

# ***Real Time Monitoring of Subsidence along I-77 Summit County, Ohio***

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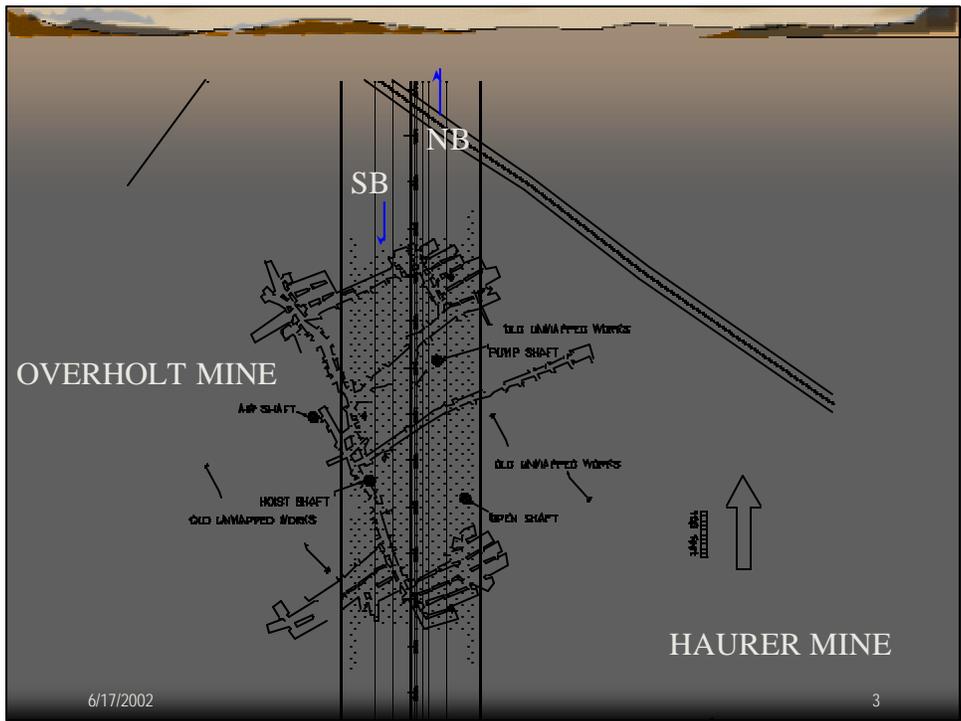
