ALTERNATIVES TO PAVING
TO CARRY HEAVY LOADS

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What are the Alternatives?

- Simply go back to gravel?
- Stabilized gravel?
- Thick base with Asphalt Surface Treatments?
  - Blotters
  - "Otta" Seals

How Big is the Problem?

What a change in 50 years!

Largest Deere tractor in 1953!

Today!

It’s not just agriculture

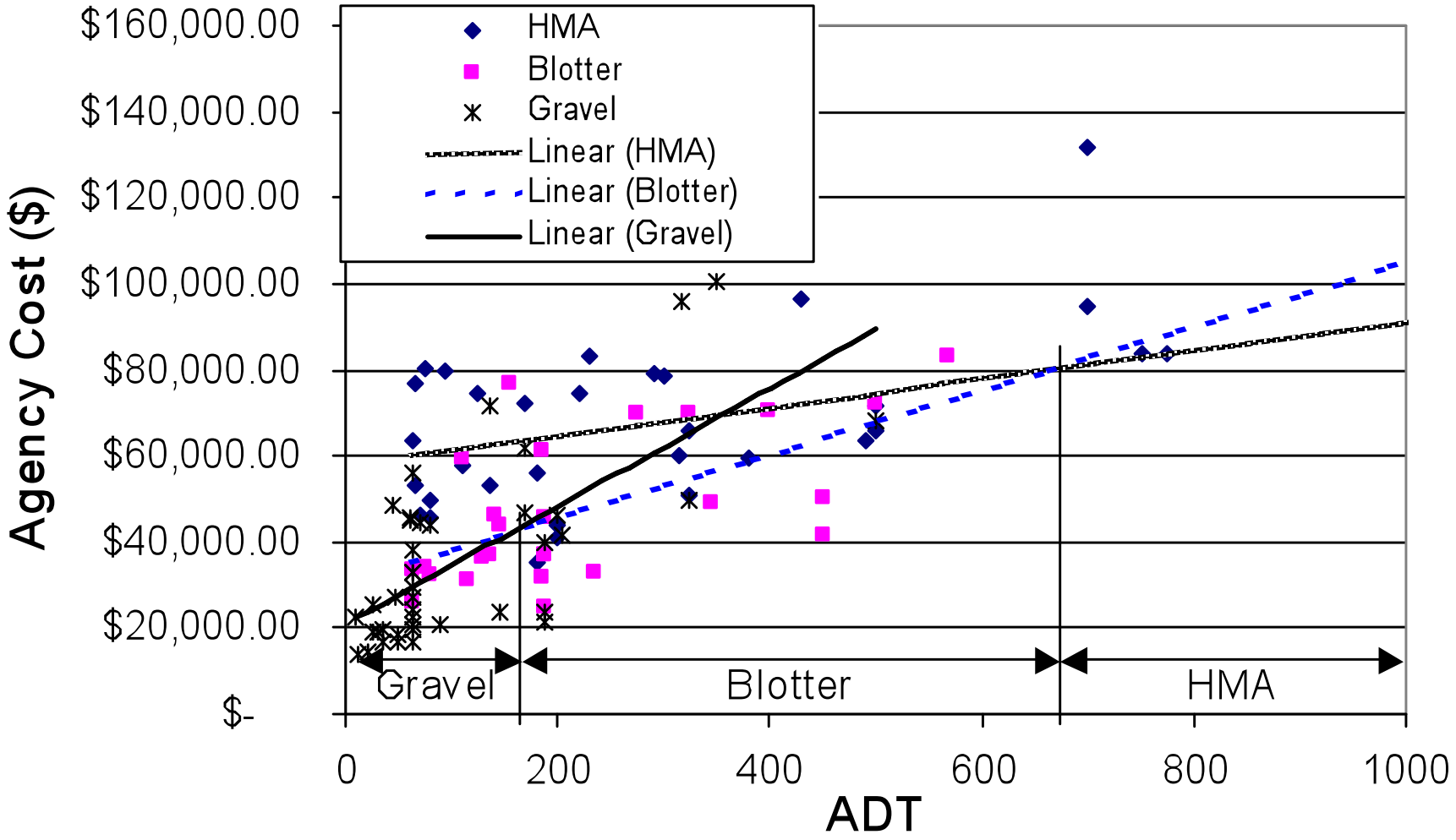
Is Going Back to Gravel the Right Decision?

