

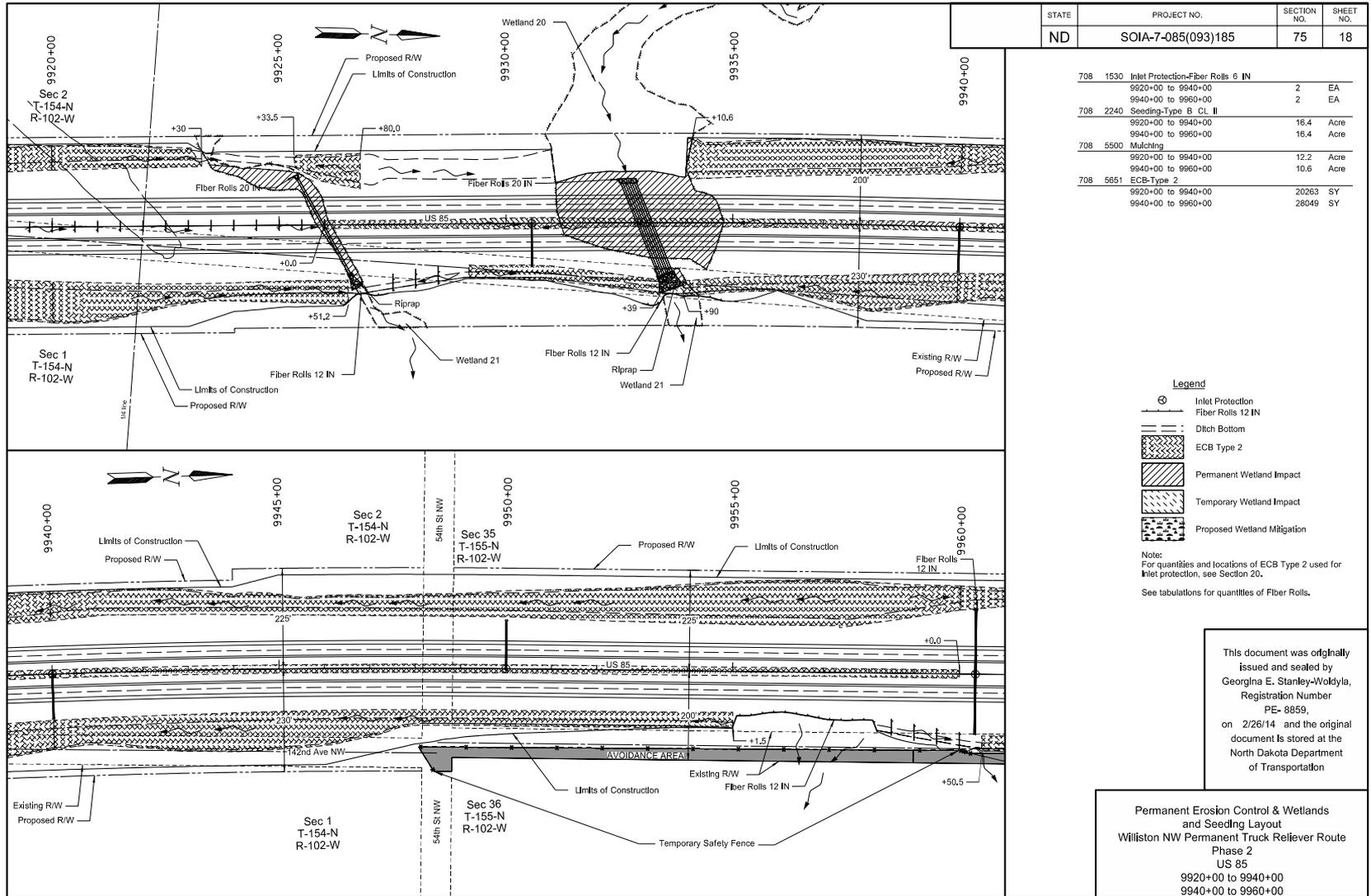
What Were They Thinking?

The Design of Temporary Erosion
Control BMPs

What Were They Thinking?

