Guidance for Installers:
How to Complete an SOWDG Work Sheet
Appendix 7 of the Guide

This fact sheet is intended to aid contractors in completing the design worksheet for a Type II mound onsite wastewater treatment and disposal system using table A.15. Please note that the most current Saskatchewan Onsite Wastewater Disposal Guide and all relevant legislation should be reviewed for further reference and to ensure that all necessary actions are completed. When designing a system, the information contained within the guide is considered a minimum. Some information within this sheet may result in a design that is greater than the suggested minimums described.

In Appendix 7 of the Saskatchewan Onsite Wastewater Disposal Guide, a worksheet is available to help contractors size a Type II mound. This fact sheet provides further guidance on completing the worksheet. For this example, the residence for which the Type II mound is designed for is a three bedroom home with an unfinished basement (owner plans on finishing with an additional room) and a master suite with a 67 gallon (300 litre) jet tub. Soil testing has determined that the soil is a granular sandy clay. There is more than 4 feet of material to any restrictive layer and the site is flat.

Note that throughout the fact sheet, the boxed in areas are excerpts from the worksheet contained in Appendix 7 of the Saskatchewan Onsite Wastewater Disposal Guide.

Regional Health Offices:

http://www.saskatchewan.ca/residents/health/understanding-the-health-care-system/saskatchewan-health-regions/regional-public-health-inspectors

The Saskatchewan

Onsite Wastewater Treatment System

Guide is available online at

http://www.saskatchewan.ca/residents/environment-public-health-and-safety/environmental-health/plumbing-sewage

1 Determine Sewage Flows

The facility to be served should be examined. For residential systems, the maximum sewage volume per day is estimated based on the number of bedrooms in the home. It is the responsibility of the installer to ensure that the estimate of bedrooms is reasonable for the home. For example, homeowners should be questioned regarding plans for unfinished basements in new homes. Other water using habits such as large whirlpool baths, multi-head showers, and hosting large parties should also be considered when selecting the maximum and average day sewage flows.

In general, a typical home should be considered to generate a maximum sewage 340 litres (75 igal) per person per day and an average flow of 255 litres (56 igal) per person per day. For homes larger than two bedrooms, 1.5 people are considered to be present for each bedroom. Exceptional water uses should be considered above these values. Appendix 2 can be used to estimate the smallest sewage flows that can be used for a number of different types of facilities.

The first step in sizing the example sewage treatment field (in this example a type II mound) is to determine the volume of sewage that can be expected to be generated on the worst day over the lifespan of the system. For this example, the expected volume of sewage could be considered to be 4 bedrooms times 1.5 people times 75 imperial gallons plus 67 gallons, which equals 517 gallons per day. Four bedrooms were selected because the owner plans on finishing the basement to include a fourth bedroom. The value of 67 imperial gallons was added to account for the presence of a large jet tub as a jet tub is not considered to be part of the typical residence water usage of 1.5 people per bedroom.

Determine the expected volume of sewage per day.

Note: *Use* **Appendix 2** *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

517 gal/day **M1**

2 Determine Area of Sand Layer

The area of the sand layer is determined by dividing the expected volume by the loading rate allowable on the sand layer.

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	
517 gallons		1 gal / ft² (or 50 L / m²) per day	=	517 ft²	M2
From M1 this worksheet					

3 Determine the Minimum Allowable Sand Layer area

In every case, the sand layer is not allowed to be less than 400 ft² so the final area of the sand layer is the greater of that calculated in step 2 (517 ft ²) and 400 ft².

Determine the minimum allowable sand layer area:

Minimum Sand Layer		Area of Sand Layer for Treatment		Area of Sand Layer	
400 ft²	**or**	517 ft ²		517 ft ²	**M3**
The minimum area of the sand layer is 37.16 m² (400 ft²)		*From M2, this worksheet*		*The greater of 37.16 m² (400 ft²) or M2*	

4 Calculate the Length of the Sand Layer

Now that the area of the sand layer is known, the exact dimensions should be determined. The width of the sand layer can be selected up to a maximum of 10 ft, however, additional guidance can be obtained by understanding and using Table A.15. For the purposes of the example, we will select a width of 3 feet.

