Sand Treatment Mound Design – Worksheet

Treatment Mound: Area Sizing

This form is to be completed and submitted with the OWMS application to register form.

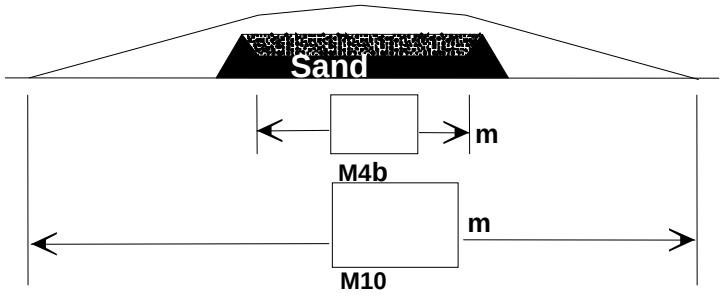
This worksheet is for use in Manitoba to: size the sand layer, mound base area, and berm dimensions as required in the construction of a treatment mound. **It can be used for:** design of a treatment mound.

Use only metric units of measurement throughout (cm, metres, litres)

Use the following Worksheet to determine the minimum required dimensions for a treatment mound and fill in the blanks on the appropriate diagram below for a level site or a sloping site of over 1%.

Treatment Mound Dimensions

Level

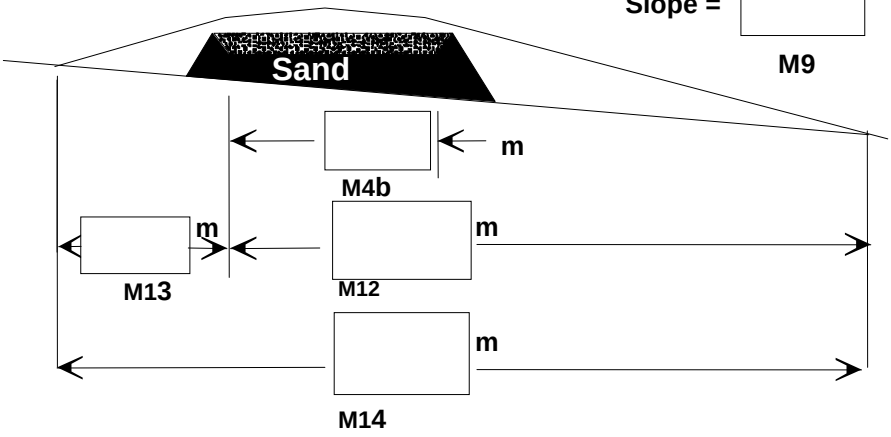


Sand Layer Length (m) _____

Overall Length of Mound (m) _____

Sloping Site

Slope = _____



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STEP 1: **Determine the expected volume of sewage per day:**

Note: Use Manitoba Minimum Expected Volume of Sewage Per Day as a guide to determine expected volume of sewage per day. Provide allowance for additional load factors.

Assure that the sewage strength does not exceed the requirements of Residential Strength Sewage.

Expected Volume of Sewage per Day

_____ L/day. **M1**

STEP 2: **Calculate the treatment area of the sand layer:**

Expected Volume of Sewage per Day		Sand Layer Effluent Loading Rate		Treatment Area Required for Sand Layer	
_____ L/day.	÷	**50 L/m^2 per day**	=	_____ m	**M2**
*From **M1** this worksheet*					

STEP 3: **Determine the minimum allowable sand layer area:**

Minimum Sand Layer Area		Area of Sand Layer for Treatment		Area of Sand Layer	
37.16 m^2	**or**	_____ m^2		_____ m^2	**M3**
The minimum area of the sand layer Is 37.16 m^2.		*From **M2** this worksheet*		*The greater of 37.16 or **M2***	

STEP 4: **Calculate the length of the sand layer:**

Area of Sand Layer		Width of Sand Layer		Length of Sand Layer	
_____ m^2	÷	_____ m	=	_____ m	**M4**
M4a *From **M3** this worksheet*		**M4b** *Select a width to a maximum of 3 metres.*			

Note: The width of the sand layer will influence the total width of the treatment mound and the amount of fill material required. The lowest cost configuration is often to make the sand layer as wide as allowed, however, on sloping sites, a narrower and longer sand layer design can reduce the amount of fill required.