- Williston Hwy 2/85 bypass
- Temporary erosion control design
- Challenges
 - Rolling sometimes steep topography
 - New roadway through undeveloped land
 - Natural channels, wetlands
 - Sand Creek, Camp Creek
 - Goal: Keep soil in place to protect waters of the state

What Were They Thinking?



What Were They Thinking?

| Spec | Code | Item Description | Unit | Quantity | Unit Cost | Total Cost |
|------|------|---|------|----------|-------------|---------------|
| 708 | 1375 | Flotation Silt Curtain | LF | 557 | \$ 15.00 | \$ 8,355.00 |
| 708 | 1376 | Removal Flotation Silt Curtain | LF | 557 | \$ 3.00 | \$ 1,671.00 |
| 708 | 1410 | Fiber Rolls 6IN | LF | 1,266 | \$ 3.00 | \$ 3,798.00 |
| 708 | 1411 | Removal Fiber Rolls 6IN | LF | 1,266 | \$ 3.25 | \$ 4,114.50 |
| 708 | 1430 | Fiber Rolls 12IN | LF | 37,781 | \$ 3.25 | \$ 122,788.25 |
| 708 | 1431 | Removal Fiber Rolls 12IN | LF | 12,504 | \$ 3.50 | \$ 43,764.00 |
| 708 | 1460 | Fiber Rolls 20IN | LF | 782 | \$ 3.25 | \$ 2,541.50 |
| 708 | 1461 | Removal Fiber Rolls 20IN | LF | 391 | \$ 3.50 | \$ 1,368.50 |
| 708 | 1530 | Inlet Protection-Fiber Roll 6IN | EA | 66 | \$ 100.00 | \$ 6,600.00 |
| 708 | 1532 | Removal Inlet Protection-Fiber Roll 6IN | EA | 33 | \$ 10.00 | \$ 330.00 |
| 708 | 1540 | Inlet Protection-Special | EA | 2 | \$ 150.00 | \$ 300.00 |
| 708 | 1541 | Remove Inlet Protection-Special | EA | 2 | \$ 50.00 | \$ 100.00 |
| 708 | 2240 | Seeding-Type B-CI II | Acre | 303.4 | \$ 450.00 | \$ 136,530.00 |
| 708 | 2260 | Seeding-Type B-CI IV | Acre | 320.3 | \$ 100.00 | \$ 32,030.00 |
| 708 | 2331 | Seeding-Type B-Special | Acre | 2.2 | \$ 5,000.00 | \$ 11,000.00 |
| 708 | 2280 | Seeding-Type B-CI V | Acre | 17.1 | \$ 450.00 | \$ 7,695.00 |
| 708 | 2531 | Seeding-Type C-Special | Acre | 4.1 | \$ 5,000.00 | \$ 20,500.00 |
| 708 | 3000 | Topsoil for Type C Seeding | CY | 1,613 | \$ 70.00 | \$ 112,910.00 |
| 708 | 5500 | Mulching | Acre | 569.3 | \$ 500.00 | \$ 284,650.00 |
| 708 | 5651 | ECB Type 2 | SY | 348,597 | \$ 2.50 | \$ 871,492.50 |
| 708 | 5653 | ECB Type 4 | SY | 3,710 | \$ 4.00 | \$ 14,840.00 |
| 708 | 8500 | Stabilized Construction Access | EA | 2 | \$ 3,000.00 | \$ 6,000.00 |
| 708 | 8501 | Removal Stabilized Construction Access | EA | 2 | \$ 400.00 | \$ 800.00 |

What Were They Thinking?

- Is this overkill?
- Is there a method to the madness?

Answer: Yes!



What Were They Thinking?

- Purpose:

Provide insights into what it takes to design temporary erosion control.

- Rule of thumb/general guidelines/standards

Ex. 3:1 slopes, culvert outlets, bioroll spacing

- Design

Ex. concentrated flow, channel lining

References: HEC-15, NDDOT Erosion Control Manual

What Were They Thinking?

Soil management:

- Soil erosion
- Sediment management

Primary Goal: Keep soil in place

How to keep it in place...

- Concept: Shear-stress
- Application: Bare soil just after final grading

What Were They Thinking?

