

Transportation Issues

Division Maintenance Staffing and Use of Contract Services Assessment

KPMG Peat Marwick
Government Services Management Consultants
for
North Carolina General Assembly
Government Performance Audit Committee
December 1992

Issue Statement

The objectives of this paper are to:

- Assess the adequacy of the Department's overall maintenance¹ staffing levels in the fourteen field divisions
- Assess the current use of outside contractors by NCDOT divisions for performing maintenance and construction services.
- Recommend changes in the type and extent of outside contracting of maintenance and construction services by the NCDOT divisions to better leverage existing NCDOT staff resources and meet peak or expanding workloads.

Background

The Department's maintenance mission is defined by three basic categories of work:

- Routine Maintenance - the day-to-day activities associated with preserving the infrastructure and providing a safe, aesthetic and comfortable highway system. Example activities include patching, traffic line painting, and snow removal. Bituminous surface treatments are also considered routine maintenance.
- Secondary Road Construction - upgrading existing roads from unpaved to paved. This includes the normal construction activities of earthwork, drainage, base, and paving.
- Contract Resurfacing - resurfacing existing paved roads by contract, normally with hot-mix asphaltic concrete.

The staffing and resources employed to carry out the Department's highway maintenance program are assigned at either of three organizational levels:

- Counties - are normally responsible for routine maintenance and most secondary road construction.
- Districts - are made up of from one to six counties. Administrative and engineering functions such as minor roadway design, permit processing, and surveying are handled by the staff at this level.

¹ The term maintenance, as used in this section, refers to both maintenance and operations activities, including repair, renewal, traffic engineering, and environmental services.

- Divisions - includes a number of division-wide crews: bituminous operations, environmental, traffic services, and equipment maintenance. Although the equipment maintenance personnel are physically assigned to county-based garages, they are managed from the Division level.

The existing NCDOT field staffing allocation was determined by establishing uniform work standards and productivity guidelines for the basic maintenance activities. The work standards were applied to the road mileage inventory to determine the staffing requirements for each of the field organizations.

NCDOT uses a variety of outside contractors to perform selected functions in the maintenance and construction areas. While most construction activities have been traditionally performed by private contractors, the role of private contractors in the area of field maintenance and operations has been a more recent development. Like many other state departments of transportation, NCDOT has been increasingly turning to outside contractors to perform maintenance functions in order to keep up with the growing maintenance workload without having to markedly expand division-based maintenance levels. While some debate the cost-effectiveness of using outside contractor forces to perform these functions, this recent development has helped the Department bridge the gap between its increasing maintenance workload and its decreasing staff resources to address this workload.

The amount of maintenance contracting has a direct impact on the need for in-house staff. The amount of contracting and the type of work which is contracted out varies by division. Overall, the Department contracts out about 22 percent of its work load, measured by dollar amounts.² Typical activities which are contracted, either totally or in part, include:

- Mowing
- Secondary Road Construction - about 50 percent of the total
- Tree Trimming
- Small Urban Projects
- Spot Safety Projects
- Maintenance of Selected Traffic Control Devices

² *Progress Report on Maintenance and Operations Personnel.* Transportation Research Circular, Number 360. Transportation Research Board, National Research Council. June 1990.

Findings

Finding 1 : NCDOT is handling a larger maintenance program with fewer in-house maintenance staff.

The Department's maintenance program has grown, in constant 1992 dollars, by about 15 percent since 1981. In the same period, staffing has gone down from 6,018 authorized permanent positions to the current 5,586 positions, a reduction of 7 percent. (See Exhibit 1.) The Department was performing \$57,000 of maintenance work per full-time employee in 1981, in 1992 dollars. For fiscal year 1992, it is performing \$71,000 of maintenance work per full-time employee.

Finding 2 : Most of the Department's maintenance program growth has occurred in the Secondary Road Construction program.

A major contributor to the increased maintenance program work load is the Secondary Road Construction program, which expanded dramatically in 1989 as a result of the Highway Trust Fund. About 92 percent of the maintenance program increase since 1981 is attributable to the Secondary Road Construction program, as illustrated in Exhibit 2.

Finding 3 : Most Division construction work is performed by outside contractor forces.

