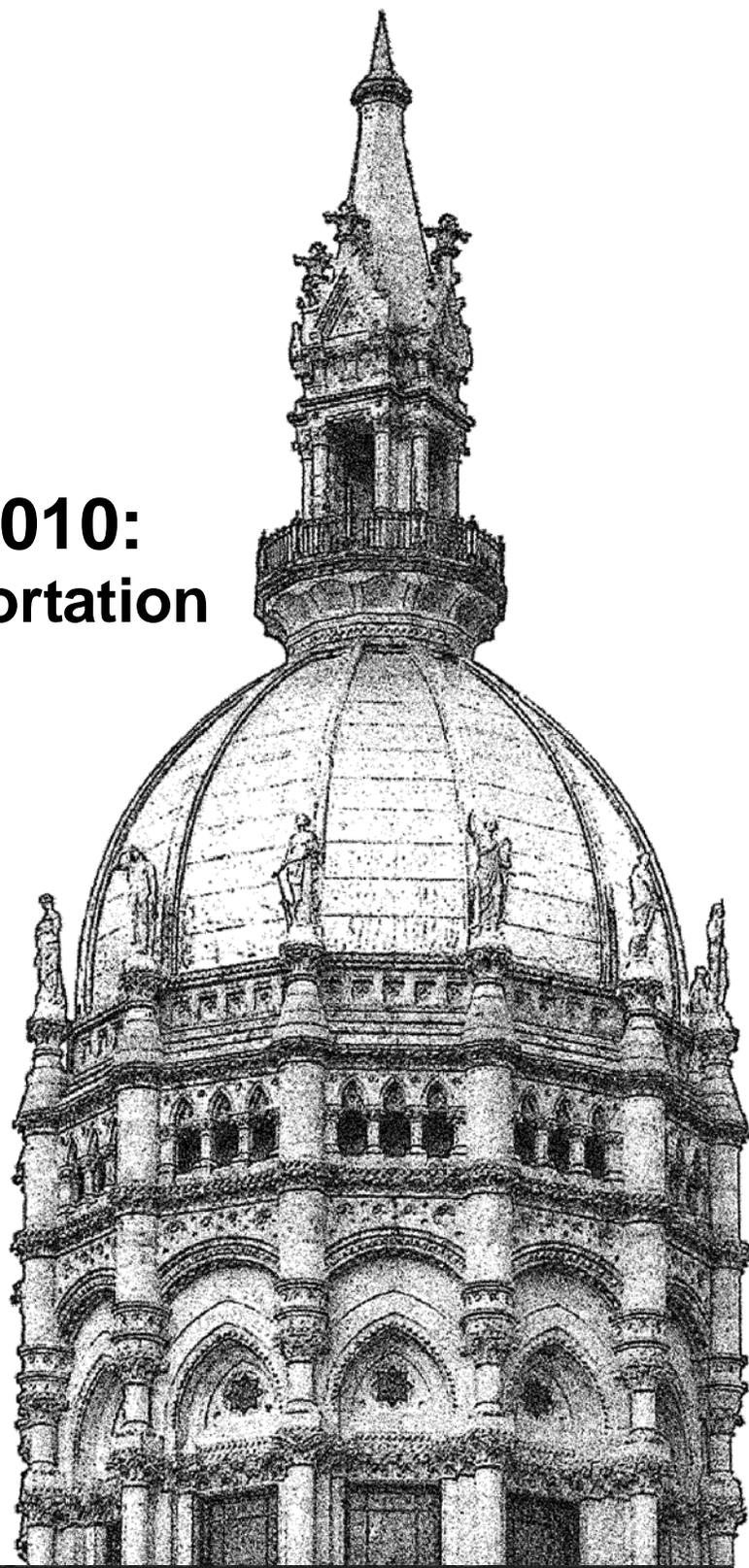


RBA Pilot Project 2010: Department of Transportation Project Delivery

DECEMBER 2010



**Legislative Program Review and
Investigations Committee**

Connecticut General Assembly

**CONNECTICUT GENERAL ASSEMBLY
LEGISLATIVE PROGRAM REVIEW AND INVESTIGATIONS COMMITTEE**

The Legislative Program Review and Investigations Committee is a bipartisan statutory committee of the Connecticut General Assembly. It was established in 1972 to evaluate the efficiency, effectiveness, and statutory compliance of selected state agencies and programs, recommending remedies where needed. In 1975, the General Assembly expanded the committee's function to include investigations, and during the 1977 session added responsibility for "sunset" (automatic program termination) performance reviews. The committee was given authority to raise and report bills in 1985.

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Department of Transportation
Project Delivery**

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Executive Summary

Results-Based Accountability Pilot Project Study 2010: DEPARTMENT OF TRANSPORTATION PROJECT DELIVERY

Study Purpose

- This study was undertaken to fulfill the second phase of the program review committee's effort to test the use of a Results-Based Accountability (RBA) approach for its legislative oversight work.
- The study focused on capital project delivery implementation by the Department of Transportation (DOT). Specifically, it examined the agency's process from formal project initiation through completion to answer the three main RBA program performance questions: *How Much Did We Do? How Well Did We Do It? Is Anyone Better Off*

State Progress on Population-Level Results

- The study also identified the following "quality of life results statement," within which an RBA framework was developed for DOT project delivery to guide committee staff data collection and analysis: *Connecticut's transportation system is maintained in a state of good repair and allows for safe, efficient movement of people and goods, livable communities, and sustainable growth.*"
- The state's progress in achieving this desired population-level result was examined based on five key indicators: safety, efficiency, state of good repair, environmental quality, and economic vitality.
- Much of what drives the indicators is beyond the control of DOT or any single state agency; there also are limitations to the availability and/or quality of current indicator data. Overall, progress toward achieving the population-level results statement is mixed.
- DOT has instituted a number of management reforms and undertaken several planning efforts intended to make better progress on state transportation system goals. However, overall accountability for results is diluted, and there is no comprehensive long-term strategic plan for, or systematic way to track progress on, achieving these goals.

PRI Recommendations

- 1. Amend existing statutory language to replace the department's current master plan requirement with an annual transportation system progress reporting process based on Results-Based Accountability principles. Each year, by January 15th, the Department of Transportation shall submit to the legislature, and publish on its website, an RBA framework that includes the quality of life results statement for the**

state transportation system and an assessment of progress toward those results based on key indicators.

2. **The framework, results statement, indicators, and annual progress reports should be prepared jointly with the Transportation Strategy Board, with input from major partners and stakeholder groups.**
3. **As part of an RBA data development agenda, DOT, in consultation with its partners, should review the adequacy of current indicators and related data resources for assessing progress toward desired results for the state transportation system. Together, they should determine whether there may be more appropriate alternatives for primary indicators and what additional secondary indicators are needed to provide greater public accountability. Preference should be given to indicators that are compatible with the national performance measures.**

DOT Project Delivery Performance Assessment (Program Report Card)

- Transportation project delivery is a process and not a discrete agency program with a single, cohesive management structure. Performance can be gauged according to several core measures: projects are delivered on schedule, within budget, in compliance with relevant standards and requirements; and delivered projects achieve their intended benefits.
- The transportation department's overall performance on these core measures is unclear and difficult to assess at present. Quantitative data necessary to address RBA questions regarding outputs, efficiency, and outcomes of the project delivery process are limited, rarely centrally collected, and sometimes not available.
- DOT has implemented and is considering many positive changes and promising initiatives to enhance project delivery; it is too early to determine their full impact.

How Much Did We Do?

- The size and scope of the DOT project delivery workload is difficult to determine because project data are maintained in a number of different information systems. The best available data about active DOT projects are for those authorized to receive federal funding. Information about completed projects is only centralized at this time for capital improvements carried out by the agency's Bureau of Engineering and Construction.
- The number and size of active projects and projects delivered by DOT can vary greatly from year to year. Based on best available data:
 - the department's annual workload of all active federally authorized highway and public transportation improvements averaged 285 projects, with a total annual

value (not including any federal stimulus funding) about \$560 million on average (FFYs 06-09); and

- on average, the agency's Bureau of Engineering and Construction delivered around 63 construction projects per year, with total final construction costs per year (design expenses not included) ranged from about \$100 million to more than \$740 million (SFYs 05-09).
- The bulk of projects the department delivers involve federal funding and are subject to federal planning, design, construction, and procurement requirements.
- Staff resources for project delivery include department employees and outside professional services; the capacity and cost of DOT staff responsible for project delivery is not known.

PRI Recommendations

- 4. The department, as part of its effort to establish a centralized new project initiation process, should develop and maintain a database that can identify and monitor the agency's complete project delivery workload.**
- 5. The transportation department should seek the assistance of the Connecticut Academy of Science and Engineering in preparing a talent assessment of its existing staff capacity and projecting its future staffing needs for capital improvement project delivery implementation. The results of this assessment should be completed by July 1, 2012, and shared with the legislature's Appropriations and Transportation Committees.**
- 6. The department should establish a mechanism to track the direct and indirect costs of the design, construction inspection and administration, and project management services its employees provide on a per project basis. Measures of project delivery workload, such as project dollar value per employee, also should be developed and used to monitor trends in internal staff capacity.**
- 7. The Department of Transportation should conduct an analysis of transportation project design costs that compares the costs associated with work done by department employees to costs of using private design firms. The analysis should be conducted and completed by July 1, 2012, with a report of the results forwarded to the legislature's Transportation and Appropriations committees on or before that date.**

How Well Did We Do It?

- Overall, there has been limited relationship between original budgets and schedules set during project design and the actual costs and times to complete projects. The department, partly in response to federal concerns, is working to improve the accuracy of its project cost and time estimates and better control the design phase of project delivery.
- The department lacks an automated transportation project management system that can track and monitor projects throughout the entire project delivery process, from initiation through completion. As such, aggregated data on project delivery performance is lacking.
- Additional performance measures need to be developed for major milestones within the project delivery process; current measures on project timeliness and cost effectiveness need strengthening.

On-Time Performance

- The time required to complete the transportation project delivery process – from initiation of project design through construction – increased between 2001 and 2010.
- The time to complete the full project delivery process averaged 1,918 days (5.3 years) for projects completed between 2001-10. The project design component accounted for the largest portion of time within the overall project delivery process, averaging 1,195 days, or 61% of the full project delivery process.
- Project construction completion times determined as part of the project design process are consistently underestimated: 37% of projects were completed on-schedule. The average for 15 other states was 53% between 2001-05.
- Projects exceeded their original construction dates by an average of 223 days (median was 144 days).
- The percent of projects completed beyond their original schedules was higher for state projects than municipal projects, 68% and 44% respectively.
- The highest percentage of projects not completed within their original schedules was for those with the highest original costs (>\$20 million). Conversely, the lowest percentage of projects not completed on time was those with in the lowest original cost range (<\$5 million).
- Projects exceeding their original completion dates with original costs over \$20 million were completed an average of 852 days beyond their deadlines. This average is almost five times that of projects not completed on schedule in the “less than \$5 million” range, which averaged 174 days.

PRI Recommendations

- 8. The Department of Transportation should continue to examine ways to streamline the time it takes to complete major milestones within the project delivery process. Once the agency's new integrated project management system is fully operational, targets for completing each major step of the design process should be set and monitored by the engineering bureau, with the assistance of the performance measures unit. Attention should be paid to: 1) the degree to which design consultants and staff engineers meet established deadlines for designing projects; 2) the process used by project designers to estimate the amount of time necessary for project completion to ensure such estimates are realistic; and 3) the advertising and contract bidding processes.**
- 9. The department should continue to fully focus on the link between project design and time extensions to project construction due to design errors or omissions, with the specific goal of increasing the department's performance for completing projects in accordance with their original schedules.**
- 10. DOT should set a yearly performance goal for delivering transportation projects within schedule for construction purposes, rather than continuing to use its recently-established standard of "maximizing percent of construction contracts completed on time." The department's performance toward achieving the new goal should be part of its current initiative to measure project completion performance. The goal should be realistic and re-evaluated at least annually.**
- 11. The department should add the following components to its current measure for on-time project delivery performance: 1) the aggregate times projects are taking to complete beyond their original deadlines; and 2) the aggregate amount of time each reason for scheduling extensions (as identified in the department's current measure) adds to the overall time for completing projects.**
- 12. DOT should begin benchmarking its performance for delivering transportation projects on schedule with the performance of other states for comparative purposes. DOT should identify best practices used by states with better project completion performance, and determine whether to implement such practices within its project delivery process.**
- 13. DOT should include on its website a "watch list" of all projects approaching time overruns for the design and construction components of the project delivery process.**

On-Budget Performance

- The percent of projects incurring cost overruns of more than 10% decreased 49% for projects completed between 2001-10, which the sharpest decline occurring in 2010.
- Just under three-fourths of projects incurred some degree of cost overrun when compared to original construction budgets; the average cost overrun for projects over budget was 23% and the median was 12%.
- Of the projects completed below their original budgets, the average amount under budget was 8% and the median amount was 5%.
- Construction for 42% of projects was completed over original budgets by more than 10%. The average cost overrun for the projects over 110% of their original budgets was 37% and the median was 21%.
- The percent of projects incurring cost overruns of >10% was essentially the same whether the state or a municipality delivered the project: 42% and 41% respectively.

PRI Recommendations

- 14. The Department of Transportation should begin analyzing its project delivery process with the goal of developing a system through which the department can fully determine the project costs associated with each major milestone of the project delivery process. The system should allow DOT to identify the level to which projects are completed within established budgets for each milestone. The results should be reported as part of the department's performance measure for delivering projects on-budget.**
- 15. The department should establish a goal of having the lowest responsible bid amount be no greater than the design engineer's estimate. Progress toward achieving such goal should be measured at least annually.**
- 16. DOT should set a yearly goal of delivering transportation projects within budget for construction purposes, rather than continue using its recently-established standard of "maximizing percent of construction contracts completed on-budget." The department's performance toward achieving the goal should be part of its current initiative to measure on-budget performance. The goal should be realistic and re-evaluated at least yearly.**
- 17. The department should add the following components to its current measure for on-budget performance: 1) the total dollar amount of construction cost overruns; and 2) the amount each reason for cost overruns (as identified in the department's current measure) adds to overall project costs.**

18. DOT should sharpen its focus for analyzing project design cost estimates with bid amounts and final project costs to link the cost estimating process with overall project construction costs. The results should be included in the department's performance measures as an indicator of estimating accuracy for transportation projects, and for use to continually improve the project estimating function.
19. The department should continue researching whether it should set different contingency standards for projects based on project cost and/or type of project. Any changes to the current contingency level should continue to move the project delivery process toward delivering projects within original budgets.
20. The department should include on its website a "watch list" of all projects approaching cost overruns (including applicable contingencies).
21. The department should begin analyzing its performance on delivering transportation projects within budget with the performance of other states for comparative purposes. The results also should be used in helping develop appropriate benchmarks and standards for delivering cost effective projects.

Is Anyone Better Off?

- Overall timeliness of project delivery is just beginning to be tracked and reported by DOT.
- Cost-effectiveness cannot be determined; complete costs of projects from design through final delivery and data on project end results are not easily available.
- Customer satisfaction with DOT project delivery performance is not measured in any comprehensive way.

PRI Recommendations

22. The DOT performance measures unit should identify existing sources of customer feedback information throughout the agency and become a repository for all data related to customer satisfaction. Unit staff also should help managers in each bureau develop low-cost ways, such as focus groups and on-line surveys, to regularly obtain and use input from stakeholders to assess project delivery and other critical performance areas.
23. The department should establish and report on measures of customer satisfaction as part of the ongoing development of its performance measurement system.

Overarching Issues

- The department needs to ensure progress toward data-driven management of the state transportation system and performance measurement becomes embedded within the department.
- A stronger connection between performance, funding decisions, and strategic goals also is needed. The agency's current RBA and performance measurement efforts could be combined to reduce duplication and promote a better partnership with the legislature.
- Several overarching issues for DOT project delivery success were identified, including:
 - Better control over project initiation and design development is necessary to ensure the department's program of capital improvements can be effectively managed and measured.
 - Current agency automated systems do not support strong project management and oversight throughout the entire project delivery process. Information systems for managing design development are especially weak. Effective coordination between the preconstruction and construction phases is impeded by a lack of up-to-date project management tools and technology
 - A better use of "lessons learned" from completed projects could help to ensure best project delivery practices with proven results are transferred across the agency and broadly applied.
 - Quality assurance efforts need to be better integrated with the agency's performance measurement system to promote continuous quality improvement.
 - Creative contracting methods shown to save time and money for construction project delivery cannot be used by the department at present and need to be explored.
 - Information exchanged between the Departments of Transportation and Environmental Protection is not fully coordinated or in total compliance with the requirements of a Memorandum of Understanding between the two departments regarding staffing.

PRI Recommendations

- 24. DOT should create a performance measurement results steering committee comprised of top managers representing each bureau. It should meet quarterly with performance measures staff and the commissioner to review and discuss current results data, identify successes and problem areas, and direct actions to improve outcomes.**
- 25. The department should incorporate RBA as a primary tool for promoting performance measurement and management for results throughout the agency.**
- 26. The department should continue developing the centralized project initiation process and have it in place through a formal department policy statement by July 1, 2011. This process should be used to maintain and regularly update the agency's five-year capital planning document.**
- 27. Implementing the new integrated project management system as scheduled should be a top priority of agency leadership. Also, the department should ensure the new system will be able to track all major steps of the preconstruction process, including: consultant hiring; agreement execution; rights-of-way and utility relocation milestones; and timeframes for environmental reviews and permitting.**
- 28. The quality assurance office should organize and sponsor a lessons learned event to evaluate project delivery success for a sample of completed projects at least annually.**
- 29. The quality assurance office should work with the performance measures unit to develop quantitative measures of compliance and quality for projects the department delivers. As a first step, quality assurance and performance measurement staff should compile, review, and summarize the results of evaluations of contractor and consultant performance to share with top agency managers.**
- 30. Enact legislation to permit the department to use design-build and other alternative contracting approaches on pilot basis. Prior to project initiation, the department shall submit a project, and the criteria used to select it as a pilot for design-build or other alternative contracting method, to the legislature's Transportation Committee for review and approval. DOT also shall evaluate the delivery success of the pilot project in terms of timeliness, cost, and quality, and report the results to the Transportation Committee within three months of project completion.**
- 31. DOT and DEP should re-evaluate the requirements of the current memorandum of understanding regarding support for permit staff to ensure they include realistic reporting requirements of how the funding is used, how it makes the transportation**

project permit processing function more efficient, and what benefits DOT (and the state) receives from its funding of DEP positions. Any revisions to the MOU should occur by October 1, 2011.