Shear:

- Hydrodynamic force of water flowing in a channel.
 - Effective shear
 - Permissible shear

Simple Equation:

$$\tau = \gamma d S_0$$

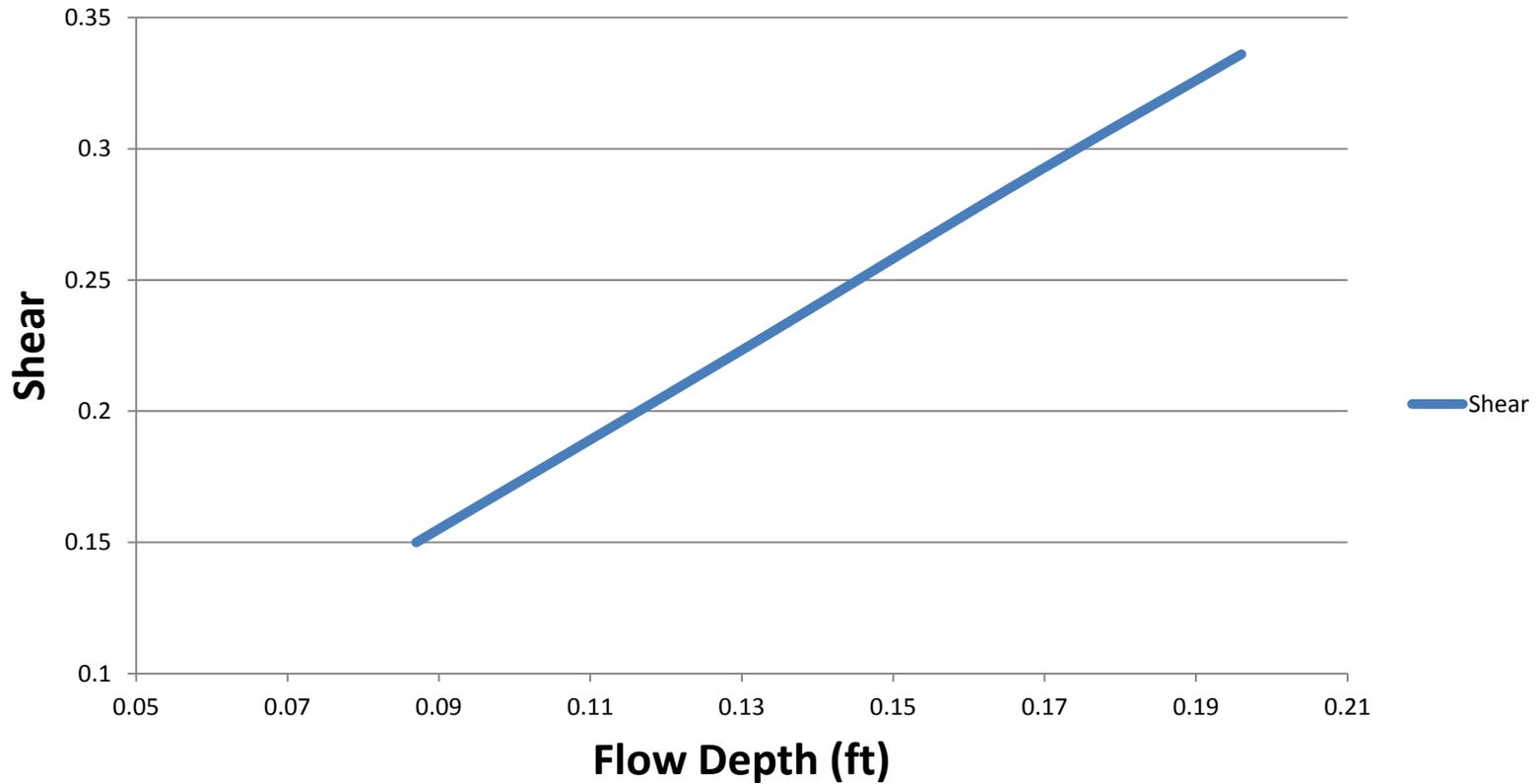
γ = weight of water

d = flow depth

S_0 = slope

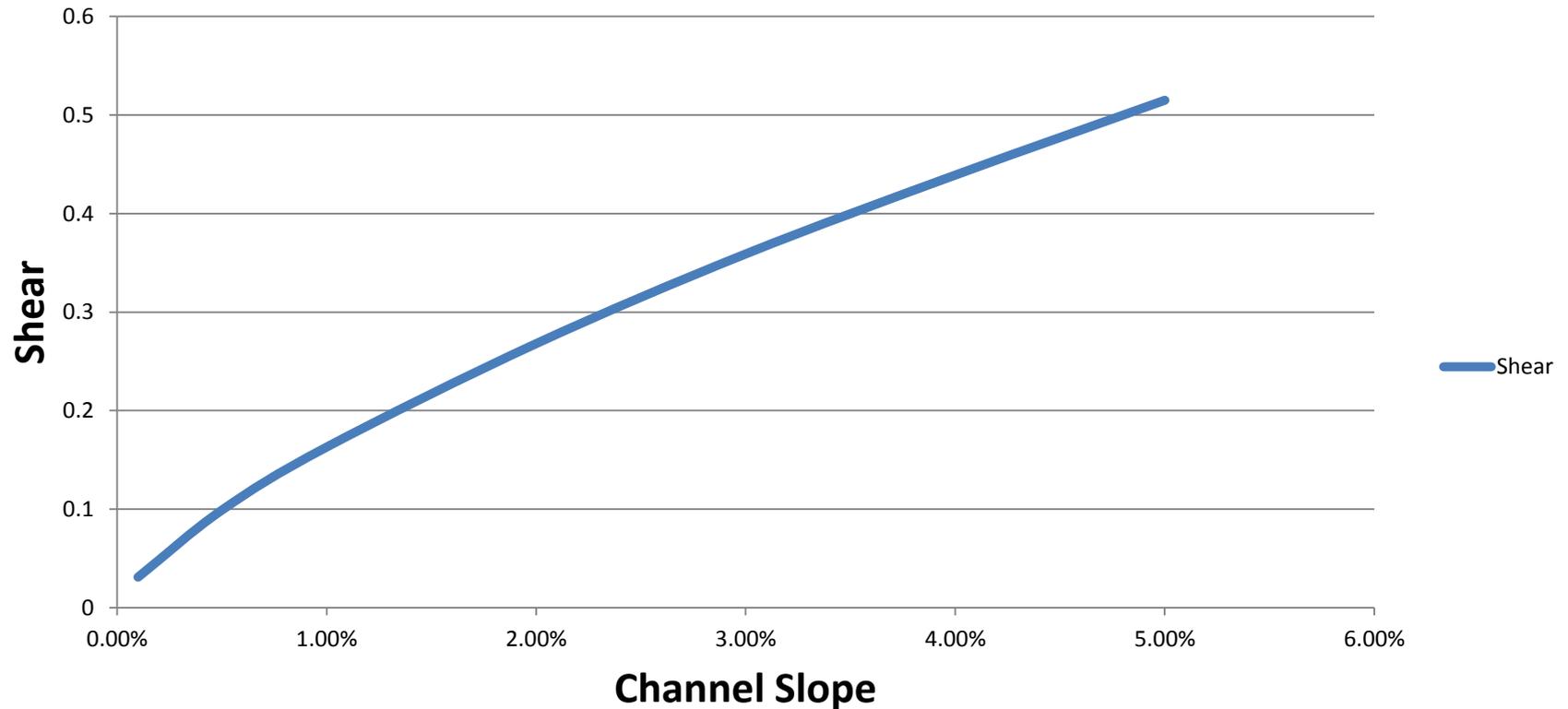
What Were They Thinking?

