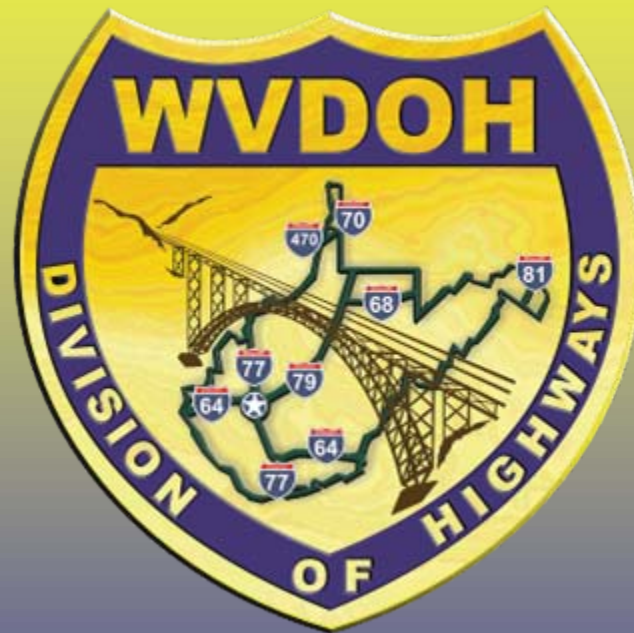


***West Virginia Route 2 Rock Fall Hazards  
at “The Narrows”  
Using a Rock Fence Catchment System  
for Remediation***



***Aaron L. Wentz  
WV DOT***



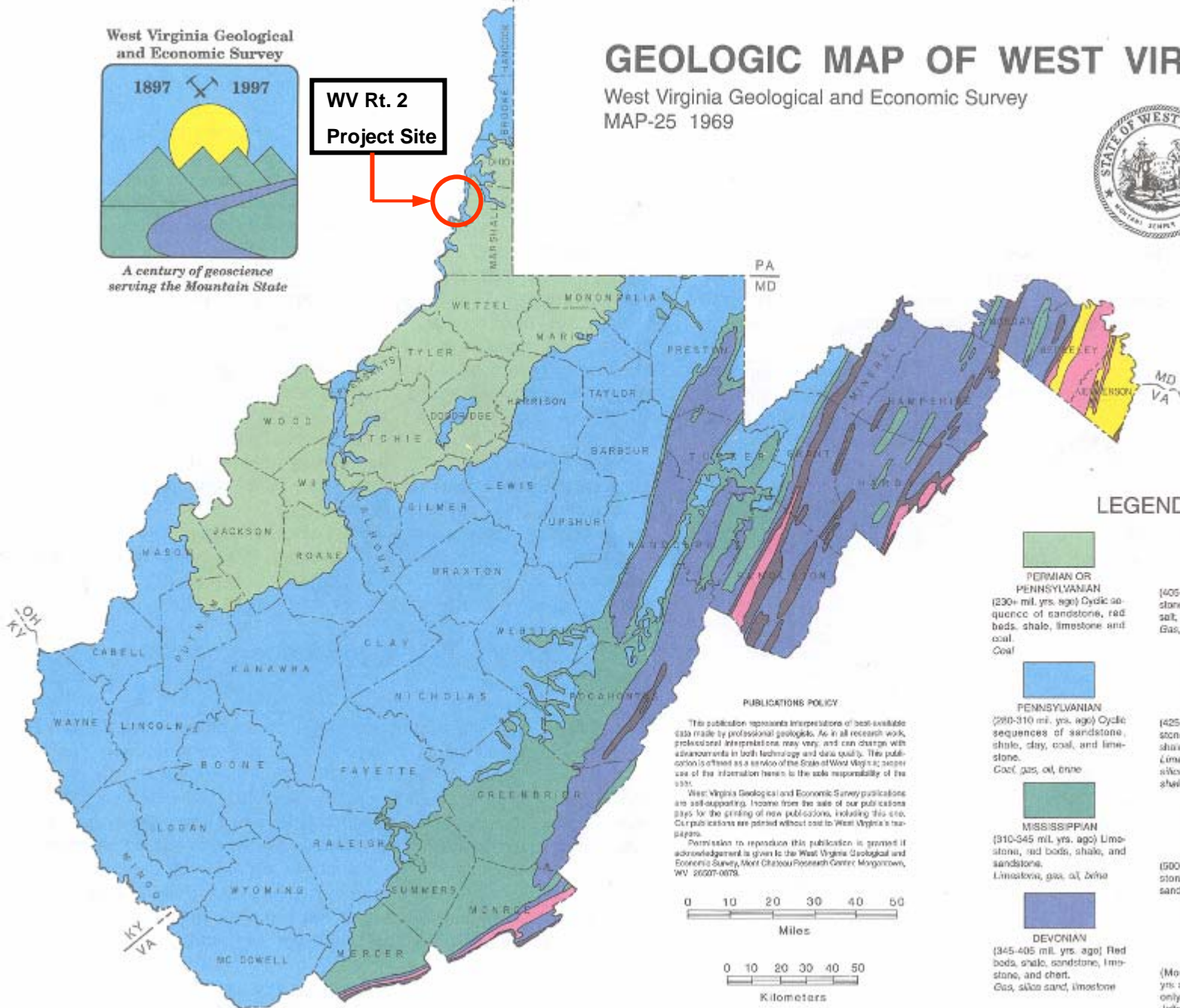
A century of geoscience serving the Mountain State