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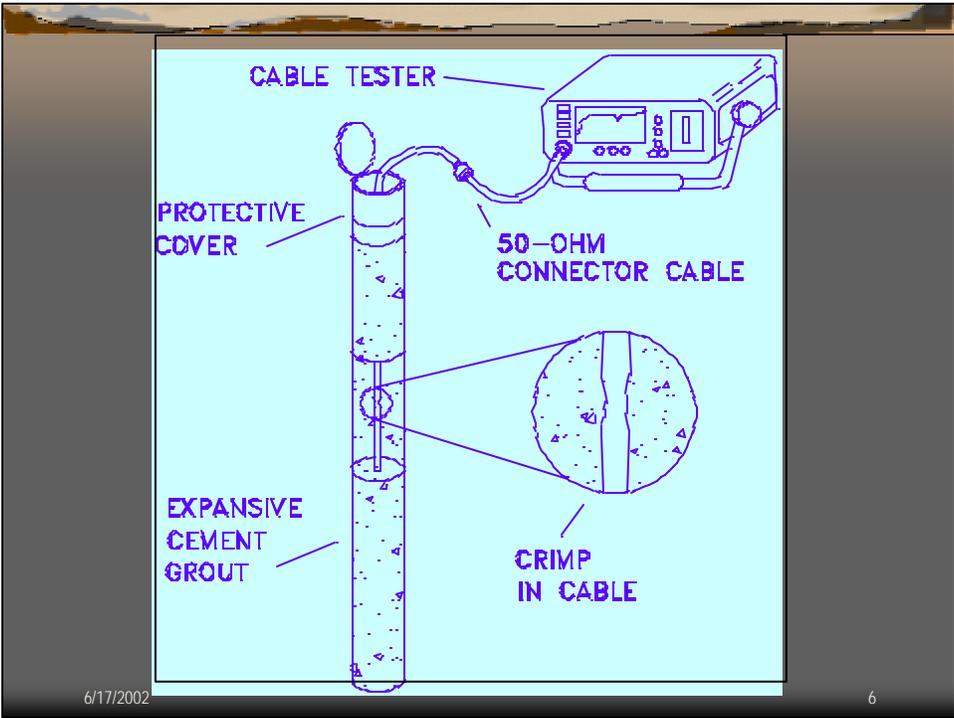
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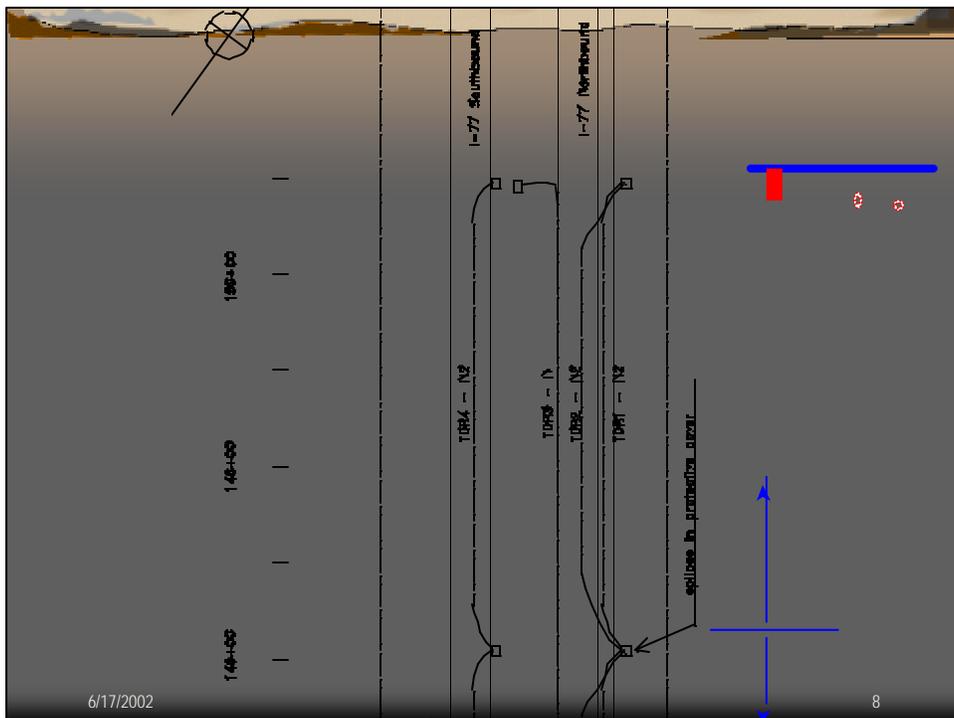
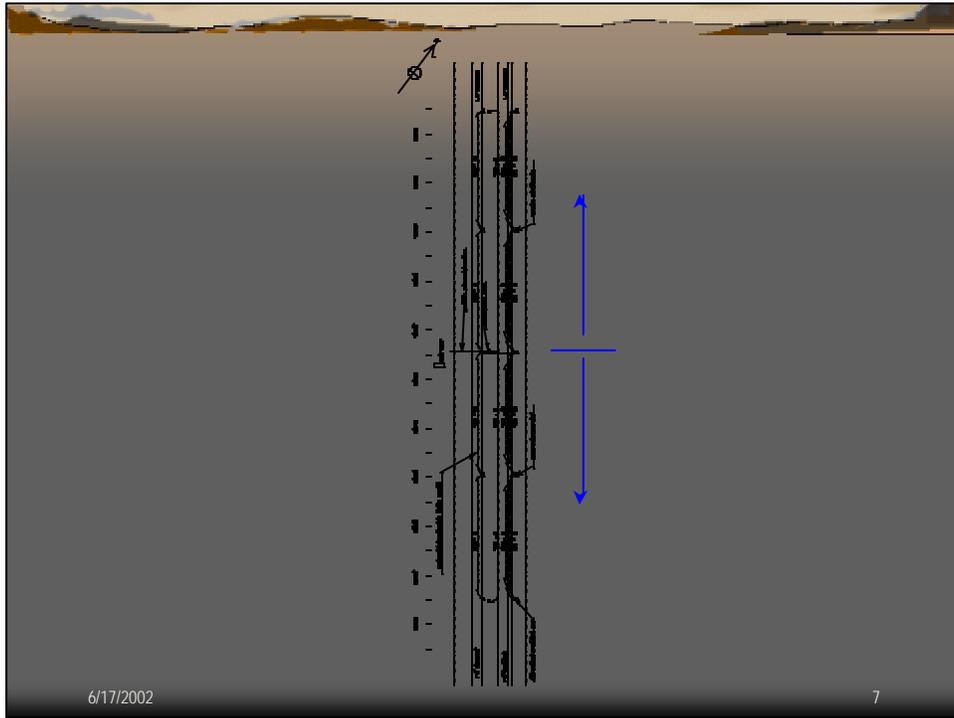


