

Interstate 20 Improvements near Birmingham, Alabama. A Case History in Innovative Teamwork, Project Safety and Final Results

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Introduction

‘Nothing in life is so exhilarating as to be shot at without result.’

Winston Spencer Churchill





Overview

- Aging Interstate rock slopes
- Past blasting practices and legacy issues
- Non-Geotech Design Review on Improvements
- Non-Construction Interests
- I-20 Design Development
- Rock Slope Concerns
- Design/Construction Modifications
- What was going to happen happened – *without result.*
- Acknowledgements – why it worked



Aging Interstate Rock Slopes





Aging Interstate Rock Slopes





Aging Interstate Rock Slopes



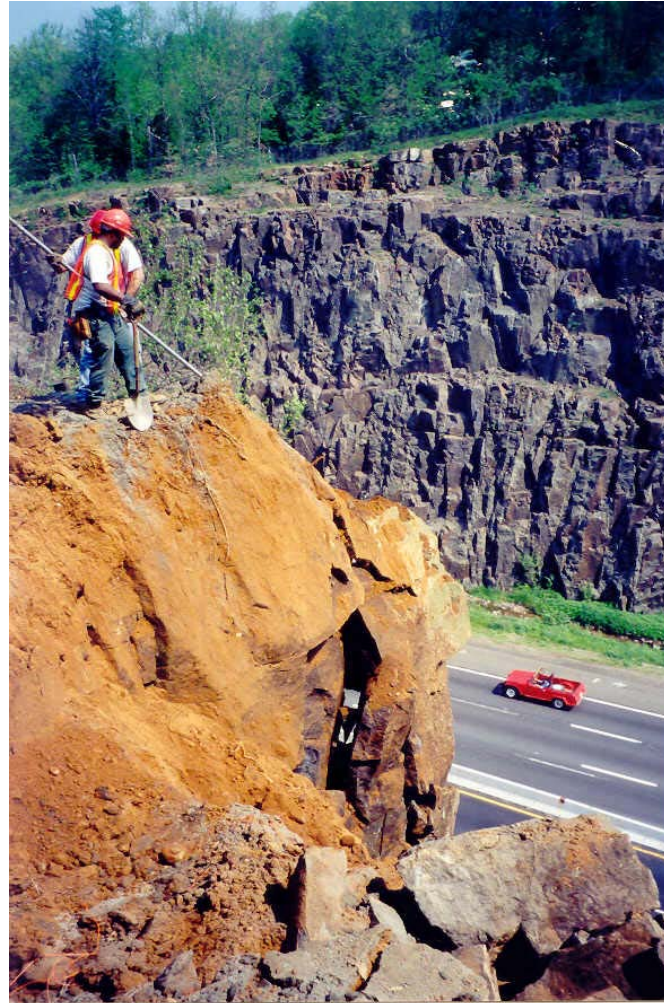


Past Blasting Practices and Legacy Issues





Past Blasting Practices and Legacy Issues





Past Blasting Practices and Legacy Issues





Past Blasting Practices and Legacy Issues

I-287/87 rebuilding begins



Photos by Seth Harrison/The Journal News

New York State Thruway Authority crews clean up crushed rock and debris yesterday on Interstate 87 at the Interstate 287 split after the first round of rock blasting in a major exit renovation project.

Blasting starts



Past Blasting Practices and Legacy Issues





The worst that can happen



Scene of rockslide on Saw Mill Run Boulevard, between Fort Pitt and Liberty tunnel entrances. Two people were killed and one injured when boulders tumbled from hillside.

Massive rockslide kills 2

A seam of mud beneath a huge boulder may have been the culprit in a rockslide on Saw Mill Run Boulevard yesterday afternoon that killed two men and seriously injured another.

The 1:45 p.m. slide occurred just 10 minutes after workers had set off 17 small explosive charges in the steep sandstone slope that looms over the northbound lanes of the boulevard between Woodruff Street and Crane Avenue.

(This story was written by Post-Gazette staff writer Mark Roth based on his reporting and that of staff writers Carol Fatten and Ken Fisher.)

John Laskowski, president of Ray Construction Co. of Canonsburg, Washington County, which had a city contract to clear the rocks off the slopes, said that the blasting may have loosened the mud behind the boulder just

enough to cause it to topple to the roadway about 60 feet below.

The boulder and several other large rocks — an estimated 600 tons of sandstone in all — landed first on top of bulldozer operator Andrew Bargar, 22, of Fairview, Washington County, killing him instantly.

