Minimum Leaching System Spread
MLSS

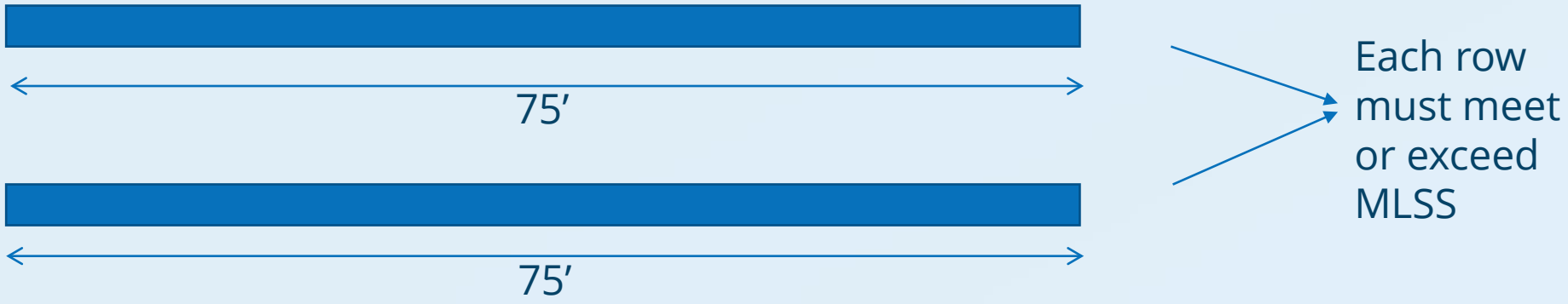
January 2023

Technical Standards Appendix A
Pg. 59-63

Minimum Leaching System Spread (MLSS)

- Minimum length a leaching system must be spread across elevation contours for each row.
- 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 <u>each</u> leaching row needs to be. <u>Keep in mind ELA must also be met.</u>



MLSS Definitions

- **Hydraulic gradient** means the percent slope of the naturally occurring grade
  - Radial (all directions) flow over a flat groundwater table (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

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)

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

Use of MLSS Formula

- MLSS categories:

1) Subsurface Sewage Disposal System (SSDS) Layouts for New Lot Creation
2) New SSDSs, MLSS Compliant Repairs and Conceptual B100a Areas (Code-Complying & Potential Repair Areas)
3) Non-compliant MLSS repairs and B100a potential repair areas.

MLSS

Receiving Soil (RS) Depth formula and calculation information.

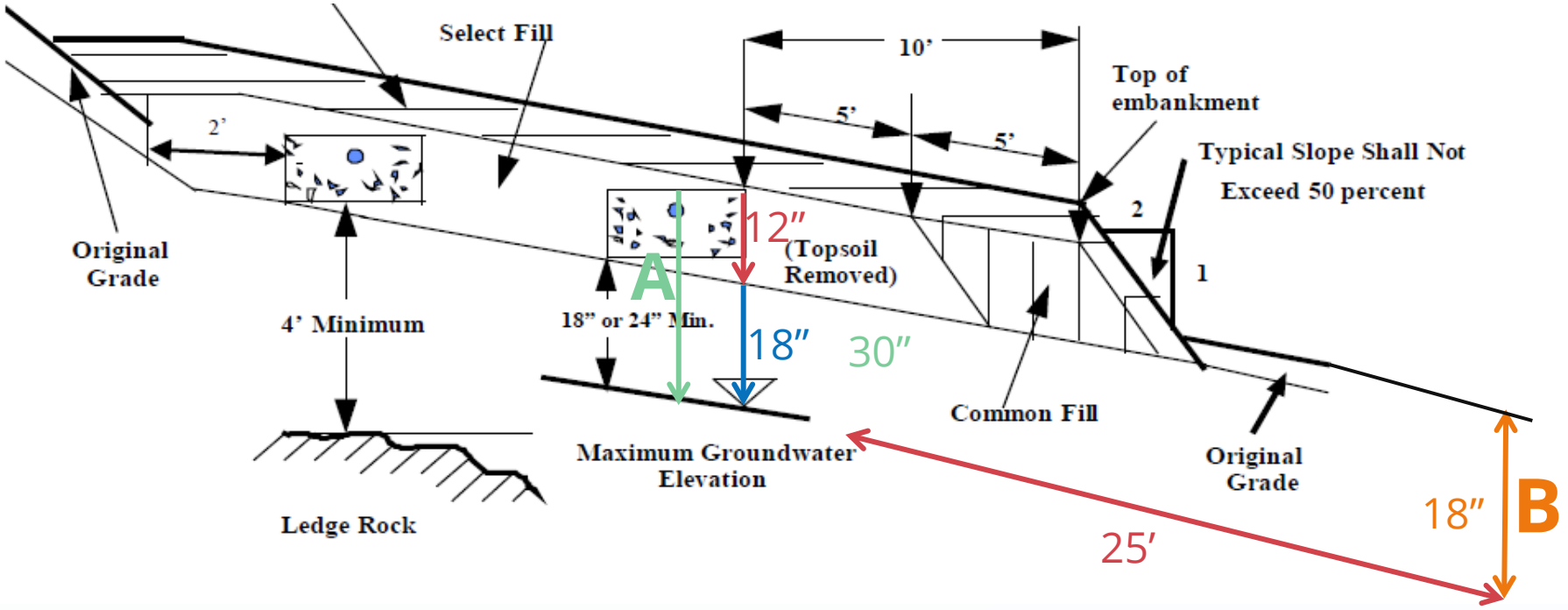
RS Depth = (A+B)/2

Three categories for RS Depth determinations. Each category includes language and cross sections that detail receiving soil measurements in the leaching system area and surrounding soil.

Calculating Receiving Soil: Sloped Lots

$$\text{RS Depth} = \frac{A + B}{2}$$

A = Receiving soil in the leaching system (LS) area.
B = Receiving soil surrounding the LS. Surrounding soil is soil down-gradient of the LS on lots with sloped restrictive layers, and soil around the perimeter of the LS on lots with flat groundwater tables.



Not to scale

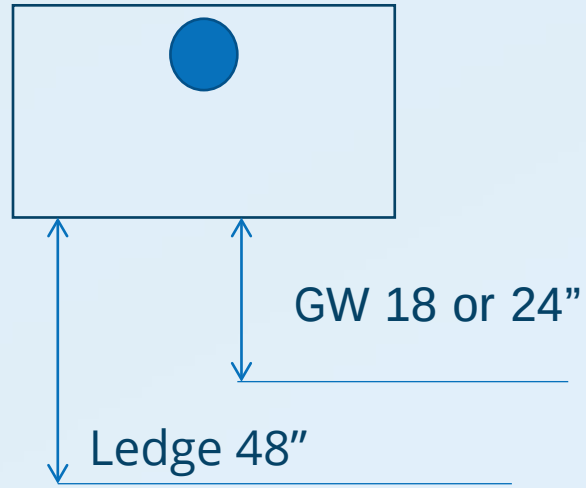
- RS depth in the system area (A) 18" + 12" = 30"
- RS depth at 25' is (B) 18"

(A) 30"+ (B)18" = 48" 48"/2=24"

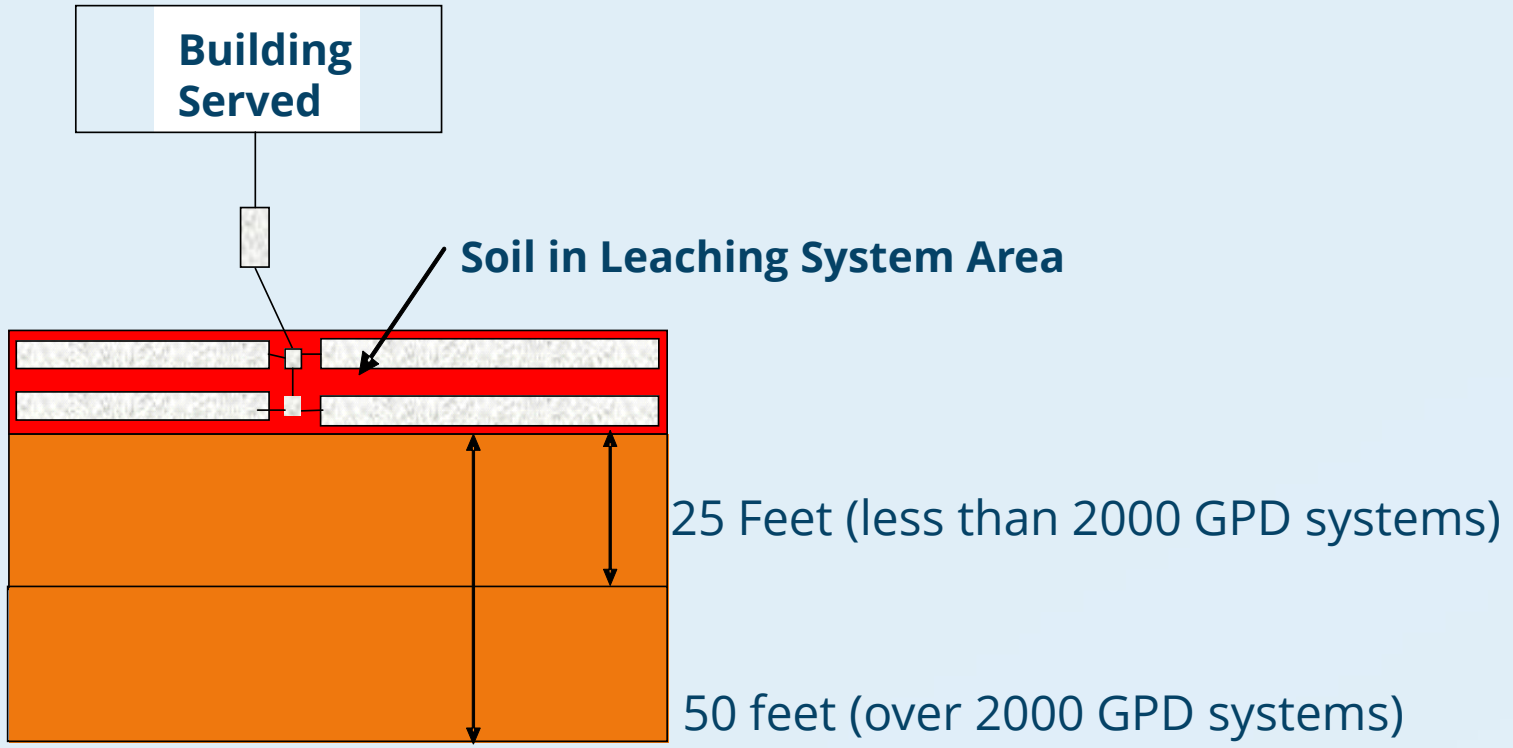
Receiving soil depth is 24"

Separation Distances for Determining Receiving Soil Depth

- As determined by soils testing, location of the 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

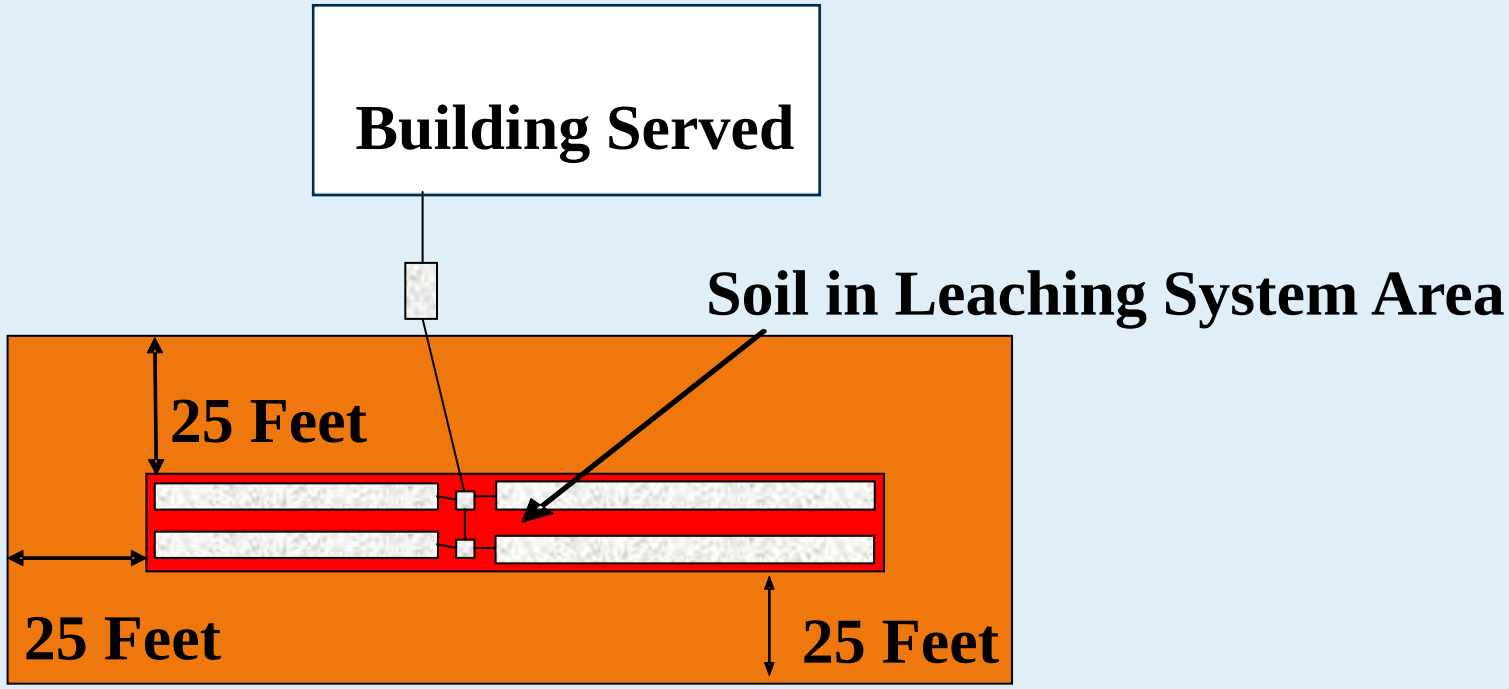


Receiving Soil on Sloped Lots



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

Receiving Soil on Flat Water Table Lots



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

Category 1
Subsurface Sewage Disposal System Layouts for New Lot Creation

Category 1

- Leaching system spreads shall equal or surpass the required MLSS. The RS Depth shall only include naturally occurring soil in both the leaching system area and the surrounding soil area (e.g., down-gradient of leaching system, around perimeter of leaching system).

Category 1 SSDS Layouts for New Lot Creation

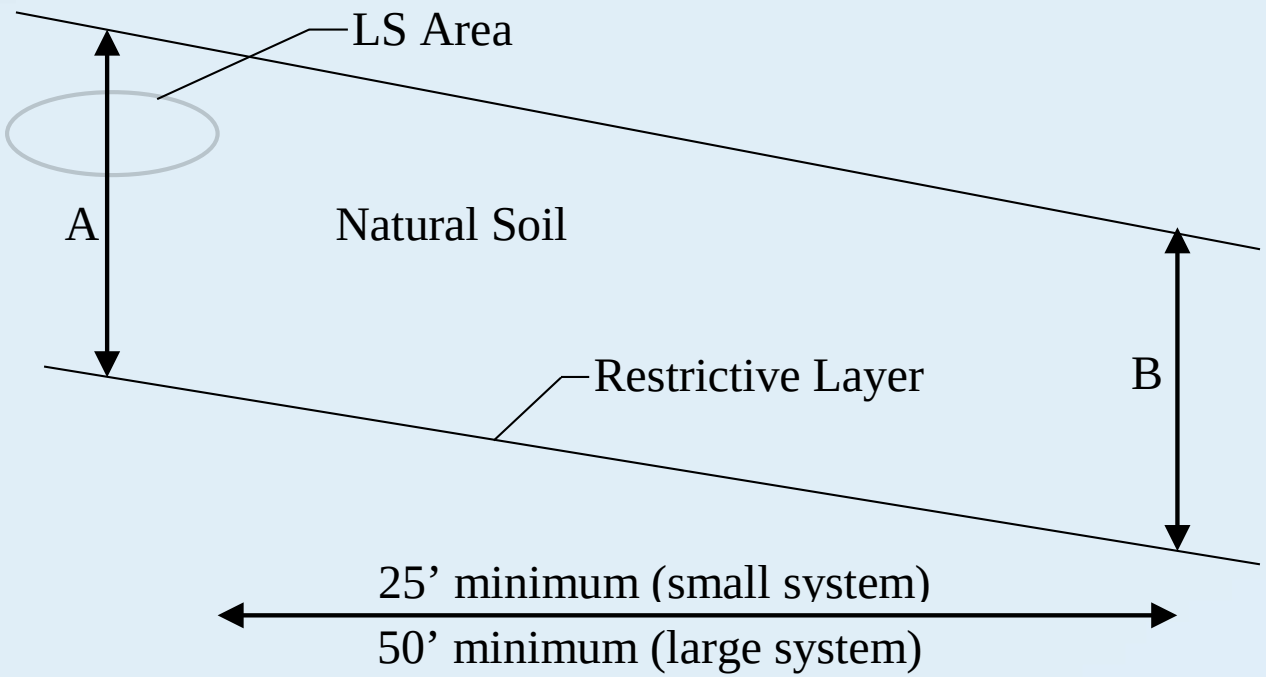


Diagram 1 - Sloped Restrictive Layer

MLSS Category 1

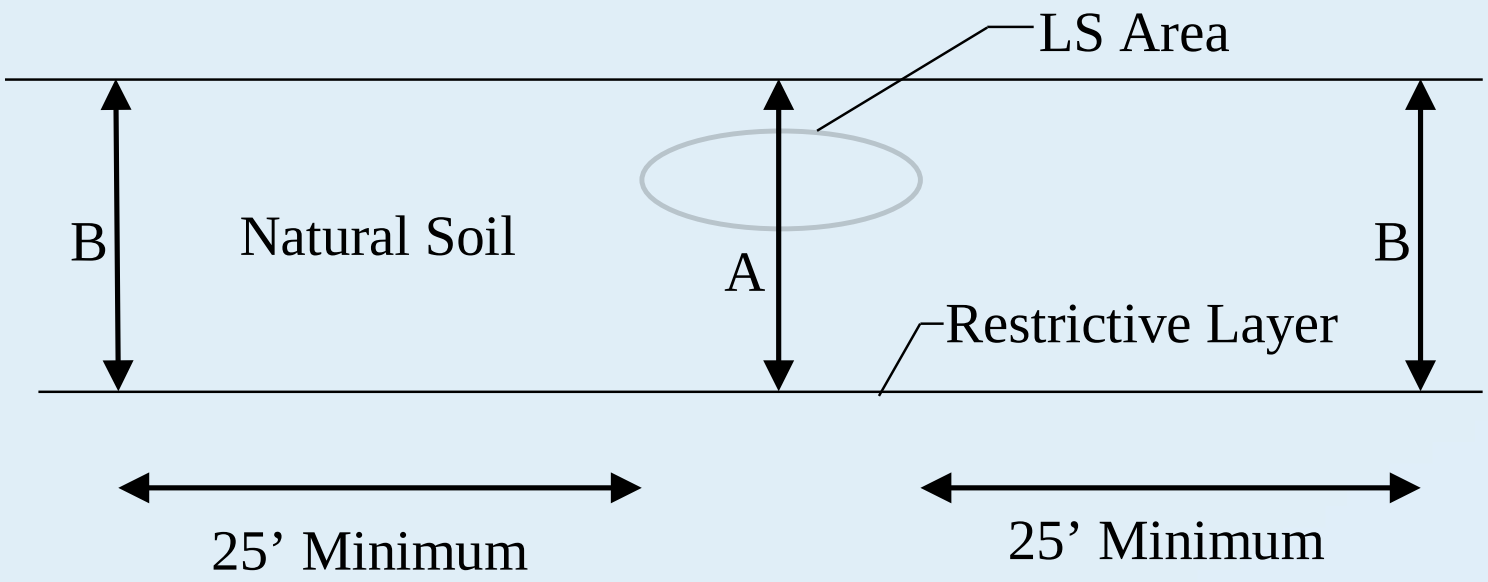


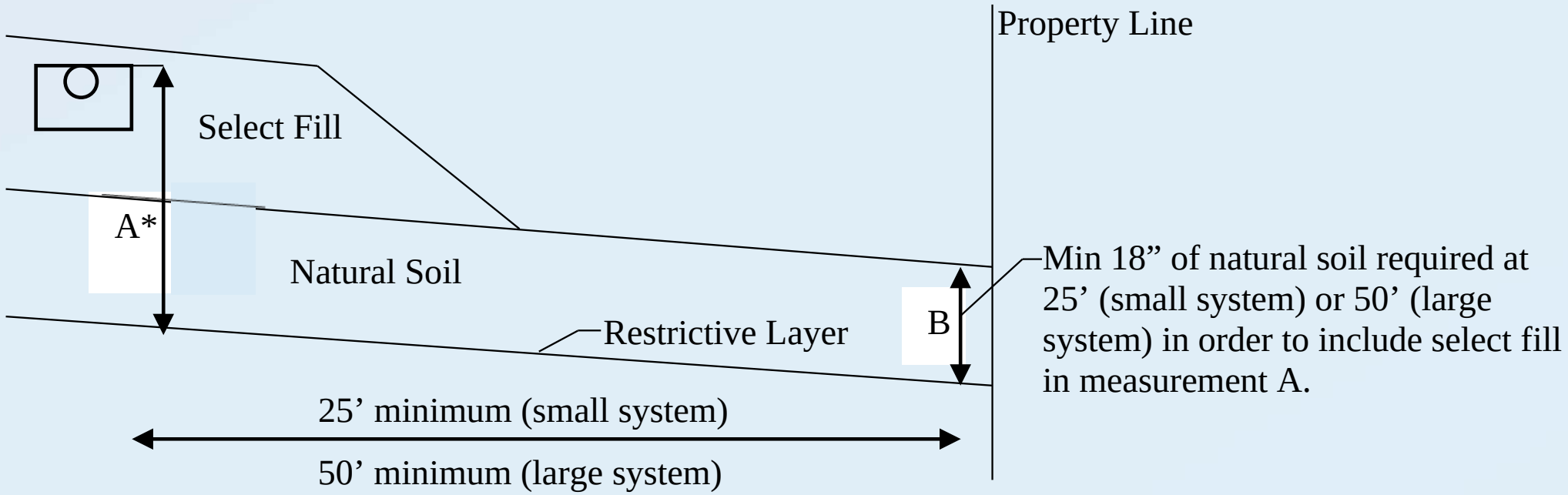
Diagram 2 - Flat Groundwater Table

Category 2
New Subsurface Sewage Disposal Systems, MLSS Compliant Repairs and Conceptual B100a Areas (Code-Complying & Potential Repair Areas

MLSS Category 2

- Receiving soil in the leaching system area can include and select fill.
- Measurement from top of leaching system, minimum natural soil requirements for including select fill in the leaching system area
- Receiving soil measurements are noted in both the category language and in Diagram 3.
- Limits natural soil measurements in the leaching system area when the top of the system is more than 12 inches below natural grade are noted in both the category language and in Diagram 4.

Category 2 - New SSDSs, MLSS Compliant Repairs and Conceptual B100a Areas (Code-Complying & Potential Repair Areas)



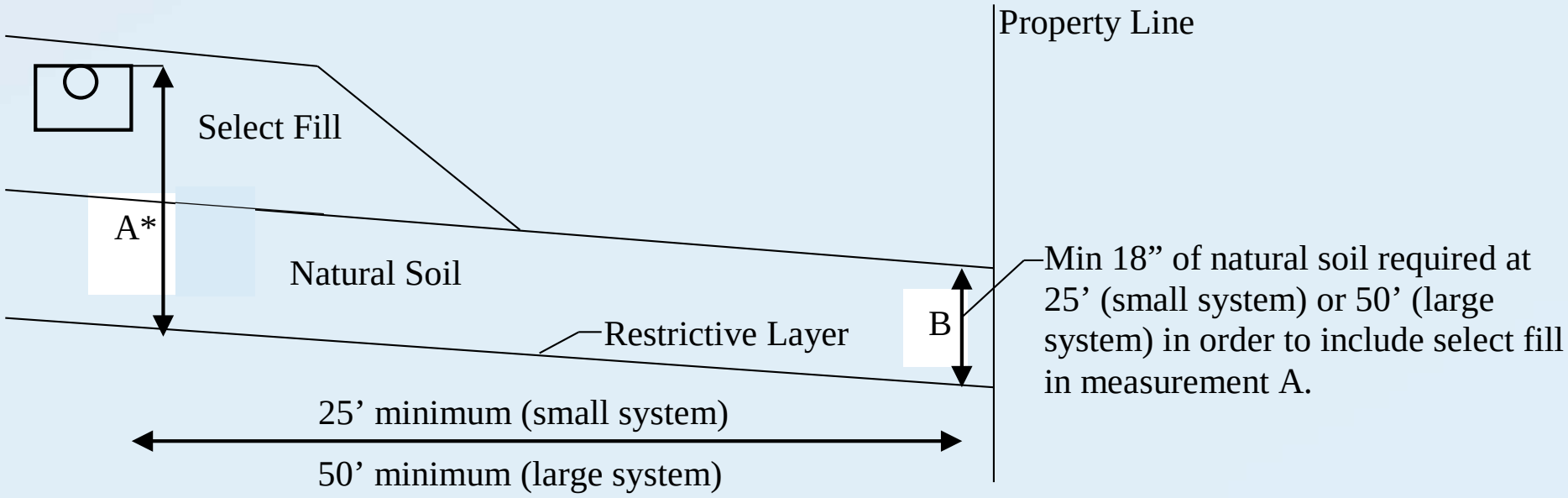
*Receiving soil in LS area may include up to 24” of select fill measured from top of system if all receiving soil is on property and there is at least 18” of natural soil throughout the receiving soil.

Diagram 3 – LS in Select Fill (Sloped Restrictive Layer)

Category 2: New and B100a Code Compliant Leaching System (LS) Installations

- Count up to 24” of select fill in the LS area for elevated systems on sites with at least 18” of naturally occurring receiving soil on the property (25’/50’ downgrade for small/large systems).

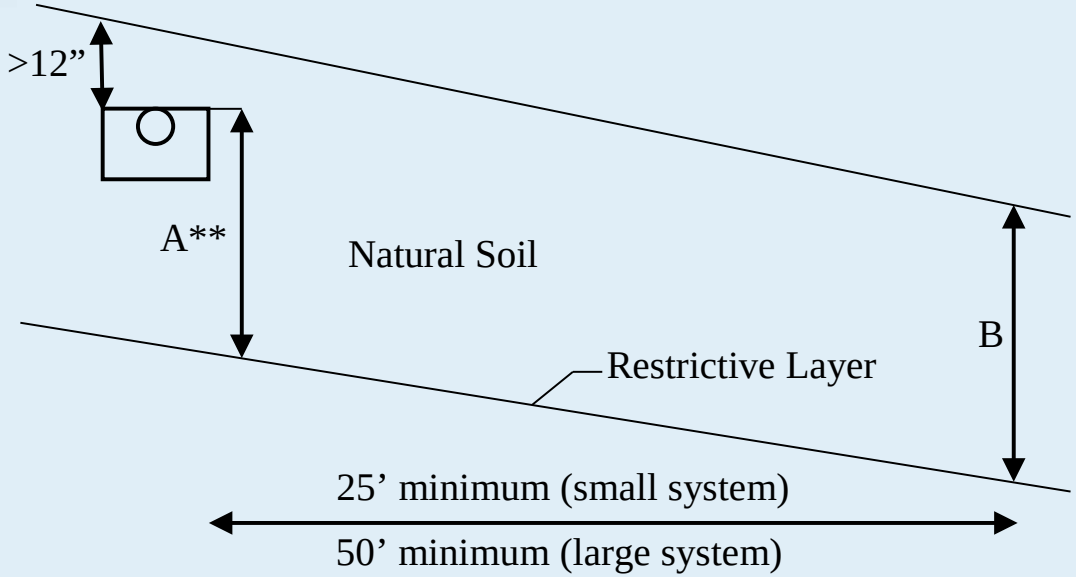
MLSS Category 2



*Receiving soil in LS area may include up to 24”of select fill measured from top of system if all receiving soil is on property and there is at least 18” of natural soil throughout the receiving soil.

