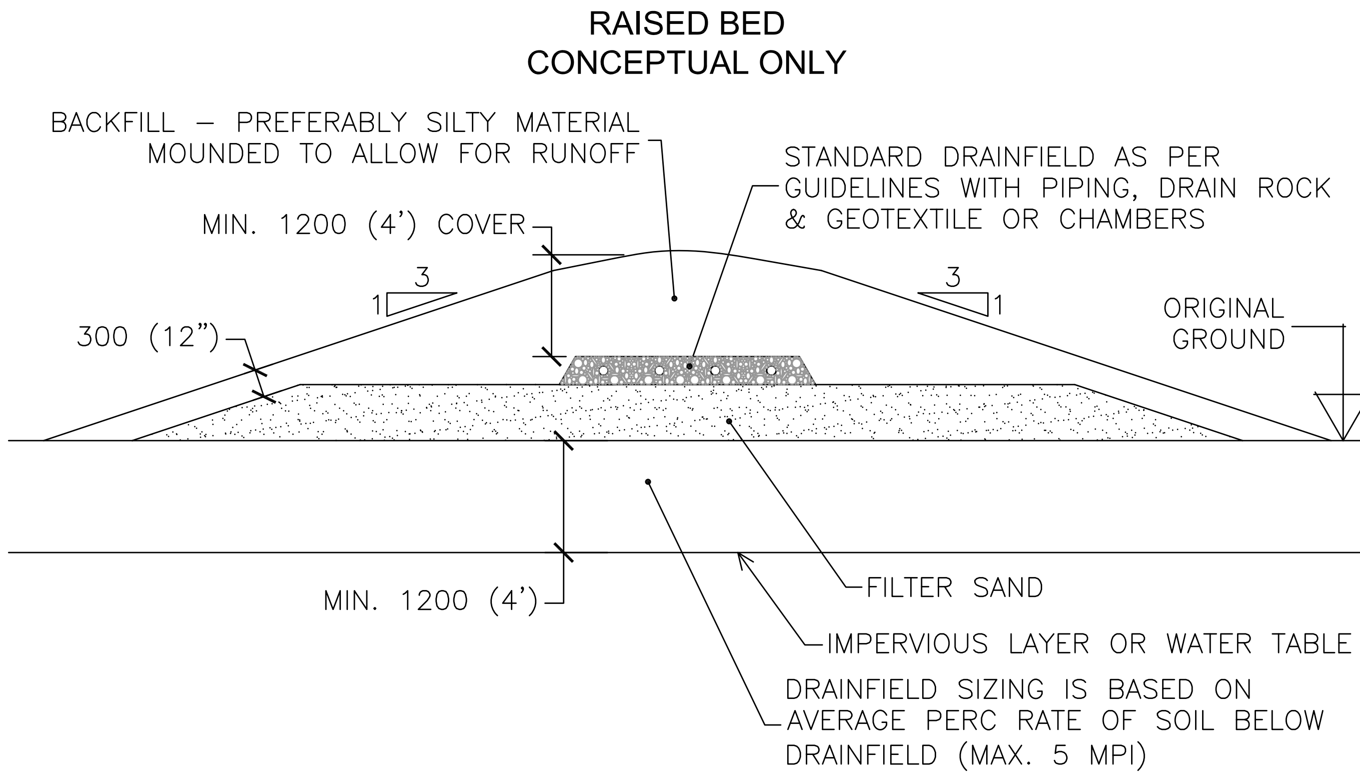


Figure 7:



RAISED BED
CONCEPTUAL ONLY
BACKFILL – PREFERABLY SILTY MATERIAL MOUNDED TO ALLOW FOR RUNOFF
STANDARD DRAINFIELD AS PER GUIDELINES WITH PIPING, DRAIN ROCK & GEOTEXTILE OR CHAMBERS
MIN. 1200 (4') COVER
3
1
3
1
300 (12")
ORIGINAL GROUND
FILTER SAND
MIN. 1200 (4')
IMPERVIOUS LAYER OR WATER TABLE
DRAINFIELD SIZING IS BASED ON AVERAGE PERC RATE OF SOIL BELOW DRAINFIELD (MAX. 5 MPI)

Appendix A:
estimated* sewage flows per day

Establishment	Litres	Imperial Gallons	
CHURCHES	22	5	per sanctuary seat
CAMPS			
Campground			
(central comfort station)	130	29	per camper
(flush toilets-no showers)	90	20	per camper
Construction Camps			
(semi-permanent)	190	42	per person
Day Camps	55	12	per person
COTTAGES and SMALL DWELLINGS			
(seasonal occupancy)	160	35	per person
DWELLINGS			
Boarding houses	160	35	per person
Apartments (multi-family)	200	44	per person
Rooming houses	150	33	per person
Single family	570	125	per bedroom
FACTORIES			
No showers	110	24	per employee
With showers	150	33	per employee
FOOD SERVICE OPERATIONS:			
Ordinary restaurant	150	33	per seat
24 hour restaurant	225	49	per seat
Tavern	90	20	per seat
Curb service	220	48	per car space
HOTELS (private bath)	200	44	per double room
LAUNDRIES (coin operated)	1700	374	per machine
MOTELS	180	40	per double unit
NURSING and REST HOMES	450	99	per person
OFFICE BUILDINGS	90	20	per employee
PICNIC PARKS (bathhouse)	40	9	per picnicker
RECREATIONAL VEHICLES PARKS	200	44	per R.V. space
(additional information available from Environmental Health Services)			
SCHOOLS			
Elementary	45	10	per pupil
Jr./Sr. High	70	15	per pupil
SWIMMING POOLS	31	7	per swimmer

*The above estimated sewage flows per day should be used as a guide and represent average figures for various types of establishments. Actual values may vary, depending on site-specific conditions and usage factors.

Appendix B
Calculating the Soil Absorption Area Based on the Percolation Test

PERCOLATION RATE [minutes per 25 mm (1 in)]

If the percolation test rate is between 0.1 and 5 minutes, the soil is considered too coarse and therefore the percolation rate too fast for trench systems. The absorption bed system must be installed with a sand filter 0.6 m (2ft) below the drain rock.

Percolation Rate minutes/25 mm (1 in)	**MINIMUM SOIL ABSORPTION AREA REQUIRED**			
	Absorption Bed		Wide & Deep Trench	
	m^2/bedroom	ft^2/bedroom	m^2/bedroom	ft^2/bedroom
5	17.4	188	11.6	125
6	18.8	203	12.5	135
7	20.0	215	13.3	143
8	21.0	227	14.0	151
9	22.1	237	14.7	158
10	23.0	248	15.3	165
11	23.7	255	15.8	170
12	24.5	263	16.3	175
13	25.1	270	16.7	180
14	25.8	278	17.2	185
15	26.4	285	17.6	190
16	27.5	296	18.6	200
17	28.1	302	19.1	206
18	28.5	308	19.7	212
19	29.1	314	20.4	220
20	29.7	320	20.9	225
21	30.3	326	21.5	231
22	30.6	330	22.0	237
23	31.2	336	22.6	243
24	31.8	342	23.2	250
25	32.4	348	23.8	256
26	32.7	353	24.3	262
27	33.3	359	24.9	268
28	33.8	363	25.6	275
29	34.4	369	26.1	281
30	34.8	375	26.7	287
31	35.3	380	27.2	293
32	35.9	386	27.8	299
33	36.3	390	28.4	306
34	36.8	396	29.0	312
35	37.5	401	29.6	318
36	37.7	405	30.1	324
37	38.3	411	30.8	331
38	38.6	416	31.3	337
39	39.2	422	31.9	343
40	39.6	426	32.4	349
41	40.1	431	33.0	355
42	40.5	435	33.6	362
43	40.8	440	34.2	368
44	41.3	444	34.8	374
45	41.7	449	35.3	380
46	42.2	453	35.9	386
47	42.5	458	36.3	391
48	42.8	461	36.9	397
49	43.2	465	37.5	403
50	43.5	468	37.8	407
51	43.8	471	38.2	411
52	44.1	474	38.6	415
53	44.4	477	38.9	419
54	44.6	480	39.4	424
55	44.9	483	39.7	427
56	45.2	486	40.1	431
57	45.5	489	40.3	434
58	45.8	492	40.7	438
59	45.9	494	41.0	441
60	46.1	495	41.4	445

Slower than 60 minutes per 25 mm (per inch) soil absorption system may not be used.