The boulder then crushed a white Ford Fiesta with Ohio license plates and the cab of a Kruger tractor-trailer truck. The driver of

the Fiesta was killed, while the truck driver was thrown from his cab and was listed in critical condition last night in Mertry hospital with head and chest injuries.

The truck driver was identified by hospital officials as Robert Hildner, 48, of North Hiram, Ohio. The Fiesta driver's name was being withheld by county prosecutor's officials pending notification of next of kin.

The affected section of Saw Mill

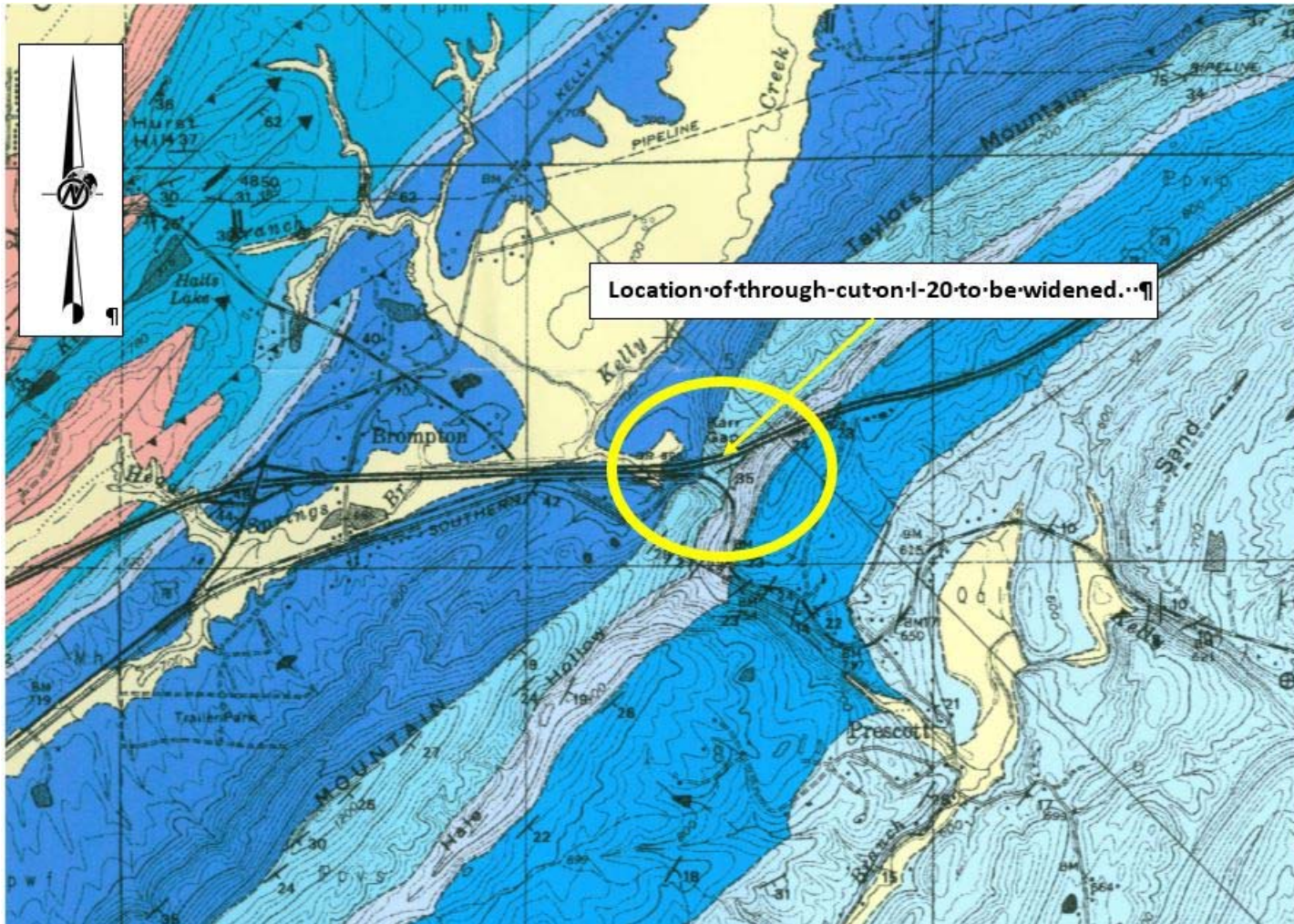
Run Boulevard will remain closed until at least this afternoon, when the city's remaining geologists on the project are scheduled to give a report on the slide to Public Works Director Lou Gaetano and Mayor Caligiuri, Gaetano said last night.

