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Review of Operations in the Virginia Department of Transportation's Project Development Process

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Abstract

The Virginia Department of Transportation's (VDOT's) project development process (PDP) directs how construction projects are developed. The purpose of this study was to evaluate the manner in which operations is currently considered throughout the PDP and to identify opportunities to expand and enhance the consideration of operations such that the outcome is a more efficient and effective roadway system. The term *operations* refers to the safe, efficient, and effective movement of traffic on the highway system.

Overall, the PDP is working well with regard to addressing traffic engineering issues. The project team process is valuable in reviewing and developing plans. Although there is some variety in the manner in which TE staff participates in the PDP across regions, there is consensus that the process is most effective when TE staff members are involved regularly and throughout the process. A blend of flexibility to account for the uniqueness of projects and project teams and consistency in the application of the basics of the PDP is important.

Communication among all PDP team members is a critical component of the process. The resolution of recommendations brought by any team member needs be documented and disseminated to all team members. Checklists used to ensure that all issues have been addressed are not currently universally employed but are considered valuable in instances where team members are new to the process or the team desires the additional structure checklists provide. Clear procedures for dispute resolution are needed to improve the PDP process when consensus cannot be reached on recommendations.

Recommendations are offered for improving the operations aspect of the PDP, including providing a description of role and responsibilities of the TE staff in the PDP, providing guidance as to who has responsibility and accountability for TE and safety-related items in the plans, reviewing the process for establishing a schedule and budget to make certain that adequate time is provided for project development and reviews with a focus on program management, and examining the opportunity to begin the PDP concurrent with the end of the planning process.

FINAL REPORT

REVIEW OF OPERATIONS IN THE VIRGINIA DEPARTMENT OF TRANSPORTATION'S PROJECT DEVELOPMENT PROCESS

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(A partnership of the Virginia Department of Transportation
and the University of Virginia since 1948)

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ABSTRACT

The Virginia Department of Transportation's (VDOT's) project development process (PDP) directs how construction projects are developed. The purpose of this study was to evaluate the manner in which operations is currently considered throughout the PDP and to identify opportunities to expand and enhance the consideration of operations such that the outcome is a more efficient and effective roadway system. The term *operations* refers to the safe, efficient, and effective movement of traffic on the highway system.

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INTRODUCTION

With the creation of the system operations directorate, the system operations business plan, and related organization restructuring, the Virginia Department of Transportation (VDOT) is poised for a centralized, coordinated effort to place a significant policy and program-wide priority on operating the transportation system to maximize mobility-related performance as a core business function. This system operations business includes (1) maintaining the system assets, (2) operating the system as efficiently and effectively as possible, (3) improving traveler information and services, and (4) ensuring the safety and security of the traveling public.[1] The term *operations* refers to the safe, efficient, and effective movement of traffic on the highway system. An examination of the role of operations in other business processes is needed to determine where additional benefits could be achieved. One such business process where an expanded role for operations could be beneficial is the project development process (PDP).

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VDOT's Project Development Process

VDOT's project development concurrent engineering process (CEP) directs how construction projects are developed and is inseparable from project management (see Figure 1). The CEP and the preliminary engineering PDP are described in an Instructional and Information Memorandum from VDOT's Location & Design (L&D) Division and on a website.[2,3] The CEP is "blended" into the PDP, and the terms are virtually interchangeable. PDP is the more generic term for the process. The term *concurrent engineering* emphasizes the importance of multiple disciplines working simultaneously on individual project-related activities in a coordinated effort. The development phase has three parts:

1. Scoping
2. Phase I design (initial plan design)
3. Phase II design (preliminary design and engineering).

The construction program has three parts:

1. Phase III design (final design)
2. Phase IV design (design and engineering to support right-of-way-utility and environmental processes)
3. Preparation for advertisement.

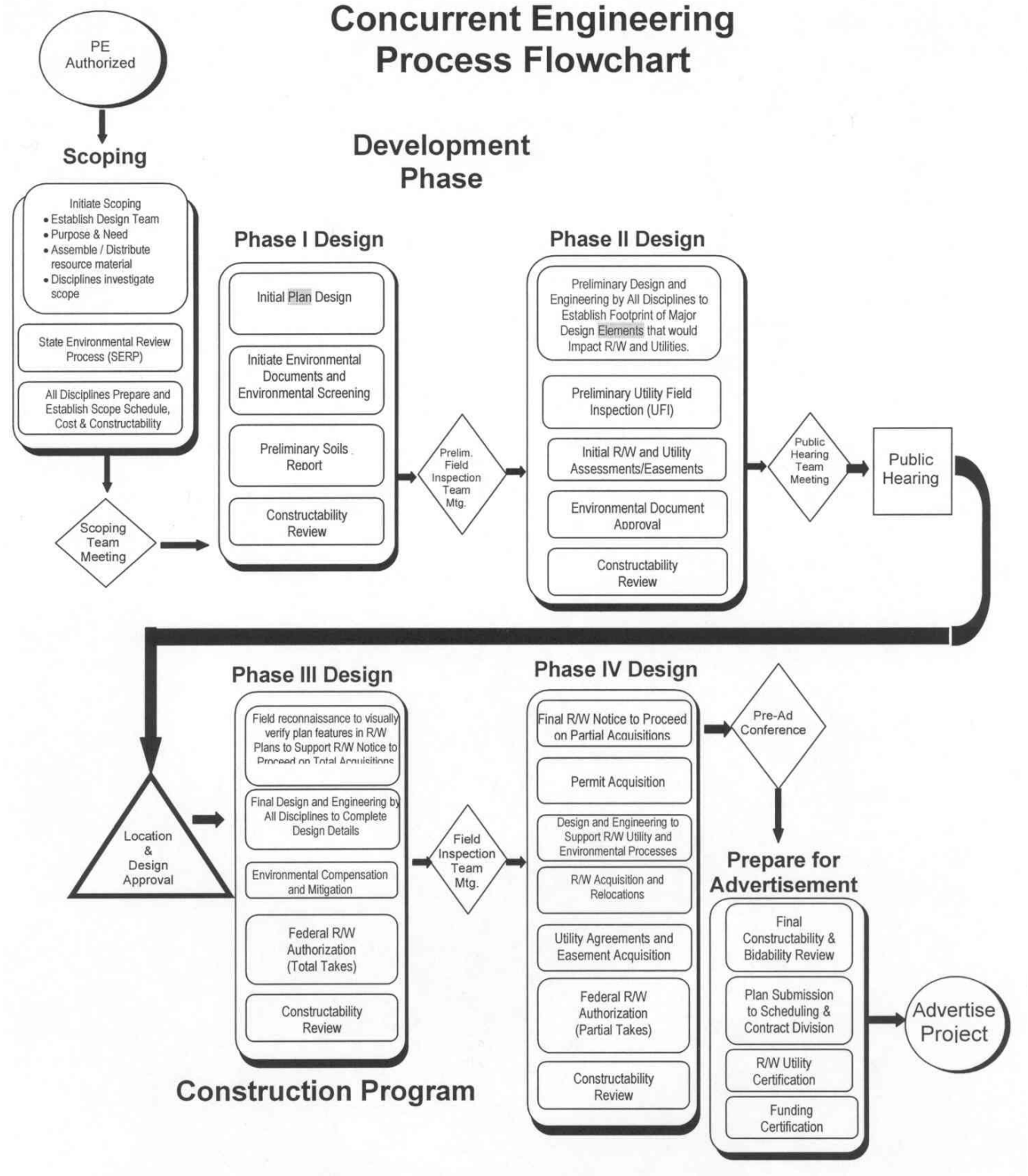

Figure 1. VDOT's Project Development Process

The Project Development Process and Operations

Project Design

Historically, operations has been a major consideration in VDOT's PDP for only very large projects. As an example, for most projects, maintenance of traffic (MOT) plans consider the efficient movement of traffic through the work zone a secondary consideration to ease of construction. By taking operations into consideration much earlier in the process and including operational issues in decisions made throughout the project lifecycle, congestion could be reduced and safety could be enhanced, not only for the duration of the work zone but also once the project is complete and in service. The intent is to ensure that what is constructed will meet the traffic needs as planned.

