

SAVE THE DATE

October 18-20, 2022

RAPID CITY, SD

37th Annual
North Central Regional
**LOCAL ROAD
CONFERENCE**



Gravel Tips

Steve Monlux
LVR Consultants LLC
Missoula MT
406-544-1919
stevemonlux@gmail.com

37th Annual North Central Local
Roads Conference

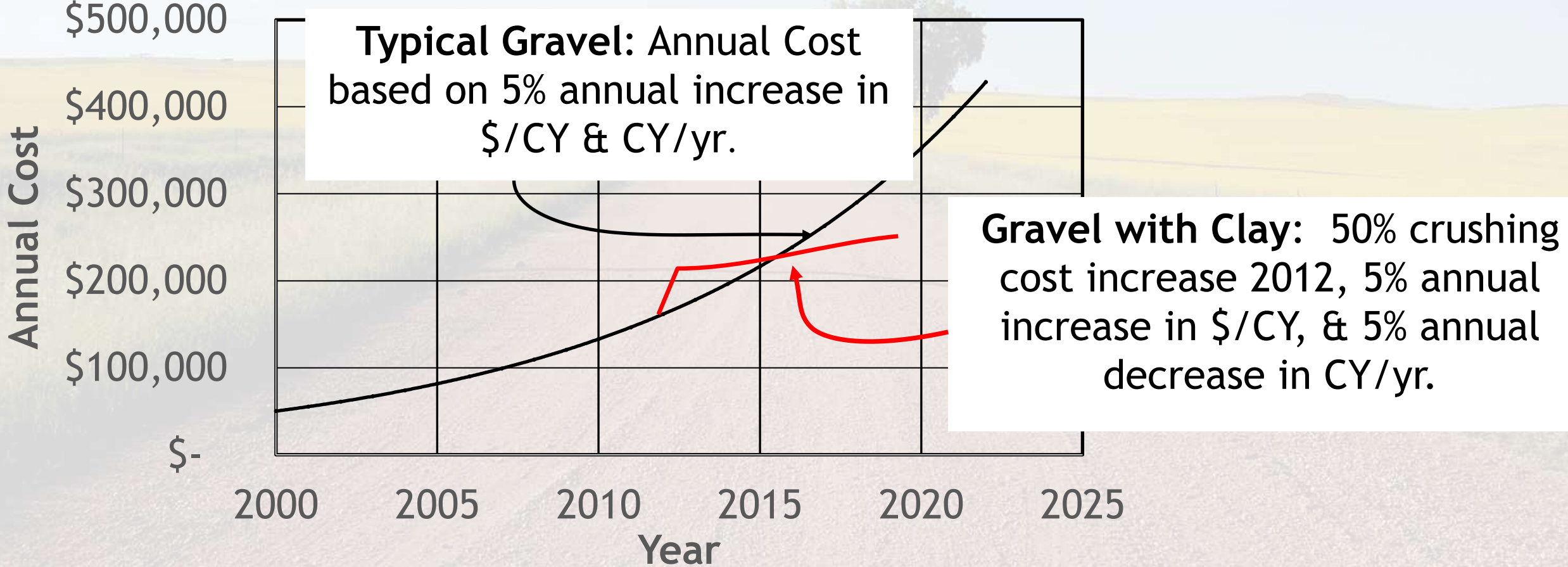
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Source of Information & Resources

- Gravel Road Practitioners → Local road crew
- The Public
- Internet
- LTAP Personnel and Resource Library

Lower annual cost for gravel by crushing more expensive gravel that lasts longer.