Gaetano said he will not schedule any clearing of the road or a resumption of the blasting until he hears the conclusions of the geologists.

(Continued on Page 8, Column 4)



Interstate 20 East of Birmingham





Interstate 20 East of Birmingham





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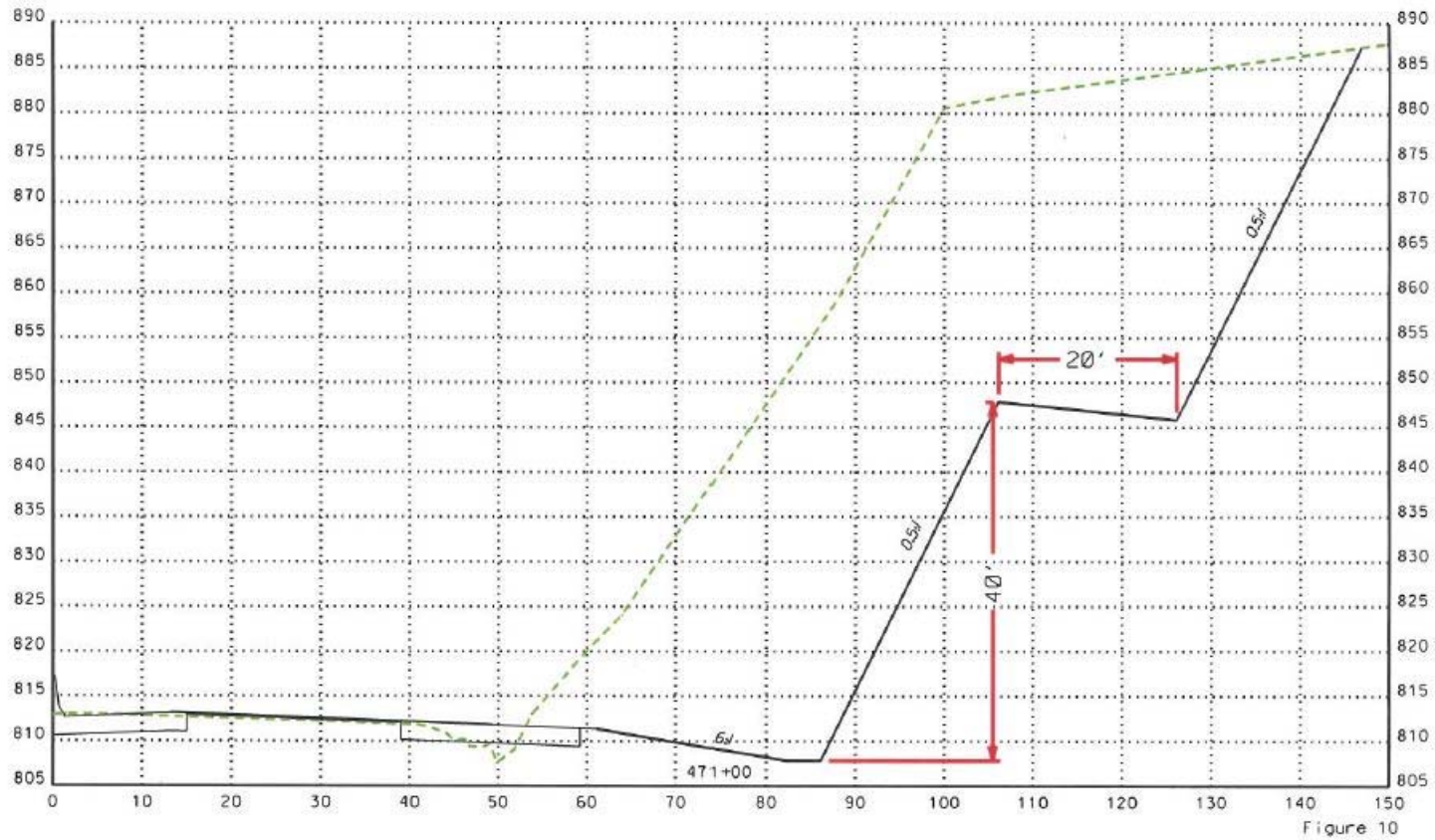


Interstate 20 East of Birmingham

- Cut is through sandstones and metaquartzite transitioning eastward to sandstone over shale
- Original construction cuts in hard units were steep – probably ~ 4-on-1 (65-75 degrees after aging)
- Shales standing at 60 degrees with shotcrete and 50 degrees unarmored
- Open bedding planes and joints on the face suggesting backbreak up to 30 feet.
- Initial Design (2003) had cuts of 20 to 30 feet westbound and 15 to 25 feet eastbound – project delayed by Katrina...