Diagram 3 – LS in Select Fill (Sloped Restrictive Layer)

MLSS Category 2



**Receiving soil in the LS area is measured from natural grade; if the top of system is more than 12” below natural grade then it is measured from the top of the system.

Diagram 4 – LS in Natural Soil (Sloped Restrictive Layer)

Category 3
MLSS Non-compliant Repairs (NCR) and B100a MLSS Non-compliant Potential Repair Areas

NCR MLSS Category 3

- If there is less than 18 inches of naturally occurring receiving soil, or when the leaching system cannot meet the MLSS or hydraulic analysis a non-compliant repair (NCR) MLSS assessment shall be conducted.
- The NCR MLSS considers the hydraulic capacity of existing receiving soil, both fill and naturally occurring, and additional fill included in the SSDS design
- PE plan required if less than 25% compliance with required NCR MLSS.

MLSS Category 3

Diagrams (5 & 6) provide conditions and limitations for considering the various types of soil in determining the receiving soil measurements.

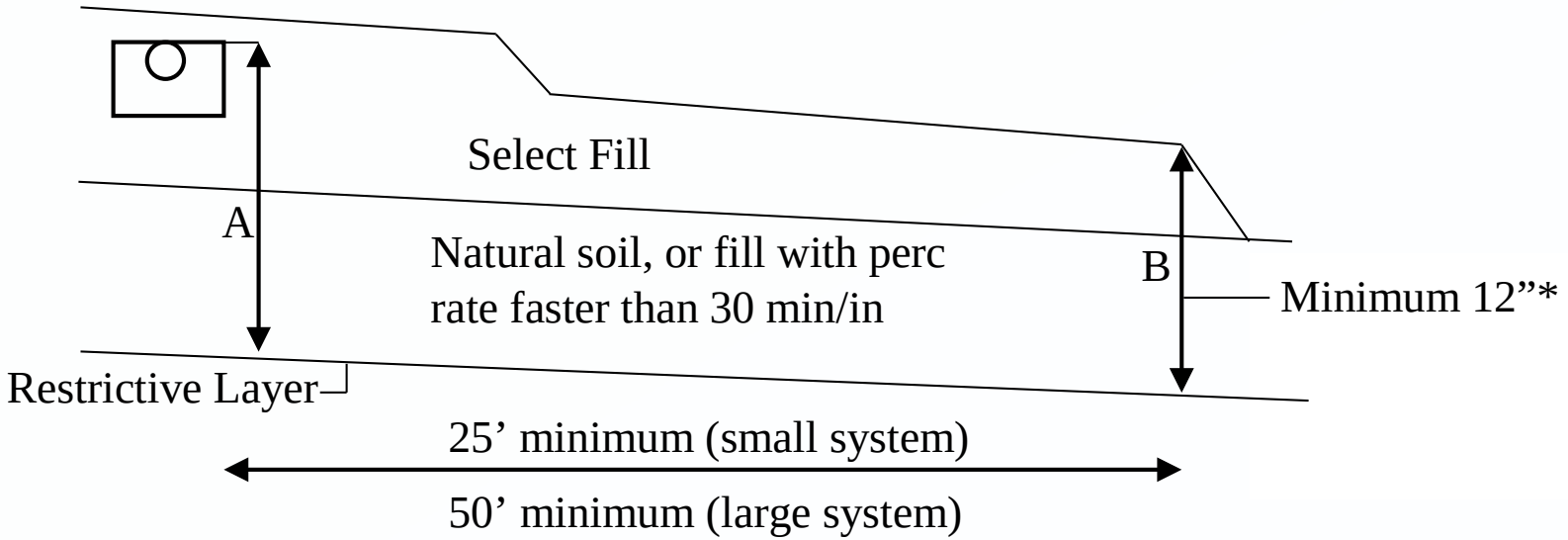


Diagram 5 – Select Fill, and Natural Soil or Fill as Receiving Soil (Sloped Restrictive Layer)

MLSS Category 3

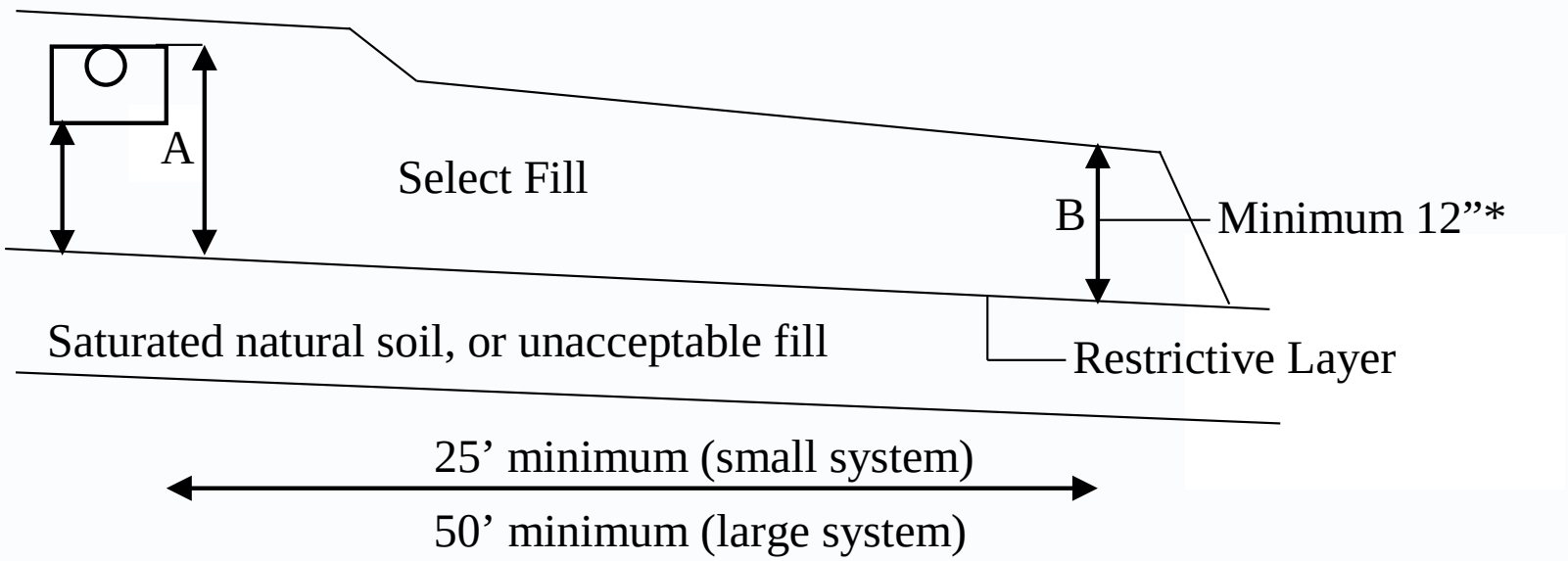


Diagram 6 – Select Fill Receiving Soil (Sloped Restrictive Layer)

*On flat groundwater table lots there shall be a minimum of 6” of receiving soil 25’ around the perimeter of the leaching system.

NCR MLSS

- Receiving soil in the leaching system area shall be measured from the top of the leaching system to the restrictive layer.
- Existing receiving soil fill must perc faster than 30 min/inch.
- Permit to Discharge shall note that system is non-compliant relative to MLSS, and that an exception has been granted.
- Permitted flow shall be based on most limited percentage of ELA or NCR MLSS provided

NCR MLSS

PERMIT TO DISCHARGE

Approval is hereby given to John L. Smith (Property Owner), in accordance with Public Health Code Section 19-13-B103e (h) to discharge to a subsurface sewage disposal system located at 123 East Main Street (Street Address) in the town of Hartford, CT that will receive domestic sewage from a:

Residential building containing 3 bedrooms. Single family (Y/N): Y.
Restaurant containing _____ seats.
Commercial/Office building providing _____ square feet.
Other structure as described: _____.

Design Flow = 450 **gallons per day**. **Permitted Flow** = 315 **gallons per day.**
The design flow shall equal the permitted flow, except for non-compliant repairs (See Section IV D).

In order to provide a sufficient factor of safety it is recommended that the average daily discharge not exceed 2/3 of the permitted flow or 210 gallons per day.

Operation and Maintenance: Septic tank shall be inspected regularly and pumped as needed but not less frequently than every five years. The septic tank has an effluent filter (Y/N) Y. Effluent filters require periodic cleaning. Failure to clean filters can result in sewage backup into the building or effluent breakout. Restaurants serviced by external grease interceptor tank(s) require quarterly inspections and cleaning as necessary. Tank pump-outs tracked by local health department (Y/N) Y. If yes, stipulate pump-out requirements: Every 5 years.

Special Requirements and Restrictions: 1.System malfunction or failure shall be addressed.

Exceptions (Repairs Only): Leaching system is non-compliant relative to MLSS requirements. 70 % of the NCR MLSS has been provided. Refer to approved plan dated 3/7/14 on file for additional information.

CONNECTICUT
DEPARTMENT OF PUBLIC HEALTH

DPH
Connecticut Department of Public Health

Using the MLSS Formula Tables

Factor Tables (pg. 63)

HYDRAULIC FACTORS (HF)

Hydraulic Gradient (% Slope)

Receiving Soil Depth (Inches)	<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								

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.

For a central SSDS serving a single-family dwelling and a residential outbuilding, the main dwelling shall utilize the FF based on the single-family criteria and the FF shall be increased by 0.5 for each bedroom in the outbuilding.

Single-family lots:	**FF**	
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

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 original grade and at least 24 inches above maximum groundwater.

MLSS Formula (pg. 63)

- Hydraulic Factor (HF)
  - Receiving soil and slope
- Percolation Factor (PF)
  - Percolation rate
- Flow Factor (FF)
  - Design flow

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

Hydraulic Factor (pg. 63)

MLSS = FF x PF x **HF**

HYDRAULIC FACTORS (HF)

Hydraulic Gradient (% Slope)

Receiving Soil Depth (Inches)	<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
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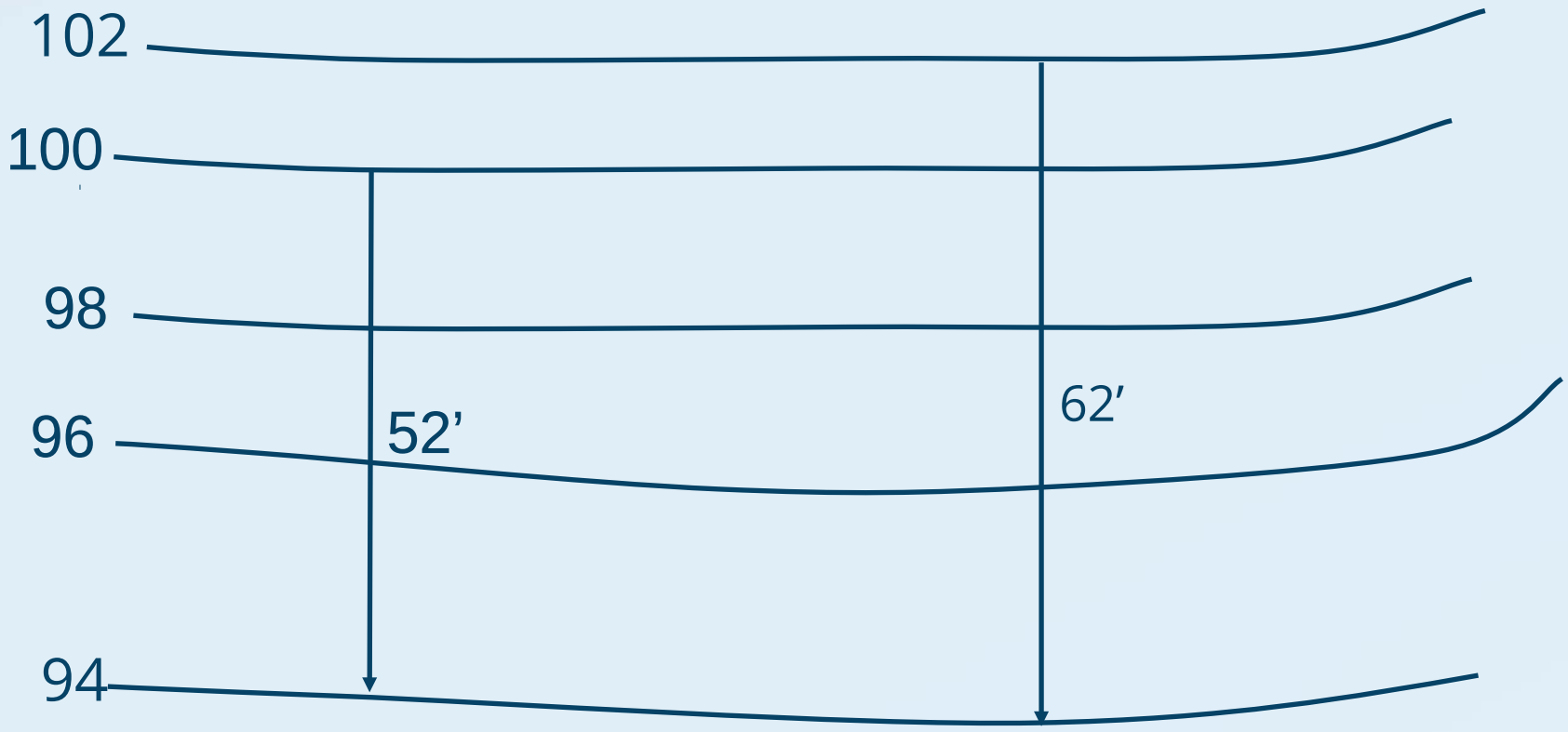
30.1 - 36.0	48	42	34	30	28	26	24	20	18
36.1 - 42.0	42	36	30	28	26	24	20	18	16
42.1 - 48.0	36	32	28	26	24	20	18	16	14
48.1 - 60.0	30	28	24	22	20	18	16	14	10
>60.0	MLSS Need Not be Considered								

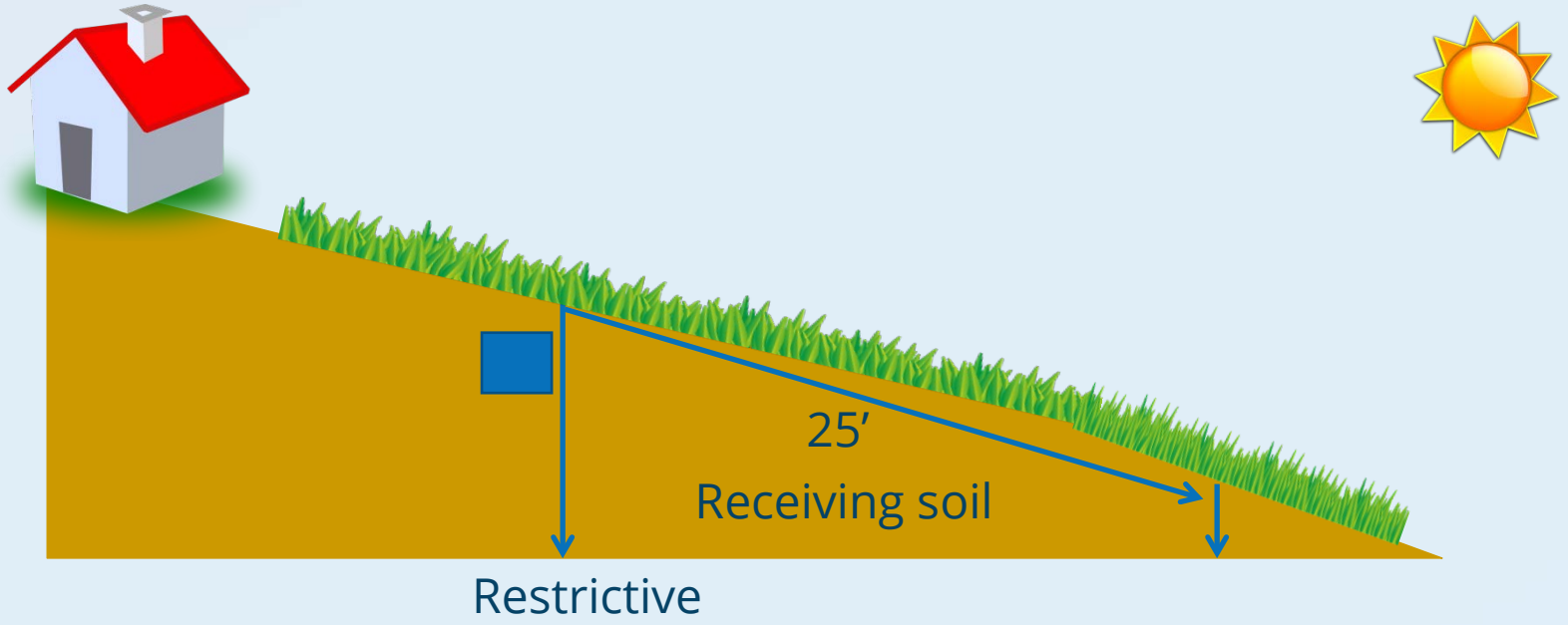
Calculating Slope
(see slides 79-89 for in-depth review of slope)



6 / 52 x 100 = 11.53%

8/62 x 100= 12.9%

Measuring for Receiving soil: Sloped lots



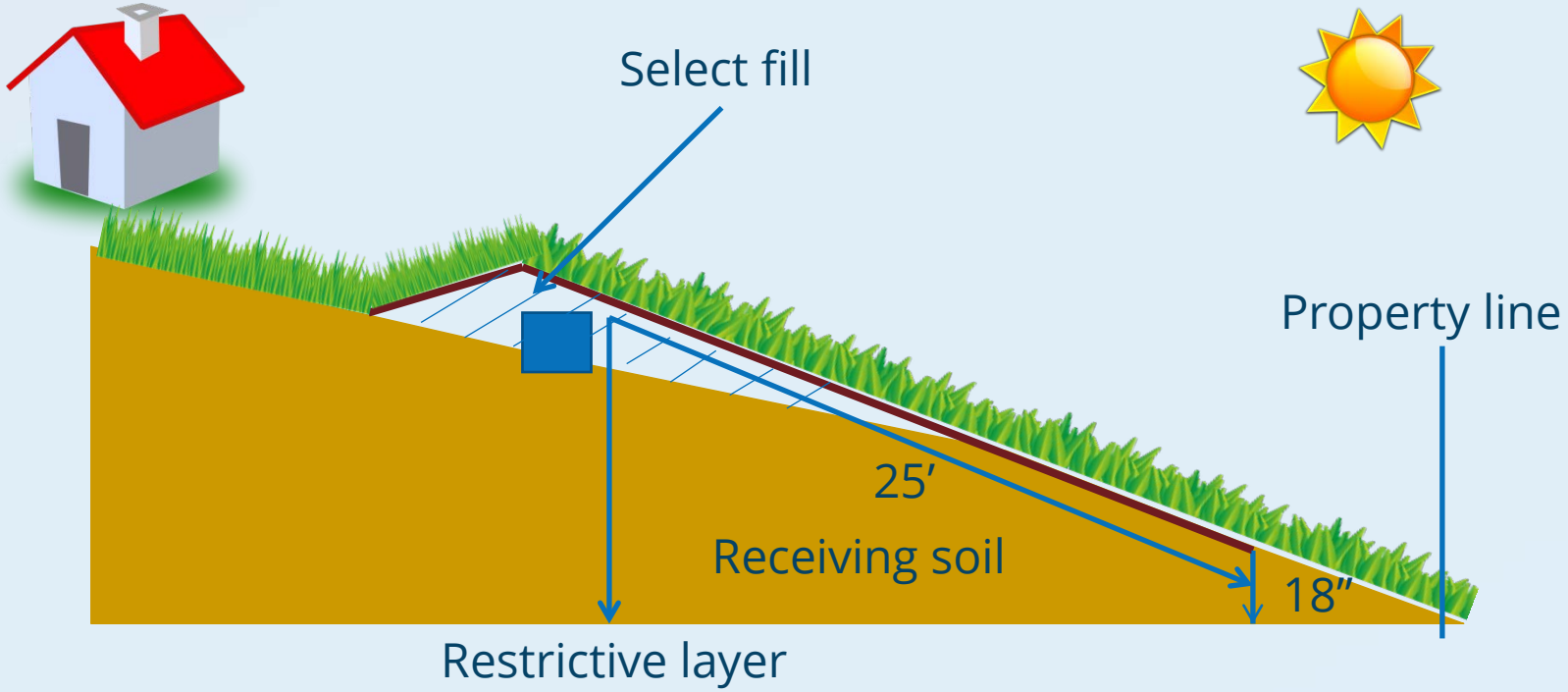
Below grade installations:

- Top of ground to restrictive layer

If top of system is installed more then 12” into grade

- Top of leaching structure to restrictive layer (category 2)

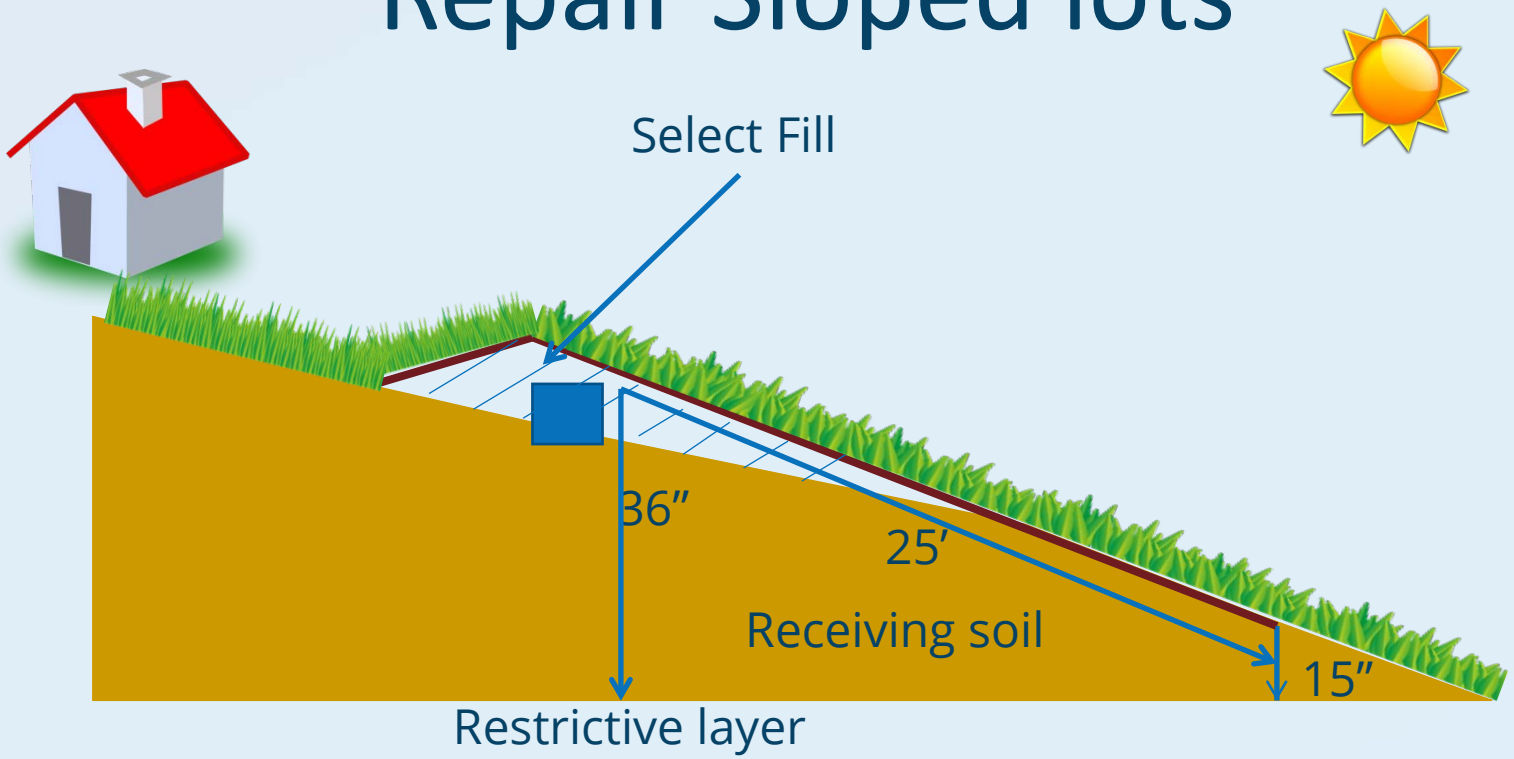
Measuring for Receiving soil: Sloped lots



Above grade installations (must have 18” of natural soil as part of the receiving soil):

- Code Complying Systems
  - 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)

Repair Sloped lots



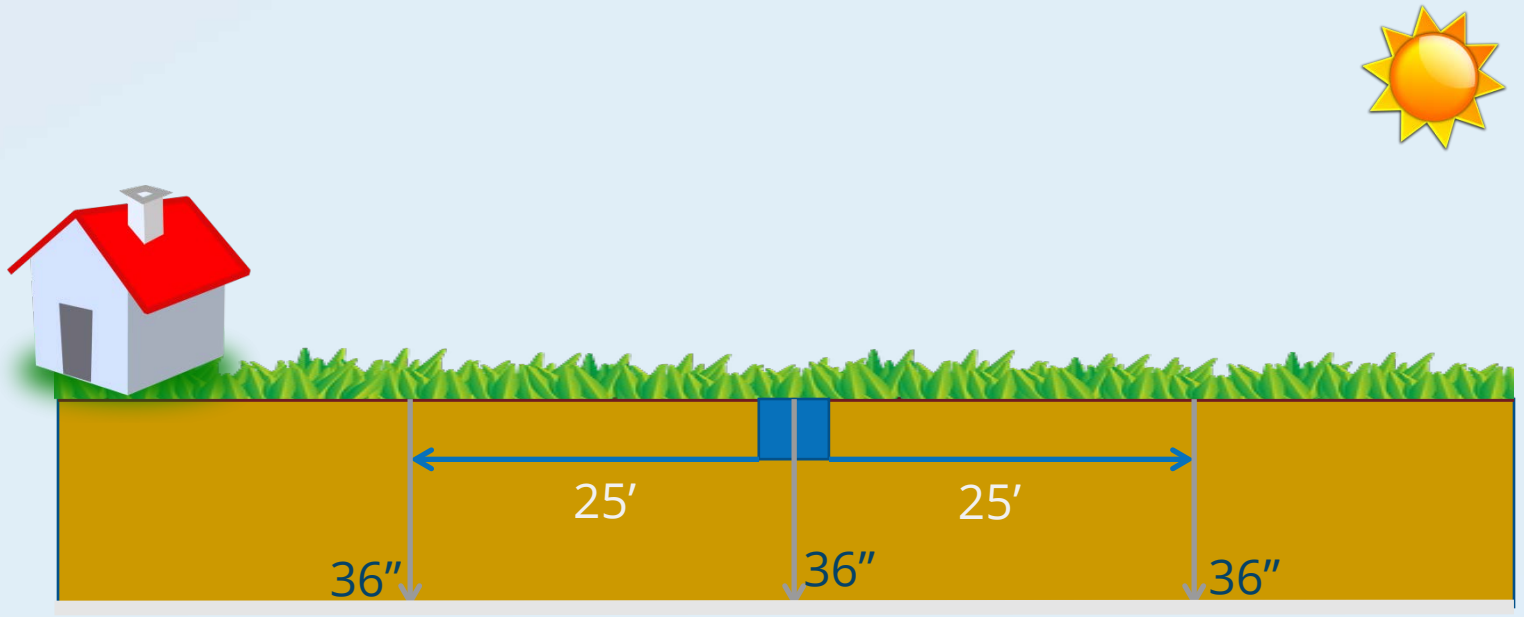
Repairs and B100a potential repair areas:

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”

Measuring for Receiving soil: Flat Lots



Restrictive layer: Maximum ground water at 36”

Receiving soils depth is 36”

Hydraulic Factor

- <u>HF = Hydraulic Factor</u>
  - Percent slope = rise / run x 100

- Depth of Receiving Soil- Max. groundwater, ledge rock, impervious soil (perc slower than 60 min/inch)

HF Example:

S = 8.3%

HYDRAULIC FACTORS (HF)

Hydraulic Gradient (% Slope)

Receiving Soil Depth (Inches)	<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
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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”

HF Example:

S = 6.3%

HYDRAULIC FACTORS (HF)

Hydraulic Gradient (% Slope)

Receiving Soil Depth (Inches)	<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
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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”

HF Example:

S = 5.2 %

HYDRAULIC FACTORS (HF)

Hydraulic Gradient (% Slope)

Receiving Soil Depth (Inches)	<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
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48.1 - 60.0	30	28	24	22	20	18	16	14	10
>60.0	MLSS Need Not be Considered								

RS = 37”

Flow Factor (pg. 63)

MLSS = **FF** x PF x 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.