32. The commissioners of DOT and DEP should establish an interagency workgroup to meet and discuss ways to fully achieve a balance between expediting transportation project delivery and ensuring proper protection of the environment. Issues to be discussed within the workgroup should include: maximizing environmental permitting coordination and streamlining; involving DEP in the transportation project design phase as early as reasonable; examining alternative mitigation strategies; assessing the implementation of creative contracting methods (including design-build); and identifying ways to fully attain and maintain efficient and effective communication. The workgroup should be established by July 1, 2011, and relevant information, including agendas and meeting minutes, should be posted on each agency's website.

33. The Office of Environmental Planning should begin to fully track its performance for processing environmental review documents and permit applications for transportation projects. The office should determine its main performance measures and frequently gauge its performance against those measures. The results should become part of the department's overall performance measurement system. The department also should determine whether its new automated project management system could contain information to better track and measure environment-related activities within the transportation project delivery process.

Introduction

DOT PROJECT DELIVERY: RBA PILOT PROJECT STUDY 2010

In June 2010, the Legislative Program Review and Investigations Committee (PRI) authorized its second pilot study using Results-Based Accountability (RBA) principles – an assessment of project delivery implementation by the state Department of Transportation (DOT). This study had two main purposes: to further test RBA as a tool for program review committee work; and to use the RBA approach to find ways expedite and improve how the department delivers capital improvements to the state transportation system from the point design is initiated through project completion.

RBA is a data-driven evaluation tool for improving government performance and overall community well-being. It is used by cities, counties, and executive branch agencies in over 40 states and by at least seven other countries. In Connecticut, the legislature’s Appropriations Committee has been applying the RBA approach to its state budget process since 2005. (Background information about Results-Based Accountability is provided in Appendix B).

As mandated by law (Public Act 09-166), the program review committee carried out its first RBA pilot project study of selected human services programs during 2009. The committee’s final report, which assessed family preservation and support programs administered by the Department of Children and Families (DCF), was issued to the Appropriations Committee in January 2010. In accordance with P.A. 09-166, the report also contained an evaluation of whether the PRI pilot project should be continued in some form.

The program review committee found Results-Based Accountability to be a promising practice for its legislative oversight efforts. PRI proposed continuing the committee’s pilot project effort for at least one more year in a different budget area to permit fuller consideration of how RBA can be used to improve various types of state programs and policies. The committee selected transportation as its second study topic area, with a focus on how to expedite the DOT process for delivering capital improvements. It decided to use the RBA approach to try to identify ways to reduce state transportation project completion times and overall costs, while maintaining compliance with critical standards related to safety, quality, environmental protection, and public accountability.

Study Scope

Transportation project delivery encompasses project development and project implementation, a long, complex, and multi-faceted process. Due to time and staffing constraints, the program review committee limited the scope of this study to the latter phase – DOT project implementation. This includes the beginning of the formal project design phase through completion of the actual improvement. Therefore, the “front end” of the process – the phase that entails planning, approving, prioritizing, and selecting which projects will be undertaken to improve the state transportation system – was not examined in detail or evaluated as part of this committee report.

Applying the RBA approach to DOT project delivery implementation proved challenging. It required analysis of performance and outcomes at two levels of accountability: a) the program-level, which assesses agency management efforts and end results for customers; and b) population-level, which assesses quality of life results for the broad community that many entities and programs contribute to achieving.

Rather than a discrete program, however, DOT project delivery is a major agency function that contributes to a wide range of goals desired from the state's transportation system. It is a multi-phase process, carried out across all six DOT bureaus for many different types of improvement projects related to all state infrastructure components: highways; bridges; rail and bus facilities and systems (public transportation); ports; ferries, and bikeways, walkways and trails.

Given this complexity, it was not possible to capture all aspects of DOT project delivery performance within the study timeframe. The program review staff was able to use RBA principles to develop an accountability framework for transportation project delivery that links effective performance of this function with the state's high level transportation system goals. Indicators of the state's progress toward these population results also were identified and assessed.

At the program performance level, analysis of DOT project delivery centered on the design and construction activities carried out by the department's Bureau of Engineering and Construction (BEC). While the bulk of the bureau's project delivery work involves the highway system (roads and bridges, under both state and local control), it also oversees a number of public transportation and aviation bureau capital construction projects. Design and construction work carried out by other bureaus (e.g., rail electrification upgrades), or any improvements accomplished through capital acquisitions (e.g., new equipment like rail cars or buses), however, were not examined as part of this study.

Research Methods

PRI staff met with all top managers and most high level staff of DOT who have key project delivery responsibilities. State Department of Environmental Protection (DEP) personnel involved in reviewing DOT projects, and key personnel from the federal agencies that fund and oversee improvements to Connecticut's highway and public transportation systems (FHWA and FTA), also were interviewed. Several stakeholder groups, such as representatives of the construction industry and the consulting engineering community, as well as regional planning organizations, were contacted for input regarding DOT project delivery performance. A meeting of the state Transportation Strategy Board also was observed by committee staff.

A variety of local and national experts on transportation matters were contacted for information, particularly regarding project delivery best practices. They included: the Connecticut Academy of Science and Engineering (CASE), the American Association of State Highway and Transportation Officials (AASHTO), and the national Transportation Research Board (TRB). The numerous plans and reports related to transportation projects that DOT is required by state and federal law to produce, and all recent federal and state audits, program reviews, and studies concerning DOT project delivery, were reviewed by committee staff.

PRI staff gathered and analyzed available data related to core measures of project delivery performance from a number of sources within DOT including: the planning and finance and administration bureaus; and the offices of quality assurance, construction, engineering, claims within the engineering and construction bureau. This information was used to determine areas of strength, areas in need of improvement, and possible reasons for current levels and trends in agency performance.

The pilot project's six-month timeframe did not permit PRI staff sufficient time to evaluate all aspects of the process for implementing capital improvements or to examine a representative sample of DOT construction projects in-depth. A database containing cost and schedule information for the bulk of the agency's state and federally funded construction projects completed between January 2001 and June 2010, however, was developed and analyzed. In addition, generally recognized best practices for implementing major transportation system improvements were identified as a backdrop for assessing the department's overall project delivery performance. (See Appendix C for a summary of national literature on suggested best practices.)

PRI staff reviewed written agency manuals and guidance documents and conducted interviews with DOT and federal agency staff to gain insight into the procedures and policies actually used for project delivery. Project management staff for one of the department's "mega" projects (the Q Bridge Corridor project in New Haven), which has been a testing ground for a number of innovative practices, were interviewed in-depth regarding any broadly applicable "lessons learned" about delivery success. The program review committee also held an informational public hearing on the DOT project delivery study at the Legislative Office Building on October 6, 2010.

Report Organization

Background information about the Department of Transportation project delivery process is presented in Chapter I. It also provides a brief description of the agency's overall mission and main responsibilities, its current organizational structure, and basic department staffing and budget information.

Chapter II contains an RBA framework for DOT project delivery developed for this study and a report card summarizing the committee's assessment of the state's progress on achieving the its transportation system goals. A second, program-level RBA report card evaluating the transportation department's project delivery performance is provided in Chapter III. Both report cards use the following symbols:

- +** Indicates a positive trend
- Indicates negative trend
- ↔** Indicates little or no change over time or mixed results
- ?** Progress cannot be determined at present

RBA framework and population-level results. An RBA framework is intended to place major state programs and services within the larger context of broad, statewide goals to which they contribute. The committee's accountability framework for DOT project delivery presented in Chapter II outlines in one page: a statement of state transportation system goals (quality of life results) to which successful project delivery contributes; the key indicators for measuring progress toward those population-level results; the main partners, state strategies, and major state programs involved in achieving them; and key program-level measures of DOT project delivery performance.

It is followed by a population-level accountability report card based on currently available key indicator data for broad state transportation system results. More details on each indicator are provided in Appendix D. Current DOT efforts for making better progress toward these high-level goals and several program review committee proposals for improving population-level accountability also are discussed in Chapter II.

Program performance report card. The purpose of an RBA program report card is to provide a concise, data-driven performance assessment of a major program, agency function, or system. The program review committee's assessment of DOT project delivery performance is summarized in a program report card format in Chapter III. This chapter further presents PRI committee findings about the overall efficiency and effectiveness of the state transportation department's project delivery process. It also includes the program review committee's recommended legislative and administrative changes to reduce construction project delivery times and costs, and increase agency accountability for successful project design and completion.

Agency response. It is the policy of the Legislative Program Review and Investigations Committee to provide agencies subject to a study with an opportunity to review and comment on committee findings and recommendations prior to publication of the final report. Written responses were solicited from the state Departments of Transportation and Environmental Protection and one was received from DOT. A copy is provided in Appendix A.

I: Background

DEPARTMENT OF TRANSPORTATION PROJECT DELIVERY OVERVIEW

Agency Role, Organization, and Resources

Prior to a discussion of the project delivery process, it is important to understand the organization of the Department of Transportation and its overall responsibilities. The department's current role, according to its mission, is to ensure *Connecticut has a safe and efficient intermodal transportation network that improves the quality of life and promotes economic vitality for the state and the region.*¹

The department is organized into six bureaus, as shown in Figure I-1. Each bureau carries out a distinct function to help the department fulfill its mission. The bureaus are:

Engineering and Construction: manages the design, engineering, construction, and oversight functions for DOT capital projects across transportation modes. Four district offices throughout state provide construction administration of projects.

Public Transportation: manages the development, operation, and maintenance of the state's public transportation system through a network of rail, bus, cycling, and pedestrian services and facilities; also regulates motorbus, taxi, livery, intrastate household goods, and railroad entities.

Highway Operations: maintains and preserves safe operation of the state's highway and bridge system, including snow and ice control, equipment repair, and maintenance. The bureau is supported by four district highway maintenance facilities statewide.

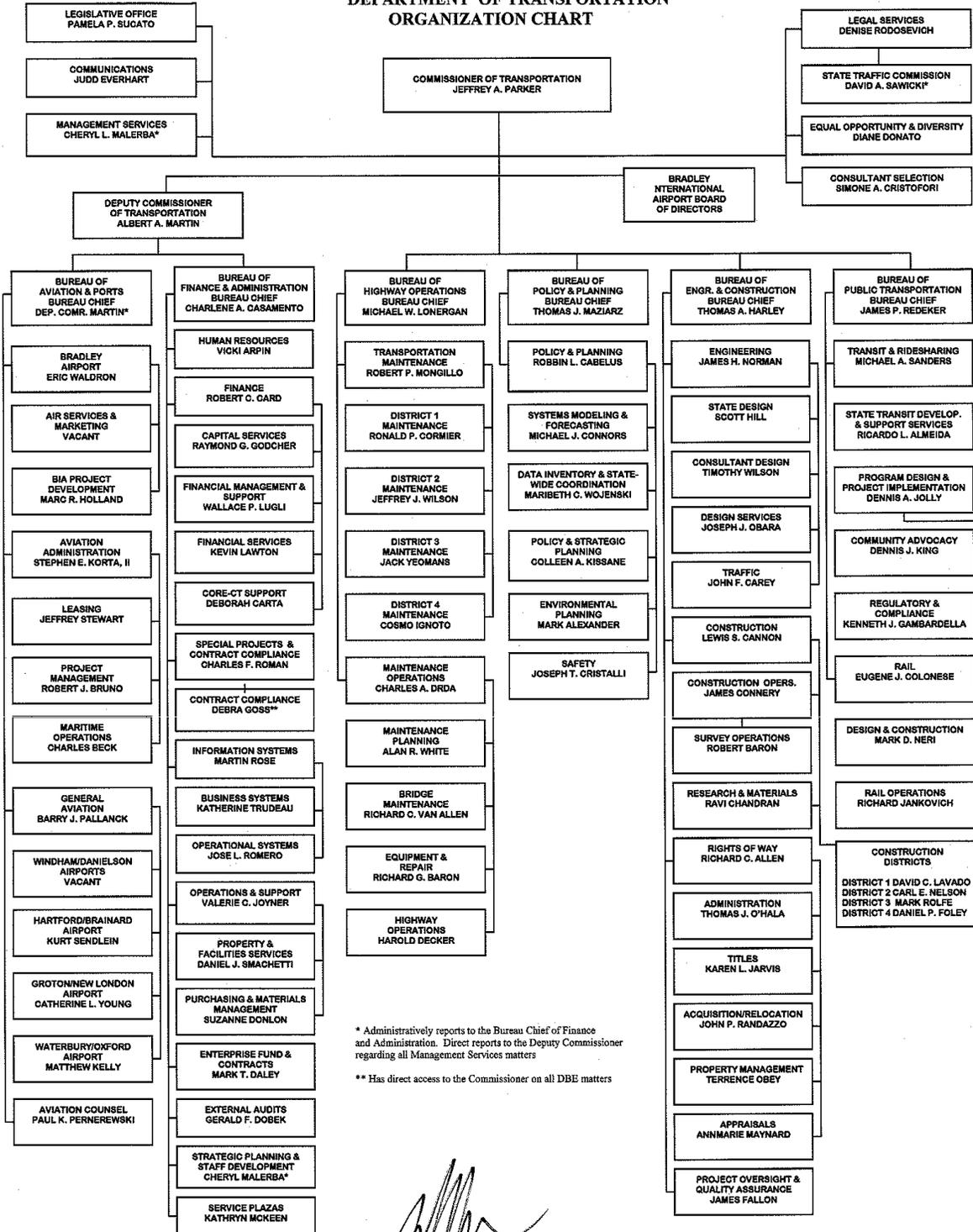
Aviation and Ports: operates, manages, and develops the state-owned aviation, ferry, and pier facilities; also licenses and regulates private aviation facilities, state harbor and river pilots, and agents of foreign vessels.

Finance and Administration: provides fiscal and support services, including personnel development, maximization of fiscal and operational performances, and improvement of the department's business processes using information systems technology.

Policy and Planning: maintains inventories and data for current transportation systems, forecasts transportation needs, assesses environmental impact of transportation plans, and plans and prioritizes future direction of transportation projects and funding by mode.

¹ CT DOT 2009 Master Transportation Plan 2009-2010, January 2009 (p. 2).

**STATE OF CONNECTICUT
DEPARTMENT OF TRANSPORTATION
ORGANIZATION CHART**



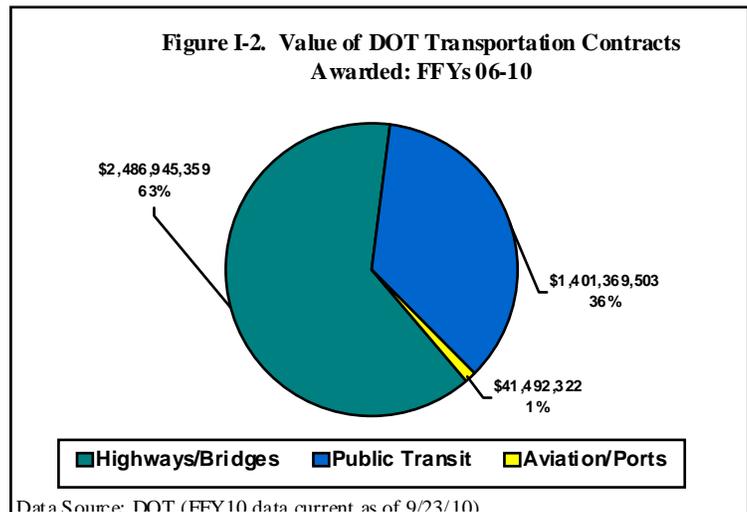
* Administratively reports to the Bureau Chief of Finance and Administration. Direct reports to the Deputy Commissioner regarding all Management Services matters
 ** Has direct access to the Commissioner on all DBE matters

Jeffrey A. Parker, Commissioner
 August 10, 2010

Responsibilities. The state Department of Transportation is responsible for the implementation, maintenance, and preservation of the state’s transportation network. This includes all modes of transportation: public transit, highways and bridges, aviation, maritime, bicycle, and pedestrian.

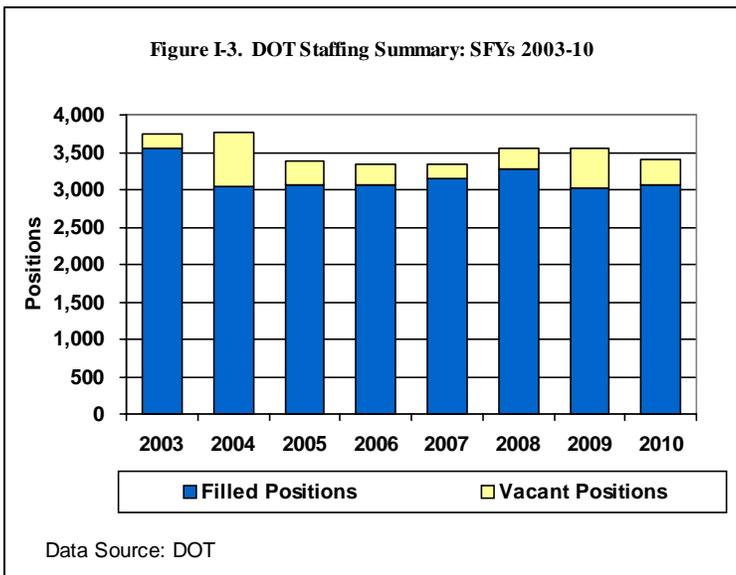
In terms of transportation project delivery, the department is responsible for coordinating with a variety of stakeholders to identify, fund, design, construct, and maintain projects. The key partners involved in the project delivery process are federal and state agencies, regional planning organizations, municipalities, private sector consultants and contractors, and the general public.

