

It's Only Muddy Water, So Why is it So Hard to Dispose of?

**Contact Link for
Latest Information and OSU Fact Sheet**

[Email: Info@DitchWitch.com](mailto:Info@DitchWitch.com)

**Mention: HDD Mud Residue Disposal Research
Information and Provide an Email Address**

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But....

Research Provides Some Real Time Data
and Measured Results for Disposal Options



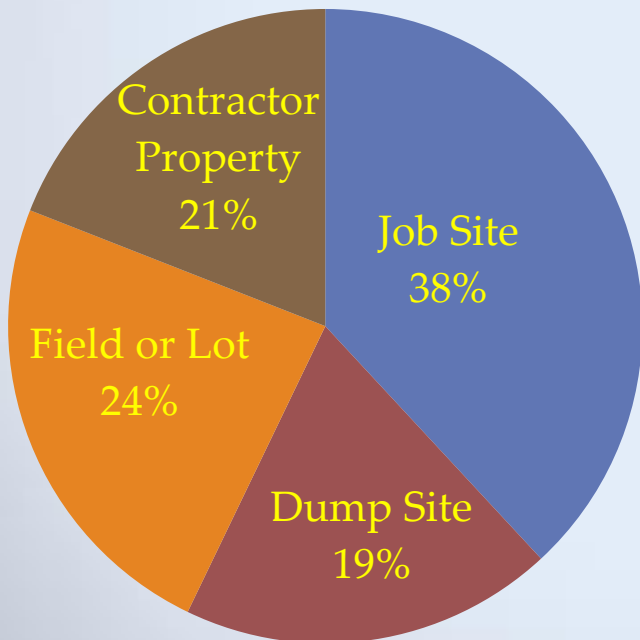
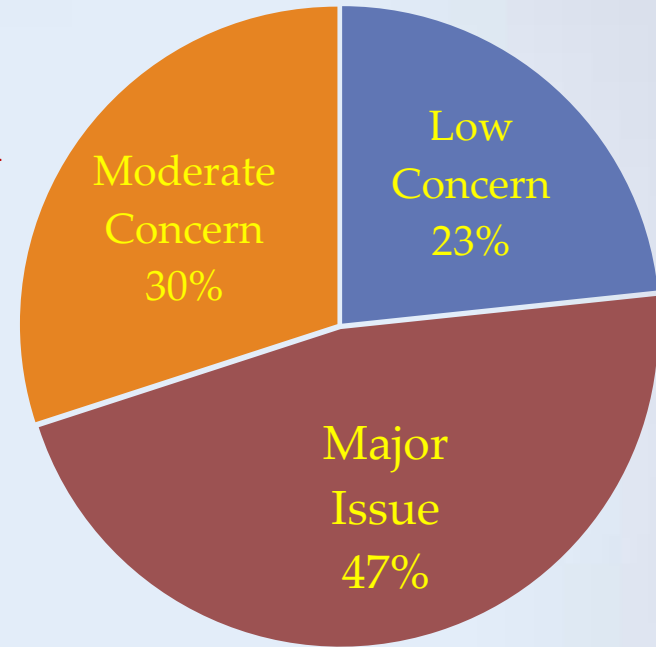
Agenda

1. Survey: Current Mud Disposal Methods and Info
2. Mud Sample Analysis Nationwide
3. Research Of Mud Disposal on Bare & Vegetated Soils
4. Conclusions, Is Land Application Safe and Viable?
5. Prescription for Land Application of Mud Residue



Key Survey Points

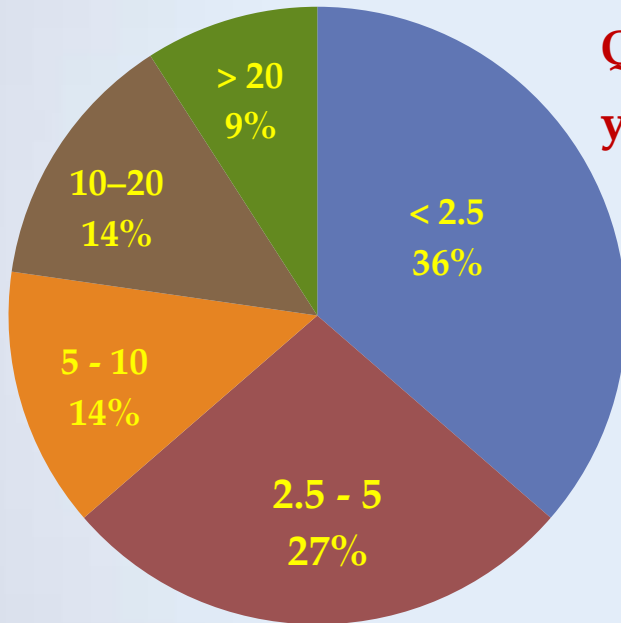
Question: Rank How Big of an Issue Mud Disposal is (10 = Major Issue)



Question: Describe What your Usual "Fluid Disposal" Activity Looks Like?

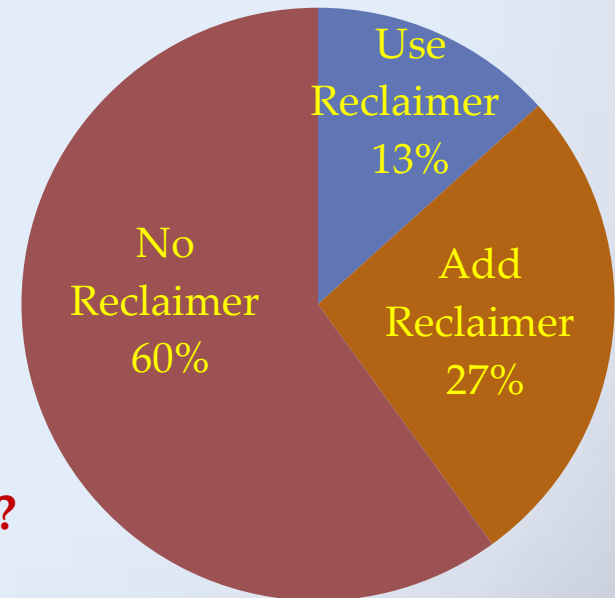
Key Survey Points

Mud Disposal 1000s Gal / Week



Question: How much Mud do you Dispose of per week?

