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

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The Land Quality Section reviewed the program delegation to the Department of Transportation, Division of Highways (DOT) on January 14-16, 2008. The format was revised this year to focus on contract construction and design-build 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

Fourteen contract construction projects and two maintenance/force account projects were chosen based on the stage of construction and the significance of the projects. Projects were generally 30 to 70 percent complete, and one project was selected from each of the 14 divisions. The projects selected were:

CONTRACT PROJECTS

Division	County	TIP #	Route	Contract Amount	Length	% Complete
1	Bertie	R-2404A	US-17	$63,828,888.00	8.7 miles	86.95%
2	Beaufort	R-2510B	US-17	$192,040,143.00	6.8 miles	34.78%
3	Craven	B-4088	SR-1615	$686,157.50	0.152 miles	46.21%
4	Johnston	B-3481	NC-96	$1,325,336.05	0.218 miles	36.03%
5	Durham, Wake	R-2904, U-4026	NC-54	$35,467,891.08	6.363 miles	29.72%
6	Cumberland	R-2562AC	NC-87	$1,441,222.65	1.119 km	64.41%
7	Guilford	U-3313	SR-1129	$6,188,810.27	1.17 miles	63.42%
8	Lee	R-2417AB	US-421	$28,303,461.02	2.163 km	83.46%
9	Rowan	R-2911D	US-70	$16,829,234.79	2.851 miles	64.91%
10	Union	R-2616	US-601	$53,783,000.00	10.9 miles	14.50%
11	Caldwell	R-2237B	US-321	$63,420,752.12	6.57 miles	59.52%
12	Iredell	I-4411	I-77	$21,427,285.07	1.994 miles	34.62%
13	Buncombe	B-3119	SR-2804	$1,437,718.32	0.151 km	45.74%
14	Cherokee	R-977A	US-64	$47,999,079.76	8.489 km	74.99%

MAINTENANCE/FORCE ACCOUNT PROJECTS

Division	County	Name	Route	Length
3	Duplin	Old Field Road	SR 1971	1.2 miles
14	Jackson	Shook Cove Road	SR 1135	0.7 miles

OVERALL REVIEW CRITERIA

The Roadside Environmental Unit (REU) notified project construction management personnel of the review on the day preceding each day of 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.

Contract Construction Projects Summary

Project	Plan		Measures		Ground Cover		Overall Effectiveness
Name	adequacy	implementation	installation	maintenance	timeliness	adequacy	
US 17 Bertie	Good	Good	Good	Fair	Good	Fair	Fair
US 17 Beaufort	Good	Good	Good	Good	Good	Good	Good
SR-1615	Good	Good	Good	Good	Good	Good	Good
NC-96	Good	Good	Good	Good	Good	Good	Good
NC 54	Good	Good	Good	Good	Good	Fair	Good
NC 87	Good	Good	Good	Good	Good	Fair	Good
SR-1129	Good	Good	Good	Good	Good	Good	Good
US 421	Good	Good	Good	Good	Good	Good	Good
US 70	Good	Good	Fair	Good	Good	Fair	Fair
US 601	Good	Good	Fair	Good	Good	Good	Good
US 321	Fair	Good	Fair	Good	Good	Good	Good
I-77	Good	Fair	Fair	Fair	Fair	Poor	Fair
SR-2804	Good	Good	Good	Fair	Fair	Fair	Good
US 64	Good	Good	Good	Fair	Good	Good	Good

US 17 Bertie County— Ditches needed to be cleaned out in several areas. Rills have formed on road shoulders in several locations. Washed areas needed repair seeding. The Hardin borrow pit needs to be reseeded on the wall where a beach area was proposed. A wetland area above a culvert needed to be stabilized with ground cover to prevent sediment from entering between the silt fence and special control silt fence. Another area downstream of a culvert needed ground cover.

US 17 Beaufort County – Water in the borrow pit was clear. The borrow material was did not contain clay but just sand which settles out. The pit is not dewatered. Currently work is progressing on site. A gantry was built to assist in the building of the bridge. Seventy percent of the bypass is complete (not including the bridge). DOT asked for additional clearing around bridge. The project

wetland impact limits were originally permitted for 30 feet on each side of the bridge. The 404 permit was amended with the ACOE to allow more impact. Additional stabilization is needed under bridge. Currently vehicles are used to travel to and from under the bridge. Areas are seeded and look good on the approaches to the bridge.

SR 1615 – The project was completed in December 2007. REU will is conducting monthly inspections until permanent ground cover is established. Maintenance forces were in the process of repairing an eroded area and seeding and mulching.

NC-96 – Site looked great. Additional ground cover was needed on back slope on northeast side of bridge. DOT had trouble installing a skimmer basin to the required dimensions on the northwest side of the bridge. DOT used an innovative design with a two-tiered basin using flexible pipe to transport the water from surface of the upper basin to the lower basin. Both basins had baffles. The second basin had a skimmer. The design worked well.