For a central SSDS serving a single-family dwelling and a residential outbuilding, the main dwelling shall utilize the FF based on the single-family criteria and the FF shall be increased by 0.5 for each bedroom in the outbuilding.

Single-family lots:	**FF**	
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

Flow Factor Example:

Non-Residential Flow Factor:

Design Flow (GPD) / 300

1000 GPD Retail

1000/300 = 3.33 Flow Factor

Percolation Factor (pg. 63)

MLSS = FF x **PF** x 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 original grade and at least 24 inches above maximum groundwater.

MLSS Example

- 5 Bedroom House
- Design Percolation Rate = 24 min/in
- Receiving Soil = 32”
- Slope = 9.1 %

MLSS = FF x PF x HF

- FF = **2.0**
- PF = **1.5**
- HF = **24**
- MLSS = **2.0** x **1.5** x **24** = **72 feet**

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.

For a central SSDS serving a single-family dwelling and a residential outbuilding, the main dwelling shall utilize the FF based on the single-family criteria and the FF shall be increased by 0.5 for each bedroom in the outbuilding.

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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 original grade and at least 24 inches above maximum groundwater.

HYDRAULIC FACTORS (HF)

Hydraulic Gradient (% Slope)

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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								

MLSS Category 1 and 2 Examples

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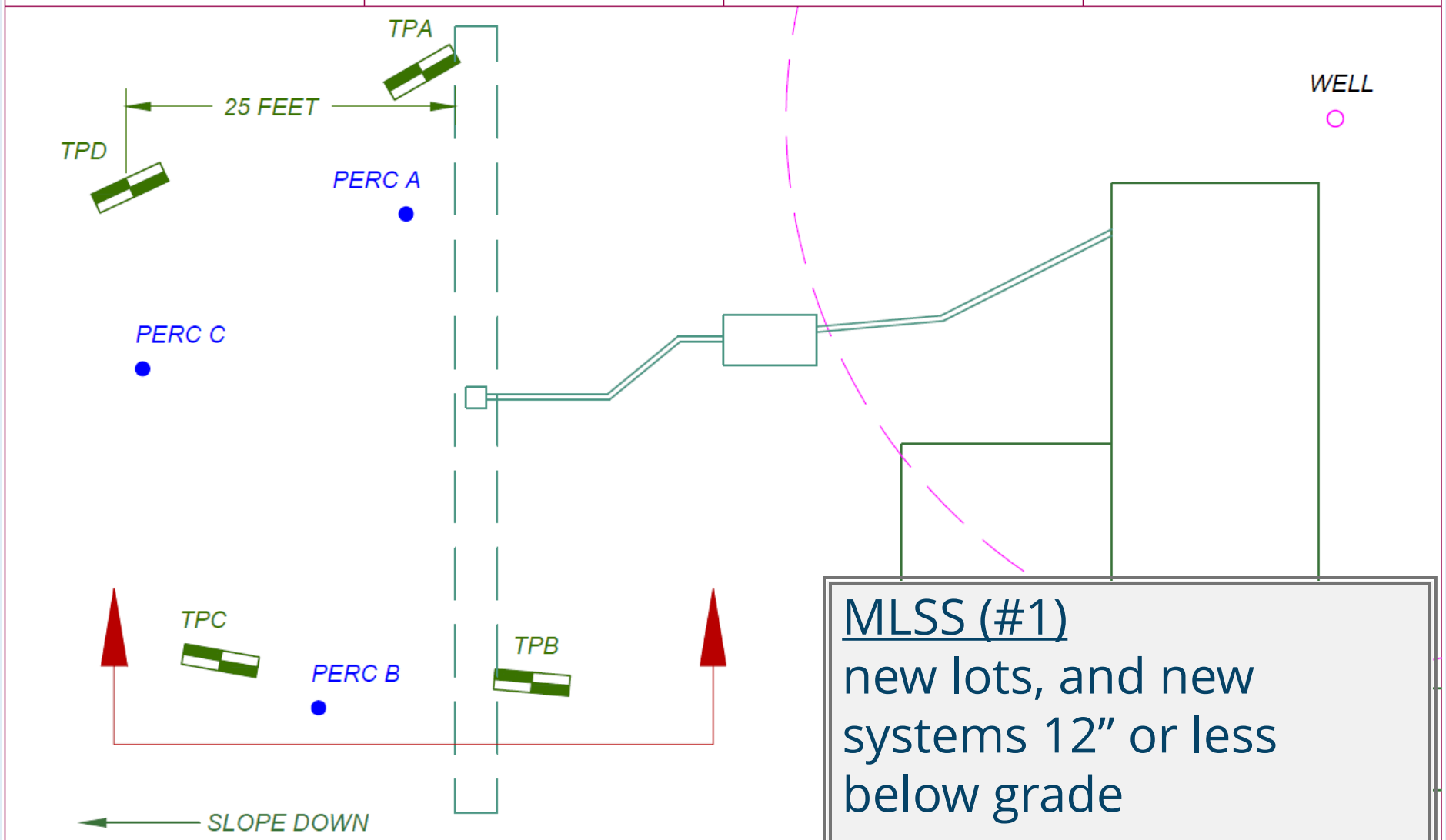
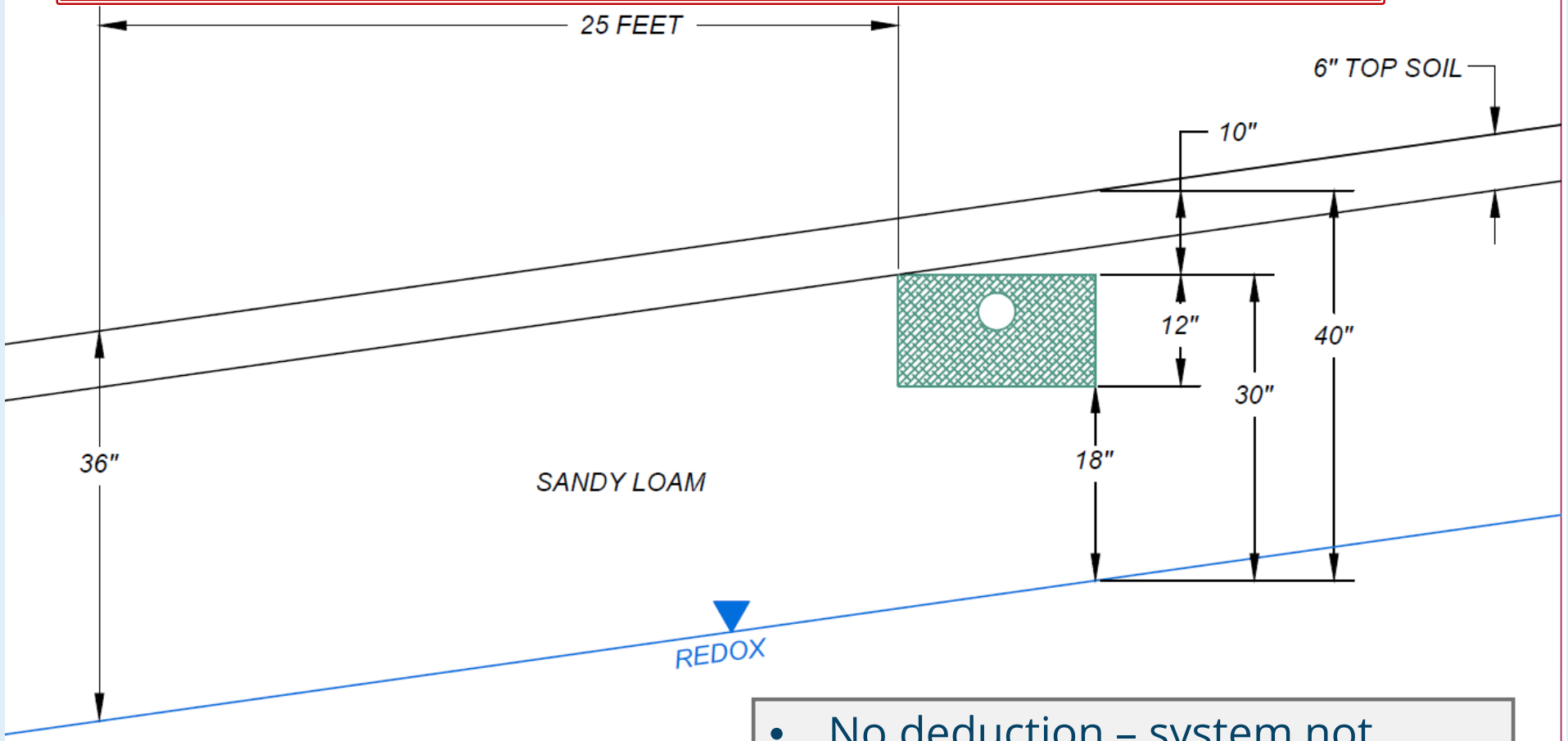
TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-6 TOPSOIL	0-6 TOPSOIL	0-6 TOPSOIL	0-6 TOPSOIL
6-40 BRN SANDY LOAM	6-40 BRN SANDY LOAM	6-36 BRN SANDY LOAM	6-36 BRN SANDY LOAM
40-81 GRY SILT LOAM	40-85 GRY SILT LOAM	36-81 GRY SILT LOAM	36-81 GRY SILT LOAM
REDOX AT 40	REDOX AT 40	REDOX AT 36	REDOX AT 36



DRAWING 3 J.M.LAUDANO FEB 2016

MLSS (#1)
new lots, and new systems 12” or less below grade

MLSS (#1): Conceptual systems, new lots, and new systems 12” or less below grade



MLSS IS BASED ON RECEIVING SOIL DEPTH OF (40" + 36") / 2 = 38"

- No deduction – system not deeper than 12” below grade
- RS Depth = 38”

DRAWING 3A J.M.LAUDANO FEB 2016

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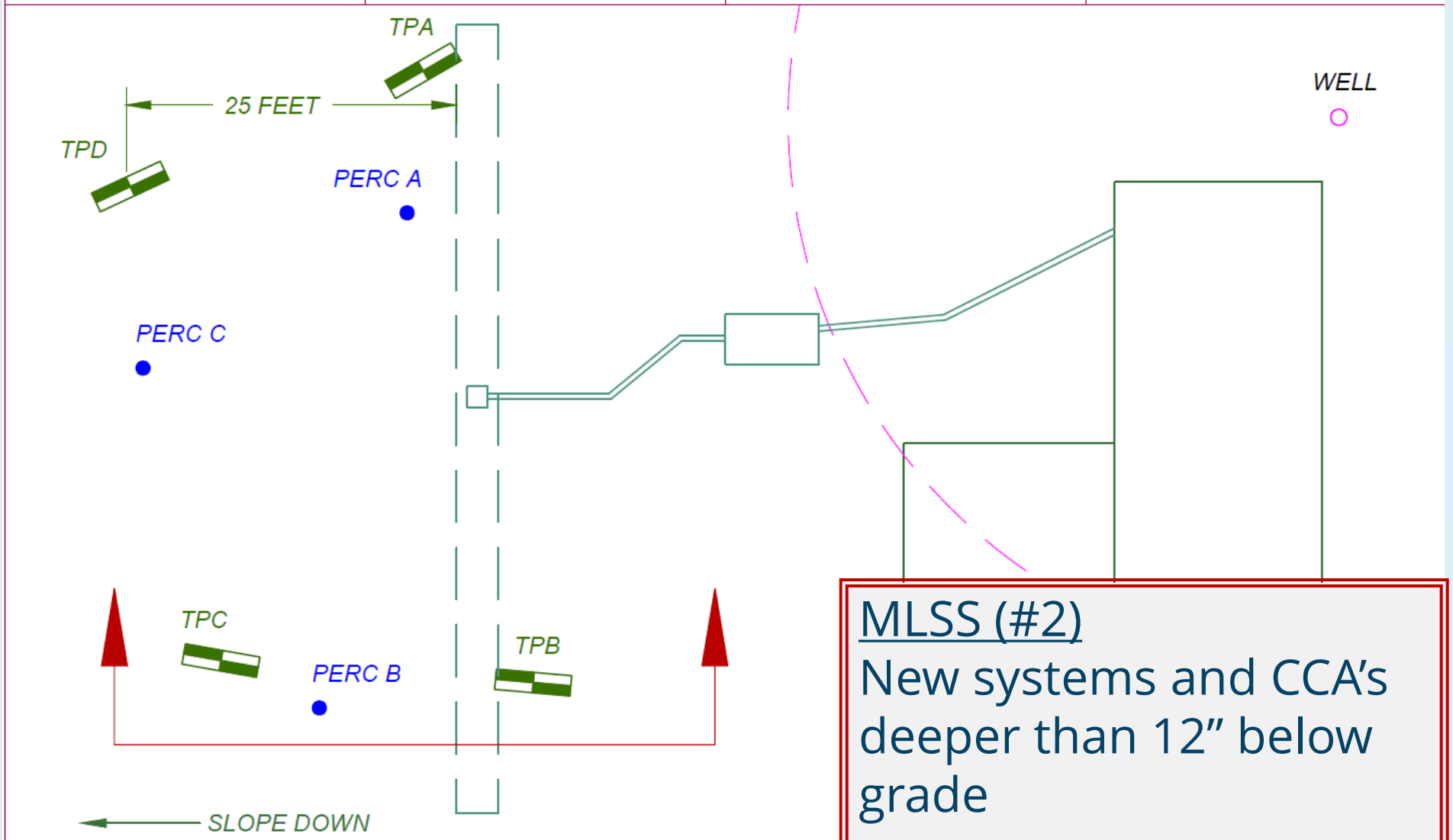
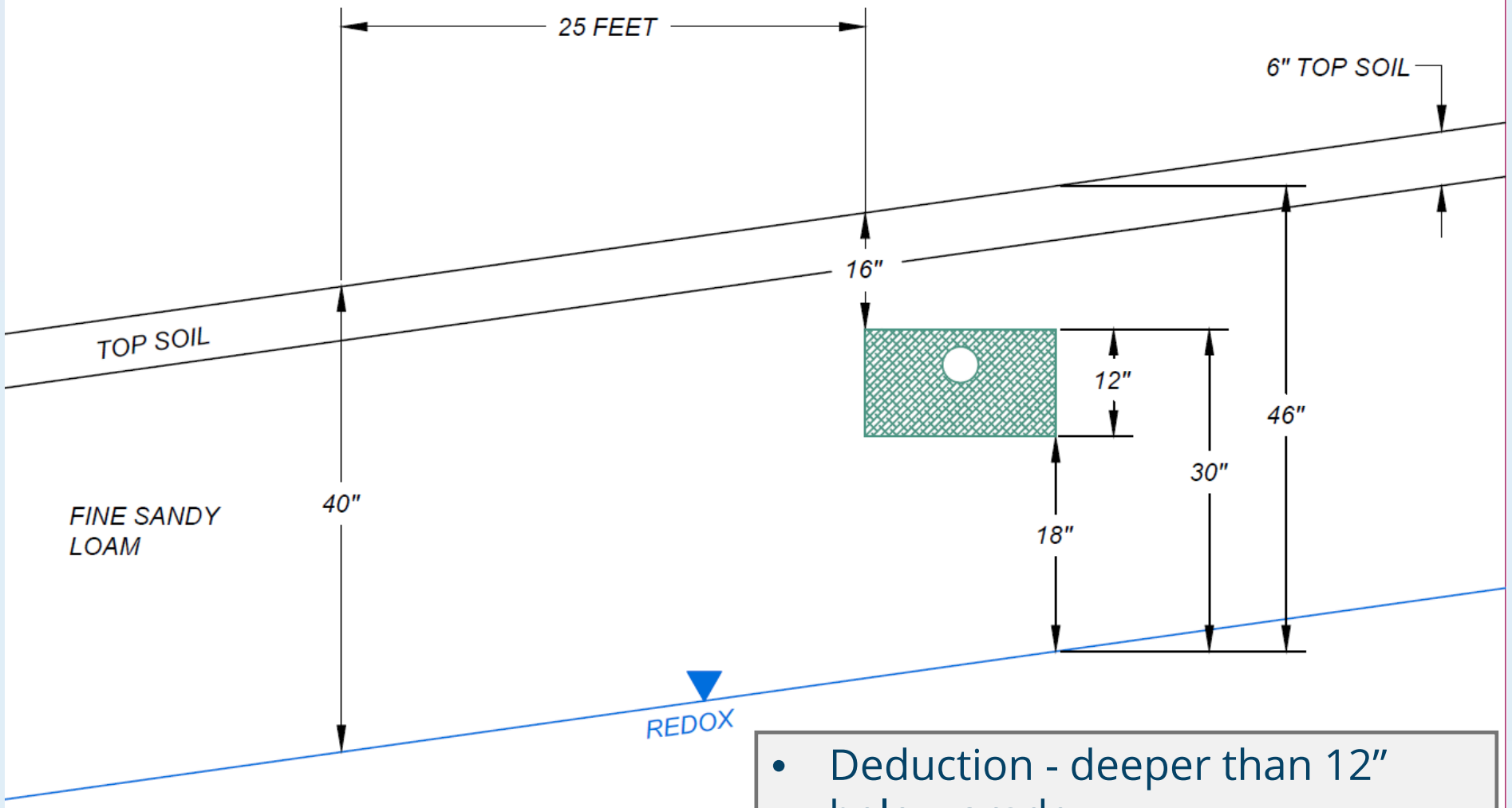
TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-6 TOPSOIL	0-6 TOPSOIL	0-6 TOPSOIL	0-6 TOPSOIL
6-46 BRN FINE SANDY LOAM	6-46 BRN FINE SANDY LOAM	6-40 BRN FINE SANDY LOAM	6-40 BRN FINE SANDY LOAM
46-81 GRY SILT LOAM	46-81 GRY SILT LOAM	40-81 GRY SILT LOAM	40-81 GRY SILT LOAM
REDOX AT 46	REDOX AT 46	REDOX AT 40	REDOX AT 40



MLSS (#2)

New systems and CCA's deeper than 12" below grade

MLSS (#2): New systems/CCA's deeper than 12" below grade



- Deduction - deeper than 12" below grade
- Receiving soil measured from top of system
- RS Depth = 35"

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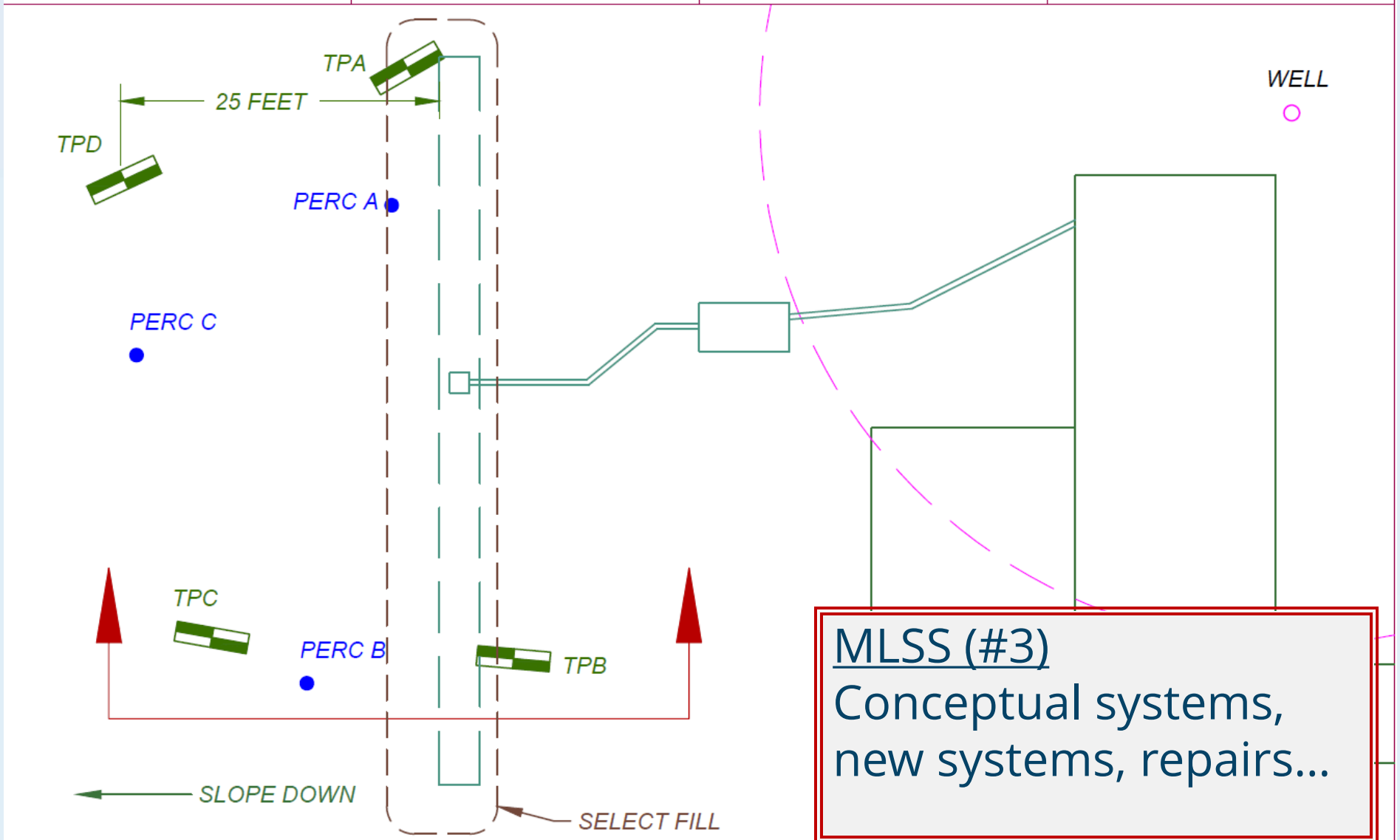
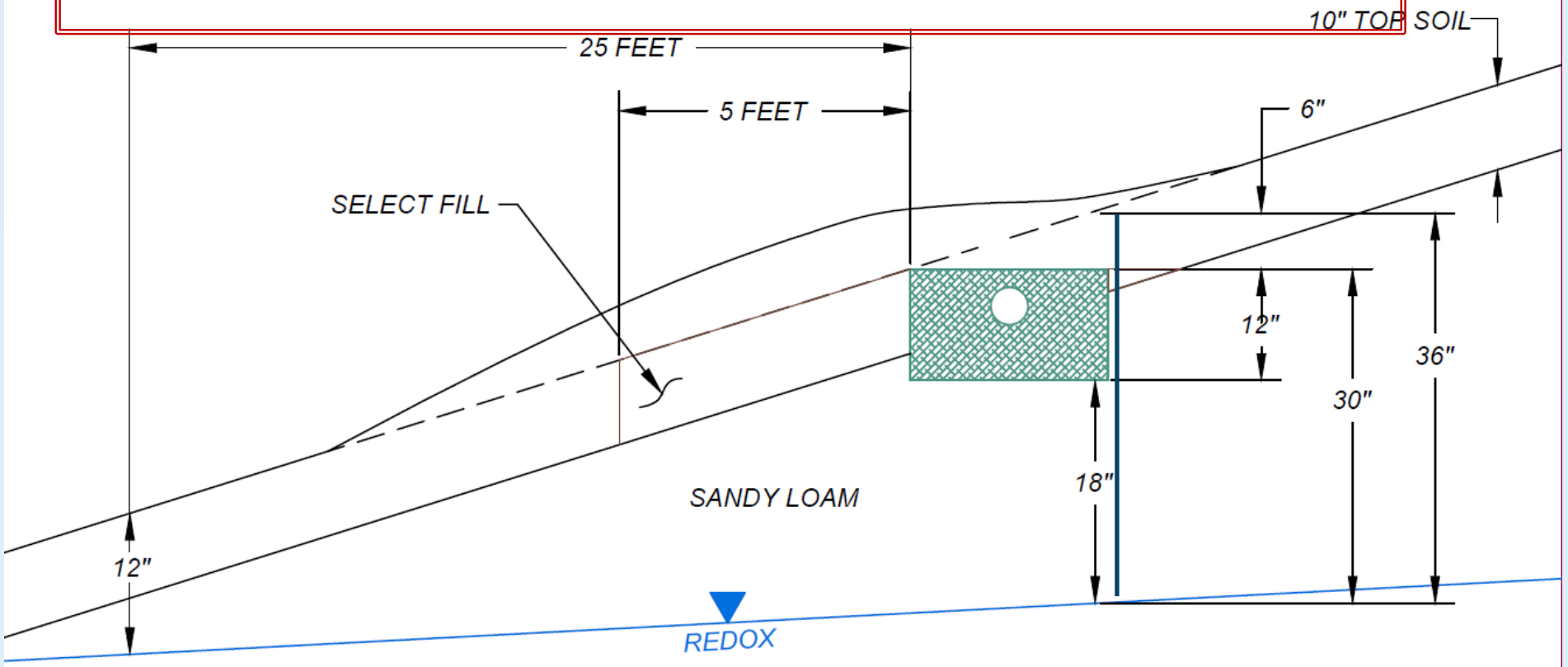
TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-10 TOPSOIL	0-10 TOPSOIL	0-10 TOPSOIL	0-6 TOPSOIL
10-36 BRN SANDY LOAM	10 -36 BRN SANDY LOAM	10-12 BRN SANDY LOAM	10-12 BRN SANDY LOAM
36-61 GRY SILT LOAM	36-65 GRY SILT LOAM	12-48 GRY SILT LOAM	12-48 GRY SILT LOAM
REDOX AT 36	REDOX AT 36	REDOX AT 12	REDOX AT 12



MLSS (#3)