Question: Do you utilize a Reclaimer?



Mud Reclaimer Example

Example:

- Disposing of 8000 Gallons/Wk
- \$27/Ton Disposal Fee (or \$0.45/gal)
- 60 Mile Round Trip for Disposal
- Assume Mud Reuse Rate is 10:1



Mud Reclaimer Example

Example of Disposing of 8000 Gallons/Wk @ \$0.45/gal

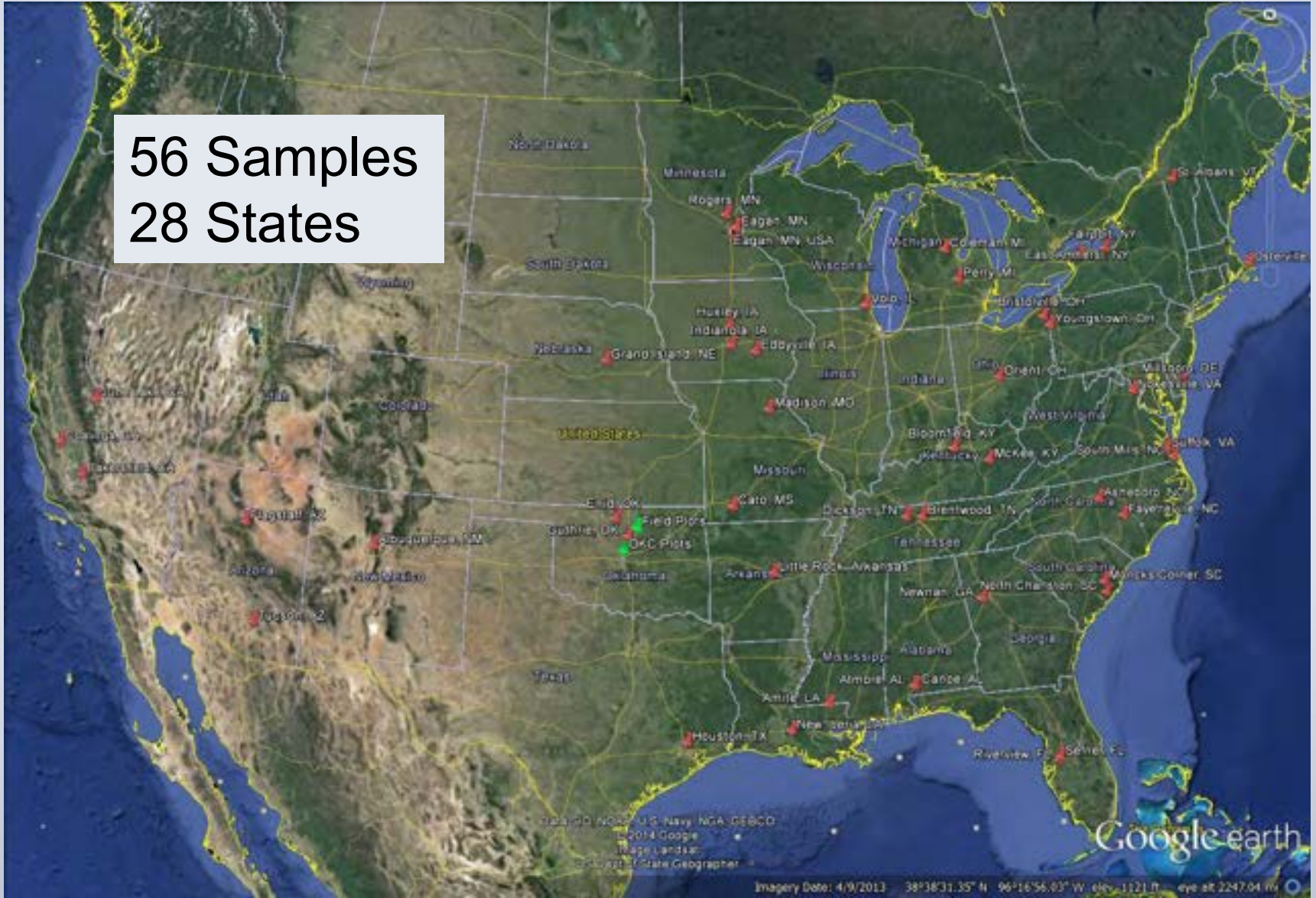
Est. Disposal Fees using Conventional Mud Mixing				Est. Disposal Fees using Mud Cleaner			
312,000	Tot Mud Gal/yr Disposed	\$140,400	Disposal Fees \$/Year	134,160	Tot Gal/yr Disposed, incl soil cuttings	\$60,372	Disposal Fees \$/Year
24,960	Total Miles Driven/yr	\$28,080	Vehicle Op Cost for Disposal	10,733	Total Miles Driven/yr	\$12,074	Vehicle Op Cost
1,129	Disposal labor hrs + 1 hr per trip	\$22,583	Tot Labor Cost for Disposal	486	Disposal hrs + 1 hr per trip	\$9,711	Tot Labor Cost for Disposal
347	Number of Batches Mixed/yr	\$14,560	Tot Mud Cost per Year (Labor + Additives)	35	Number of Batches Mixed/yr	\$1,456	Tot Mud Cost per Year (Labor + Additives)
\$ 278,000	Tot Equip Cost (FM25+2Vac+ 2Trucks)	\$92,667	Equip Cost (1/3 each yr)	\$ 205,000	Tot Equip Cost (MR90+Vac+ Truck)	\$67,650	Equip Cost (1/3 each yr)
\$298,290 Yearly Disposal & Operating Cost				\$151,263 Yearly Disposal & Operating Cost			

Everyone Says it's Harmless, So
Why is it so Hard to Dispose of "Muddy Water"?