- This decision needs very careful analysis.
- The SDDOT funded a study of surface selection for local government – completed in 2004.
- Study can be found online at: http://www.state.sd.us/Applications/HR19ResearchProjects/oneproject_search.asp?projectnbr=SD2002-10
- Please consider a very brief summary on the following slides ---

Local Road Surfacing Criteria Study
SDDOT Project 2002-10

- **Data provided by 26 counties (120 total roadway sections)**
- **20 yr life-cycle cost used in the Study.**
- **Three surface types analyzed:**
  1. **Gravel (Stabilized Gravel study also intended, but there was insufficient data for analysis).**
  2. **Blotter (Asphalt Surface Treatments – This in not pavement, but prime/chip seal on aggregate base)**
  3. **Hot-mixed Asphalt Pavement**

Data summary of gravel, blotter and HMA surfaces



SDDOT Project 2002-10 (Con’)

- **Summary:**
  - **Gravel suitable up to approx 170 ADT.**
  - **Blotter (Asphalt Surface Treatment) suitable up to approx 650 ADT.**
  - **Hot-mixed Asphalt Pavement is most cost effective thereafter.**

High volume traffic on common gravel surfacing – difficult for long term!

Deep Layer Needed to Carry Heavy Loads

From SDDOT *Rural Road Design, Maint, & Rehab Guide*

Table 4.2. Suggested gravel layer thicknesses for new or reconstructed rural roads.

Estimated daily no. of heavy trucks	Subgrade support condition[1]	Suggested minimum gravel layer thickness, mm (in)
0 to 5	Low	165 (6.5)
	Medium	140 (5.5)
	High	115 (4.5)
	Low	305 (12.0)
	Medium	230 (9.0)
	High	180 (7.0)
	Low	370 (14.5)
	Medium	290 (11.5)
	High	215 (8.5)

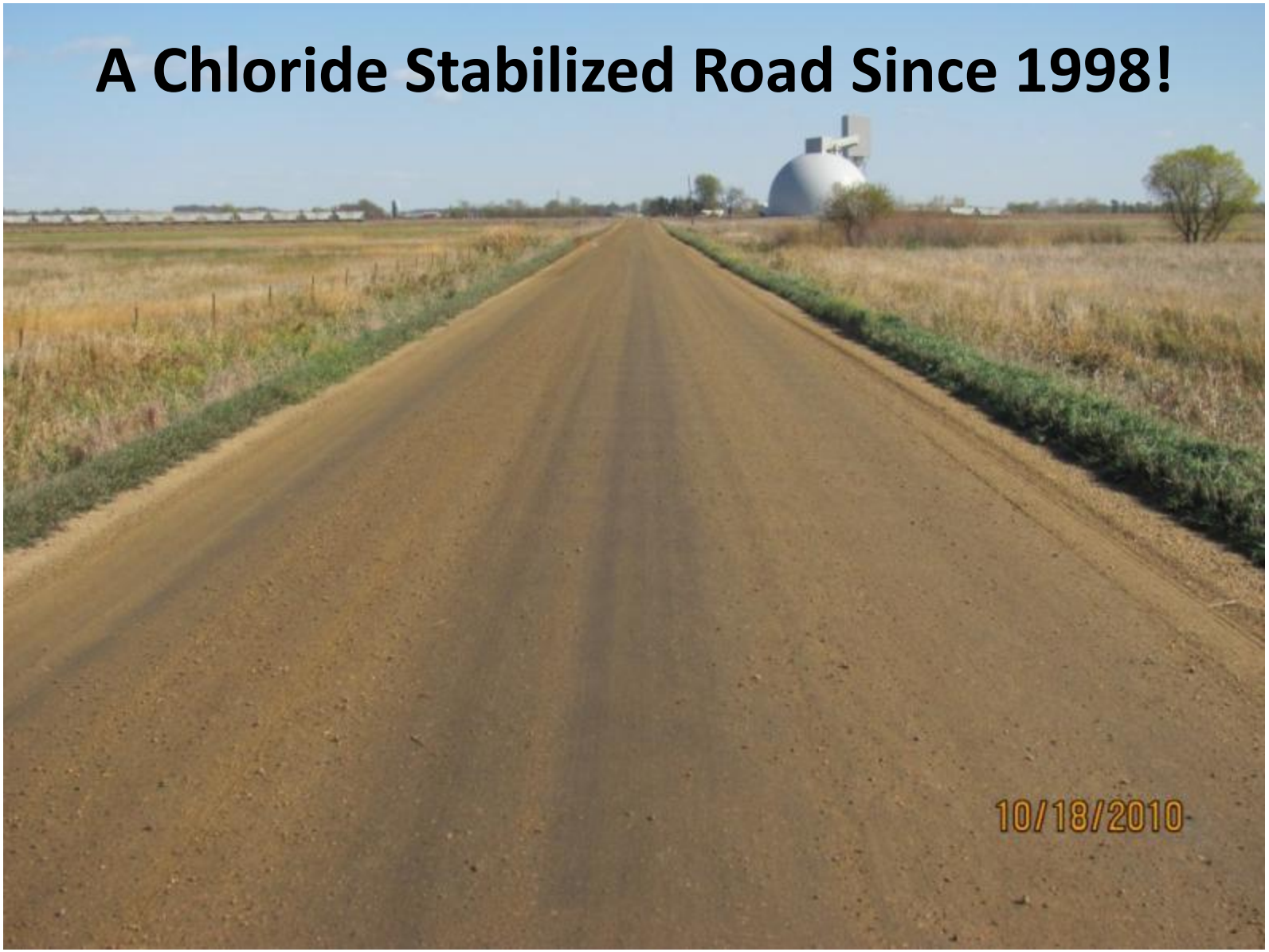
14.5 inches of gravel needed to carry 25 to 50 trucks per day over weak subgrade!

