Real Time Monitoring of Subsidence
SR2, Ottawa County, Ohio

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Geohazards Impacting Transportation in the Appalachian Region
Beckley, West Virginia, August 2012
Site Location and Conditions
Certainteed Mine
Abandoned 1930

U. S. Gypsum Mine
Abandoned 1977
STA 1280+00
STA 1331+00
STA 1336+26
STA 1345+79
DAS1 STA 1307+05
DAS2 STA 1345+79
TDR Principle, Trenching, and Cable Installation
Cables can be grouted into boreholes or trenches to monitor deformation.
TDR System
System Calibration
SR2 Westbound Travel Lane STA 1307+05 to 1280+02
West of DAS1 (Cable WBT-1W)

Reflection Magnitude (ρh)

0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 0.5

STA 1307+05 85 Lt
DAS1

STA 1280+02 69 Lt
total length 2770 feet

STA 1301+78 70 Lt
splice

crimps
Activity Monitoring
Real Time Monitoring with Time Domain Reflectometry (TDR)

Kevin M. O'Connor, Ph.D., P.E.
GeoTDR, Inc.
Westerville, Ohio
www.geotdr.com
Activity near Westbound STA 1345+00
SR2 Westbound Passing Lane STA 1345+79 to 1336+26
DAS2 (Cable WBP-2)

STA 1345+79  22 Lt Splice

Activity at 232 ft (70.78 m)
STA 1344+63

Reflection Magnitude (ft/ft)

Distance (ft)

11-Nov-11
Splice open
8-Feb-12

8/3/2012
SR2  Westbound Travel Lane STA 1345+79 to 1335+98
DAS2  (Cable WBT-2)

STA 1345+79  107 Lt DAS2

STA 1335+98  107 Lt total length 981 feet
SR2 Westbound Travel Lane STA 1345+79 to STA 1335+98
DAS2 (Cable WBT-2)

Activity at 199 ft (60.6m) STA 1343+80

STA 1345+79 107 Lt
DAS2

Reflection Magnitude (rho)

Distance (ft)
Activity at STA 1343+80

MINED VOIDS AT 95 TO 105 FT BELOW SURFACE

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Activity at STA 1344+63
Action Plan

- At preset times or whenever a user wishes, the TDR cables are interrogated and the data is compared to a baseline that is stored in the data logger.

- At any location where the difference between the baseline and the current reading exceeds a predetermined magnitude an entry is made in an activity log.
Action Plan (cont)

- The Activity Log file of each cable will be a running list of cable deflection events that exceed the magnitude criterion.

- The TDR system will send out a Notification of Alert when it has detected cable deflection that meets alert levels based on criteria programmed in the data logger.

- Alerts will be in the form of emails.
Criteria for Levels of Alert will be based on the amount of deflection, and the rate of change of deflection when assigning an alert level.

The Ohio DOT will develop action plans (response, remediation, and further investigation) based on the level of alert, on-site evaluation and log file evaluation.