Conceptual systems, new systems, repairs…

MLSS (#3): Conceptual systems, new systems, repairs…



MLSS IS BASED ON RECEIVING SOIL DEPTH OF (36" + 12") / 2 = 24"

- Receiving soil measured from grade.
- <18” downgradient; RS Depth = 24”

DRAWING 4A J.M.LAUDANO FEB 2016

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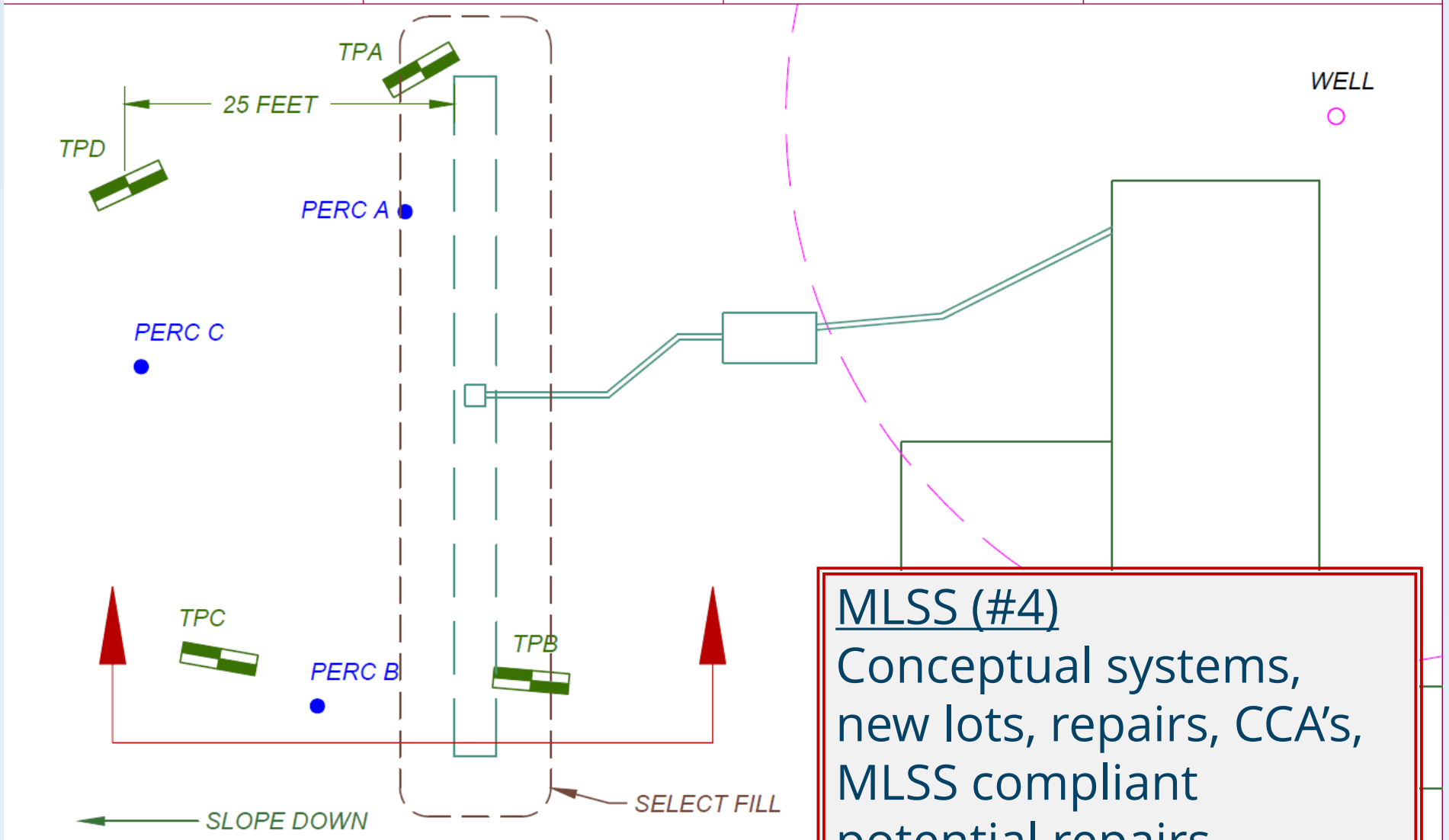
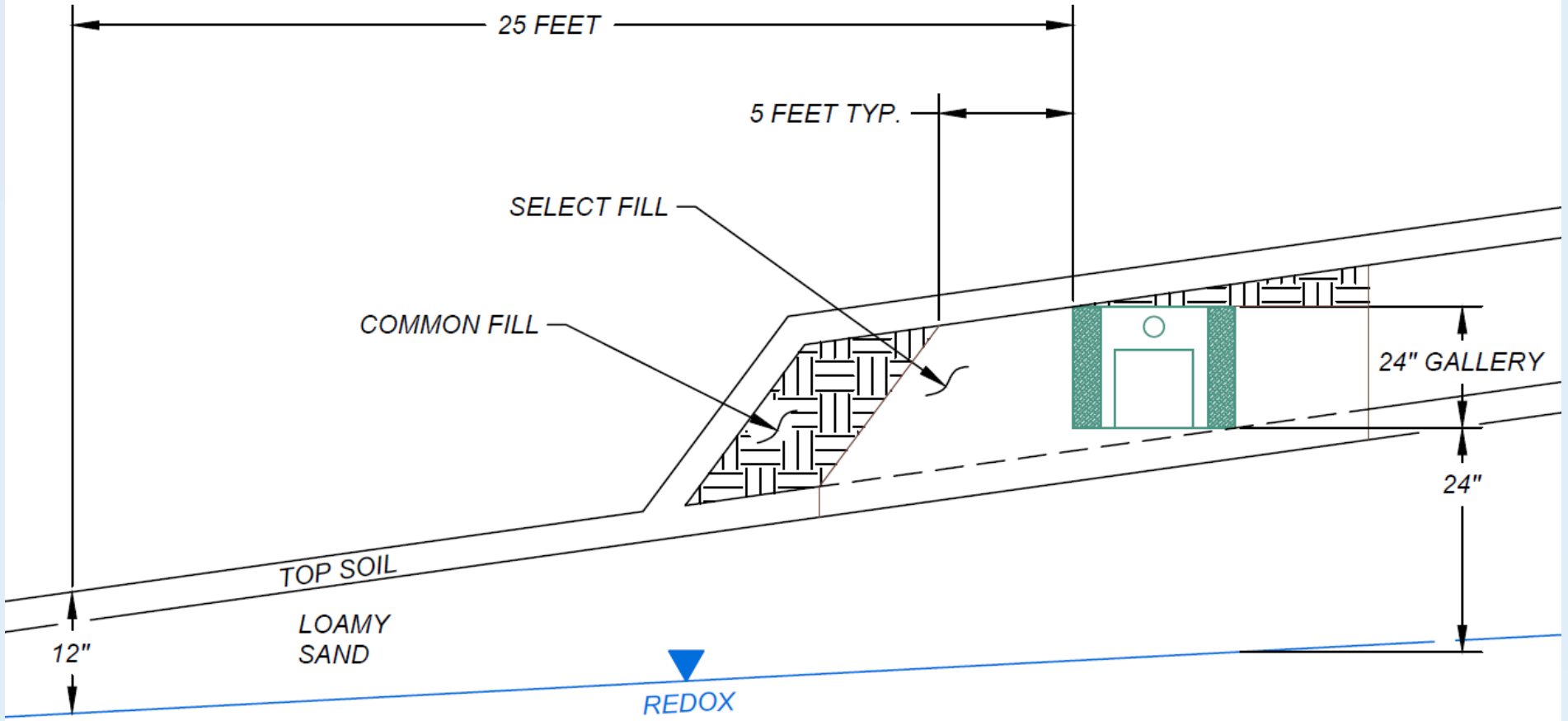
TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-10 TOPSOIL	0-10 TOPSOIL	0-10 TOPSOIL	0-6 TOPSOIL
10-24 BRN LOAMY SAND	10 -24 BRN LOAMY SAND	10-12 BRN LOAMY SAND	10-12 BRN LOAMY SAND
24-61 GRY SILT LOAM	24-65 GRY SILT LOAM	12-42 GRY SILT LOAM	12-45 GRY SILT LOAM
REDOX AT 24	REDOX AT 24	REDOX AT 12	REDOX AT 12



MLSS (#4)

Conceptual systems, new lots, repairs, CCA's, MLSS compliant potential repairs

MLSS (#4): Conceptual systems, new lots, repairs, CCA's, B100a potential repair areas



MLSS IS BASED ON RECEIVING SOIL DEPTH OF (24" + 12") / 2 = 18"

- <18" downgradient; therefore NO additional credit given for select fill
- RS Depth = 18"

DRAWING 5A J.M.LAUDANO FEB 2016

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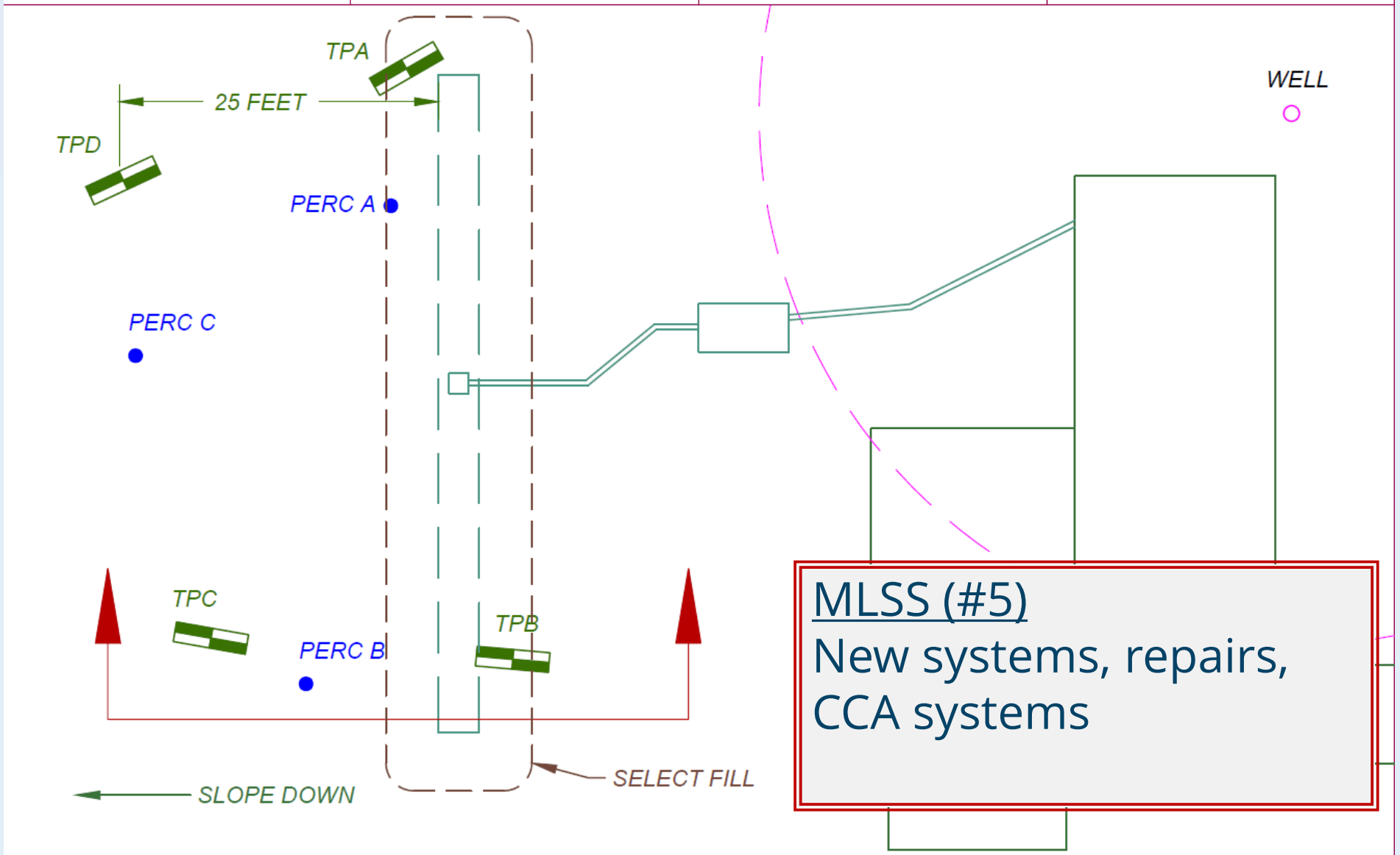
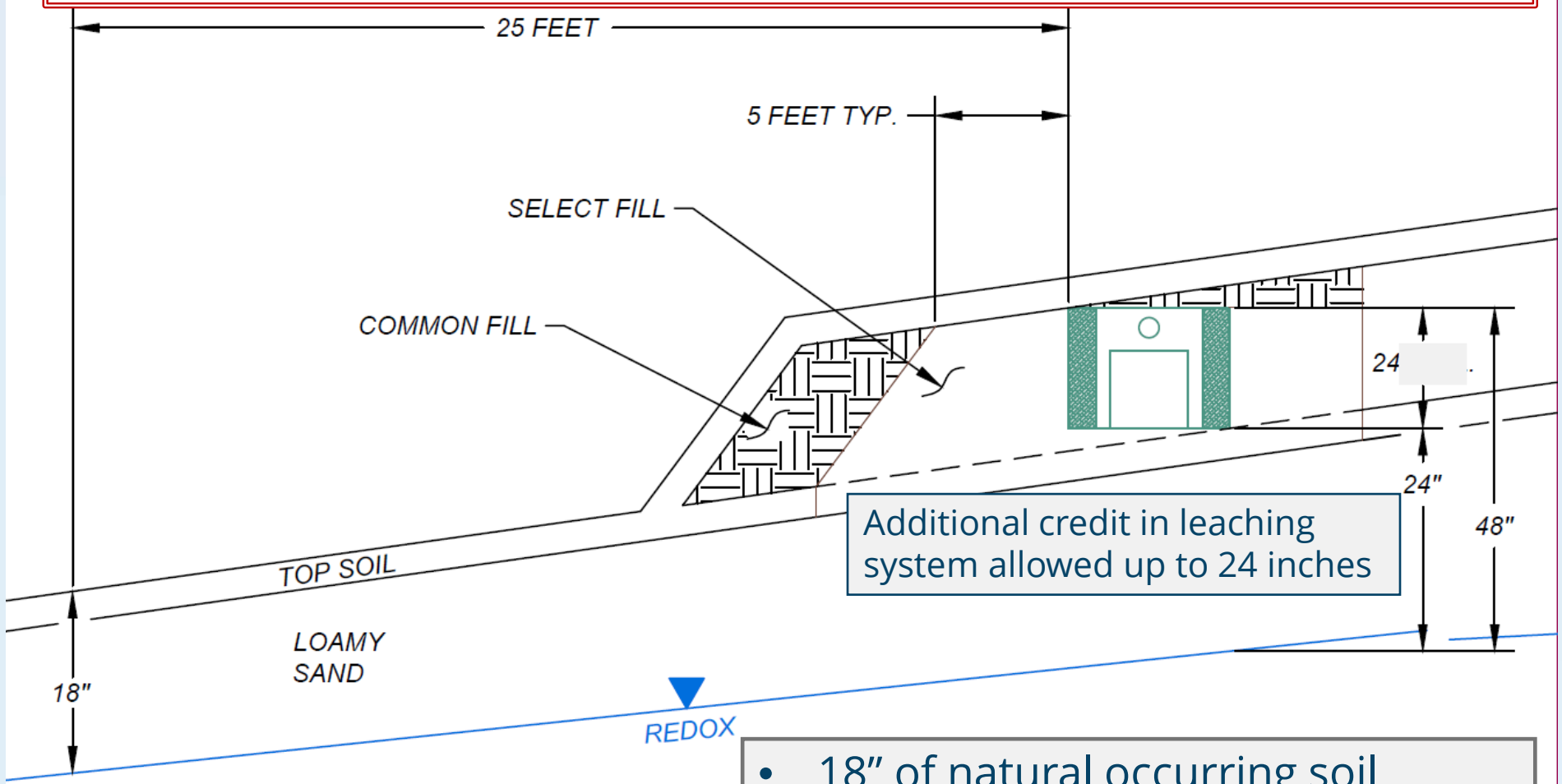
TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-10 TOPSOIL	0-10 TOPSOIL	0-10 TOPSOIL	0-6 TOPSOIL
10-24 BRN LOAMY SAND	10 -24 BRN LOAMY SAND	10-18 BRN LOAMY SAND	10-18 BRN LOAMY SAND
24-61 GRY SILT LOAM	24-65 GRY SILT LOAM	18-42 GRY SILT LOAM	18-45 GRY SILT LOAM
REDOX AT 24	REDOX AT 24	REDOX AT 18	REDOX AT 18



MLSS (#5)
New systems, repairs, CCA systems

MLSS (#5): New systems, repair, CCA systems <u>being installed</u>



Additional credit in leaching system allowed up to 24 inches

- 18” of natural occurring soil
- Max credit of 24” can be given for select fill to top of system
- RS Depth = 33”

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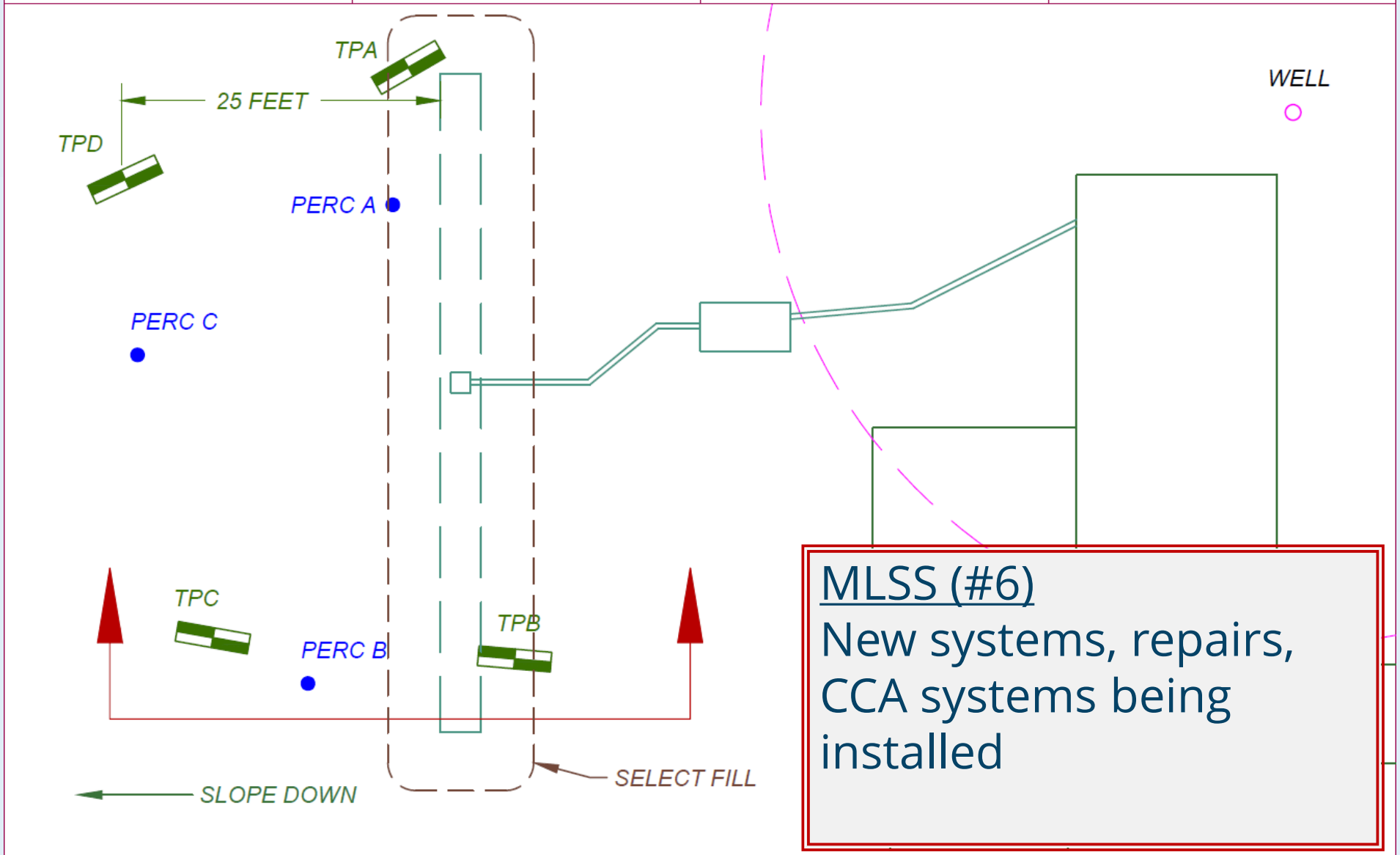
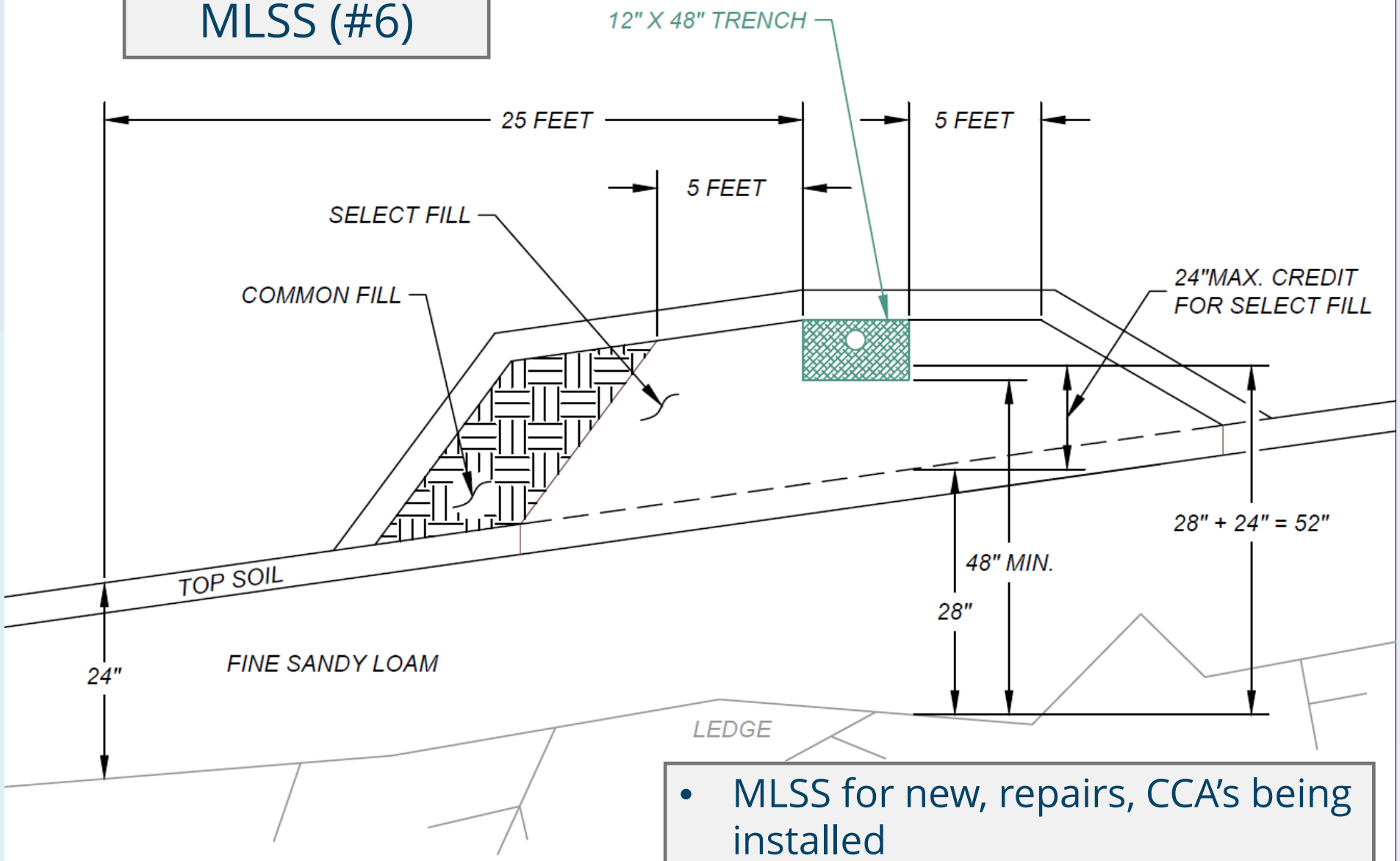
TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-6 TOPSOIL	0-6 TOPSOIL	0-8 TOPSOIL	0-8 TOPSOIL
6-28 RED BRN F.S. LOAM	6-28 RED BRN F.S. LOAM	8-24 RED BRN F.S. LOAM	8-24 RED BRN F.S. LOAM
LEDGE 28	LEDGE 28	LEDGE 24	LEDGE 24
REDOX N/O	REDOX N/O	REDOX N/O	REDOX N/O
GW N/O	GW N/O	GW N/O	GW N/O



MLSS (#6)

New systems, repairs, CCA systems being installed

MLSS (#6)

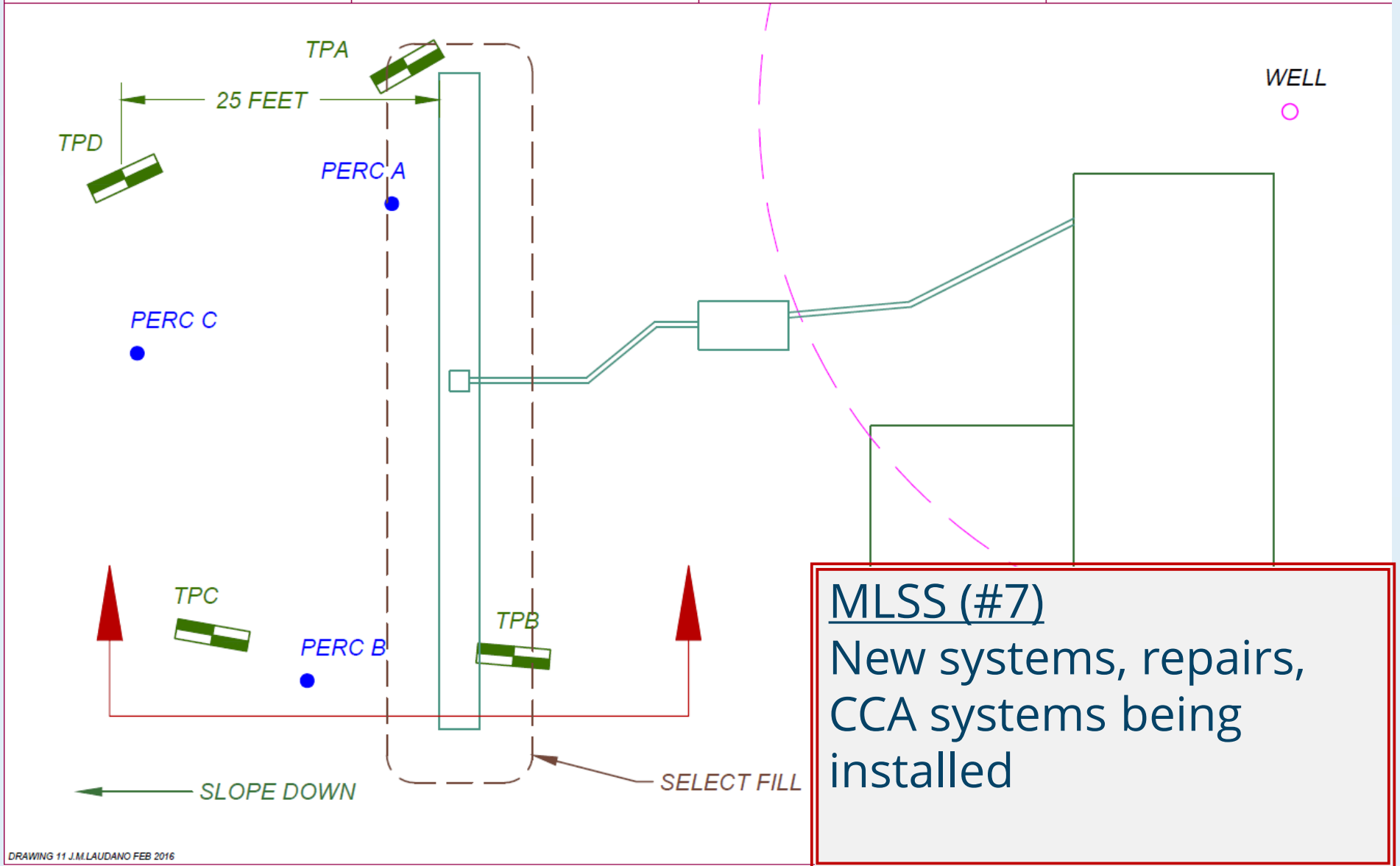


MLSS IS BASED ON RECEIVING SOIL DEPTH OF (52" + 24") / 2 = 38"

