Review of Erosion and Sedimentation Program Delegation to the North Carolina Department of Transportation, Division of Highways

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Performed by:

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The Land Quality Section reviewed the program delegation to the Department of Transportation, Division of Highways (DOT) on August 26-27, 2008. Since primarily contract construction projects were reviewed last February, most of the projects in this review were maintenance projects, with twenty-four hour notice given to the project staff of the review. The review and the results reported here are in accordance with requirements of the Sedimentation Control Commission (SCC) delegation to the DOT.

PROJECT REVIEWS

Sixteen projects were reviewed over two days. Mrs. Sonya Tankersley reviewed eight projects in the eastern half of the state while Mr. Gray Hauser reviewed eight projects in the western half of the state. During the review the remnants of Tropical Depression Fay brought heavy rain to the western part of the state. Project conditions deteriorated significantly overnight and by August 27 many projects had received 4.5 to 6 inches of rain, approximating the 10-year, 24-hour storm. Projects damaged by the rain were typically rated "Fair," with the acknowledgement that rainfall may have exceeded the design storm and there had been no opportunity for maintenance of the erosion and sediment control measures. One project received a "Fair/Poor" rating because basins failed due to poor embankment compaction.

OVERALL REVIEW CRITERIA

The Roadside Environmental Unit (REU) notified project construction management personnel of the review on the day preceding the review. Each project review consisted of reviewing the erosion control plan for adequacy, inspecting the project for compliance, and examining the project files. LQS regional office personnel participated in the project inspections. Plans were available for review at all sites.

Each project is briefly described below. A table summarizing the projects appears on the following page.

SR 1146 Arnold Hill Road is a 0.8-mile secondary road project that involved widening and paving the road. The project received an overall rating of "Fair" because of inadequate ground cover on the banks or slopes behind the ditches.

NC Highway 43 Connector is a contract construction project that is 2.5 miles in length. The project received an overall rating of "Fair" because runoff had broken over a fill slope, and the silt fence at the bottom of the slope had failed. Ground cover was needed on a slope at a ramp. The majority of the project had good groundcover.

SR 1349 Hancock Place is a secondary road project that was almost complete. It had on overall project condition of "Good." No problems were noted and ground cover was excellent.

Project Name	County	NC DOT Division	DENR Region	Plan		E & S C Measures		Adequate Groundcover	Sediment Damage	Overall Effectiveness
				Adequate Design	Adequate Implementation	Adequate Installation	Adequate Maintenance			
SR 1146 Arnold Hill Road	Washington	1	Washington	Yes	Yes	Yes	Yes	No	No	Fair
NC 43 Connector	Duplin	2	Wilmington	Yes	Yes	No	Yes	Yes	Yes	Fair
SR 1349 Hancock Place	Carteret	2	Wilmington	Yes	Yes	Yes	Yes	Yes	No	Good
SR 1513 Whitestocking Road	Pender	3	Wilmington	Yes	Yes	No	Yes	Yes	No	Good
SR 1918 Bridge over Carraway Creek	Wayne	4	Washington	Yes	Yes	Yes	Yes	Yes	No	Good
SR 1601 Rock Brook Road	Granville	5	Raleigh	Yes	Yes	Yes	Yes	Yes	No	Good
NC 98 Wake Forest Bypass	Wake	5	Raleigh	Yes	Yes	No	Yes	Yes	Yes	Good
SR 1320 Hilburn Road	Columbus	6	Wilmington	Yes	Yes	Yes	Yes	No	No	Fair
SR 1105 Burney Mill Road	Randolph	8	Winston-Salem	Yes	Yes	Yes	Yes	No	No	Good
SR 1812 Peter Hairston Road	Davie	9	Winston-Salem	Yes	Yes	Yes	Yes	Yes	No	Excellent
US 421 Rest Area	Wilkes	11	Winston-Salem	Yes	Yes	No	No	Yes	Yes	Fair/Poor
SR 1129 Laurel Creek Road	Watauga	11	Winston-Salem	No	No	Yes	No	Yes	Yes	Fair
SR 1336 Moore Mountain Road	Alexander	12	Mooresville	Yes	Yes	Yes	No	No	Yes	Fair
NC 146 Long Shoals Road	Buncombe	13	Asheville	Yes	Yes	Yes	Yes	No	Yes	Fair
SR 1260 Wildcat Run	Haywood	14	Asheville	Yes	No	No	Yes	No	Yes	Fair
NC 281	Transylvania	14	Asheville	Yes	Yes	Yes	No	Yes	Yes	Fair

SR 1513 Whitestocking Road is a secondary road project 1.3 miles in length being constructed in three phases. Some slopes needed ground cover. Precast headwalls had not arrived for culverts that had already been installed. No sedimentation damage had occurred and the project was rated as "Good."