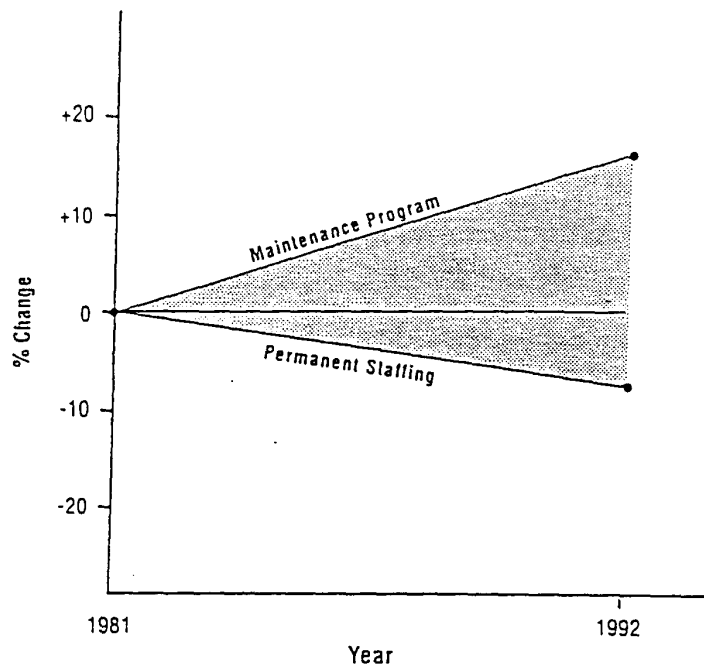
Exhibit 3 lists the approximate proportion of division field activities that are performed by outside contract forces. As shown in Exhibit 3, the vast majority of division construction activities is performed by outside contractor forces, under the project management oversight of NCDOT division resident engineers. By State law, all construction projects over \$300,000 are to be performed by outside contractors, which are procured by competitive bid.

In more recent years, with the growth in construction work load spawned by the Highway Trust Fund, the NCDOT Construction and Materials Branch has increasingly contracted out selected construction engineering and inspection (CEI) functions to leverage in-house construction forces and reduce the problems of rapid staffing changes. Examples include:

- Requiring contractors to assume increasing responsibility for their own process control by having them perform day-to-day materials sampling, while the Department's construction staff performs verification testing and reviews the overall operations.
- Requiring contractors to perform their own construction layout (surveying) on selected projects (32 projects to date).
- Contracting out the entire construction engineering and inspection functions to private engineering firms, reporting to Department resident engineers, which has been done on several contracts as part of an on-going pilot program.

EXHIBIT 1

Growth in the Maintenance Program Versus In-House Staffing



- Explanatory Notes:
1. Maintenance Program is that portion of the maintenance program normally performed by in-house forces. It includes routine maintenance, traffic operations, roadside/environmental, and the secondary road construction program. It excludes contract resurfacing.
 2. The % change is based on constant 1992 dollars calculated by using the maintenance cost trend index.

Sources: NCDOT for maintenance program and staffing data.

Highway Statistics - 1988, Federal Highway Administration,
U.S. Department of Transportation for maintenance cost trend
index from 1981 to 1988.

EXHIBIT 2

Increase in the Maintenance Program (Millions of 1992 Constant Dollars)

<u>FY</u>	<u>Maintenance</u>	<u>% of Total Program</u>	<u>Secondary Road Construction</u>	<u>% of Total Program</u>	<u>Program Total</u>
1981	\$277	80%	\$ 68	20%	\$345
1988	\$272	78%	\$ 77	22%	\$349
1992	\$281	71%	\$115	29%	\$396

Source: NCDOT

EXHIBIT 3

DIVISION CONTRACTING OUT BY FUNCTION

<u>Function</u>	<u>Approximate Contract Proportion</u>
Administration	0%
Contract Construction	100%
Secondary Road Construction	50%
Resurfacing	70%
Small Urban, Discretionary, and Public Access Roads	95%
Spot Safety Projects	95%
Maintenance and Operations	12%

Source: Interviews with NCDOT division personnel and Highway Operations Division staff

These instances demonstrate NCDOT's increasing willingness to use outside contract resources to help meet the work load needs in the construction program during peak periods to avoid postponing funded projects due to lack of in-house staff. Continued Department oversight of these contracted out CEI functions ensures proper internal control over these quality control/quality assurance activities.

Finding 4 : Half of the Secondary Road Construction program is performed by in-house Division maintenance forces.

Prior to the mid-1980's, the paving of unpaved secondary roads was largely done by in-house maintenance forces. Since the mid-1980s, the Department has made significant progress in contracting out increasing proportions of the Secondary Road Construction program, particularly the base and paving portions of these projects. This has resulted in 50 percent of the Secondary Road Construction program being contracted out.

The \$300,000 limit for in-house performance of construction projects enables the NCDOT divisions to retain the remaining 50 percent of the Secondary Road Construction program by using in-house maintenance forces. The in-house portion currently amounts to about \$50 million annually, but could readily be contracted out to an industry suffering from the national recession. The Department keeps half of the Secondary Road Construction program to utilize available division maintenance forces who are not adequately funded to address the Department's remaining maintenance work load.

Finding 5 : Most routine maintenance and operations activities continue to be performed by in-house Division forces.