WV Rt. 2  
Project Site



# GEOLOGIC MAP OF WEST VIRGINIA

West Virginia Geological and Economic Survey  
MAP-25 1969



## LEGEND

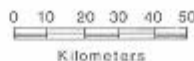
- |   |   |
|---|---|
|    |    |
| <b>PERMIAN OR PENNSYLVANIAN</b><br>(230+ mil. yrs. ago) Cyclic sequence of sandstone, red beds, shale, limestone and coal.        | <b>SILURIAN</b><br>(405-425 mil. yrs. ago) Sandstone, shale, limestone, rock salt, and ferrous beds. Gas, limestone, artificial brine.                                |
|    |    |
| <b>PENNSYLVANIAN</b><br>(280-310 mil. yrs. ago) Cyclic sequences of sandstone, shale, clay, coal, and limestone. Gas, oil, brine. | <b>ORDOVICIAN</b><br>(425-500 mil. yrs. ago) Limestone, dolomite, sandstone, shale, and metabasalts. Limestone (particularly low silica), building stone, clay-shale. |
|    |    |
| <b>MISSISSIPPIAN</b><br>(310-345 mil. yrs. ago) Limestone, red beds, shale, and sandstone. Limestone, gas, oil, brine.            | <b>CAMBRIAN</b><br>(500-600 mil. yrs. ago) Limestone and dolomite, some sandstone and shale.  |
|    |    |
| <b>DEVONIAN</b><br>(345-405 mil. yrs. ago) Red beds, shale, sandstone, limestone, and chert. Gas, siliceous sand, limestone.      | <b>PRECAMBRIAN</b><br>(More than 600 mil. yrs. ago) Gneissites. Present only in extreme eastern Jefferson County.   |