Annual Cost of Gravel

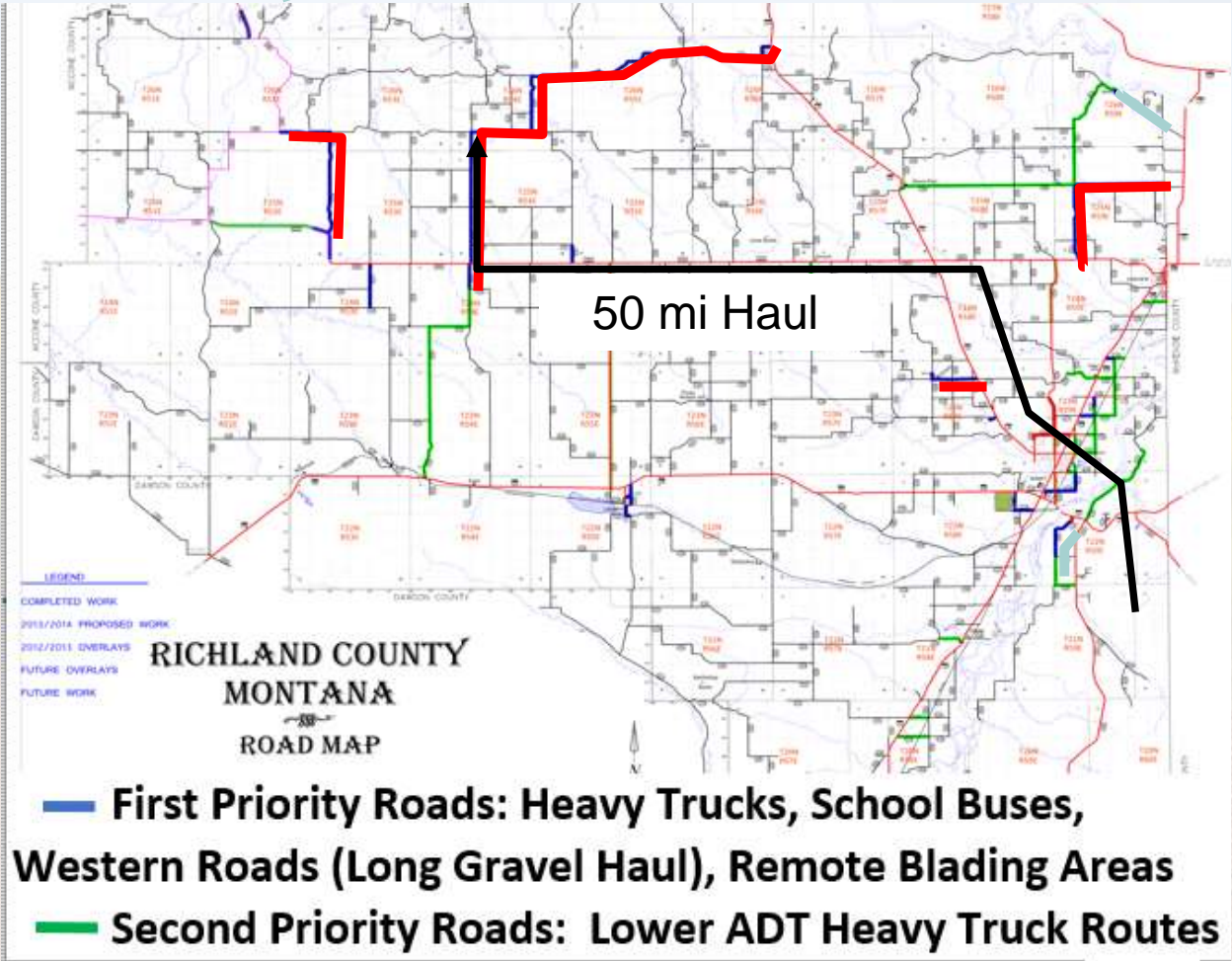


Determine the best locations for high quality, expensive gravel.