Appendix C
Absorption Bed/Sand Filter

In a soil formation with a percolation rate between 0.1 and 5 minutes/25 mm (1 in), 0.6 m (2 ft) of filter sand is to be installed below the drainrock. This sand (accepting soil) is to meet the following gradation:

Sieve (mm)	Percent Finer by Weight
#4 sieve (4.75)	100

- 100 per cent of the "sand" must pass through a #4 sieve (i.e., cannot contain any gravel)

#10 sieve (2.00) — **75-100**

- *Up to 25 per cent of the "sand" can be retained on a #10 sieve*
- *Between 75 per cent to 100 per cent of the "sand" can pass through a #10 sieve*

#60 sieve (0.25) — **15-75**

- Between 25 per cent to 85 per cent of the "sand" can be retained on a #60 sieve
- Between 15 per cent to 75 per cent of the "sand" can pass through a #60 sieve

#200 sieve (0.08) — **0-15**

- Between 85 per cent to 100 per cent of the "sand" can be retained on a #200 sieve
- Up to 15 per cent of the "sand' can pass through a #200 sieve (i.e., can have up to 15 per cent silt and/or clay)

Silt & Clay	Sand	Gravel
less than #200 sieve (0.08 mm)	between #200 sieve (0.08 mm) and #4 sieve (4.75 mm)	greater than #4 sieve (4.75 mm)

Different graded material may be used if the percolation rate is limited to 5 min/25 mm (1 in). This is equivalent to a design rate of 60 lpd/m^2 (1 gpd/ft^2). The intent of the filter sand is to ensure that wastewater does not exit the layer too quickly to permit the organic mat to complete treatment. Where a filter is required, a bed system must be used which only uses the bottom area for percolation.

Appendix D
Summary of Setback Distances

Septic tank, sewage holding tank or contained privy must not be less than:

1.5 m	(5 ft)	from a lot boundary
1.5 m	(5 ft)	from any building
5.0 m	(16 ft)	from a road or driveway
15.0 m	(50 ft)	from any source of potable water, or natural boundary or high water level of any water body
9.0 m	(30 ft)	from a buried water storage tank

Soil absorption system or pit privy must not be less than:

1.2 m	(4 ft)	from any seasonal high ground water table or impermeable barrier such as bedrock, clay or permafrost
3.0 m	(10 ft)	from septic tank
5.0 m	(16 ft)	from a lot boundary
6.0 m	(20 ft)	from any building
5.0 m	(16 ft)	from any road or driveway
30.0 m	(100 ft)	from any source of potable water, or natural boundary or high water level of any water body

Sewage disposal system must not be less than:

9.0 m	(30 ft)	from a buried holding tank for potable water
60.0 m	(200 ft)	from any community well

Guidelines for Soils Investigation and Percolation Tests

Soils Investigation

A test pit is often the best method to use to determine soil conditions.

Two things to consider when choosing an absorption field/percolation test location are to pick an absorption field location which is lower than what would be considered to be a good building site on the lot (please keep in mind that pump-up systems are an option as well) and to pick an area with good accepting soils (sands, gravels, or silty sands) if possible.

Test pits must be within 3 metres (10 ft) of the anticipated disposal site, and must extent at least 1.2 metres (4 ft) below the anticipated bottom of the soil absorption system (see Figure 8, page 36).

For large systems (commercial buildings, dwellings with 5+ bedrooms) more than one test pit and percolation test hole may be required.

Once the test pit has been dug, information on the types of soil (see Table 4, page 37) is to be recorded on your application form available from the Environmental Health Services office.

Testpitting

Test pits for percolation testing have to "prove out" accepting soils and establish 1.2 m (4ft) of soil separation above bedrock, seasonal high water table or an impervious soil. Therefore, excavate to a depth of at least 4.0 m (13 ft) See Figure 8, page 36.

On the application form, prepare a detailed log of the test-pit noting soil texture changes & colour changes in the soil as well as the presence of bedrock and/or groundwater. Establish an accepting soil horizon.

Once the depth of accepting soil has been established, excavate a small trench off your main test pit and prepare the percolation test location as described below.

Percolation Test

The percolation test provides the data necessary to properly design your soil absorption system. The percolation rate is expressed as the time in minutes that it takes for water to drop from a head of 150 mm to 125 mm within the percometer.

Following is an approved procedure for carrying out the percolation test (see Figure 8, page 36):

1. To determine the depth for your test hole, it is best to excavate a hole with a backhoe to a depth of 4 m (13 ft) or more, obtain soils information and select the soil layer that you think is suitable for the absorption of the sewage effluent. Then excavate a bench or step on the sidewall of the test pit. When the test is made from a step or bench of a test pit, the percolation test hole therein should not be closer than 0.5 m (1.6 ft) to the sidewall of the pit.

2. The test hole is to be hand augured or dug to a diameter of 150 mm (6 in) and to a depth of 300 mm (1 ft) into the soil layer intended to accept the sewage effluent. The bottom of the percolation test hole must be at least 1.2 m (4 ft) above the groundwater level and bedrock/impervious soil layer.

3. The auger is likely to smear the soil along the sidewalls of the test hole. Therefore, it is necessary to scratch or scarify the bottom 0.5 m (1.6 ft) sidewall as well as the bottom of the hole. This can easily be carried out with a rake or a pointed instrument/nails driven into a board.

4. Remove all loose soil material from the bottom of the test hole, and then add 50 mm (2 in) of 6 to 20 mm (1/4 to 3/4 in) diameter drainrock to protect the bottom from scouring when water is added. The gravel can be contained in a nylon mesh bag to be removed after the test is performed for use in additional percolation tests.

5. Carefully fill the test hole with clean water to at least 300 mm (12 in) in depth, and continue to do so until the soil is saturated. Saturation means that the void spaces between the soil particles are full of water. Keep soaking the hole until the rate at which the water seeping away becomes constant.

   In the event that the soil layer consists mainly of:

   (a) heavy silts or clays, then water must be kept in the hole to allow for saturation and swelling. Keep water in the hole for at least 4 hours, preferably overnight. Refill, if necessary, or supply a surplus reservoir of water, maintaining the 300 mm (12 in) depth with an automatic siphon. Use a hose or similar device to add water to the hole and to prevent washing down the sides of the hole. Measure the percolation rate after at least 16 hours, but no more than 30 hours after water was first added to the hole. This ensures that the soil has an ample opportunity to swell and to approach the natural condition during the wettest season.

   (b) sand and gravel, and you are unable retain water in the hole after attempting to saturate the soil, then you may assume that your rate of percolation is less than 5 min./25 mm (1 in). Should this be the case, then 0.6 m (2 ft) of filter sand may be required. Refer to Appendix C, page 32, for sand filter specifications.

6. Stand the percometer up in the hole and support it with cobbles. A bed of small stones under the percometer is important to allow free flow of water.

7. Make sure the float and measuring device accompanying the percometer are in place and working. As water is poured down throughout the percometer, the float will come up. Fill the percolation test hole you excavated in your trench and keep it full during the pre-soak period (4 hours for fine grained soils – 10 gallons of water for sand and gravel).

8. The percolation rate is the amount of time it takes for the water to drop from a head of 150 mm (6 in) to 125 mm (5 in) within the percometer, so after your pre-soak is completed, fill the percometer to 150 mm and measure the amount of time it takes to drop to 125 mm. Record the time, repeat the test as necessary and record the results on your application. Continue taking readings until three consecutive percolation rates vary by no more than 10 per cent. Those are the numbers that are to be submitted.