NC 54—Overall the site was in good condition. Spoil removed from sediment control measures needed to be placed in a better location away from the stream. Trees were being planted on the banks of the stream relocation. Minor ground cover and installation problems were noted.

NC 87— Two small areas needed ground cover—on the shoulder of road where the detour had been and a bare area in the median on the North end of the bridge on the northbound side. The bridge project was to address scour undermining the bridge. Once the area of sediment under the bridge was removed the flow no longer scoured under the bridge. The bridge was not replaced expect for the north end on both lanes. The riprap slope under the bridge looked great. The southbound stream bank side was never touched. Project has been finished and turned over to maintenance.

SR 1129— Groometown Road in Greensboro is being widened. The storm drainage outfall into Sedgefield Lake was checked, along with the edge of the lake. No sedimentation damage was observed. The project was been well protected.

US 421— Site looked great. Several areas were identified that needed ground cover. Slope stability was a problem on a service road, and a ramp at an intersection. The service road area had been recently regraded and needed ground cover. The ramp has been settling. There is a potential for slope failure, which DOT is currently monitoring. Before paving of the ramp was to begin, cracking appeared at the top of slope. The paving of the ramp has been delayed to study the slope. It will be constructed with the next segment of the project. The slope is adequately vegetated and a silt fence is at the toe of the slope, which will remain indefinitely. Monitoring wells have been installed to detect the level of water in the slope to monitor stability. The area is well stabilized and has not sloughed.

US 70—Little to no seedbed preparation had been done before recently applied temporary seeding. The quality of installation of sediment controls was inconsistent. Some were well installed and others were not. Sediment controls had been maintained except at the bridge crossing.

US 601— Project being built to new standards with baffles in all basins and some skimmer basins. A couple basins needed to be adjusted in location. Contractor had built basins with incorrect spillway elevations, and this was being corrected with sandbags on some basins. Road grader had bladed out diversion berms to slope drains along new roadbed.

US 321— Massive cuts blasted from rock, and massive fills consisting of boulders characterize project. Numerous small waste areas are located along the project. An active waste area was the only location with poor management. Diversions were needed across haul road, and better sediment controls in ditch below waste area entrance. Falling/sliding rock a major safety concern on project.

I-77— Ground cover was poor. Areas had not been dressed and seeded after curbing was installed. A slope drain discharging directly into a drainage was unprotected at the inlet and outlet. A poorly installed Pipe Inlet Sediment Trap (PIST-A) was the handling entire waste area within a quadrant of the intersection. Two basins that had been installed in the area had been removed as fill was placed.

Another PIST-A was being used instead of two TRSD-B shown on the plan below a fill slope over a cross culvert.

SR 2804— Ground cover was fair to good, with much of the banks in rock. There was little erosion. A stone bench for a crane had been removed from the Broad River. Sand in the stream had been dug out to reopen pool where the bench had been. Special silt fence should be reinstalled before fill for ramp to river is excavated. The overall effectiveness of the sedimentation and erosion control measures was good.

US 64—Ground cover on slopes was generally good. Cotton fiber mulch had been used on many slopes. Grass was typically growing in the depressions made by "tracking" the slope, but not on the ridges in between. The exceptional drought in the mountains caused sparse stands of grass. The cotton mulch had broken down, leaving bare areas. Silt fence is being taken out along the toe of slopes prior to seeding. Two cross culverts received sediment because silt fence was removed the prior week, and it rained heavily over the weekend. A slope drain was draining the roadbed directly into a creek. The slope drain inlet should be protected with adequate sediment storage. The worst sedimentation was a bar of shale rock below a box culvert. The shale rock had been placed as substrate in the box culvert at the direction of DWQ.

Maintenance Projects Summary

Project	Plan		Measures		Ground Cover		Overall Effectiveness
Name	adequacy	implementation	installation	maintenance	timeliness	adequacy	
SR 1971	Good	Good	Good	Good	Good	Good	Good
SR 1135	Good	Good	Good	Good	Good	Good	Good

SR 1971, Old Field Road— The shoulders of road have been reseeded and mulched. The mulch was to be tacked the next day. One culvert needed silt fence above the pipe to prevent sediment from entering a farm ditch. The steepness of graded slopes may make ground cover difficult to establish.

SR 1135, Shook Cove Road—This project involves the widening and paving of an existing gravel road in mountainous Jackson County. A small stream classified as trout waters runs at the base of a fill slope. A trout waiver was not issued for this project until plans were revised to provide a permanent buffer zone between the toe of the fill slope and the stream. About 250-300 feet of the stream is to be relocated using natural channel design. The road will be widened toward the stream using rock fill. The work area had been cleared this fall and grassed for the winter. Special silt fence was located along the toe of the slope. The site was well maintained.

ADMINISTRATIVE REVIEW

The Roadside Environmental Unit is responsible for the erosion and sedimentation control plans prepared for DOT contract projects. The Hydraulics Unit designs 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 contained monthly inspection reports from the REU.