Traffic impact analysis is the process by which the operational characteristics of a particular project are determined. When and how traffic impact analyses for individual projects are conducted has a tremendous impact on operations decisions made within the PDP. These analyses are often performed 3 to 4 years before construction. As a result, traffic conditions may change substantially in the time between the analysis and actual construction. If the changes are significant, the design developed based on the older data may be inappropriate. For example, if left-turn volumes have increased between the time of data collection and construction, turn lane lengths may be insufficient to handle the queue lengths that will result. More substantial changes in traffic patterns may result in the need to increase the geographic area evaluated such that all impacts are known and potential impacts to adjacent areas or intersections mitigated. In addition, staff of VDOT's Transportation & Mobility Planning Division and Location & Design (L&D) Division and VDOT's district traffic engineering (TE) staff may all provide traffic or capacity analysis during the design process with little to no linkage among the three analyses. VDOT's Traffic Engineering Division is working to establish guidelines for traffic impact analyses. The guidelines would identify the appropriate type and level of analysis based on the project size, location, phasing, and need.

Operations in Work Zones

A federal ruling addresses traffic operations when a work zone is present. The Federal Highway Administration (FHWA) published the Final Rule on Work Zone Safety and Mobility on September 9, 2004.[4] It facilitates the comprehensive consideration of the broader safety and mobility impacts of work zones across project development stages. The key features of the Final Rule are as follows:

1. a policy-driven focus that will institutionalize work zone processes and procedures at the agency level

2. a systems engineering approach that addresses work zone considerations starting early in planning and progressing through project design, implementation, and performance assessment, with an emphasis on addressing the broader impacts of work zones

3. development of transportation management plans (TMP) that address traffic safety and control through the work zone, transportation operations, and public information and outreach phases

4. overall flexibility, scalability, and adaptability of the provisions so as to customize the application of the regulations according to the needs of individual agencies and to meet the needs of the various types of highway projects.

FHWA is continuing to develop tools to assist the states in implementing the final rule. VDOT has begun to incorporate these features into its PDP through L&D Division Instructional and Informational Memorandum IIM-LD-241 TED-343, *Work Zone Safety and Mobility: Transportation Management Plan Requirements,* issued August 15, 2006.[5]

Given VDOT's emphasis on operations as a core business function; the FHWA final rule on work zone safety and mobility; and awareness of opportunities to improve the safety, efficiency, and effectiveness of the highway system, there is a need to examine the role of operations in the PDP.

PURPOSE AND SCOPE

The purpose of this study was to evaluate the manner in which operations is currently considered throughout the project development process and to identify opportunities to expand and enhance the consideration of operations such that the outcome is a more efficient and effective roadway system. The deliverable is documentation of a review of the current process and recommendations to revise it.

The scope of the study was limited to operations as it relates to project development. Specifically, the focus of the study was the impact of permanent traffic control on operations of the improved road section and adjacent sections after construction is complete. Since VDOT has initiatives underway regarding traffic operations during construction, this project addressed new needs and supported the existing initiatives as appropriate.

METHODS

Five tasks were performed to accomplish the objective of this study:

1. *Review the literature and survey state departments of transportation (DOTs).* A literature search included using multiple databases to identify literature related to operations in project development. The questionnaire survey shown in Appendix A was emailed to state DOT representatives of the AASHTO Subcommittee on Design. The survey requested information on how they accounted for operations in project development.

2. *Review VDOT's PDP.* The investigator met with regional VDOT TE staff in two regions and asked them to explain and demonstrate their part of the PDP using actual completed and current projects. The investigator attended "project day" meetings in four districts on different projects in various phases.

3. *Review operations issues and problems in recently completed and ongoing projects.* Operations-related issues and problems were identified through discussions with VDOT staff involved with the PDP. Opportunities for improving the operations aspect of the PDP were identified. The output was a list of issues and problems in the PDP that should be considered for resolution.

4. *Identify potential solutions to problems identified in the reviews.* The investigator and others in VDOT provided suggestions to resolve the identified issues in the PDP. The solutions were assessed to identify the ones that offered the highest potential for improving the process if implemented.

5. *Incorporate the solutions into the PDP.* This step identified potential revisions to the PDP to address operations and improve the process.

RESULTS AND DISCUSSION

Review of Literature and Survey of State DOTs

Literature Review

Although several documents related to the PDP were identified, most did not specifically address operations in the process. The Texas Transportation Institute has produced a series of reports related to a project entitled *Incorporating Safety into the Highway Design Process.* The objectives of this research project are (1) to develop safety design guidelines and evaluation tools to be used by Texas DOT designers, and (2) to produce of a plan for the incorporation of these guidelines and tools in the planning and design stages of the PDP. One of the documents is the *Roadway Safety Design Synthesis.*[6] The synthesis describes the effect of key design components on street and highway safety. The purpose of this document is to promote the explicit and objective consideration of safety in the design process. It is envisioned to be a reference document that will be useful to engineers and researchers who desire detailed safety information on various highway geometric design elements. The synthesis was used to develop the guidelines presented in the *Interim Roadway Safety Design Workbook.*[7] This document focuses on quantifying the safety relationships between design components and crash frequency. The information should aid designers in making decisions regarding the benefit and costs of design alternatives. These documents are intended to serve as references for designers as they develop the plans.

Survey of State DOTs

Responses were received from 9 of the other 49 state DOTs, for an 18 percent response rate. Selected portions of the results are presented here. With respect to operational analysis, 5 state DOTs use the *Highway Capacity Manual*[8] for capacity analysis. Two of these also use other tools, with 1 DOT specifying Synchro. Two other state DOTs also use Synchro as their primarily analysis tool; 1 also uses SimTraffic, and the other uses VISSIM.

All respondents review project plans for safety to varying degrees. PennDOT has a safety certification review process that, although not as broad based as a general operations review, provides a good example of such a process. Safety reviews detect and correct safety deficiencies at the design field view (seemingly equivalent to VDOT's field inspection) (preliminary and/or final). A committee is selected for each project; the recommendations go to the district engineer. The safety review procedures are described in Appendix B. The district safety review is required prior to approval to proceed from the preliminary engineering to the final design stage and for any design exception requests. The means for transmitting the results of the district safety committee review vary by district. One district submits written meeting minutes that include requests, recommendations, and comments regarding the project. Another district submits a memorandum with three options: committee recommends approval as presented, approval is subject to supplied comments, or comments must be addressed and the project resubmitted for review. Below the three options block is a safety review checklist that lists three options for committee approval of various review items: yes, no, or not applicable. The 10 categories for review items by category are shown in Table 1 of Appendix B.

Safety audits supplement the safety certification review process by providing a formal procedure for safety reviews. Safety audits identify deficiencies and problems at multiple stages in the process, and the audit team consists of a standing team with at least three core members including the district traffic engineer as the leader; the findings go to the assistant district engineer for design or construction. Although available, PennDOT has made limited use of safety audits.

Review of VDOT's Project Development Process

Generally, TE staff has an advisory role in the PDP. The following is a summary of discussion points made on a variety of aspects of project development during the interviews of regional TE staff in all nine districts, L&D staff in one district, a preliminary engineer in one district, and project day meetings. Occasionally, individual comments are presented to highlight selected points.