Figure I-2 shows the total value of contracts awarded for highway, bridge, and public transit projects receiving federal funding for the five year period of FFYs 06-10. As the figure shows, \$3.93 billion in transportation project contracts were awarded during this period. The total value of contracts awarded for highways and bridges was almost \$2.5 billion (63 percent), while the value of public transit project contracts was \$1.4 billion, or just over a third of the overall value. Additional information on awarded contracts is presented later in the report.



Staff resources. Figure I-3 shows the department’s level of filled and vacant positions for SFYs 2003-10. Combined, the two categories equal the department’s allocated positions.

The trend in positions is mixed. For the period analyzed, filled positions peaked in FY03, at 3,559. The fewest filled positions occurred in FY04 (3,028), which is the year immediately following a statewide retirement incentive program for public employees.

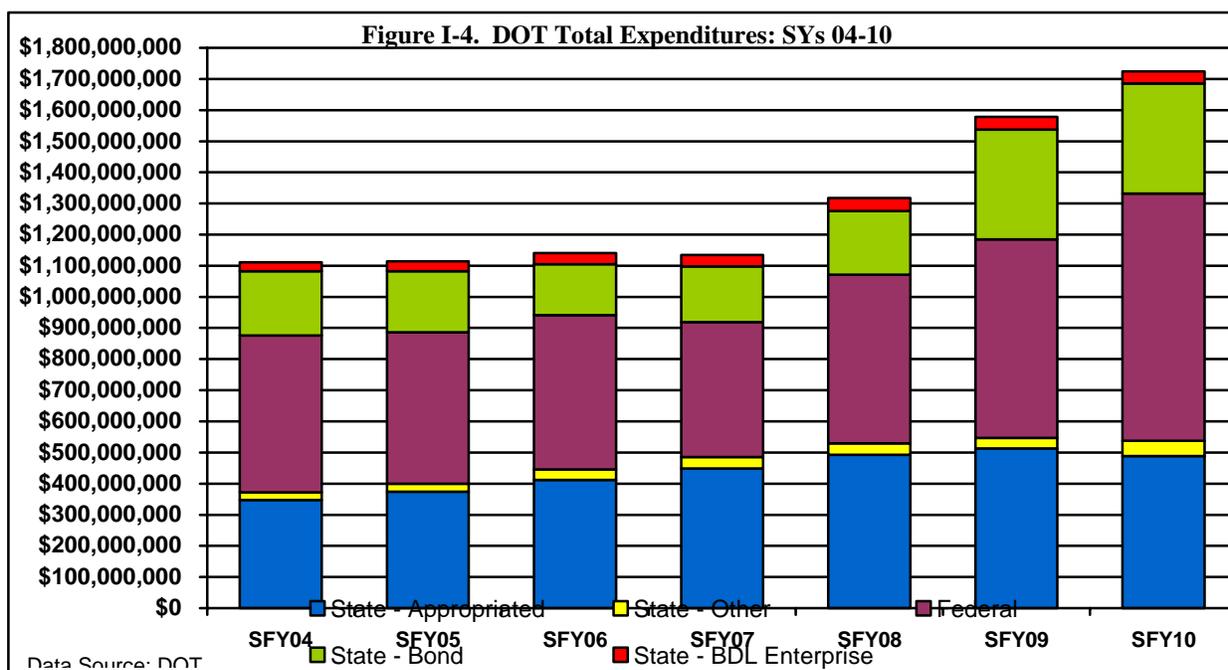


Expenditures. Connecticut’s transportation network receives funding from various sources. Revenue from federal, state, and municipal levels, help finance the development, implementation, and preservation of the state’s transportation infrastructure.

Federal and state funds are the primary sources of funding for state and local transportation programs. The key source of federal funding is the current federal Safe, Accountable, Flexible and Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), passed in 2005. SAFETEA-LU reauthorized the federal highway, transit, safety, research, and motor carrier programs for the six-year period of FFY2004 through FFY2009. Funding under SAFETEA-LU expired in September 2009, and has been extended through a series of continuing resolutions.

In Connecticut, the state’s Special Transportation Fund (STF) is the primary source of state funding for projects. The Special Transportation Fund is funded by transportation-related taxes, fees, and revenues, as well as the proceeds of Special Tax Obligation Bonds. The STF pays the debt service cost for state bonds issued as a means of providing funds for the state's share of transportation projects when state matching is required to receive federal funding for projects. In addition, Bradley airport is funded through the self-sustaining Bradley Enterprise Fund.

Figure I-4 shows the trend in budget expenditures for the Department of Transportation for state fiscal years 2004-10. Overall DOT expenditures remained relatively steady between SFYs04-07, at roughly \$1.1 billion. Expenditures increased each year since then, to their current level of approximately \$1.7 billion. The increase can be attributed to additional funding from most sources, including federal stimulus funding beginning in FY 09.



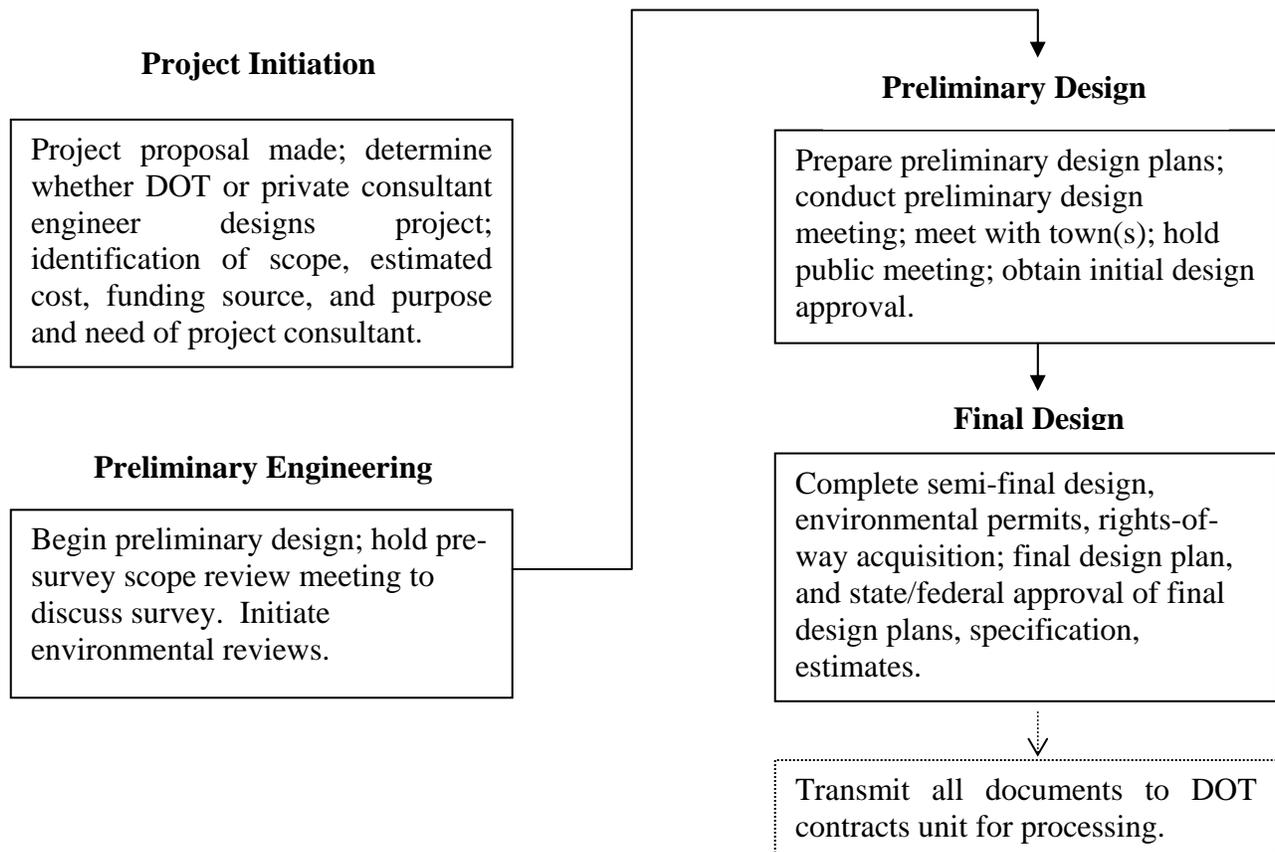
Process Summary

Transportation project delivery implementation within the Department of Transportation generally can be discussed in three main phases, each with unique components and requirements: 1) design; 2) bidding and awarding; and 3) construction. The full process, as described by DOT, includes myriad requirements and internal checks and balances within each phase, and is too detailed to include in this report. Instead, major steps of the design, bid and award, and construction phases are summarized below.

PHASE I: DESIGN

Once a transportation project has been authorized and funding commitment is obtained, the process moves to the design phase. This phase helps to more accurately define the project scope and cost, and incorporates preliminary engineering studies, preliminary design, and final project design. Various parts of the process occur simultaneously, as discussed below, and the key phases of the process are similar across state transportation projects. Figure I-5 highlights the main components of the transportation project design process.

Figure I-5. DOT Transportation Project Design Process



Project Initiation

Summary

- Refine project scope and preliminary cost
- Determine use of, and select, in-house design engineer or consultant engineer
- Identify funding source(s)
- Assign project number
- Obtain state and/or federal authorization for project
- Obligate funding/establish budget

Transportation projects are initiated through a detailed conceptualization and planning process involving various stakeholders, including state and federal agencies, regional planning organizations, environmental entities, and economic development/business groups. Key factors determining the types of projects initiated include preservation and maintenance of existing infrastructure, areas with high accident rates, safety improvements, and road/passenger capacity. Project cost is also a critical factor.

FHWA (highways and bridges), the Federal Transit Authority (public transportation), and the Federal Aviation Administration (airports) are key federal agencies involved in developing the scope of a transportation project. The agencies' involvement early in the process helps maximize their ability to participate in state DOT design decisions when federal funding is involved.

Once the scope of a project is identified, the eligibility for funding is evaluated, as are possible sources of funding. There are various federal and state funding sources available for different classifications of projects (e.g., roads, bridges, rail, bus, and air). After DOT estimates the cost of the project and identifies the necessary funding source(s), a Recommended Project Memorandum (RPM) is created. The RPM contains specific information about the project, including location, a broad scope, estimated cost, and funding source.

For federally-funded highway/bridge projects, FHWA will determine at this point whether it will maintain oversight of the project or if it will delegate the responsibility to DOT, as permitted by a formal stewardship agreement with FHWA.² For public transportation projects, FTA may decide to use a private consultant to perform project management oversight, while FAA uses in-house staff to manage projects. Federal authorization is also required to begin the pre-engineering phase of the project for federally funded projects.

The beginning stage of project delivery further includes the decision whether to use DOT engineers or an outside professional consulting firm to design the project. This decision is

² Section 106 of Title 23, United States Code, requires the Federal Highway Administration and the state to enter into an agreement documenting the extent to which the state assumes the responsibilities of FHWA for oversight of transportation projects under Title 23. The Stewardship/Oversight Agreement formalizes these delegated responsibilities and agreements to address how the Federal-aid Highway program will be administered in the state.

usually based on the complexity of the project, including the overall level of staff specialization and experience, as well as the overall level of staff resources necessary to complete the design.

For projects requiring outside design assistance, DOT may select a consultant or use on-call consultant engineering firms to complete portions of the work. The department estimates consultants design approximately 60 percent of the projects as measured by dollar value, and approximately 50 percent of the projects as measured by number.

Design consultant selection. If DOT decides to use the professional services of a consultant for project design, a specific process to select a consultant must be followed. The department's consultant selection process is conducted in accordance with applicable laws, regulations, and policies, regarding the advertisement, bid receipt/review, and selection of services. The process is intended to be impartial, equitable, and transparent. The goal is to ensure the consultants selected demonstrate the competence and qualifications necessary to fulfill DOT requirements.

Consultant prequalification. State law requires DOT to annually solicit consulting firms to become prequalified in technical categories for which the department anticipates it will need such professional services in the upcoming year. By mid-November, businesses wanting to be prequalified for the following year must submit information regarding their qualifications based on criteria established by the department.

A Technical Qualifications Panel (usually consisting of the department's Chief Engineer, Engineering Administrator, and the Construction Administrator) analyzes the information submitted by the consultants, and then recommends eligible consultants for prequalification to the commissioner by each January. (If a prequalified list contains less than five consultants, any consultant may submit a letter of interest to the department in response to a bid soliciting professional consulting services.) Prequalified consulting firms receive notice each time the department solicits bids for transportation projects that match their prequalification categories.

Consultant Selection Panel. Any bureau requesting professional consulting services must first obtain approval from the commissioner. Upon approval, DOT solicits responses (i.e., letter of interest) from prequalified consulting firms.

Once the responses are received, an internal DOT panel evaluates them and selects a consulting firm. The panel consists of three department employees appointed by the commissioner, one person appointed by the bureau chief of the bureau requesting consulting services, and one person appointed by another bureau chief of the bureau administering the specific project, if desired. Members selected by bureau chiefs must be approved by the commissioner, and each panel is a separate entity responsible only to the commissioner.

The selection panel individually rates each consultant using standardized criteria/forms. The panel then puts together a rank-ordered list of consultants based on the panel members' ratings. The list is sent to the consultant selection office for review and approval by the commissioner. The selection panel then interviews a short list of the highest ranked firms (typically five) using a uniform format, using a predetermined set of questions. A second rank-ordered list of the firms is assembled based on the interviews. This list and supporting

information are sent to the consultant selection office for review. The commissioner has the final selection authority for each consultant hired.³ As this point, the selection is made public. A report by the commissioner outlining the selection process and how the final decision was made becomes available after a contract is executed between DOT and the consultant.

Consultant Selection Office. The Consultant Selection Office (CSO), a unit within the commissioner's office, is responsible for the administration and execution of all the necessary procedures for selecting DOT's professional consultants. The office coordinates information for the consultant selection panels, and ensures the consultant selection process follows all applicable department, state, and federal rules. The office is the liaison between the department and consulting firms.

Assignment meeting and contract execution. A meeting between the design consultant and the DOT consultant design unit occurs once the design consultant engineer is chosen. The groups discuss a more detailed scope of work, along with the responsibilities of the consultant and transportation department. The consultant will be given available information already developed for the project, including planning reports, public hearing transcripts, and planning maps. The department also will identify any known unusual design problems that may be encountered.

Following the meeting, the consulting design firm works on a more defined scope of work and the assigned DOT project manager identifies the various disciplines within the department to work on the project; both parties work independently to determine the consultant hours for the approved scope of services. A negotiation committee within DOT then works with the parties to generate a final agreement regarding project details and fees. After the completion of all the work performed by the consulting engineer, a final audit of the consultant agreement is performed by the Bureau of Finance and Administration.

Preliminary Engineering

Summary

- Conduct preliminary engineering studies (e.g., hydraulics, structures, and soil)
- Coordinate with DEP, federal agencies
- Determine level of environmental documentation needed
- Identify, refine, analyze alternatives
- Hold preliminary engineering studies review meetin

Once either the department or consultant staff has been chosen, the project delivery process moves into the Preliminary Engineering phase. This is a key part of the early project design process because it entails the development of various preliminary engineering studies, as well as determining the level of environmental documentation needed based on potential

³ C.G.S. Sec. 13b-20i requires that specific objective criteria guide the department's selection of professional consultants, including the volume of work performed by the firm within the past three years. The commissioner will generally approve the consultant panel's recommended list of consultants unless a firm has over five percent volume of consultant work with the department or has been selected to provide consultant services within the previous six months. The commissioner uses his/her discretion in such cases.

environmental impact. These engineering studies run concurrent with the environmental and public input components of the process (discussed later).

The purpose of the preliminary engineering studies is to begin to gauge the level of engineering necessary to properly design the project. Depending on the type of project proposed, the preliminary engineering studies conducted could include evaluations of drainage systems and structures, analyses of intersections and traffic patterns, and an identification of utilities possibly affected by the project. Another possible evaluation at this stage is preliminary analysis of hydraulic crossings for potential impact on floodplain management, again depending on the type of project.

During this phase, the design engineer also will review, identify, verify, and delineate any inland wetlands, tidal wetlands, and watercourses impacted by the project. In addition, for vertical construction evaluations, the overall demand for the facility will be reviewed (e.g., the number of gates needed for an airport terminal or the number of repair bays desired for a maintenance facility).

Environment. The DOT Office of Environmental Planning (OEP) conducts an internal environmental review process in the beginning phases of any transportation project. The review helps establish the level of documentation necessary for the project's potential environmental impact.

The OEP review and resulting preparation of environmental documents are intended to aid in determining a preferred alternative to best balance meeting identified needs of a project with minimizing environmental impacts. Documents are prepared for both the public and technical reviews, focusing on key transportation issues and the potential effects of the alternative strategies being considered. Some of the information is preliminary and oftentimes is not finalized until the environmental permit preparation phase near the end of the project design process.

Environmental documents are prepared and processed to satisfy federal and state requirements. Topics that may be included within an environmental document are:

- project summary and description;
- project purpose and need;
- alternatives considered;
- affected environment and environmental consequences;
- list of agencies, organizations, and persons to whom copies of the document are sent; and
- public involvement, comments, and coordination.

Projects receiving federal funding must follow the environmental documentation requirements specified in the National Environmental Policy Act (NEPA), while state funded-only projects are obligated to follow the requirements contained in the Connecticut Environmental Policy Act (CEPA).

At this stage, a public meeting is held to begin to more fully discuss project design, including discussion about either an Environmental Impact Study (federal) or Environmental Impact Evaluation (state), if necessary, and potential rights-of-way (ROW) considerations. If ROW issues are discussed at the meeting, no final decisions are made at this point, and additional work to verify property ownership and conduct title searches is done later in the design process. The process provides the public with an opportunity to comment before the project design is approved.

