MD 24 (Rocks Road) Slope Repair Project

Summary of Engineering Studies

OVERVIEW

- Recap
- Additional Studies
  - Geotechnical
  - Dendrogeomorphic
    - Counting tree/ root rings
  - Detailed Stream Morphology
- Concepts Results
- Summary

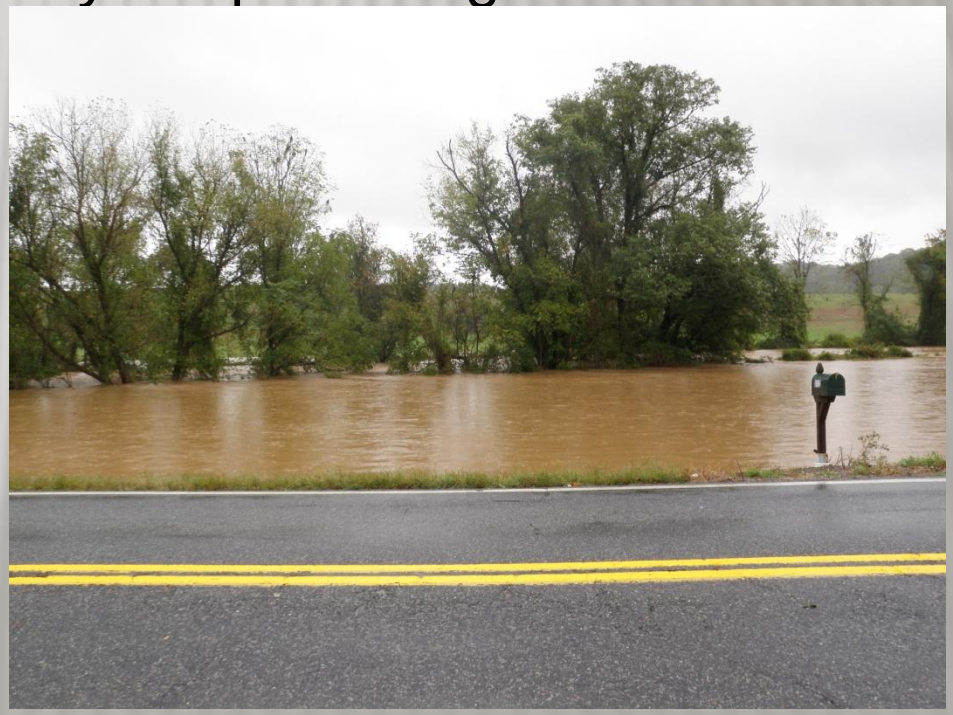
Purpose of this project is preserve the roadway infrastructure and ensure the public safety.

(the slope is deficient and unsafe.)

RECAP

- Clean Water Act
  - Section 404 – Wetland and Waterway Permit
  - Alternative Analysis
  - Avoid, Minimize, Mitigate.
  - ‘A fundamental precept of the 404 program is -if aquatic impacts can be avoided, <u>they should be avoided</u>’
- MDE, DNR , USFWS, US Army Corps of Engineers

- Erosion Process
- Possible Stabilization Techniques
- Concept Development
- Evaluation



ENGINEERING & SCIENTIFIC STUDIES

Previous Studies

- ✓ **Hydrology**
  - ✓ Rain
  - ✓ Flood potential
  - ✓ Storm flows
- ✓ **Geomorphic Report**
  - ✓ Stream geometry
  - ✓ Migration pattern
  - ✓ Stream characteristics
- ✓ **Road Subsidence Survey**
- ✓ **Hydraulics**
  - ✓ Channel Chrematistics
  - ✓ Channel Velocity and stresses
  - ✓ Water level in river
- ✓ **Geotechnical**
  - ✓ Soil composition
  - ✓ Location of Bedrock
  - ✓ Ground penetration radar (Seismic)

Additional (NEW) Studies

- ❑ **Geotechnical**
  - ❑ Additional Seismic Refraction
    - ❑ Non-destructive
  - ❑ Refined Recommendation
- ❑ **Hydrology**
  - ❑ Updated based Sept 30th Storm
- ❑ **Dendrogeomorphic**
  - ❑ Tree & Root Ring Evaluation
- ❑ **Detailed Geomorphic Report**
  - ❑ Bank Pins
  - ❑ Piping
  - ❑ 2-dimensional flow analysis
- ❑ **Refined Concepts**

EVALUATION OF DEER CREEK WITHIN AREA OF INTEREST

The existing conditions of Deer Creek were found to be incised, degraded and laterally unstable. The effects of past channel manipulation from damming, channel relocation, railroad impacts, and roadway infrastructure within a confined valley setting have contributed to past stream degradation and is likely to contribute to ongoing degradation in the future. **This process of channel migration should be expected to continue for the foreseeable future**.