- MLSS for new, repairs, CCA's being installed
- Maximum of 24" additional credit can be given for select fill
- RS Depth = 38"

DRAWING 8A J.M.LAUDANO FEB 2016

TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-2 TOPSOIL	0-5 TOPSOIL	0-4 TOPSOIL	0-6 TOPSOIL
2-36 RED BRN HTM (FILL)	5-39 RED BRN HTM (FILL)	4-41 RED BRN HTM (FILL)	6-40 RED BRN HTM (FILL)
36-44 ORIG. TS	39-40 ORIG. TS	41-44 ORIG. TS	40-44 ORIG. TS
44-70 RED SANDY LOAM	40-73 RED SANDY LOAM	44-59 RED SANDY LOAM	44-58 RED SANDY LOAM
REDOX N/O	REDOX N/O	REDOX N/O	REDOX N/O
LEDGE 70	LEDGE 73	GW N/O	LEDGE 58



MLSS (#7)

New systems, repairs, CCA systems being installed

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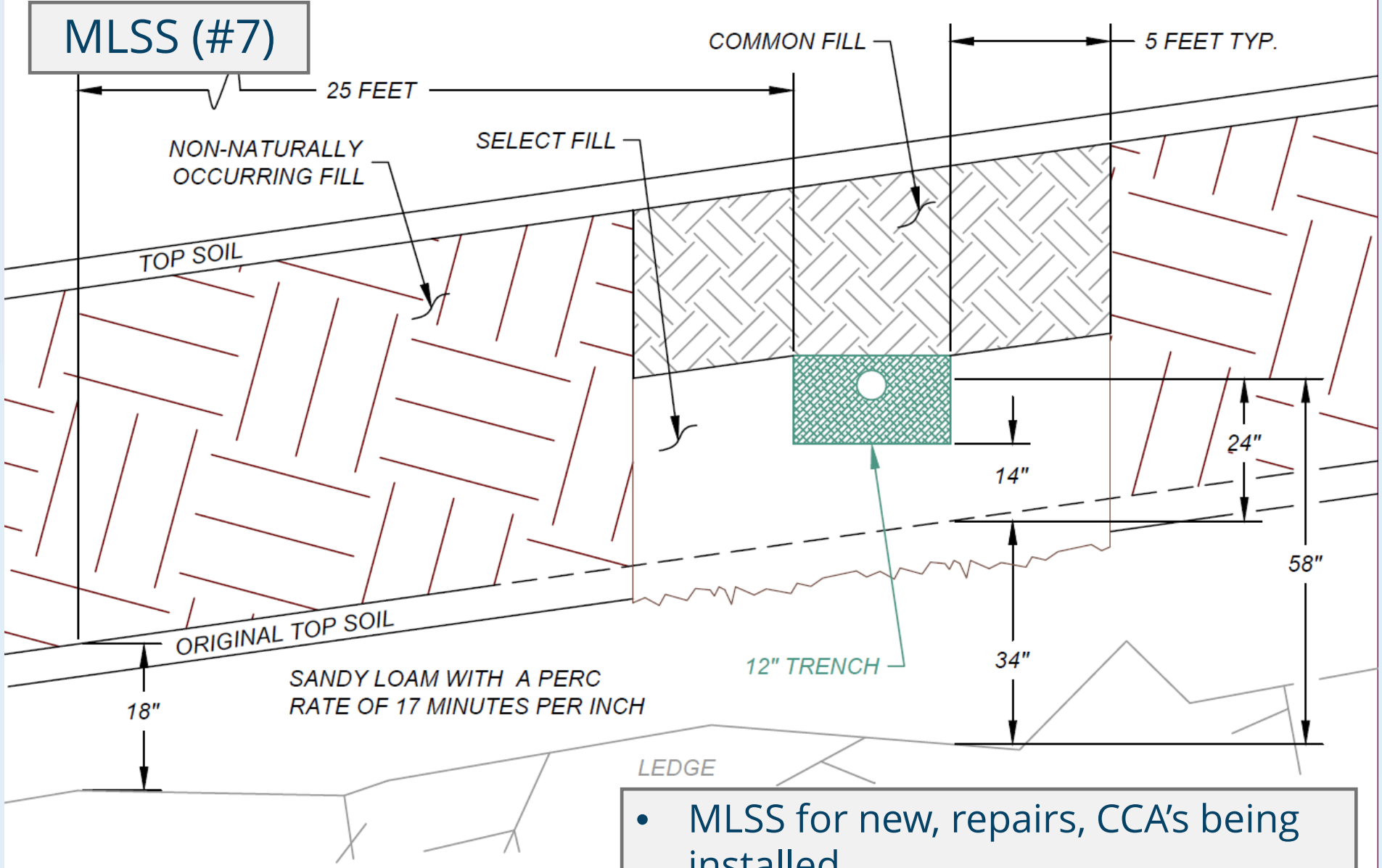
MLSS (#7)



MLSS IS BASED ON RECEIVING SOIL DEPTH OF (58" + 18") / 2 = 38"

DRAWING 11A J.M.LAUDANO FEB 2016

- MLSS for new, repairs, CCA's being installed
- Max of 24" additional credit can be given for select fill to top of system
- RS Depth = 38"

Category 3 NCR MLSS Examples

NCR MLSS

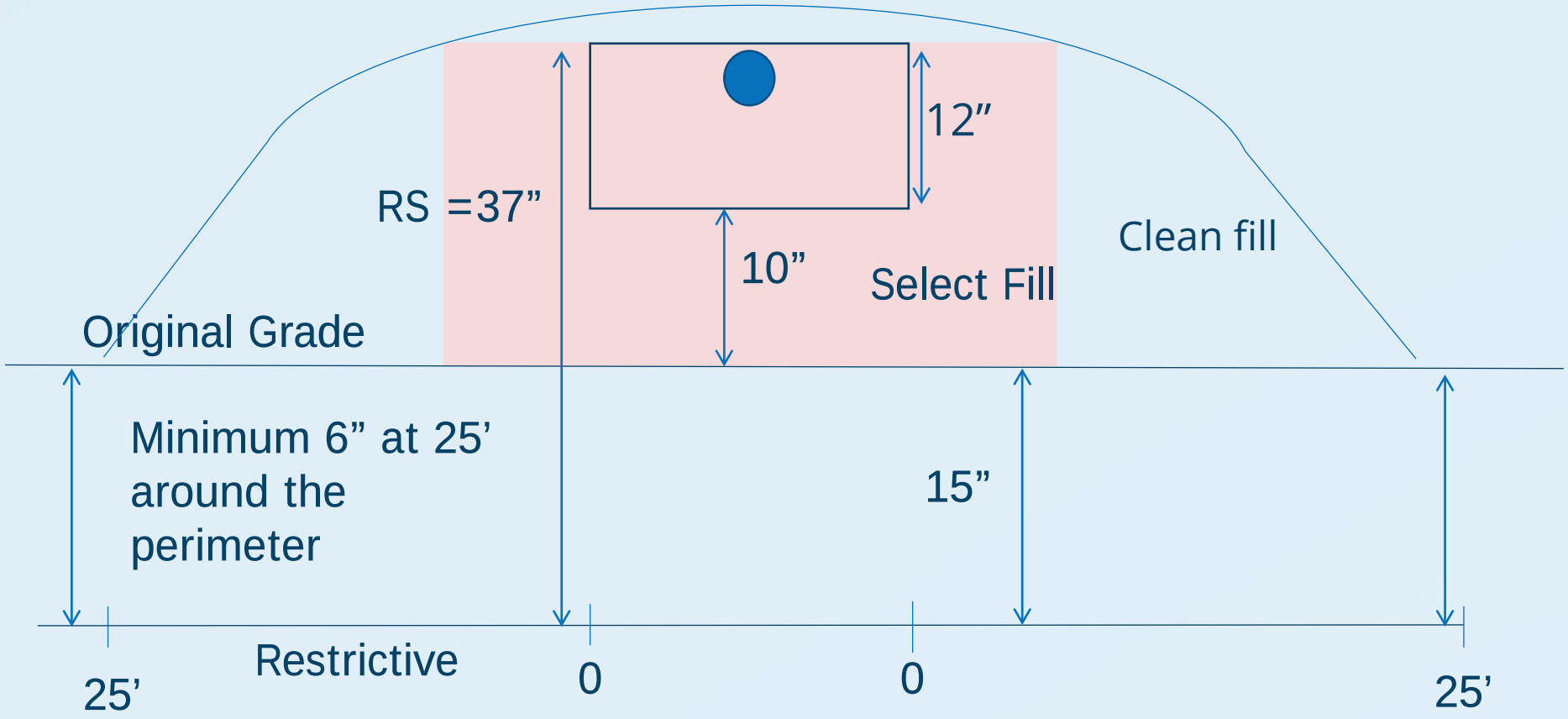
- Repairs and Potential Repair Areas that cannot provide the required MLSS require an assessment referred to as a Non-Compliant Repair (NCR) MLSS

- This requires an exception be granted by the local director of health (NCR MLSS discussed more in Phase 2)

NCR MLSS: Flat lots

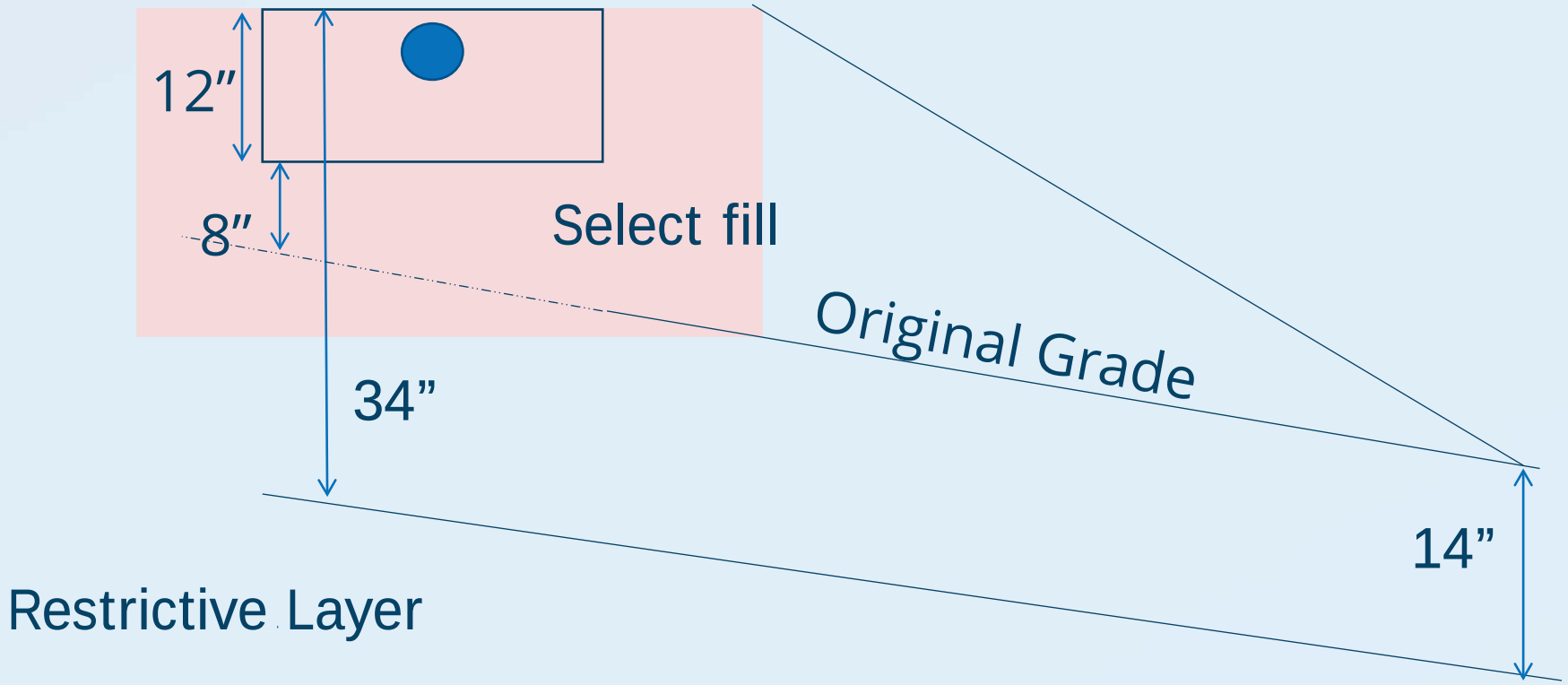
Average depth within the system area and 25’ around the perimeter.

RS depth $\frac{37+15}{2} = 26$



NCR MLSS: All other lots

Average depth of the receiving soil in the system area and within 25’ downgradient



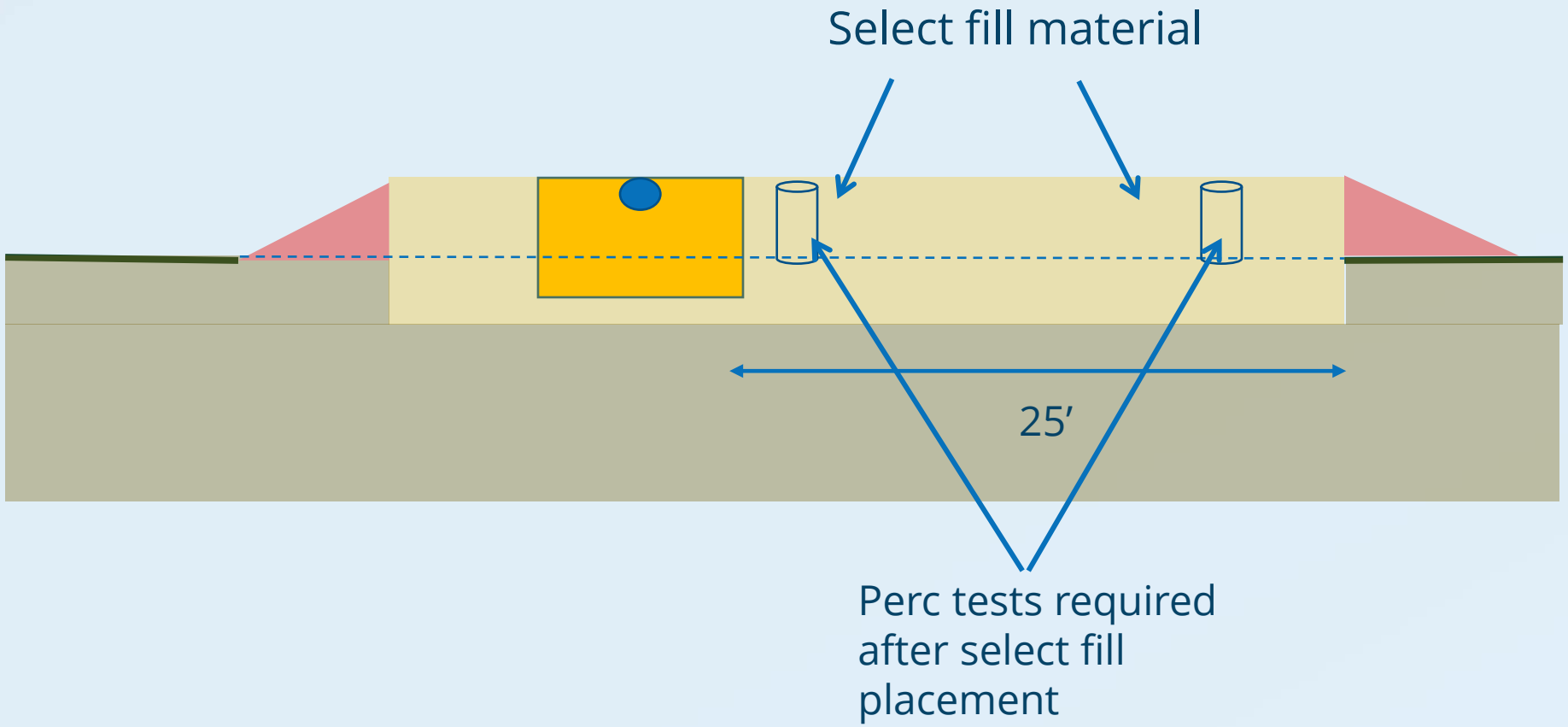
RS Depth = $\frac{34 + 14}{2}$ = 24”

Need Minimum 12” @ 25’

Category 3 :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
- Percolation rate of select fill can be used for NCR MLSS calculations when receiving soil is entirely select fill.
- Select fill used as receiving soil must be perc tested to confirm basis of design.

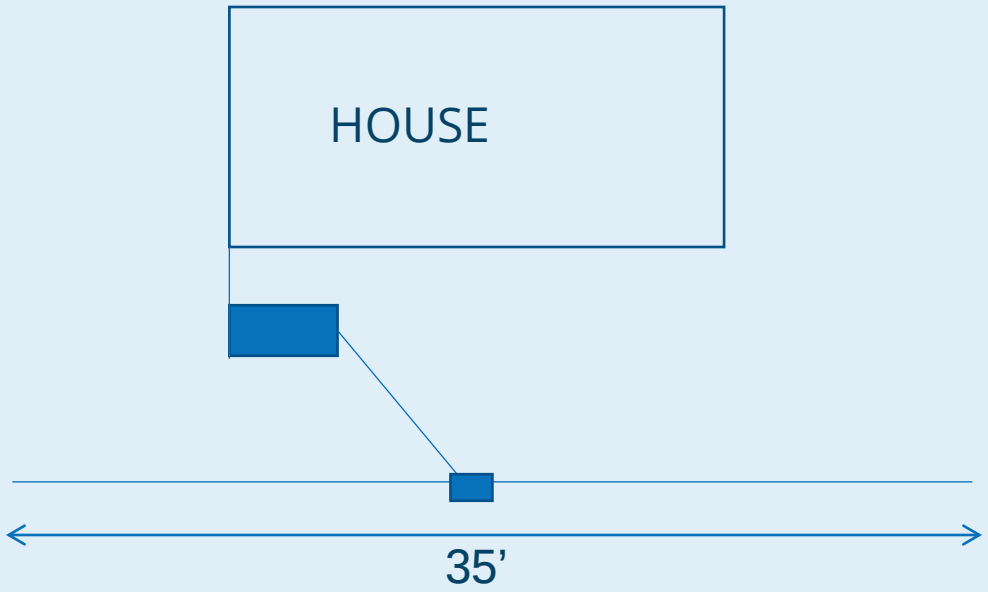
Select Fill as Receiving Soil



NCR MLSS

- The leaching system spread must be the maximum percent possible of the NCR MLSS based on RS depth of 18-22 inches or based on the depth of the existing receiving soil if greater.

NCR Maximizing Spread

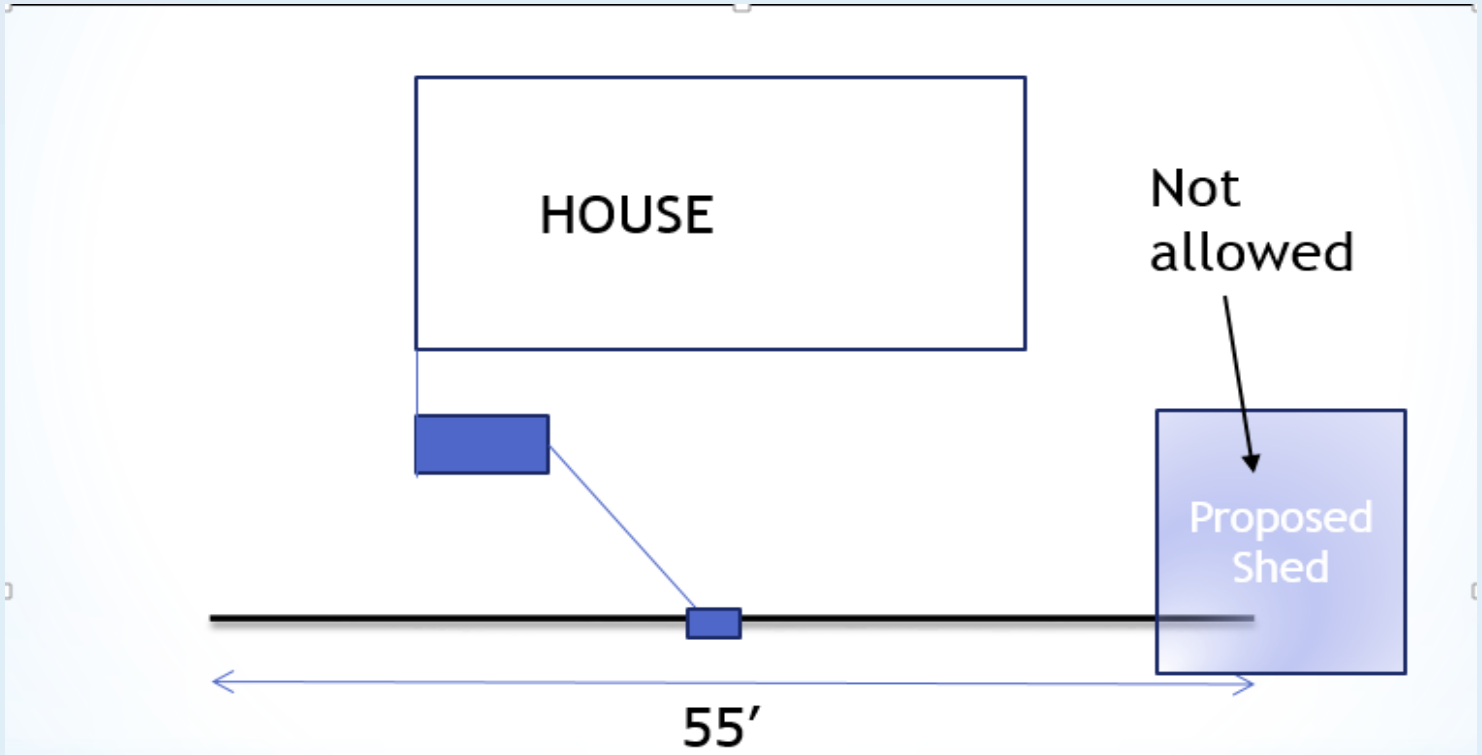


If NCR MLSS based on 18” = 55 feet, but only 35 feet can be installed on the property, then each row must be at least 35 feet in length.
Additional fill can be used to reduce NCR MLSS to no less than 35 feet.

NCR MLSS

- B100a NCR MLSS used for building additions, pools and accessory structurers.
- **Cannot reduce potential repair area!**

NCR MLSS Requirement



If NCR MLSS based on 18” = 55 feet, then each row must be at least 55 feet in length if it can be installed on the property. Additional fill cannot be used to reduce the NCR MLSS and to allow for shed!