Items Reviewed

District TE staff typically reviews plans with a focus on the following items:

1. traffic control devices (signs, signals, markings)
2. clear zones and guardrail needs
3. crossover spacing and access management

4. all design elements that impact safety such as grade, alignment, turn lane length, turning radius, and adequate sight distance
5. analysis of crashes and traffic data accidents, identification of traffic flow problems
6. signal poles and conduits for future needs on plans
7. sequence of construction, MOT plans now expanded to traffic control plans
8. traffic issues during and after construction.

One of the challenging and important issues for safety is determining the need for guardrail. Whereas a plan is flat, at field and constructability reviews, the 3D effect and therefore locations where guardrail is required are evident. All TE staff review plan elements concerning traffic control devices and guardrail, and some also review other elements of the plan.

Capacity Analysis

TE staff in two districts stated that capacity analysis is routinely updated during the PDP by the district planning staff. In one case, the district planning staff performs a capacity analysis at the beginning of the process. The analysis is repeated just prior to the public hearing to identify and incorporate any new developments planned in the project area. In the other district, at the preliminary field inspection (PFI), capacity is checked to see if the new values are still "in the ball park." of the old ones. At this stage, the design can be tweaked to account for any identified changes whereas at the field inspection (FI), major change is difficult. In a third district, a capacity analysis is done only by TE or district planning staff if requested by the project manager. For these analyses, turning movement counts are routinely requested if the available counts are more than 2 years old.

Although capacity analyses are conducted locally in several districts, others rely on resources available in VDOT's Transportation & Mobility Planning Division, especially when more complex analyses are required (e.g. simulation analysis.)

Project Day

Project day is a monthly meeting for project milestones and other project-related discussions. The meeting provides time to discuss specifics and make decisions regarding important issues related to the design plans.[2] Program/Project Management System (PPMS) is a computer-based data management system for VDOT programs and projects. PPMS meetings are held specifically to discuss project schedules and the status of projects; the focus is on project management and administration. In many VDOT districts, project day also addresses the PPMS meeting focus of the project management. Project day is going well and helps to keep all informed; it is especially useful to project managers (PMs). In one district, there is no project day. This district typically has separate meetings for each project, averaging about 10 meetings per month.

Checklists

A checklist can be a tool in ensuring that all aspects of the PDP have been reviewed from a TE perspective. Although there is no standard statewide TE checklist as part of the PDP, two districts have designed their own checklist. In one, the checklist covers the constructability review stages, PFI, FI, and the pre-ad conference. In the other, the checklist addresses each PDP phase. Two other districts use a checklist prepared by TE staff and designed for the FI stage. Of these two, one district uses the checklist on an occasional basis and the other uses a checklist depending on the project size. The remaining districts do not use checklists. TE staff from one district views checklists as beneficial for new people. One staff member commented that after one becomes experienced, the reviews become second nature. Another district was not aware of any checklists but thought that one would be helpful.

Resolving Differences

How differences are resolved when the PM disagrees with the TE staff recommendations varies from district to district. In many cases, the recommendations are accepted. In one district, the district preliminary engineer makes the decision when there is no consensus, but this happens infrequently. Most understand the constraints and are able to reach a consensus.

In another district, when resolving differences, TE staff typically takes the issue to the next level of management. For disagreements on projects internal to the district, the issue first goes to the regional traffic engineer, then to the appropriate assistant district administrator. There are times when differences can be worked out at the table. The goal is to have everyone on the project team on the same page. Having more people involved in field visits and reviews helps.

Safety Certification

When asked about the need for a formal certification process such as the one used by PennDOT (see Appendix A), six districts responded that they already do this without the formalities. The intent of the certification is covered in the plan review process. One district has a process similar to certification in place. At the project day meetings, there is a signoff sheet for team members to sign at the end of each phase of the PDP. By signing off, team members signify that the project is ready to move to the next phase. The project is held up if there are major questions to be resolved. Safety is one aspect that is considered in the signoff process. A sample copy of this form, "Construction Risk & Readiness Index," is provided in Appendix C.

Although there was some concern expressed that a formal safety certification would add another layer of process, staff from two districts felt there could be value in a group of people looking at a project from a different perspective. In addition, requiring a sign off on projects for safety makes people think differently.

Review of Operations Issues and Problems in Recently Completed and Ongoing Projects

Plans Not Reviewed

In one district, involving TE staff is at the discretion of the PM. For about 30 percent of the projects, TE staff is involved only at the end of the process. It is very expensive to address TE comments when plans are almost complete. One staff member stated: "For projects that work best, TE staff was involved throughout from the beginning. When brought in at the pre-advertisement stage, it is too late."

Roles and Responsibility

There is some evidence to suggest that TE staff may not be informed of the CEP changes that have been made and what they mean in terms of relative stages of completeness of plans.

Regionalization of the traffic functions has created a challenge since in some cases a district was split among multiple regions. As of July 1, 2006, system operations (including TE) functions are conducted by five regions across the state. The PDP functions across nine districts statewide. These districts now interact with different regional traffic staff. In some instances, it is a challenge for district staff to engage with regional staff.

Acceptance of and Feedback on Recommendations

At least four districts expressed concern about their ability to have an impact in the review process. Staff from at least two districts reported that they do not receive much feedback from the PM when their recommendations are rejected. One commented that "TE does not receive remarks from L&D on their comments. If a response is received, then it is 'no.' No action on TE comments throughout the process may result in a problem at the end of the project construction. There are a number of PMs and there is a lack of consistency in what is requested and how it is done."

Issues with the Process

In most districts, TE staff is involved throughout the PDP, but the extent of the involvement does vary from one district to another. Some staff in one district stated that the biggest problem with regard to the PDP is process management in that extra work is created because of forms and process monitoring. One staff member commented that although forms and monitoring are intended to guide and structure the process, they may also tend to be burdensome, lead to over-management, and limit creativity and the ability to create ways to perform the tasks. "Each project is unique and treated individually rather than following a rigid process. This philosophy/ approach should be promoted. The purpose is not to solve problems but to eliminate them. Go to the basis of the issue; fix it, and put this in the culture."

Scheduling and Resources

Six of the nine districts reported that the PDP is driven by VDOT's Dashboard (the push for on-time and on-budget completion of projects). Here the emphasis is on the time element. The majority of projects are designed with tight schedules. Many staff reported that in some cases, enough review time is not provided. The following statements made by staff reflect this concern: "If the plans are not ready on time, the review time is reduced. The deadlines may not be realistic to allow the TE staff to provide a quality review when there are periodic surges in the workload." "Typically, there are no extensions on due dates. Either the time constraints create rush reviews or TE staff has to prioritize what projects will be reviewed when they are overloaded, which happens fairly often."

Identify Potential Solutions to Problems Identified in the Reviews

This section focuses on solutions to the issues and problems identified in the reviews. Flexibility, staff size, and capabilities are factors to consider in the development of solutions. Many of the solutions were suggested by the same VDOT staff that identified the problems.

Plans Not Reviewed

One option for this issue is to remove the PM's discretion with regard to the role of TE reviews in the PDP. Some think it is better for TE staff to have the opportunity to choose its level of involvement. TE staff prefers the option to decline.

Roles and Responsibility

There is a need to define the responsibilities of the TE staff in the PDP. TE staff needs to provide the right TE input at each stage of development. This may also be helpful in ensuring that TE staff understands what is to be considered at each major milestone and what value it can provide to the PDP at that stage.