Education Efforts

NC DOT has contracted with N. C. State University to train and certify contractors and staff in the design, management and installation of sedimentation and erosion control practices. Levels I, II and III A and IIIB have been implemented. Research on the use of PAM treated straw wattles in the mountains was completed last year. Significant reduction in turbidity and total suspended solids were obtained. A special provision has been developed for use of the PAM treated straw wattles on contract construction projects. Installation training was developed by NC State for NC DOT maintenance forces. Wattles are being tested at locations around the state.

Plans and Specifications

Plan Preparation

The Roadside Environmental Unit staff prepares plans for contract construction projects. Most of the projects reviewed this year were built to older standards. Some were built to new standards, featuring porous baffles in the temporary sediment traps and basins and skimmers for dewatering.

Since the review focused on contract construction, only two plans for maintenance projects were reviewed in the field. The Shook Cove Road plan was atypical, and required several revisions to develop a plan for providing a buffer on a trout stream.

The methodology for sizing ditchline measures on maintenance projects was reviewed as part of the training materials for the NC DOT Level III Certification for erosion control plan design. RUSLE 2 software can be used to model sediment yields and basins are sized accordingly. When existing right-of-way is insufficient to install measures based on annual erosion rates, the basins are sized for 21% percent of the annual soil loss and the area is to be stabilized in 30 days. The sediment storage volumes developed in this model may be adequate, but the resulting surface area doesn't provide adequate sediment trapping efficiency. The use of PAM treated straw wattles or other treatments to enhance settling should be integrated into the system of sediment control measures to offset this insufficient surface area for gravity settling.

The US 19 project in Madison County was reviewed for a waiver of the trout buffer zone. This contract construction project for work in HQW trout waters utilized skimmer basins and straw wattles. Additional sediment control for large cut slopes during clearing and grubbing was required before approval. During the site visits, the plans for US 64 in Murphy were reviewed. Extensive additional sediment control for large cut slopes had been added in the field, with the revisions drawn on the clearing and grubbing plans. Clean water diversions were needed early in the clearing process. These projects suggest that more sediment control should be provided on the clearing and grubbing phases of these mountain projects.

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. This was being done consistently across the state.

Land Quality Section Evaluations of DOT Projects

LQS staff continues to schedule DOT project inspections along with all other public and private construction. The LQS Regional Engineers were given the discretion of scheduling these inspections by their respective staffs based upon workloads and other priorities within their respective offices. Land Quality did not issue any Notices of Violation to NC DOT last year.

CONCLUSIONS

1. Of the sixteen projects reviewed, 13 were in good condition and three were in fair condition. Early establishment of ground cover is the strongest part of NC DOT's program.

2. Record keeping and documentation were good on most projects.

3. Some of the resident engineers have better documentation of their weekly erosion control inspections than others. Detailed reports that tracked the date that a corrective action was first noted and the date it was corrected appeared to get better results.

4. No failed slope drains were observed. A few were unprotected because inlet protection had been removed for paving or grading.

5. Cotton fiber mulch provided little residual ground cover after several months.

6. The N. C. Department of Transportation has established general and specific minimum criteria for land disturbing activities requiring an environmental document under the State Environmental Policy Act (SEPA) that are more lenient than the general and minimum criteria the N. C. Department of Environment and Natural Resources has established for N. C. Department of Transportation projects. The comparable rules are found in 15A NCAC 01C .0408 and 19A NCAC 02F .0102. Thus a road project greater than five acres in disturbed area in High Quality or Trout waters (non-Coastal counties) would require an environmental assessment before Land Quality could approve the sedimentation and erosion control plan. The N. C. Department of Transportation proceeds on such projects without an environmental assessment because it has adopted rules that do not provide any special consideration for High Quality, Outstanding Resource, or Trout waters.

RECOMMENDATIONS

1. Inspection reports used for weekly sedimentation and erosion control measures should be standardized and include location, needed action, date first reported, and date corrected. The NC DOT inspector and the contractor should sign the reports. Records of rainfall data and other stormwater monitoring data should be kept in a uniform manner.

2. Cotton fiber mulch should be limited to applications when moisture and temperature are favorable for rapid establishment of vegetation.

3. Diversions, traps and basins should not have vertical side slopes. Construction details and training should emphasize installation that allows stabilization of these measures with vegetation.

4. Enhanced sediment settling with flocculants should be integrated with traditional practices when adequate surface area cannot be provided for measures.

5. Adequate sediment control for the clearing and grubbing of cut slopes in steep terrain should be provided.

6. 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.

7. The inlet protection for slope drains should be designed for adequate sediment trapping and storage when the drain discharges without further sediment control.

8. For all projects for which the N. C. Department of Transportation has received a delegation to approve sedimentation and erosion control plans, the N. C. Department of Transportation should develop a plan to be consistent with the North Carolina Department of Environment and Natural Resources in determining if a land disturbing activity requires an environmental document under the State Environmental Policy Act.