National Environmental Policy Act. Requirements specified in the National Environmental Policy Act are intended to determine the level of potential environmental impact of proposed transportation projects and allow for public input into the project development process. The NEPA process consists of an evaluation of the environmental effects of initiatives (e.g., transportation projects) involving federal funding, including identifying alternatives to such initiatives. Appendix E provides a diagram of the NEPA process.

For projects involving federal funding, the DOT Office of Environmental Planning determines the type of documentation required for the environmental component of the project. Three levels of environmental impact determine what environmental documentation must be prepared under NEPA:

- 1) ***Categorical Exclusion (CE)*** – any project/actions determined not to have a significant impact on the quality of the human environment, resulting in neither an environmental assessment or an environmental impact statement;
- 2) ***Environmental Assessment (EA)*** – a decision-making tool when a project is not considered a “categorical exclusion” yet the significance of the environmental impacts of the project are not fully understood, possibly warranting additional study and analysis; determines whether sufficient evidence exists requiring the agency to prepare an environmental impact statement or if a finding of no significant impact (FONSI) is appropriate; and
- 3) ***Environmental Impact Statement (EIS)*** – a detailed evaluation of the environmental impacts in comparison to the Environmental Assessment.

Federal regulations detail the process for developing an Environmental Impact Statement. The key steps of the process are:

- ***Scoping:*** Initial meetings are held among stakeholders to discuss various factors of the project, including existing laws, project information, and any research needed.
- ***Notice:*** Public notice is made that the agency is preparing an EIS. Information about the project and how the public can become involved in the process must be provided.
- ***Draft EIS:*** A draft EIS is prepared, providing a full description of the affected environment, a reasonable range of alternatives, and an analysis of the impacts of each alternative.

- **Comment:** Additional public input is received through written comments and public hearing statements.
- **Final EIS and Proposed Action:** A final EIS is drafted along with the agency's proposed action. The document is made public, and additional comments may be received within a 30-day period.
- **Record of Decision:** Once any outstanding issues are resolved, the agency prepares a Record of Decision, which details the agency's final decision regarding the environmental impact of the project. If members of the public are still dissatisfied with the outcome, they may sue the agency in Federal court. (A supplemental EIS may be prepared if new environmental impacts are discovered requiring re-evaluation of the proposed action in the final EIS.)

Depending on the type of project, the Federal Highway Administration, Federal Transit Administration, or Federal Aviation Administration makes the decision regarding environmental impact and level of environmental documentation necessary. If an EIS is required, each of those agencies has final approval authority based on the type of project.

Connecticut Environmental Policy Act. The requirements under the Connecticut Environmental Policy Act and the National Environmental Policy Act are similar. CEPA, like NEPA, establishes a process to ensure state agencies, such as DOT, consider environmental factors when proposing *state funded* projects that could significantly impact the environment.

CEPA requires state agencies proposing projects (e.g., DOT) to adopt an "environmental classification document" (ECD). The ECD is a tool used to help determine whether an environmental study is needed and, if so, the type of study necessary for a proposed project. The Office of Policy and Management must approve all ECDs, which document:

- typical agency actions that may have significant impacts and will thus require Environmental Impact Evaluations (EIEs);
- joint federal/state actions for which environmental impact statements are prepared pursuant to the National Environmental Policy Act; and
- typical agency actions whose degree of impact is indeterminate, which may require EIEs but will at least require a Finding of No Significant Impact (FONSI).

Similar to NEPA, after the concept of a transportation project is made available, DOT must hold a public scoping meeting to receive feedback about the proposed project. Details of the proposed action are presented at the meeting, including a description of the project, its purpose and need, potential sites, and any potential alternatives to the project. If the scoping process determines the project could result in significant environmental impact, DOT must develop an Environmental Impact Evaluation (EIE). The EIE is a detailed report describing the project, any major environmental impact the project may pose, comments received during the

scoping meeting, additional comments received, and measures aimed at mitigating any negative environmental impact.⁴

The EIE is submitted to the public and other state agencies (e.g., Department of Environmental Protection and the Office of Policy and Management) for inspection and comment. DOT is required to hold a public hearing on the EIE if a certain number of people request such a hearing. Upon conclusion of the public comment period, the transportation department reviews any pertinent information received. Responses to any substantive issues raised must be prepared by the agency. A public record of decision is also prepared. The record of decision is to consider the findings of the EIE process and outline whether the agency intends to proceed with the project and/or make any changes to the project to avoid or minimize negative environmental impact.

The EIE record of decision is sent to the Office of Policy and Management for evaluation. Upon review and evaluation of the EIE, OPM prepares a written statement as to whether the EIE complies with applicable state law. The statement is sent to DOT and made available to the public. The agency must consider all feedback received during the process and decide whether to proceed with the proposed project. Environmental impact evaluations are not required for projects for which such statements have previously been prepared according to state or federal law.

Preliminary Design

Summary

- More fully analyze preliminary engineering studies, including hydraulics, intersection capacity, alignment, lane arrangement, drainage design, and sedimentation/erosion control
- Request rights-of-way preliminary cost estimate for affected properties and/or acreage
- Develop preliminary project cost estimate
- Develop preliminary design statement, including rights-of-way requirements, for review by DOT

Following the Preliminary Engineering phase, transportation projects move into the Preliminary Design phase. A more formal analysis is undertaken of existing structures and intersection and traffic patterns. Initial contact with utility companies is also made.

For a new alignment project (i.e., new road), the design engineer will develop a “scaled graphical baselines” document for the project. The baselines reflect the project description and applicable design standards. Some of the items considered when establishing the baselines include: protected resources (e.g., historic, archeological, water supply resources, and species); existing and proposed utilities; other proposed state/town projects; locally sensitive areas;

⁴ If the project is only funded with state money, criteria set forth in the department’s Environmental Classification Document (ECD) will determine whether or not a state Environmental Impact Evaluation is required under CEPA. For projects funded with both federal and state funds, a single environmental document (e.g., EIS/EIE or EA/EIE) is prepared that addresses both NEPA and CEPA requirements.

zoning/future development; open space; wetlands and floodplains; and property impacts (including commercial usage such as parking and access).⁵

The department/consultant engineer also holds meetings with the municipalities potentially affected by the proposed transportation project. Conceptual project plans are presented to the municipalities, which may give feedback, including any concerns with the proposed project.

Additional technical studies are conducted by the design engineer, as necessary, such as the type and location of any substructure or superstructure elements associated with a project. Sufficient pilot borings and other subsurface investigations necessary to develop a satisfactory design may also be obtained; if required, a detailed soils program is addressed.

The design engineer will also start addressing anticipated work zone safety concerns as part of the Preliminary Design effort. If the project is determined to have significant concerns, the design engineer, in consultation with DOT project engineers, will develop a preliminary Transportation Management Plan. The plan is to include temporary traffic control plans (e.g., staging, and maintenance and protection of traffic plans), a transportation operations plan, and a public outreach/involvement plan.

Meetings between DOT and the consultant engineer occur throughout the Preliminary Design phase to discuss the project design, with the goal of identifying a selected course of action. As the project design becomes more finalized, the design engineer will submit to DOT various documents at the end of the Preliminary Design phase. Prints of all plans are submitted along with a Preliminary Design Statement. The design engineer, through the project engineer, must also meet with a DEP fish biologist to review all streams and determine which crossings and channels will be designed for fish passage. This meeting will be held prior to the Preliminary Design Statement submission.

The Preliminary Design Statement includes a summary of studies undertaken, relevant sketches, the advantages/disadvantages of various alternatives considered, the narrative of the transportation management plan, and a preliminary estimate of construction costs. This estimate is the first attempt to detail such costs and becomes the benchmark upon which future project cost measurements will be based.

After the Preliminary Design Statement is assessed by the department, a meeting is held with the design engineer to review the project design to date. The preliminary design phase culminates with state and/or federal approval of the selected course of action, and then the final design phase begins. At the conclusion of the Preliminary Design phase, the overall project design is roughly 35 percent complete.

Public involvement. Each transportation project requires public outreach at various levels of planning and design. Outreach includes public informational meetings, public hearings,

⁵ DOT Consultant Administration and Project Development Manual, September 2008, p.22.

receiving comments outside of the public hearing process including those from affected stakeholders, and making transportation documents available to the public.⁶

Once the project design is roughly 30 percent complete, a public informational meeting on the proposed project occurs (in addition to a public hearing required under NEPA or CEPA). Although the project is not fully designed at this stage, the department views the elements of project design completed at that time provide enough information for the public to gain a general understanding of the project.

The purpose of the informational meeting is to provide the public with general information about the project and for DOT to receive feedback about the project. An explanation of the project is provided at the meeting, including: project purpose, need, and consistency with federal/state goals and objectives; local urban planning; major design features of the project and alternatives; the social, economic, and environmental impacts of the project; and the department's procedures for receiving oral and written comments from the public. A presentation on the rights-of-way process is made at the public information meetings, although there is typically no formal discussion with potentially affected property owners about ROW issues until later in the design process.

Feedback from the public is analyzed by the department and design engineer, and used to make design adjustments to the project, if considered prudent and feasible. The intent is to help ensure any concerns among the public are addressed before the project design becomes finalized. Federal regulation requires DOT to hold at least one public hearing for any project receiving federal funds, if the project: 1) requires significant amounts of right-of-way; 2) substantially changes the layout or functions of connecting roadways or of the facility being improved; 3) has a substantial adverse impact on abutting property; 4) has a significant social, economic, environmental, or other effect; or 5) requires a hearing after the Federal Highway Administration determines a public hearing is in the public interest.⁷

Context Sensitive Solutions. Context Sensitive Solutions (CSS) is a practice that considers the total context within which transportation project decisions are made. CSS is a requirement of SAFETEA-LU⁸ and an approach DOT supports; Connecticut was a pilot state developing it. Some of the key components of CSS are: 1) a collaborative, interdisciplinary approach to project planning, design, and implementation; 2) involvement of all stakeholders; 3) the final project preserves scenic, aesthetic, historic, and environmental resources; and 4) the project maintains public safety and mobility.

The department has noted to committee staff it recognizes the importance of involving the various stakeholders affected by transportation projects in the project planning, designing, and implementation processes. The department further notes that public and stakeholder buy-in from project onset helps create much more effective projects than simply implementing a top-down approach.

⁶ DOT has developed a "Public Involvement Manual" outlining policies and procedures it must follow.

⁷ 23 CFR 771.111(h)(2)(iii)

⁸ SAFETEA-LU is the acronym for the current primary federal transportation funding legislation. It stands for Safe, Accountable, Flexible, Efficient Transportation Equity Act- Legacy for Users.

Final Design

Summary

- Approve semi-final design plan
- Finalize various plans, such as drainage, hydraulics, floodways, erosion control; for vertical construction plans, include architectural, civil mechanical and electrical systems
- Coordinate with utilities
- Obtain necessary environmental permits
- Acquire rights-of-way
- Authorize consultant to proceed with final design
- Developed finalized project cost estimate
- Submit final approved design plans, specifications, and estimate documents to contracts unit

Upon DOT approval of the preliminary design, transportation projects move into the final design phase. Within this phase, projects move through semi-final design and then final design. At the conclusion of semi-final design, transportation projects are roughly 60 percent designed. With the approval of final design plans, project design is considered 90 percent complete.

The semi-final design phase contains multiple components, including: utility coordination meetings and plans; subsurface exploration analysis; scour analysis; hydraulic analysis; soils and foundation analysis; floodway/floodplain analysis; and value engineering.⁹ Throughout the design process and culminating in the final design plan, project design engineers are continuing to conduct surveys and refine plans for various project facets, such as topography, elevations, drainage, property lines, and utilities. This work culminates during the final design phase.

Although multiple design events, reports, and analyses occur during the final design phase, two central events are required: 1) obtaining any necessary environmental permits, and 2) acquiring any necessary rights-of-way. Each of these steps involves interaction and coordination between DOT and outside entities. Discussions between DOT and state and/or federal environmental agencies must occur during the environmental permitting process, while interaction between DOT and property owners occurs if property acquisition is required.

In the final design phase, the design engineer prepares and submits for review by DOT (and the applicable federal agency) a design statement consisting of a proposed final design plan. The statement is a written narrative of the details of the project design, including public utilities affected, reimbursable funds, and environmental permit information. Upon federal and state

⁹ A *scour analysis* is a review of the erosion or removal of stream bed or bank material from bridge foundations due to flowing water. *Value Engineering* is a federal requirement (23 CFR Part 627) that states must follow for federal-aid highway projects on the National Highway System estimated at \$25 million or more, and for bridge projects estimated at \$20 million or more. It is a systematic process of project review and analysis conducted during project design using a multi-discipline team approach not associated with the project. The purpose of the review is to provide the needed function safely, reliably, and at the lowest cost possible, including improving project value and reducing project completion time.

approval of all plans, specifications, and estimates associated with the project design, the relevant documents are forwarded to the department's contracts unit for processing.

PHASE II: CONSTRUCTION CONTRACTOR BID AND AWARD PROCESS

Once a transportation project is designed, and has received the appropriate federal authorization (when applicable), and funding is available to begin implementation of the project, the project is then advertized for bids. The state uses a prescribed competitive process to bid and award construction contracts to the lowest responsible bidders. The department's Bureau of Finance and Administration coordinates the bidding and award processes.

Contractor Prequalification

Summary

- Construction contractors must be prequalified by DOT to bid on projects
- Contractors apply for prequalification under specific work classifications
- Prequalification is based on several factors, including a contractor's previous experience for a particular type of classification, work performance, and financial capacity requirements

Construction contractors must be prequalified by DOT before bidding on projects and receiving contracts. The department has an established process whereby contractors submit qualification information for review by DOT prior to bidding on any contract. Prequalifying contractors through formal review and evaluation prior to the bidding process helps ensure the department has an adequate supply of qualified, responsible contractors when transportation projects are advertised for bid. Process efficiency is gained by prequalifying contractors rather than taking time to screen contractors after project bids are received.

Prospective contractors are required to submit specific types of information to DOT as part of the prequalification process. The information, submitted on a prescribed form, primarily gives the department a summary of a contractor's previous construction experience and financial condition. Contractors are also required to provide information about organization, plant and equipment, financial interests of the company and its individual principal employees, and a statement describing any type of adverse circumstances (i.e., legal issues, criminal convictions, and/or previous inability to act responsibly as low bidder).

The prequalification process also allows DOT to determine the specific type of work a contractor is qualified to perform. Detailed information must be presented as to the contractor's previous relevant experience in performing the specific classification of work for which the contractor is seeking prequalification. Information about the adequacy of the contractor's plant and equipment also is required. Examples of contractor classifications include road construction, bridge construction, demolition, and supply of transportation-related materials.

Contractors classified for a particular type of work may be limited by the department to bid only on projects up to a certain value. DOT determines limits on contractors based on the

complexity and value of projects a contractor previously performed, along with any other factors deemed relevant by the department, including financial capacity. The department establishes a contractor's maximum bidding capacity using information supplied by the contractor's bonding company.¹⁰ The information identifies the maximum value of construction work the applicant is capable of performing as determined by the bonding company. In addition, DOT may reduce or revoke a prequalified contractor's maximum bidding limit based on the overall performance record of the contractor, including quality and timeliness of work.

Once a contractor's prequalification application is reviewed by DOT, and a classification and bidding level are established, a contractor is considered prequalified for 16 months beginning with the close-of-business date for the contractor's most recent fiscal year. Contractors applying for renewed prequalification must submit the required information at least 30 days prior to the expiration of their current prequalification period. DOT may grant extensions at its discretion based on the reasons for the extension submitted by the contractor.

Any contractor's prequalification information deemed false, deceptive, or fraudulent by DOT may be rejected. If this happens, contractors are classified as nonresponsible and disqualified from bidding on any transportation projects for up to two years at the discretion of DOT.

Bid Solicitation and Opening

Summary

- Bid solicitations for construction projects are advertised upon approval of project design, federal authorization (when applicable), and funding availability
- Bids must be received using standardized format established by DOT
- Specific checks and balances exist in bidding process to ensure integrity of process

Bid solicitations for construction projects are advertised upon approval of project design and confirmation of available funding. Any necessary federal approval is also obtained before DOT puts a project to bid. Once a project is advertised, interested contractors request a bid proposal form from the department on a specific request form, which must include information about the contractor.¹¹ The bid proposal form includes bid opening information, as well as project location, a brief description of the work to be performed, and materials required. DOT also makes design plans and specifications available to interested parties for a fee. Contract specifications, addenda, and postponement notices also are available and maintained on the state contracting portal.

In cases where response to a bidder's question after projects have been advertised may provide information not available in public documents, DOT will issue a notice or addendum to

¹⁰ Bond companies must appear on the U.S. Department of Treasury's listing of certified companies approved to issue bonds for transportation construction projects.

¹¹ Bid proposal forms are not transferable; the contractor making the initial request for a bid proposal form must be the contractor that actually submits the bid. Sanctions exist when this policy is not followed.

all bidders clarifying or resolving any related issue. Addenda to bids may also be made if an error is found in any of the bid documents, including the design plans. Bidders are required to notify DOT within two business days of finding any error. Further, by signing a bid, contractors are attesting to certain conditions (e.g., no pending legal actions or not excluded from bidding on other state or federal contracts.)

Bid Review, Award, and Post-Bid

Summary

- All opened bids checked for responsiveness
- Bidders must attest to non-collusion
- No proposal accepted without appropriate surety bond equal to one-third amount of bid
- Projects may be withdrawn

After bids are opened, proposals are reviewed for “responsiveness” to determine if the bids comply with all applicable requirements. Each bidder must at least include in its bid the following information: 1) completed bid proposal; 2) required bid bond for specific project (or annual bid bond where contractor may be low bidder for DOT projects awarded during the year covered by the bond); 3) a non-collusion affidavit; and 4) any other information deemed necessary by DOT. DOT reserves the right to reject bids, advertise for new bids, or cancel an award or contract execution prior to the contractor proceeding with the work. Bids with errors, including missing relevant information, may be rejected.