Notes. [1] Low subgrade support: average CBR ≤ 3 percent; medium subgrade support: 3 percent < average CBR ≤ 10 percent; high subgrade support: average CBR > 10 percent. [2] CBR = California Bearing Ratio of the in-place subgrade soils. Methods of estimating CBR are discussed in section 7 of this document.

An Alternative: Stabilized Gravel

- **Long term performance has been observed by SDLTAP on two roads in SD –**
  - **Lawrence County**
  - **Brookings Township**

Remarkable success with stabilized gravel



Portland Cement Railcar Offloading Facility

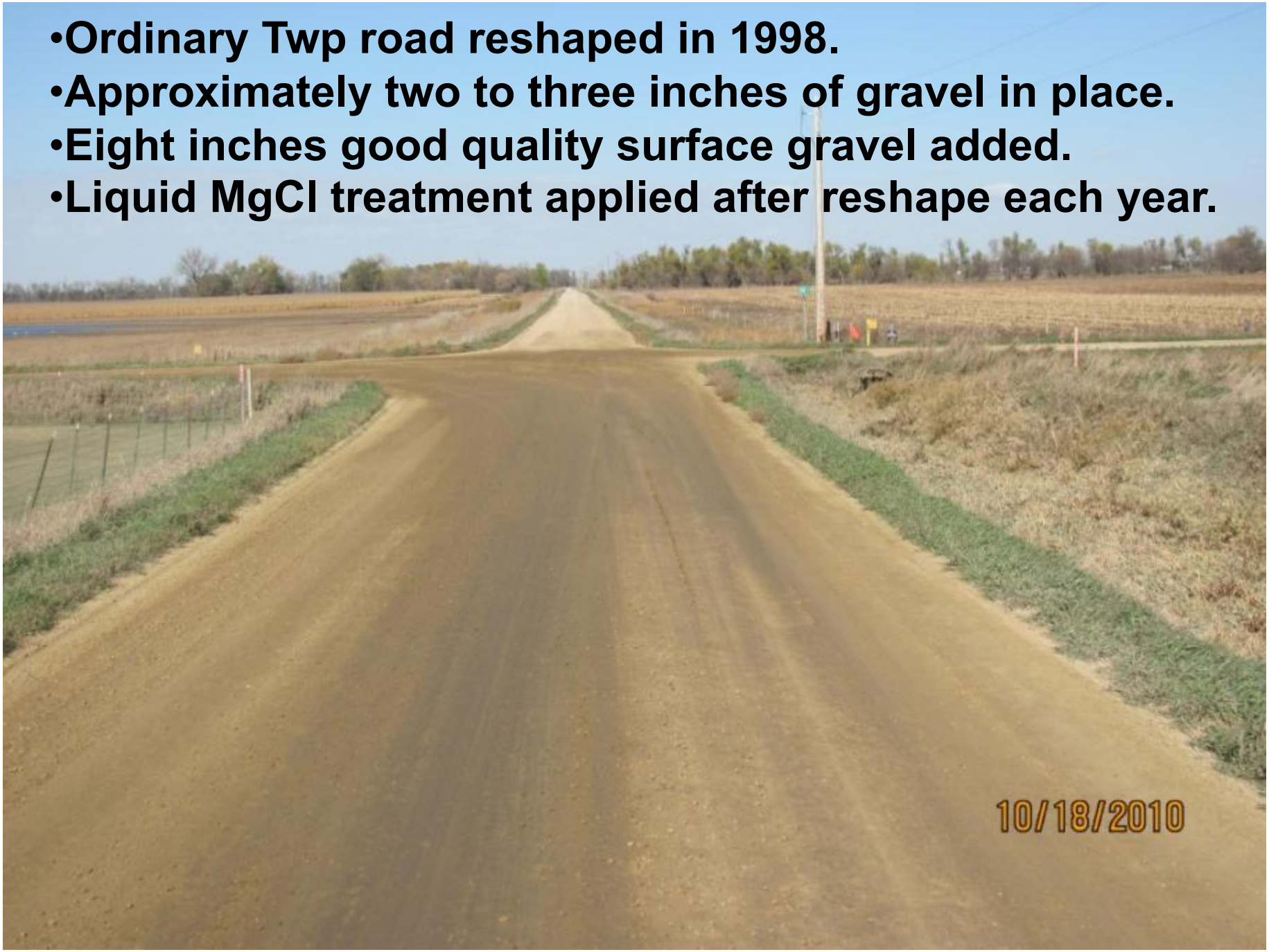
Seven-axle portland cement hauler being loaded.

Time in: 2:05PM

Time out: 2:12PM

The road carries up to 80 of these rigs per day.

Less than 200 tons of gravel replaced in 12 yrs!


•Ordinary Twp road reshaped in 1998.
•Approximately two to three inches of gravel in place.
•Eight inches good quality surface gravel added.
•Liquid MgCl treatment applied after reshape each year.
10/18/2010

Maitland Rd – Lawrence Co, SD

Heavy Residential Traffic & Continued Development

A Model of Successful Gravel Stabilization for 21 Years


Annual Treatment, Gravel Replacement and Blading has averaged $3600 Per Mile Annually in Past 5 years. (Preliminary)
10/21/2010

A High-End Treated Gravel Alternative: From Richland County, MT

Their Problems – Serving Heavy Oil/Gas Development and Agribusiness

Mixing Bentonite™ into Top Three inches of an Eight inch gravel layer.