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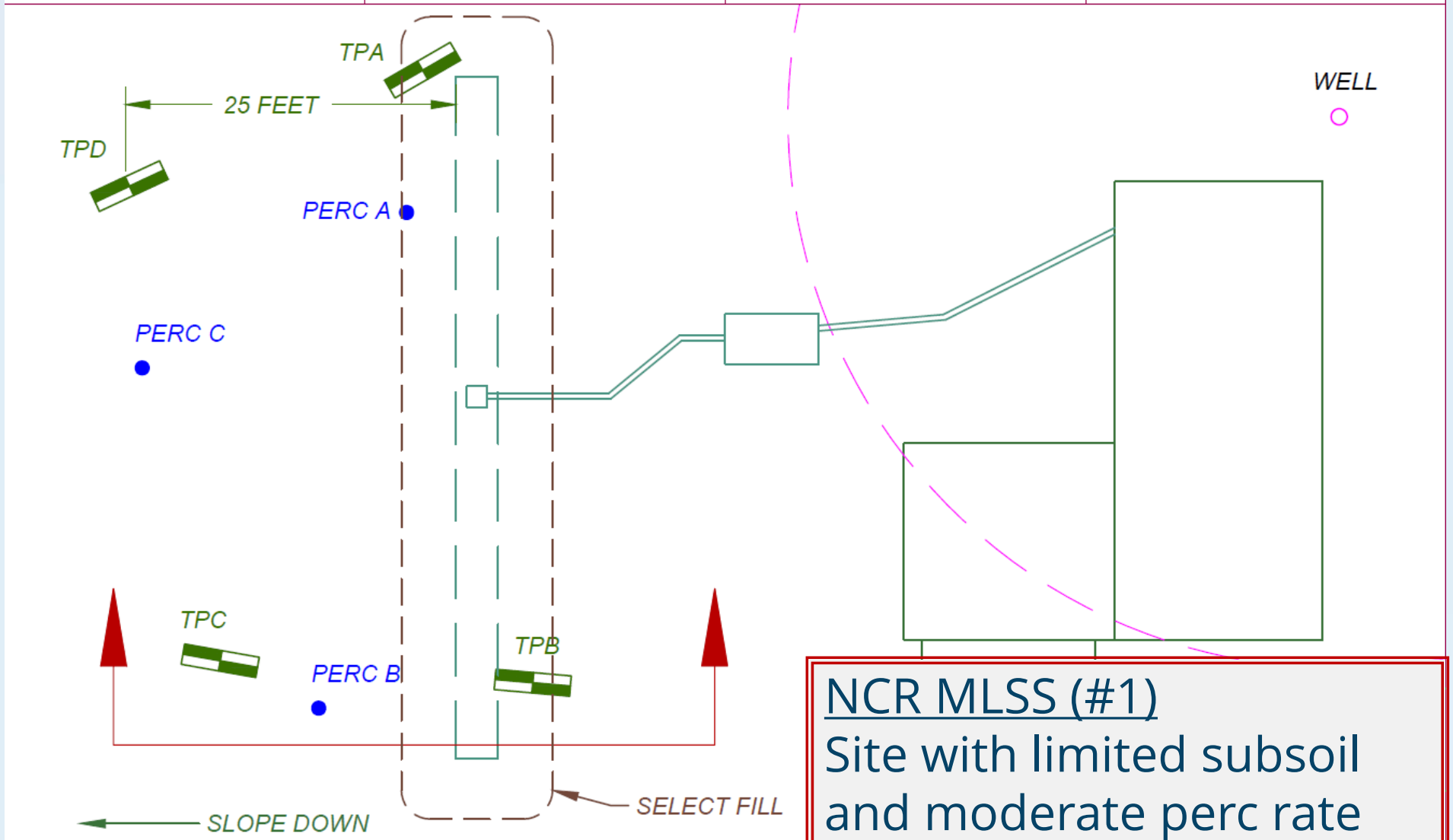
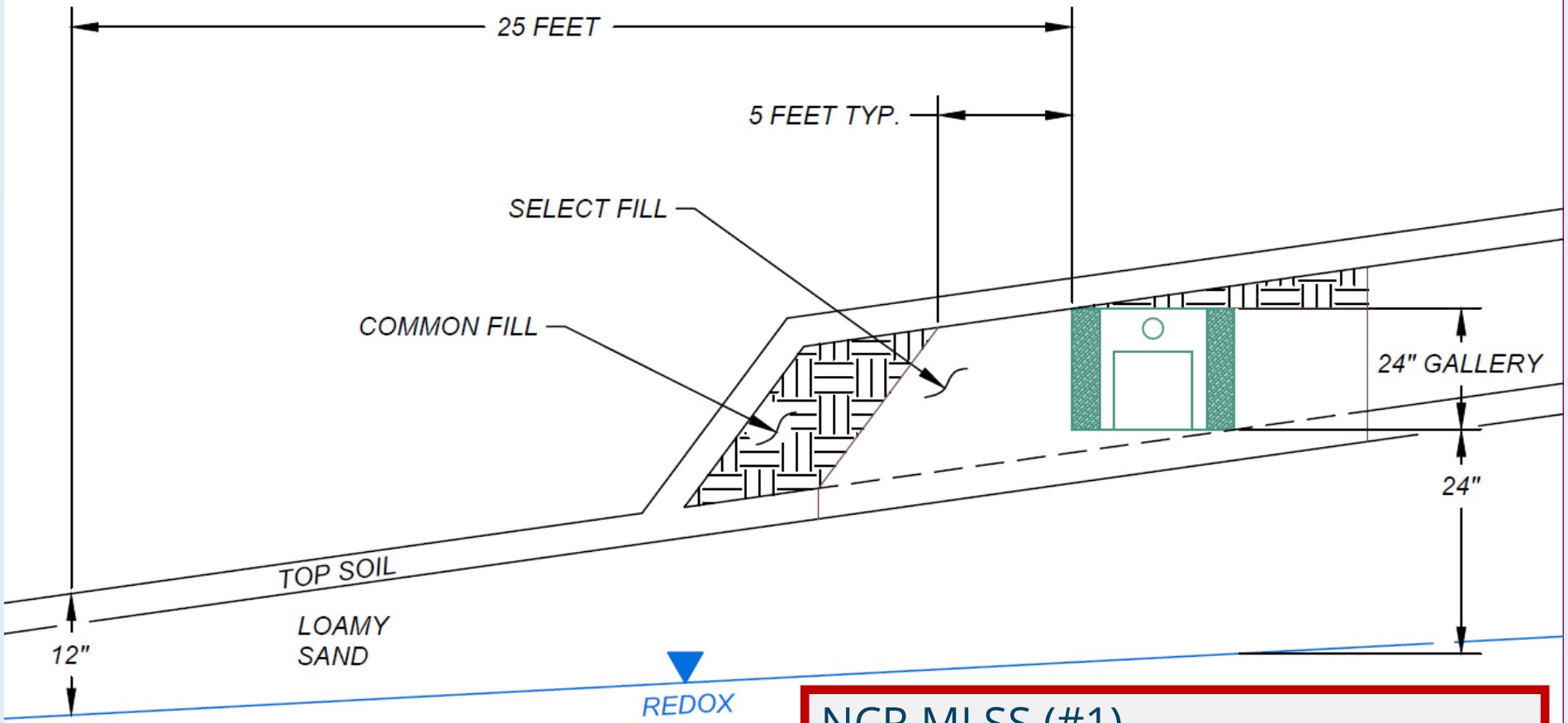
TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-10 TOPSOIL	0-10 TOPSOIL	0-10 TOPSOIL	0-6 TOPSOIL
10-24 BRN LOAMY SAND	10 -24 BRN LOAMY SAND	10-12 BRN LOAMY SAND	10-12 BRN LOAMY SAND
24-61 GRY SILT LOAM	24-65 GRY SILT LOAM	12-42 GRY SILT LOAM	12-45 GRY SILT LOAM
REDOX AT 24	REDOX AT 24	REDOX AT 12	REDOX AT 12



DRAWING 5 J.M.LAUDANO FEB 2016

NCR MLSS (#1)

Site with limited subsoil and moderate perc rate



MLSS IS BASED ON RECEIVING SOIL DEPTH OF

$$\frac{(48 + 12)}{2} = 30''$$

DRAWING 5A J.M.LAUDANO FEB 2016

NCR MLSS (#1)

- Increased soil available in leaching system area only.
- NCR MLSS designed on perc in natural soil.

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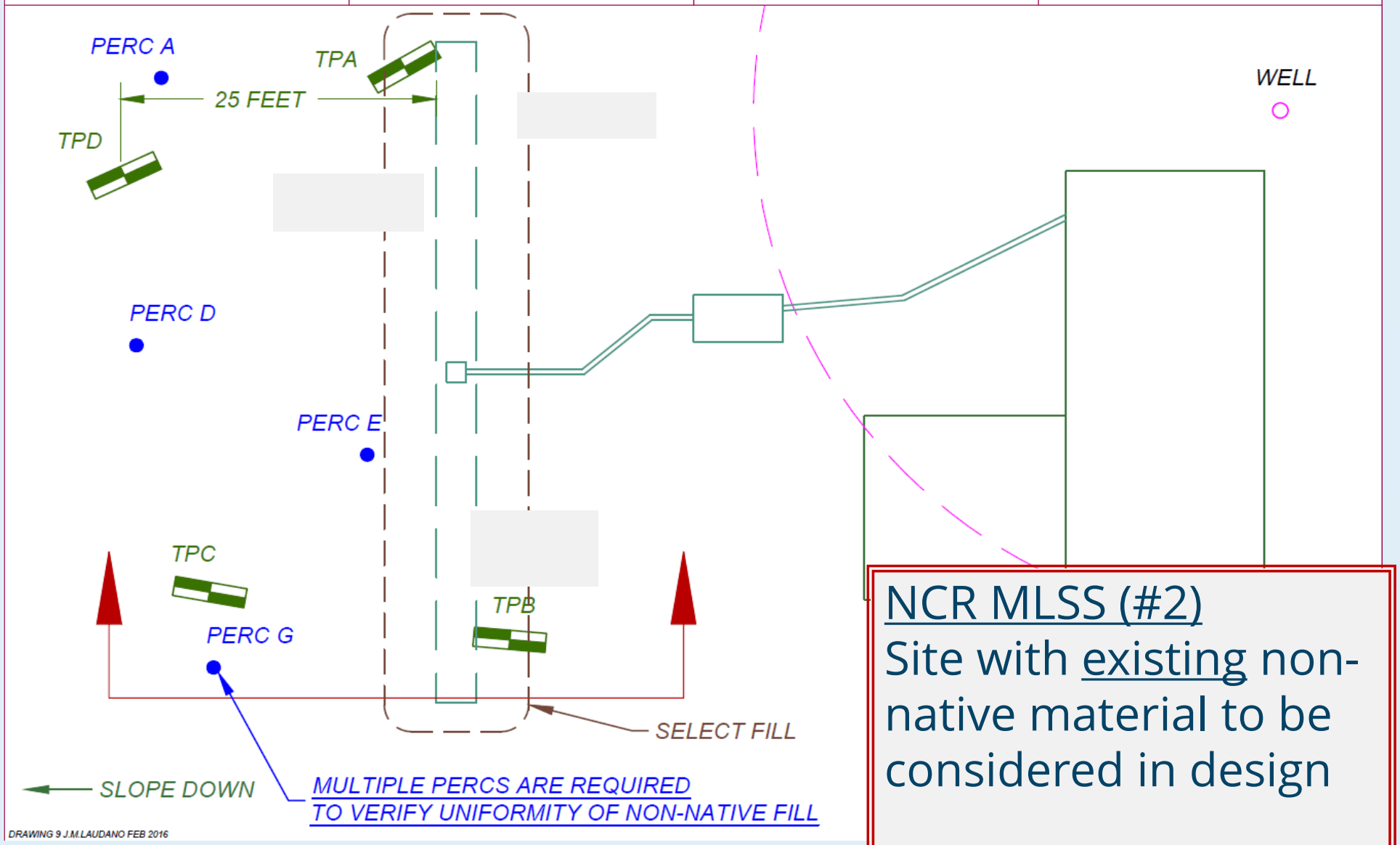
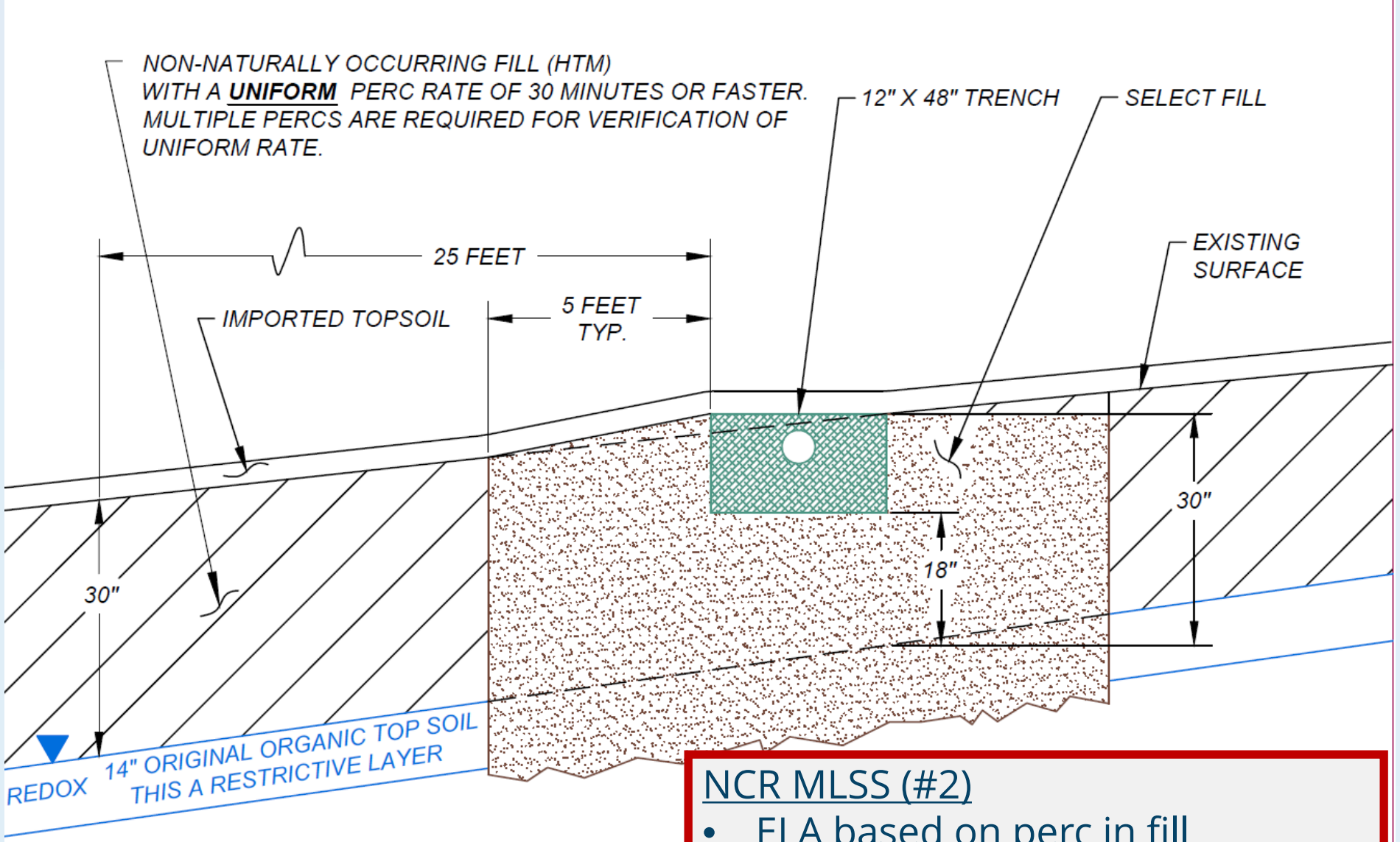
TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-30 MISC. NON-NATIVE FILL	0-30 MISC. NON-NATIVE FILL	0-30 MISC. NON-NATIVE FILL	0-30 MISC. NON-NATIVE FILL
30-42 ORIG. ORGANIC TS	30-42 ORIG. ORGANIC TS	30-44 ORIG. ORGANIC TS	30-44 ORIG. ORGANIC TS
42-76 SILT LOAM	42-76 SILT LOAM	44-76 SILT LOAM	44-76 SILT LOAM
REDOX 30	REDOX 30	REDOX 30	REDOX 30
GW 45	GW 45	GW 45	GW 45



NCR MLSS (#2)
Site with existing non-native material to be considered in design



NCR MLSS IS BASED ON RECEIVING SOIL
DEPTH OF (30" + 30") / 2 = 30"

DRAWING 9A J.M.LAUDANO FEB 2016

NCR MLSS (#2)

- ELA based on perc in fill
- NCR MLSS designed on perc in non-native material (must be faster than 30 m/i).

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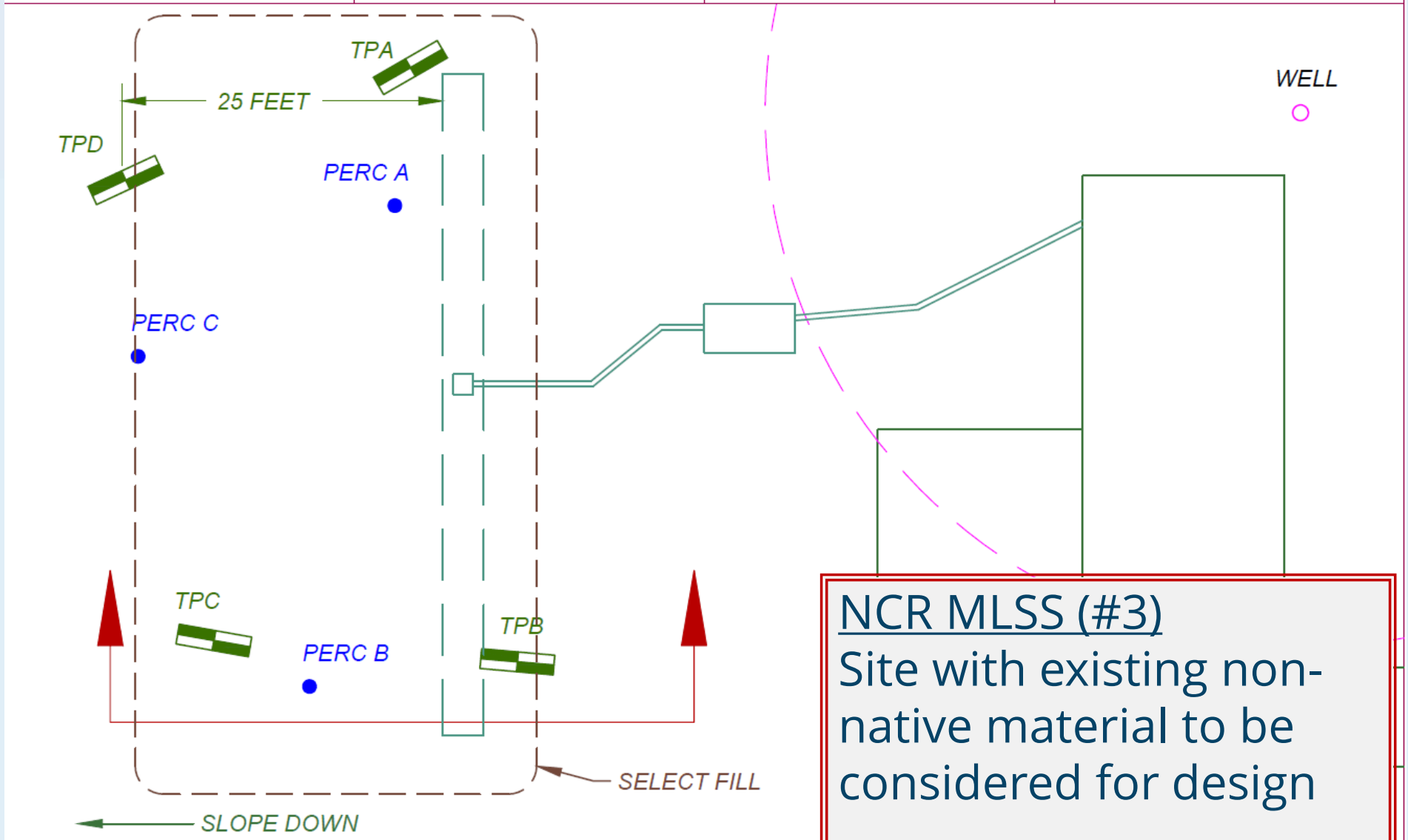
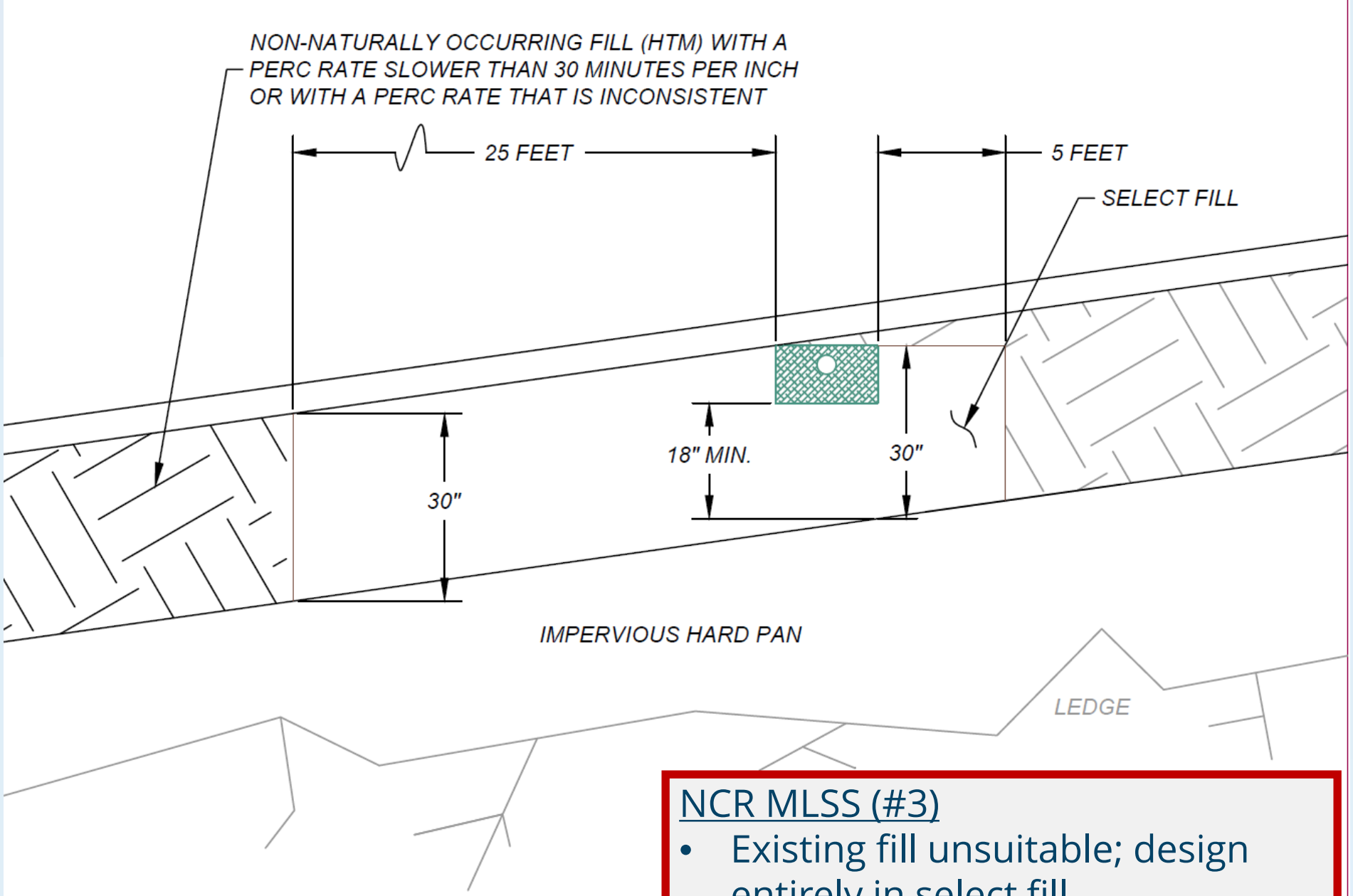
TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-6 TOPSOIL	0-6TOPSOIL	0-5 TOPSOIL	0-6 TOPSOIL
6-36 RED BRN HTM (FILL)	6-36 RED BRN HTM (FILL)	5-36 RED BRN HTM (FILL)	6-36 RED BRN HTM (FILL)
36-70 BRN HARD PAN	36-67 BRN HARD PAN	36-69 BRN HARD PAN	36-66 BRN HARD PAN
REDOX 36	REDOX 36	REDOX 36	REDOX 36
LEDGE 70	LEDGE 67	LEDGE 69	LEDGE 66



DRAWING 10 J.M.LAUDANO FEB 2016

NCR MLSS (#3)
Site with existing non-native material to be considered for design



NCR MLSS IS BASED ON RECEIVING SOIL DEPTH OF (30" + 30") / 2 = 30"

DRAWING 10A J.M.LAUDANO FEB 2016

NCR MLSS (#3)

- Existing fill unsuitable; design entirely in select fill
- ELA and NCR MLSS designed on perc in select fill material

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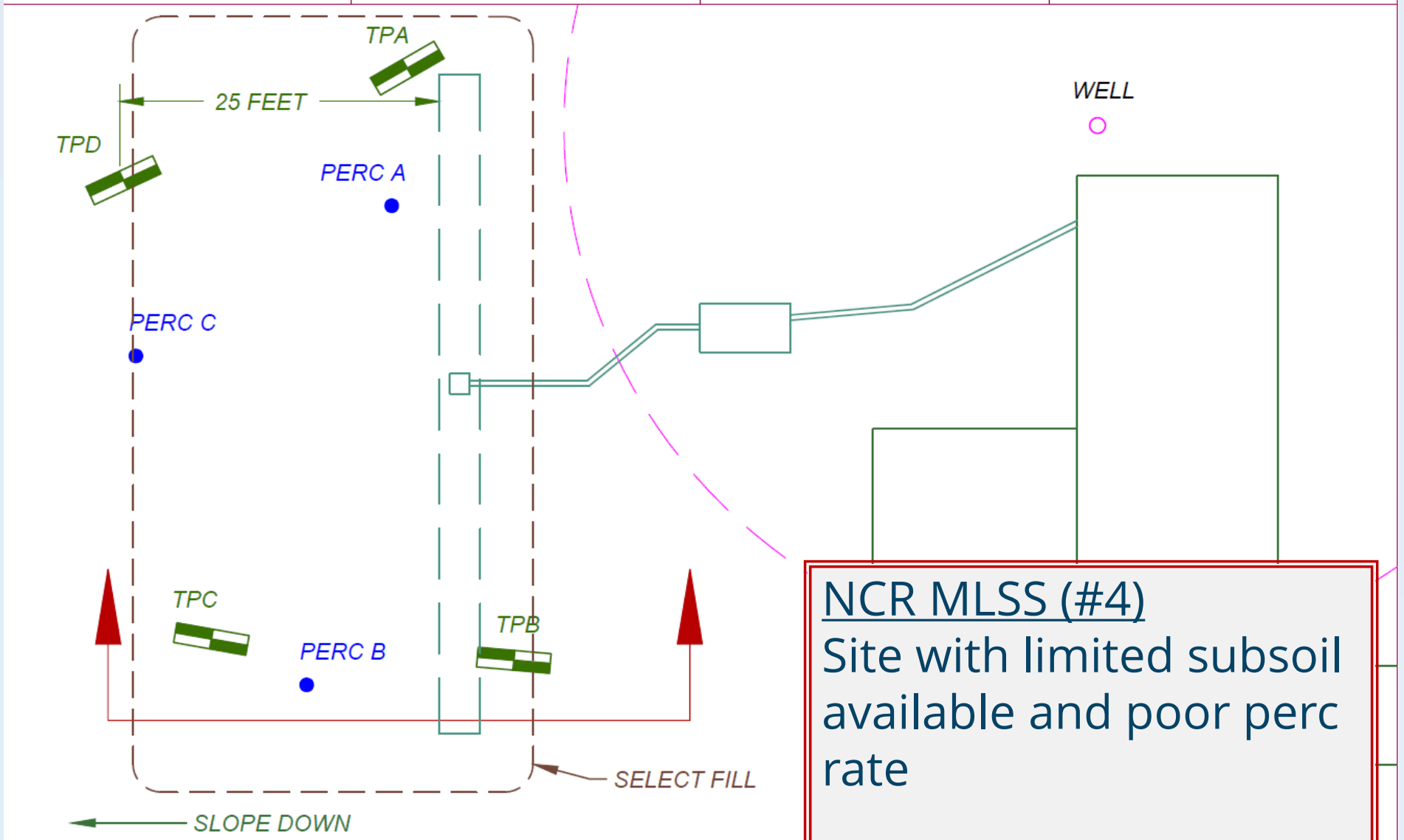
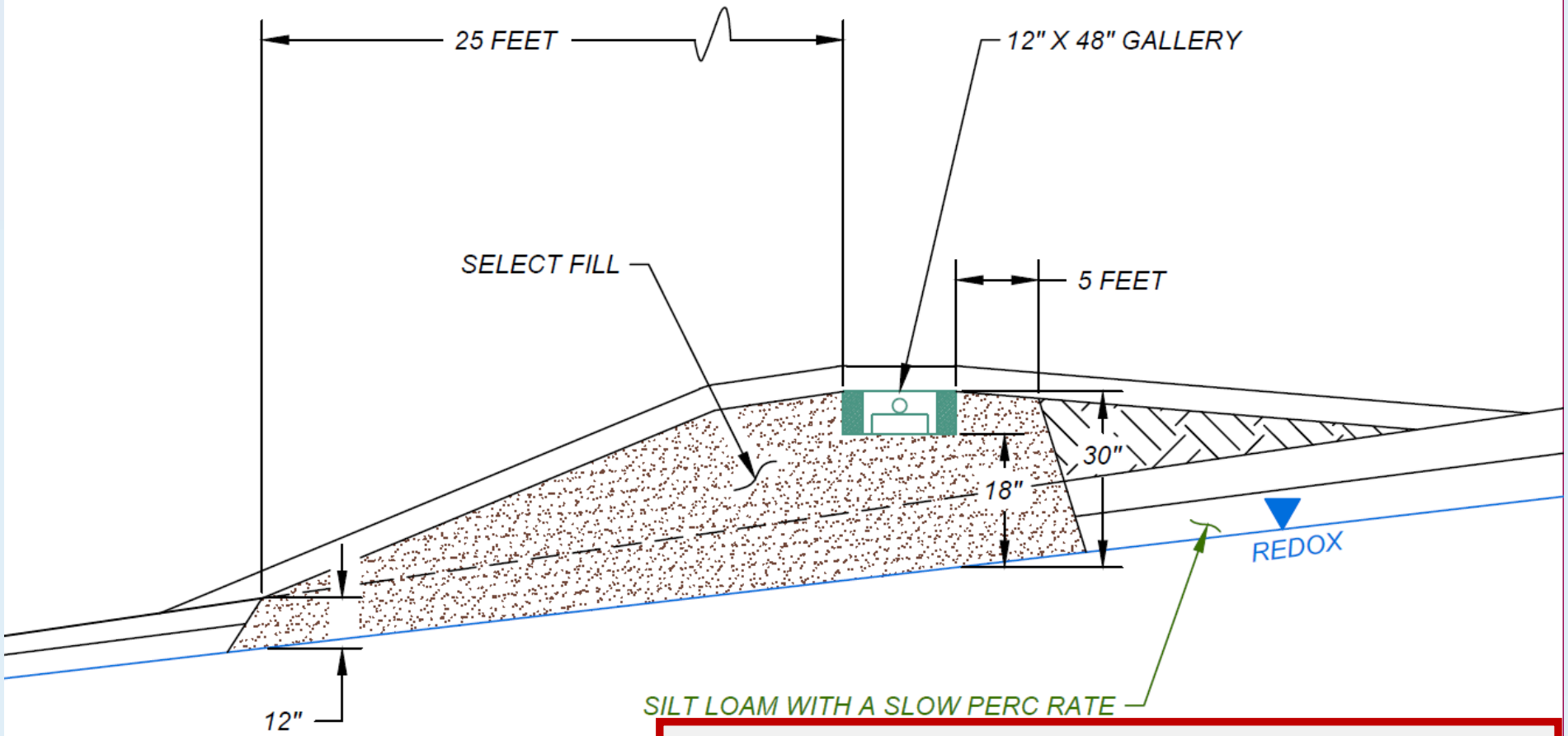
TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-6 TOPSOIL	0-6 TOPSOIL	0-6 TOPSOIL	0-6 TOPSOIL
6-12 SILT LOAM	6-12 SILT LOAM	6-12 SILT LOAM	6-12 SILT LOAM
12-48 V. DENSE SILT LOAM	12-48 V. DENSE SILT LOAM	12-48 V. DENSE SILT LOAM	12-48 V. DENSE SILT LOAM
LEDGE N/O	LEDGE N/O	LEDGE N/O	LEDGE N/O
REDOX 12	REDOX 12	REDOX 12	REDOX 12
GW 28	GW 28	GW 18	GW 18