Greatest return on investment is on Heavy Truck routes

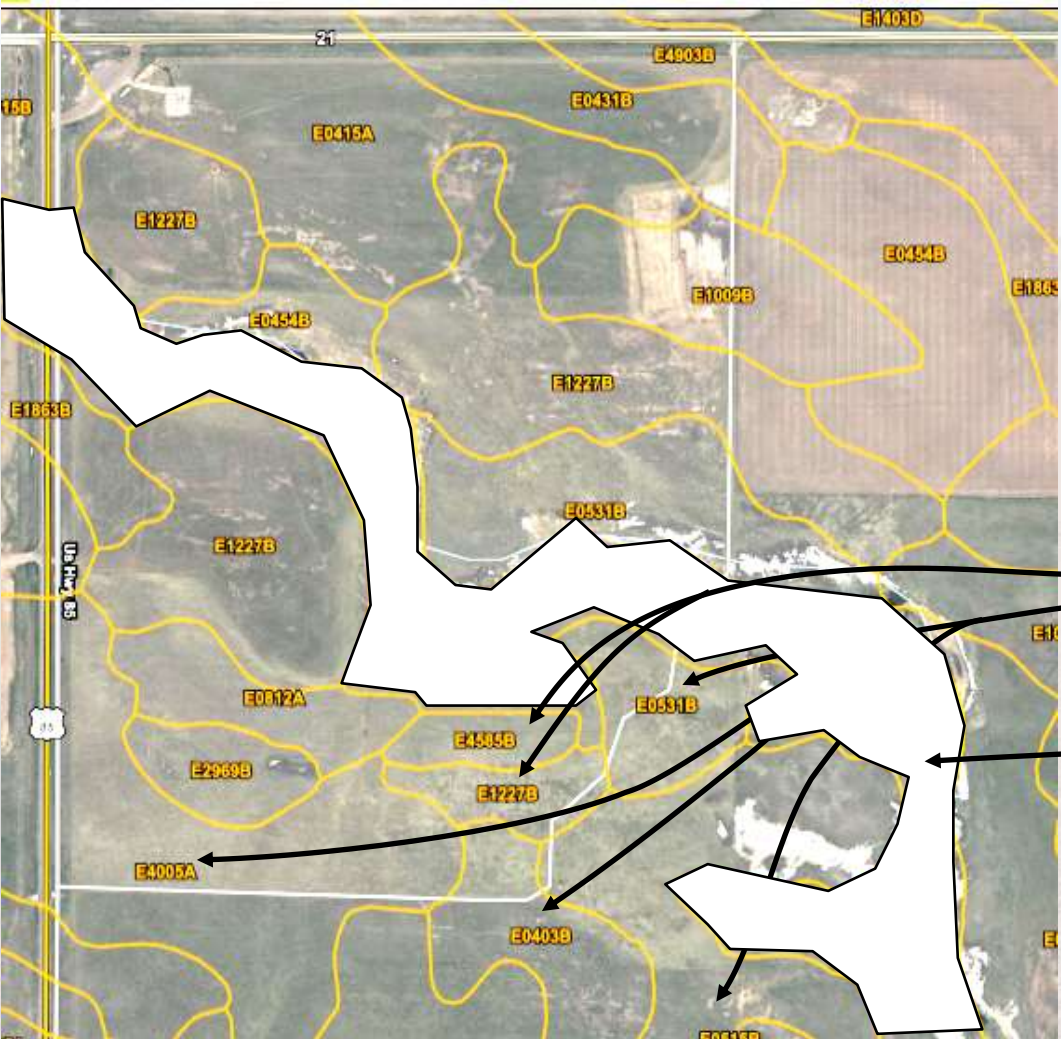
Why?

Reduces gravel replacement costs



Find Gravel & Clay with NRCS Web Soil Survey

(Slope Co ND)



Sieve Sizes		Sand Overburden		Clay Overburden				Gravel
Spec	WSS	4585B	1227B	0531B	4005A	0403B	0515B	4561F
1"	1"							
3/4"	3/4"							
#4	#4	75	100	100	100	100	100	50
#8	#10	65	100	100	100	100	100	40
#30	#40	55	80	99	95	95	99	25
#200	#200	40	40	86	75	85	86	20
PI		7	4	26	25	25	26	1
Depth, Inches		5 to 60	0 to 60					25 to 60