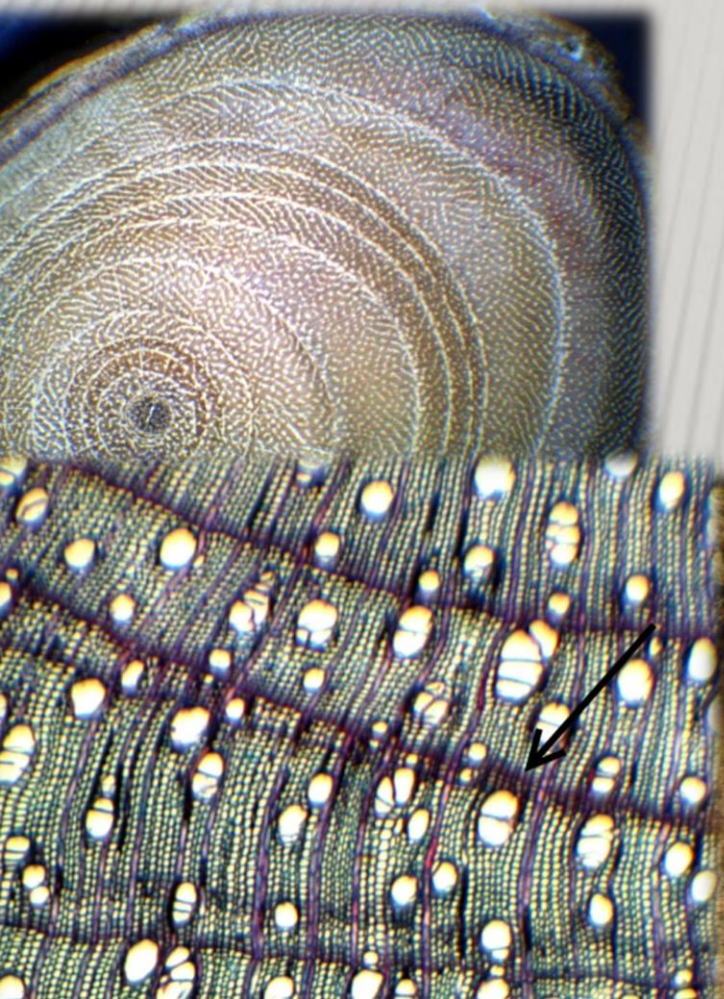
- From SHA Geomorphic Study

GEOTECHNICAL (SOILS CONDITIONS)

- Non-Destructive Testing
- Slope Requirements
  - Overburden
  - Rock
  - Stability
- Catchments

DENDROGEOMORPHIC (Counting Rings)