Calculate the length of the sand layer:

Area of Sand Layer		Width of Sand Layer		Length of Sand Layer	
517 ft²	÷	3 ft	=	172 ft	**M4**
M4a *From M3, this worksheet*		**M4b** **Select a width to a maximum of 3 m (10 ft)**			

5 Determine the (Design) Soil Effluent Loading Rate

One can select the soil effluent loading rate in a number of ways. If the Health Region allows, a percolation test may be used. In which case, the loading rate can be selected from the fourth column of Appendix 1. A more detailed approach is to complete soils testing and select the loading rate based on the listing in Appendix 15. However, as the soil type in this example is Sandy Clay, the listing gives "not suitable without further testing". Therefore Table A.15, which is based upon both the texture and the structure of the soils, should be used. Determining the structure of the soil is not covered in this fact sheet, but the example gives the structure as granular. Looking at table A.15, "SC" stands for sandy clay, and GR stands for Granular. In the BOD >30 column (4th column from the left), a loading rate of 0.14 imperial gallons per square foot is given. This loading rate describes the allowable application rate of the sewage to the underlying soils not to the sand layer.

Determine the (design) soil effluent loading rate:

Note: Effluent loading rate can be determined from soil texture classification or from percolation test results according to Appendix 8. Appendix 1 provides the effluent loading rates from soils between 5 and 120 min/inch perc rates.

Soil Effluent Loading Rate

0.14 gal/ft² per day **M5**

6 Calculate the Preliminary Infiltration Area of the Soil

Using the expected sewage volume from Step 1 and dividing by the loading rate determined in Step 5, the infiltration area of native soil is determined to be 3693 ft².

Calculate the preliminary infiltration area of soil before area reduction factors:

Expected Volume of Sewage per Day		Soil Effluent Loading Rate		Preliminary Infiltration Area	
517 gallons	÷	0.14 gal/ft² per day	=	3693 ft²	M6
From M1, this worksheet		*From M5, this worksheet*		*(Required for Soil. Before Reduction Factors.*	

7 Apply Allowed Soil Size Reduction Factors

As this system being constructed is a mound system, a 30% reduction of size is allowed. This reduction is based on the enhanced treatment capacity of the sand layer when compared to a standard field system.

Calculate the required infiltration area including allowed area reduction factors:

Infiltration Area Required for Soil	Reduced Area Factor	Required Infiltration Area	
3693 ft²	0.7	2585ft²	M7
(Before Reduction Factors.) *From M6 this worksheet*	**A reduction of up to 30% (1-0.70) can be applied to Type II Mounds**	**(Including reduction factors)**	

8 Calculate the Required Width of the Infiltration Area

The length of the mound is the same as the length determined for the sand layer and in this example the length of the sand layer was determined to be 172 ft. This is therefore the length of the overall mound and the width can be calculated by dividing the known area by the length.

Calculate the required width of the infiltration area:

Required Infiltration Area		Length of Sand Layer		Width of Required Infiltration Area	
2585ft²	÷	172 ft	=	15 ft	M8
(Including Reduction Factors.) *From **M7** this worksheet*		*From **M4** this worksheet*			

9 Determine the Slope Criteria

In this example the slope was given as 0%. However, if the slope is greater than 1%, the overall size of the mound may be determined by either a) the need to ensure that the slopes are not excessively steep, or b) the need to cover the whole required infiltration area. In this example, if the mound area does not cover 2585 ft2, break-out of sewage onto the surface of the ground is very likely.

Determine the slope criteria of the installation site:

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 the installation site	
0%	M9

Note: the following calculations apply ONLY to the minimum height configuration of a mound. 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, go to Step 10 - slopes greater than 1%, go to Step 12.