Mud Sample Survey and Analysis

Mud Sample Survey

56 Samples
28 States



Mud Sample Analysis

- Solids Content
 - Dry sample weight divided by wet weight
- Electrical Conductivity (Dissolved Solids)
- pH (Acid/Base)



Mud Sample Analysis

EC ($\mu\text{S}/\text{cm}$), pH, and Solids Content

Electrical Conductivity		pH		Solids Content	
Mean	1181.4	Mean	7.37	Mean	37%
Median	925.7	Median	7.48	Median	36%
Minimum	118.1	Minimum	4.69	Minimum	4%
Maximum	3950.0	Maximum	9.95	Maximum	72%

*Threshold for
Saline Soils > 4000*

*Most Soils Range
from 4.5 – 8.5*

Mud Sample Analysis

EPA 3050B Solids Digestion

Metal	Typical Levels in Soil (mg/Kg)	Number of Samples Above Range Of Typical Soils
Copper	6 - 80	5
Manganese	80 - 1300	1
Zinc	17 - 125	1
Nickel	4 - 55	0
Arsenic	4 - 9	0
Chromium	7 - 221	0
Cobalt	1 - 22	0
Cadmium	0.06 - 1.1	0
Lead	10 - 84	0

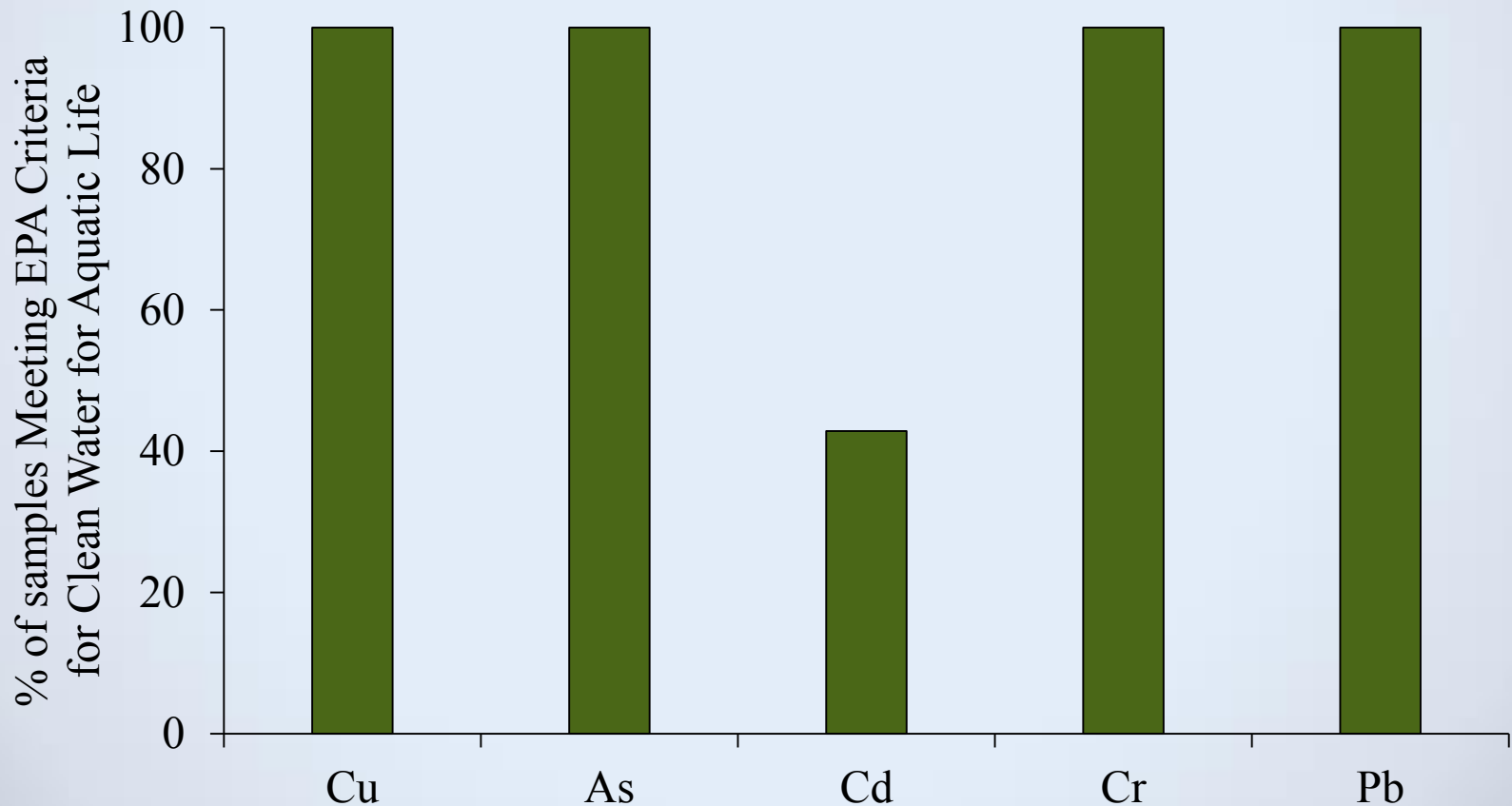
McBride M.B. (1994) Environmental chemistry of soils Oxford university press.

Mud Sample Analysis

Liquid Portion: EPA Criteria for Aquatic Life

So you might not want to use it for your Aquarium.

But nothing in this data indicates it's unsafe for land application.