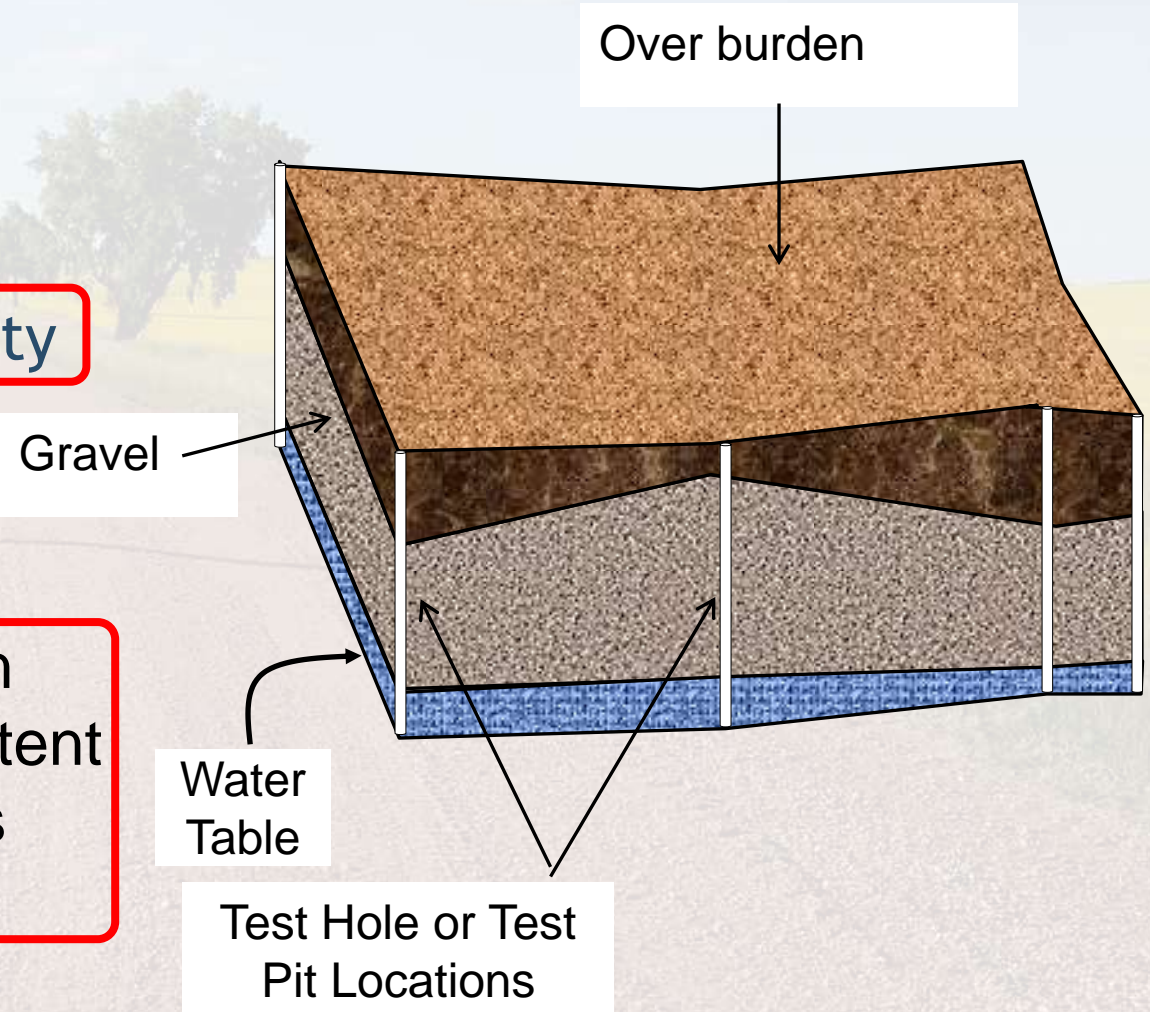
If you have to reject sand to get in spec, add overburden with high minus #200 and PI

Investigate pits to determine pit run gradation & PI prior to setting spec limits.

- Purpose -> Reduce Costs
- Objectives for Both Existing & New Pits
 - Determine Layer Depths
 - Determine/Confirm Quantity & Quality
- Location of New Pits
 - NRCS WSS and Vegetation on Google Earth Image
 - Road cut slopes

Don't require PI unless clay is available locally

Gradation
Clay Content
Hardness
Durability



Consider bentonite clay if no local clays

- Large Projects:
 - Determine best percentage by testing (Clay optimization Tests Procedure) or
 - Build short test projects at different percentages - evaluate for 1 full year
- Small Projects, use 2% bentonite for non plastic gravels
- Local Bank Run clays will always be cheaper than bentonite

Consider using specs & contract options that have worked well for others

- Tighten gradation limits where realistic for specific pits
- Link Minus #200 to PI Specs: “PI + #200 spec range of 20 to 25, Max #200 =18” or
- PI Lab must accurately test PI Control Sample

% Passing #200	8 to 14	12 to 18
Plasticity Index	6 to 10	3 to 7

- If designated pit does not have clay for plasticity, use optional bid items for both of the following
 - Meet PI specs using clay from private sources
 - Add 2% bentonite to the crushed gravel by bin feeder and conveyor belt



- Include statement on Pit Plan Drawings: “Other private sources of gravel or clay additive may be used provided the gravel is stockpiled in the provided pit”.