See page 9 now for the sizing of your absorption system.

Figure 8:

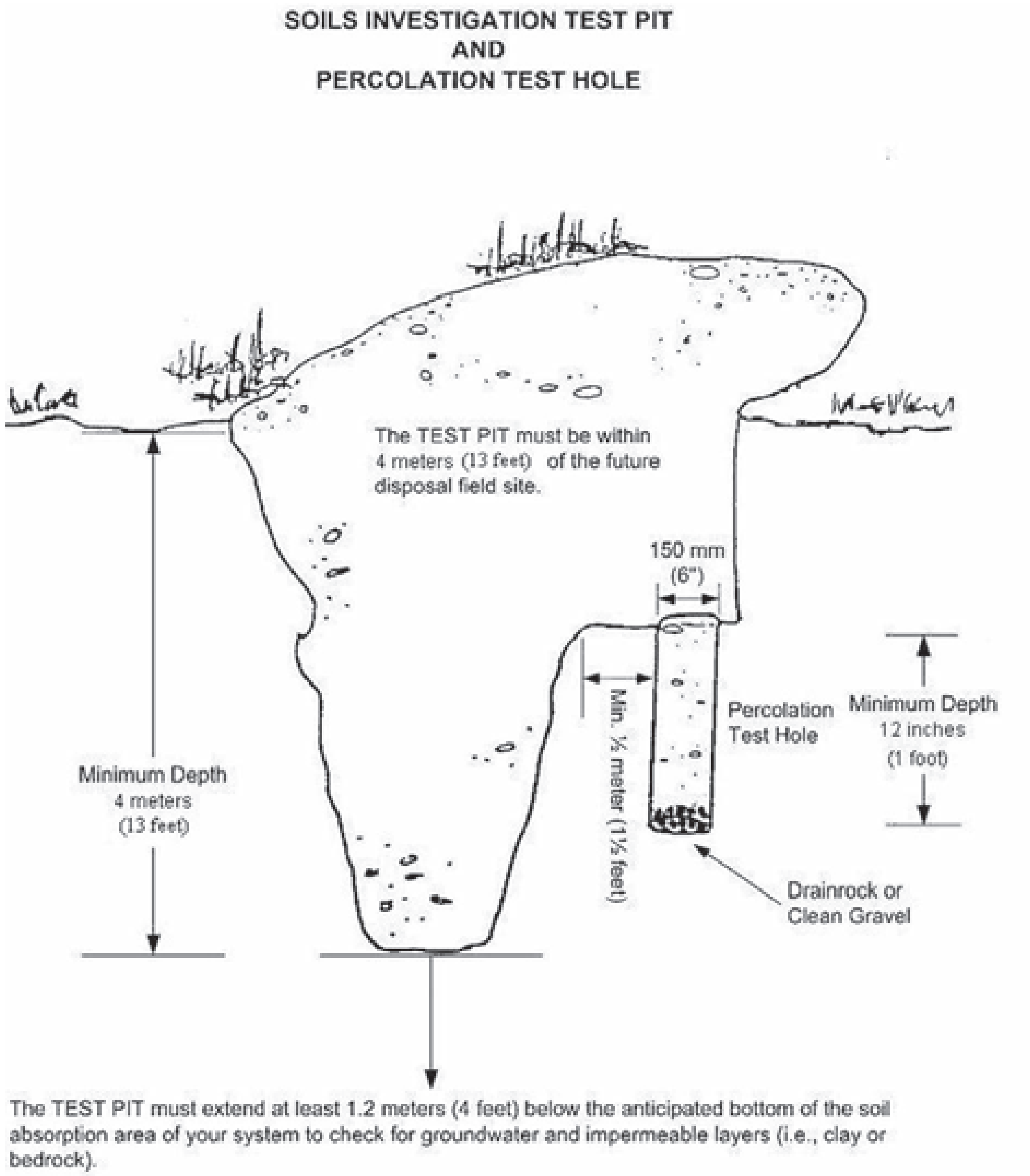

SOILS INVESTIGATION TEST PIT
AND
PERCOLATION TEST HOLE
The TEST PIT must be within 4 meters (13 feet) of the future disposal field site.
150 mm (6")
Min. ½ meter (1½ feet)
Percolation Test Hole
Minimum Depth 12 inches (1 foot)
Minimum Depth 4 meters (13 feet)
Drainrock or Clean Gravel
The TEST PIT must extend at least 1.2 meters (4 feet) below the anticipated bottom of the soil absorption area of your system to check for groundwater and impermeable layers (i.e., clay or bedrock).

Table 4:
Textural Properties of Soil

	Feeling and Appearance	
Soil Class	**Dry Soil**	**Moist Soil**
Sandy Gravel	Loose stones and single grains which feel gritty. Squeezed in the hand, the soil mass falls apart when the pressure is released.	Squeezed in the hand, it forms a cast which crumbles when touched. Does not form a ribbon between thumb and forefinger.
Silty Sand	Aggregates easily crushed; very faint velvety feeling initially but with continued rubbing, the gritty feeling of sand soon dominates.	Forms a cast which bears careful handling without breaking. Does not form a ribbon between the thumb and forefinger.
Sandy Silt	Aggregates are crushed under moderate pressure; clods can be quite firm. When pulverized, soil has velvety feel that becomes gritty with continued rubbing. Casts bear careful handling.	Cast can be handled quite freely without breaking. Very slight tendency to ribbon between the thumb and forefinger. Rubbed surface is rough.
Clayey Silt	Aggregates are firm but may be crushed under moderate pressure. Clods are firm to hard. Smooth, flour-like feel dominates when soil is pulverized.	Cast can be freely handled without breaking. Slight tendency to ribbon between the thumb and forefinger. Rubbed surface has a broken or rippled appearance.
Silty Clay	Very firm aggregates and hard clods that strongly resist crushing by hand. When pulverized, the soil takes on a somewhat gritty feeling due to the harshness of very small aggregates which persist.	Cast can bear much handling without breaking. Pinched between the thumb and forefinger, it forms a ribbon whose surface tends to feel slightly gritty when dampened and rubbed. Soil is plastic, sticky and puddles easily.
Clay	Aggregates are hard; clods are extremely hard and strongly resist crushing by hand. When pulverized, it has a grit-like texture due to the harshness of numerous very small aggregates which persist.	Casts can bear considerable handling without breaking. Forms a flexible ribbon between the thumb and forefinger and retains its plasticity when elongated. Rubbed surface has a very smooth, satin feeling. Sticky when wet and easily puddles.

Photographic Record of the Stages of Installation of a Sewage Disposal System

The *Sewage Disposal Systems Regulation* requires a photographic record of the stages of installation to be submitted to a Health Officer within 30 days of installation of the sewage disposal system. This list provides a guide to what the photographs must depict.

All photographs must be marked with the permit number and the legal description of the property the sewage disposal system was installed on.

Delays in issuing Approval to Use may occur if the photographs do not clearly depict the installation of the sewage disposal system, or if the record is incomplete.

Septic Tanks and Sewage Holding Tanks
If a septic tank or sewage holding tank will be installed, submit a picture depicting the:

- Excavation containing the septic tank or sewage holding tank.
- Volume marking(s) on the septic tank or sewage holding tank (e.g., stencil on the tank).
- Required in-situ bedding material for the septic tank or sewage holding tank (e.g., pea gravel).
- Certification marking or label on septic tank or sewage holding tank (e.g., CAN/CSA-B66).
- Trench between septic tank or sewage holding tank and the building to which it will/is connected - must show the flex coupling.
- Septic tank or sewage holding tank covered with soil to original ground level showing all clean-outs and observation pipes, and relationship to building that it services (if present) or other distinguishing permanent landmark(s).

If a septic tank will be installed, submit a picture depicting the:

- Trench between septic tank and soil absorption system (e.g., absorption bed, trenches).

If a sewage holding tank will be installed, submit a picture depicting the:

- High level alarm and automatic water shut-off.

