A Planning Process To Develop Traffic Management Plans During Highway Reconstruction

A. J. NEVEU and L. MAYNUS

ABSTRACT

As the emphasis by transportation agencies shifts away from new construction and toward the repairing and maintenance of existing facilities, the problem of how to maintain traffic through and around the reconstruction becomes an important issue facing agency officials. The New York State Department of Transportation formed a task force to develop a document to guide the regional offices in the preparation of traffic management plans that may include transportation system management (TSM) actions. A planning process was presented for the regions to follow to determine whether TSM actions were necessary to maintain traffic and a list of possible TSM actions to implement was provided, which was drawn from previous experience in Pittsburgh, Syracuse, and Boston reconstruction projects and reported on the specific application, costs, and effectiveness of the TSM action.

From the 1950s to the early 1970s the major focus of the nation's highway program was on construction of new and better facilities to carry increasing traffic volumes at high speeds. The freeway systems now present in many urban areas were planned and constructed during this period. As these highways begin to reach their design service life, the emphasis of the state transportation agency is shifting away from building new facilities to rebuilding the older, deteriorating systems. Concern over the condition of the transportation infrastructure has grown rapidly in the past few years. In New York State, for example, voters in 1983 approved a $1.25 billion bond issue devoted entirely to a 5-year program to rebuild the state's transportation infrastructure.

As this reconstruction continues to grow in importance, a problem comes to the forefront that was not a concern in the construction of new facilities. During the reconstruction of a highway section, the designer has to be concerned with the existing traffic on the facility. In most cases, traffic volumes are low enough to be adequately handled within the project site by traditional strategies for the maintenance and protection of traffic, which may include lane closures, lane constructions, crossovers, and off-site detours onto alternative routes. However, many urban highway systems support such high levels of traffic that these strategies will not be enough to permit reasonable traffic flows during the reconstruction period. A concerted effort involving every level of government, labor, and business must be used to alleviate traffic disruptions due to reconstruction on these high-volume roadways.

Recent reconstruction projects in Pittsburgh and Syracuse have demonstrated the use of transportation system management (TSM) actions to reduce traffic congestion by offering alternative travel options. Although the use of TSM actions is not remarkable in itself, their use in a reconstruction context was an important milestone. It marked a change in the way that transportation agencies plan for traffic management during reconstruction. Whereas previously almost all of the planning was confined to the project site, now strategies that were, in some cases, far removed from the project site were being considered to help reduce congestion and maintain mobility. At the same time, FHWA began to allow construction funds to be used for these off-site actions. These factors have combined to spur greater interest in these innovative traffic management plans.

Because of this increased concern for traffic management planning during reconstruction, it became necessary to collect information from recent experiences and provide this to other potential users.

The New York State Department of Transportation (NYSDOT) undertook the development of a manual to provide some guidance to their regional offices for the preparation of traffic management plans, which may use TSM strategies (1). This manual is composed of two sections. The first develops a procedure by which reconstruction projects that may need TSM actions to maintain traffic flows at an acceptable level can be easily identified and addressed. This procedure outlines steps to follow by which the project manager can determine whether the project may need TSM actions and the major points to consider in the development, implementation, and monitoring of the traffic management plan.

The second portion of the manual is devoted to specific TSM actions that have been or may be used in traffic management efforts. This section draws heavily on experience with TSM strategies in reconstruction projects in Pittsburgh, Syracuse, and Boston. Information is presented on location of the action, a description of the specific program that was developed, estimates of its effectiveness and cost, and general comments on its applicability, special circumstances, or possible improvements. In addition, sample contracts or arrangements between major parties involved in the implementation of specific TSM actions are included where possible. With this manual, the highway planner can begin identifying reconstruction projects that may need special attention to the traffic management plans and can select which types of actions may be applicable for these projects.