Additional Spec Options For Stockpile Contracts

- **Sampling & Testing:**

- Daily Acceptance Sample tested by Certified Lab (See Next Slide)
- Have PI lab test PI Control Samples prior to crushing

- **Payment:**

- Use Average Test Results and Simple Pay Adjustment System
- 5% Bonus for meeting tighter spec,
- Reductions for just meeting looser specs

- **Measurement:**

- Pay by Drone measure of CY in Stockpile -
- Accepted Qty is amount crushed between 95 & 105% of specified

PF	1.05	1.0	0.75
3/8"	72-85	70-87	66-91
#16	27-40	25-42	21-46
#200	12-16	8-18	6-20
PI	4-10	4-10	0-10

Use Daily Composite Samples for Acceptance when Crushing and Stockpiling (AASHTO T2 or ASTM D75)

- Take full loader bucket samples every two hours



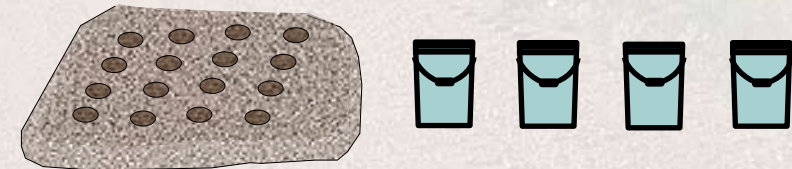
- Form a sampling stockpile throughout day



- Back drag stockpile to flatten



- Take two composite samples at the end of each day - minimum of 140 lbs. for 1" minus

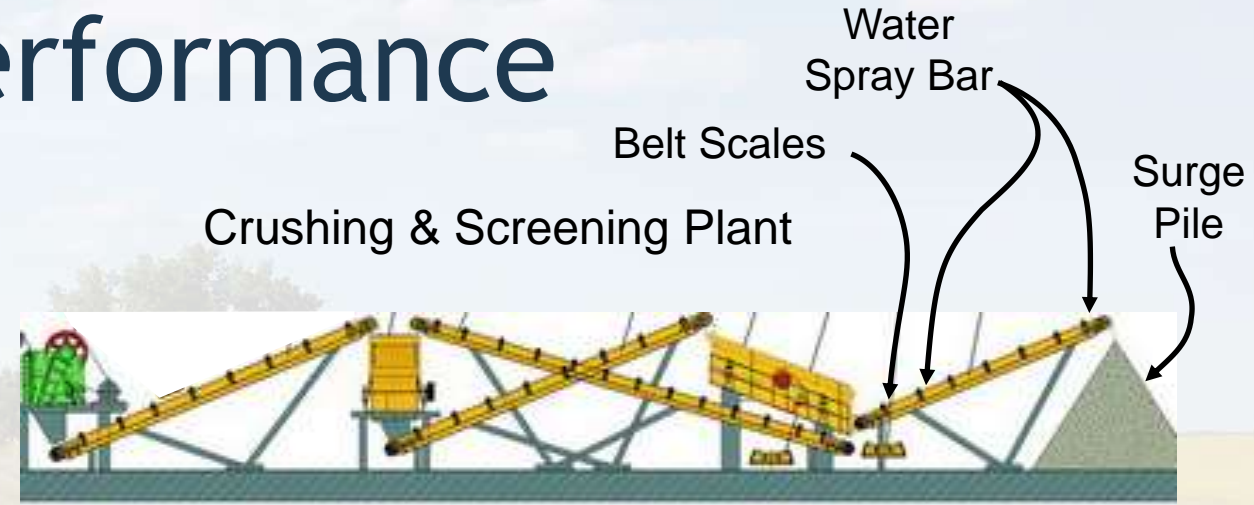


- Fill at least two 5 gallon buckets from the same locations - Contractor tests half the sample, Engineer tests the other half for acceptance testing

