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**SUMMARY OF OPTIONS
SLOPE STABILIZATION
LAW-7-17.4/18.45
LAWRENCE COUNTY, OHIO**

Fuller, Mossbarger, Scott & May Engineers, Inc. has prepared this document presenting options considered for addressing slope instability on the existing State Route 7 in Lawrence County, Ohio.

Option 1: No Action

The option would include continuing to conduct maintenance when debris falls occur above the road and repairing damage to the east edge of road resulting from slope creep.

Advantages/Disadvantages

- Option does not address the motorist-safety concerns,
- Will likely require "emergency" maintenance activities to respond to falls above the road to clear driving lanes,
- Maintenance records will be required to develop opinions of cost.

Option 2: Regrading - Partial Slope Stabilization (above existing State Route 7) \$ 16,500,000

The option would include constructing a catchment ditch at the toe of the slope and approximately 32-feet wide from the west edge of pavement. The actual required catchment ditch width and geometry would be determined during the design phase of the project based on rockfall analyses. The preliminary, 32 feet width of ditch would be used in developing opinions of construction cost for Option 2. The lower portion of the existing slope would be regraded by constructing a $\frac{3}{4}H:1V$ slope from the edge of the catchment ditch to top of rock and removal of colluvium and loose rock above the regraded slope up to the base of the existing sandstone highwall. The outcrop of the upper sandstone would be benched at the base a minimum of 10 feet, then cut at $\frac{1}{2}H:1V$ for stabilization purposes. The slope would be graded to a maximum of $1\frac{1}{2}H:1V$ above the sandstone to the top of the slope. New Jersey barriers would be placed near the west edge of pavement as additional protection from rockfall.

Advantages/Disadvantages

- Proposed $\frac{3}{4}H:1V$ slope is flatter than the high-angle joints and fractures observed in the sandstone outcrops near the road and will reduce the occurrence of block failures in the sandstone,
- The final configuration of the catchment ditch should be designed to collect rockfalls from above and reduce the likelihood of debris impacting the driving lanes, thereby improving motorist safety,
- Volume of material removed during regrading will be less than other regrading options resulting in lower initial construction costs,
- Less volume of material generated during grading will result in reduced hauling and spoil material disposal costs,

- Periodic rockfalls or colluvium slides into the catchment ditch are expected. The option will require periodic maintenance to remove, transport and dispose of debris collected in the catchment ditch,
- Catchment ditch maintenance activities may be scheduled at the discretion of ODOT personnel, rather than on an emergency response basis.

Option 3: Regrading - Full Slope Stabilization (above existing State Route 7)

47,674,466

The option would include constructing a catchment ditch at the toe of the slope and approximately 20-feet wide from the west edge of pavement. The entire existing slope would be regraded on a 1½V:1V (Option 3a) slope or a 2H:1V slope (Option 3b). Intermediate benches, 20 feet in width, would be constructed on the regraded slope at vertical intervals not exceeding 100 feet. The actual required widths of the catchment ditch and intermediate benches would be determined during the design phase of the project based on the slope geometry and rockfall analyses. New Jersey barriers would be placed near the west edge of pavement as additional protection from rockfall.

Advantages/Disadvantages

3b

131,401,525

- Proposed slope angle is flatter than the high-angle joints and fractures observed in the sandstone outcrops near the road and will reduce the occurrence of block failures in the sandstone,
- Proposed slope angle will stabilize the non-durable shales encountered in the borings and observed in the field,
- Incidence of rockfalls will be reduced and will improve motorist safety,
- Option includes grading and improvement of the entire slope,
- Following the initial capital construction costs, slope maintenance costs will be reduced,
- Significantly greater volume of material removed during regrading, as compared to other options, will result in higher initial construction costs,
- Large volume of material generated during grading will require hauling and disposal, resulting in high spoil material disposal costs,
- Property acquisition costs for both regrading and spoil disposal may be higher than in other options.

Option 4: Rock Reinforcement Stabilization

59,881,684

The option would include installing untensioned or tensioned rock bolts to reduce the occurrence of block failures in the sandstone. Also, application of a layer of shotcrete could be used to protect the non-durable shale from weathering and degradation at the face of the slopes. The locations of such stabilization methods would be determined during the design.

Advantages/Disadvantages

- The required locations for such reinforcement will be difficult to determine during the design phase. Removal of colluvium will be required to expose intact rock and identify locations where reinforcement will be beneficial.
- Construction will likely expose additional areas requiring reinforcement and will result in changes to the construction contract.

- Performance of shotcrete under freeze-thaw conditions is suspect.
- Option may provide relatively inexpensive, short-term stabilization of specific areas of concern.

Option 5: Realignment

The option would include selecting a new alignment for State Route 7, constructing a new highway, and abandoning the existing State Route 7.

Advantages/Disadvantages

- Eliminates the motorist safety concern for the existing State Route 7 (following completion of a new highway),
- High capital outlay for design, right-of-way acquisition, utility relocation and construction of new highway and likely the costliest option,
- Long lead time for siting, design and construction of new road. The maintenance and safety issues for the existing State Route 7 may need to be addressed during the interim,

Option 6: Slope Stabilization (below existing State Route 7)

The option would include constructing retaining walls at the sections of road that have shown signs of creep and stabilizing existing slopes.