DOT may decide to withdraw a project prior to issuing an award with no plans for re-advertising the project. Reasons for withdrawing a project include: loss of funding; failure to obtain any necessary permits prior to project bids or awards; mistakes in bid quantities; errors in project design; pre-bid, pre-award design changes significantly changing the project; or failure to receive a bid price within available funding limits.

PHASE III: CONSTRUCTION

Summary

- Pre-construction meeting with key project construction personnel
- Daily project monitoring occurs on-site
- Construction materials tested
- Change orders reviewed
- Project closed out

The final phase of the transportation project delivery process is construction. The contractor selected through the bidding process begins work on the project once the “notice to proceed” has been given. Until that time, contractors are not permitted to begin work on the project and are liable if such work does begin.

The transportation department's process for administering its construction contracts is outlined in Figure I-6. The process begins when a construction contract is advertised. Once the contract is awarded, the DOT engineering and construction bureau's construction office assumes responsibility for seeing the project is completed on time, within budget, and in compliance with all contract provisions.

Contract Award

As Figure I-6 shows, many aspects of the DOT contract management process are automated. As soon as a construction contract is awarded, it is added to the department's computerized Site Manager system. The Site Manager system is the agency's primary tool for managing its construction contracts. It tracks payment, testing, contractor, and subcontractor information for all active projects. Detailed information is maintained for both tasks and materials, in terms of quantity, unit price, and total cost. Itemized accounts of any contract changes occurring during construction, such as new or additional work, decreased quantities or detailed tasks, and time extensions, are also maintained. Information is updated daily and available on-line to agency managers and staff. The Site Manager system is also linked to the department's automated financial management system (CORE-CT).¹²

Preconstruction Meeting

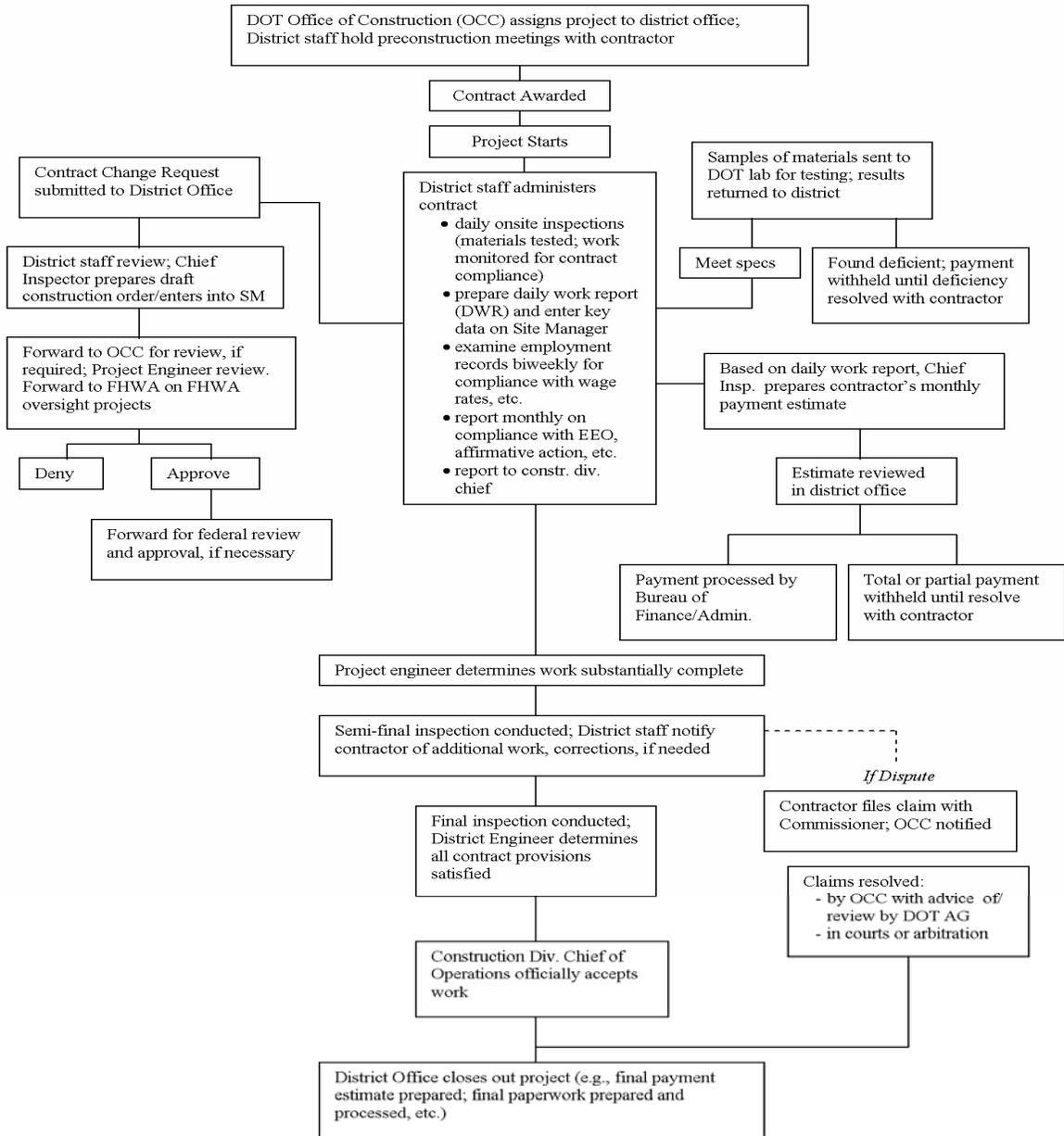
Soon after a contract is awarded, a preconstruction meeting attended by the contractor's representatives, DOT district personnel who will oversee the project and other key department staff, local officials, and representatives from affected utility companies, is held to discuss, among other matters, inspection procedures and general contract management issues. Department staff also holds a separate conference to go over equal employment opportunity and affirmative action issues with contractors before construction starts.

On-Site Monitoring

Once work begins, district office staff monitors each project in its entirety on a daily basis. A chief inspector, working under the direction of a project engineer, is assigned to each project and carries out all daily construction administration functions, such as ensuring work is in conformance with contract plans and specifications, materials testing, reporting on work status, initially reviewing requests for contract changes, and meeting with the contractor to discuss progress as well as problems. The project engineer provides technical assistance when needed, interpreting plans or specifications if a dispute arises, and oversees inspection records for accuracy and completeness, attends progress meetings, and reviews and recommends approval of construction orders and progress payments.

¹² Core-CT is the state's central financial and administrative computer system. The system encompasses central and agency accounting functions (e.g., purchasing, accounts payable, accounts receivable, billing, assets, inventory, project costing and customer contracts) and human resource function (e.g., payroll, time and labor, human resources, and benefits). DOT began using CORE in 2008 for financial management purposes.

Figure I-6. DOT Construction Contract Management Process



Detailed construction engineering and inspection work at the job site may be carried out by DOT employees or, for some projects, contracted out to private engineering firms. In either case, a DOT project engineer oversees the project and all staff, whether state or consultant employees, with the intent to ensure all construction and related engineering is performed in accordance with department policies and procedures.

On-site DOT inspection staff prepares daily work reports and enters key work progress data for the project on the department's Site Manager system. The inspection report provides an itemized listing, by type, quantity, and unit price, of all work tasks performed on a particular workday, as well as information about site conditions, and the contractor's performance. Minority and disadvantaged firms' participation through set-aside or goal programs is also recorded during daily inspection. The daily work report, which is subject to review and approval by the DOT district chief inspector or project engineer, is the basis for the monthly, or in some cases bimonthly, payments made to the contractor.

Using the daily work reports, the district chief inspector prepares the periodic payment estimates, which are reviewed by the project engineer, the supervising engineer, and the assistant district engineer for accuracy and completeness before being forwarded to the department's accounts payable staff for processing. In addition, available project funds are regularly monitored to ensure additional funds are obtained in a timely manner, if necessary.

District inspectors periodically review contractor biweekly employment records to check for compliance with various wage, hour, affirmative action, and preferential hiring requirements. The district staff also monitors and reports periodically on contractor progress toward achieving set-aside program goals. As specified points in a project, district staff prepares reports for the Construction Office on the contractor's affirmative action accomplishments.

Materials Testing

Materials provided by construction contractors are tested for compliance with specifications at the department's laboratory. A prescribed schedule of minimum testing requirements applies to all projects although the frequency and scope of materials testing varies, depending on the type of materials involved and any special issues that may arise. The district chief inspector is responsible for ensuring adequate and sufficient testing occurs on all projects.

District inspectors forward samples of all testable items to the lab for testing. Testing requests are entered and results are received on-line through the Site Manager system. If items are found deficient, district staff seeks corrective action and, if necessary, can withhold payment until compliance is achieved through supplying adequate materials.

Time Extensions and Construction Orders

Requests from contractors for time extensions or changes to contract items are handled initially by district staff. Any change to a contract, whether to increase or decrease work or materials, add new work, or extend the project schedule, is processed by the department as a construction change order. Authorized construction orders are officially incorporated into a project's contract document and enforced like the original provisions.

By department policy, only changes deemed essential to the successful completion of a project should be authorized. After determining a proposed change is essential and not covered by existing contract provisions, district staff can initiate a construction order by completing the required information on the Site Manager system. The chief inspector prepares the final draft of the construction change order, which is subject to review and approval by the project engineer

and supervisory engineering personnel in the district office. In some instances, construction orders need approval by the Office of Construction.

A contractor is given an opportunity to review and comment on the draft construction order before final processing. If a project receives federal funding, review and approval by the appropriate federal agency may also be required before a construction change order can be executed. In addition, if it appears a proposed change will require design revisions, the construction staff will ask the engineering office of the department's Engineering and Construction bureau to review it.

When the project engineer determines a project is substantially complete, the assistant district engineer will be notified and a semifinal inspection will be scheduled. The inspecting party, which generally consists of the district construction staff, contractor, staff from other DOT units (e.g., traffic or maintenance), and federal officials for federal projects, review all work details to determine if all contract obligations have been fulfilled. The contractor is notified in writing of inspection findings, unsatisfactory work items (if any), and expected corrections. A contract is not considered complete until all items noted in the inspection reports are finished to the satisfaction of department staff.

When the contractor notifies the district office all corrective work is completed, a completion notice is prepared and sent to the Office of Construction. A final inspection by the district engineer is conducted to determine whether the project has been satisfactorily completed; if so, a written certification of completion is issued to the contractor.

Following a final inspection, the district engineer prepares the necessary paperwork to officially accept the work and project, and forwards the information to the Office of Construction's Construction Division Chief for approval. The district engineer must also close out the contract, including processing the final payment estimates. Final payments are adjusted to include: 1) any incentive payment a contractor may have earned for completing a project ahead of schedule; or 2) liquidated damages the contractor may owe the state for failing to meet a project's completion deadline.

The department will not completely close out a contract if litigation related to the project is pending or outstanding disputes remain. Disputes with contractors over contract provisions are initially handled at the district office level. Matters not settled informally by district staff, or formal claims, are forwarded to the Office of Construction for evaluation and potential resolution. When notified of a formal claim, the office will consult with the assistant attorney general assigned to DOT, and then direct the district on how to proceed with the contractor. By law, contractor claims can be pursued in the courts or through arbitration.

II: RBA Framework

DOT PROJECT DELIVERY: RBA FRAMEWORK AND POPULATION RESULTS

In essence, Results-Based Accountability is a way of evaluating the efficiency and effectiveness of state programs, agencies, or systems within a larger context of the broad quality of life goals they are intended to help achieve. Under the RBA approach, an accountability framework can be developed that outlines:

- desired *quality of life results*, in the form of a positive statement about population-level outcomes, to which the program, agency, or system under review is intended to make a major contribution;
- key population-level *indicators* for tracking statewide progress toward those results;
- the main public *strategies* for achieving them;
- the *partners*, public and private, with significant roles in implementing those strategies;
- the *major programs* and activities undertaken to carry out those roles; and
- core *performance measures* for assessing program-level outcomes for customers/clients directly served.

Once an RBA framework is developed, it can be used to guide data collection and analysis at both the population and program levels of accountability. The information gathered serves two essential purposes. The first is to help in understanding the “story behind the data,” or the reasons for current outcomes and what the trends will be if nothing changes. The second purpose is to determine what actions can be taken, particularly any low or no cost changes, to “turn the curve,” or improve end results for customers, and for the target population overall, in measurable ways.

Accountability Framework for DOT Project Delivery

The RBA framework for DOT project delivery prepared for this committee study is presented in Figure II-1. In accordance with the study scope, this accountability framework focuses on state transportation system improvement implementation, the phases of the process from formal design through completion. The planning and prioritizing phase of DOT capital projects, while crucial to successful delivery, is not reflected directly in the framework or the committee’s related analysis.

The committee’s one-page framework was developed with assistance from DOT policy and planning bureau staff. It is based primarily on a literature review of model transportation agency policies and practices and discussions with various state and federal transportation agency staff and stakeholder groups. Acronyms used in this accountability framework are listed in a table that follows Figure II-1.

FIGURE II-1. RESULTS-BASED ACCOUNTABILITY FRAMEWORK: DOT PROJECT DELIVERY

POPULATION LEVEL ACCOUNTABILITY					
QUALITY OF LIFE RESULTS STATEMENT:					
<i>“Connecticut’s transportation system is maintained in a state of good repair and allows for safe, efficient movement of people and goods, livable communities, and sustainable growth.”</i>					
RESULTS STATEMENT INDICATORS OF PROGRESS (POPULATION LEVEL)					
Indicator 1: Safety <i>Highway Fatality Rate</i>	Indicator 2: Efficiency <i>Road Congestion</i>	Indicator 3: Good State of Repair <i>Infrastructure Condition</i>	Indicator 4: Environmental Quality <i>Reduced Air Pollution</i>	Indicator 5 Economic Vitality <i>Jobs Created</i>	
PARTNERS CONTRIBUTING TO RESULTS STATEMENT					
Connecticut General Assembly Congress Other States in Region RPOs and Municipalities (Local Officials) Transit Operators Advisory Groups (TSB, BBD, BICAB, SIMTF, CPTC, CRCC, CMC)		Governor State Agencies: DOT; DAS; DEP; DECD; DMV; DPS; OPM; SHPO Federal Agencies: US ACE; US DOT (FAA, FHWA, FRA, FTA, NHTSA); US EPA; US FWA Agency Employees (and Unions)		Construction Industry Design/Engineering Industry Business Community Airlines and Rail Providers Freight Providers and Users Port Operators and Users Traveling Public	
MAIN STATE STRATEGIES FOR ACHIEVING RESULTS STATEMENT					
Establish and Enforce Safety Standards	Preserve Existing Infrastructure & Capacity	Maximize Operating Efficiency	Reduce Congestion/ Increase Choices & Connections	Follow Sustainable Practices & Increase Livability	Promote Public Participation & Accountability
AGENCY AND PROGRAM LEVEL ACCOUNTABILITY					
DOT’S CONTRIBUTION TO RESULTS STATEMENT: MAIN ROLES AND RELATED MAJOR PROGRAMS					
Reduce injuries, fatalities, safety risks	Plan and manage resources to meet public needs, achieve goals	Implement system preservation/capacity improvement programs (all modes)	Operate or oversee facilities/services that move people and goods	Ensure public accountability and transparency	
<ul style="list-style-type: none"> - National design standards for highways, bridges, rail, airport safety - Injury/fatality data & research to inform safety efforts - Eliminate hazards, snow and ice removal - Airport & port security - Various targeted efforts such as: <ul style="list-style-type: none"> o work zone safety o seat belt use o impaired/distracted driving o rail crossings o motorcycle safety o local enforcement support 	<ul style="list-style-type: none"> - Inventory, track, evaluate system conditions - Master/long-range plans, STIP, SIP, other statewide planning efforts - Context Sensitive Solution practices - Environmental assessments, mitigations/ accommodations - Asset management/life cycle costing - Constrained capital planning (5-yr. capital plan) 	<ul style="list-style-type: none"> - Inspect current infrastructure - Conduct preventative maintenance, routine repairs (e.g., paving, upgrades) - Deliver capital improvements (e.g., major rehabilitation, renewal, new or expanded capacity) <ul style="list-style-type: none"> o Design/preliminary engineering o Construction administration project management - Hire outside resources for as needed (vendors, contractors, design/other consultants) - Acquire property, equipment - Research/test materials, equipment, techniques 	<ul style="list-style-type: none"> - State and municipal airports - Ports/ferries - Rail system - Bus system - Taxi services - Ridesharing program - Bikeways/walkways - Highway/bridge operations (e.g., snow/ice removal, mowing, signs, motorist assistance) 	<ul style="list-style-type: none"> - Agencywide quality assurance/control (QA/QC) efforts - Communication and outreach <ul style="list-style-type: none"> o Public participation process o Stakeholders meetings - Publications (plans, reports, website) - Information technology - Centralized business processes (e.g., contracting, budgeting, funding, accounting, and fiscal reporting) 	
PROGRAM LEVEL PERFORMANCE MEASURES: DOT PROJECT DELIVERY IMPLEMENTATION (from initiation of design through completion of capital improvements)					
<ul style="list-style-type: none"> ● On schedule ● In compliance with relevant standards and requirements (e.g., work quality, environmental, financial) 			<ul style="list-style-type: none"> ● On budget ● Intended project benefits achieved (e.g., improved safety, increased mobility, reduced pollution, sustainable growth) 		

Acronyms Used in Figure II-1. DOT Project Delivery RBA Framework	
<i>State Agencies</i>	
• DAS	Dept. of Administrative Services
• DEP	Dept. of Environmental Protection
• DECD	Dept. of Economic and Community Development
• DMV	Dept. of Motor Vehicles
• DPS	Dept. of Public Safety
• OPM	Office of Policy and Management
• SHPO	State Historic Preservation Office
<i>Federal Agencies</i>	
• FAA	Federal Aviation Administration
• FHWA	Federal Highway Administration
• FRA	Federal Rail Administration
• FTA	Federal Transit Administration
• NHTSA	National Highway Traffic Safety Administration
• U.S. ACE	U.S. Army Corps of Engineers
• U.S. EPA	U.S. Environmental Protection Agency
• U.S. FWA	U.S. Fish and Wildlife Administration
<i>Advisory Groups</i>	
• TSB	Transportation Strategy Board
• BBD	Bradley (International Airport) Board of Directors
• BICAB	Bradley International Community Advisory Board
• SIMFT	Statewide Incident Management Task Force
• CPTC	Connecticut Public Transportation Commission
• CRCC	Connecticut Rail Commuter Council
• CMC	Connecticut Maritime Commission
<i>Other</i>	
• RPOs	Regional Planning Organizations

Overall, the committee’s accountability framework for DOT project delivery: clearly articulates the desired population-level results statement to which effective delivery of transportation capital improvements contributes; establishes key indicators for tracking progress all major partners, including the state transportation department, together are making the toward those results; highlights the roles and related major programs undertaken by DOT to achieve the state transportation goals; and identifies core measures for the agency’s project delivery implementation performance.