If a sewage holding tank will be installed where it may be subject to the effects of buoyancy due to flooding, submit a picture depicting the:

- Anchoring harnesses, turnbuckles, and cables.
- “Deadmen” or concrete pad.

Soil Absorption System
If a soil absorption system will be installed, submit a picture depicting the:

- Excavation for the soil absorption system which shows the soil profile.
- Soil absorption system covered with soil to original ground level showing all clean-outs, observation pipes, and relationship to building that it services (if present) or other distinguishing permanent landmark(s).

If installing a soil absorption system in “fast” soils (less than 5 minutes per inch percolation rate), submit a picture depicting the:

- Filter sand and its depth – a tape measure or similar device should appear in the picture.

If installing a soil absorption system using drain rock, submit a picture depicting the:

- Drain rock and its depth – a tape measure or similar device should appear in the picture.
- Perforated pipe(s) (the total length must be clear and easy to determine) – if installed in sections, a picture of each stage of installation of the pipe must be provided.
- Perforated pipe(s) covered with drain rock.
- Drain rock covered with geotextile or rigid insulation (e.g., Styrofoam).

If installing a soil absorption system using chambers, submit a picture depicting the:

- Chambers (the total length must be clear and easy to determine) – if installed in sections, a picture of each stage of installation of the chambers must be provided.

Pump-up and Raised Soil Absorption Systems

If the sewage disposal system is to contain a mechanical pump (inside your septic tank) which discharges sewage to a raised soil absorption system, submit a picture depicting the:

- Forcemain exiting man-way.
- Anti-siphon device.
- Pump on mount or stand after installation in septic tank.
- Mounded forcemain.
- Insulation of the forcemain.
- Frost plug in man-way.
- Warning indicator system and automatic water shut-off.

Please include any other necessary photographs that show a part of the installation of the sewage disposal system not described above. See Figures 3, 4, 5 and 6 on pages 26-28.

Application Submission Requirements

Please be advised that applications must be received at least 48 hours in advance of planned receipt of the permit. The permit must be issued prior to installation of system.

As a minimum, the following must be submitted to Environmental Health Services along with an application for a permit to install a septic system:

- A sketch showing a profile of the system layout, including septic tank, and absorption system plus a plan showing the location and horizontal distances between all system components, water supply, and structures.
- Where applicable, the pump-up system design rationale and specifications for:
  - pump selection
  - controls (level switch settings)
  - forcemain (type, diameter, class, insulation)
  - height and distance for effluent transfer from tank to absorption system

Once a permit has been issued there can be no alteration to the sewage disposal system or other work it refers to without the approval of a Health Officer.

11 Sewage Disposal Systems Regulation

Getting Your System Approved

Within 30 days of the installation of the system, the following information shall be provided to a Health Officer:

- Photographic record of the stages of installation
- Completion of the *Notification of Installation and Undertaking to Maintain a Sewage Disposal System*
- Other documentation as requested by the Health Officer (Tank CSA approval, Septic Tank Installation Declaration form, Abandonment and Reclamation document, Receipts)

Approval to Use a Sewage Holding Tank requires the following to be submitted for review by a Health Officer:

- *Septic Tank and Sewage Holding Tank Installation Declaration* form;
- photographs of the stages of installation;
- receipt or other form of proof from a qualified electrical contractor or certified electrician (for high level alarm and automatic water shut-off); and
- *Notification of Installation and Undertaking to Maintain a Sewage Holding Tank* form.

Provided that the Health Officer is satisfied that all requirements have been met, written approval to use the sewage disposal system shall be issued by the Health Officer.

13(2) Sewage Disposal Systems Regulation

ADDENDUM:
Septic Systems in the Yukon –
A Guide to their Design and Maintenance (2006)

Water, Sewage And Environmental Health

Properly operating septic systems are a good way to control waterrelated disease. Bacteria, viruses and parasites found in sewage are the principal causes of water-related disease, such as various gastrointestinal illnesses, hepatitis A and Giardiasis (Beaver Fever). Sewage from toilets is classified as *black water* and all other domestic sewage–for example, wastewater from the shower, kitchen sink, washing machine, etc.–is referred to as grey water.

Both grey and black water can be expected to contain significant numbers of disease-causing microorganisms. Some people believe that grey water can bypass the septic tank or other sewage treatment system, but this tends to ignore the characteristics of such waste. Grey water typically contains between one and three million faecal coliforms and between three and ten thousand Faecal Streptococci microorganisms per 100 ml. These “indicator” types confirm the potential presence of a wide range of disease-causing microorganisms originating in the intestines of humans and animals. Additionally, grey water tends to have sufficiently high levels of suspended solids and fat that, without pretreatment, nuisance conditions can result and health risks arise when it is discharged into the ground.

Full treatment of septic tank effluent requires that it be discharged into the unsaturated soil zone. This discharge, at an appropriate rate, will fully utilize the treatment available through filtration and chemical/ biological breakdown processes. Disease-causing organisms can survive for longer periods during prolonged cold spells in the Yukon. Their containment and eventual breakdown beneath the ground surface protects human and animal health. Travel through one to two feet of unsaturated silty, sandy, or clay loam soil can be expected to remove the sewage microorganisms, and protect ground and surface water. Protection of the environment and the public health is further enhanced because of the required set-back distances, the safety zones established for surface water, wells and property lines. Soil conditions vary and a greater unsaturated soil depth and/or a sand filter is required in coarse, granular soils. In the Yukon, many areas are suitable for soil absorption systems. However, there are some situations where they cannot be used. Factors preventing installation include lot size, soil type, and the proximity of bedrock, high water table or permafrost.

The septic system should receive all discharges from toilets, and the waste from baths, washbasins, showers, sinks and washing machines. Surface water from roofs, yards and foundation drainage, together with spring run-off, must be excluded from the septic tank and absorption bed area.

How a Septic System Works

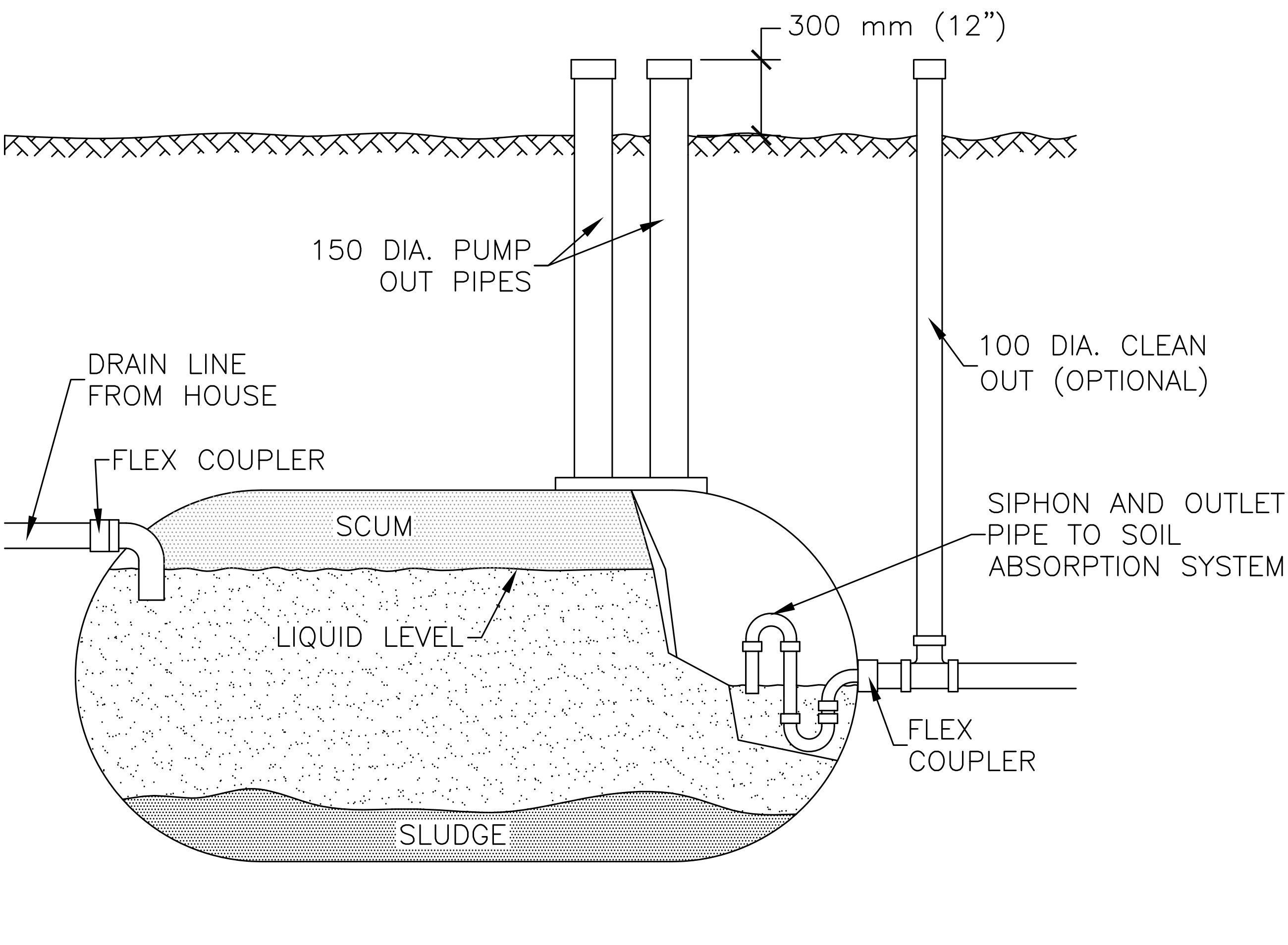
A septic system consists of two main components: a *septic tank* and a *soil absorption system*.

