

MLSS - Minimum Leaching System Spread


Technical Standards Appendix A
Pg. 56-60

Connecticut Department of Public Health
Keeping Connecticut Healthy



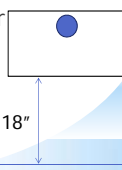

Site Hydraulics

- * Important factor when designing a septic
- * The naturally occurring soil surrounding leaching systems shall adequately absorb or disperse the expected volume of sewage effluent without overflow, breakout or detrimental effect on ground or surface water.
- * Water movement through soil:
<https://www.youtube.com/watch?v=vmo0FRVgkM>




Separation Distances

- * Bottom of the Leaching System
 - * 18" above groundwater, redox or compact layer (restrictive layer)
 - * 24" if receiving soil percolation rate is faster than 5.0 minutes per inch
 - * 24" if a large system over 2000 GPD or located in a tidally impacted groundwater table
 - * 4' over ledge rock, 24" of which is naturally occurring soil



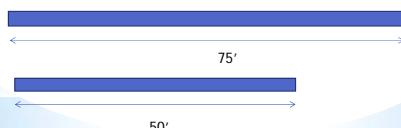

Ground Water Table



Minimum Leaching System Spread (MLSS)

- * Minimum length a leaching system must be spread across elevation contours
- * Not required for sites with greater than 60" depth to the restrictive layer or reserve areas

Length can vary with different site conditions and design criteria. MLSS tells us how long each leaching row needs to be.

Minimum Leaching System Spread (MLSS)

- * Only considers naturally occurring soils for layouts of new systems and conceptual sewage disposal areas




MLSS

- * Human transported materials are not naturally occurring




DPH **MLSS**

*Down gradient soil must be considered

What is happening downhill?

DPH **MLSS Formula**

- *Hydraulic Factor (HF)
- *Percolation Factor (PF)
- *Flow Factor (FF)

*MLSS = HF x PF x FF

DPH **Factor Tables**

HYDRAULIC FACTORS (HF)

Receiving Soil Depth (Inches)	Hydraulic Gradient (% Slope)									
	<1.0	1.0	2.0	3.0	4.0	5.0	6.0	8.0	10.0	>10.0
6.1 - 17.0	See Comments in Section VIII A									
18.0 - 23.0	71	62	54	46	42	34	30	28	24	24
24.1 - 26.0	66	58	48	42	34	30	28	24	24	24
26.1 - 30.0	54	49	42	34	30	28	24	24	24	24
30.1 - 32.0	49	42	34	30	28	24	24	24	24	24
32.1 - 42.0	42	34	30	28	24	24	24	24	24	24
42.1 - 60.0	34	30	28	24	24	24	24	24	24	24
60.1 - 100.0	24	24	24	24	24	24	24	24	24	24
>100.0	MLSS Need Not be Considered									

FLOW FACTORS (FF)

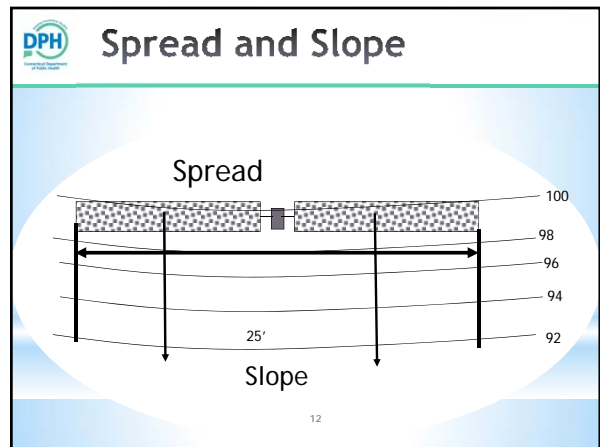
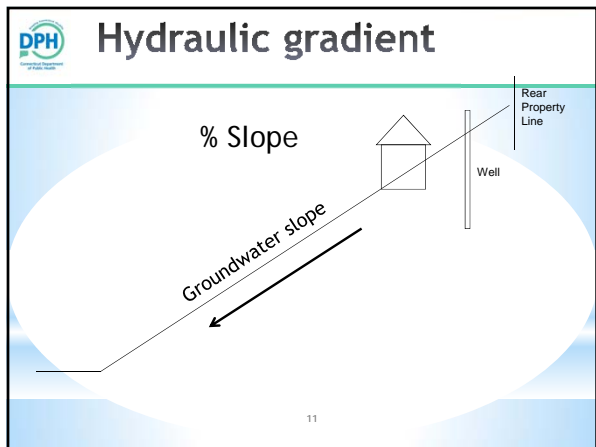
Flow Factor = Design Flow/300	Percolation Rate	Percolation Factor (PF)
1.0	10 to 100 Minutes/Inch	1.0
2.0	10 to 200 Minutes/Inch	1.25
3.0	20 to 300 Minutes/Inch	1.5
4.0	30 to 450 Minutes/Inch	1.75 or 1.5*
5.0	45 to 600 Minutes/Inch	2.0 or 1.5*