SR 1918 Bridge over Carraway Creek is a contract construction project only 0.2 miles in length. The backside of diversion berms needed better ground cover. The project had no sedimentation damage and was rated as "Good."

SR 1601 Rock Brook Road is a secondary road-paving project 1.1 miles in length. It had been provided with ground cover, and would be paved later in the season. No problems were noted and it was rated as "Good."

NC 98 Wake Forest Bypass is a 1.6-mile contract construction project. The most notable problem was a pipe outlet in the middle of a fill slope. There had been past sedimentation damage that had been removed. The overall project rating was "Good."

SR 1320 Hilburn Road is a 1.2-mile secondary road project. The sediment basins on the project were well installed. The project received a "Fair" rating because the road shoulders and ditch banks were bare and eroding. The eroded slopes needed fine grading and ground cover.

SR 1105 Burney Mill Road is a secondary road widening and paving project 2.4 miles long that is notable for a crossing of the Uwharrie River. The project was rated "Good-Very Good." The only problem was the steep cut slopes with no seedbed preparation that are typical of maintenance projects.

SR 1812 Peter Hairston Road is a secondary road widening and paving project that was finished except for paving. The grass in the ditches had withstood high flows from the heavy rain overnight. Overall project condition was rated as "Excellent."

US 421 Rest Area is a contract construction project to add a rest area on US 421. Two skimmer basins had failed overnight during heavy rain. Water apparently flowed along the outside of the barrel pipe, eroding the embankment from within. Poor compaction of the fill around the barrel pipes was suspected. Rock-filled bags used to divert runoff into a drop inlet had been rolled down the paved ramp by the stormwater runoff. Restoration of sedimentation damage below the failed skimmer basins was planned. The project was rated "Fair," due to the damage that had occurred overnight.

SR 1129 Laurel Creek Road is a secondary road widening and paving project that is 1.0 miles long. The aggregate base course on the roadbed was heavily rilled and eroded from hard rain. The project used 4' x 3' x 2' silt basins in the ditches that were too small to catch the volume of sediment being generated. The porous baffles in the basins had trapped a lot of the base stone. Areas where cut slopes were to be excavated after rock breaking and blasting had no measures at the toe of the cut. A temporary ditch need to be shaped at the toe of the rock excavation at the end of each workday and

some temporary measures installed. Wattles treated with PAM would have helped control the suspended sediment in the runoff. Silt fence had been placed at the toe of a rock wall along Laurel Creek. Laurel Creek was just out of its banks and had undermined the silt fence. The site was rated "Fair."

SR 1336 Moore Mountain Road is a secondary road widening and paving project that is 1.6 miles long. The road winds around and up a mountain close to the Alexander/Wilkes county line. The road is being constructed without a ditch against the cut slope on the upper side. The plan is to pave a curb against the toe of the slope, in order to reduce the road width. Unfortunately, the heavy rain the night before the inspection cut a ditch out of the aggregate base course. The eroded base stone filled all the sediment traps, with only the tops of the porous baffles protruding from the sediment. Compounding the problem was the way the hardware cloth and inlet protection had been installed against the sides of yard inlets with concrete lids. With no space between the stone and the inlet throat, runoff did not get into the inlets, and continued down the roadbed eroding the base stone. There were areas of hard, steep cut slopes that had no seedbed preparation. The project was rated "Fair."

NC 146 Long Shoals Road is a contract construction project, that while only a mile long, includes a bridge over the French Broad River, and new roadway bridges and interchange with I-26. The sediment control measures were generally effective. The project was rated "Fair" due to areas needing ground cover, especially slopes with minimal sediment controls.

SR 1260 Wildcat Run is a secondary road widening and paving project involving 1.3 miles of narrow twisting roads serving a few residences and summer homes perched on a mountain side in the Maggie Valley area. There was no room to install measures, and the cut slopes were almost vertical, with poor stabilization. It was pouring rain during the inspection, and stream sedimentation was occurring, primarily from the fines washing out of the base stone. The project was rated "Fair."

NC 281 is a contract construction project to widen and pave NC Highway 281, which is still a gravel road in places. The temporary ground cover on slopes was good. The small silt basins or traps used single porous baffles and were trapping heavy sediment. However, the basins were too small to clarify runoff going into trout waters. The runoff carried a high sediment load from fines in the base stone. The project needed to have ditches in the work area shaped sufficiently to install wattles treated with PAM.