It is the district's decision as to who has responsibility and accountability for TE and safety-related items in the plans. This is mainly an issue when there is a disagreement. As with certification, this is not an issue unless consensus building and accountability in the recommendation and feedback process are not working. It should be clear who makes the ultimate decision and the actions to take in this instance. For example, it may be that the TE staff first discusses this with the regional traffic engineer. Then it goes before the district preliminary engineering manager or other designated person in authority. Again, there should be flexibility, and the expectation is that this process to resolve disagreements would be infrequently used. TE should be included on project teams for all plans.

In certain districts, there is a need to improve the cooperation and relationships between project team members, specifically, the PM and TE staff members. It should be understood that the PDP is a team effort and that all team members have ownership of the final product.

Acceptance of and Feedback on Recommendations

In a district where there had been significant disagreements between the TE and L&D staff on reviews and the rejection of TE recommendations, the situation has improved. Two things helped: (1) building a stronger case for recommendations by providing supporting evidence, and (2) having more sit-down discussions with PMs to present and hear both sides of the story. Working together in this manner fosters solutions that are acceptable to both and improves the final product with respect to time and money. Building relationships and the ability to work well together as a team are essential.

Follow up on TE comments and recommendations would also improve the process. One TE staff member offered the following solution: "When a recommendation is made but is not accepted, a reason with supporting evidence should be given by the PM or designer as to why the recommendation was rejected. Constructive comments and many questions should be expected. All involved in the review process are owners of the plans and should cooperate to make them the best plans together."

Capacity Analysis

With regard to the required capacity analysis, VDOT's Traffic Engineering Division is working with a consultant to prepare a toolbox for traffic analysis**.** The deliverable from this effort should be useful for traffic and capacity analyses in the PDP. The general rule of requesting a capacity analysis and traffic counts if they are more than 2 years old and traffic has changed appears reasonable. Once the toolbox is available, there will be a need to determine how to apply it to the PDP. In other words, details are needed with regard to developing, securing, and interpretatively using traffic data and analyses for the PDP.

Process Management

According to staff in one district, with regard to process management, there may be some value in beginning the PDP concurrent with the end of the planning process. This would provide opportunities to add more information to the output of the planning process.

Scheduling and Resources

There may be value in spending more time on drainage, utility, and signal location in the PDP. These issues are often revealed at the FI. Some staff stated that changes that would delay construction are avoided; thus, these issues are not adequately addressed. It would be helpful to review projects in a time frame that allows the team to identify and address problems that are likely to occur in construction. Another option is to increase the TE staff available for plan review, especially engineers. Currently, project day is the main venue for project discussion. In most cases, a separate meeting to discuss a specific project has been eliminated. One district staff believes that there is value in having a separate project meeting as the districts once did before project day to review plans together by going sheet by sheet through projects. It would be helpful to determine when the need or urgency justifies a separate meeting before project day.

Districts may need to log the needs for the PDP process and determine if more resources or better management is needed to engage in the process effectively. Accurate estimates of the time required for the various stages of the PDP including all required reviews should be used to develop realistic schedules for all projects. This would allow projects to remain "on time" while ensuring that all reviews are complete and comprehensive. There is also a need to assess the impacts of regionalization of TE functions on the operations components of the PDP.

Another perspective on the scheduling issue is that VDOT has been managing and still appears to manage projects at all levels and not programs. VDOT is only beginning to recognize the need to have some staff, namely, district L&D engineers, managers who are professional engineers, or the regional operations directors or their designees, manage programs. This includes assembling resources and individual project schedules so that reviews, design charettes, meetings, etc., can be done with limited resources and project commitments can still be met. Project schedules need to be set up from a programmatic standpoint, and districts need to coordinate them with key CO staff as well. Only so many projects can be designed and/or reviewed in a given period of time with the resources available. Plan reviews seem to be critical because, for the most part, they cannot be outsourced as easily or as purposefully as can design work.

With regard to the large workload, TE staff should set their project priorities and the extent to which they will be involved in the process on a project-by-project basis. This is an element of flexibility in the review process. TE staff wants to be involved with every project from pre-scoping through PFI, but after they have reviewed the PFI plans and submitted a design review report, it could be appropriate for TE staff to end their involvement in some projects. A meeting to discuss any concerns with TE recommendations would be held and final decisions on any outstanding issues would be communicated to all participants subsequent to that meeting.

There will be projects, such as urban projects, roundabout designs, and projects with a lot of roadside hazards, in which TE staff should remain involved in the design review all the way through the FI stage. In addition, working out bicycle and pedestrian accommodations, requirements of the Americans with Disabilities Act, access management, roadside hazard protection, etc., takes more than one plan review. TE staff can identify which projects require additional traffic management and traffic safety attention and continue their involvement.

By limiting their involvement on less complex projects, TE staff may submit recommendations and then turn their focus toward developing optimum traffic management strategies for the TMP and assessing the performance of other TMPs already implemented in the field so as to gather and take advantage of lessons learned. TE staff would remain actively involved with the development, review, and performance assessment of the TMP for each project all the way through construction. By setting their project priorities in the PDP, TE staff could gain the best benefit-time investment and become more proactive rather than reactive. This would eliminate a lot of time being charged to projects. It would also help establish clear lines of accountability and help offset some of the additional time now being required through construction because of current TMP requirements.

Checklists

Checklists in VDOT's *Traffic Engineering Design Manual* are useful but are limited to a focus on TE design elements; this statewide document is readily available.[9] There is a need for a checklist specific to TE review to be coordinated with other available checklists. A checklist used by VDOT's Northern Virginia District is provided in Appendix C as an example and perhaps starting point for the process to develop a statewide TE checklist. Comments from district and CO staff would lead to the development of a recommended TE checklist. The checklist would also serve as an indicator of the role of TE staff members. Text may need to be added to describe their role thoroughly. Education or training on the CEP in general and the TE's role in particular may also be needed.

Accountability in Comments and Responses

It is important that those providing comments on plans document thorough, compelling reasons for recommendations or suggested changes in the plan review process. Clearly stating the suggested change or comment and providing supporting evidence for the change should facilitate direct communication and improve the chances that the recommendations are accepted. The response to the comments should have the same level of clarity and supporting evidence to justify the response. Face-to-face meetings and discussions should be held as needed to support and develop understanding. Safety or operations certification is one means for making certain that these elements are given the proper level of attention in the PDP. If the process is working properly, certification is not necessary. Instead, it is incumbent upon the PM to make sure that all comments are carefully and seriously considered. A comment resolution form may facilitate provision of comments and the responses (see Appendix C).

Signoff Sheets and Certification

Some districts are pleased with the use of signoff sheets as a record stating that the project is ready to move to the next phase and showing who participated in the meeting and agreed with the assessment. Others are satisfied with the consensus building process. The consensus is that although certification has some benefits, it is not needed if the process is functioning properly. Given the already tight time constraints, there is concern that it would add another review level and more bureaucracy.

Scoping

There is a separate research effort at the Virginia Transportation Research Council to identify options for enhancing the value of the scoping stage to the overall PDP.[11] Although the scoping process has the potential to reduce project development time and costs, it is not known if VDOT is taking full advantage of this potential. Two pieces of evidence support this belief. First, anecdotal information from VDOT personnel suggests that scoping practices vary widely throughout the agency. It would be valuable for VDOT to compile and share the best practices with regard to project scoping. Second, the recent federal reauthorization (SAFETEA-LU) gives states additional flexibility with their project development practices, but it is not yet clear how to use this flexibility in the most practical manner. The scope of this research is limited primarily

to the steps leading up to scoping (specifically, planning and programming) and the scoping process itself. Within the scoping process, development and documentation of the project's purpose and need, stakeholder support, evaluation of alternatives, environmental impacts, and degree of consensus on major design features at these stages are components whose examination may facilitate the PDP.