MLSS Need Not be Considered

*If leaching system is entirely in select fill and the bottom of system is above existing grade and at least 24 inches above maximum groundwater.

DPH **MLSS Definitions**

- Hydraulic gradient means the percent slope of the naturally occurring grade
 - Radial (all directions) flow over a flat groundwater table (essentially 0 percent slope)
 - slope of the naturally occurring soil within and at least 25 feet down-gradient of the leaching system (50 feet for large systems)
- Leaching system spread means the leaching system length of effluent application to the receiving soil



DPH **MLSS Definitions**

- Restrictive layer means the first layer beneath the receiving soil that impedes downward movement of effluent
 - ledge rock
 - maximum groundwater (redoximorphic features)
 - groundwater monitoring: average of at least 5 consecutive weekly readings taken during the most restrictive 30-day period of the wet season (Feb. 1 - May 31)
 - impervious soil (percolation rate slower than 60 minutes per inch)

13

DPH **Restrictive layer**

DPH **MLSS Definitions**

- Receiving soil is the soil in the leaching system area and surrounding soil that is available to disperse effluent
 - flat groundwater table includes the soil within 25 feet around the perimeter of the leaching system
 - Lots with a slope
 - Includes the soil at least 25 feet down gradient of a small system
 - Includes the soil 50 feet down gradient of a large system (2,000 GPD or greater)
- Receiving soil depth (RS Depth) means the average depth of receiving soil (soil in a leaching system area and surrounding soil) measured down to the restrictive layer

15

DPH **Receiving Soil on Sloped Lots**

RS Depth = depth of receiving soil in system area and surrounding soils

DPH **Measuring for Receiving soil: Sloped lots**

Restrictive

Below grade installations:

- Repair:
 - Top of ground to restrictive layer
- New: If top of system is installed more than 12" into grade
 - Top of leaching structure to restrictive layer
- New: If top of system is installed within 12" of grade
 - Top of ground to restrictive layer

DPH **Measuring for Receiving soil: Sloped lots**

Restrictive layer

Above grade installations (must have 18" of natural soil in receiving soil):

- New Code Complying Systems (installed)
 - From top of system to restrictive layer if all receiving soil is on the property and there is 18" of suitable soil 25' down gradient (maximum of 24" of select fill can be counted but must install)

18

DPH * Repair Sloped lots

Select Fill

36"

25'

15°

Receiving soil

Restrictive layer

Repairs and B100a potential repair areas:
Receiving soil depth

- The average depth in the system area and at least 25' down gradient
- Suitable fill material may be counted

$36 + 15 = 51$ $51/2 = 25.5$ Receiving soil depth is 25.5"

19

DPH Calculating Receiving Soil: Sloped Lots

12" stone trench

10'

5'

2'

1'

Top of embankment

Typical Slope Shall Not Exceed 50 percent

Original Grade

4' Minimum

15' Minimum

30"

(Topsoil Removed)

Common Fill

Original Grade

18"

25'

Ledge Rock

Maximum Groundwater Elevation

- RS depth in the system area $18" + 12" = 30"$
- RS depth at 25' = 18"

Not to scale

$30" + 18" = 48"$ $48" / 2 = 24"$
Receiving soil depth is 24"