2003 Design (Sitz) for 2005-2006 Letting





Project Let in 2009 – awarded to Wright Bros.

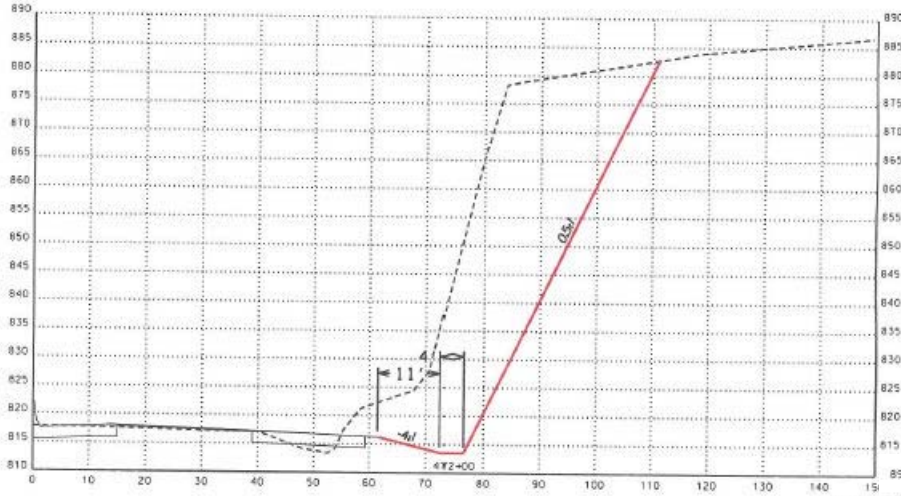


Figure 11

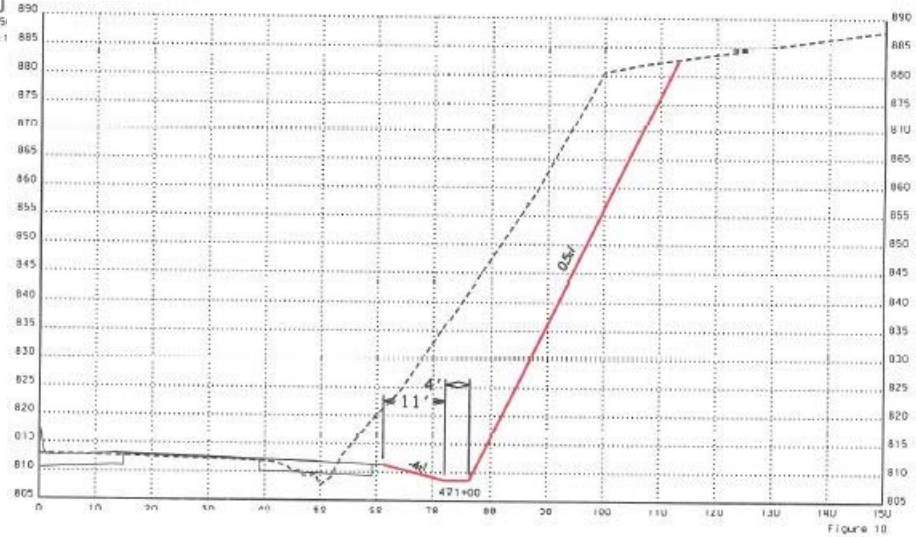


Figure 10





I-20 Key Issues

- Project Arrangement and Setting
- High traffic volume (ADT~ 75000) on two-lane barrels
- Limited travelled lane offset from rock slopes
- Tall, slender cuts – all in backbreak - can only cast toward the roadway
- Observable wedge scarps open joints and thrust faults – would large wedges come out as before?