Prototype Equipment being Tested for Accurate Application/Mixing


CAUTION
FLYING
DEBRIS
DANGER
ROTATING DRUM
STAY BACK

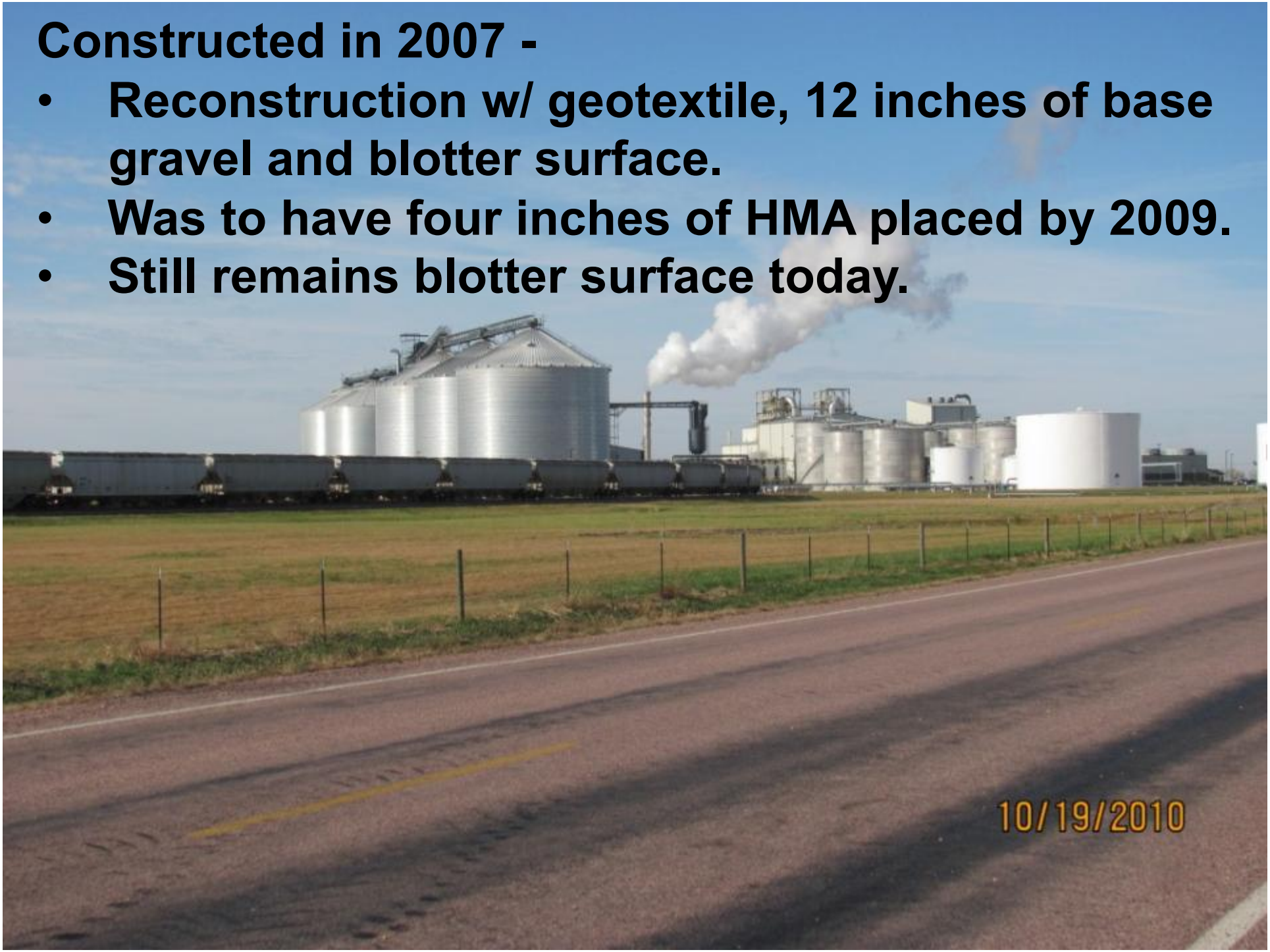
Also Testing Surface Treatment with CaCl2 in Pellet Form.