A septic tank is a two-compartment, watertight container which is used to pretreat household sewage (black and grey water) before it enters the soil absorption system. The sewage stays in the first compartment long enough to enable the heavier solids to settle out to the bottom and the lighter solids, including fats and grease, to rise to the surface and form a scum layer. The retained sludge and scum undergo partial digestion and conversion to a liquid form acceptable to the receiving ground. A properly designed and maintained septic tank can remove most of the settleable solids before it is discharged into the soil absorption system.

A siphon chamber, which is usually incorporated in the tank, stores the effluent and intermittently discharges it to the absorption system in large flushes. The owner should inspect the septic tank to ensure that the baffles have been properly installed and test the siphon before it is backfilled.

The septic tank must meet the appropriate CSA standard.

TYPICAL SEPTIC TANK CROSS SECTION

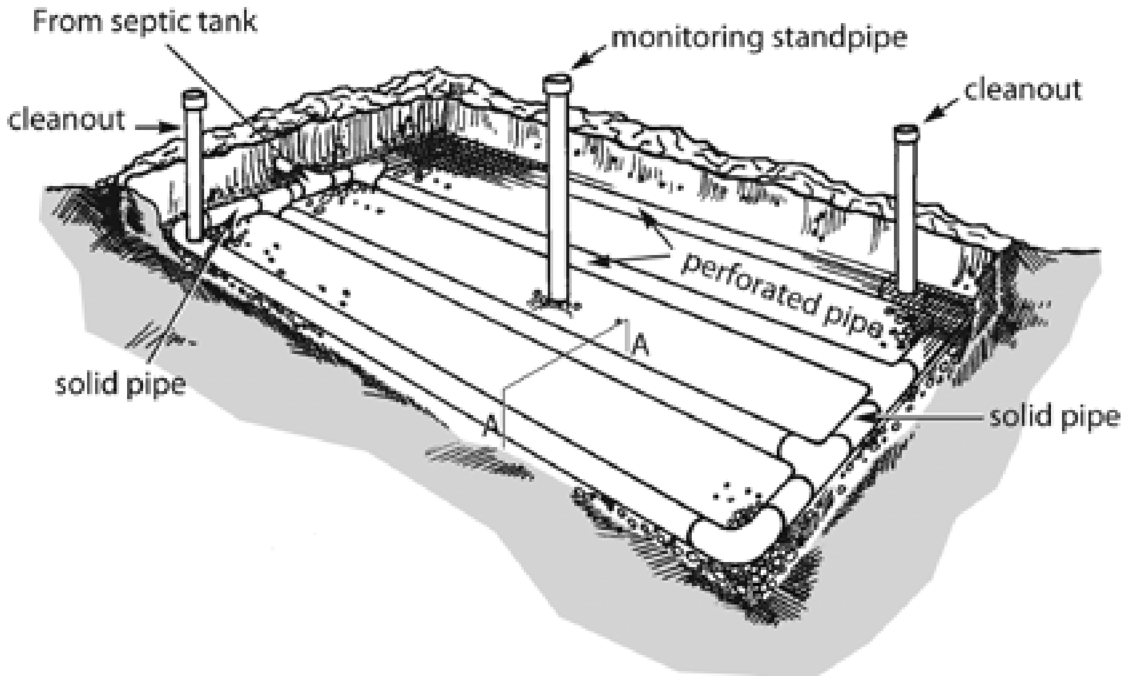


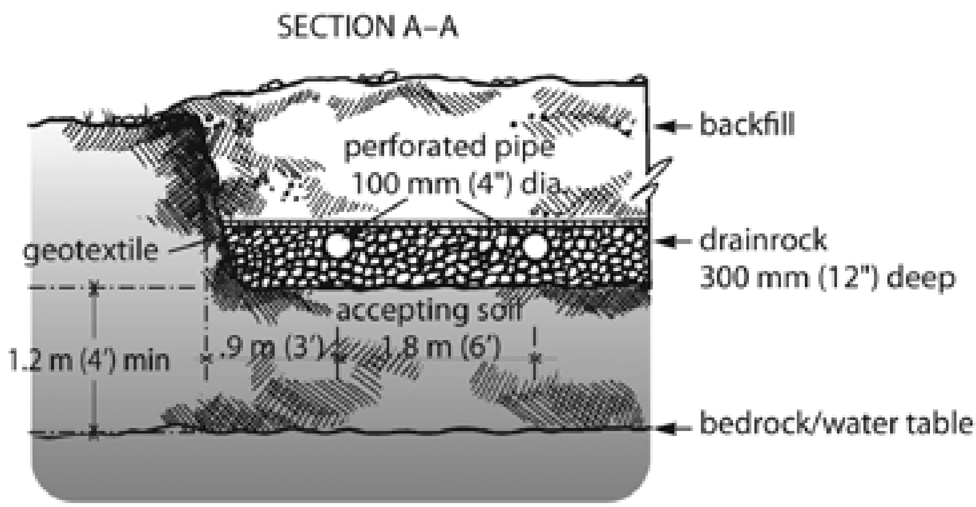
Soil Absorption Systems

Two main types of soil absorption systems are used in the Yukon: the *absorption bed*, and the *absorption trench*. Due to cold winter climatic conditions, both the septic tank and the soil absorption system (if uninsulated) require a minimum soil cover of 1.2 m (4').

