APPENDIX E - DESIGN EXAMPLE

Dispersal options for peat treated effluent:

Normally subsurface discharge of effluent dispersal through Bottom drain units would be utilized on sites with an appropriate amount of existing permeable soil. Unfortunately in Nova Scotia most of the soils are impermeable at depths below the bottom of a peat unit and some alternative to bottom discharge may be required. In this example there is a total depth of 0.9m permeable soil below grade.

The site is relatively flat and the house will be on a slab. Grades from the house to the tank, distribution box and peat units until be minimal and critical to consider to avoid pumping. Assume that this has been checked and gravity feed is possible. The peat unit is 1.02 m deep (outside dimensions), the top is 75 to 100 mm above grade (assume 75). Therefore the bottom of the units is 1020 mm – 75 mm = 945 mm (.945 m) below grade. From our test pit information the depth of permeable soil is only 900 mm below grade. Therefore if the peat units are installed relative to existing grade, the bottom of the unit will be into impermeable soil and bottom discharge is not possible in this case. End drain discharge units can be utilized followed by a dispersal trench for distribution of treated effluent. Another option may to raise the bottom drain peat units and distribution box, pump septic tank effluent to the distribution box and use bottom discharge. Both options are considered below.

1. END DRAIN UNITS (Dispersal Trench)

Design of the dispersal trench can be accomplished by a simple calculation utilizing the Horizontal Loading Rate Table 2 based on soil depth, lot slope along with the depth of the dispersal drain, and holding time from the volume of the drain.

A 10 m trench (dispersal trench) 1m wide and 0.6 m deep for treated peat effluent is sufficient in most circumstances to disperse the treated effluent. Simple formulas to aid in this calculation are: (a) $Q=V*A$, (b) $v=k*i$

A QP1 will adjust this length and width of the dispersal trench in accordance the site conditions to ensure treated effluent is distributed back into the environment through the available existing permeable soils. Scarifying of the downslope organic layer downslope of this dispersal trench will also aid in the distribution of treated effluent especially in silty clay soils. Addition of a sand mantle may also be designed in addition to the dispersal trench if the existing natural depth of permeable soil is not sufficient.

The QP1 Professional Engineer will formulate the required length and width of the treated peat effluent distribution trench along with any required additional controls. A typical dispersal trench design could be the following - Trench depth 0.6 m, Trench width 1 m and Trench length 10 m.

2. BOTTOM DRAIN UNITS (Pad/Mantle)

To size the dispersal pad/mantle under the peat cells we would use the Loading Rates from Table 1 of the Brookfield Technical Manual. Soil type is sandy-silt so therefore the maximum loading rate is 27L/day/m^2.

Therefore minimum are of dispersal field = $\frac{1000\ L/day}{27\ L/day/m^2}$ = 37.04m^2

Maximizing the length of pad along slope to 15m the required width would be

$\frac{37.04\ m^2}{15\ m}$ = 2.47 m

To maintain the separation of 600mm on the upper side of the pad will require the maximum cut to be 0.90-(0.60 + 2.47 x 2%) = .25m. (The bottom of the peat units will be a maximum 250mm below existing grade.)

The finished grade around the units will be the depth of the units minus the depth of the cut minus the height of the top of the unit above the finished grade.

Calculation: 1020 mm – 250 mm – 75 mm = 715 mm

Therefore if we wanted to build up around the peat units to an elevation 715mm above existing grade and pump septic tank effluent, we could install a 2.47m x 15m sand pad/mantle under bottom draining units. Due to peat module physical size a sand pad measuring 3.0m x 15m would be realistic.

For this example we will assume that it would be too difficult to blend this option into the lot and make it look acceptable to the client so we choose end drain units to dispersal trench incorporating a pump to elevate peat units to satisfy existing grades of only 2%.

Summary of designed system components:

1. 2800 L septic tank with effluent filter as supplied by Brookfield Concrete Products Ltd.
2. Distribution box using four of nine available outlets, each equipped with a Flow Equalizer, as supplied by Brookfield Concrete Products Ltd.
3. Four piped discharge peat units as supplied by Brookfield Concrete Products Ltd
4. Pump chamber and pump sized according to the Guidelines to lift effluent from the septic tank to the D-box or Flow-splitters to ensure gravity to dispersal trench. Pump Chamber as supplied by Brookfield Concrete Products Ltd.
5. Dispersal trench design is 0.6m depth, 1m width and 10 m length or QP1's specification.

NOTE: When designing for the replacement of an existing malfunctioning system where in-ground disposal of effluent is not possible due to site limitations, Nova Scotia Environment may allow disinfection and surface discharge of effluent form a Brookfield Peat Treatment System. Any such approvals will be on a case by case basis and approval will depend on the proposed discharge point. The system designer should check with Environment early in the design process to determine what information they will require regarding the proposed discharge point.

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