### PUBLICATIONS POLICY

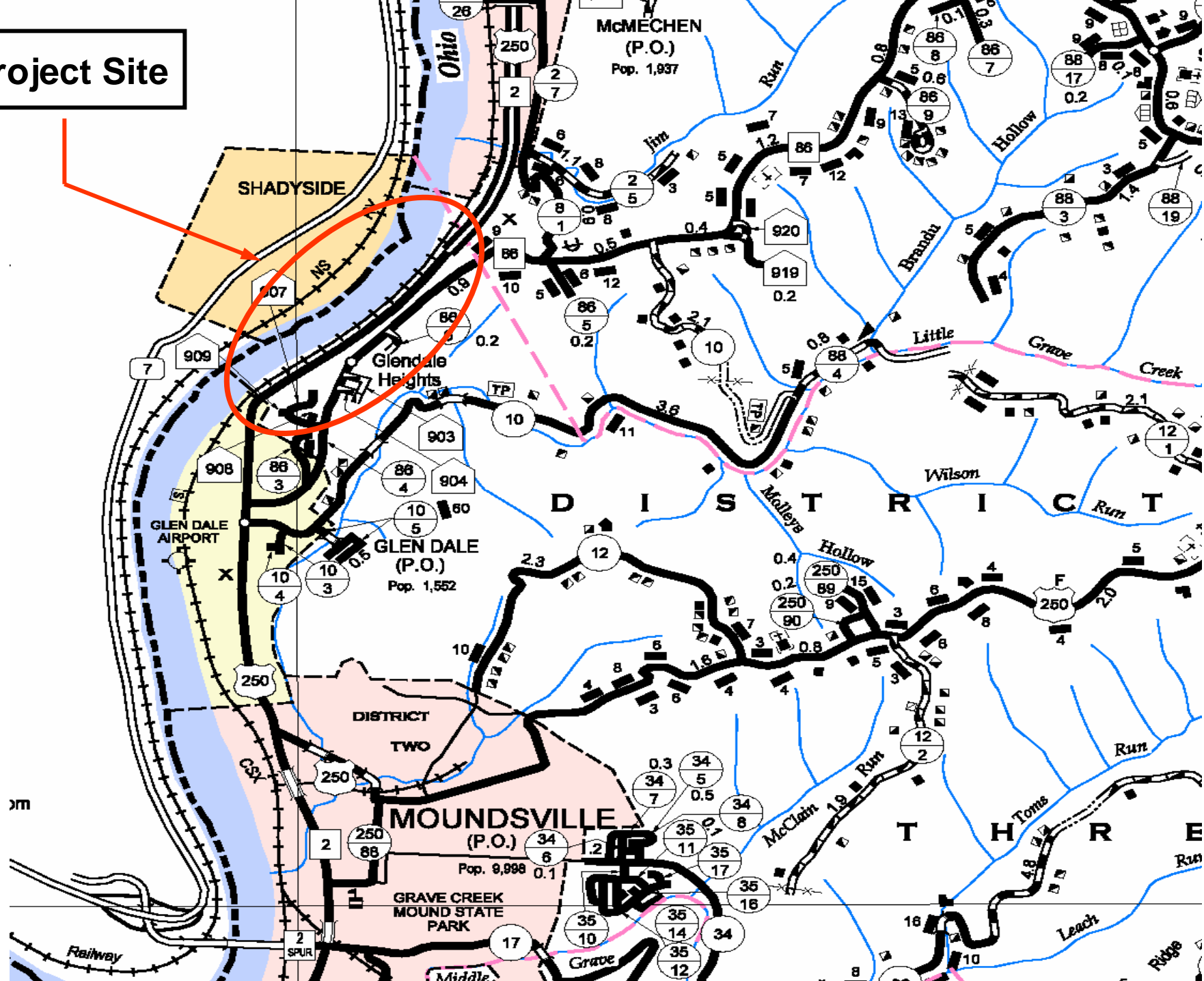
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**Project Site**