Absorption Bed

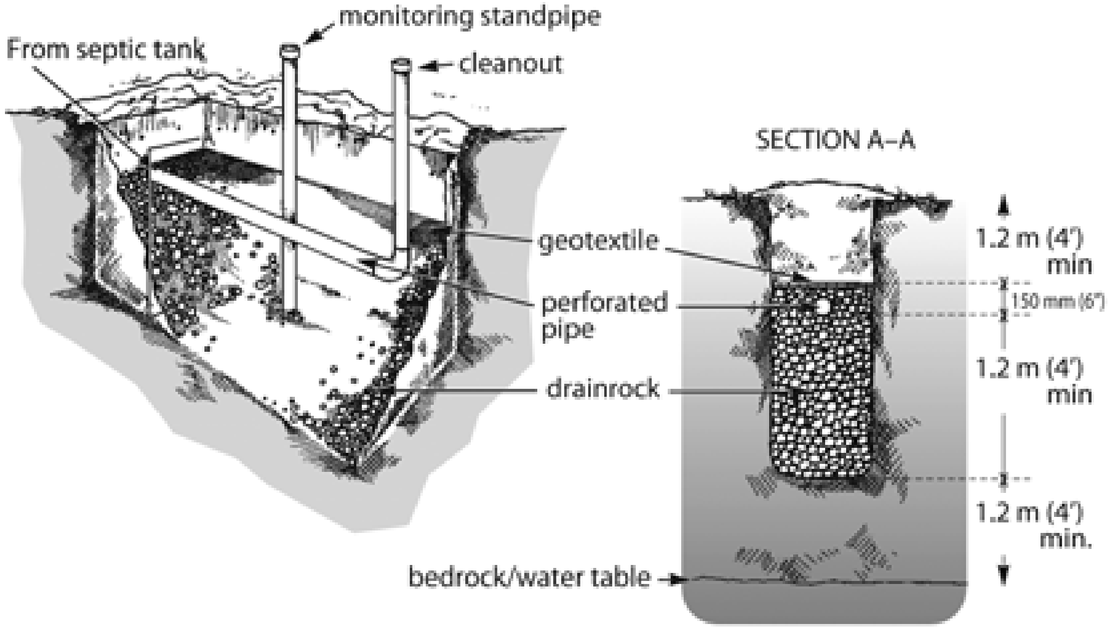
An absorption bed is a rectangular excavation containing 300 mm (12") of drain rock, perforated pipes, geotextile and standpipes that receive septic tank effluent. Absorption occurs only through the bottom of the bed.





Deep Absorption Trench

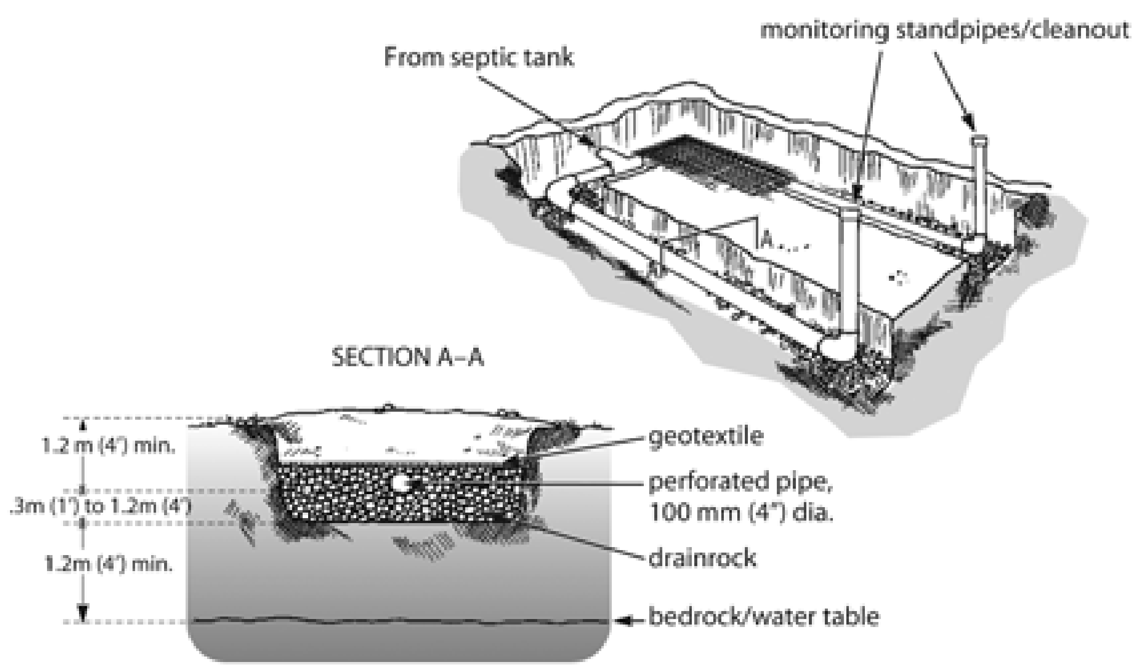
A deep absorption trench is 450 – 900 mm (18" – 36") wide and contains at least 1200 mm (4') of drain rock below the perforated piping. The effluent seeps into trench sidewalls from the drain rock.



Wide Absorption Trench

A wide absorption trench combines some of the features of the bed and deep trench and is usually 900 mm (3') to 1500 mm (5') wide and has 300 mm (12") to 1200 mm (48") of drainrock below the perforated pipe.

When trenches are installed parallel to each other, the separation distance between trench walls must be three times the depth of the drain rock nbelow the pipe or 3m (10'), whichever is greater.



Design and Installation

Before designing a septic system, it is essential that complete and accurate site investigations are carried out. This is important to determine whether a lot is suitable for onsite disposal. For new house construction, these investigations should be carried out before the house design is completed in order to ensure that the house location is suited to the septic system location, thereby allowing you to determine the most cost effective design. The site investigation should include the following:

- Location and setback distances (see opposite page)
- Soil conditions (soil type and percolation rate)
- Surface features (ground slope, rock outcrops, traffic areas, etc.)
- Provision for expansion or replacement of septic system
- Depth to groundwater and bedrock (minimum vertical clearance from bottom of absorption system to groundwater is 1.2 m (4 ft.))

The percolation rate is a measure of the soil's ability to absorb liquid and is the single most important parameter used for sizing a soil absorption system. The percolation test must be performed according to procedures specified, a copy of which is available from Environmental Health Services.

In the Yukon, many areas are suitable for soil absorption systems. However, there are some conditions which will prevent the installation of such a system. These include fine grained soils (very slow percolation rate), inadequate lot size, permafrost, inadequate distance to natural water bodies, and insufficient vertical clearances to bedrock and/or groundwater.