- Follow AASHTO T2 or ASTM D75 Procedure

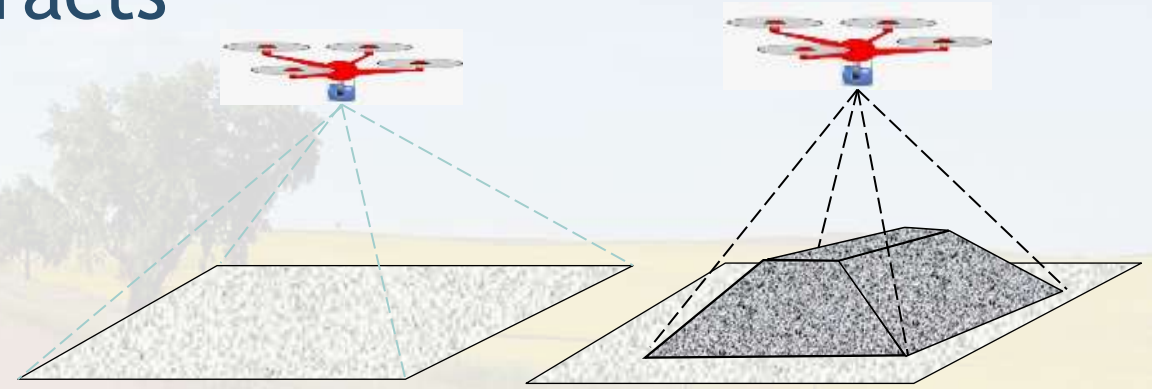
Add water during crushing to lower costs and improve performance

- Best Location to Add Water:
On the Crusher Pay Belt
- Less segregation in stockpile
- Less evaporation and water haul than
when applied to road
- Less segregation during blade processing, less blade processing →
- Better compaction, less rolling
- Longer lasting crown



Require drone measurement of stockpiles

- Cubic Yards for Stockpile Contracts - measured by drone
- Agency pays for two surveys:
Stockpile floor and
Stockpile



- If quantity less than 95% of specified, Contractor crushes more gravel and pays for final survey
- Pay on actual cubic yards in stockpile between
- 95% and 105% of specified quantity

Reduce washboards by rejecting sand and adding clay overburden



Reduce float by reducing top size, crushing rock smaller to tighter gradation



Reduce dusting by adding clay and building a durable road crust



Reduce pothole formation by increasing crown.

Other Benefits

- Reduces blading
- Lowers traffic speed which reduces accidents, lowers gravel loss rate
- Lowers complaints (potholes, washboards, loose rock)



Determine cause of rutting to ensure fix is permanent

Ruts in Gravel Layer



Increase Crown
Reduce Clay content

Ruts in Subgrade



Increase Gravel Thickness
Strengthen Subgrade



1.7%
Crown

Build a Good Road Crust after Gravel Compaction

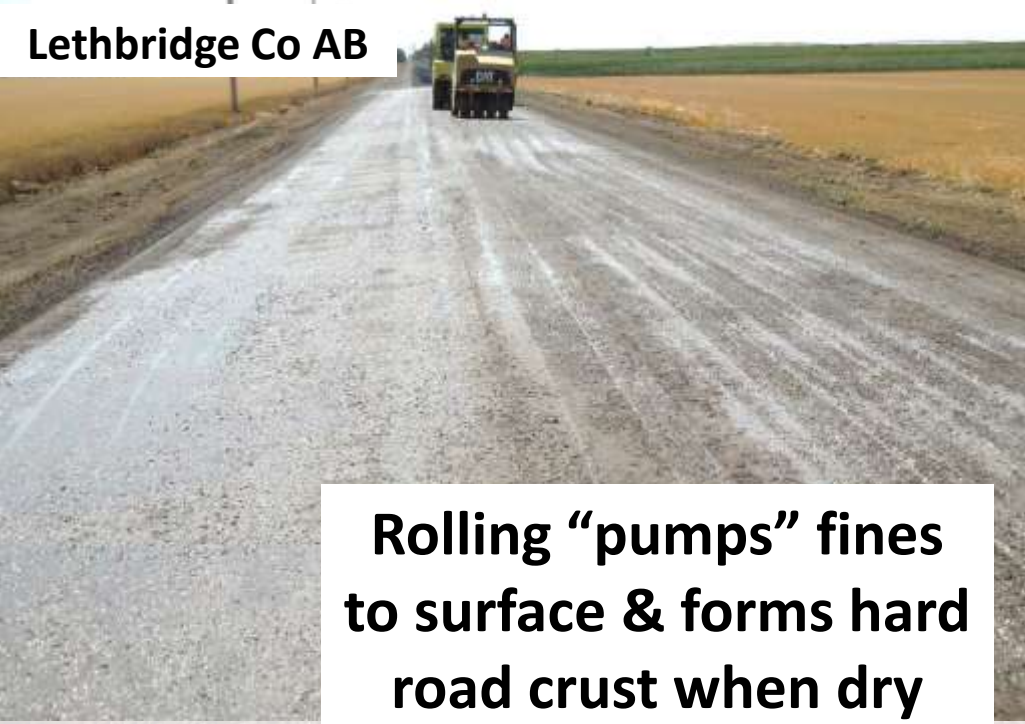
Wet road surface full width – try to limit runoff on shoulders