## Northbound Lane Rock Cut Prior to Construction



## Northbound Lane Rock Cut Prior to Construction



## Northbound Lane Rock Cut Prior to Construction



## Concrete Wall Bordering Southbound Lane



## Concrete Barrier and Piling Bordering Southbound Lane





# Soldier Pile Wall Repair Along Southbound Lane



# Narrow Shoulder With "Modified" Bike Path!



# Anchored Cable Net Drape Along WV Rt. 2 at Newell, West Virginia



# Anchored Cable Net Drape Along WV Rt. 2 at Newell, West Virginia



# Vegetated Slope Above Rock Cut Catching Falling Debris



# Preliminary Design Considerations for Draping



## Origin of March 25, 2005 Rock Fall/Debris Flow



## Origin of March 25, 2005 Rock Fall/Debris Flow





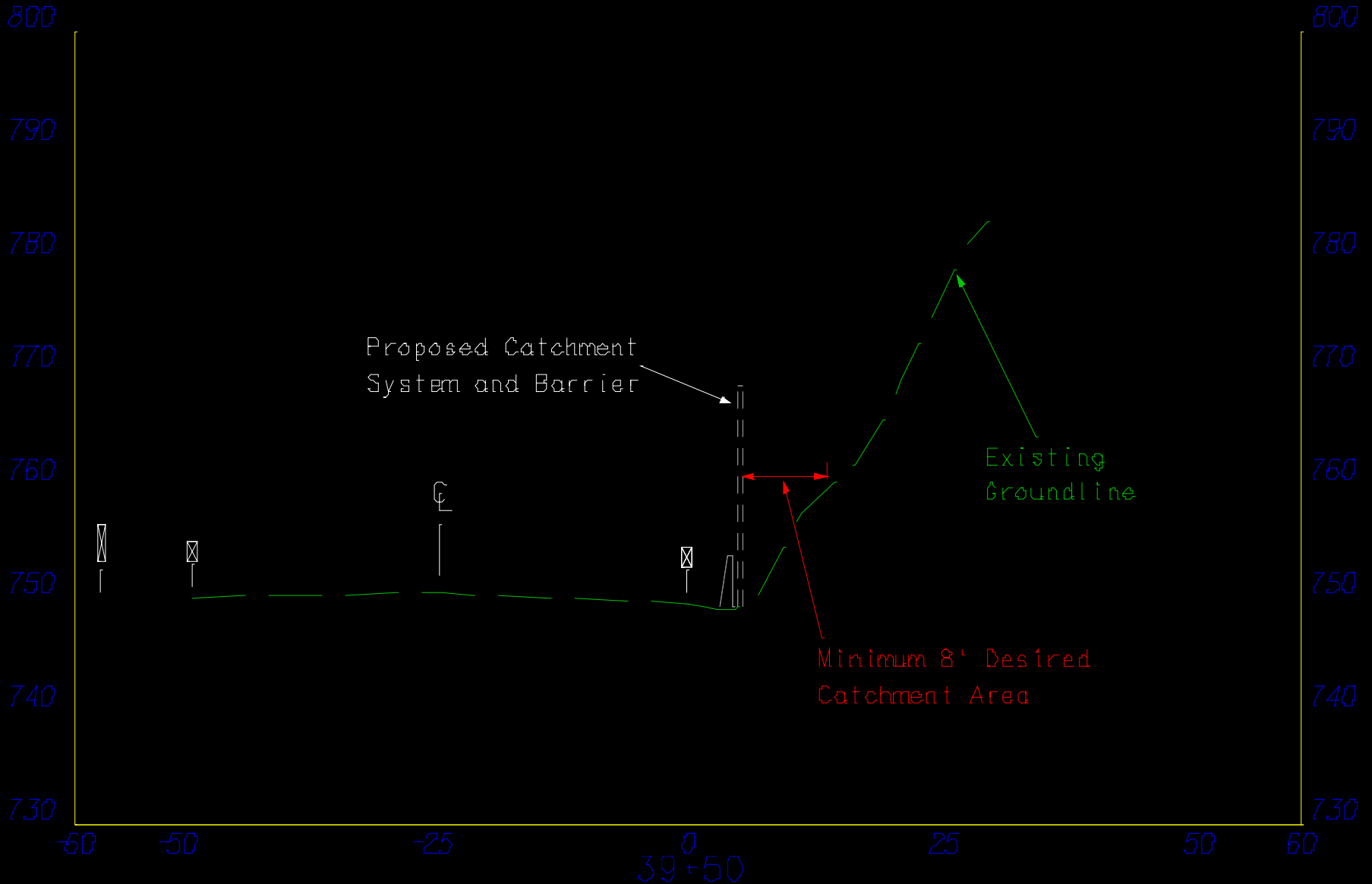
# March 25, 2005 Rock Fall Debris



# March 25, 2005 Rock Fall Debris



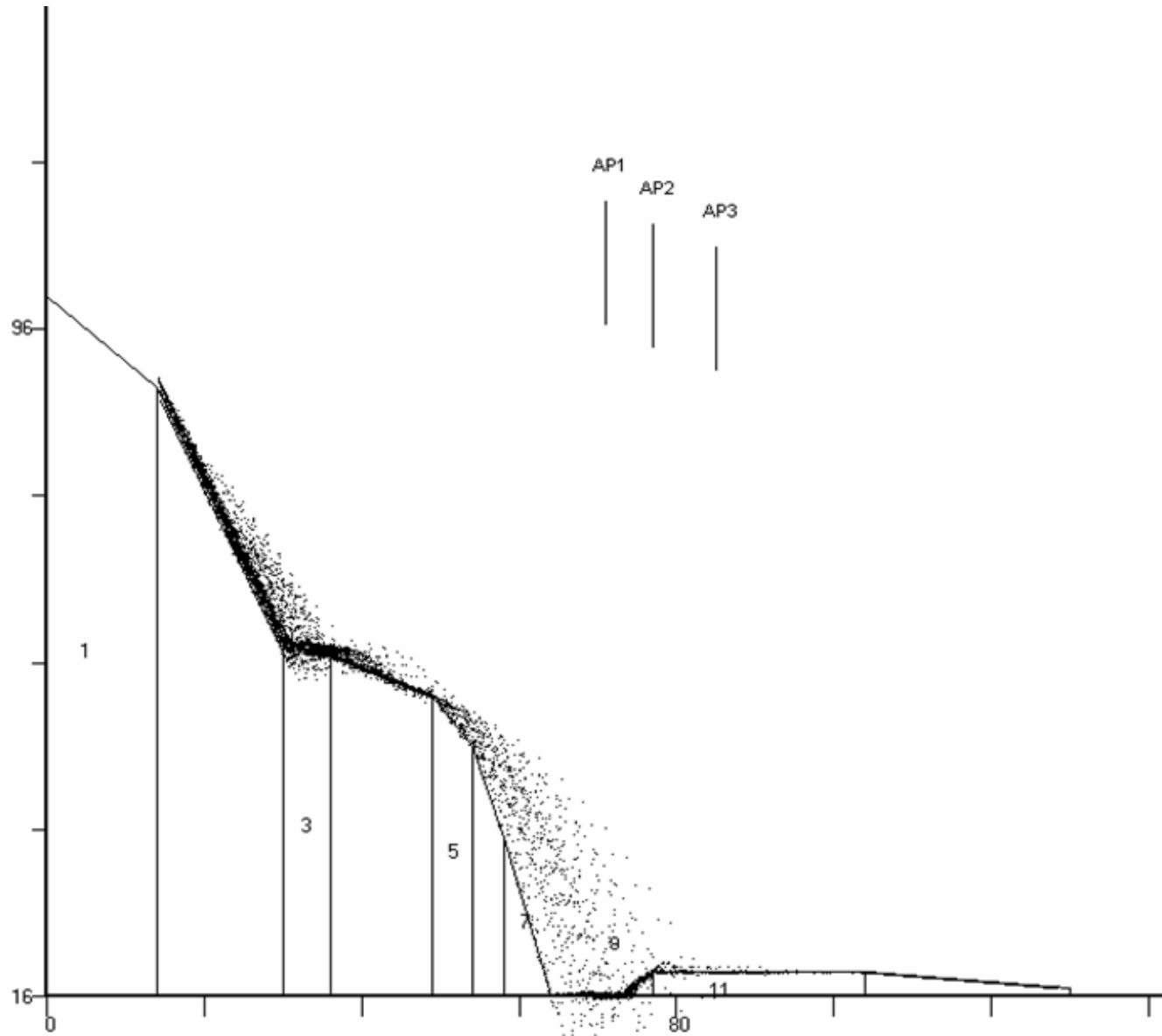
# Existing Section at Site



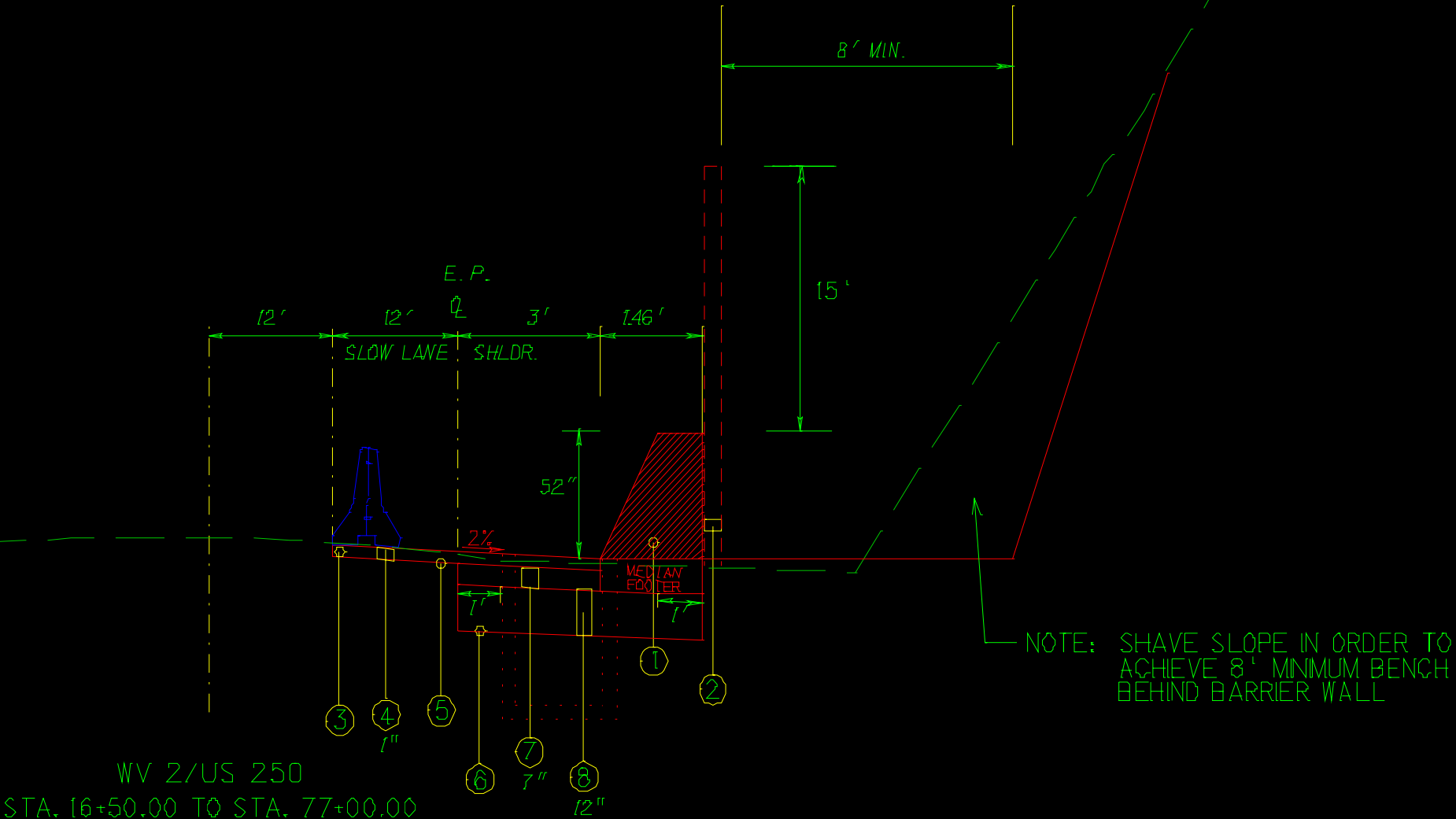
# Impact Location of March 2005 Rock Fall