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STEP 5: Determine the (design) soil effluent loading rate:

Note: Effluent loading rate can be determined from soil texture classification **or** from percolation test results.

Attachment 1 provides the effluent loading rates for various soil classifications between 5 and 120 minute per inch perc rates.

Soil Effluent Loading Rate	
L/m^2 per day	**M5**

STEP 6: Calculate the preliminary infiltration area of the soil BEFORE area reduction factors:

Expected Volume of Sewage per Day		Soil Effluent Loading Rate		Primary Infiltration Area	
L/day.	÷	L/m^2 per day.	=	m^2	**M6**
*From **M1** this worksheet*		*From **M5** this worksheet*		*(Required for Soil. Before Reduction Factors.)*	

STEP 7: Calculate the required infiltration area INCLUDING allowed area reduction factors:

Infiltration Area Required for Soil		Reduced Area Factor		Required Infiltration Area	
m^2	X	**0.75**	=	m^2	**M7**
*(Before Reduction Factors.) From **M6** this worksheet*		*A reduction of up to 25% (0.75) can be applied to treatment Mounds.*		*(Including Reduction Factors.)*	

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STEP 8: **Calculate the required width of the infiltration area:**

Required Infiltration Area		Length of Sand Layer		Width of Required Infiltration Area	
m²	÷	m	=	m	**M8**
*(Including Reduction Factors.) From **M7** this worksheet*		*From **M4** this worksheet*			

STEP 9: **Determine the slope criteria of the installation:**

If the slope of the installation site exceeds 1%, proceed to Step 12.
If the slope is 1% or less, proceed to Step 10.

Slope of Installation Site

% **M9**

Note: The following calculations apply ONLY to the minimum height configuration of a mound unless a value is entered above. If it is necessary to raise the sand layer, (for example to provide clearance to the water table) the following calculations are NOT adequate for the design.

For slopes of 1% or less, use **STEPS 10 - 11**

STEP 10: **Calculate the required infiltration area INCLUDING allowed area reduction factors:**

Toe to Toe Width Based on 4:1 Slope Requirement		Width of Required Infiltration Area within Berms		Toe to Toe Width of Mound	
m	**or**	m	=	m	**M10**
M10a *4:1 Slope Requirement Refer to Berm Dimensions Diagram this worksheet, or determine by calculation*		**M10b** *From **M8** this worksheet*		*The greater of **M10a** or **M10b***	

STEP 11: **Proceed to STEP 16:**

STEPS 12-15 are used only for installations where the slope exceeds 1%

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For slopes exceeding 1%, use **STEPS 12 - 15**

STEP 12: Calculate the required width of the infiltration area:

The width of the mound is based on the **greater of**:
- the width as determined by the 4:1 slope requirement, **or**
- the width required to provide adequate infiltration area.

Downslope Berm Width Based On 4:1 Slope Requirement Plus Width of Sand Layer

Downslope Berm Width at 4:1 ____ m

M12a
Refer to Berm Dimensions Diagram this worksheet

+

Sand Width Layer ____ m

M12b
*From **M4b** this worksheet*

Width of Required Infiltration Area Under Sand Layer and Downslope Berm

Width of Sand Layer and Downslope Berm

____ m (**M12c**) or ____ m (**M12d**) = ____ m **M12**

4:1 Slope Requirement

From M8 this worksheet

*The greater of **M12c** or **M12d***

STEP 13: Determine the width of the upslope berm:

Width based on 4:1 Slope Requirement
Refer to Berm Dimensions Diagram this worksheet, or determine by calculation.