Shear vs Flow Depth
(Slope constant, flow varied)

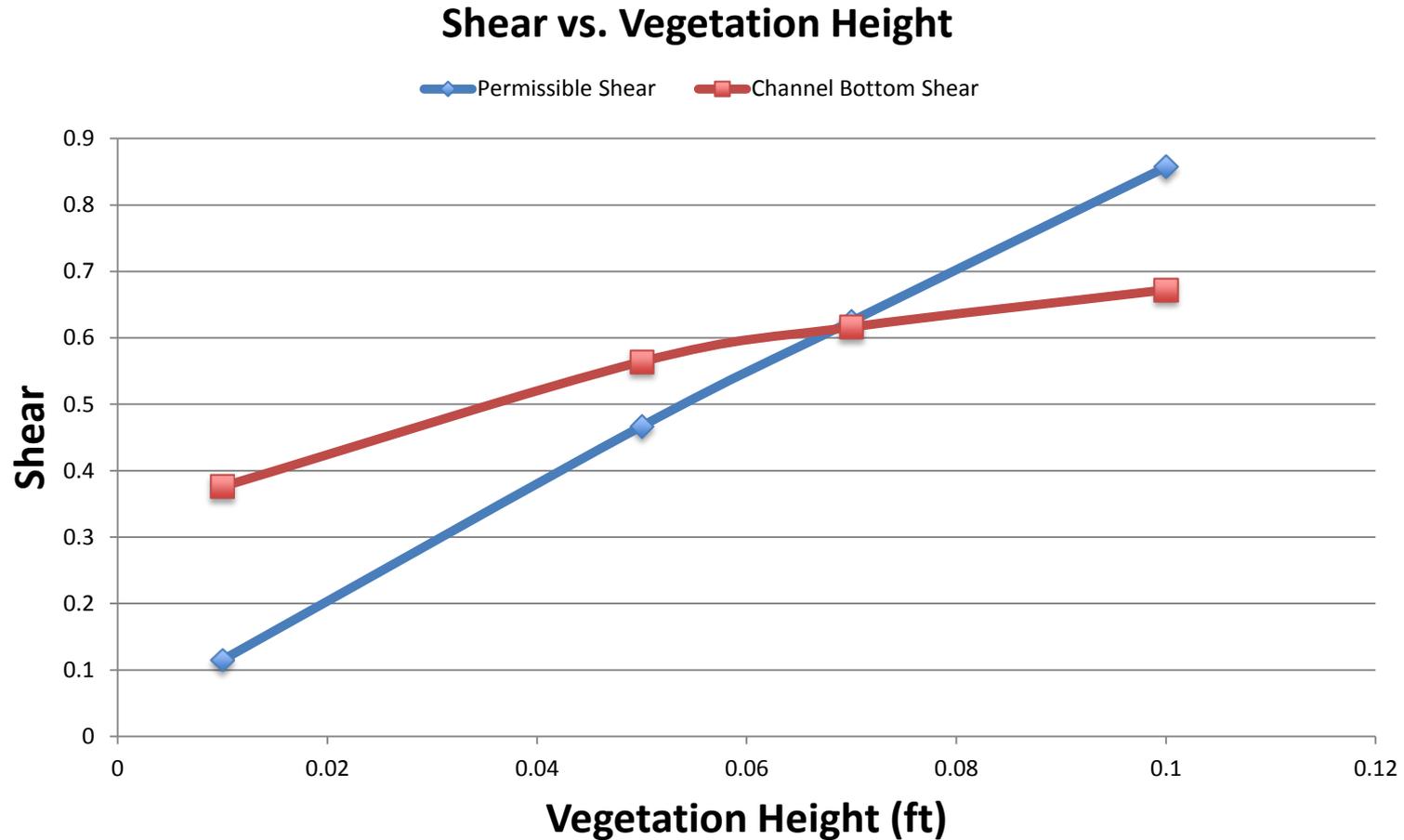


What Were They Thinking?

Shear vs Slope
(constant flow)