Addressing Key Issues

- Staging Construction – Constructing Eastbound side first to make room
- Adjusting slope angles to be shallower than geologic features.
- Shifting traffic to the new median to provide catchment at the toe of the westbound slopes
- Blasting at night when traffic was least intense (least impact to stakeholders) – you need a thinking blaster, not the cheapest.....
- Be prepared for a slow wedge failure – with room and equipment for rapid clean up.

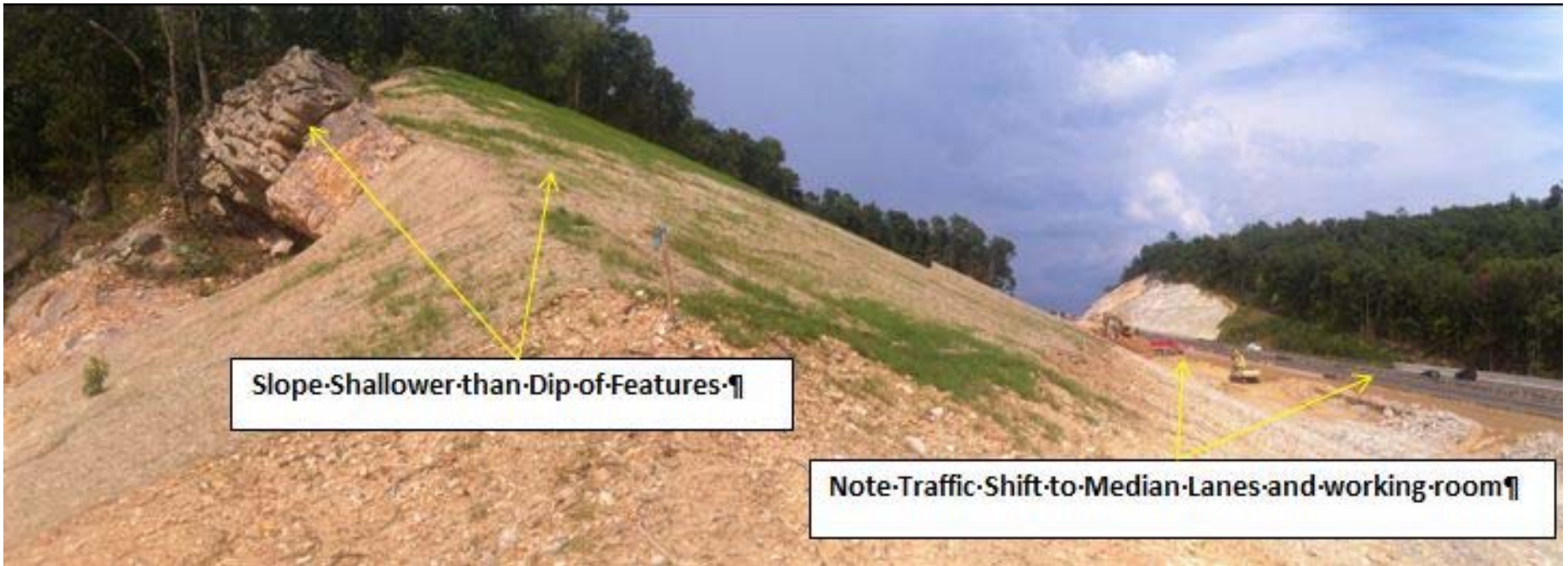


Staging Construction – Constructing Eastbound Side First to Make room





Adjusting slope angles to be shallower than geologic features.





Shifting traffic to the new median to provide catchment at the toe of the westbound slopes





Blasting at night when traffic was least intense (least impact to stakeholders)





Blasting at night when traffic was least intense (least impact to stakeholders)





Be prepared for the slow wedge failure with room for catchment





Be prepared for the slow wedge failure with room for catchment





What was going to happen, happened – without result



Temporary Lane Shift Developed with ALDOT

Originally Planned Travel Lanes



Key Approach Elements for Success

- Ensure the slope design is kinematically stable;
- Consider Construction constraints – give the blaster room to turn the blast to cast parallel to live roadway
- MPT – work with traffic control to get active lanes as far as possible from blasting.
- Blast during off-peak hours.
- Stage Construction to accommodate adverse conditions
- Engage stakeholders, owner, designer, and contractor to work together to address difficult conditions.



What was going to happen, happened – without result

We would like to acknowledge:

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- Hunter Hudson, Lead Inspector – Thompson Engineering
- Michael Prince, Project Manager - Wright Bros.
- Paul Luker, Project Superintendent – Wright Bros.
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Questions?