Width of Upslope Berm

____ m **M13**

STEP 14: Calculate the required infiltration area INCLUDING allowed area reduction factors:

Width of Sand Layer and Downslope Berm + **Width of Upslope Berm** = **Toe to Toe Width of Mound**

____ m + ____ m = ____ m **M14**

*From **M12** this worksheet* *From **M13** this worksheet*

STEP 15: **Proceed to STEP 16:**

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STEP 16: **Summerize the information:**

Width of Sand Layer	(from **M4b** this worksheet)	m
Length of Sand Layer	(from **M4** this worksheet)	m
Slope of Installation Site	(from **M9** this worksheet)	%
Toe to Toe Width of Mound	(from **M10** or **M14** this worksheet)	m

STEP 17: **Proceed to STEP 16:**

Fill in the appropriate diagram on the first page with the numbers calculated in this worksheet.

STEP 18: **Proceed to STEP 16:**

This worksheet does NOT consider all the requirements of the Manditory Standard.
Please work safely and follow safe practices near trenches and open excavations.

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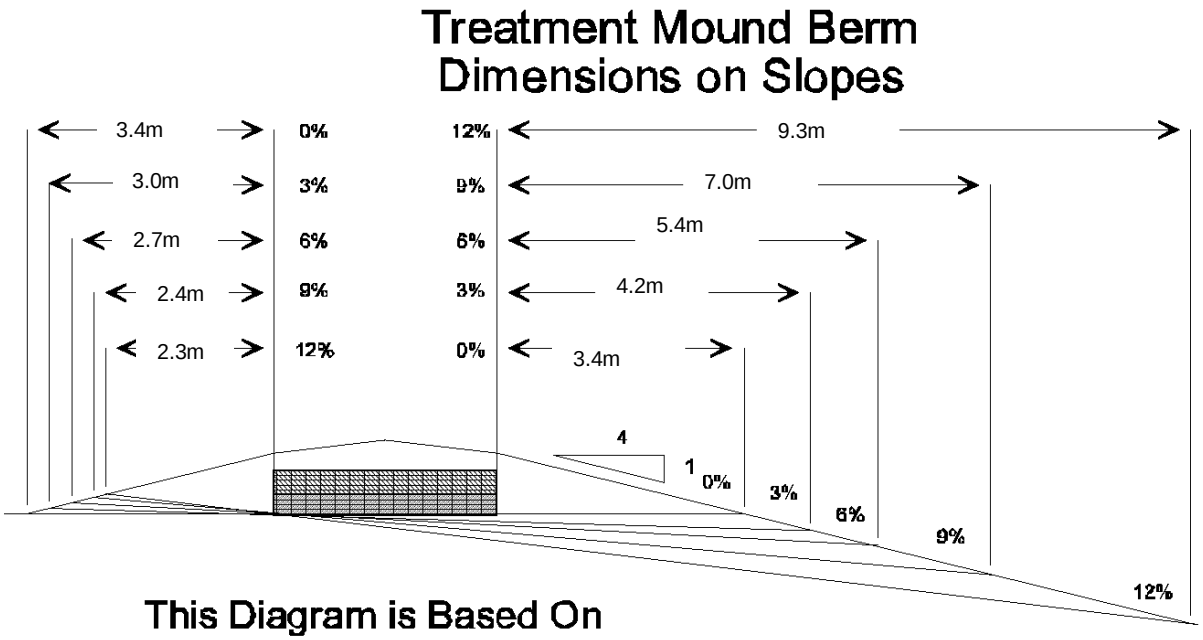

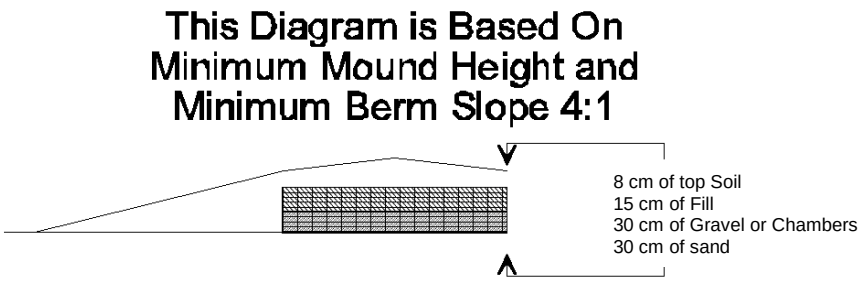

83 cm Minimum Height
at the Side of the Sand Layer