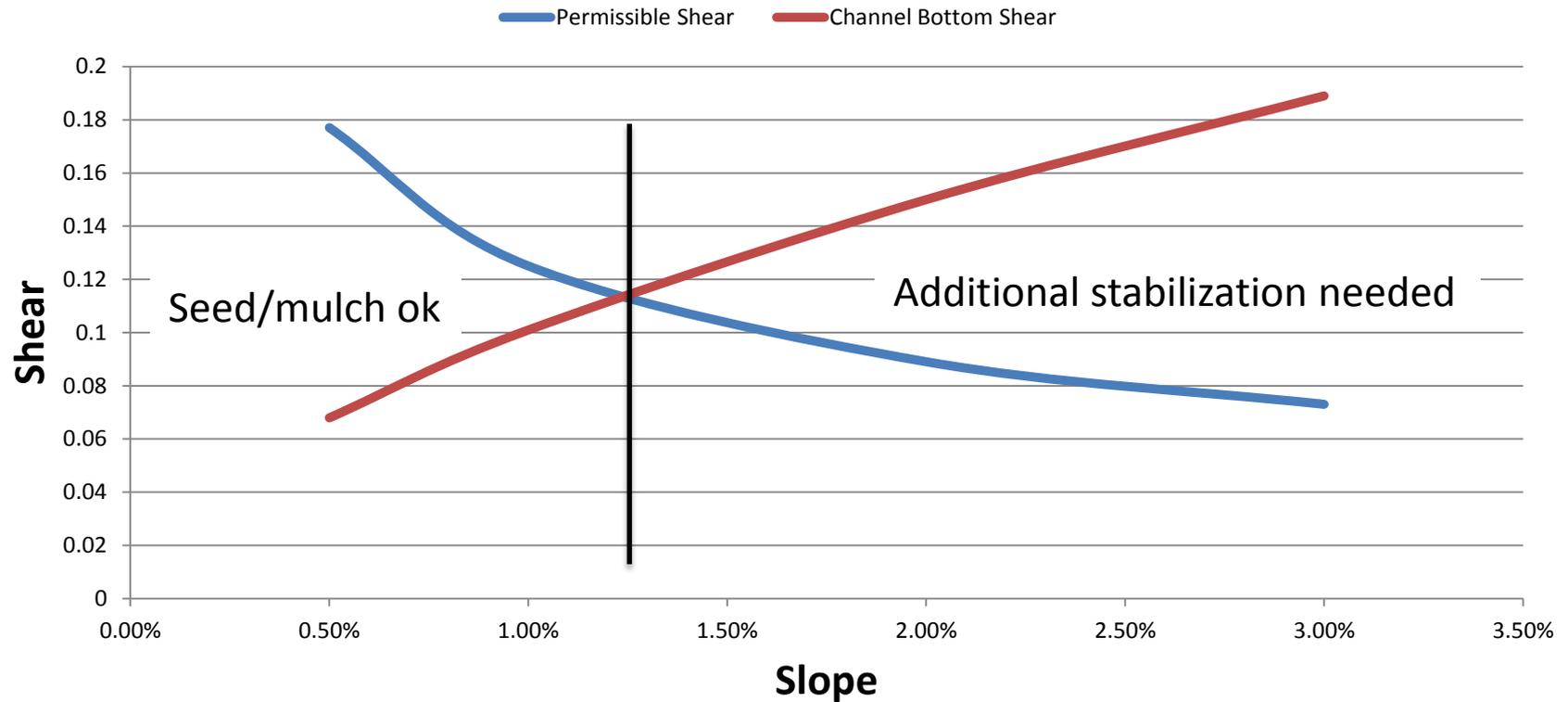


What Were They Thinking?