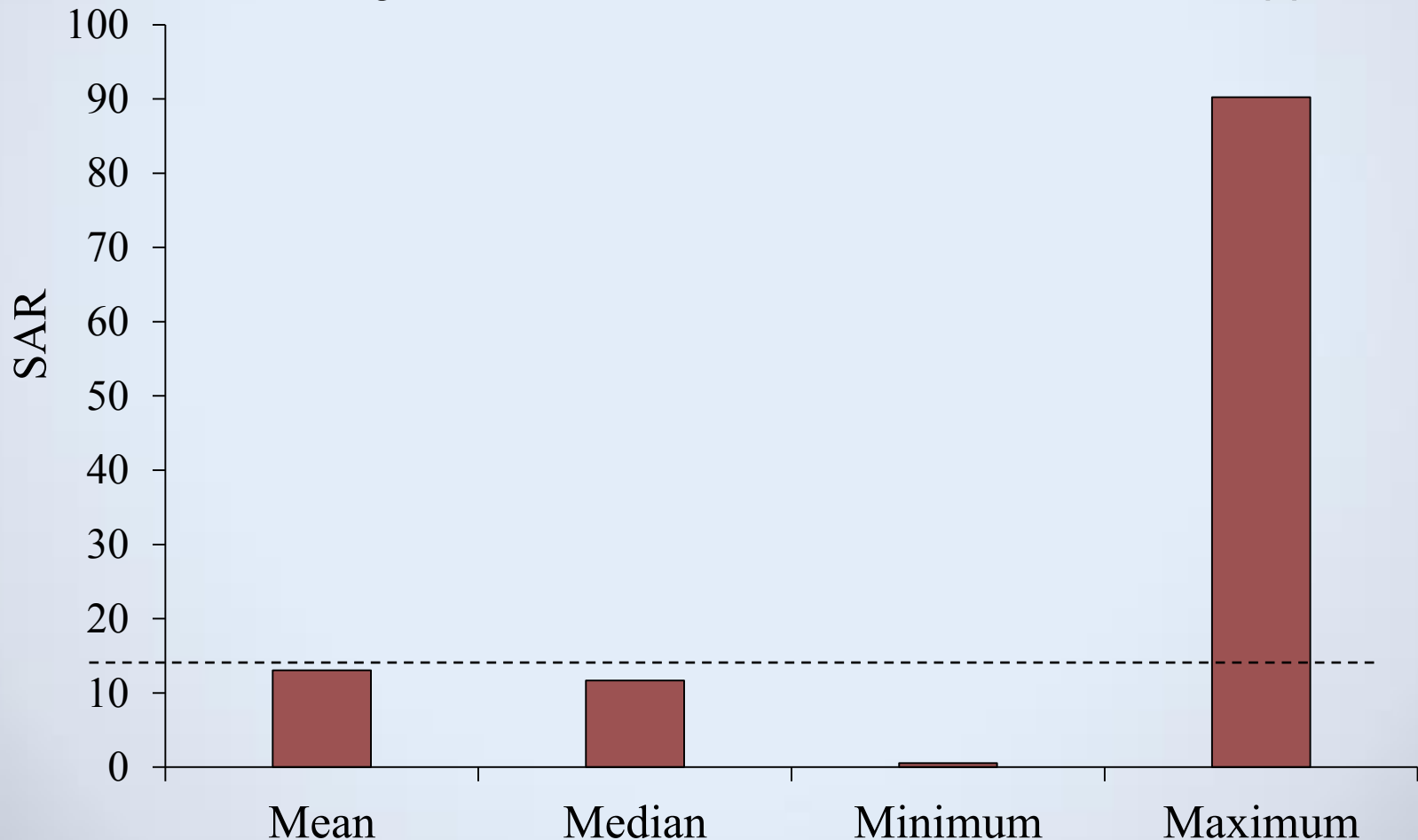


Mud Sample Analysis

Liquid Portion: Sodium Adsorption Ratio

So you might not want to use it for your Geraniums.

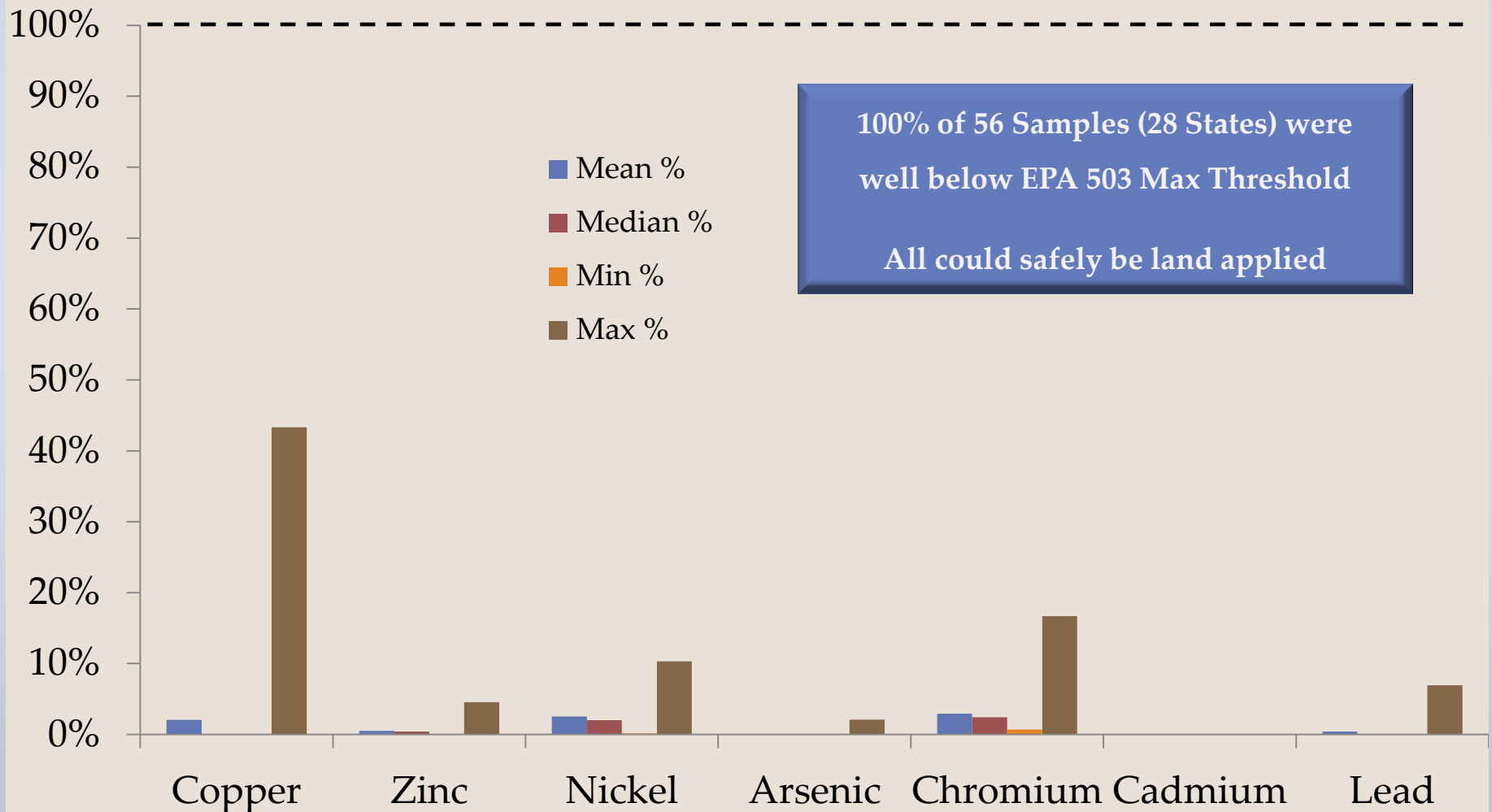
Nothing in this data indicates it's unsafe for land application.