Summary

A number of potential solutions are offered that may be beneficial to some districts. The list is by no means intended to be all-inclusive; there are other possible solutions that should be considered. There is much emphasis on flexibility; if there is a solution that is helpful to a district, it should be considered. Otherwise, there is no attempt to dictate that solutions be applied everywhere or where they are not needed. The Recommendations section that follows focuses on solutions that may be appropriate for statewide application.

FINDINGS AND CONCLUSIONS

- *Overall, the PDP is working well with regard to addressing traffic engineering issues.* The project team process is valuable in reviewing and developing plans. Although there is some variety in the manner in which TE staff participates in the PDP across regions, there is consensus that the process is most effective when TE staff members are involved regularly and throughout the process. A blend of flexibility to account for the uniqueness of projects and project teams and consistency in the application of the basics of the PDP is important.

- *Communication among all PDP team members is a critical component of the process.* The resolution of recommendations brought by any team member needs be documented and disseminated to all team members. Checklists used to ensure that all issues have been addressed are not currently universally employed but are considered valuable in instances where team members are new to the process or the team desires the additional structure checklists provide. Clear procedures for dispute resolution are needed to improve the PDP process when consensus cannot be reached on recommendations.

RECOMMENDATIONS

1. *VDOT's Location & Design Division should consider adding the following language to Preliminary Engineering Project Development Process, IIM-LD-226.2*[2]*:*

> **Accountability in comments and responses**
>
> It is important that those providing comments on plans document thorough, compelling reasons for recommendations or suggested changes in the plan review process. Clearly stating the suggested change or comment and providing supporting evidence for the change should facilitate direct communication and improve the chances that the recommendations are accepted. The response to the comments should have the same level of clarity and

supporting evidence to justify the response. Face-to-face meetings and discussions should be held as needed to support and develop understanding. It is important to make certain that these elements are given the proper level of attention in the PDP. It is incumbent upon the project manager to make sure that all comments are carefully and seriously considered. It should be understood that project development process is a team effort and all team members have ownership of the final product. [The comment resolution form shown in Appendix C may be one tool to facilitate this.]

Signoff sheets

The use of signoff sheets as a record that the project is ready to move to the next phase and also who participated in the meeting and agreed with the assessment is one tool for documentation. [A sample signoff sheet is provided in Appendix C.]

It is conceivable that a document other than the IIM might be the appropriate place to provide this information.

2. *VDOT's Location & Design Division should provide a description of role and responsibilities of the TE staff in the PDP.* A TE checklist for PDP should serve as the anchor.

3. *VDOT's Traffic Engineering Division should assist VDOT's Location & Design Division in providing guidance on the use of traffic and capacity analyses tools in the PDP.*

4. *VDOT's Location & Design Division should provide guidance regarding who has responsibility and accountability for TE and safety-related items in the plans.* This is mainly an issue where there is a disagreement. It should be clear who makes the ultimate decision and the actions to take when there is a disagreement. For example, it might be that the TE staff first discusses this with the regional traffic engineer. Then it could go before the district preliminary engineering manager or other designated person in authority. Again, there should be flexibility. The expectation is that this process to resolve disagreement would be infrequently used.

5. *VDOT's Location & Design Division should review the process for establishing a schedule and budget to make certain that adequate time is provided for project development and reviews.* The emphasis should be on opportunities to improve the process through program management instead of project management. The issues to determine are (1) the adjustments that need to be made in scheduling and budget to facilitate the development of effective plans, and (2) when target dates and/or budgets should be modified to make adjustments to a project design.

6. *VDOT's Location & Design Division should examine the opportunity to begin the PDP concurrent with the end of the planning process.* This would provide opportunities to add more information to the output of the planning process.

7. *VDOT's Location & Design Division* should assess the PDP and make revisions as appropriate. A review of how each district's L&D or preliminary engineering section executes the PDP should be conducted. The review should include how well the districts are following the existing process, with special attention given to the items listed in

Recommendation 1, what needs to be added or revised to address issues identified in this study, and what additional tools are needed to facilitate the PDP.

COSTS AND BENEFITS ASSESSMENT

Construction and maintenance activities make up the bulk of VDOT's budget. In many cases, small changes made to enhance operations can yield large benefits at relatively small costs. These benefits can take the form of both enhanced safety and improved traffic flow. It is difficult to quantify the benefits and costs associated with this recommendation. Therefore, the following are qualitative costs and benefits that may be expected.

- improved safety and traffic flow in the projects that are constructed based on more effective reviews
- a more effective, comprehensive PDP through more clearly defined TE roles and responsibilities
- a smoother, cordial process with all participants taking ownership of the process and working together harmoniously
- more efficient program management of the PDP with regard to coordination and scheduling of resources.

ACKNOWLEDGMENTS

The author thanks numerous VDOT staff who provided information for this project. The project advisory committee included Karen Kilby, Harry Lee, Virginia Stepp, and Mike True. The technical review panel included Steve Edwards, Emmett Heltzel, and Cathy McGhee. Thanks go to Linda Evans for editing the report.

REFERENCES

1. Sorrell, C.S. 2005. *VDOT's Systems Operations Business Plan: Executive Summary.* Virginia Department of Transportation, Richmond.

2. Virginia Department of Transportation, Location & Design Division. May 17, 2005. *Preliminary Engineering Project Development Process.* IIM-LD-226.2. Richmond. http://www.extranet.vdot.state.va.us/locdes/electronicpercent20pubs/iim/IIM226.pdf. Accessed May 19, 2005.

3. Virginia Department of Transportation. Concurrent Engineering Website. Richmond. http://www.virginiadot.org/projects/concureng-default.asp. Accessed May 19, 2005.

4. Federal Highway Administration. 2004. Final Rule on Work Zone Safety and Mobility on September 9, 2004. *Federal Register (69 FR 54562).* Washington, D.C. www.ops.fhwa.dot.gov/wz/resources/final_rule.htm. Accessed June 16, 2005.

5. Virginia Department of Transportation, Location & Design Division. August 15, 2006. *Work Zone Safety and Mobility: Transportation Management Plan Requirements.* IIM-LD-241 TED-343. Richmond.

6. Bonneson, J., Zimmerman, K. and Fitzpatrick, K. 2005. *Roadway Safety Design Synthesis.* Texas Transportation Institute, College Station. http://tti.tamu.edu/documents/0-4703-P1.pdf. Accessed March 5, 2007.

7. Bonneson, J., Zimmerman, K. and Fitzpatrick, K. 2006. *Interim Roadway Safety Design Workbook.* Texas Transportation Institute, College Station.

8. Transportation Research Board. 2000. *Highway Capacity Manual 2000* Washington, D.C.

9. Virginia Department of Transportation, Location & Design Division. 2006. *Traffic Engineering Design Manual.* Richmond. http://www.vdot.virginia.gov/business/locdes/traffic-engineering-manual.asp. Accessed March 2, 2007.

10. Lantz, K.E., Jr., and Woody, J. July 28, 2006. *A Review and Assessment of the Process VDOT Employs in Project Scoping* (Research Proposal). Virginia Transportation Research Council, Charlottesville.

APPENDIX A
SURVEY ON OPERATIONS IN THE PROJECT DEVELOPMENT PROCESS

Name:
State DOT:
Email Address:

Project Development Process

1. Please provide documentation or a web link that describes your project development process. Traditional phases of the project development process are: 1) Pre-scoping, 2) Scoping Meeting, 3) Initial Road Design, 4) Preliminary Road Design, and 5) Detailed Road Design.

Capacity and Operations analysis

2. a. What capacity analysis methods are used, in what phases are they used, and who (title and division/field office) uses them?

   b. What operations analysis methods are used, in what phases are they used, and who (title and division/field office) uses them? The methods include analytical/deterministic methods, and traffic simulation models; please specify the method or model. How you determine which tool to use?

   c. Do you have a check list related to capacity and operations analyses? ___ yes ___ no If yes, please provide a copy of the check list.

   d. Describe any efforts to provide continuity or linkage between the various phases and capacity and operations analyses.