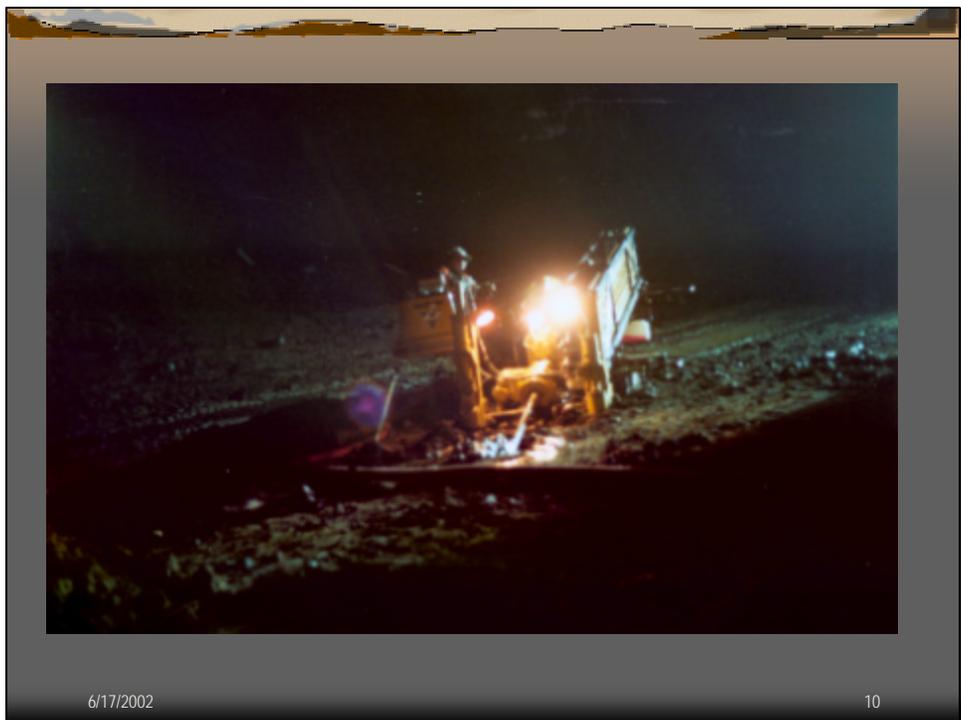
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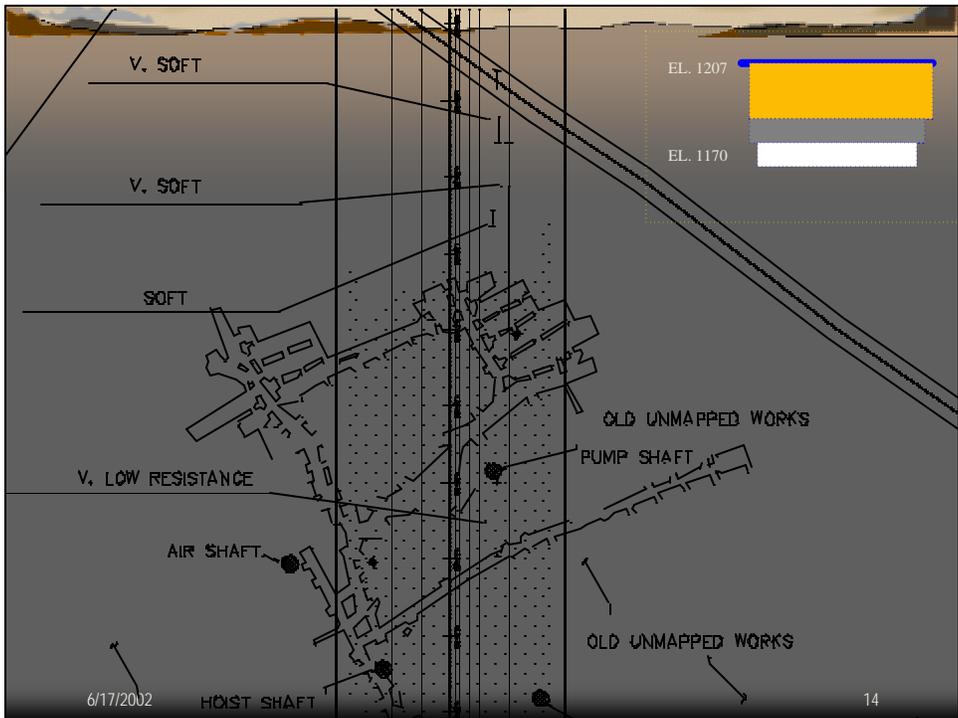