Mud Sample Analysis

Total Metals in Solid Portion

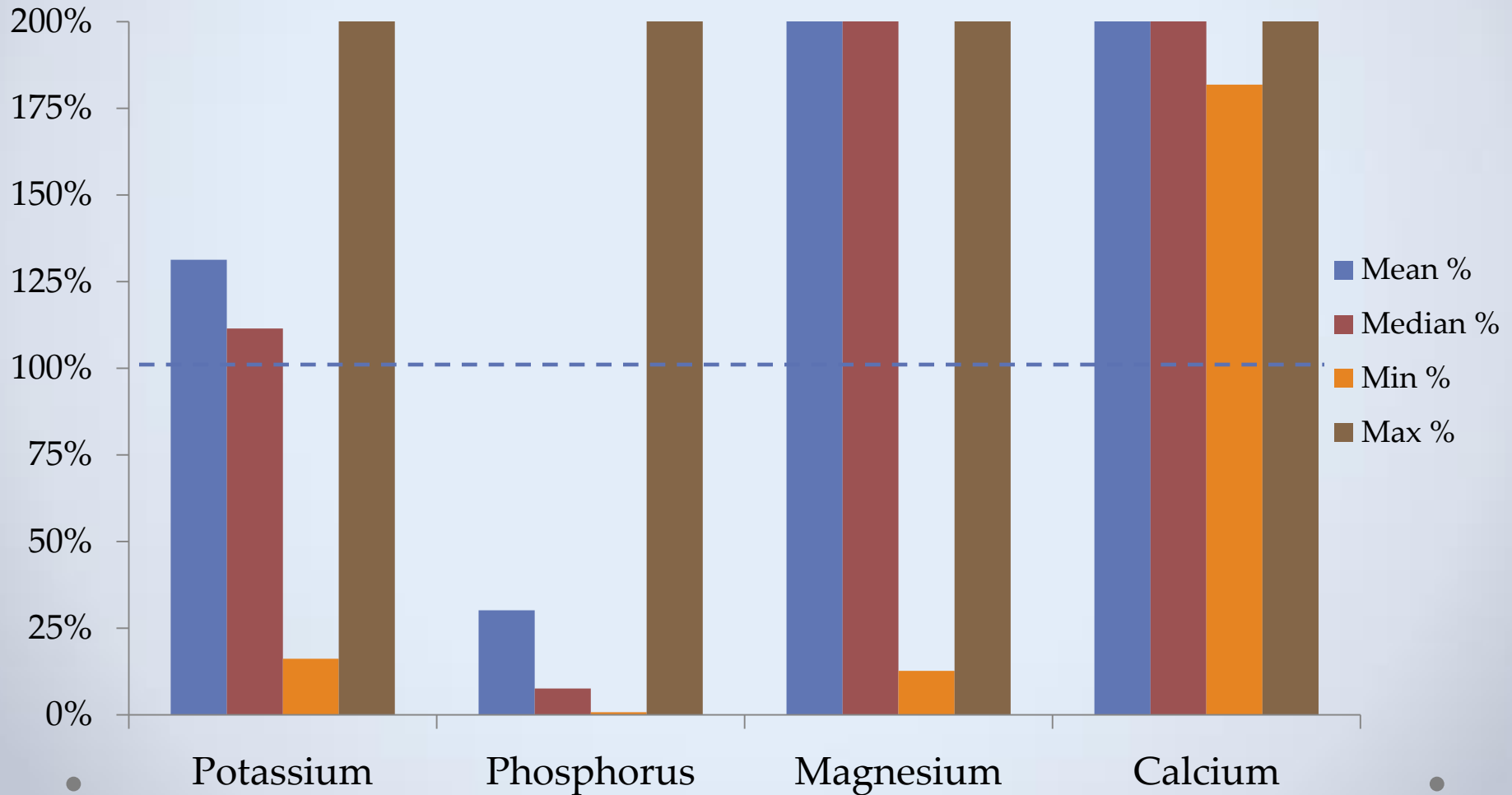
% of Max of EPA 503 Biosolids Land Application Threshold



Mud Sample Analysis

Plant Available Nutrients

Percent of Agronomic Optimum (for turfgrass)



Nation Wide Mud Sample Survey

The “Big Picture”

Potting Soil



vs.

100 % could be used
as Soil Amendment



HDD Residual (Mud) Land Application Studies

Two field studies

1. Vegetated Bermuda Pasture or Hayfield (Cover)
2. Bare plots with all Vegetation Removed (Bare)

Covered Plots



Mud Residue Applied at rates of: 0, 10, 20, 30, 40 & 50 Tons/Acre of Solids portion