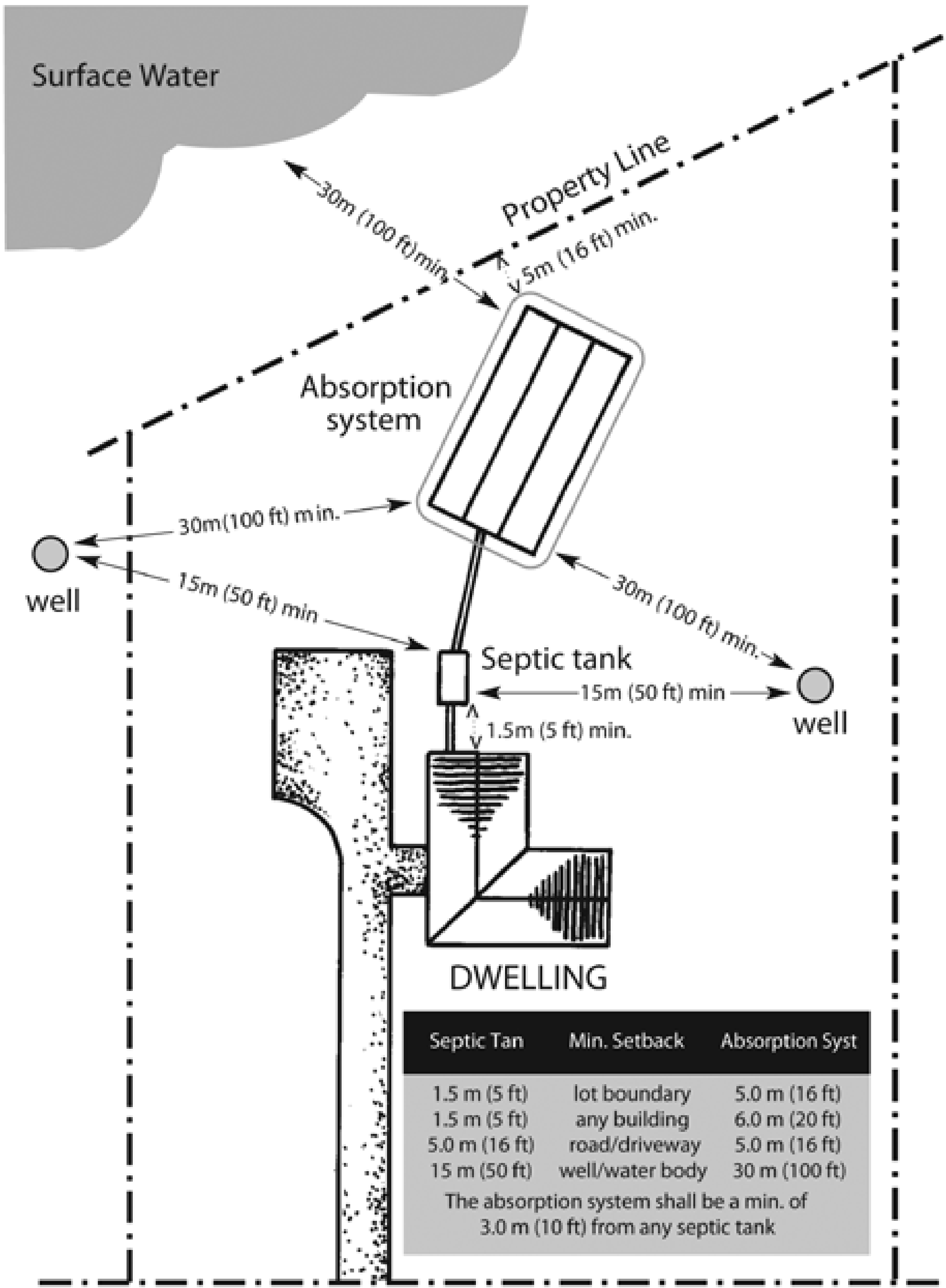
Design

Designs for septic systems can be completed by the homeowner, contractor or engineering consultant. Detailed information and advice, if required, is available from the Environmental Health Office in Whitehorse. A Permit to Install a Sewage Disposal System is required prior to the installation, modification or upgrading of any septic system. Developers should also check with local municipal requirements. A sewage disposal permit is required before a building permit may be issued by Building Inspectors for the Yukon Government or the City of Whitehorse.

Installation

It is very important that a septic system be installed carefully and in strict accordance with the approved design. Failure to do so may result in problems with the system. The septic tank must be installed and suitably bedded, design grades for building sewers must be adhered to, and care must be taken to ensure the absorption bed components are installed according to the approved design. Further information and owner's responsibilities are outlined in "Application and Permits".

Minimum Setback Distances



Septic Tan	Min. Setback	Absorption Syst
1.5 m (5 ft)	lot boundary	5.0 m (16 ft)
1.5 m (5 ft)	any building	6.0 m (20 ft)
5.0 m (16 ft)	road/driveway	5.0 m (16 ft)
15 m (50 ft)	well/water body	30 m (100 ft)

The absorption system shall be a min. of 3.0 m (10 ft) from any septic tank

Operation and Maintenance

A sewage system which has been properly installed should, with proper care and maintenance, provide many years of service. There are, however, some things which you, the homeowner, should be aware of that will help the system to function properly. These are:

1. **Surface Water**
   Do not allow roof drains to discharge to the septic tank or surface waters to drain towards the area of the disposal field.

2. **Water Usage**
   Excessive and unnecessary water usage should be kept to a minimum in the home. If automatic washers and dishwashers are used, make sure full loads are washed each time. Excessive use of water, such as doing numerous washings in one day, could flush solids from the tank to the disposal field.

3. **Garbage Disposal Units**
   Wastes from garbage disposal units are not easily digested by bacteria in the septic tank and only add to the volume of solids in the septic tank which must be removed by pumping the tank. Therefore, the use of garbage disposal units is not recommended.

4. **Operation**
   Moderate use of household drain solvents, cleaners, disinfectants, etc. should not interfere with the operation of the sewage disposal system, but indiscriminate use may cause problems. Toilet paper substitutes, paper towels, newspaper, sanitary napkins, etc. should not be flushed into the septic tank since they will not readily decompose.

5. **Starters and Cleaners**
   There is no need to use commercial “starters”, “bacterial feeds”, or “cleaners” for the septic tank or disposal field. Some additives can actually create problems by causing solids to be carried into the absorption system, resulting in soil clogging.

6. **Inspection and Cleaning**
   The septic tank should be inspected once every year and the tank pumped out when necessary. As a minimum, the tank should be cleaned every two years. Failure to pump out a septic tank when required may result in sludge or scum being carried over to the disposal field, resulting in soil clogging and complete failure of the system. The tank should not be washed or disinfected after pumping. The cleaning should be performed by professionals familiar with proper procedures and having adequate equipment.

7. **Vegetation**
   The area over a disposal field should have a good vegetation cover. However, shrubs or trees should not be planted over the area in order to allow the system to be kept open to sunlight.

8. **Increased Waste Loads**
   If the waste loads and volumes of sewage entering the soil absorption system are greater than that for which the system was designed, failure of the field can occur. Contact the Environmental Health Office regarding enlargement/repair/replacement options.

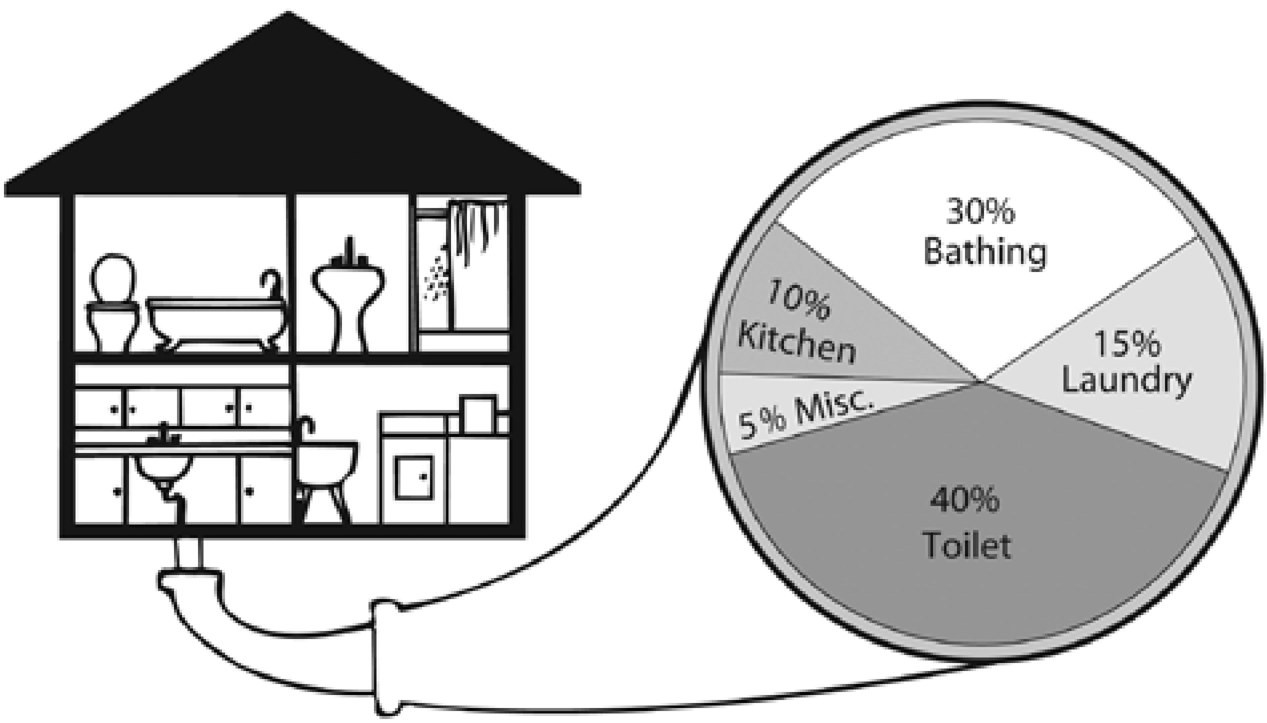
9. **Vents and Accesses**
During the winter, airtight caps should be securely fastened on all cleanouts and monitoring pipes. These pipes should also be fitted with insulation plugs to help discourage the escape of heat from the soil absorption system.