DPH Plan View

75' From Wells

4 Bedroom House

15' min from property line

136" spread

25' to Down Gradient Storm Drain

ROAD

Not to scale

DPH * Receiving Soil on Flat Water Table Lots

Building Served

25 Feet

Soil in Leaching System Area

25 Feet

25 Feet

RS Depth = depth of receiving soil in system area and surrounding soils

DPH Measuring for Receiving soil: Flat Lots

36"

25'

36"

36"

Restrictive layer: Maximum ground water at 36"

Receiving soils depth is 36"

23

DPH Hydraulic Factor

Pg. 60

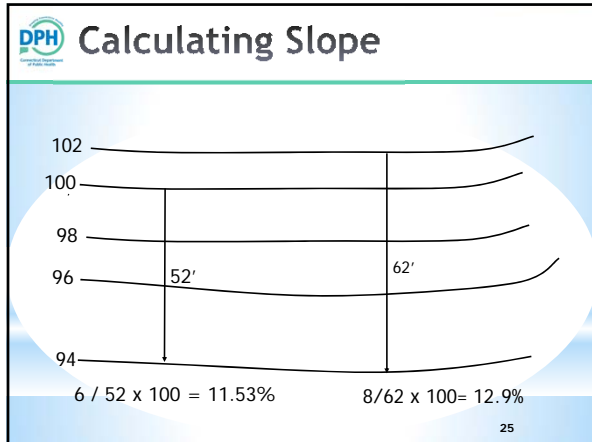
$MLSS = FF \times PF \times HF$

HYDRAULIC FACTORS (HF)

Hydraulic Gradient (% Slope)

	-1.0	1.0-2.0	2.1-3.0	3.1-4.0	4.1-6.0	6.1-8.0	8.1-10.0	10.1-15.0	>15.0
0.1-17.9	See Comments in Section VIII A								
18.0-22.0	72	62	54	48	42	34	30	28	26
22.1-26.0	66	56	48	42	34	30	28	26	24
26.1-30.0	56	49	42	34	30	28	26	24	20
30.1-36.0	48	42	34	30	28	26	24	20	18
36.1-42.0	42	36	30	28	26	24	20	18	16
42.1-48.0	36	32	28	26	24	20	18	16	14
48.1-60.0	30	28	24	22	20	18	16	14	10
60.0	MLSS Need Not be Considered								

Receiving Soil Depth (Inches)



Hydraulic Factor

- **HF = Hydraulic Factor**
- Percent slope = rise / run x 100
 - 8 ft (rise) / 100 ft (run) x 100 = **8.0%**
 - 8 ft / 50 ft x 100 = **16.0%**
 - 6 ft / 40 ft x 100 = **15.0%**
 - 12 ft / 50 ft x 100 = **24%**
- Depth of Receiving Soil- Max. groundwater, ledge rock, impervious soil (perc slower than 60 min/inch)

26

Example : S = 8.3%

HYDRAULIC FACTORS (HF)

		Hydraulic Gradient (% Slope)										
		-1.0	1.0-2.0	2.1-3.0	3.1-4.0	4.1-6.0	6.1-8.0	8.1-10.0	10.1-15.0	>15.0		
0.1 - 17.9		See Comments in Section VIII A										
18.0 - 22.0		72	62	54	48	42	34	30	28	26		
22.1 - 26.0		66	56	48	42	34	30	28	26	24		
Receiving Soil Depth (Inches)	26.1 - 30.0	56	49	42	34	30	28	26	24	20		
	30.1 - 36.0	48	42	34	30	28	26	24	20	18		
	36.1 - 42.0	42	36	30	28	26	24	20	18	16		
	42.1 - 48.0	36	32	28	26	24	20	18	16	14		
	48.1 - 60.0	30	28	24	22	20	18	16	14	10		
>60.0		MLSS Need Not be Considered										

RS = 27"

27

Example : S = 6.3%

HYDRAULIC FACTORS (HF)