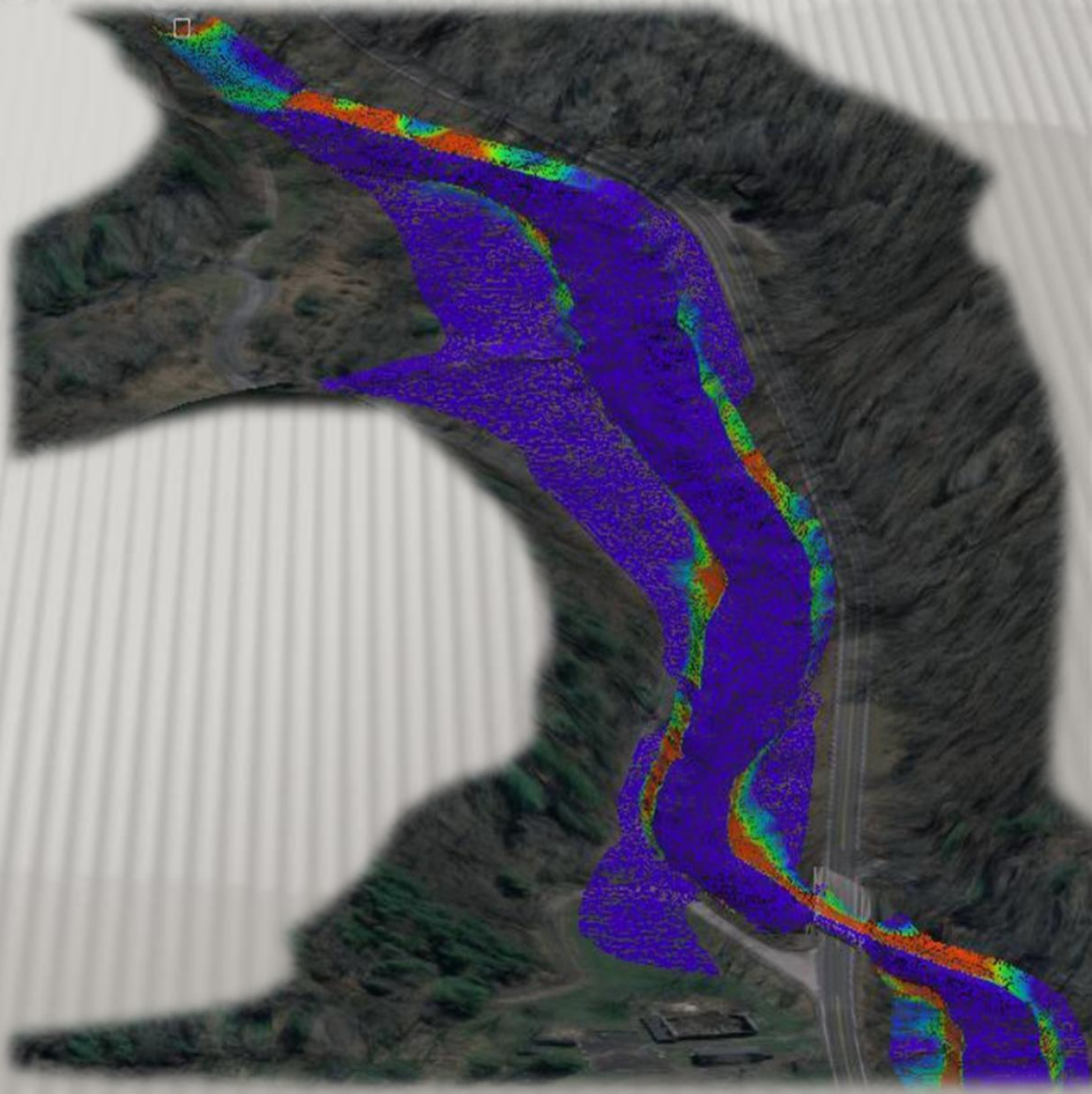
Dendrochronology is a method for dating using the patterns of tree and root rings. In this case, root rings were used. We use exposed tree roots to estimate the rate and timing of their exposure.



- Able to look at history of erosion : 5- 50 years
- Piping Cavities on Slope
- Historical Erosion Rate up to 9 inches per year
  - 3 to 4 inches per year
- Erode to a vertical face ***close to*** edge of pavement within 30 years

STREAM MORPHOLOGY REPORTS

- Piping cause from runoff from the hillside
- Erosive power of the stream
- Advanced river modeling
  - 2-D flow analysis
  - Defined areas of need
- Pressure Transducers
  - Measures stress on bank
- Bank Pins
  - Loss some pins during Sept storm
- Piping from hillside, under road to stream, stream washing sediments downstream,



STREAM MORPHOLOGY REPORTS

- Major Storm in September 2010 provided good data
- Smaller storm produced higher river level
- Loss bank pins
- Observed
- Soils highly susceptible to piping and are highly erodible

REFINED CONCEPTS

Section A

Concept 1- No roadway shift, stream slope Stabilization, little land-side excavation for drainage and piping controls

Concept 2 – minor roadway shift, little stream side stabilization, major land-side excavation

Section G

Concept 1 - No roadway shift, stream slope stabilization, little land–side excavation for drainage and piping controls.

Concept 2 - minor roadway shift, little stream side stabilization, major land-side excavation

REFINED CONCEPTS

Impact Description and Range		Section A No-Shift Acre	Section A with Shift Acre	Section G No-Shift Acre	Section G with Shift Acre
Temporary Impact-Stream	Minimum	0.19	0.29	0.09	0.56
	Maximum	0.32	0.60	0.13	1.23
Permanent Impact-Stream	Minimum	0.45	*0.10*	0.34	0.37
	Maximum	0.67	0.25	0.40	0.43
Temporary Impact - Land Side	Minimum	0.18	0.23	0.10	0.08
	Maximum	0.19	> 2.6	0.23	0.23
Permanent Impact-Land-side	Minimum	0.01	0.32	0.15	0.38
	Maximum	0.08	1.1	0.21	1.10
Total Impact	**Minimum**	**0.83**	**0.94**	**0.67**	**1.39**
	Maximum	**1.26**	**1.95**	**0.98**	**2.99**

Thank You