50 T/Ac Plot
Immediately
after application



Covered Plots



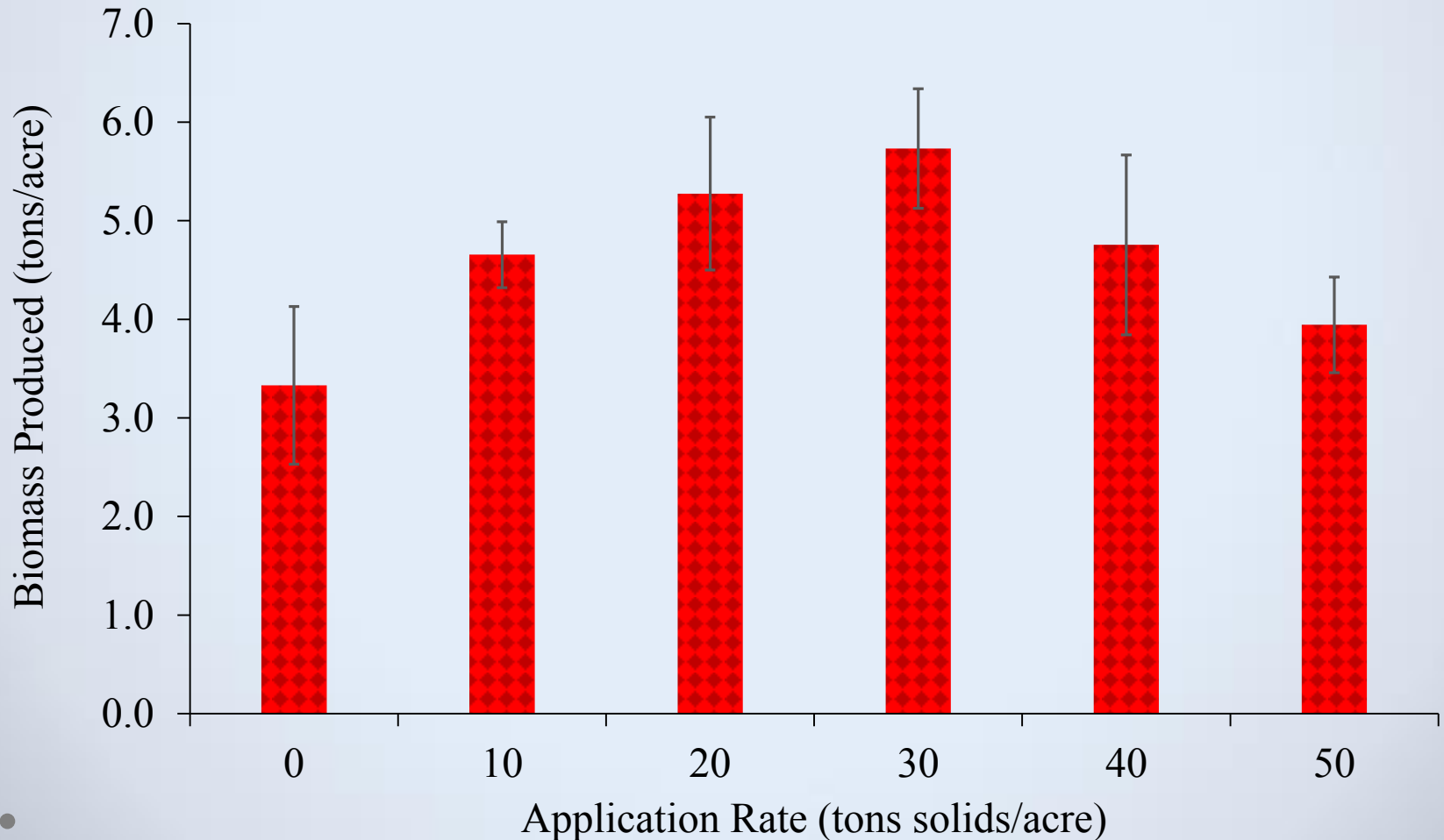
Row of plots after Application
50 Tons/Acre Plot in foreground



Days later
after a rain

Covered Plots: Biomass after 120 days

- Means appears to indicate an increase in Biomass w/ application of mud
- But Statistical analysis shows no significant difference at 95% Conf Level