Stark Co ND



Road Crust

Lethbridge Co AB



Rolling “pumps” fines to surface & forms hard road crust when dry



Compacted Gravel

Good Road Crust

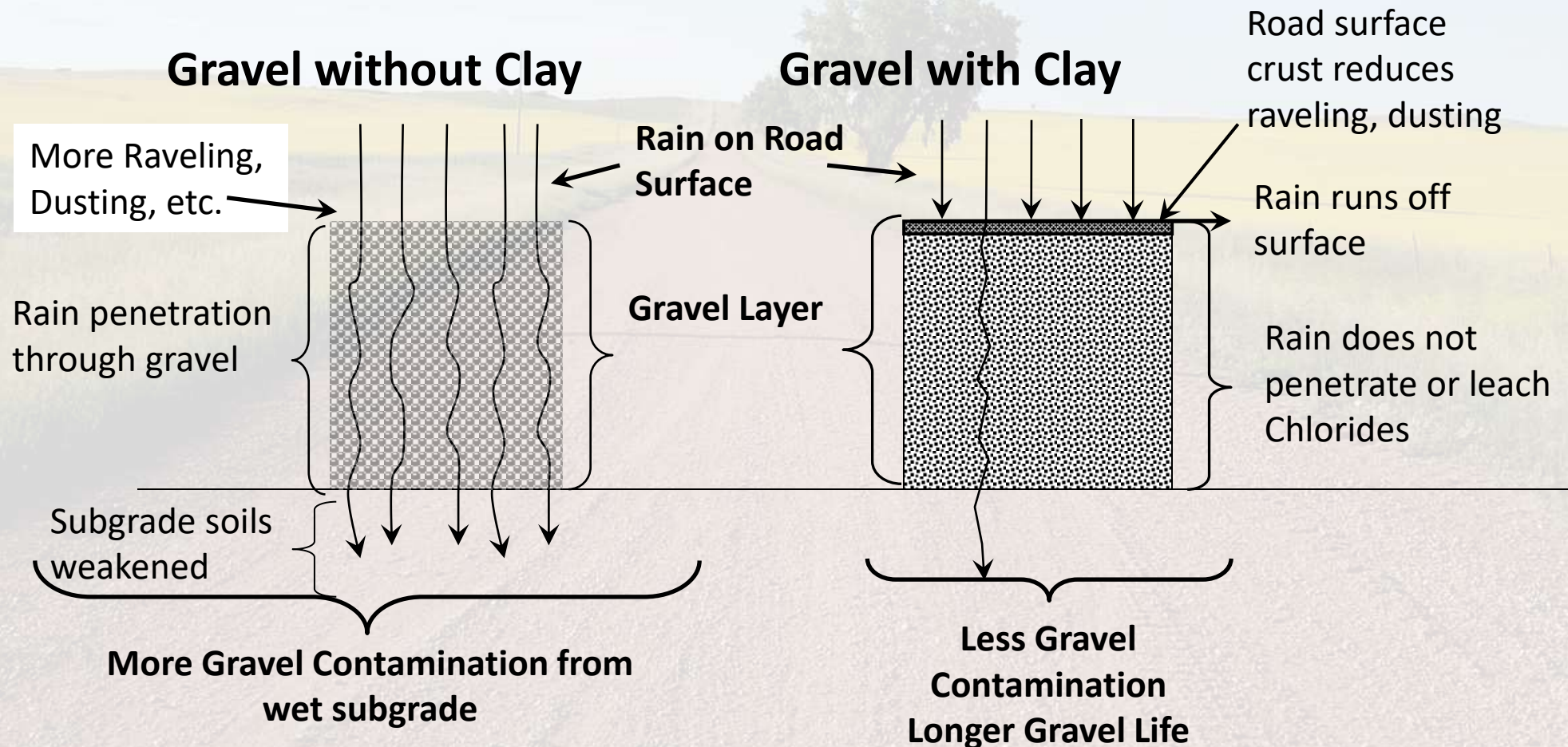


2% Bentonite &
1.5% Calcium
Chloride solved
extreme washboard
problems on 8%
grades

West Tensleep Road
Bighorn NF, Wyoming - 2006

Use chloride only if gravel contains enough clay for road crust

- Clay fills voids in gravel, forms road crust, sheds rain, retains chloride, etc.
- Chloride increases clay life by reducing dust



Always blade chloride treated gravel after rains, not before or during rain storms

- If compacted road surface is opened by blading, all rain is absorbed by chloride which takes days to dry out
- Tons of fines and chloride that build a road crust are removed by vehicle undercoating
- Public becomes irate
- Road crust life shortened