10 Determine the Toe to Toe Width of the Mound

Based on a maximum of 4 horizontal to 1 vertical slopes, and a typical height of 33 inches (3 inches of topsoil over 6 inches of fill over 12 inches of gravel/chambers over 12 inches of sand) the minimum horizontal distance of the berm from the edge of the sand layer to ground surface is 33" times 4, which equals 132" or 11 ft. Therefore the total toe to toe width based only on geometry is 11 feet on each side plus the width of the sand layer (3 ft), which, in this example equals 11 ft + 3 ft + 11 ft or 25 ft. In step 8, we calculated the width of the infiltration area that needed to be covered as 15 ft. To select the total width, the maximum of the two numbers (one is determined to ensure that the side slopes are not too steep and the other is to ensure that sufficient native soil is covered to allow the wastewater to infiltrate to below ground). In the example, this is 25 ft.

Toe to Toe Width Based on 4:1 Slope Requirement		Width of Required Infiltration Area within Berms		Toe to Toe Width of Mound
25 ft	OR	15 ft		25 ft 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

After completing Step 10, proceed to Step 16.

11 Remember:

For Slopes of <u>1% or less</u>, Step 10, then 16

For Slopes <u>greater than 1%</u>, Steps 12-15, then 16

12 Determine the Width of the Sand Layer Plus the Downslope Berm

For slopes greater than 1%, use steps 12-15

For the purposes of demonstration, we will assume that the example had a slope of 3%. Steps 12 to 15 (only) will be based on this slope. In this case, we should use a diagram to determine the geometrical minimum size of the mound from toe to toe (based on ensuring that the slopes are not too steep). By looking at the diagram at the end of Appendix 7 of the Onsite Wastewater Disposal Guide, select the downslope distance. In this example, it would be 13 ft – 10 in.

In the case that the mound is located on a slope, only the downslope toe of the berm is considered to be effective for wastewater infiltration. This is because water will not run uphill from the sand layer to infiltrate through the upslope covered area. In this calculation, you can see that the geometry of the mound is the limiting factor. Even though, this example demonstrates that geometry is the limiting factor, it is important to complete this step as often the amount of area required for infiltration into the native soil is limiting.

Determine the width of the sand layer plus downslope berm:

*The width of the mound is based on the **greater of:***

- *the width as determined byt eh 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		Width Required Infiltration Area under Sand Layer and Downslop Berm		Width of Sand Layer and Downslope Berm	
13 feet 10 inches					
M12a *Refer to Berm Dimensions Diagram this worksheet*					
+					
Sand Layer Width 3 feet					
M12b *from M4b Worksheet*					
16 feet 10 inches	**OR**	15 feet		16 feet 10 inches	**M12**
M12c *4:1 Slope Requirement*		**M12d** *From **M8** this worksheet*		**The greater of M12c or M12d**	

13 Determine the Width of the Upslope

From the diagram, select the appropriate upslope distance (9 feet 10 inches for the example).

Determine the Width of the upslope berm:

Width of Upslope Berm

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

9 feet 10 inches **M13**

14 Determine the Toe to Toe Width of the Mound – Slopes >1%

The toe to toe width of the mound includes both the width calculated in Step 12 and Step 13. In the example where the slope is 3%, the total width is 26 ft 8 inches.

Determine the Toe to Toe Width of the Mound:

Width of Sand Layer and Downslope Berm		Width of Upslope Berm		Toe to Toe Width of Mound	
16 feet 10 inches	+	9 feet 10 inches	=	26 feet 8 inches	M10
*From **M12** this workbook*		*From **M13** this workbook*			

15 Proceed to Step 16
For Slopes Greater than 1%, Steps 12-15 should be completed

16 Summarize the Information

Based on the original example of a flat site.

Width of Sand Layer	*(from **M4b** this worksheet)*	**3 feet**
Length of Sand layer	*(from **M4** this worksheet)*	**172 feet**
Slope of Installation Site	*(from **M9** this worksheet)*	**0%**
Toe to Toe Width of Mound	*(from **M10 or M14** this worksheet)*	**25 feet**

17 Complete the Berm Diagram

Fill out the appropriate boxes on the first page of appendix 7

Complete the berm diagram dimensions on first page.

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

18 Confirm Design Complies with the Guide

Lastly, it is the responsibility of the designer and installer to ensure that all requirements in the guide and from the health region are complied with.

Confirm the design complies with the guide.

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