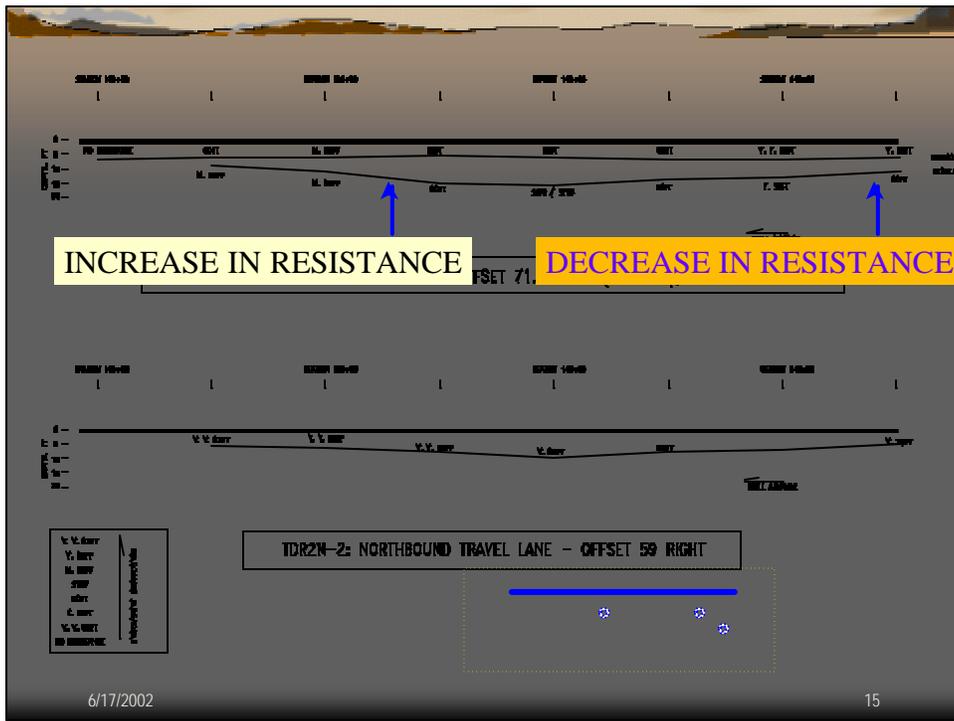


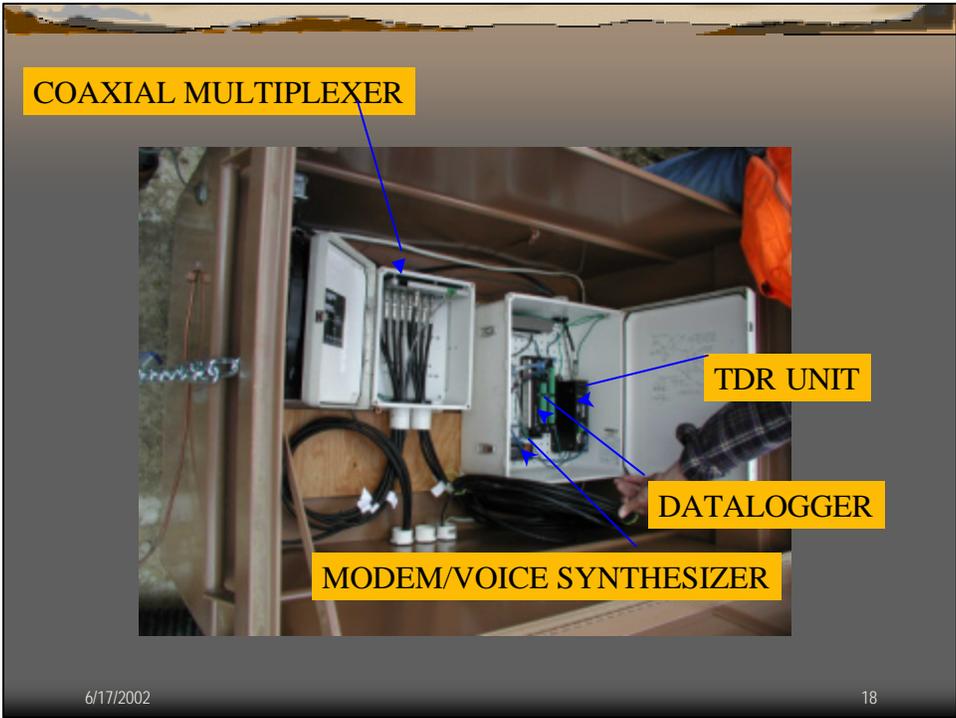










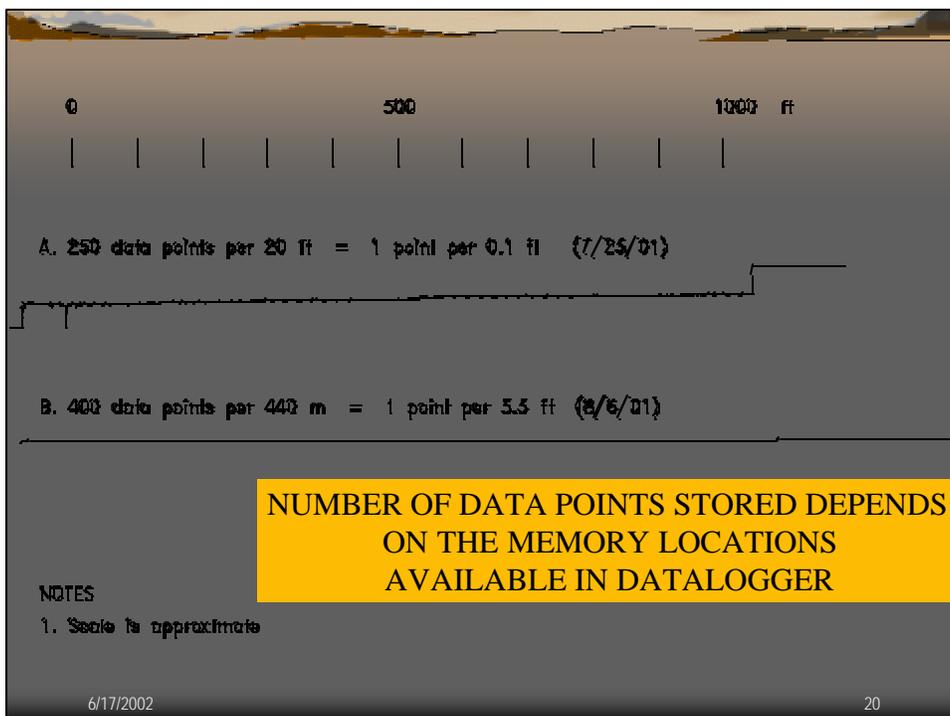


## REAL TIME MONITORING

- Real time, automated monitoring versus periodic manual monitoring
- Datalogger compares data against baseline
- Call back alarm
- "Event below location \_\_\_\_ at \_\_\_\_ ft from datalogger"