Further refinement of the framework, particularly more and better indicator and performance measure data, is needed. However, the program review committee believes the current version can serve as a starting place for guiding better performance management at DOT and more data-driven policy and resource allocation decisions at the legislature. The main elements of the PRI accountability framework in Figure II-1 are described briefly below.

Quality of Life Results Statement. For the purposes of this RBA study, the program review committee adopted the following statement about desired quality of life results: “*Connecticut’s transportation system is maintained in a state of good repair and allows for safe,*

efficient movement of people and goods, livable communities, and sustainable growth.” The statement, shown at the top of Figure II-1, is based on the current DOT mission as outlined in: the agency’s enabling legislation; recent state and federal transportation planning documents; and conversations program review staff had with various state transportation system stakeholders.

Key Indicators of Progress. Under the RBA approach, indicators that capture critical, measurable aspects of desired population-level outcomes are developed to track progress toward state goals. Three to five key indicators, sometimes called “headline” indicators, should be used to monitor and report on areas of primary importance. They can be supplemented with any number of relevant secondary indicators for measuring how the state is doing in achieving a results statement.

As Figure II-1 illustrates, the results statement for this study encompasses five complex outcome areas related to the state transportation system:

- safety;
- efficiency;
- good state of repair;
- environmental quality; and
- economic vitality.

PRI staff worked with DOT staff and other stakeholders to define and find adequate measures for the five key indicator areas shown in Figure II-1. Brief descriptions of each indicator, along with a summary of available trend data in a report card format, are provided later in this chapter.

Partners. DOT has a central role in achieving the results statement developed for this study. However, as Figure II-1 shows, it is only one of many partners that contribute to a safe, efficient, and effective intermodal transportation network in Connecticut. The various state and federal agencies and organizations, as well as municipal and regional entities and private sector groups, that share accountability for progress toward the results statement are listed upper half of the figure (under the heading *Partners Contributing to Results Statement*). Among DOT’s public partners with significant roles in transportation project delivery are:

Federal Highway Administration (FHWA): the agency within the U.S. Department of Transportation (U.S. DOT) that provides federal financial resources and technical assistance to state and local governments for constructing, preserving, and improving the National Highway System, and for urban and rural roads that are not part of the highway system but are eligible for federal aid.

Federal Transit Administration (FTA): the U.S. DOT agency that administers federal funding to support a variety of locally planned, constructed, and operated public transportation systems throughout the nation, including buses, subways, light rail, commuter rail, streetcars, monorail, passenger ferry boats, inclined railways, and people movers.

Federal Rail Administration (FRA): the modal administration of the U.S. transportation department responsible for promulgating and enforcing national rail safety regulations, administering railroad assistance programs, and consolidating federal government support of rail transportation activities.

Federal Aviation Administration (FAA): the U.S. DOT modal administration responsible for the safety of nation's civil aviation system, including developing and operating a national system of air traffic control and navigation, and for ensuring airport sponsors that accept federal grant funds or the transfer of federal property for airport purposes comply with applicable federal laws and FAA rules and policies.

Regional Planning Organizations (RPOs): regional entities in Connecticut responsible for conducting transportation and other types of planning activities for specific geographic areas. Under federal law, depending on their population, RPOS are designated as Metropolitan (over 50,000) or Rural (under 50,000). Metropolitan and Rural Regional Planning Organizations (MPOs and RRPOs, respectively) have different roles and authority in state transportation planning, programming, and project selection processes.

Regional Planning Organizations also are grouped into three federal Transportation Management Areas (TMAs) for Connecticut, again based on population (over 200,000). In addition to consulting with DOT in planning transportation system improvements and selecting projects for federal funding, TMAs must have lead roles on state projects eligible for federal Congestion Mitigation and Air Quality Improvement (CMAQ) funds.

Strategies. In developing the RBA framework for this study, the committee determined state government employs a number of strategies that are intended to help achieve the transportation system results statement. These range from statewide efforts for promoting safe and efficient travel throughout the transportation network to various agency activities aimed at preserving, maximizing, and expanding infrastructure capacity in sustainable and accountable ways. All of the public and private partners identified in Figure II-1 have, to varying degrees, responsibility for some or all of these strategies. Cooperation and coordination among these many entities is required to make progress toward the desired population-level outcomes for the state transportation system.

DOT roles and major programs. The main roles and many programs DOT carries out as the state's multi-modal transportation planning and implementation agency are summarized in the lower part of Figure II-1. Accountability for results at this level rests with agency leadership and department program managers. Performance is measured with information that answers the three main RBA program accountability questions: how much is done; how well it is done; and whether anyone is better off because of these programs and agency efforts.

Project delivery is most directly part of the agency's role in preserving and improving the state transportation system (see the third column in the lower half of the figure under *Agency and Program Level Accountability*). However, efficient and effective implementation of DOT projects is important to the success of many department efforts across its wide range of roles.

Program performance measures. Four key measures of DOT project delivery performance identified for the committee study are highlighted at the bottom of the RBA framework in Figure II-1. Two are generally accepted basic performance measures for any type of building project: on-budget and on-schedule. The committee used national definitions developed for a comparative analysis of state DOT construction cost and schedule data.²⁵ They are:

On-budget – actual reported final cost is equal to or less than the original contract award amount (strict measure) or within 10 percent of that amount (lenient measure)

On-schedule – actual reported completion date or number of working days charged is equal to or less than the originally scheduled completion date or amount of originally authorized working days (strict measure) or (lenient measure) the updated completion date or amount of working days

The two other performance measures listed in the figure address more qualitative ways of assessing effective DOT project delivery. One involves quality assurance and other compliance matters during the construction project delivery process. The other concerns whether it can be determined if a project, once delivered, achieved its intended benefits. Neither has a standard definition.

Data program review committee staff developed for each core measure, along with some additional performance information related to DOT project delivery, are presented in program report card in Chapter III. That chapter also includes committee proposals for increasing the timeliness, compliance, cost-effectiveness, and quality of capital improvements implemented by the department.

Population-Level Results: Performance Report Card

Information for assessing Connecticut's overall progress in achieving its transportation system goals is summarized below in Figure II-2, which is a population-level results performance report card prepared by the PRI committee. In addition to highlighting data trends for key indicators of state progress under the heading "*How Are We Doing*", the figure includes: a short discussion of the main reasons for current levels of performance called the "*Story Behind The Data*." The program review committee's recommendations for improving transportation system outcomes are presented in the last section of the report card entitled "*What Will It Take to Do Better*."

²⁵ *Comparing State DOTs' Construction Project Cost and Schedule Performance: 28 Practices from Nine States*, AASHTO, May 2007.

Indicator definitions. In brief, the working definitions for the five key population accountability indicators used for this study are:

- **Safety: transportation-related fatality/injury rates**
At present, annual rates on a population and a vehicle-miles-traveled basis are readily available for the highway system. Some rail and aviation safety data also are gathered regularly by the department. However, no general indicator of incidents or risk has been developed for all modes by Connecticut DOT or other state or federal transportation agencies.
- **Efficiency: congestion/operating measures (i.e., travel demand compared with system capacity)**

Congestion measures are one common way to examine the operating efficiency of transportation systems. There is no universally accepted definition of congestion for state transportation systems. However, all states report certain data about the capacity and use of their highways to the federal government. The main way road congestion is reported as the ratio of traffic volume during peak travel hours to highway capacity

At present, DOT reports annually on state roadway congestion, calculated as the percent of highway network miles with traffic volumes approaching or above capacity. Other ways of measuring congestion under consideration by the department are travel time, delay, speed, and level of services. Operating efficiency of other modes is tracked by DOT in several additional ways including on-time performance percentages for rail and bus services and for flights at state and municipal airports.

Operating efficiency for individuals and goods also entails accessibility and how well components of the transportation systems connect (intermodality). Use of public transit reflects, to some extent, the mobility options available within transportation network. DOT collects and reviews extensive ridership data from Connecticut's rail and bus systems for state and federal reporting purposes.

The department is working on other indicators for capturing the state's progress on creating an intermodal network. For example, data related to the public's access to various mobility options (e.g., percentages of the Connecticut population with walking distance to rail or bus services and how available options are connected (e.g., bus/rail services link to airports, bike storage is available on trains and buses, parking is provided at train it stations) is being developed.

- **State of good repair: condition of transportation infrastructure (preservation and maintenance of existing facilities and equipment)**

Preserving existing infrastructure is one of the top priorities of state and federal transportation agencies. DOT believes keeping Connecticut's transportation system in a state of good repair is critical to its mission. Progress toward this desired result, however, is difficult to track at present.

Data about the condition and quality of the state's transportation network are available only by mode and just for certain components (e.g., highway pavement condition, structural status of bridges, age of bus fleet, etc.). The department is considering better ways to assess the status of the overall system. In addition, a federal effort to develop a composite index for the health of the nation's transportation infrastructure and services is currently underway.

- **Environmental Quality : air quality impact (transportation-related pollution)**
Measures of the condition of the environment, particularly air quality, often are used to represent overall quality of life for a population. At present, DOT puts together and reviews data on transportation-related air pollution as part of its federal air quality compliance efforts. The agency is working on a performance measure regarding green house gas (GHG) emissions, which is also the basis for pending national environmental quality standards for state transportation departments.

Many federal and state policies now emphasize objectives related to broader aspects of quality of life, such as sustainable and livable communities and better public health. However, indicators and the related data needed to measure these types of results are not well developed and, in most cases, are a matter for further research.

- **Economic Vitality: employment impact (of transportation investments)**
Measures of the economic condition within a state, region, or other area, often focus on employment. The primary indicator used to judge a transportation project's economic impact now is how many jobs is creates or sustains. Data on job creation is gathered by DOT for many of its major highway projects and is required for projects funded with federal stimulus (ARRA) monies.²⁶

²⁶ Jobs related to transportation infrastructure capital improvement often are estimated using a methodology developed by FHWA in 2007 (see: www.fhwa.dot.gov/policy/otps/pubs/impacts/index.htm). The FHWA analysis determined that every \$1 billion invested in highway construction would support approximately 27,800 jobs. The total number represents 9,500 jobs directly in the construction sector, about 4,300 in industries supporting the construction sector, and approximately 14,000 in other sectors of the economy not related to construction. Efforts to update and expand information about the job impact of all types of transportation projects, however, are ongoing. See, for example: Economic Development Research Group (for the American Public Transportation Association), *White Paper: Job Impacts of Spending on Public Transportation: An Update* (April 2009); and Political Economy Research Institute, University of Massachusetts, *Prioritizing Approaches to Economic Development in New England: Skills, Infrastructure, and Tax Incentives* (August 2010).

Transportation projects often produce other important economic benefits related to business growth, increased property values, or more efficient travel times for people and goods. However, the full economic impact of investments in transportation system improvements is difficult to capture, and, at present, the subject of much research.

National indicators. As noted earlier, the primary indicators included in the study's population accountability report card were selected with the assistance of DOT policy and planning bureau staff and input from the agency's top managers. They also correspond to the national performance measures for state transportation agencies that are being developed by the American Association of State Highway and Transportation Officials (AASHTO) in cooperation with the U.S. Department of Transportation

Since 2008, AASHTO has been working to build consensus among its state and federal agency partners on the key elements of an effective national performance measurement program. To date, it has recommended eight national goal areas; the organization's performance measurement work group has proposed a preliminary set of indicators (referred to as "Tier 1" measures) related to five of those areas including: safety; pavement preservation; bridge preservation; congestion/operations; and freight/economic competitiveness.²⁷ Measures for three other goal areas – environment, connectivity, and transit – and two additional tiers of measures for all areas are in development.

Indicator data sources. Connecticut DOT, as part of its existing internal performance measurement system and for national reporting purposes, currently collects and reports data concerning four of the five key indicator areas – safety, efficiency, state of good repair, and economic vitality. At the time of the PRI study, federal decisions about environmental performance standards for state transportation agencies were pending. The department was still considering how best to measure air quality outcomes so no data were available for this report card.

The information included in committee's population performance report card (Figure II-2, below) is based on the agency's quarterly performance reports related to: highway fatality rates (safety); roadway congestion (efficiency); the condition of each major system component -- highways, bridges, rail system, bus system, and airports (state of good repair); and jobs created from certain transportation capital projects (economic vitality). Copies of relevant DOT performance measure reports that were most current at the time of the committee study (October 2010) are provided in Appendix D.

²⁷ For more details, see *State Performance Measure Overview*, AASHTO Standing Committee on Performance Management: <http://highways.transportation.org/Documents/SCOPM%20Performance%20Measures%20Folio.pdf>

Figure II-2. RBA POPULATION PERFORMANCE REPORT CARD

Desired Quality of Life Results Statement:

“Connecticut’s transportation system is maintained in a state of good repair and allows for safe, efficient movement of people and goods, livable communities, and sustainable growth.”

HOW ARE WE DOING?

<i>Key Indicators*</i>	<i>Progress</i>	<i>Most Current Data</i>
1. Safety: People and goods move safely in the state. <i>(Deaths due to highway accidents minimized)</i>	+	<ul style="list-style-type: none"> Annual highway fatality rate in Connecticut consistently below the national average – 0.83 per 100 million vehicle miles traveled (VMT) vs. 1.25 nationwide in 2008 Connecticut’s highway fatality rate under the state target (1.00 or less fatalities per 100 million VMT) every year from 2004 through 2008 Using a three-year moving average, which better reflects changes over time in a small number, Connecticut’s highway fatality rate dropped from 0.93 in 2006 to 0.91 in 2008
2. Efficiency: People and goods move efficiently. <i>(Highway system travel at or below capacity)</i>	↔	<ul style="list-style-type: none"> Congestion on state roads, in terms of the percent of miles approaching or above capacity, remained at about 15% from 2003 to 2009
3. State of Good Repair: The state transportation network is in good repair. <i>(All system components in acceptable condition and reliable)</i>	↔	<ul style="list-style-type: none"> Gradual improvement in the percentage of Connecticut’s national highway system roads (interstates and major state routes) with good ride quality, up from 37% in 2005 to 44% in 2009 <i>(positive)</i> Small decline in percentage of state highway bridges in good condition and slight increase in portion rated poor between 2007 and 2009; given aging infrastructure, number of poor bridges on increase since 1998 <i>(negative)</i> Reliability of state rail service varies with rail vehicle age – three types of vehicles achieving targets for distance between mechanical failures as of 2010 while two types below; reliability dramatically improves with phase-in of fleet replacement program <i>(positive)</i> Reliability of state bus service in terms of miles between road calls declined below target in recent years (FYs 09 and 10) as average age of bus fleet increased <i>(negative)</i> At least 90% of pavement at all state airports rated good or excellent as of January 2010; overall pavement condition goal of 100% good or excellent met at Bradley and three of six general aviation airports <i>(positive)</i>
4. Environmental Quality: The quality of the state environment is protected. <i>(Air pollution from transportation sources reduced)</i>	?	<ul style="list-style-type: none"> Data on greenhouse gas emissions related to the transportation system (in accordance with national methodologies) still in development by DOT
5. Economic Vitality: Economic growth in the state is promoted. <i>(Transportation projects have positive employment impact)</i>	?	<ul style="list-style-type: none"> Only employment data compiled now is total number of jobs created or sustained as the result of transportation projects funded through federal economic stimulus program (ARRA) – totaled 16,158 between June 2009 and July 2010

*Details regarding each key indicator are contained in the DOT quarterly performance measure reports provided in Appendix D.

STORY BEHIND THE DATA

As the above report card summarizes, how well the state is doing in achieving the quality of life results desired for its transportation system is unclear. Connecticut continues to make improvements in the area of safety, at least in terms of highway travel. However, there appears to be little progress in system efficiency, as measured primarily by road congestion. The state of repair of Connecticut's current infrastructure is mixed, varying greatly by component. Trends in environmental quality related to the transportation system, if measured by a reduction in air pollution, cannot be determined at this time. The impact of transportation system investments on the state's economy also is not well-understood.

Existing key indicator data, for the most part, are too limited to draw many conclusions about system wide performance and progress. As discussed above, there are many shortcomings to currently available transportation system indicators and corresponding data sources.

Each primary indicator reflects only selected aspects of results desired from a high quality, efficient, and effective state transportation system. Two of the three indicators for which there are data just relate state highway systems. Further, it is difficult to capture results for a multimodal transportation network because no composite indices exist for any of the indicators. Finally, much of the indicator information is lagging, sometimes by as much as two years.

Despite the many data limitations, the key indicator areas included in the framework represent high-level performance information state transportation agencies currently produce and consistently report for federal funding purposes. They also are the basis for work on national performance standards for state transportation agencies being carried out by the American Association of State Highway and Transportation Officials (AASHTO) in partnership with the U.S. Department of Transportation. The limitations of current indicators are well recognized by AASHTO and the federal government. Research to refine and develop better primary measures is ongoing at the national and state level. There also are plans to develop many second and third tier measures to provide supplemental information about transportation system performance in all areas and at many levels.