The manual focuses only on use of TSM actions for...
Traffic management during reconstruction. The more basic and traditional plans for maintenance and protection of traffic are not addressed. These have been addressed for many years by highway designers and were more commonly used in the past. The foundation of a good traffic management plan will always begin with aggressive, on-site strategies to maintain flow and protect the work crews. Only in special cases do TSM actions need to be implemented, monitored, and evaluated. New and more effective on-site techniques are being introduced, and older ones are being reemphasized or redefined. The highway designer must be ready to use these new procedures as they are introduced.

The purpose of this paper is to present the planning process developed during the study. The planning process is based on the experiences from previous reconstruction projects on which TSM strategies were used to alleviate traffic disruptions (2,3). These steps were designed to conform to the current NYSDOT design process and responsibilities, but the general concepts could be easily adopted by other states.

**PLANNING PROCESS TO FORMULATE A TSM PLAN**

**Background**

As the nontraditional types of traffic management strategies become more widely known and applied, it is necessary to define where their evaluation and implementation fall in the current process for developing traffic maintenance and protection plans. This is especially important at this time when the concepts are still very new and no guidance on how to best utilize them is generally available.

A general planning process is presented that outlines the steps to follow to initiate and implement a traffic management plan. This procedure does not change the way highway designers develop "traditional" traffic maintenance and protection plans; it does, however, determine the new concepts regarding the selection and implementation of TSM strategies should appear in the process.

The basic philosophy behind the TSM planning process is to do only the traffic management activity that is necessary to maintain a reasonable level of service through and around the reconstruction site. For a majority of the projects the traditional traffic maintenance and protection schemes that have been developed and implemented by the highway designer for many years will be adequate. However, there will be cases in which the project will be sufficiently complex or traffic volume will be sufficiently large to warrant additional traffic management strategies. In addition, a group of projects in the same general region may also require TSM actions for traffic management, even though any one of them is not large enough to merit such consideration. These procedures facilitate identification of these projects and outline a process to develop traffic management plans to fit those extraordinary circumstances.

The procedures fit into the current NYSDOT design process with little difficulty. They do not change the existing process but rather add several steps if traffic management actions are needed. If these actions are not needed, the process is not different from the existing one.

This procedure is intended to provide some guidance to project designers in determining whether TSM actions will be necessary. It is not intended to be the exact process to be followed for each project. Differences between projects and areas are too great to allow this. Each project must be addressed differently, and this procedure should be viewed as one way of approaching the analysis questions.

This expanded planning process is shown as a flow chart in Figure 1. Each of the boxes is briefly described in the following sections.

**Step-By-Step Process**

1. **Examine Areawide Construction Schedule:** The magnitude and nature of construction within an area determine to a large extent what types of traffic maintenance actions can be applied and how effective they will be. Problems could arise if some of the alternative routes for a reconstruction project are being worked on at the same time. This would include not only state projects, but also county, city, and utility company (telephone, power, water) projects as well. If there are conflicts between projects, consideration should be given to altering the construction schedule if other constraints (e.g., funding deadline) allow.

2. **Commit to Highway Reconstruction:** Once the areawide construction schedule has been examined and possible conflicts minimized, the reconstruction project or projects can be programmed. The planner should be aware of activities, such as upcoming bond issues, that may accelerate the programming of related projects. The construction schedule must be flexible enough to accommodate such changes without interference with projects that have been previously programmed.

3. **Develop Maintenance and Protection of Traffic Plan:** Maintaining and protecting the traffic flow is an integral and traditional part of highway reconstruction. This has been part of the design phase for many years, and no changes are envisioned here. A comprehensive traffic maintenance plan can eliminate or reduce many traffic problems without resorting to TSM actions. Development of the plan for maintenance and protection of traffic should begin early enough in the design phase to indicate how traffic will be handled in the construction zone, to allow assessment of the capacity loss, and to develop an adequate TSM plan, if necessary. This is especially important if related projects are accelerated. Anticipating such project acceleration may prevent the TSM plans from breaking down. Because the traffic maintenance plan is affected by the highway design, and vice versa, interactions between two activities should be continued and increased. The traffic maintenance plan should explicitly consider commuter and through traffic separately, because their needs are different and strategies to assist one may negatively affect the other.