Safety

3. a. When are safety reviews conducted and on what types of projects? Who conducts these reviews?

b. What are the components of a review? Please provide any checklists that are used for the reviews.

c. In what phases of the process and under what conditions (types of projects by activity or project costs), are the following activities performed: gather and analyze crash data and develop trends, incorporate crash mitigation measures into the plans based upon the identified crash trends.

d. What safety analysis methods are used and when are they used?

e. Who and what division or field office handles safety analysis?

4. Do you have a formal safety certification for your projects? ___ yes ___ no. If yes, please include a copy of the documents (or links to them) describing the certification and the process.

General

1. What training and professional development activities do you offer to address operations and safety in the project development process?

2. How are suggested safety or operations improvements that are not funded addressed?

Thank you. Please return by Friday, December 1, 2006, to:

Ben Cottrell
Virginia Transportation Research Council
530 Edgemont Road
Charlottesville, VA 22903-2454
(434) 293-1932 FAX (434) 293-1990
Ben.Cottrell@VDOT.Virginia.gov

APPENDIX B
PENNDOT SAFETY REVIEW PROCEDURES

DESIGN MANUAL PART 1A: TRANSPORTATION ENGINEERING PROCEDURES (ftp://ftp.dot.state.pa.us/public/Bureaus/design/PUB10a/Toc-1a/TOC-1A.pdf)

E.0 INTRODUCTION

The Safety Review is one of PENNDOT's main check points for quality assurance on highway design projects. PENNDOT's design procedures require that all projects be submitted for safety review by a qualified, District Safety Review Committee before contract letting. Peer review and dedication to roadway safety are at the heart of the Safety Review process.

E.1 PURPOSE AND PROCEDURE

1. Purpose. The Safety Review is to detect and correct any safety deficiencies identified in the design as early as possible in the design process.

2. Procedure:

a. Safety Review Submission. The Safety Review Submission and review should be scheduled to occur as early in the design process as possible. The submission and review should precede the project Design Field View (if applicable) by at least two weeks. This will enable the Safety Review Committee to detect any safety deficiencies and recommend any safety enhancements well ahead of final plans preparation. This will also allow any required revisions to be incorporated with minimal impact to the project schedule. Comments generated by Safety Review should be presented and addressed at the Design Field View (Preliminary and/or Final, if applicable).

When the plans are sufficiently detailed to address the issues listed on the attached Safety Review checklist, the Project Manager shall prepare and submit two copies of the Safety Review Submission to the District Safety Review Committee. Safety Review Submission plans must identify all applicable items on this checklist to the level of detail required for a Design Field View Submission. The Safety Review Submission shall precede the Design Field View (if applicable) by at least two weeks and shall include:

(1) Color-coded plans
(2) Profiles
(3) Typical sections
(4) Project Design Criteria Report.

The Project Design Criteria Report is particularly necessary on roadway rehabilitation projects where the safety of existing features must be evaluated and improvements made in the proposed design. This document should summarize:

(1) Existing design deficiencies
(2) Design exception requests with justifications
(3) Crash histories for the previous three years
(4) Traffic data (AADT, percentage trucks, directional splits)
(5) Traffic control concepts.

b. Committee Recommendations. The Safety Review Committee shall return one of the following three recommendations to the District Engineer/Administrator:

(1) Plan Approval
(2) Plan Approval subject to revisions
(3) Plan Rejection.

The recommendation shall be accompanied by both copies of the Safety Review Submission containing the committee's review comments. Implementation of the Committee's recommendations is at the discretion of the District Engineer/Administrator. One copy of the Safety Review Submission and comments shall be retained in the project file by the District's Project Manager. The other copy shall be returned to the District Design Squad or consultant with specific direction on actions to be taken.

c. Safety Review Committee Selection. The effectiveness of PENNDOT's Safety Review program depends on the qualifications and dedication of committee members and the commitment of the District

Engineer/Administrator to implement the Committee's recommendations. Committee members must be selected with care.
(1) The optimum committee size is five persons. They should be from diverse backgrounds. The Project Manager should not be on the team; however, someone knowledgeable of the major items of the project should be included.
(2) Committee members should be selected by the District Engineer/Administrator from a pool of qualified District personnel rather than a fixed team for all reviews. At least one person on the committee must have considerable traffic engineering experience.
d. Safety Review Checklist. Table E.1 is a Safety Review Checklist to be used as a guide for all project safety reviews. This checklist is not a substitute for sound engineering judgment and should not be considered all inclusive. Many items included on this list will not apply to all projects. Additional items should be considered and reviewed as appropriate to the specific project.

E.2 SAFETY AUDITS

A. Background. Strict adherence to guidelines and standards is not always sufficient to provide a safe design. Care must be taken that guidelines and standards are not substitutes for experience and ability in the appropriate and effective application of these principles to minimize safety risks. Safety audits provide a strategic process for reviewing projects from a safety perspective to help reduce the likelihood of safety deficiencies and improve the effectiveness of a design. Safety audits supplement PENNDOT's traditional safety review process by providing a formal procedure for safety reviews to ensure consistency so that safety is built into the facility from the beginning.

B. Definition. A Safety Audit is a formal and systematic procedure for an independent and qualified team of experts to identify and analyze features of the highway or an existing or proposed transportation project that could be potentially dangerous. Thus, a safety audit is a formal method of investigating the crash potential of an existing facility or proposed design, thereby making safety an integral and separate component of facility operation and design. Design safety audits facilitate the elimination or correction of unsafe features during design development. PENNDOT's safety audit process helps ensure that new and existing facilities are as safe as possible.
The key elements of the Safety Audit Process are:
1. An interdisciplinary review team
2. Use of a comprehensive audit list
3. Access to the design throughout design development
4. Project field views to evaluate safety considerations on site.

C. Purpose and Objectives. The purpose of a safety audit is to analyze existing roadways or new projects to identify safety deficiencies or problems that are not compatible with the function of the facilities. The process is not specifically designed to provide solutions or suggest recommendation for remedies.

The various objectives of a safety audit include:
1. Minimize the potential and severity of crashes on facilities affected by the project;
2. Minimize the need for changes or improvements after construction;
3. Reduce overall costs of the project for the length of its operational life
4. Improve general awareness of safe design, construction, and maintenance practices.

D. Recommendations. The following recommendations will allow the benefits of the safety audit process to be incorporated in design projects while reducing the potential for project delays.
1. Audit Team. Each District should establish a safety audit team with at least three core members and additional personnel may be added as needed on specific projects. It is recommended that the District Traffic Engineer be the team leader.
2. Timing. Conducting the safety audit at the appropriate time can minimize the potential for project delay. However, the project schedule must be adjusted to incorporate the safety audit process. In addition, the average audit cost is modest and can usually be incorporated into the project design cost.