The indicators included in the RBA Framework for this study are a good start at establishing high level comparative accountability measures. They are needed to begin to understand the overall outcomes from the significant state resources allocated to achieving the results statement. PRI staff did not develop any estimate of all state funding resources applied to achieving this results statement; however, expenditures just of the Connecticut Department of Transportation since FY 04 have totaled over \$1 billion per year.

It is important to keep in mind that much of what drives the key indicators are influences beyond the control of DOT or any single state agency. Further, while DOT has a leadership role concerning the safety, efficiency, and condition of the state's transportation network, other state agencies have the primary role for matters concerning the environment (Department of Environmental Protection) and economic development (Department of Community and Economic Development).

In recent years, DOT has undertaken a number of management efforts to make better progress toward state transportation system goals. As discussed in more detail in the next

chapter, the department adopted a constrained five-year capital plan last year aimed at taking a more strategic approach to investing state resources for improving all components of the system. Strategies for preserving current infrastructure and enhancing system efficiency, while ensuring safety and quality, are addressed in the statutorily required DOT biennial master plan, the long-term state transportation plan prepared for the federal government, and the various federally required annual transportation improvement plans.

The department, in cooperation with other agencies, engages in several other planning efforts focused on specific indicator areas. For example, DOT, with the Departments of Public Safety and Motor Vehicles, develops the federally required state highway safety improvement plan each year. The department also works with the Department of Environmental Protection to prepare the state implementation plan for meeting national air quality standards required by the federal environmental agency.

In addition to these DOT efforts, under state law, Transportation Strategy Board (TSB) is responsible for developing, recommending, and periodically revising a transportation strategy for the entire state system. The board's strategy must include specific tactics and approaches for: stimulating sustainable economic growth; enhancing the quality of life of state residents; easing mobility of people and goods; improving access and connectivity; adequately maintaining infrastructure and equipment; and enforcing safety and security. It also must include the board's projection of required capital investments and operating costs, and recommended funding sources, for implementing the strategy.

At the time of the committee study, TSB was in the process of developing its latest revised strategy. For the first time, it was being prepared with the help of DOT planning bureau staff.

Taken together, the various planning efforts of the department and the board outline what the state is doing to meet its transportation goals and what can be done better. However, none of the present planning documents or processes have produced a comprehensive long term strategy for achieving the desired results statement. Further, there is no ongoing, systematic way to track progress. Having multiple plans with divergent purposes for the state transportation system dilutes accountability.

WHAT WILL IT TAKE TO DO BETTER?

DOT has demonstrated a new commitment to performance measurement and management for results. There also has been positive development toward stronger integration of strategic and operational responsibilities in the latest Transportation Strategy Board planning process. However, program review committee believes additional steps are needed to facilitate and promote population-level accountability.

The following recommendations are intended to focus responsibility for, and clarify the desired results of, the state transportation system. In addition, they should help state policymakers and agency managers better determine where additional or modified efforts are needed to make progress in achieving transportation system outcomes for all Connecticut residents. PRI recommends:

- **Amend existing statutory language to replace the department’s current master plan requirement with an annual transportation system progress reporting process based on Results-Based Accountability principles. Each year, by January 15th, the Department of Transportation shall submit to the legislature, and publish on its website, an RBA framework that includes the quality of life results statement for the state transportation system and an assessment of progress toward those results based on key indicators.**
- **The framework, results statement, indicators, and annual progress reports should be prepared jointly with the Transportation Strategy Board, with input from major partners and stakeholder groups.**
- **As part of an RBA data development agenda, DOT, in consultation with its partners, should review the adequacy of current indicators and related data resources for assessing progress toward desired results for the state transportation system. Together, they should determine whether there may be more appropriate alternatives for primary indicators and what additional secondary indicators are needed to provide greater public accountability. Preference should be given to indicators that are compatible with the national performance measures.**

III: RBA Program Performance

DOT PROJECT DELIVERY: PROGRAM PERFORMANCE REPORT CARD

Using the RBA approach, three main types of data are collected and analyzed to assess program-level performance. These measures of program accountability include:

- Outputs on quantity of effort (*How much did we do?*)
- Outcomes about quality of effort (*How well did we do it?*)
- Outcomes for customers, those served by the program (*Is anyone better off?*)

An RBA program evaluation seeks to use this information to: determine trends in performance; understand the reasons for identified trends and current conditions (“the story behind the data”); and find ways to improve program performance (actions to “turn the curve”), especially in terms of better end results for customers.

Information developed to try to answer the three main RBA program accountability questions about DOT project delivery is presented in this chapter. An overview of the primary program performance measures and data sources used for the committee’s assessment is provided first. Next, data for four key program measures are summarized in a report card format in Figure III-1. The figure also includes some brief background information about the department and its project delivery process as context for the discussion of trends in agency performance. The figure is followed by more detailed quantitative performance information developed by committee staff related to each RBA question.

Specific findings about DOT project delivery efficiency and effectiveness, and corrective actions proposed by the program review committee, are included in the discussions of the three RBA program performance questions. The chapter ends with PRI committee findings and recommendations related to several overarching DOT project delivery performance issues.

Overview of Performance Measures and Data Sources

As described Chapter I, DOT project delivery implementation is a complex process carried out by the agency’s four operating bureaus, with support from the centralized finance and planning bureaus. The procedures and policies related to project delivery also vary by transportation mode (e.g., highways, public transit, aviation) and funding source. It was necessary, therefore, to identify and review a wide array of measures that can reflect the full range of the department’s project delivery “program.”

For the purposes of this study, the three main RBA program performance questions were approached as follows:

- **How much did we do?** Measures of the size and scope (quantity) of the department’s project delivery effort that include: the number, size, and type of projects undertaken or completed each year; and the amount of resources, in terms of funding and staffing, used to deliver DOT projects.

- **How well did we do it?** Measures of the quality of DOT project delivery performance, such as the percentage of projects that are: on-schedule; on-budget; implemented with a minimum of changes; and in conformance with required standards and best practices;
- **Is anyone better off?** Client outcome measures usually are the most challenging RBA data to obtain, as few programs or agencies gather or maintain any information on what difference the functions they carry out and services they provide make to the people who receive them. Further, it can be difficult to isolate results due to a particular state program or function, especially over the long term, from intervening, externally driven factors (e.g., economic conditions, weather, changes in federal law).

Direct client outcomes from DOT project delivery can be captured by measures of whether the agency's efforts result in timely and cost-effective transportation system improvements. Successful DOT project delivery also means the public benefits of the improvements themselves – such as enhanced safety, increased mobility, economic growth, sustainable development, protection of the environment and more livable communities – can be achieved sooner and more fully. Under RBA, one of most important effectiveness measures, whether customers are satisfied with agency or program performance.

PRI staff compiled and analyzed performance data related to transportation system capital improvements readily available from the department and, with agency assistance, developed some additional output and outcome information related to project delivery. A primary source of quantitative information on project delivery was the department's internal performance measurement effort – “On the Move” – initiated in January 2009.

At the time of the committee study, the DOT Bureau of Policy and Planning tracked 31 performance measures developed to address program results related to the following five core policy objectives: safety and security; preservation; efficiency and effectiveness; quality of life; and accountability and transparency. Progress was updated quarterly and reported on the agency website. A sample of the department's quarterly performance measures summary report, which was released in July 2010 (for January 1 through March 31, 2010), is presented in Appendix F.

Several federal sources of DOT project delivery performance data also were examined by PRI staff. These included various status reports the Federal Highway Administration and the Federal Transit Administration require about projects they fund as well as the U.S. DOT annual “Condition and Performance” report on highways, bridges, and transit nationwide.

Completed project database. To examine Connecticut's performance for delivering projects on-time and on-budget, committee staff used data compiled by the department during the fall of 2010 as part of an AASHTO research initiative. The AASHTO Standing Committee on Quality is working to collect and analyze consistent, comparable information about states' performance in delivering transportation projects on-time and on-budget and establish a nationwide database. One goal is to provide state transportation departments with centralized

information, allowing them to learn from each others' experiences and helping them establish and apply common performance measures about transportation system priorities.

To date, 36 states, including Connecticut, are participating in this AASHTO initiative. The final database will include information for all transportation projects these states completed between January 2001 through June 2010.³⁰ Initial results of the analysis are expected to be published by AASHTO in the spring of 2011.

For this study, program review committee staff analyzed Connecticut DOT project delivery information for 793 projects delivered between 2001-10. The data sent by DOT to AASHTO only included information for the construction phase of the project delivery process and not for the preconstruction phase, specifically project design and project bid/award. The department assembled preconstruction data for the projects as best it could from various sources, since no comprehensive project management system exists. In some cases, complete information is not available for various projects, which is noted in the analysis when applicable.

Near the end of the committee study, DOT began publishing two new performance measures for project delivery timeliness and cost effectiveness. The new measures are based on a recent point-in-time and do not include the department's past experience with completing construction contracts on budget or on schedule. Performance prior to that timeframe is not part of the baseline used within the measures.

Data limitations. The department discussed with committee staff its preference for using current data from which to base its future performance for delivering projects on time and on budget, rather than incorporating past performance as part of developing a baseline or performance standard. The committee believes examining historic performance helps provide a broader, more meaningful baseline from which to compare and measure the department's performance at delivering projects on time and within budget. PRI also recognizes the difficulty in determining and analyzing all the factors contributing to project cost effectiveness and completion times without a more complete review of individual projects. For this reason, the analysis presented in this chapter serves as but one proxy of the overall timeliness and cost performance of the transportation project delivery process.

Further, as shown later in Figure III-1, much of core information needed to evaluate agency performance remains unavailable. Historically, the majority of the department's construction projects have not met original schedules or stayed within original budgets. The department is well aware of its performance problems and has been taking positive steps to begin to find solutions. In recent years, DOT has instituted many management reforms, often in response to critical outside reviews, to help improve its accountability and transparency. The department seems to have adopted most of the best practices used by other state agencies recognized as leaders in timely, cost-effective transportation project delivery.

³⁰ The completion date used in the database is "final voucher date" for projects. The final voucher date is the date assigned when projects are closed out for financial and administrative purposes, and not the date a project becomes available for public use. Projects are considered "substantially complete" – open for public use – before their final voucher dates.

Changes in structure, policies, and procedures to try to increase project delivery efficiency and effectiveness were continual during the PRI study. DOT's project delivery process, and the management systems needed to monitor how well it is being implemented, were still evolving. Overall, it was too early to tell completely what impact changes made to date are having on the department's project delivery results.

However, the committee's RBA-based performance assessment revealed several overarching areas of concern for DOT project delivery success. These include: effective control of project initiation; still-developing quality assurance functions; inefficient coordination of environmental matters; and the inability to use alternative contracting. In addition, high-level project management information systems are inadequate.

Generally, top managers responsible for transportation project delivery lack the performance data needed to determine what is working well, what is not, and how best to make improvements. Project management during the design phase is particularly weak, yet timely, high quality project documents and accurate estimates are the foundation for successful construction completion.

The PRI committee recommendations for addressing these challenges, in a number of cases, are focused on low and no cost ways to support and expand current positive initiatives within the department. The goals of all the proposed improvements included in this chapter are to expedite delivery of needed transportation improvements while increasing cost-effectiveness and maintaining safety and quality. In addition, committee recommendations are intended to strengthen overall performance management capacity and accountability within DOT.

Figure III-1. RBA PROGRAM PERFORMANCE REPORT CARD:

DEPARTMENT OF TRANSPORTATION PROJECT DELIVERY

Contributes to the Quality of Life Results Statement:

Connecticut's transportation system is maintained in a state of good repair and allows for safe, efficient movement of people and goods, livable communities, and sustainable growth.

Main Contribution: helps to preserve current transportation infrastructure, improve system capacity, and increase mobility options in compliance with work quality, environmental, financial, and other relevant standards. While DOT project delivery is more a major state agency function than a program, it makes a significant contribution toward achieving the results desired for the state's transportation system. Completing capital improvements on time and within budget, without sacrificing safety or quality, is crucial to safe, efficient, and effective movement of people and goods throughout the state.

PROGRAM BACKGROUND

- Delivery of state transportation system capital improvement projects involves both project development and project implementation. This report card, in accordance with the PRI study scope, focuses on the *implementation* phase of DOT project delivery, from the point formal design begins through completion of the improvement.
- DOT project delivery implementation is aimed at carrying out capital improvements to the state system of transportation:
 - on time;
 - within budget; and
 - in compliance with appropriate standards and requirements.
- Efficient and effective project delivery also helps achieve the safety, mobility, environmental, economic, and other public benefits desired from an implemented improvement sooner and more fully.
- Four separate operating bureaus have direct roles in administering the wide array of highway, bridge, public transit, aviation, and maritime improvement projects delivered by DOT. The Bureaus of Finance and Administration, as well as Policy and Planning, provide critical support functions for effective project delivery implementation, such as budgeting, accounting, contracting, and performance measurement.
- Four federal agencies – Federal Highway Administration, Federal Transit Administration, Federal Rail Administration and Federal Aviation Administration – have significant roles in Connecticut's transportation project delivery implementation.
- The state's 15 Regional Planning Organizations and 169 municipalities also are main DOT partners in implementing state transportation system improvement projects.
- The main steps in the DOT process for delivering capital construction projects, described in the detail in Chapter I, are:

- project initiation, which includes scoping and selection of outside professional services, if determined necessary;
 - design development (i.e., preliminary engineering, preliminary and final design);
 - bid and contract award; and
 - construction, which includes contract administration, inspection and testing, project management, and close-out.
- The Bureau of Engineering and Construction is responsible for delivering all highway system and most other types of DOT capital construction projects. Information presented in the following report card is based on committee staff analysis of that bureau’s project delivery performance.

DOT PROJECT DELIVERY PERFORMANCE SUMMARY

Four key measures of transportation project delivery performance are highlighted below, followed by separate discussions of each RBA program performance question: How much did we do? How well did we do it? Is anyone better off? In addition, committee findings and recommendations are discussed regarding several overarching issues identified as challenges for successful DOT project delivery.

KEY MEASURES*	PROGRESS	CURRENT DATA
<i>1. Projects are delivered on schedule.</i>		<ul style="list-style-type: none"> ● Performance data that reflect time for both the design and construction phases of project delivery are not readily available through current agency information systems ● PRI staff analysis of a database created for this study on projects completed over the past 10 years shows: <ul style="list-style-type: none"> ○ Total time to complete project design and construction averaged 5.3 years, with the design phase accounting for 61% of the full process ○ Overall, 37% of all completed projects met their scheduled construction completion times; in comparison, the average for 15 other states during 2001-2005 was 53% ○ The median time over schedule for construction completion was 144 days ● Initial data for a new on-time measure for DOT construction projects (excluding design phase) was issued in October 2010; 45% of 29 total contracts completed during 2nd Quarter 2010 met their original contract schedules for construction completion

<p>2. Projects are delivered within budget.</p>		<ul style="list-style-type: none"> • Performance data that reflect total costs of both the design and construction phases of delivering a project are not readily available through current agency information systems. • PRI staff analysis of a database created for this study on projects completed over the past 10 years shows: <ul style="list-style-type: none"> ○ Original construction budgets (award amount not including any contingency) were exceeded for the majority of completed projects (74%), with an average cost overrun of 23% ○ Construction budgets including a 10% contingency amount, were exceeded for 42% of completed projects; the median overrun was 21% ○ The portion of completed projects exceeding 110% of their original construction budget each year decreased between 2001 and 2010 • Initial data for a new within-budget measure for construction projects (excluding design phase) was issued in October 2010: 69% of 29 total completed during 2nd Quarter 2010 met their original contract budgets for construction, when defined as the awarded value plus 10% contingency
<p>3. Projects are delivered in compliance with relevant standards and best practice</p>		<ul style="list-style-type: none"> • Information about financial status, work quality, and compliance with labor laws, safety standards, and environmental requirements tracked for individual DOT construction projects • Quantitative measures and aggregated data about quality assurance performance for delivered projects not in place at this time
<p>4. Project benefits are delivered in a timely, cost-effective way</p>		<ul style="list-style-type: none"> • Comprehensive data on the size, scope, and costs of DOT project delivery lacking • Final outcome data based on intended end results from specific improvements (e.g., fewer accidents, faster travel times, greater access, reduced pollution, new jobs) studied for only a small number of completed projects • Customer satisfaction with delivered projects not measured

How Much Did We Do?

At present, the size and scope of the DOT project delivery workload is difficult to determine as project data are maintained in a number of different systems for financial and other purposes. The best available data about active DOT projects are for those authorized to receive federal funding. Information about completed projects is only centralized at this time for capital improvements carried out by the agency's Bureau of Engineering and Construction.

In summary, PRI found:

The number and size of active projects and projects delivered by DOT can vary greatly from year to year. Based on best available data, in recent years:

- The department's annual workload of all active federally authorized highway and public transportation improvements averaged 285 projects, with a total annual value (not including any federal stimulus funding) about \$560 million on average (FFYs 06 – 09).
- On average, the agency's Bureau of Engineering and Construction delivered around 63 construction projects per year, with total final construction costs per year ranging from about \$100 million to more than \$740 million (FYs 05-09).

The bulk of projects the department delivers involve federal funding and are subject to federal planning, design, construction, and procurement requirements.