10. **Traffic Over Absorption System**
The area above and near a soil absorption system should never be used as a traffic area for vehicles or pedestrians. An accumulation of snow is important in order to maintain a cover of natural insulation to prevent freezing. During winter months, it is recommended that a snow fence or other suitable barrier be placed around the absorption system to discourage any traffic on the area. This will help maintain a thicker layer of snow insulation over the area.

11. **Periodic Occupancy**
If the residence is used only periodically, or if extended absences occur, freezing problems can develop in the winter. Extra insulation (i.e. leaves, straw, sawdust, snow) over the system can help to reduce the freezing potential. When the house will be vacant for extended time periods, and there is a potential for freezing, it is advisable to have the septic tank emptied.

12. **As-Built Plans**
A detailed diagram showing the exact location of the septic tank and disposal field should be placed in a suitable location in the home for future reference along with the application, final approval certificate, and photos of the installation. This documentation can also be helpful when selling the property at a later date.

Water Usage of a Typical Household



Application and Permits

When you are planning to build a home on a property where there are no piped sewage services available, you must adhere to the regulations pursuant to the *Public Health and Safety Act*. Below is listed an outline of steps that would normally be followed from the time you have decided to install a septic system to completion of the installation.

1. Contact the Environmental Health Office to pursue your application requirements (i.e. application forms, standards, guidelines, etc.).
2. Carry out site investigations required to determine the suitability of your property for a septic system. This includes location and setback requirements, soils conditions (percolation test and soils investigations), surface features, and provisions for replacement or expansion. This can be done by the homeowner, contractor or engineering consultant.
3. Complete a septic system design and submit the necessary ***Permit Application*** to the Environmental Health Office. The Environmental Health Officer can guide you through the application process. If all necessary data is supplied and the proposed system is judged suitable, a ***Permit to Install a Sewage Disposal System*** will be issued. Note that the permit is also subject to compliance with federal, territorial and municipal laws, including subdivision prospectus agreements.
4. After the sewage disposal permit has been issued, a building permit for new house construction may be issued by the municipal or territorial government. An occupancy permit will not be issued by the Building Department until final approval to use the septic system is obtained from the Environmental Health Office.
5. Photographs must be taken, depicting each stage of the installation and as-built drawings of the system must be prepared. This includes photos of the excavation, drain rock placement (showing depth and quality), all piping, geotextile plus the septic tank prior to final backfilling. Such photos should be properly identified and dated.
6. Before backfilling a septic system, the owner or agent must contact the Environmental Health Office at least 72 hours before a final inspection is required. If the installation has been carried out properly, approval will be given to the owner in writing.
7. After construction, the owner must sign and submit a ***Notification of Installation and Undertaking to Maintain a Septic Tank and Soil Absorption System***, together with copies of the photographs.

   Records of installation and a letter of approval will help in future sale of the property and in the processing of financing arrangements.

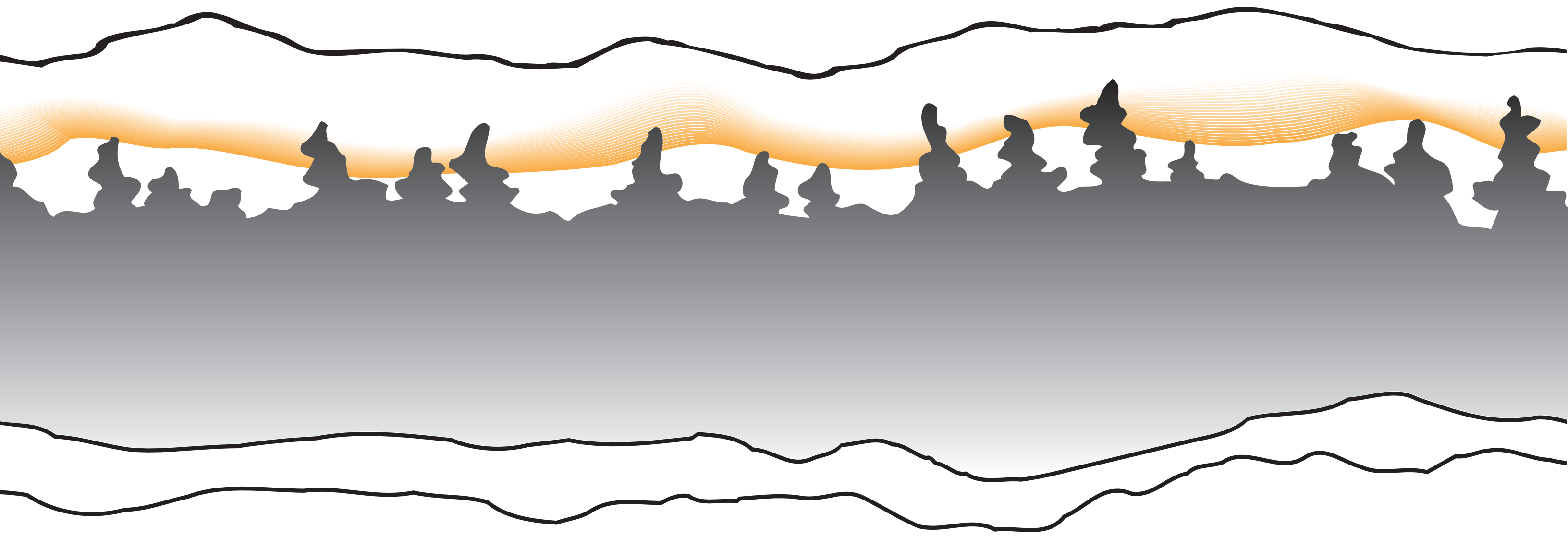
Glossary

Chemical and Biological Breakdown	*A natural treatment process whereby sewage is converted to other materials which are less harmful to humans and the environment.*
Drainrock	*Clean gravel, 20 to 65 mm (3/4 to 2-1/2") in diameter, with no more than 3% fines (0.080 mm) residual after screening. These specifications must be adhered to for final approval of soil absorption systems.*
Faecal Coliforms	*A large group of bacteria which normally thrive in the intestines of warm-blooded animals including humans. Their presence indicates recent sewage contamination.*
Geotextile	*An approved permeable filter fabric which prevents mixing of finer soil materials with the underlying drainrock.*
Microorganisms	*Organisms which cannot be seen with the naked eye, e.g. bacteria, viruses, and certain parasites.*
Percolation Rate	*The time rate of water drop in a test hole expressed as minutes per 25 mm (1"). The percolation rate must be determined in accordance with procedures specified by Environmental Health Services. It is a measure of the soil's ability to absorb liquid and is the single most important parameter used to size a soil absorption system.*
Sand Filter	*Fine sand/silt material that has a percolation rate of 5 minutes/25 mm (1") or slower. In course, granular soils having a rapid percolation rate, a sand filter 600 mm (2 feet) deep must be installed to reduce the rate of effluent percolation through the soil to ensure adequate soil treatment of the effluent.*
Septic Tank Effluent	*The liquid that flows out from a septic tank.*
Set Back	*A separation distance, measured horizontally.*
Soil Absorption System	*A subsurface disposal system used to absorb effluent from the septic tank. Two main types of systems are the absorption bed and the absorption trench.*

For more information on sewage disposal systems in Yukon, please contact:

Environmental Health Services

#2 Hospital Road
Whitehorse, Yukon Y1A 3H8
Phone: (867) 667-8391
Toll-free (within Yukon) 1-800-661-0408, ext. 8391
Fax: (867) 667-8322
E-mail: environmental.health@gov.yk.ca



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