DRAWING 12 J.M.LAUDANO FEB 2016

NCR MLSS (#4)

Site with limited subsoil available and poor perc rate



NCR MLSS IS BASED ON RECEIVING SOIL DEPTH OF (30" + 12") / 2 = 21"

DRAWING 12A J.M.LAUDANO FEB 2016

NCR MLSS (#4)

- Select fill material may be used for entire system design
- Keep system 18” above redox
- ELA and NCR MLSS sized on perc in fill

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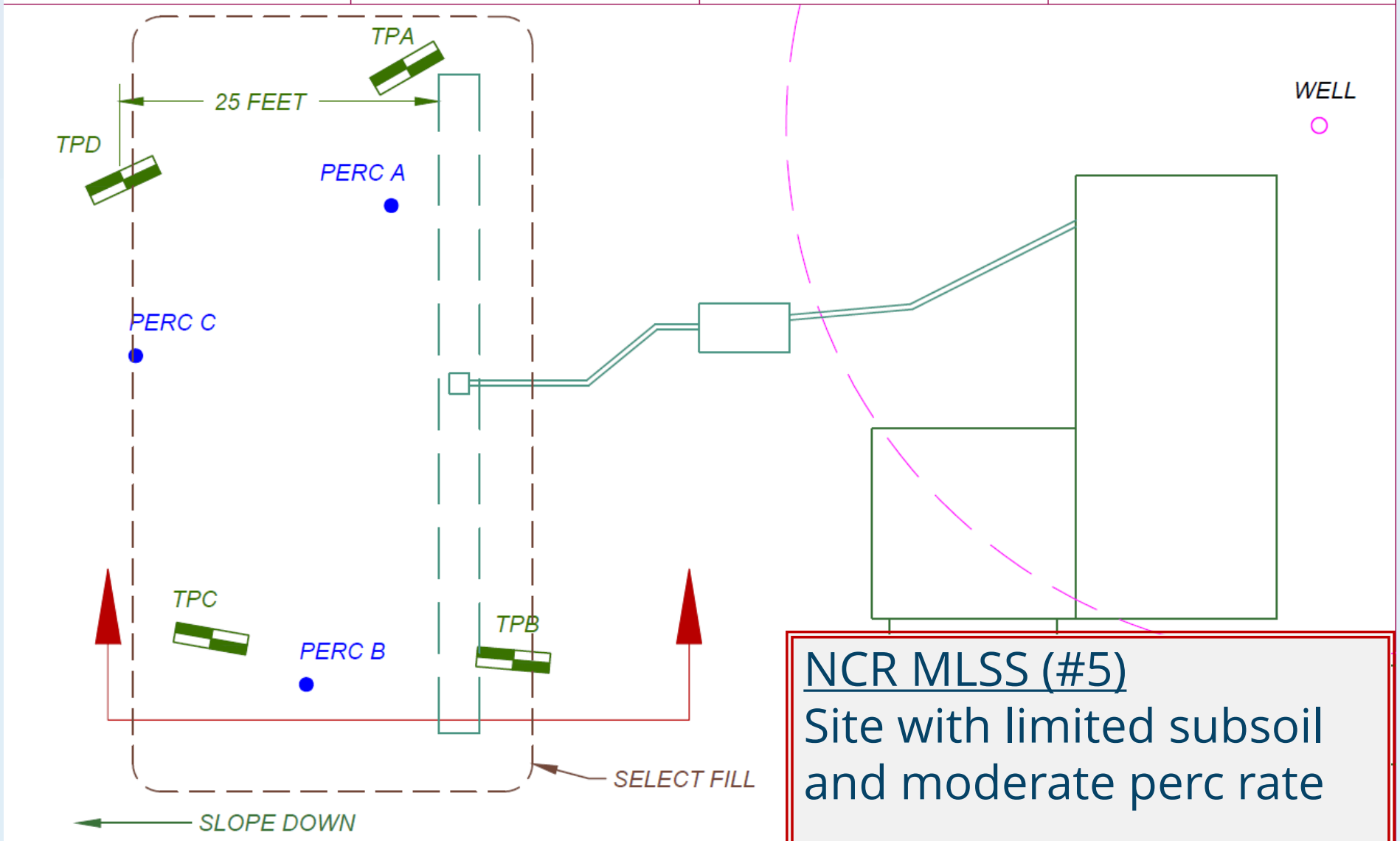
TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-2 TOPSOIL	0-2 TOPSOIL	0-2 TOPSOIL	0-2 TOPSOIL
2-12 ORN BRN SILT LOAM	2-12 ORN BRN SILT LOAM	2-12 ORN BRN SILT LOAM	2-12 ORN BRN SILT LOAM
12-48 V. DENSE SILT LOAM	12-48 V. DENSE SILT LOAM	12-48 V. DENSE SILT LOAM	12-48 V. DENSE SILT LOAM
REDOX 12	REDOX 12	REDOX 12	REDOX 12



NCR MLSS (#5)

Site with limited subsoil and moderate perc rate

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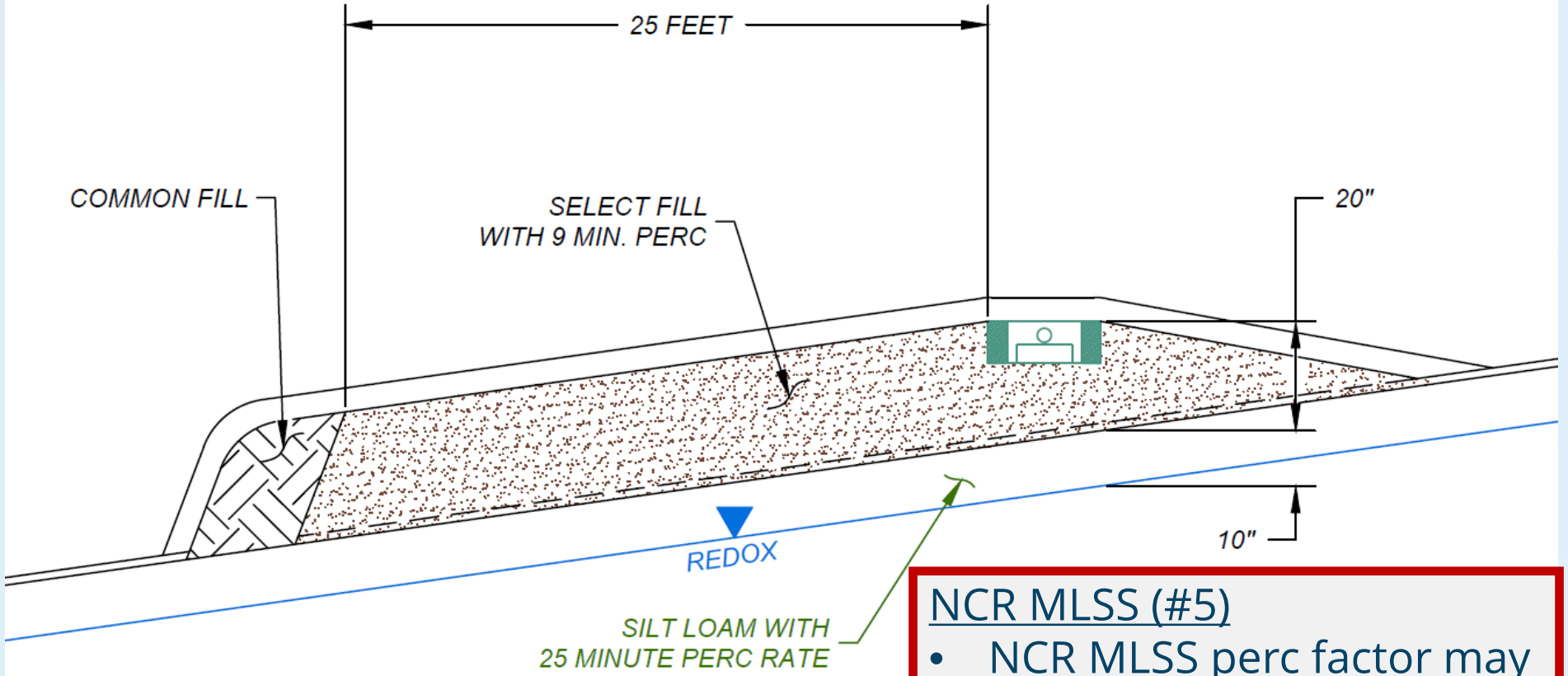
PROPORTIONATE PERC RATE CALCULATION:

PERC FACTOR (PF) = (20/30) x 1.2 + (10/30) x 2.0 = .80 + .67 = 1.47



MLSS IS BASED ON RECEIVING SOIL DEPTH OF
(30" +30") / 2 = 30"

DRAWING 13A J.M.LAUDANO FEB 2016

NCR MLSS (#5)

- NCR MLSS perc factor may be averaged on ratio of select fill and natural soil
- ELA sized on select fill perc

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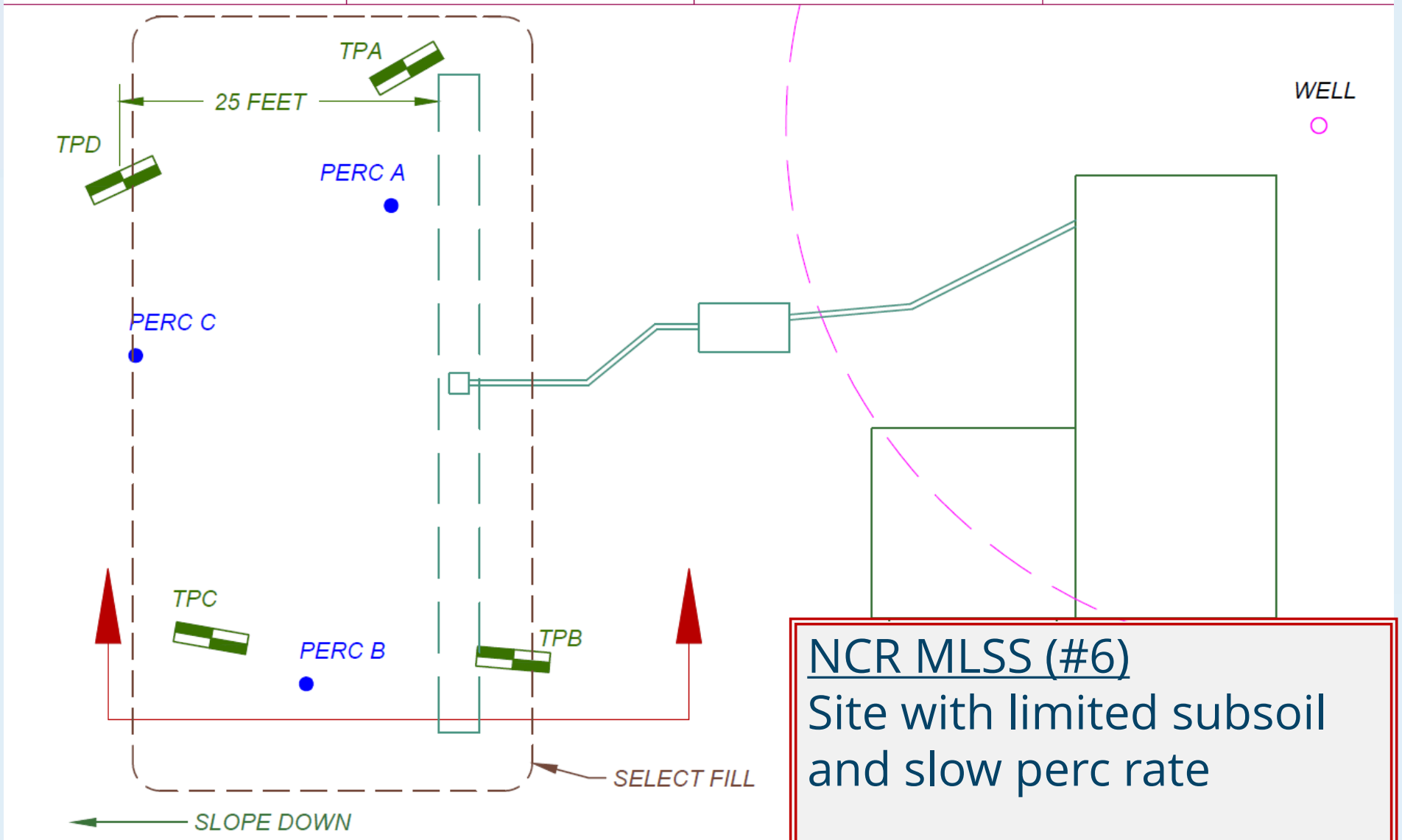
TEST PIT A	TEST PIT B	TEST PIT C	TEST PIT D
0-2 TOPSOIL	0-2 TOPSOIL	0-2 TOPSOIL	0-2 TOPSOIL
2-22 ORN BRN SILT LOAM	2-22 ORN BRN SILT LOAM	2-22 ORN BRN SILT LOAM	2-22 ORN BRN SILT LOAM
22-48 V. DENSE SILT LOAM	22-48 V. DENSE SILT LOAM	22-48 V. DENSE SILT LOAM	22-48 V. DENSE SILT LOAM
REDOX 22	REDOX 22	REDOX 22	REDOX 22



DRAWING 14 J.M.LAUDANO FEB 2016

NCR MLSS (#6)
Site with limited subsoil and slow perc rate

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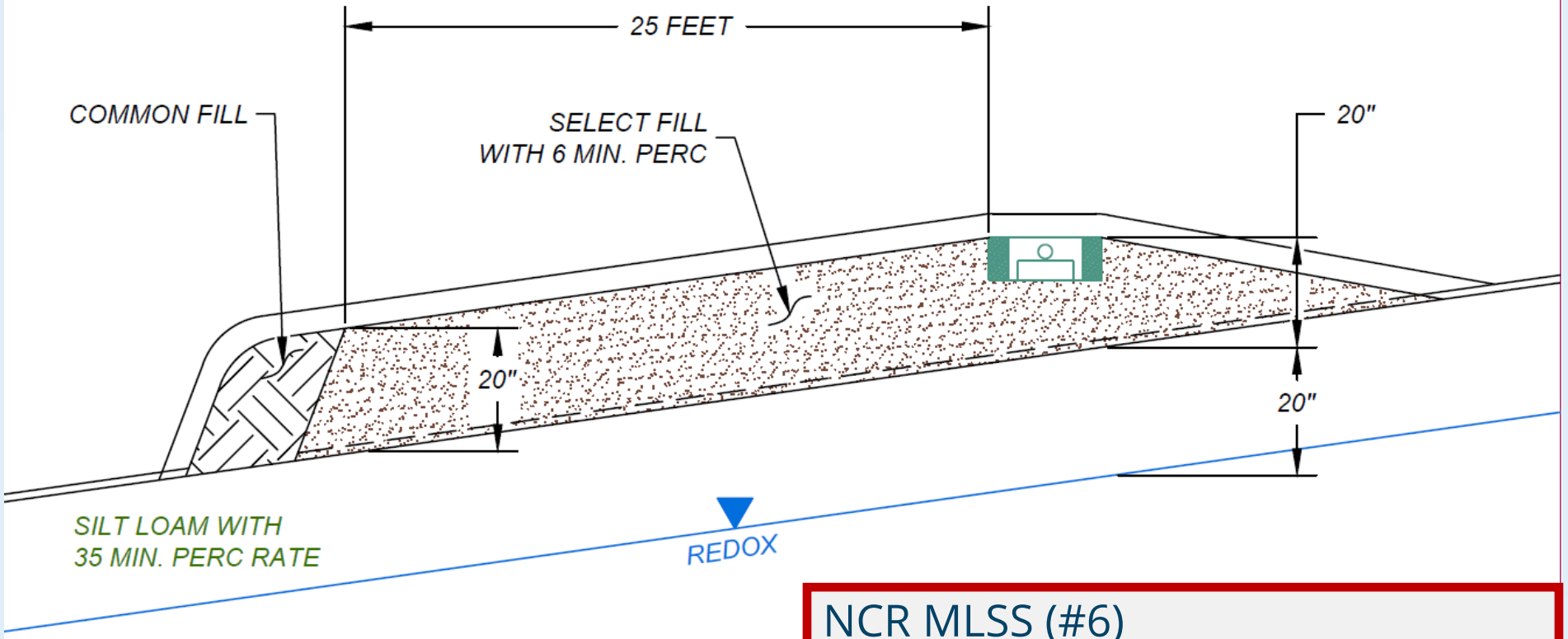
PROPORTIONATE PERC RATE CALCULATION:

PERC FACTOR (PF) = (20/40) x 1.2 + (20/40) x 3.0 = .60 + 1.50 = 2.10



MLSS IS BASED ON RECEIVING SOIL DEPTH OF
(40 + 40) / 2 = 40"

NCR MLSS (#6)

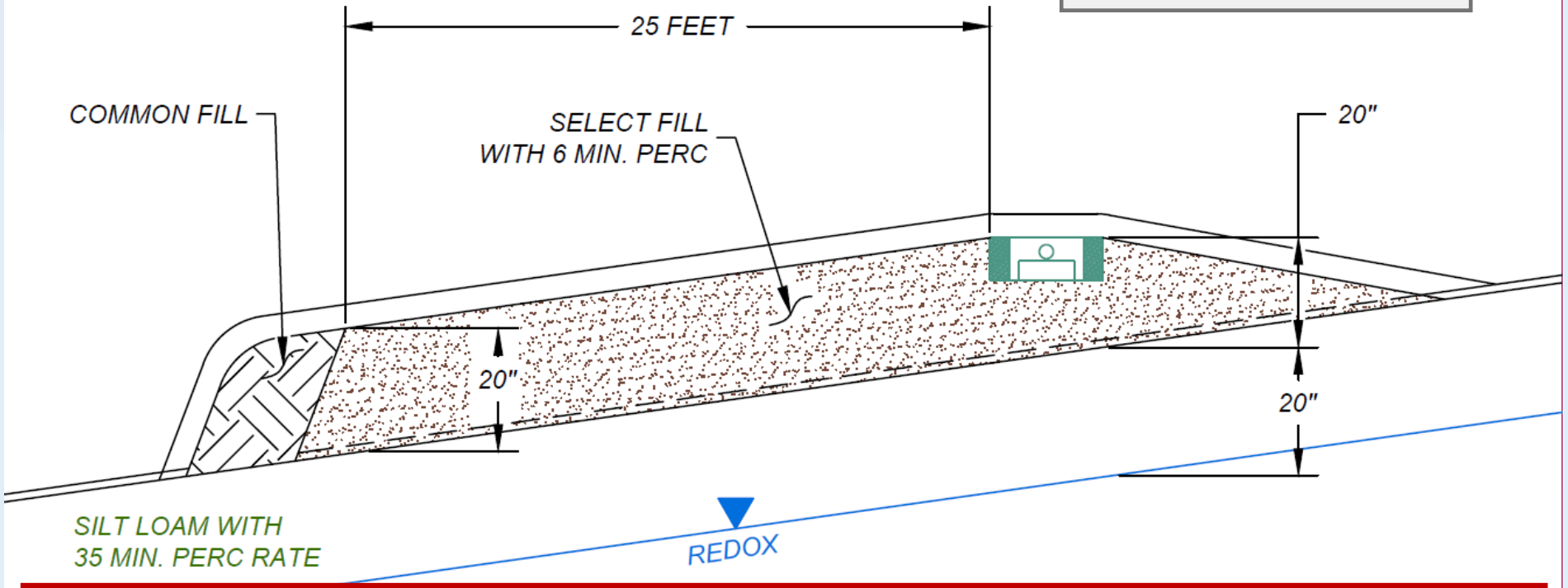
- NCR MLSS perc factor may be averaged on ratio of select fill and natural soil
- ELA sized on select fill perc

DRAWING 14A J.M.LAUDANO FEB 2016

NCR MLSS (#6) cont'd

PROPORTIONATE PERC RATE CALCULATION:

PERC FACTOR (PF) = (20/40) x 1.2 + (20/40) x 3.0 = .60 + 1.50 = 2.10



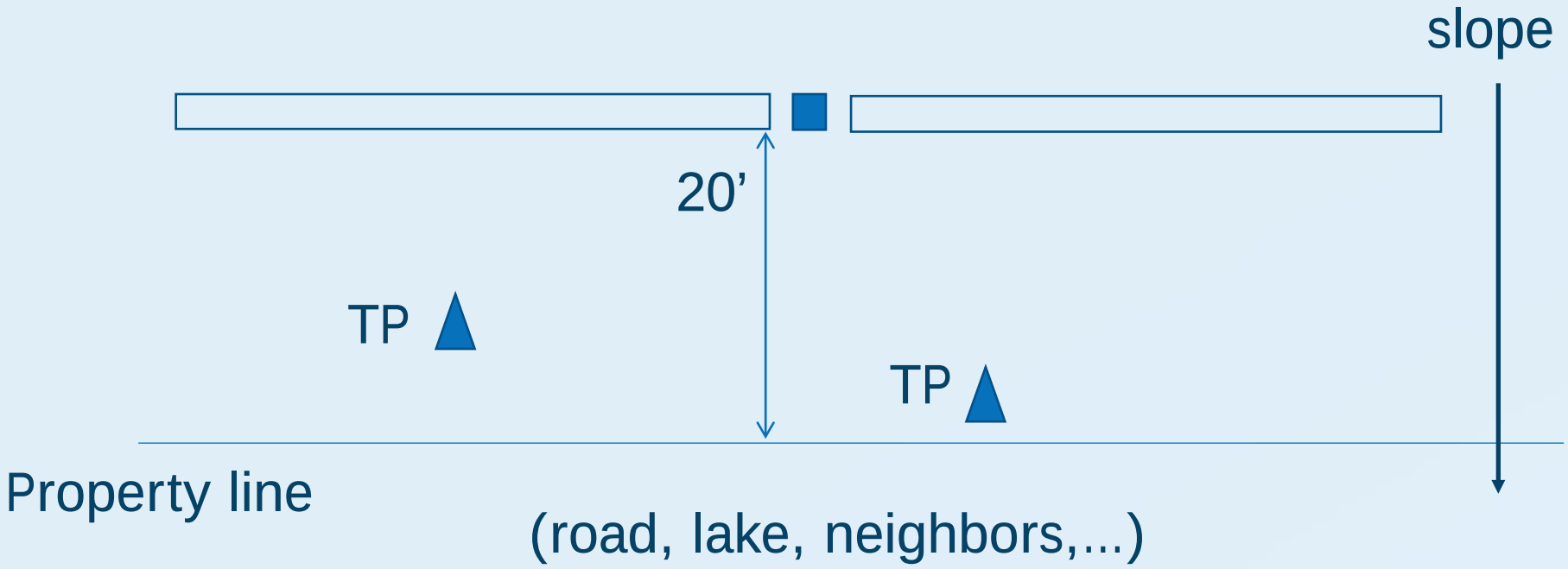
It may be beneficial to size NCR MLSS on perc rate and depth of select fill only.

NCR MLSS (assuming 3 BR, slope 8%)

1. Natural soil only. HFxFFxPF = 34 x 1.5 x 3 = 153'
2. Natural and select fill. HFxFFxPF = 24 x 1.5 x 2.1 = 76'
3. Select fill only. HFxFFxPF = 34 x 1.5 x 1.2 = 62' ←Shortest spread!!

NCR MLSS: Sites with less than 25’ to Downgradient to Property Line

- NCR MLSS is an exception
- Do the best you can and use professional judgment. Exceptions may be needed to the downgradient property line.