		Hydraulic Gradient (% Slope)										
		-1.0	1.0-2.0	2.1-3.0	3.1-4.0	4.1-6.0	6.1-8.0	8.1-10.0	10.1-15.0	>15.0		
0.1 - 17.9		See Comments in Section VIII A										
18.0 - 22.0		72	62	54	48	42	34	30	28	26		
22.1 - 26.0		66	56	48	42	34	30	28	26	24		
Receiving Soil Depth (Inches)	26.1 - 30.0	56	49	42	34	30	28	26	24	20		
	30.1 - 36.0	48	42	34	30	28	26	24	20	18		
	36.1 - 42.0	42	36	30	28	26	24	20	18	16		
	42.1 - 48.0	36	32	28	26	24	20	18	16	14		
	48.1 - 60.0	30	28	24	22	20	18	16	14	10		
>60.0		MLSS Need Not be Considered										

RS = 24"

28

Example : S = 5.2%

HYDRAULIC FACTORS (HF)

		Hydraulic Gradient (% Slope)										
		-1.0	1.0-2.0	2.1-3.0	3.1-4.0	4.1-6.0	6.1-8.0	8.1-10.0	10.1-15.0	>15.0		
0.1 - 17.9		See Comments in Section VIII A										
18.0 - 22.0		72	62	54	48	42	34	30	28	26		
22.1 - 26.0		66	56	48	42	34	30	28	26	24		
Receiving Soil Depth (Inches)	26.1 - 30.0	56	49	42	34	30	28	26	24	20		
	30.1 - 36.0	48	42	34	30	28	26	24	20	18		
	36.1 - 42.0	42	36	30	28	26	24	20	18	16		
	42.1 - 48.0	36	32	28	26	24	20	18	16	14		
	48.1 - 60.0	30	28	24	22	20	18	16	14	10		
>60.0		MLSS Need Not be Considered										

RS = 37"

29

MLSS Formula

Pg. 60

* $MLSS = FF \times PF \times HF$

FLOW FACTORS (FF)

Flow Factor = Design Flow/300

Residential: Design Flow for each bedroom is 150 GPD except for bedrooms beyond 3 in single-family residential buildings, which have a 75 GPD per bedroom design flow.

Single-family lots:

1 Bedroom = 150/300	0.5
2 Bedroom = 300/300	1.0
3 Bedroom = 450/300	1.5
4 Bedroom = 525/300	1.75 Increase FF by 0.25 for each additional bedroom

Multi-family buildings:

Minimum FF is 2.0 (4 bedrooms) and each additional bedroom increases FF by 0.5.

Non-Residential: Design Flow (GPD) / 300

30

DPH **MLSS Formula**

Non-Residential Flow Factor:

Design Flow (GPD) / 300

1000 GPD Retail

1000/300 = 3.33 Flow Factor

31

DPH **MLSS Formula** Pg. 60

* $MLSS = FF \times PF \times HF$

PERCOLATION FACTORS (PF)

Percolation Rate	Percolation Factor (PF)
Up to 10.0 Minutes/Inch	1.0
10.1 to 20.0 Minutes/Inch	1.25
20.1 to 30.0 Minutes/Inch	1.5
30.1 to 45.0 Minutes/Inch	3.0, or 2.0*
45.1 to 60.0 Minutes/Inch	5.0, or 3.0*

*If leaching system is entirely in select fill and the bottom of system is above existing grade and at least 24 inches above maximum groundwater.

DPH **MLSS Example**

• **MLSS = FF x PF x HF**

- 5 Bedroom House
- Design Percolation Rate = 24 min/inch
- Receiving Soil = 32"
- Slope = 9.1 %
- FF = 2.0
- PF = 1.5
- HF = 24
- MLSS = 2.0 x 1.5 x 24 = 72 feet

33

DPH **Appendix A: Use of MLSS**

- * Repairs and Potential Repair Areas that cannot provide the required MLSS require an assessment referred to as a Non-Compliant Repair (NCR) MLSS
- * This requires an exception be granted by the local director of health (NCR MLSS discussed more in Phase 2)

34

DPH **Non-Compliant (NCR) MLSS Repairs**

- * NCR MLSS assessment required when there is less than 18" of naturally occurring receiving soil or when at least 50 % of the required MLSS cannot be achieved
- * PE plan required if less than 25% compliant with required NCR MLSS

35