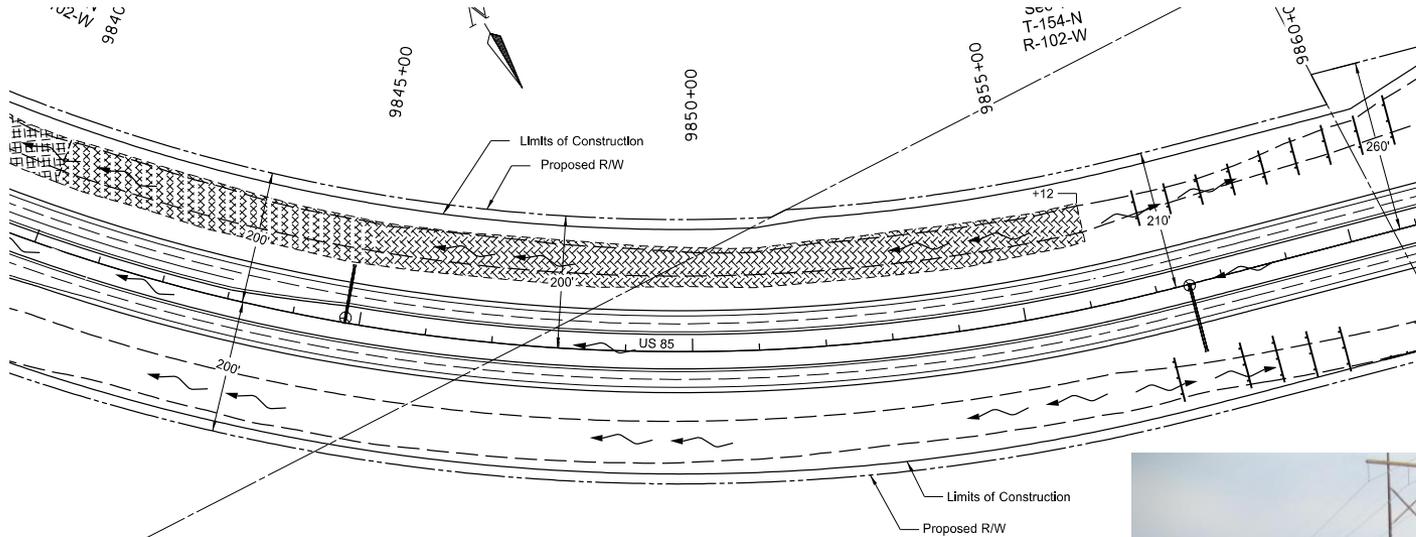


What Were They Thinking?

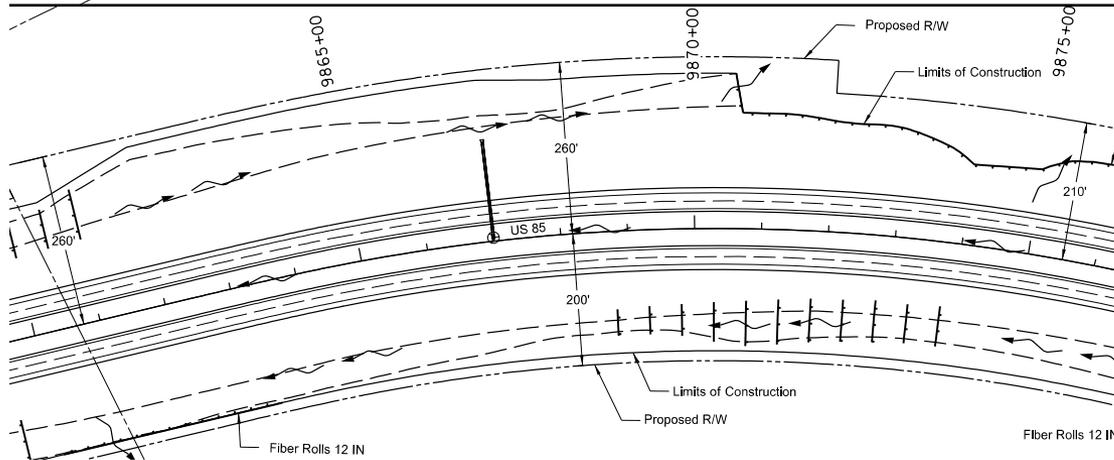
**Shear vs. Slope
(no vegetation establishment yet)**



What Were They Thinking?



| | | |
|-----|------|-----------------------------------|
| 708 | 1530 | Inlet Protection-Fiber Rolls 6 IN |
| | | 9840+00 to 9860+00 |
| 708 | 2240 | Seeding-Type B, CL II |
| | | 9840+00 to 9860+00 |
| | | 9860+00 to 9880+00 |
| 708 | 5500 | Mulching |
| | | 9840+00 to 9860+00 |
| | | 9860+00 to 9880+00 |
| 708 | 5651 | ECB-Type 2 |
| | | 9840+00 to 9860+00 |



That's What They Were Thinking!

Sometimes it's a challenge...



That's What They Were Thinking!

But usually its pure magic ...



That's What They Were Thinking!

Thank you!

Questions?