Contract provisions that accelerate reconstruction progress or minimize traffic disruption should also be considered. These would include incentives for early completion, late penalties, specific deadlines for the various tasks, strict enforcement of the schedule, nighttime work allowances, use of new materials or technology, completion of construction, visual screening of work areas, or readily available emergency vehicles to handle accidents quickly.

A good public information program is a vital part of the traffic maintenance plan. This is also a TSM action, but should not be limited to that use alone. Frequently employed public information actions include the distribution of construction maps of the area, advance publicity about the upcoming work, and frequent appearances by department staff to explain the project, its duration, and its benefits.

With such a comprehensive traffic maintenance and protection plan, many traffic disruptions can be eliminated or at least reduced to an acceptable level.
4. Identify Capacity Loss During Reconstruction: Reconstruction activities and the traffic maintenance and protection plan frequently result in a loss of capacity on the highway section under reconstruction. Lane closures, lane constrictions, protective barriers, and reduced speed limits are examples of capacity-reducing activities. It is necessary to estimate the loss of capacity and compare it with the traffic flow before reconstruction begins to determine whether the existing traffic can be handled or if diversions from this route will become necessary, especially during the peak hours.

5. Can the Traffic Be Handled? If the traffic maintenance and protection plan can accommodate the existing traffic with minimum disruptions or delay, an extensive TSM plan will not be necessary, although some TSM strategies may still be desirable. If the traffic cannot be handled, other actions to alleviate the disruptions, including an extensive TSM program, should be examined. The actual criteria to be used in this assessment should be a function of the existing conditions. It is impossible to set an arbitrary acceptable level.

6. Can the Traffic Maintenance and Protection Plan Be Revised? If the traffic plan can be revised, return to Step 3 to make alterations, then continue along the process again. If the traffic maintenance plan cannot be satisfactorily improved, other solutions must be developed.

7. Determine Capacity of Alternative Routes: The first item to consider is the use of alternative routings within or around the corridor. This should include routings for both commuter and through trips. These routes would be beyond the typical off-site detour and could encompass several possible routings. Computerized traffic simulation techniques may be helpful in defining alternative routes and their ability to handle increases in traffic. The areawide construction schedule should be examined to determine whether any work is planned on the alternative routes that would affect their usefulness for the project under construction.

8. Is the Capacity Adequate? If the alternative routes have adequate capacity, put signs in place informing the motorist of the options and the alternative routes. If adequate capacity is not available, reevaluate the traffic maintenance and protection plan to determine whether additional capacity can be gained.

9. Can the Traffic Maintenance and Protection Plan Be Revised? If revisions are possible, repeat the process from Step 3. If no revisions are possible, it will be necessary to develop TSM strategies to add to the traffic maintenance and protection plan.

10. Set Up Regional TSM Task Force: The first step in developing a TSM supplement to a traffic maintenance and protection plan is the creation of a
local departmental study group or task force composed of all involved department functions. This should include design, construction, planning, traffic and safety, and program planning as a minimum. It is this group that will provide the guidance and expertise for the development and implementation of the TSM plan. Through this group the general definition of the traffic problems should be developed, and some idea of the solutions should be formulated. It is imperative that a clearly defined leadership role be provided and supported by all the involved parties.

11. Set Up External Task Force: Once the internal task force has been organized and the problem scope with potential solutions identified, it is necessary to bring in other interested parties to advance the development and implementation of a TSM plan. These groups may include the metropolitan planning organization, city police and fire officials, mayor's office, transit operators, town and county governments, business and civic organizations, and the media. It is through these groups that most of the TSM actions will be developed and implemented. Many of the potential TSM actions become the responsibility of these organizations, so their interest and cooperation is of the utmost importance.