# Output File From CRSP Rock Fall Simulation



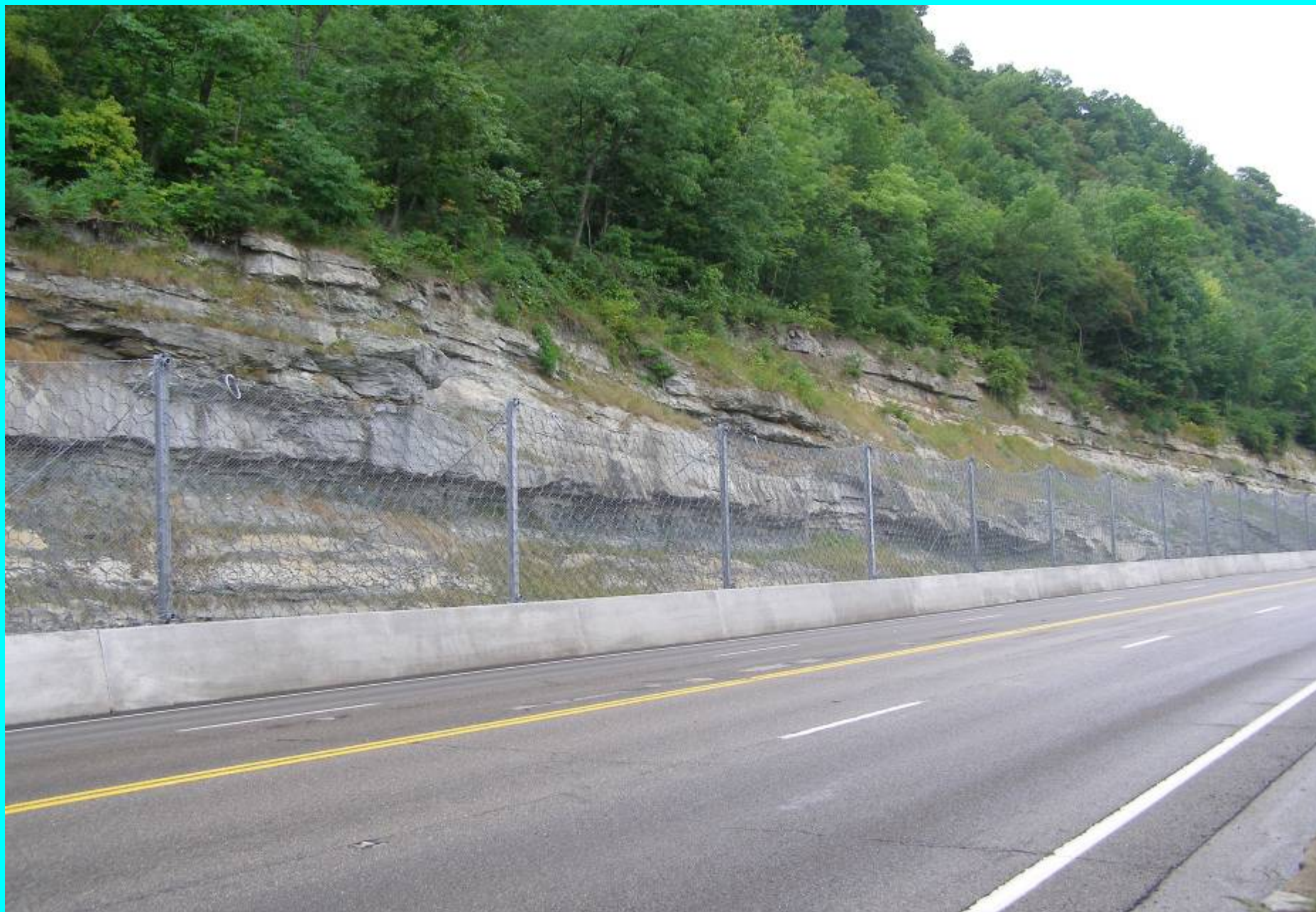
# TYPICAL FENCE SECTION



NOTE: SHAVE SLOPE IN ORDER TO ACHIEVE 8' MINIMUM BENCH BEHIND BARRIER WALL

WV 2/US 250  
 STA. 16+50.00 TO STA. 77+00.00

# Completed Geobruigg Rock Fence Catchment System

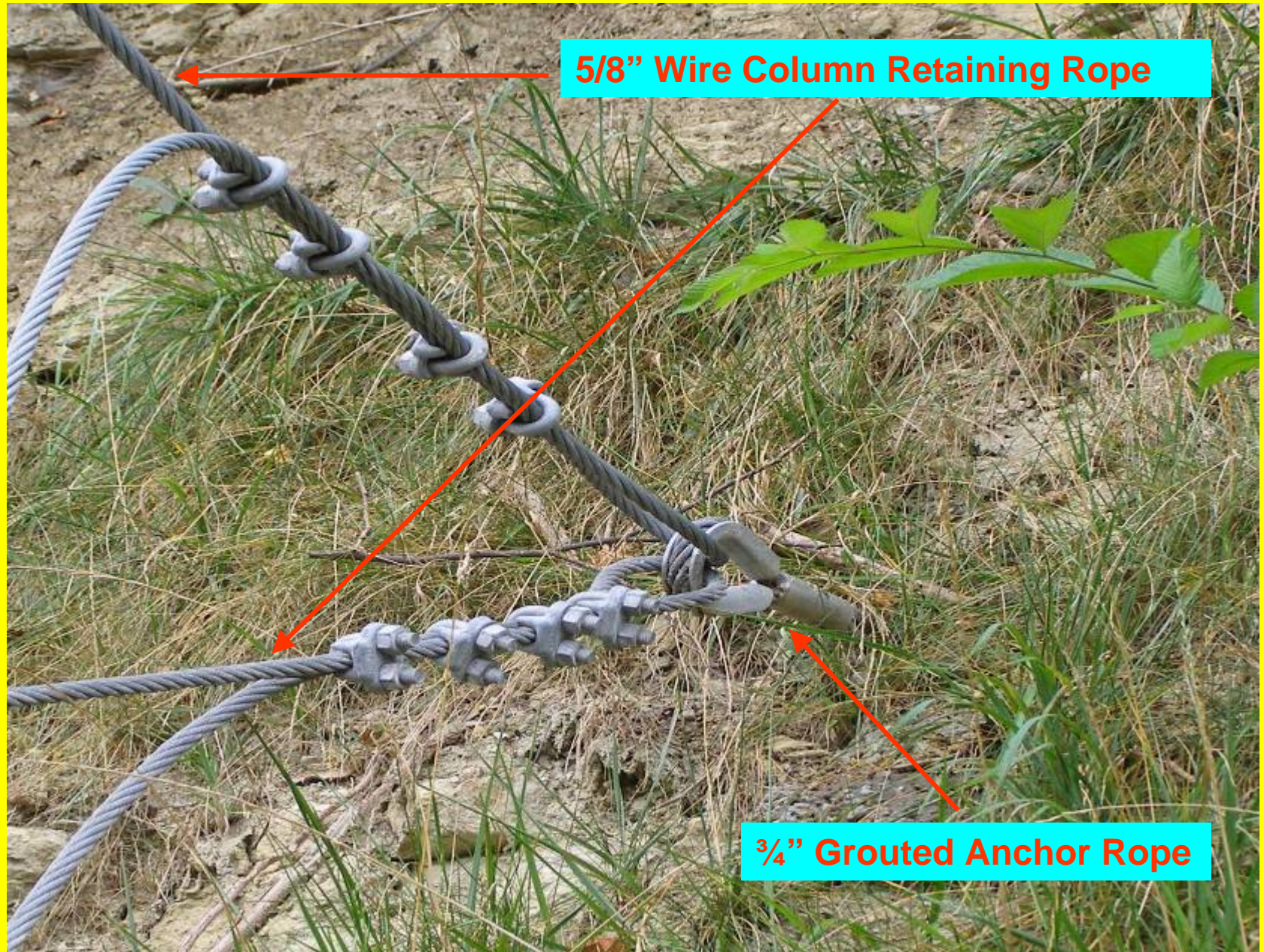


## Column Foundation and Break-Away Base Plate





# Column Retaining Rope Grouted Anchor



## Barrier Wall to Guardrail Transition



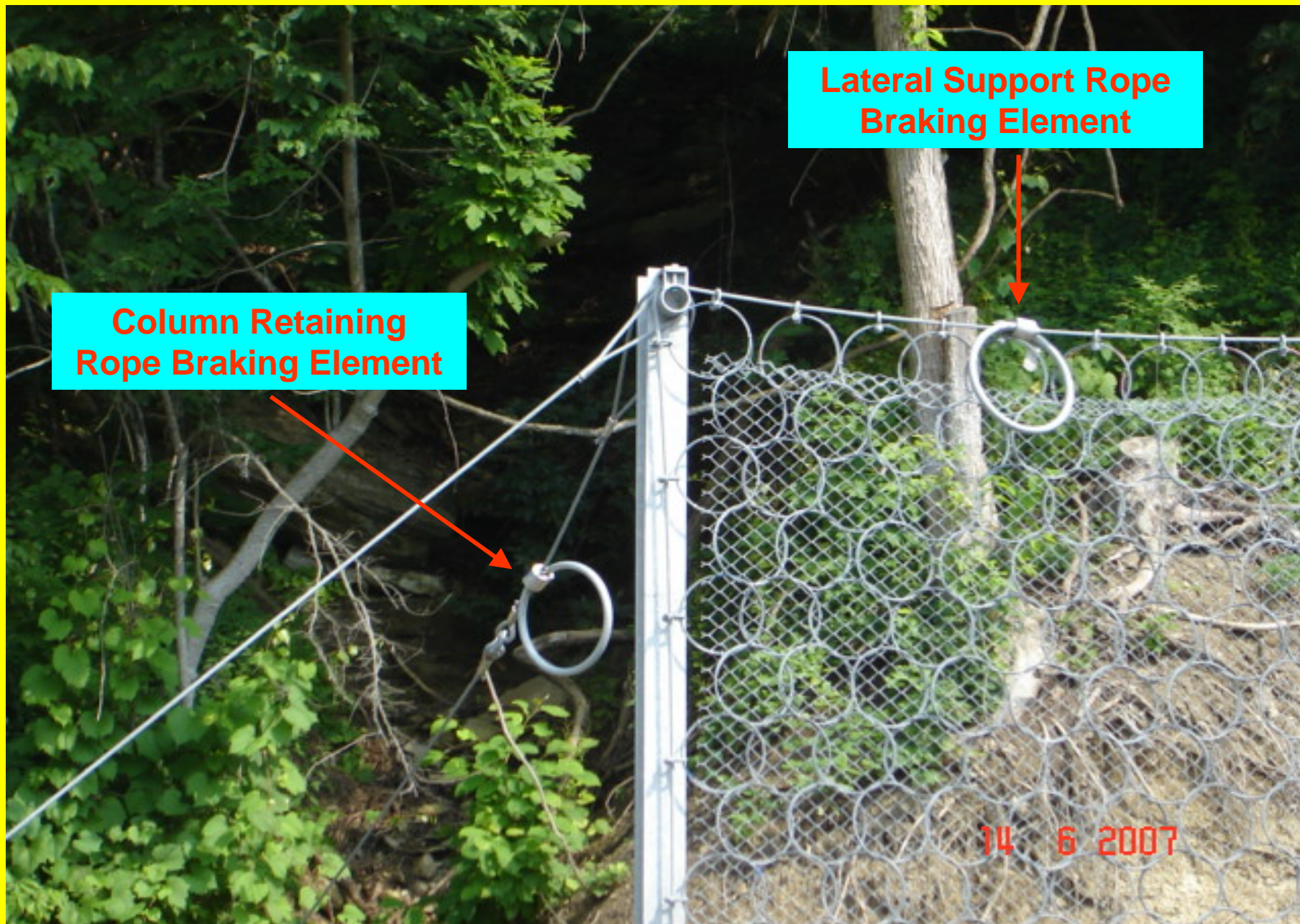
## Catchment Zone Behind Fence



**Inlet for Extended  
Culvert**

14 6 2007

# Wire Rope Braking Elements



Lateral Support Rope Braking Element

Column Retaining Rope Braking Element

14 6 2007

# Ring Net During Installation



# Installation of Ring Net



## Column Retaining Rope Removable Shackle



## First Post-Construction Rock Fall





## Rock Fall Debris Behind Fence





*Thank you from  
the  
West Virginia  
Division of  
Highways*