TABLE 1 SAFETY REVIEW CHECKLIST

Design Criteria Summary
Functional classification
Design speed
Existing and proposed level(s) of service
Traffic composition
Percentage of trucks
Crash histories (past 3 years)

Roadside Design Features
Cut and fill slopes
Clear zone widths
Traversable recovery area
Lateral clearance to fixed objects
Parking Restrictions
Safety appurtenances
Guide rail and barrier Placement
Impact attenuators
End treatments
Driveway entrances
Sight distance
Spacing
Proximity to Intersections

Traffic Control Devices
Signalization
Signing
Railroad crossing protection
Pavement markings
Passing zone restrictions
Traffic arrows
Lane use designation

Geometric Aspects
Driver expectation and consistency of design speed
Typical sections
Pavement superelevation and cross slopes
Pavement and shoulder widths
Median widths
Stopping sight distance
Horizontal and vertical
Decision sight distance
Passing sight distance
Grades: maximum
need for emergency escape ramps/climbing lanes
Design exceptions or other nonstandard

design features
Vertical and lateral clearances
Pavement and shoulder widths
Superelevation

Traffic Control Plans
Advance warning signs
Construction area speed limits
Temporary roadway design speeds
Entry and exit of construction vehicles
Lane reductions
Emergency pull-off areas

Interchanges
Acceleration and deceleration lengths
Weave lengths
Driver expectancy
Crash history
Signing
Lighting

Intersections
Pedestrian considerations
ADA requirements
Geometrics
Minimum curve radii
Design vehicle path
Crash history
Decision sight distance
Channelization islands
Auxiliary lanes
Lighting
Also see Traffic control devices

Special Considerations
Schools and recreational areas
Speed restrictions
Pavement markings
Pedestrian, bicycle and school bus movements
Fire stations and hospitals
Emergency vehicle considerations
Farm equipment
Horse and buggy traffic
Single lane bridges

Bicycle Considerations
Bicycle safe inlet grates
Signing
Shoulder widths

Miscellaneous
Drainage considerations
High water - flooding potential
Fog Considerations
Special Events

3. Criteria. Use the following criteria to conduct effective random safety audits:
a. Perform the first safety audit early enough in the design development such that changes can be incorporated into the design without causing major delays. The project schedule should be adjusted to allow time to complete the audit and incorporate findings into the project.
b. The audit team must use a combination of checklist reviews, field views, and office meetings to define safety concerns. The team must reach consensus on critical issues.
c. Prepare written audit reports. These reports should define safety concerns that need to be addressed, not solutions. They should typically be no more than two or three pages long.
d. Present audit findings to the District ADE-Design for review and response for projects in the project development phase and the District ADE-Construction for projects in the construction phase. The respective ADE will determine the appropriate course of action to address the concerns.

E. Suitable Candidates for Safety Audits. Safety audits are applicable to all types of highway design projects and existing highways. Nearly every project, with the possible exception of routine maintenance projects where pavement markings are not affected, can benefit from a safety audit, regardless of its size. Suitable candidate projects types for safety audits include:
1. Resurfacing, Restoration and Rehabilitation (3R) Projects
2. Interstate Resurfacing, Restoration, Rehabilitation, and Reconstruction (I4R)
3. Safety And Mobility Improvement (SAMI) Projects
4. Bridge Projects
5. Major Projects.
Safety audits may be conducted on projects that are considered "off-road" but still affect adjacent roadway facilities. Such projects might include commercial, residential, or industrial developments. These projects might affect such transportation issues as:
1. Vehicle/pedestrian conflicts
2. Increased pedestrian volumes
3. Spillover parking into adjacent roadways
4. Restricted visibility or delays at access/egress points
5. Significant changes in circulation, access, egress, and unloading patterns by users, especially including heavy vehicles. By conducting safety audits on these and similar projects, PENNDOT can reduce the likelihood of crashes and ensures that all projects operate as safely as possible.

F. Stages of a Safety Audit. Ideally, a project safety audit is not a one-time occurrence. Instead, it may be performed at various design development milestone and incorporated into the entire design development process so that no safety issue is overlooked.
Each audit should involve a combination of checklist reviews, field views, and office meetings to define safety concerns. Audits will also include the analysis of current documents and plans to ensure that safety deficiencies are addressed and remedied as early as possible. Early detection and correction of deficiencies justifies the cost of the safety audit. Safety audits should be conducted at each of the following stages of a project's life:
1. Feasibility. A safety audit at the initial feasibility stage of a project can positively influence the entire scope and course of the project and address various fundamental issues that help ensure a safe design. Assessing the safety at the feasibility stage can help reduce the possibility of major safety problems that require remedies once the design process begins.
2. Preliminary Engineering. In Preliminary Engineering, a safety audit can consider the overall design of the project and help eliminate safety hazards or concerns so that necessary changes are made prior to right-of-way acquisition. A Preliminary Engineering safety audit is crucial in that it is the last opportunity to make significant changes in the alignment and overall design prior to obtaining environmental clearance, right-of-way acquisition, or the start of Final Design activities.
3. Final Design. Final Design safety audits provide an opportunity to analyze the entire design for safety deficiencies. At this stage of design enough information is available for the safety audit team to evaluate the design relative to the needs of various special user groups. Problems identified and corrected during Final Design can significantly reduce the cost of changes made during construction or thereafter.
4. Pre-Opening. A safety audit at the pre-opening stage involves driving, riding, and walking the entire area of the project, both during day and at night, to ensure that the safety needs of all special users are adequately provided. The key to this audit is to ensure that safety deficiencies and issues identified in earlier audits were adequately addressed during Final Design and Construction.

5. In Service or Existing Facilities. At this stage, a safety audit can be used to evaluate a facility under service conditions. As with audits conducted during the earlier stages, any safety deficiencies should be identified and addressed as necessary.

G. Confidential In-Depth Safety Study Reports. It is very important that safety audits remain confidential. The following quote provides notification that audit reports must not be identified as documents that can be used in any civil tort action.

"In accordance with PA Consolidated Statutes Title 75-Vehicles (Vehicle Code) Section 3754 and 23 U.S.C. Section 409, this safety study is confidential and the publication, reproduction, release, or discussion of these materials is prohibited without the specific written consent of the Pennsylvania Department of Transportation's Office of Chief Counsel. This safety study is only provided to official agencies with official duties/responsibilities in the project development."

Although Pennsylvania does not have Sovereign Immunity, PENNDOT is protected by a Statute that deems SAFETY STUDIES non-admissible in Torts. This is a great security blanket; however, this may not be practical nor an option for some Agencies. The concern of Liability is valid, but the benefits that can be realized with a thorough safety audit will outweigh the risks, if care is taken when documenting the results of the audit.

APPENDIX C

DOCUMENTS USED BY VDOT'S NORTHERN VIRGINIA DISTRICT FOR THE PROJECT DEVELOPMENT PROCESS

NOVA District Traffic Engineering Checklist

Traffic Engineering: Safety Review of Highway Elements For Design Plan Submissions

The following is a NOVA Traffic Engineering review checklist of good practices and Engineering strategies that can assist in providing district wide uniformity, and place a sharper focus on the Safety and Operational features at the Concurrent Engineering Process project milestone stages.

All roadway plans should be reviewed thoroughly from the traffic flow and safety standpoint. All signal, sign and pavement marking plans and MOT plans should be reviewed thoroughly for the design accuracy, conformance to the applicable specifications, policies and procedures. These plans should be reviewed not only from the vehicular aspect but also reviewed from the pedestrian and bicycle aspects.

(Pre-Scoping)/Scoping Meeting—Conceptual:

Gather information on Project PPMS and Activity Code(s)
Gather information on Route Names and Numbers
Functional Classification - Consider characteristics outlined in the Road Design Manual, Appendix A
Review the Proposed Project in its existing Field Environment
Gather available existing count and crash data. Coordinate with Chris Bilinski if any field data collection is needed.

Go to the Meeting Prepared to Discuss Traffic Engineering Issues as below

Provide input regarding the traffic analysis and design requirements for the project.

Provide input regarding the use of consultant to do the studies and design (preferable) and resources available to do the in-house design. Provide the schedule if asked to provide in-house design. Consider the use of on-call consultant to provide services and coordinate with Mary Lou for the availability of services.

Using the available existing traffic count and crash data and field observation, provide input on the logical termini of the project based on the traffic operational and safety needs. Consider lane taper locations in case of widening projects in determining the termini. Do not close lanes too close to the signals.