12. Formulate TSM Plan: Using experiences from previous projects, a TSM plan is developed by the implementing agency with involvement of the external task force. The internal task force provides technical support and serves a review function as well. The TSM plan can include whatever actions are considered necessary or reasonable by the task force, using whatever resources are available to them. Both commuter and through traffic need consideration. The second section of the NYSDOT manual provides a selection of possible TSM actions along with the anticipated costs, effectiveness, procedural guidelines, and other helpful information.

13. Implement and Monitor: The TSM plan is implemented along with the traffic maintenance and protection plan to minimize construction-related traffic disruptions. Traffic flows should be monitored to uncover problems with the plans; revisions should be made as necessary to maintain smooth movement through the corridor. Flexibility, in terms of deleting or adding TSM actions to the traffic management plan, is essential to the plan's success.

The process presented here is to provide general guidance in identifying reconstruction projects that may require special treatment and in determining applicable TSM strategies to implement. This procedure can be used for a single project or for an areawide problem with equal ease. As more experience is gained in this area, this procedure will be refined.

TSM ACTIONS

The following pages present an example of the TSM actions given in the NYSDOT manual. These TSM actions have been or could be used to maintain traffic during reconstruction. A description of the action, the location in which it was used, the specific program implemented at that area, an estimate of its effectiveness, any cost information available, and a set of general comments covering special circumstances, possible improvements, and relationship to other actions are given (1):

**Action:** EXPRESS BUS SERVICE
**Location:** Syracuse, I-81, 1984
**Description:** Working with park-and-ride lots as designated bus stops, the area's transit authority, Central New York Regional Transportation Authority, and a private transit carrier, S&O Motor Lines, Inc. provided 12 trips into the city during the morning peak period and 10 trips out of the city during the evening peak period. These trips were operating at 15 minute intervals to provide convenience to the commuters. In order to develop the market once the service began no fares were charged during the first week.

The bus services were set up such that after the activities began they would be adjusted, eliminated, or expanded to fit the actual response of the commuters.

The operators were responsible for the advertising and other media related activities concerning the bus services. They provided a multicolor pamphlet, "THREE WAYS TO BEAT THE MAZE," explaining the TSM package and the need for it, car-pool posters and sign-up sheets, and newspaper and radio advertising.

The users of the buses were surveyed just after the services began. This was done to help evaluate the effectiveness of the system and to learn where to adjust it for increased effectiveness. See the comments section for some results of the survey.

**Costs:** Final analysis of the costs is not presently available. NYSDOT and FHWA subsidized the costs of these services such that the bus lines would not lose money.

**Comments:** Of the people responding to the survey (197), 40 percent drove alone before the service. About 14 percent had previously ridden with someone else. Almost 82 percent of those responding indicated that they used it continually (4-5 days per week) and 82 percent had found out about the service through the media efforts provided by the bus companies.

These actions are presented as separate entities in the manual but a general traffic management plan would incorporate several TSM strategies. The effectiveness of the package of actions is not explicitly considered in this manual. Some actions reinforce each other, some directly compete, and some have no impact on other actions. Extreme care should be taken to recognize any possible synergistic effect on any implemented TSM package.

This manual is not to be considered a static tool. Numerous revisions and additions to the manual are anticipated as these TSM strategies are applied and evaluated in various situations across the nation. It is therefore imperative that a good evaluation of each use of these TSM strategies be part of any traffic management plan so that other highway planners and designers may learn from each experience.
SUMMARY

The planning process developed by NYSDOT is aimed at providing the regional offices with guidance for the identification of highway projects that may need TSM strategies for traffic management and suggestions on the development and implementation of such plans. To date, this procedure has not been applied in its entirety. It is based, however, on the steps followed in previous TSM traffic management plans. It is intended to serve as a starting point for the consideration of which projects may need TSM strategies to maintain acceptable traffic flows. The characteristics of the individual project would determine the specific sequence of activities and steps to follow in the development of a traffic maintenance plan. It is hoped that as more projects are subjected to this procedure, the experience gained through them can be incorporated into the planning steps.

REFERENCES


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