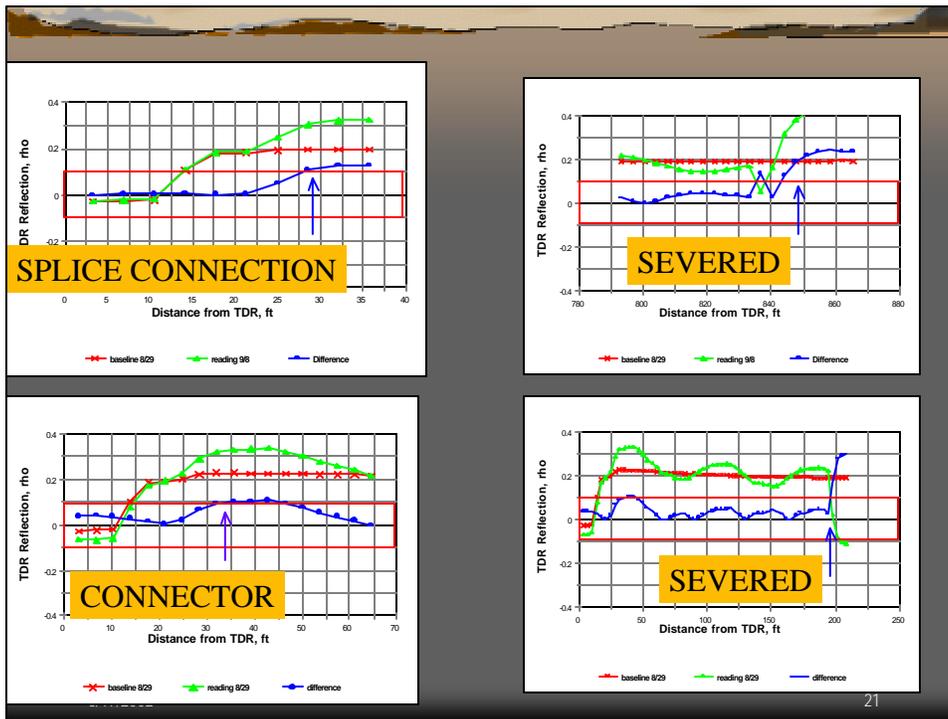
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19



6/17/2002

20



21

## Summary and Conclusions

### What did OHDoT Expect ?

- ☞ Plan of Action: grouted cable severed after 1 inch of movement, site personnel alerted, conduct geophysical survey, don't shut down road
- ☞ Horizontal directional drilling can be easily controlled
- ☞ System installed and running within 10 days
- ☞ GeoTDR takes the call

6/17/2002

22

## Summary and Conclusions

### What did OHDoT Get ?

- ✍ Horizontal drilling cannot be easily controlled
- ✍ Horizontal drilling does provide a good assessment of changes over lateral extent
- ✍ Took 3 weeks to get automated system operational
- ✍ Did not detect near surface movement in soft soil
- ✍ Did not detect any movement when trench undercut
- ✍ Alarm sounded when cable severed
- ✍ Good correlation with construction activity

6/17/2002

23

## Summary and Conclusions

### What was learned ?

- ✍ Viable to install coaxial cable in horizontal holes
- ✍ Answering phone gets old, need automated data acquisition and real time status to minimize "burn out"
- ✍ Analysis of TDR waveforms was a critical component of action plan...commitment requires chargeable time
- ✍ resistance to making modifications once system was up and running....wanted to minimize increases in alarm levels do to minimize risk of not detecting movement

6/17/2002

24

## Summary and Conclusions

### What was learned ?

- ✍ It was viable to install cable in horizontal holes but pulling cable was not a certainty
- ✍ Grouting may require far more sophistication than could be expected from average contractor...alternative grout placement schemes may require an 8-in. hole diameter
- ✍ Pump was the limitation...however other components of drilling system precluded pumping grout
- ✍ 2 ft thickness of CDF backfill created a "stiff" beam
- ✍ HDD 7800 ft cost \$156,000 (\$20/ft)
- ✍ trench and backfill 2000 ft cost \$14,000 (\$7/ft)

6/17/2002

25