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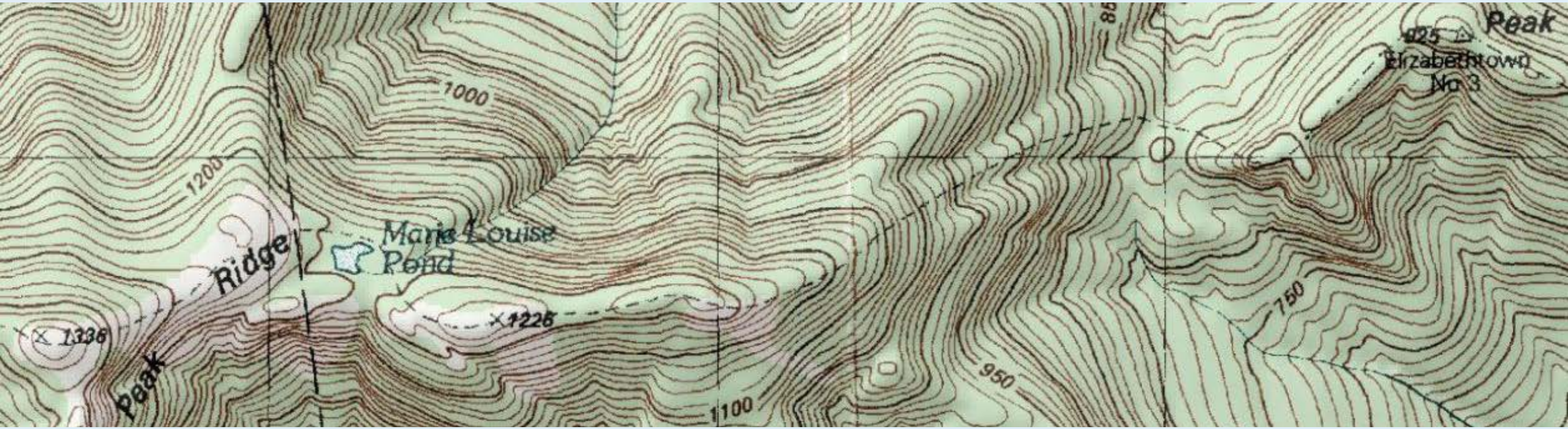
Slope Review

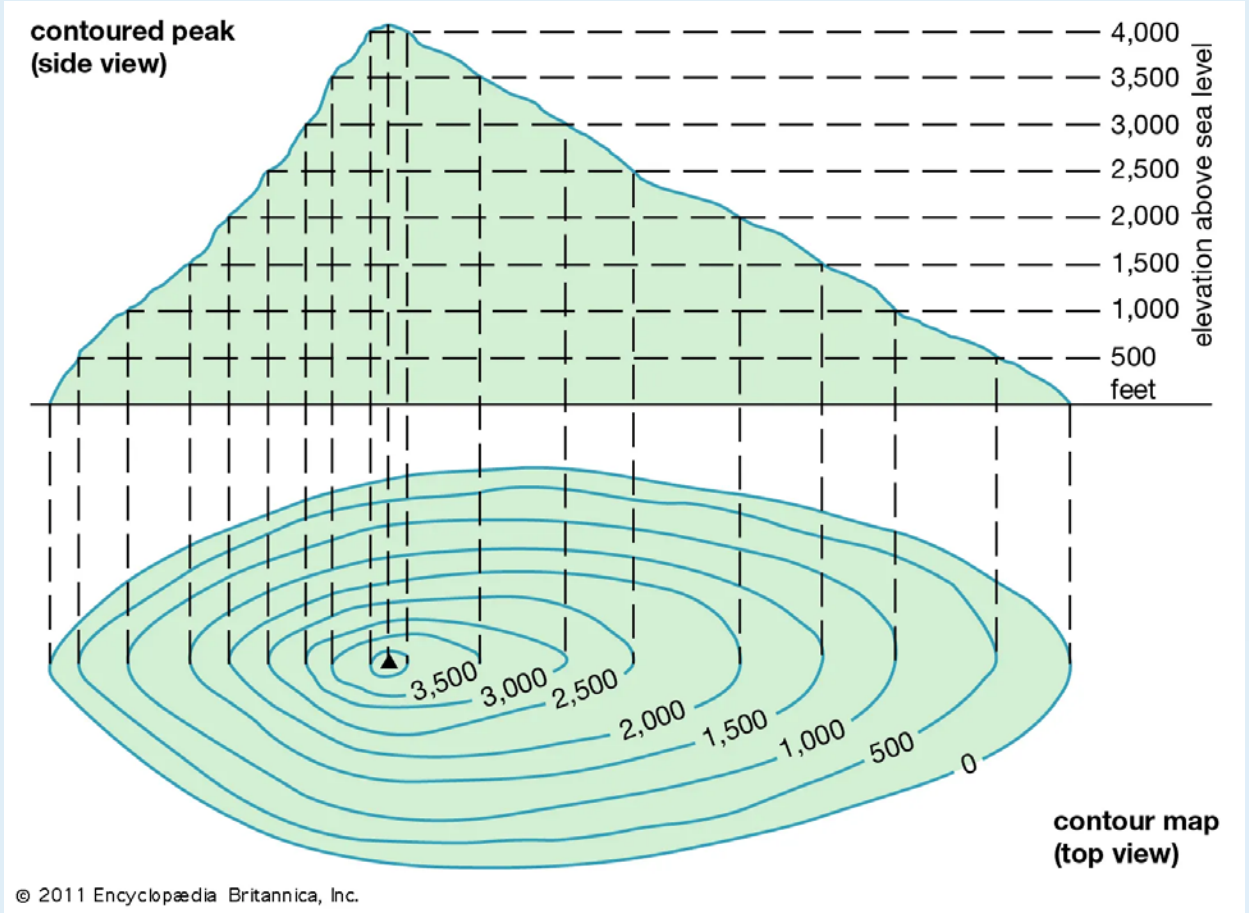
Topographic Map

- Uses elevation contour lines to show the 3-dimensional shape of the Earth's surface on a 2-dimensional map



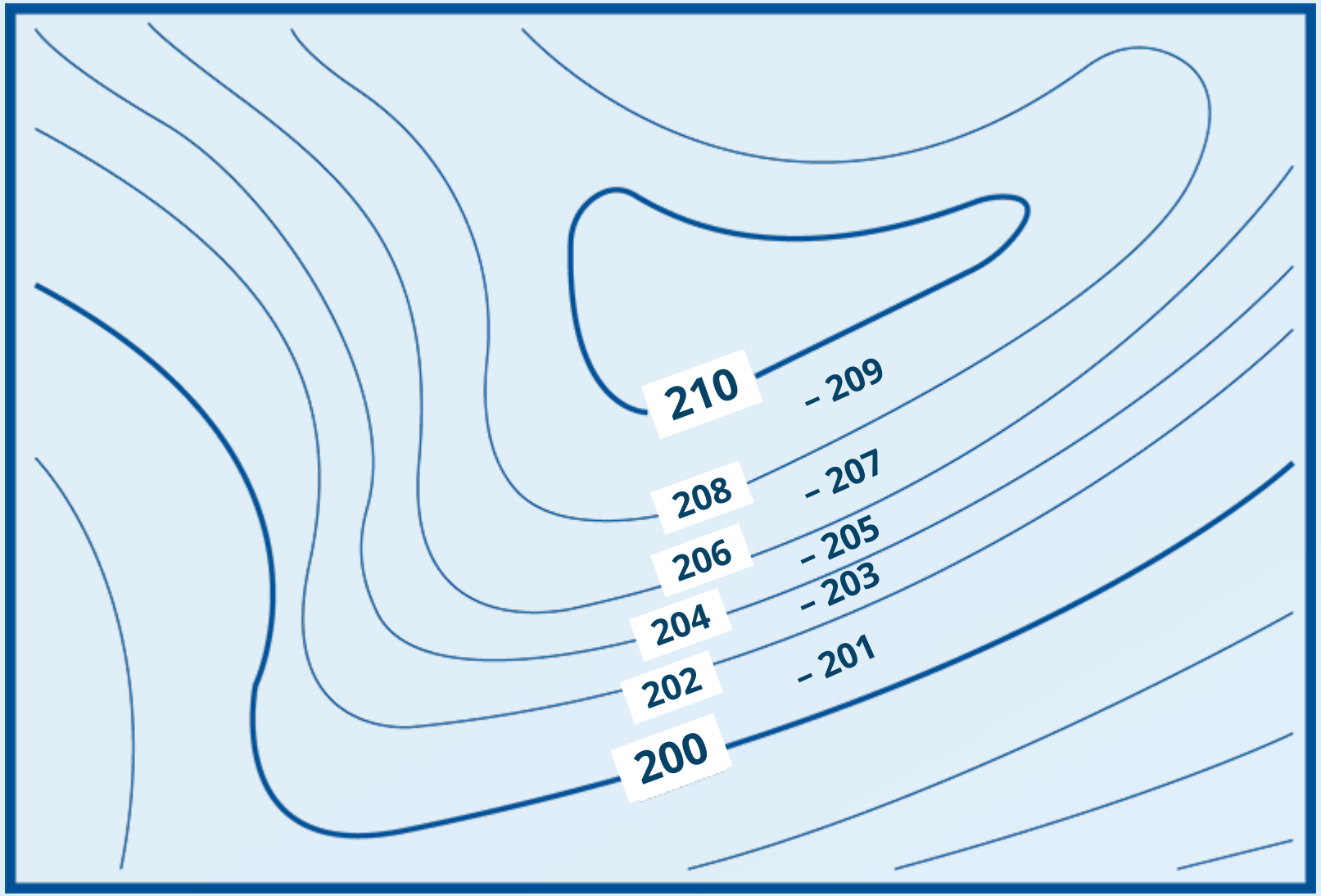
Elevation Contour Lines

- Lines connecting points of the *same* elevation on the surface of the land in relation a reference point (mean sea level or a benchmark)



Rise

- Not every line is labeled
- You may have to extrapolate between lines

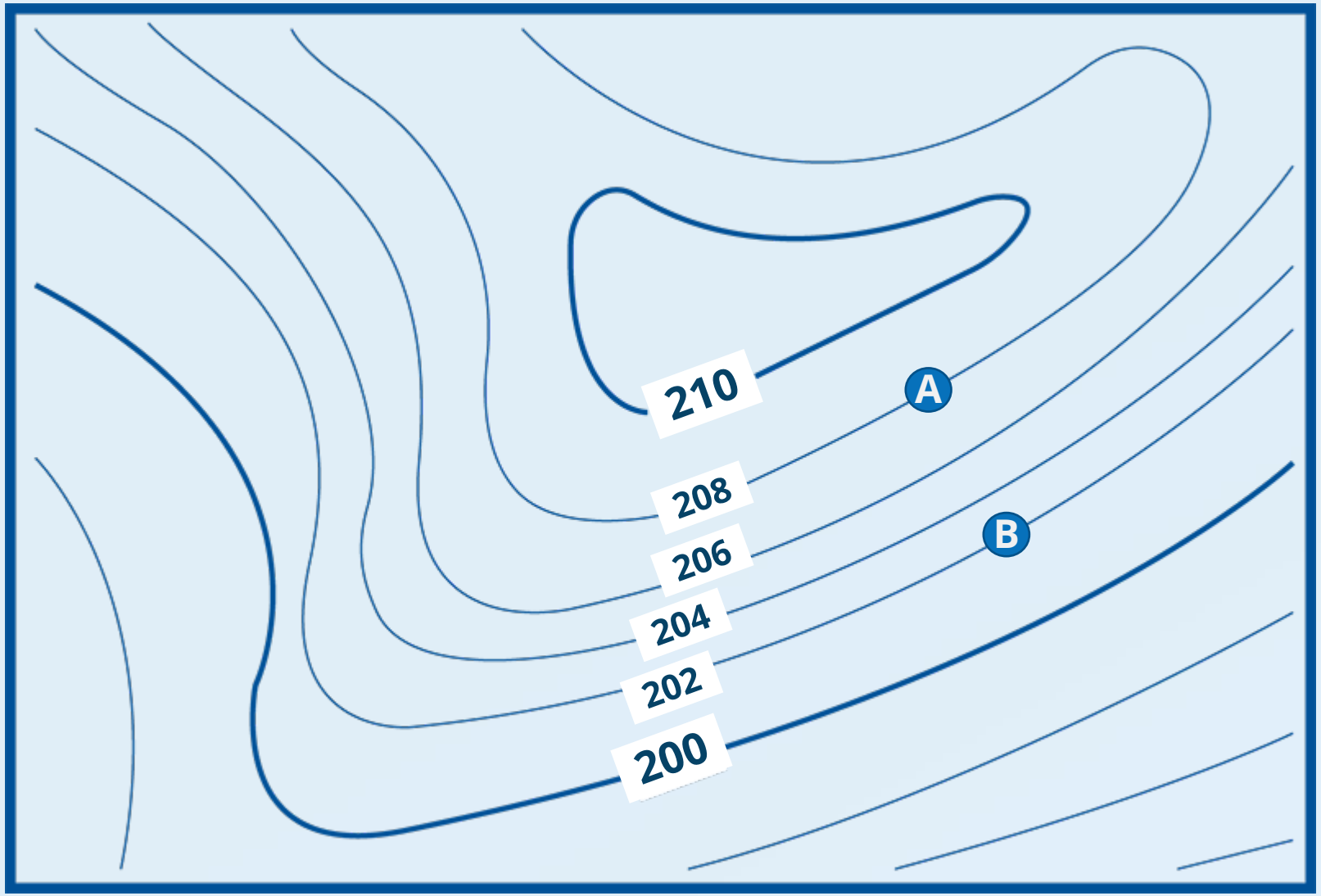


Rise

- <u>Vertical</u> distance between chosen contour lines

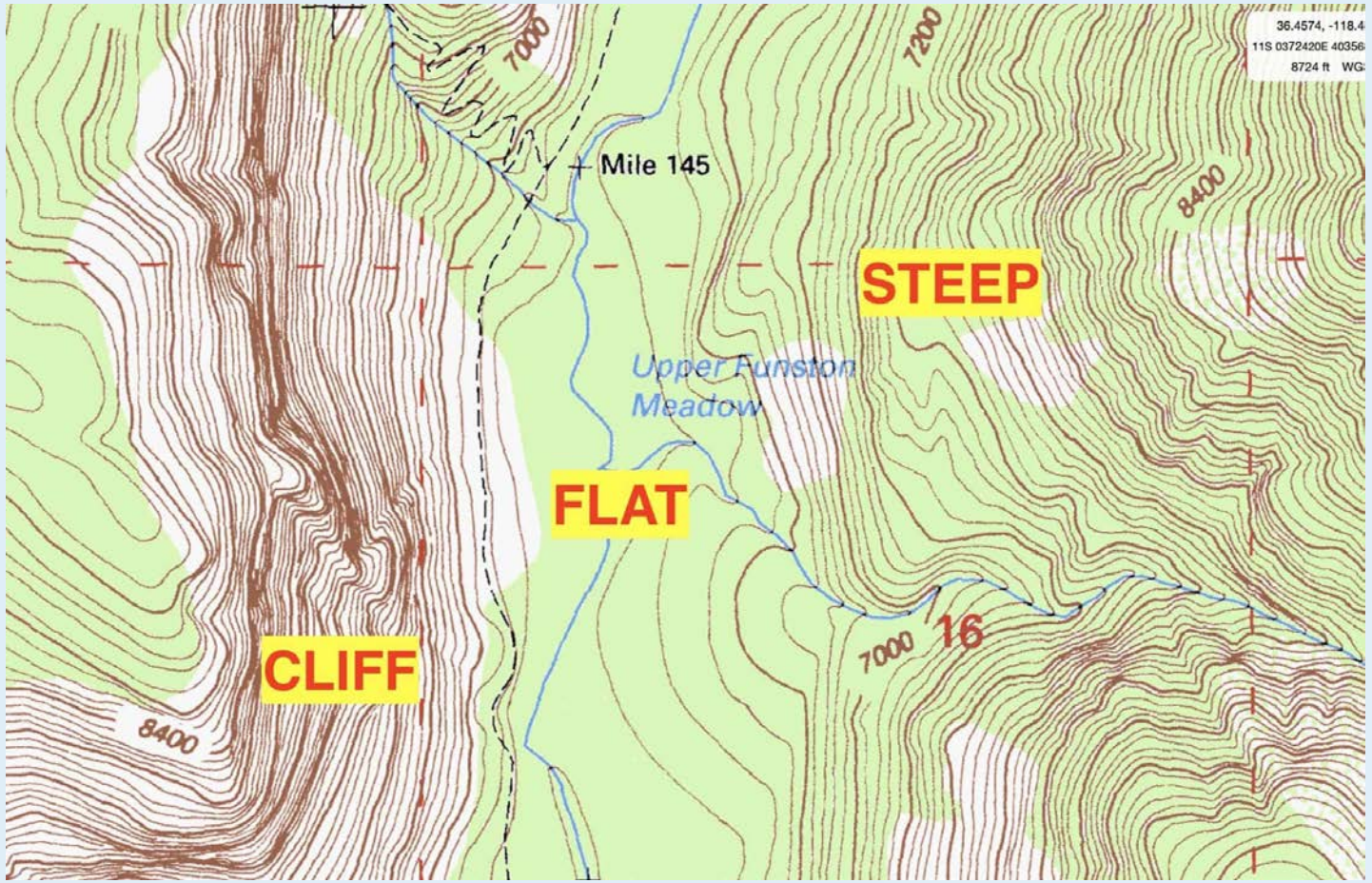
- Rise from point A to point B:

208′ – 202′ = 6′



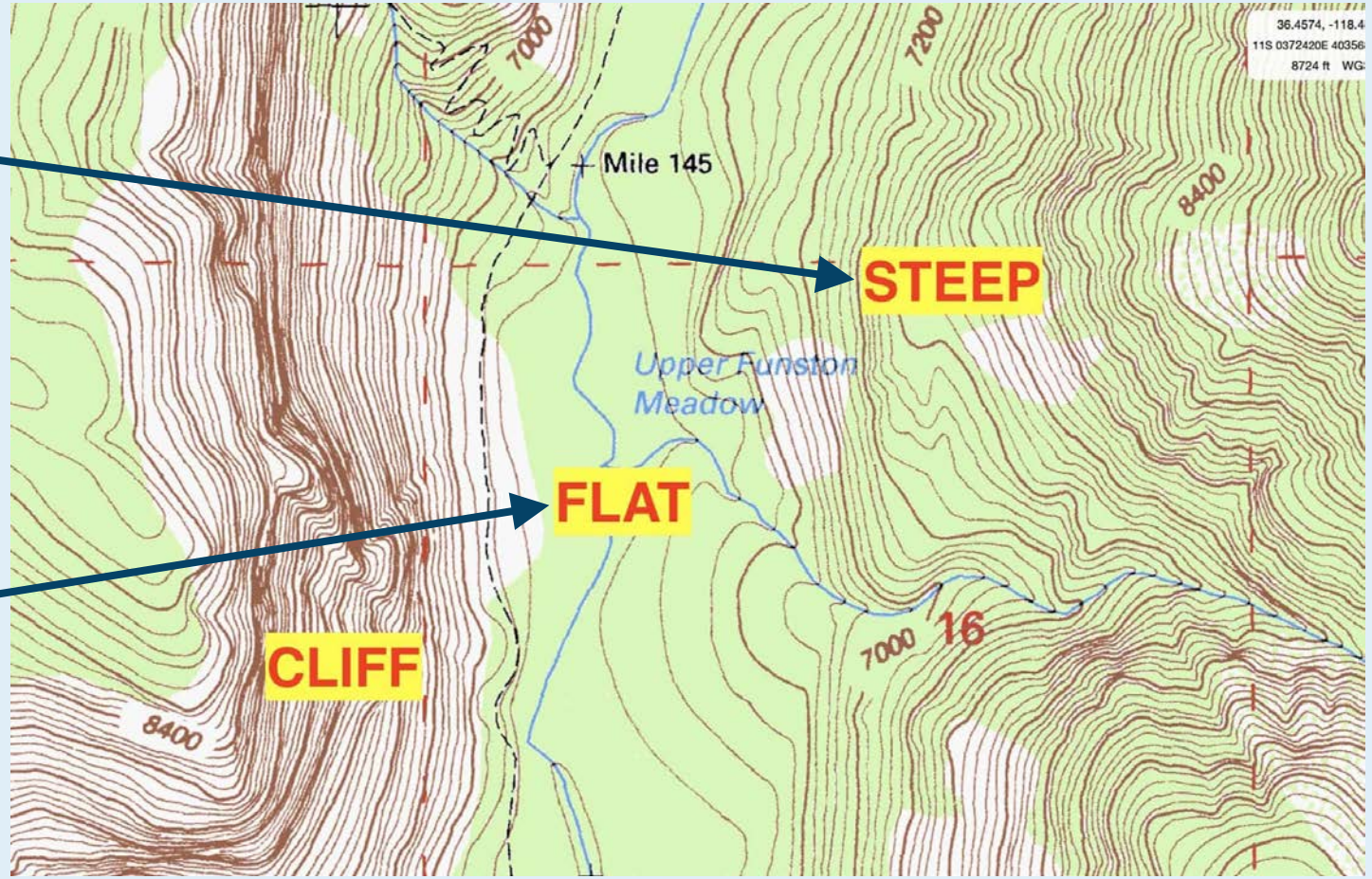
Distance Between Contour Lines

- We measure the distance *between* contour lines of know elevation to determine the degree of the slope



Distance Between Contour Lines

- Contour lines that are ***closer*** together indicate a ***steeper*** slope
- Contour lines that are ***further*** apart indicate a ***flatter*** slope



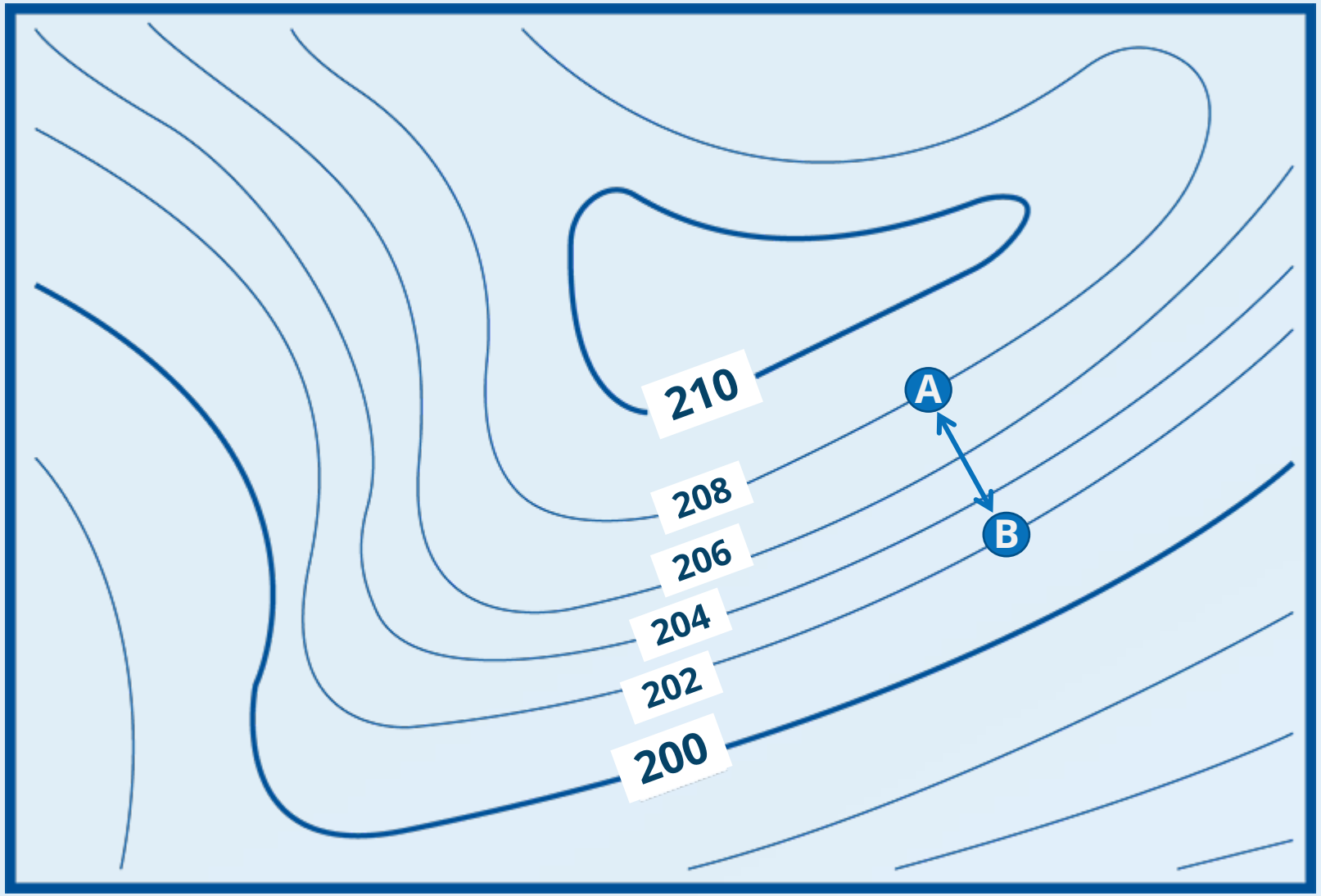
Slope Values

Flatter → Lesser Slope

Steeper → Greater Slope

Run

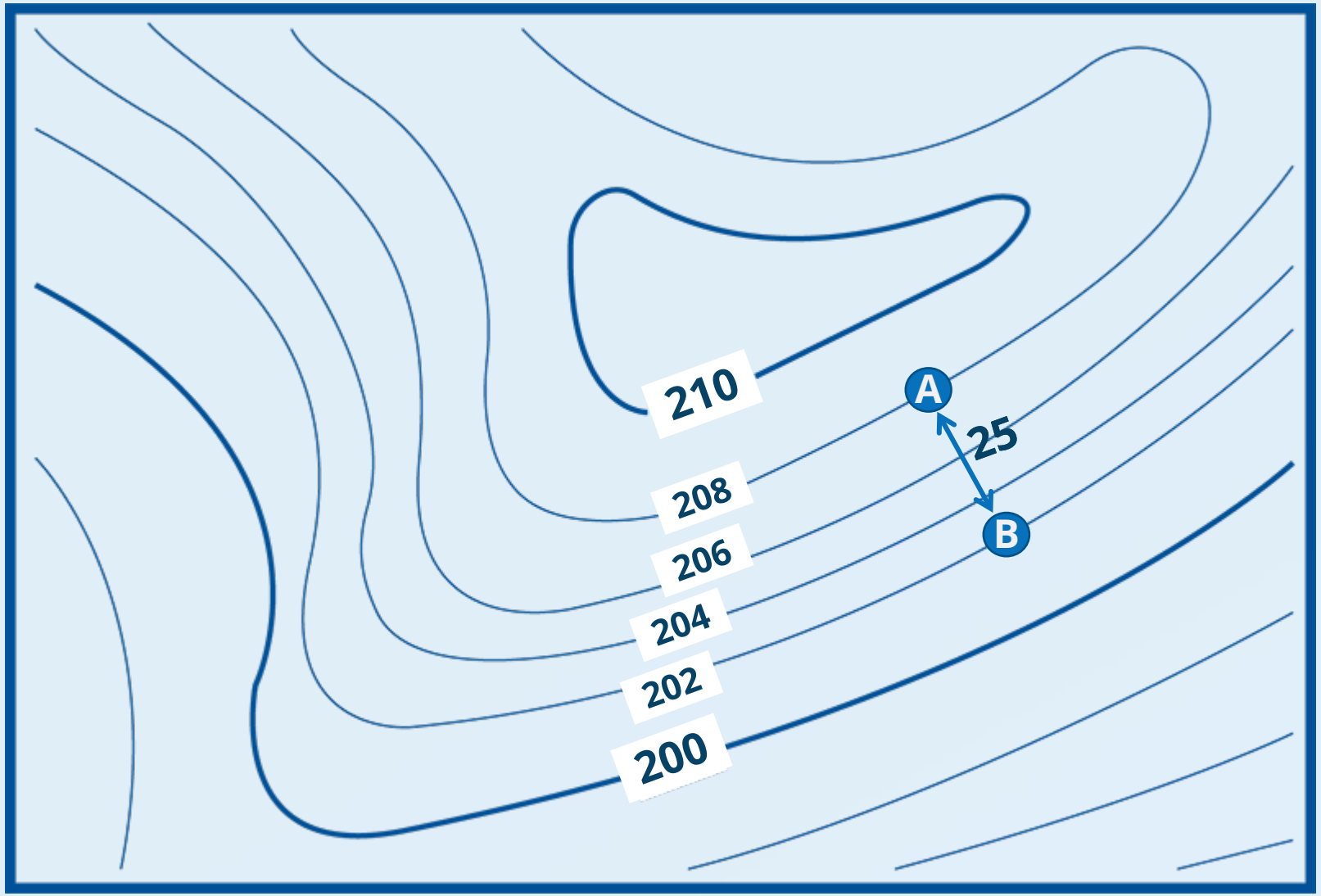
- Horizontal distance between chosen contour lines



Run

- Run is measured *perpendicular* to the contour lines.
- Run from point A to point B:

25’



Slope

- Slope from point A to point B:
- Slope = Rise/Run

6’ / 25’ = 0.24

0.24 x 100 = **24%**