- More frequent blading is needed



Encourage road crew personnel to try out ideas that may solve problems & develop better practices

Take lots of photos so you end up with a few that show good comparisons – “a picture is worth a thousand words”

Calculation based on construction records

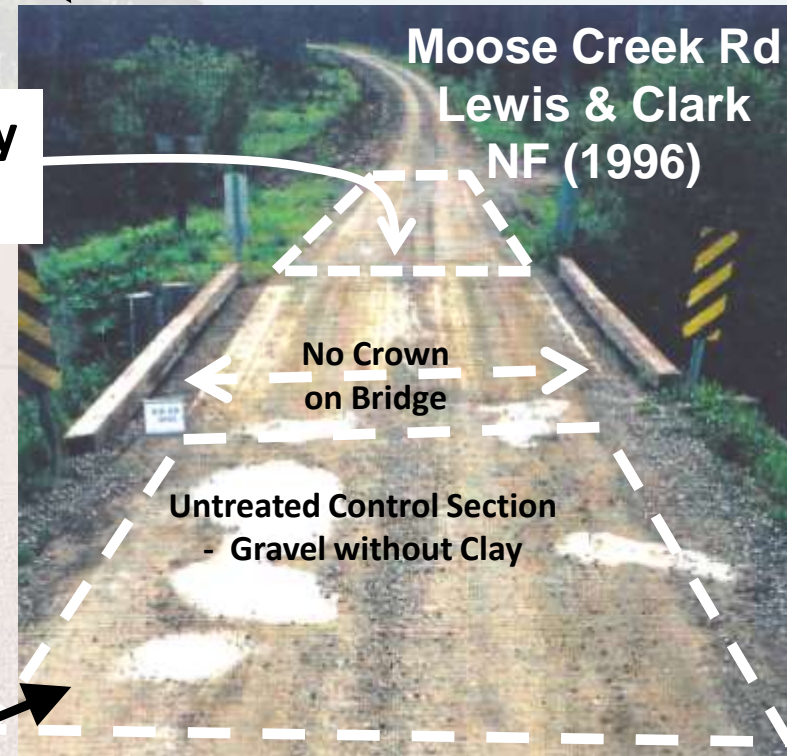
2.5% Bentonite Clay added to gravel

Run test for one year through wet and dry seasons

After one year, potholes in clay treated gravel were 30% of the volume in untreated gravel

Measure performance in some way

Always build untreated control sections using same construction practices



Thank You!

- Questions
- Comments

Contact Information

Steve Monlux 406-544-1919

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Dawson County Montana

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