Bare Plots



Plots Scraped Clean
and Levelled

Uniformly Seeded
w Bermuda Grass



Bare Plots



Mud Applied at rates of:
0, 10, 20, 30, 40 & 50 T/Ac

50 T/Ac Solids, in Foreground

Next Day



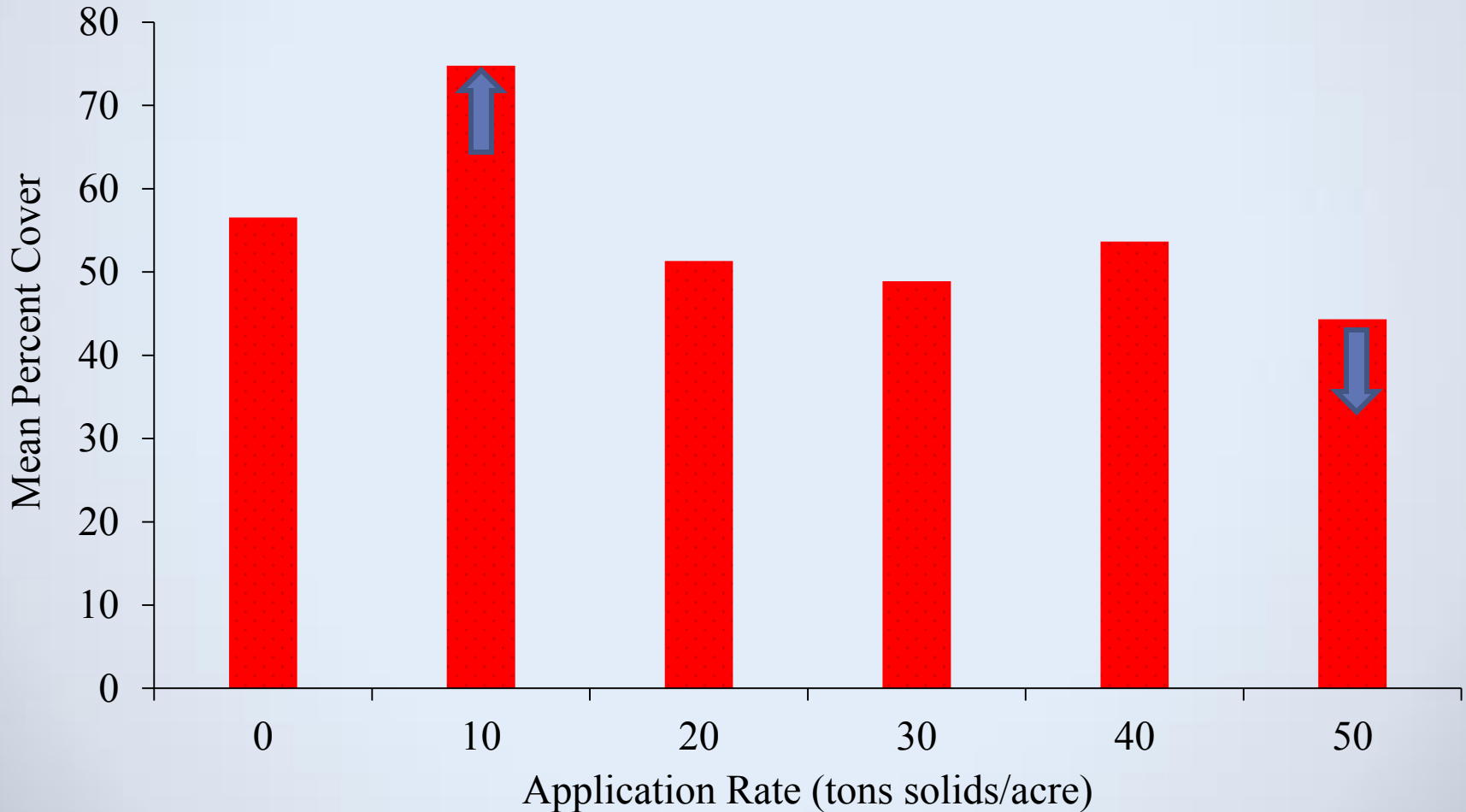
Bare Plots

120 Days After Application, No Irrigation



Bare Plots: Day 60

- 10 T/Ac produced significantly higher cover than control and other rates
- 50 T/Ac was significantly lower than control



Conclusions for Land Application Studies

1. Sample Days 0, 7, 30, and 90

- No significant chemical change in the soil for all rates on both covered and bare plots

2. Yield on covered plots

- No significant difference in yield for all rates on covered plots
- Though means seem to indicate an increase in yield w mud

3. Percent cover on bare plots

- 10 tons per acre significantly higher than control and other rates
- 50 tons per acre significantly lower than control
- All other Plots were not significantly different than control

Summary of Research

- Nationwide Sample Analysis - Chemical & Physical Characterization
 1. Solids Portion: No harmful amounts of heavy metals found
 2. All samples fell far below EPA 503 Heavy Metal Criteria for EQ Biosolids.
 3. Water Portion: Cd in some samples was only constituent found above EPA Criteria for Aquatic Life (Note, this is a criteria for surface water).
 - 4. All samples were Safe for Land Application**
- Field Study
 1. No significant difference in biomass yield
 2. No significant chemical change to soil after application
 3. Possibly aids in germination at the lowest rate applied (10 tons/acre)
 4. Possibly hinders germination at the highest rate applied (50 tons/acre)

5. Safe for Land Application

 - ❖ Caution: though no indication of excess contamination was found, that does not mean none exist everywhere. Exercise care if drilling at a site that is suspected of being in a contaminated area; have soil or mud tested before disposal.

“Prescription” for Land Application

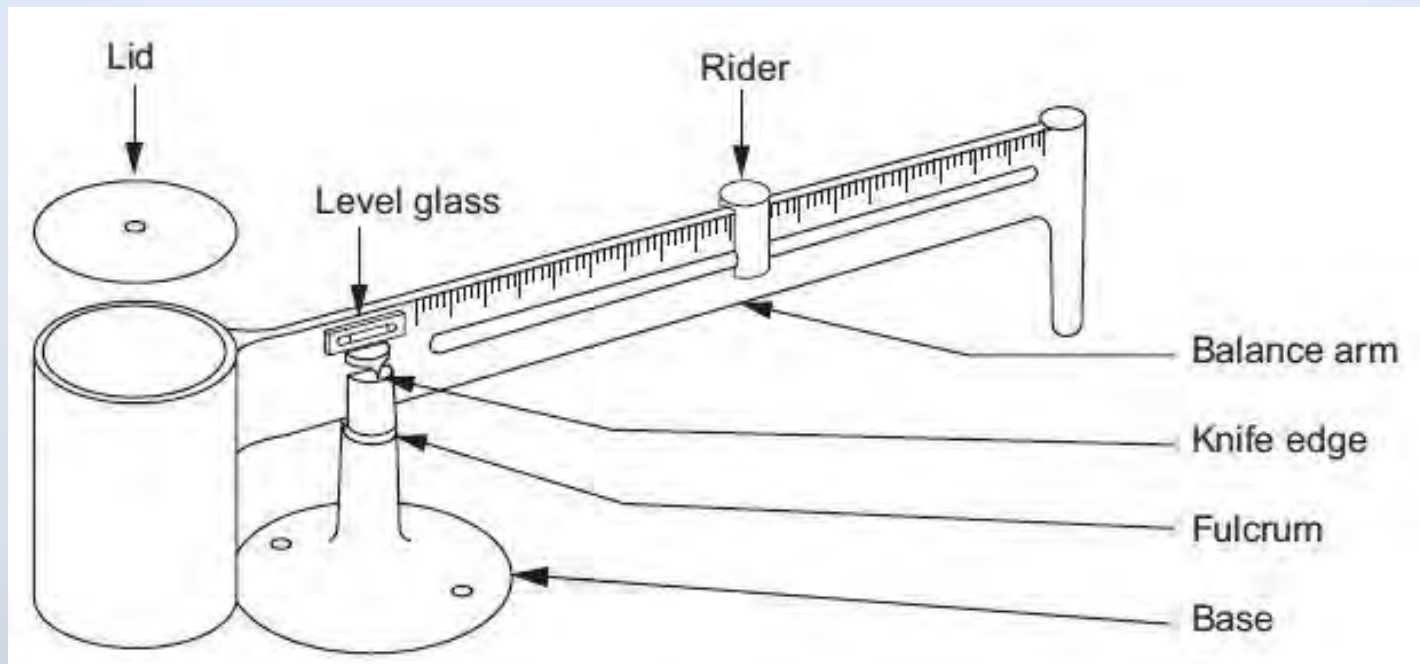
1. Investigate the jobsite, is the HDD Job site in a known or historical area for contamination?
 - If Yes: Test or Dispose Mud Residue at appropriate dump site.