In the maintenance area, the NCDOT divisions contract out a very limited portion of their responsibilities, averaging around 12 percent (excluding the Secondary Road Construction, Spot Safety, and Small Urban projects which involve the division maintenance/operations forces). This level of routine maintenance contracting reflects a more recent trend toward outsourcing these kinds of activities to help absorb a portion of the increased maintenance program work load. Exhibit 4 shows the kinds of specific activities contracted out by the NCDOT divisions in the areas of construction and maintenance, as well as their average proportion contracted out. According to these figures, the primary areas contracted out in maintenance include:

- Mowing the grass along NCDOT roadway rights of way
- Maintaining roadside rest areas, particularly along interstate highways
- Signal installation
- Specialized services (landscaping, painting, electrical work)

EXHIBIT 4

DIVISION ACTIVITIES CONTRACTED OUT

Division Contract Activities	Average Proportion Contracted Out
■ Construction	
- Construction Management	5%
- Construction Survey	5% (mostly interstate)
- Primary/Interstate Construction	100%
- Plant Mix Resurfacing	100%
- Small Urban Construction	95%
- Spot Safety Program	95%
- Access and Public Service Roads	95%
- Secondary Road Construction	50%
- Secondary Road Construction - Equipment	10%
■ Maintenance	
- Mowing (primarily along paved roads)	80%
- Rest Area Maintenance	80%
- Secondary Roads Surveys and Design	30%
- Bituminous Surface Treatment Resurfacing	50%
- Planting, Seeding, and Mulching	50%
- Lime Application	100%
- Special Tree Removal Service	100%
- Roadside Lighting Maintenance	50%
- Pavement Markings (Regular)	20%
- Pavement Markings Removal	100%
- Raised Pavement Markings and Reflectors	100%
- Signal, Loop, and Pole Installation	80%
- Logo Signing	100%
- Special Electrical Work	100%

Source: Interviews with NCDOT division personnel and Highway Operations Division staff.

¹ Includes both in-house and contracted out functions

Most other routine maintenance activities are performed by in-house forces, whose numbers have declined over the past 11 years despite a growing work load. This relatively low level of contracting for maintenance functions reflects concerns by division management over the costs of contracting out for these services, the level of service quality provided, and the flexibility and responsiveness to changing needs or conditions. Efforts to contract out mowing and roadside rest area maintenance continue to evoke concerns regarding the service performance and costs of outside contractors compared to in-house forces.

Exhibit 5 compares NCDOT to seven other state departments of transportation in terms of contracted maintenance and operations functions. The results indicate that NCDOT has about the same proportion of maintenance and operations functions performed by outside forces as the other states, on average, assuming that Secondary Road Construction is included as a maintenance activity in the NCDOT figures. If this activity is removed, then the NCDOT figure would drop to about 12 percent, which would be less than half of the average for the other seven states noted in Exhibit 5. The fact that NCDOT counts Secondary Road Construction as a maintenance function, unlike the other seven states included in the peer comparison, results from the Department's decision to allow in-house division maintenance forces to perform up to 50 percent of this activity to make up for the lack of maintenance and operations program budget growth over the last several years that is commensurate with the growth in maintenance and operations work load.

Finding 6 : While NCDOT's maintenance staffing appears lean, the Department does not currently need more in-house maintenance staff.

The Department's overall ratio of lane-miles per maintenance staff is higher than that of other state highway agencies in the southeast, as shown in Exhibit 6. This means that the Department is carrying out its maintenance program with proportionately less staff than the other states included in the peer comparison.

To make a valid comparison with the other states, only those maintenance personnel assigned at the division level and below were included in the analysis. The data show that North Carolina has an overall staffing level of 29 lane-miles per maintenance employee. This compares to an average of 21 lane-miles per employee for the other surveyed states, which had a range of 14 to 27 lane-miles per employee.

In evaluating these comparisons, it is recognized that there are variations in organizational structure, maintenance responsibilities, amount of work contracted out, and many other factors that affect staffing levels. Also, without a definitive measure of the quality of each state's road system, from a maintenance perspective, it is not feasible to determine which state had the "optimum" staffing level. Given these variables and the opportunities to contract out increased proportions of maintenance activities, the Department does not need to expand its overall in-house maintenance staff at the present time. Current staff could be reassigned to higher priority in-house functions, while selected functions are increasingly

EXHIBIT 5

COMPARISON OF CONTRACT MAINTENANCE ACTIVITY BY STATE

<u>State</u>	<u>Percent of Maintenance Work Contracted Out</u>
Florida	15%
Kentucky	12%
Maryland	16%
North Carolina	22% ¹
South Carolina	35%
Tennessee	26%
Virginia	50%
West Virginia	5%
Average	23% ²

Source: *Progress Report on Maintenance and Operations Personnel*. Transportation Research Circular, Number 360. Transportation Research Board, National Research Council. June 1990.

¹ Includes Secondary Road Construction activity for NCDOT only. If this activity is not included, the percentage of maintenance work contracted out drops to 12 percent.