ADMINISTRATIVE REVIEW

The Roadside Environmental Unit is responsible for the erosion and sedimentation control plans prepared for DOT contract projects. The Hydraulics Unit designs "Type A Sediment Basins," channels and energy dissipation below culverts. The REU also prepares plans for the Bridge Maintenance Unit projects. The REU staff focuses on locating and sizing sediment fence, temporary rock silt checks, temporary silt basins, and temporary rock sediment dams.

DOT Internal Inspection Process

REU Field Operations staff inspects all DOT projects. Each project is evaluated on a scale of 1-10 for installation of measures, maintenance of measures, effectiveness of measures, plan implementation and overall project evaluation. A score of 6 or less results in the issuance of an "Immediate Corrective Action" report (ICA). Land Quality receives a copy of each ICA and follow-up inspections. Project files contain monthly inspection reports from the REU.

Research/Education Efforts

Periodically NC DOT sponsors research to analyze or development sedimentation and erosion control measures. Three research projects conducted under contract by N. C. State University include *Monitoring the Effects of Highway Construction in the Sedgefield Lakes Watershed, Evaluating Sediment Capture Rates for Different Sediment Basin Designs* and *Stilling Basin Design and Operation for Water Quality*. The Roadside Environmental Unit provided training for county maintenance forces on the installation of straw wattles with PAM in ditches. As noted in the project reviews, none were observed in the field.

Plans and Specifications

Plan Preparation

The plan preparation process was not evaluated for this review, except as incidental to the field evaluation of projects. One maintenance project (SR 1129 Laurel Creek Road) had a plan that was clearly inadequate. Maintenance projects were still utilizing small silt basins and rock check dams. Straw wattles treated with PAM were not found on projects in the mountains. Apparently maintenance forces were following older plans.

Field Modification to Construction Plans

Field revisions to sedimentation and erosion control plans are being marked on the plans with consistency. Additional measures are drawn in on the plans and dated and initialed. NC DOT practice is being used as an example of how the private sector can document self-inspections of erosion and sedimentation control measures.

Land Quality Section Evaluations of DOT Projects

Inspections of NC DOT projects by the Land Quality Section vary by region across the state. A total of 68 inspections were done in the 2007-2008 fiscal year, principally by the Asheville and Raleigh Regional Offices.

CONCLUSIONS

Of the sixteen projects reviewed, seven were in good or better condition and eight were in fair condition and one was in fair/poor condition. The last project might have been rated in good

condition if inspected 2 days earlier. As noted earlier, the projects in the western portion of the state received 4 to 6 inches of rain during the review. Measures on NC DOT maintenance projects normally are not sized to handle the 10-year design storm due to right-of-way constraints, and the measures observed during the review were overwhelmed by water and sediment from the aggregate base course.

The failure of the skimmer sediment basins on the US 421 rest area project is a concern. It appeared they failed along the barrel pipe of the skimmer, possibly due to poor embankment compaction. The basins were long and narrow, without a wide cross-section or large surface area.

Cut slopes or road banks on the backside of ditches were poorly stabilized on some maintenance projects in both the east and the west. NC DOT reseeds these projects repeatedly until ground cover is established. REU inspects these projects for 2-3 growing seasons. It appears that an adequate seedbed is achieved in the mountains after several freeze-thaw cycles loosen the soil. Leaving slopes at a reasonable angle and making an effort at initial seedbed preparation would appear to be a more efficient course. There remains a gap in the responsibilities and capabilities of the grading crews and the landscape crews to prepare a seedbed on cut banks. (While seedbed preparation is normally the responsibility of the landscape crew, they do not have the equipment to scarify the cut banks.)

The different standards for environmental review of secondary road projects between NC DENR and NC DOT were discussed in the February 2008 review. Land Quality and REU staff have identified projects in sensitive watersheds and plan to look at the impacts of completed projects in sensitive watersheds in the coming year and report back to the Commission.

RECOMMENDATIONS

1. Enhanced sediment settling with flocculants should be integrated with traditional practices when adequate surface area cannot be provided for measures. This should be implemented immediately on all maintenance projects as well as contract construction.

2. County maintenance forces and landscaping crews need to coordinate which unit will prepare steep back slopes or cut banks for seeding.

3. Failures of skimmer sediment basins should be evaluated to determine if construction or design flaws can be identified and eliminated.

4. Sediment controls should be kept in place until ground cover sufficient to restrain erosion is established rather than being removed for the convenience of the seeding contractor. (Silt fence had been removed on the Long Shoals Road project despite the forecast of heavy rain.)

5. The Land Quality Section and NC DOT need to continue to evaluate the need for environmental review of projects in High Quality Waters and Trout Waters, and be consistent in their level of environmental protection.