Provide input on Design Features (desirable)
- Design Speed Limit
- Design Vehicle
- Divided Roadway
- Two-way left turn lanes
- Raised Median
- Shoulders
- Curb/Gutter
- Lane Widths

Capacity Needs (desirable)
- Number Lanes
- Service Roads
- Grade separated interchange vs. at-grade intersection

Safety Improvements
- Horizontal and vertical Curve Elimination to improve sight distance
- Shoulder widths
- Signal operational issues
- Intersection Alignment(s)

Clear Zone Set-backs Required
- Based on Design Speed
- Cross Sections
- Volumes

Pedestrian Needs
Bicycle Facilities
Any ITS requirements

Major MOT issues (if any)
- Possible Detour Route(s) (if suggested)

Known Access management issues and Crossover spacing issues

Preliminary Field Inspection Plans:

Make sure comments from previous reviews are addressed.

Review Traffic Analysis Report. This report should contain at least the purpose and need for the project, existing conditions for the traffic and geometric conditions, projected traffic conditions (for primary roads - ad date + 22 years and on secondary roads - ad date + 11 years), what are the proposed improvements, backup analysis data. Crash analysis should be done to identify any safety problems in the project area and potential solutions should also be identified. Traffic warrant analysis should be conducted and locations for signals should be identified. Comment on the number of lanes and turn lanes, turn lane length.

Comment on crossover spacing and other access management issues.
Review the plans from the vehicle, bicycle and pedestrian traffic stand point.
Review the width and shape of the intersection, comer radii, median size and shape (bulleted nose is preferred for turns) etc.
In the case of interchange projects, review the type of interchange, weaving issues, merge and diverge issues, radius of the loops and speed differentials with the mainline and ramp speeds, issues associated with the nearby intersections, lane taper issues etc.
Comments should be provided on the both the horizontal and vertical alignment based on traffic safety and operational standpoint.
Input should be provided on the crosswalks (crosswalks should be provided as close to the intersection as possible)
Pay particular attention to the AASHTO intersection sight distance requirements at the unsignalized intersections.
Review and comment on the following;

- ADT's
- Design Speed
- Design Exceptions
- Design Waivers
- Design Vehicle
- Typical Sections
- General Notes

Review for major issues with the MOT and detours.
Provide input on the bridge plans for the sidewalk, shoulder widths and fencing options.

Public Hearing plans:

Make sure comments from previous reviews are addressed.

At the time of public hearing the preliminary traffic control device plans should be developed. The location of the signal poles, sign poles and lighting poles should be identified, phasing of the signal determined. Mast arms should be used (NOVA) for the signal design unless they are not proven to be unfeasible in which case span wire assembly can be used.
Check for the type and alignment of the signal heads, pedestrian signals and phasing of the signals.
Check for the location of the power source and the controller cabinet location.
Check to make sure there is sufficient RlW and easements for Traffic Control Devices.
Check for the all the existing and proposed utilities prior to selecting the location of the poles.
Check for the vicinity of the retaining walls and bridges and coordinate with Bridge section for the location of the poles.
Check the location of the poles for the cut and fill slopes and design the pole accordingly.

If there are any bridges, pay particular attention to the visibility of the signs/ signal heads with the bridges. On major interchange projects, sign layouts should be included in the public hearing displays to seek input from the public on the signs.

Consultant should prepare a traffic volume display for the public hearing. If Corsim or Simtraffic is created, then simulation should also be available for the presentation.
Review the preliminary landscape plans for sight distances both horizontal and vertical. Pay particular attention to the canopy of the trees over the roadways. Check for the intersection sight distances for both the trees in the sidewalk and the median.
Review Entrance Requirements
- Grades
- Locations

Review Design Features
- Clear Zone Requirements
  - Hazard Removal
  - Guardrail Installation
  - Cut / Fill Slopes

Draft MOT and Sequence of Construction plans should be reviewed for the number and width of the lanes, barrier service type, and the need for deflection zones Review construction Notes (if provided)
Review Work Zone(s) for Length, Speed, Alignment
Review Maintenance of Traffic Issues such as
- Lane widths, number of lanes, turn lane length
- Lane transitions, tapers
- Barrier Service
  - Type
  - Need
  - Deflection Zone
- Barrier Transition and Protection
- Sufficient Number of Lanes
  - Width / Alignment
  - Turn Lanes
- Railroad Requirements (if in proximity)

Detours
- Notification and Signing Issues
- Alignment
- Length
- Lane Widths

Field Inspection Plans:

Make sure comments from previous reviews are addressed.

At this stage detailed traffic control plans including signal design, sign and pavement marking design, lighting design and ITS elements should be completed.
Watch out for the common mistakes of forgetting to remove signals, power and communication lines after relocations to the new control box is determined, and the common mistake of the roadway plans not matching the approved signals plans, or them not matching the pavement

marking and signing plans as presented for the project. Often different section designers do this work and coordination is not complete.
Make sure conduits going across bridges are coordinated with the bridge section.
Make sure plans correctly address all existing signs, including the supplemental guide signs and other signs such as "Police Station" or "Stream Crossing" names as may be requested by the local jurisdictions.

Review roadway plans from the traffic safety and operational perspective including pedestrians and bicyclists.
Make sure pedestrians are visible to traffic at all crosswalks.
Review Guardrails as per the standards. Check to see if obstructions can be relocated. If not, guardrail installations should be checked for LON to cover all obstructions, cut slopes as per the standards. Check for guardrail offset from the roadway as per the standards. Check that proper terminal treatments are provided.

Pre-Advertisement:

Make sure comments from previous reviews are addressed.
To the extent possible, Quantities, Pay Items, Specifications and Special Provisions related to the Traffic Engineering items should be reviewed.

- Signal(s)
- MOT items, temp signing, barrels, TMA's etc.
- Guardrails
- Pavement Markings
- Permanent Signing
- Lighting
- ITS elements

Conduct an Overall Review
Provide input on any last minute details that require your review and comments

NOVA District Project Review Comment and Resolution Sheet

VIRGINIA DEPARTMENT OF TRANSPORTATION PROJECT REVIEW COMMENT AND RESOLUTION SHEET				CODES: A. Accept comment—will be corrected, added, or clarified. B. DESIGNER WILL EVALUATE. C. DELETE COMMENT D. DEPARTMENT TO EVALUATE.	
VDOT PROJECT NUMBER:		UPC NUMBER:		REVIEWER(S):	DATE:
DESCRIPTION:		REVIEW PHASE & TYPE:		DISCIPLINE:	CRM: (IF REQUIRED)
ITEM NO.	DWG. NO.(1)	COMMENTS	CODE(2)	RESPONSE(2)	FINAL DISPOSITION(3)
1					
2					
3					
4					

Northern Virginia District
Signoff Sheet

CONSTRUCTION RISK & READINESS INDEX

SCOPING

Project Description: **UPC #:**
Project Number: **Scoping Meeting Date:**

Secondary Sign-Off:	Comments Have Been Adequately Considered in the Review Process			Risk & Readiness is Acceptable.	
	Initials	Date		Initials	Date
Technical Construction					
Construction					
CURE Constructability					
CURE Utility Relocation					
Permits					
Environmental					
Smart Traffic Center					
Location & Design					
Materials					
Traffic Engineering					
Traffic Field Operations					
Maintenance					
Land Development					
Right-of-Way					
Right-of-Way/Utilities					
Structure & Bridge					
Transportation Planning					
FHWA					

Primary Sign-Off:	Initials	Date
Preliminary Engineering Manager		
Project Manager		
Construction Manager		

The plans present an acceptable level of risk and readiness to proceed to the Preliminary Field Inspection Milestone.