² Non-weighted average of 8 states in sample.

EXHIBIT 6

Comparison of NCDOT Staffing
with Southeastern States

<u>State DOT</u>	<u>Number of Maintenance Personnel¹</u>	<u>Lane Mile²</u>	<u>Lane-Miles Per Employee</u>
Florida	2,500	36,220	14.5
North Carolina	5,586	163,799	29.3
South Carolina	3,611	86,999	24.1
Tennessee	2,327	32,650	14.0
Texas	6,735	181,006	26.8
Virginia	5,650	115,096	20.3
West Virginia	2,774	50,465	18.2
Average			22.8 ³

¹ Survey of state department of transportation maintenance divisions

² *Progress Report on Maintenance and Operations Personnel*. Transportation Research Circular, Number 360. Transportation Research Board, National Research Council. June 1990.

³ Weighted average of seven states in sample.

contracted out. Over time, as the State highway system expands due to the HTF program, there may be limited staff increases needed to carry out the resulting increase in routine maintenance activities.

In addition to the comparison with other states and the analysis of maintenance staffing trends, the Audit Team performed an analysis of the variation in county-level maintenance staffing. The purpose of the analysis was to determine whether there might be inefficiencies in the allocation of resources. The analysis showed that there are wide variations in the ratio of lane-miles per employee between the counties. However, there are also wide variations in the county organization, environment, and operating practices which could make the variation in staffing justifiable. The Department is currently conducting a crew-size study to determine maintenance staffing needs. The Department's approach will consider the organizational, environmental, and operating variables, and result in an equitable distribution of staff.

Recommendations

Recommendation 1 : The Department should maintain its current maintenance staffing and accomplish the increased maintenance program work load through expanded use of outside contract forces.

The overall level of staffing for the Department should be based on:

- The determination of resources needed to provide an acceptable level of service, accomplish the annual maintenance program efficiently, and erase the existing maintenance backlog
- The determination of the most appropriate mix of contract and in-house resources

As the maintenance program has increased, the Department has been able to handle a portion of the increased work through contracting. However, the Department can make additional use of private contractors. To help the Department better meet its current and future maintenance responsibilities, the following actions are therefore recommended:

- NCDOT should continue to contract out construction activities, as well as those maintenance functions, such as mowing, roadside rest area maintenance, building maintenance, signal installation, and signal maintenance, that it currently contracts.
- NCDOT should contract out all of the Secondary Road Construction program and free up the in-house maintenance staff now performing this function to concentrate on backlogged and expanding maintenance needs. This presumes that the Department receives sufficient further funding of its routine maintenance program to support the reassignment of Division maintenance forces currently involved in the Secondary Road Construction program. This could be facilitated by transferring a portion (16 percent) of

the Highway Trust Fund monies to the division maintenance budgets, as recommended elsewhere by the GPAC Audit Team.

- NCDOT should expand its efforts to contract out maintenance functions, by increasing the proportion of contracted work in such areas as: ditch cleaning, landscaping, and bituminous surface treatment resurfacing.

Increasing the types and level of routine maintenance contracted out should be based not only on the costs and service levels of the proposed efforts, but also on the relative availability of competition in the service area. This may be a problem in the more rural areas of the State, where the number of contractors capable of performing the requested functions might be limited.

Recommendation 2 : NCDOT should expand its use of municipal agreements to address growing urban operations needs.

NCDOT should expand efforts to turn over operations-related functions, such as signal maintenance, signal system operation, sign maintenance, and pavement marking maintenance, to local urbanized communities through municipal agreements. This recommendation will place operational responsibility closer to the group most impacted by the function while potentially relieving NCDOT of part of the associated costs.

Increasing the extent of maintenance operations activities performed by outside contract forces can be done in a variety of ways, including:

- Developing a demonstration project which contracts out all maintenance and operations activities within a certain geographic area (county) to serve as a basis for comparing in-house versus contract costs on an area-wide basis
- Identifying selected functions for contracting out on a district or division basis
- Identifying functions to contract out, based on the specialized nature of the work and the availability of competitive contractor resources

Implications

The proposed recommendations will provide for a greater role of the private sector in the Department's Secondary Road Construction program and its maintenance program. Increased contracting out of these program functions will provide increased flexibility to Department management in handling changes to program workloads and embracing new technology and more innovative techniques. It will also promote increased business development by providing local entrepreneurs greater opportunity to compete for work previously performed by in-house forces. This will enable the Department to better leverage its own division staff resources to:

- Address backlogged and expanding maintenance and operations workload
- Serve as quality control contract administrators over outside contract maintenance/operations providers

The effect of these recommendations will be to effectively double contract activity in the areas of Secondary Road Construction (by about \$50 million per year) and routine maintenance and operations (by about \$20 million per year).