2. Establish desired application rate of solids 10-50 Tons/Acre
 - Note for watery light muds, heavy application rates can require > 1 inch
 - Vegetated: Do not exceed 50 tons/acre of solids.
 - Bare Plots: Do not apply more than 40 tons/acre to bare soils.
 - Exercise caution for watery muds, they will easily flow across bare soils

“Prescription” for Land Application

Continued:

3. Mix or agitate the tank before application
4. Measure Mud Residue Density in (lb/gal)
 - Mud Balance (lb/gal)



“Prescription” for Land Application

Continued:

5. Knowing that typical soils and rock have density around 22 lb/gal or less, and water is 8.3 lb/gal. You can calculate the Total Volume of Mud Residue required to apply over one acre. Use Equation below or Graphical Method on next page.

- In Equation Below, Insert *Mud Density (lb/gal)* from step 4 and *Desired Solids Application Rate (Tons/Ac)* from step 2.

$$\frac{\text{Tot Gallons Mud Residue}}{\text{Acre}} = \frac{\text{Tons}}{\text{Acre}} \times \frac{1250}{\text{Mud Density} \left(\frac{\text{lb}}{\text{gal}} \right) - 8.3}$$

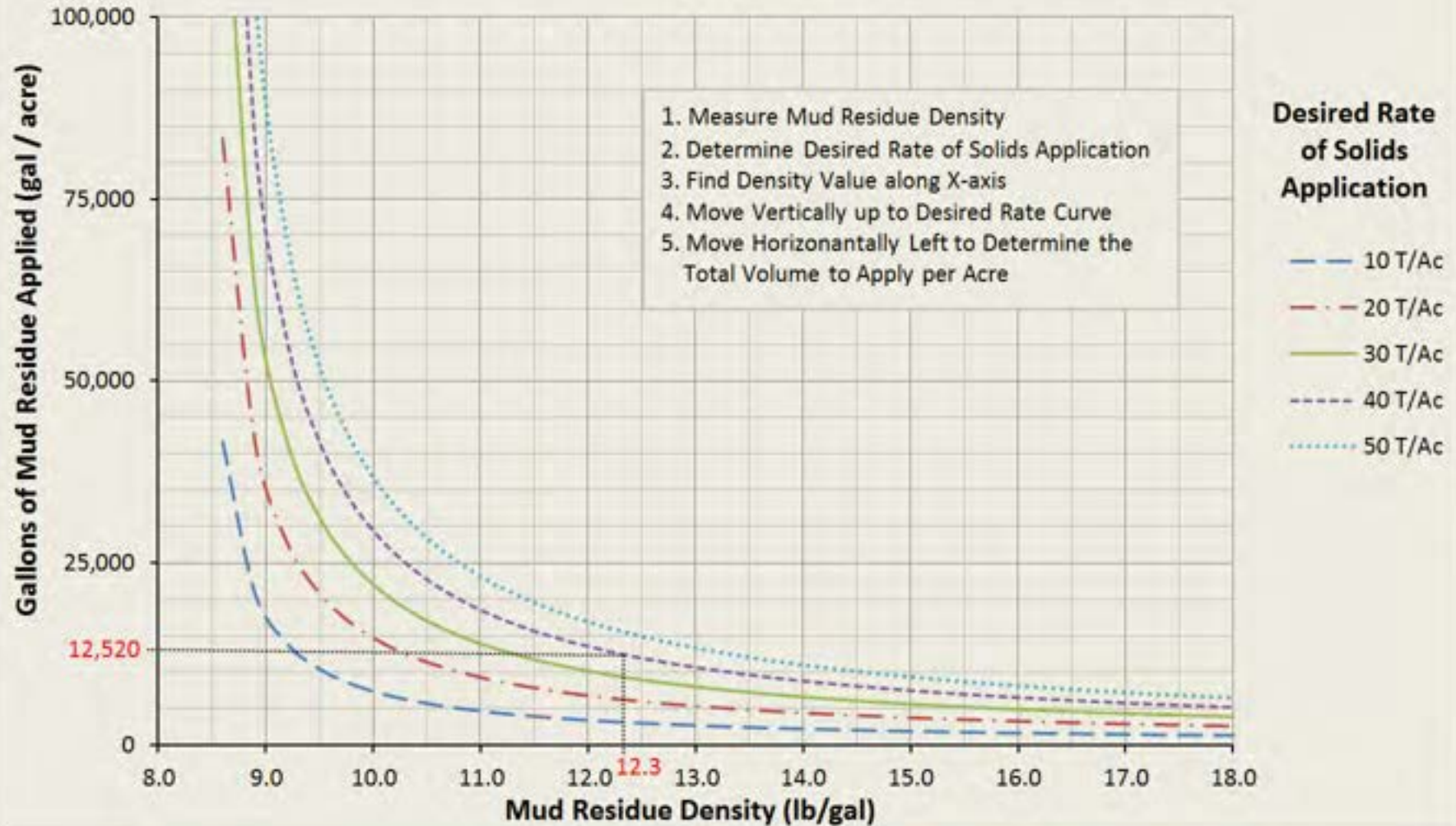
- Example, to apply a desired 40 ton/acre of solids with mud density of 12.3 lb/gal.

$$12,500 \text{ Gal/Ac} = \frac{40 \text{ Tons}}{\text{Acre}} \times \frac{1250}{12.3 \left(\frac{\text{lb}}{\text{gal}} \right) - 8.3}$$

Indicates that you would need to apply 12,500 gal/acre of mud residue to apply 40 tons of solid material per acre.

“Prescription” for Land Application

Gallons of Mud Residue to Apply per Acre



Application Rate Per Pass

- $210 \text{ ft} \div 10 \text{ ft (App Width)} = 21 \text{ Rows}$
- $12,520 \frac{\text{Gal}}{\text{Ac}} \div 21 \text{ Rows} = 596 \frac{\text{Gal}}{\text{Row}}$

1 Acre = 210 ft x 210 ft