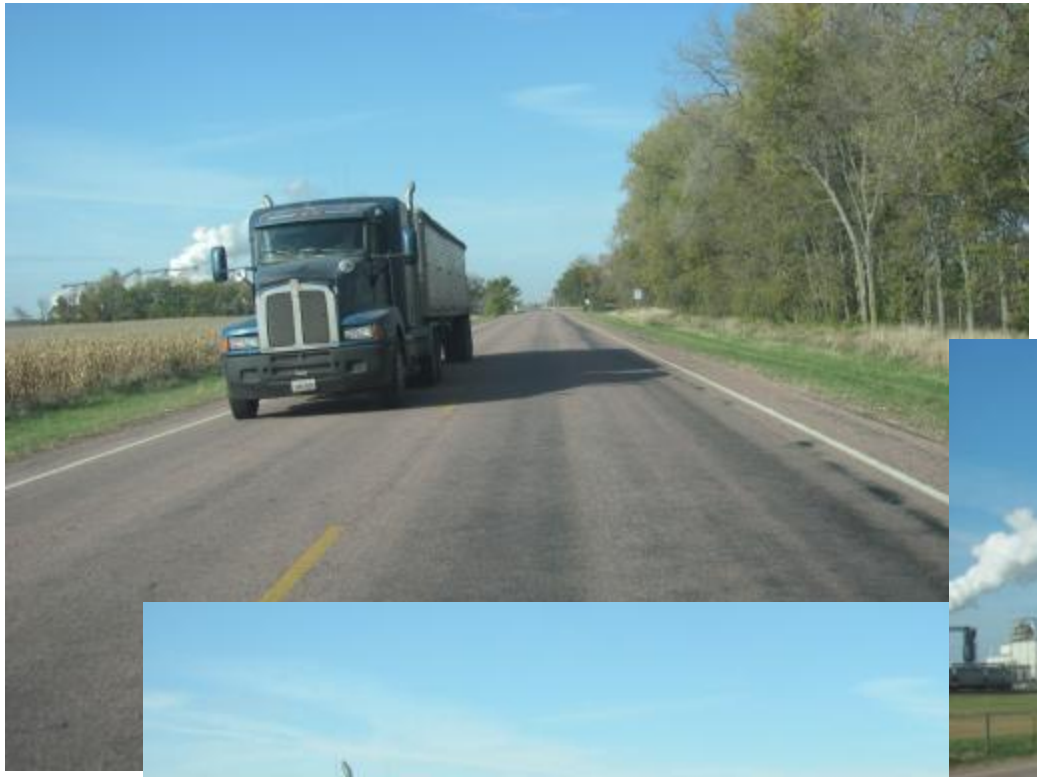
Initial Performance Has Been Outstanding on Three Test Sections

Update on Deep Base & Blotter Serving an Ethanol Plant in Davison County, SD

Constructed in 2007 -

- **Reconstruction w/ geotextile, 12 inches of base gravel and blotter surface.**
- **Was to have four inches of HMA placed by 2009.**
- **Still remains blotter surface today.**





Still carries up to 150 trucks per day

Performance overall good, but some distress is becoming a problem.

You have to build strong and deep today!

From SDDOT *Rural Road Design, Maint, & Rehab Guide*

Table 5.1. Suggested AC-Surfaced Pavement Thicknesses.

Road classification and	Subgrade	AASHTO	Aggregate base thickness (in)	Corresponding AC layer thickness (in)
			6.0, 8.0, or 10.0	6.5, 6.0, or 5.5
			6.0, 8.0, or 10.0	5.0, 4.5, or 4.0
			6.0, 8.0, or 10.0	3.5, 3.0, or 2.5
			8.0, 10.0, or 12.0	7.5, 7.0, or 6.5
			8.0, 10.0, or 12.0	6.0, 5.5, or 5.0
day in design lane)	High	27	8.0, 10.0, or 12.0	4.0, 3.5, or 3.0
Heavy truck traffic	Low	4.19	10.0, 12.0, or 14.0	9.0, 8.5, or 8.0
(50 to 200 heavy trucks per	Medium	3.55	10.0, 12.0, or 14.0	7.0, 6.5, or 6.0
day in design lane)	High	2.82	10.0, 12.0, or 14.0	5.0, 4.5, or 4.0

>50 heavy trucks daily require 14 inches of base with 6 inches of HMA if subgrade has at least medium strength

Notes. [1]Low subgrade support: average CBR[2] ≤ 3%; medium subgrade support: 3% < average CBR ≤ 10%; high subgrade support: average CBR > 10%. [2]CBR = California Bearing Ratio (CBR) of the in place subgrade soils. Methods of estimating the CBR of a subgrade soil are provided in section 7 of this document.

Otta Seals – Another Alternative

Carries approx 375 ADT, 30% Heavy Trucks.

Soy Oil Processing Byproduct – Dust Palliative AgFirst Grain Elevator in Aurora, SD

Caution on Blotter/Otta Seal Construction

- **Only works on deep base and stable subgrade.**
- **How deep?**
  - **Depends on truck traffic and subgrade soil condition.**
  - **Could require up to 20 inches of base depth!**

Summary:

- **The decision to convert a paved road to gravel needs very careful planning:**
  - **Life cycle cost analysis may show it wasn't the cheapest alternative if ADT is over 170, but also if truck traffic is high.**
  - **Blotter on deep base may be a good alternative.**
  - **Stabilized gravel is a viable alternative, but there is much yet to learn about this – lack of good life cycle data on these surfaces.**
  - **Go in with your eyes wide open!!!**