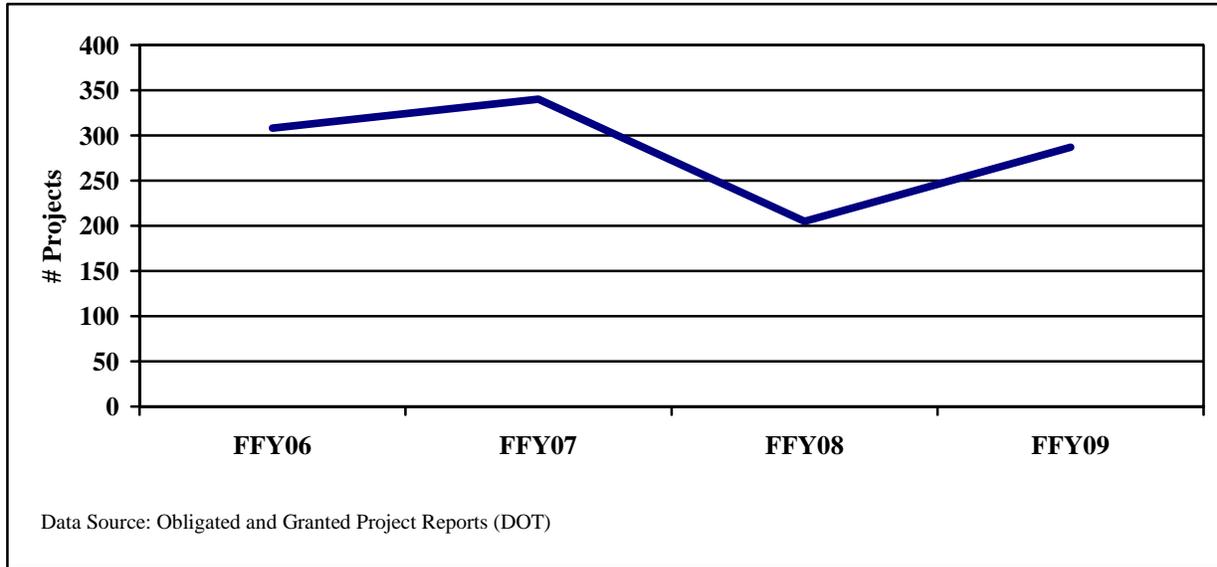
Staff resources for project delivery include department employees and outside professional services; the capacity and cost of DOT staff responsible for project delivery is not known.

Project Delivery Workload Measures

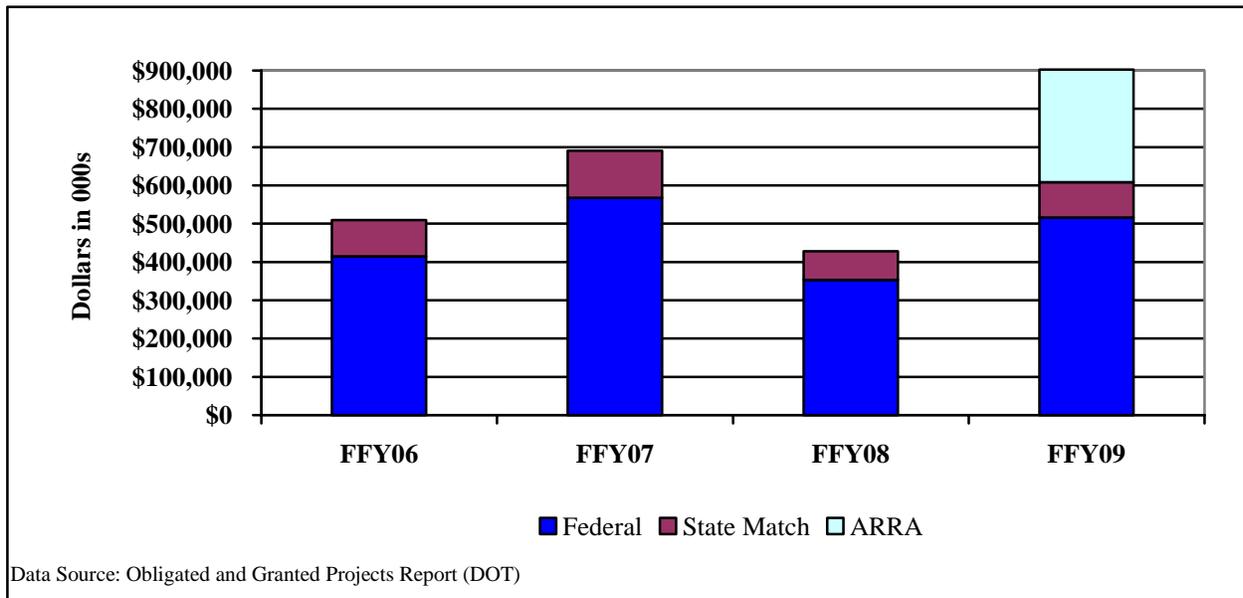
Performance Measure 1: Number of Transportation Projects Authorized (FFYs 2006-09)

- 308 highway, bridge, and public transit projects received federal funding authorization in FFY06. Projects increased about 10% to 340 in FFY07. The number of projects then decreased almost 40% to 205 in FFY08. Total projects increased 40% again in FFY09 to 287.
- States began receiving federal stimulus funding under the American Recovery and Reinvestment Act (ARRA) for transportation projects in FFY09; 52 projects in Connecticut were funded through ARRA that fiscal year.

- Includes all projects at different stages of implementation – preliminary engineering, to rights-of-way, or in some phase of construction – with federal funds authorized (i.e., obligated) in a given fiscal year. Within the construction phase, projects may be bids, awaiting awards, or under construction.

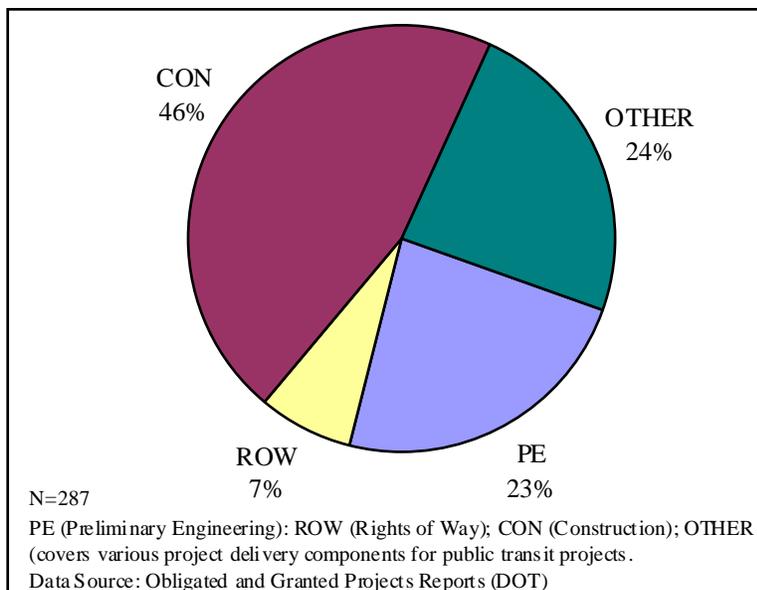


Performance Measure 2: Total Dollar Amounts for Federally-Funded Projects Implemented (FFYs 2006-09)



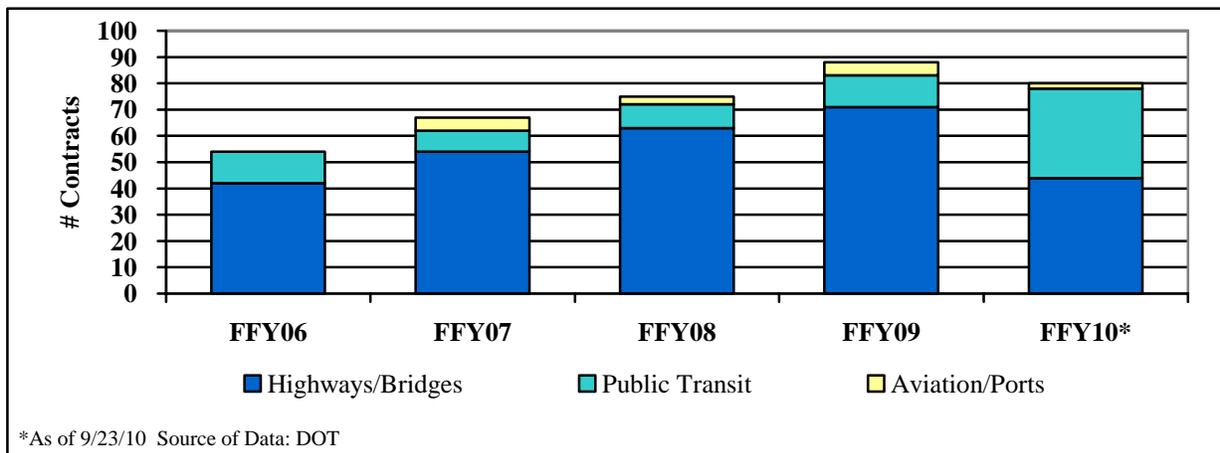
- In recent years, total funding authorized (i.e., obligated) by the federal government combined with Connecticut DOT matching state funds for projects ranged from a low of \$428 million in FFY08, to a high of just over \$902 million in FFY09.
- The increase in FFY09 is in large part attributable to the almost \$294 million in federal stimulus funding committed to Connecticut for transportation projects that year.
- Transportation projects receiving federal funding generally require matching dollars from the state. Typically, the funding ratio is 80% federal, 20% state, although it may differ depending on factors such as type of project and federal funding source.

Performance Measure 3: Types of Authorized Projects by Project Delivery Phase (FFY09)



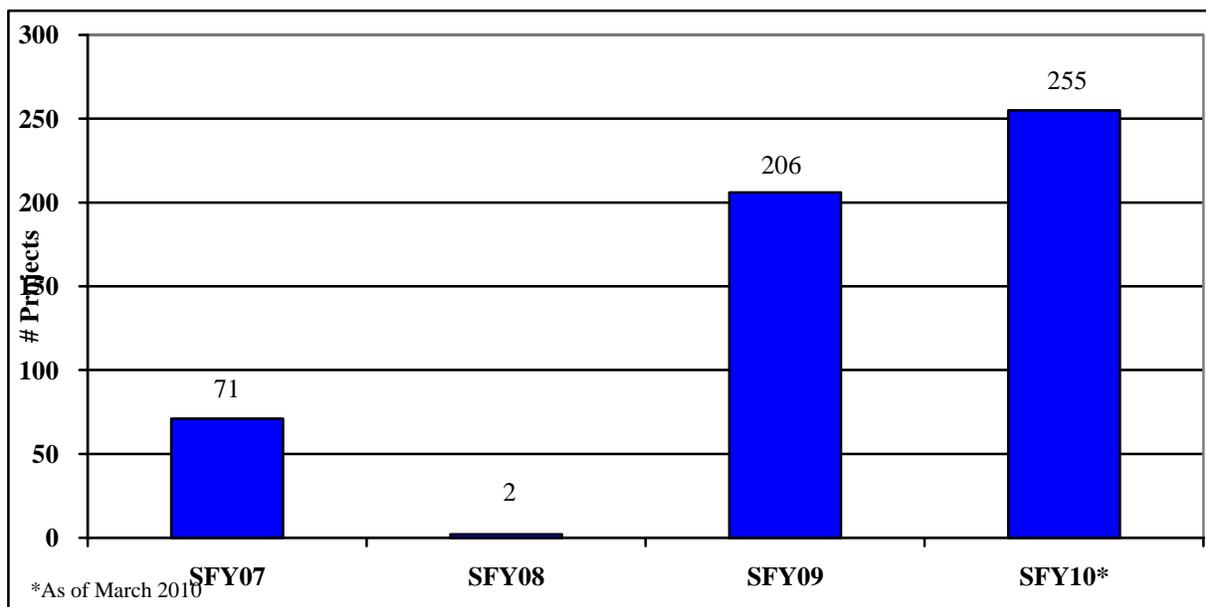
- 76% of the nearly 300 federally authorized projects in FFY09 were in some phase of design (preliminary engineering or rights-of-way) (30%) or construction (46%). Almost a quarter (24%) of projects were in another delivery phase which encompasses all parts of implementation are not formally classified as one of the other three project delivery phases, such as capital acquisition for public transit.

Performance Measure 4: DOT Projects: Number of Contracts Awarded by Mode (FFYs 2006-10)



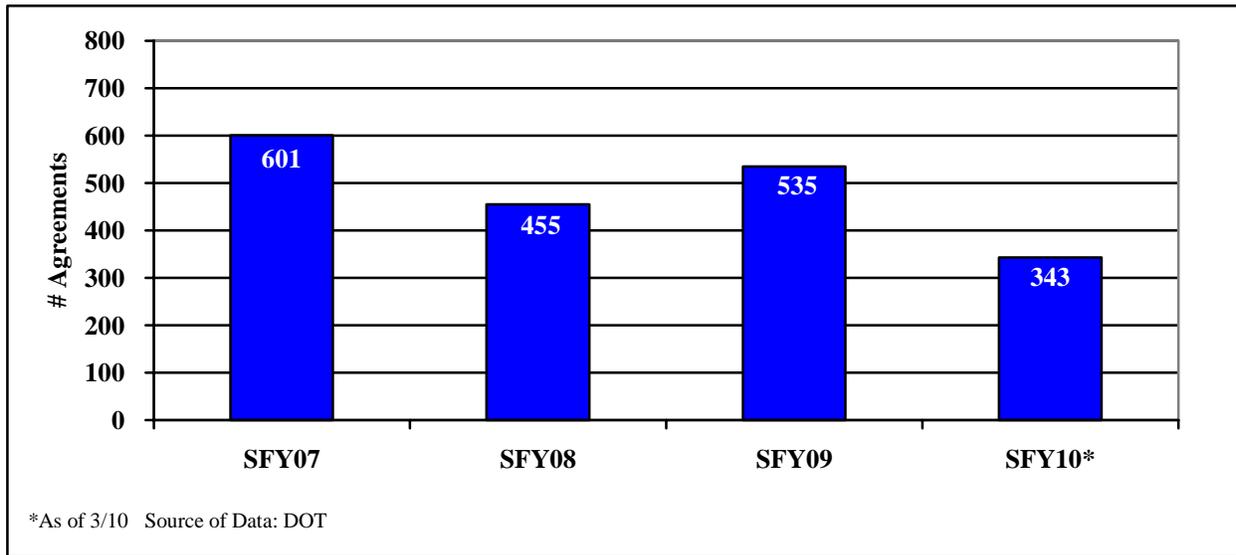
- The total number of transportation project contracts awarded by mode for FFYs06-10 was: Highway/ Bridges (274), Public Transit (75), and Aviation/Ports (15)
- Since FFY06, the highest volume of contractor contract awards has been for highway and bridge projects, which averaged roughly 80% of all awarded contracts, followed by public transit and aviation/ports.
- The number of contracts awarded for public transit projects in FFY10 more than doubled from previous years, due to an increase in awards under ARRA, state-only funded projects, and projects with special authorizations.

Performance Measure 5: Number of DOT Projects Closed Out: SFYs 2007-10 (FHWA-Funded Projects Only)



- Close out is a financial process that indicates the completion of final project payment and “paperwork.”
- The total number of FHWA projects closed out by the department has increased more than three-fold between SFY07 and the third quarter of SFY10.
- Poor close out performance in SFY08 is related in part to the department’s transition to the CORE-CT financial management system. Efforts are continuing between DOT and FHWA to lessen the current backlog of approximately 800 projects.

Performance Measure 6: Number of DOT Project Agreements (SFYs 2007-10)



- In addition to construction contracts, DOT executes a variety of agreements for project design. Agreements may include consultants for architectural, engineering, and surveying.
- The average number of agreements entered into by DOT per year since SFY07 is 483. Efficient administration of such agreements is important to the overall timeliness of the DOT project delivery process.

Performance Measure 7: Active Projects

- The best information on active transportation improvement projects only reflects those authorized to receive federal funding. From FFY 06 through 10:
 - The total number of active federally authorized projects ranged from a low of 205 in FFY 08 to a high of 340 FFY 07.
 - Total funding (federal monies combined with state matching amounts) for active federally authorized projects ranged from a low of \$428 million in FFY08, to a high of just over \$902 million in FFY09.
- In FFY 09, the majority of the 287 active federally authorized projects (76%) were highway, bridge, public transit, or aviation improvement projects in some phase of design or construction. The rest (24%) were other types of capital improvements, such as new equipment purchases for public transportation systems.

Performance Measure 8: Projects Delivered

- The number of construction projects delivered by the department varies widely year to year, with a high of 87 (FY 08) and a low of 41 (FY 06 - complete year data) in recent years.

DOT Construction Projects Delivered: FY 05 – FY 10						
	FY 05	FY 06	FY 07	F 08	FY 09	FY 10*
Number	58	41	60	87	71	34
Total Cost (in millions)*	\$139.577	\$100.249	\$254.385	\$741.114	\$243.265	\$ 74.948

*Total construction cost based on final voucher data; FY 10 data partial through June 1.
Source: PRI staff analysis of DOT completed project data

Story Behind the Data:

At this time, there is no single source of active or completed project information that combines funding and delivery status information for all capital improvements DOT oversees. The best data on the department's active project delivery work are for federally funded projects, based on federal authorization and obligation reports prepared through the CORE-CT system. It was not possible, within the study timeframe, for the department to develop similar information about projects solely funded with state monies or state funding provided for municipal transportation improvement projects. Some limited information PRI staff developed regarding the number and size of municipal construction projects overseen by DOT is provided in the following section.

For delivered projects, the best existing information is data concerning federally authorized completed construction projects (i.e., those with federal and state matching funds or federal with local matching funds and state oversight) that were carried out by the agency's Bureau of Engineering and Construction. Again, comparable information for projects funded just with state money could not be prepared in time for this study.

Complete information on how much the department is doing in terms of numbers, size, and types of projects delivered is a necessary first step to understanding the relationship between output levels and available resources.

Actions to Turn the Curve:

DOT recognizes the many limitations of its data about project delivery. As noted earlier, the agency is in the process of implementing a comprehensive project management system for its construction projects. That system will help better identify the agency's construction project delivery workload at each stage of the implementation process, from design through completion and close-out. In addition, the new capital project initiation process DOT is considering adopting would centralize information about all agency improvement projects proposed and undertaken by any bureau or funding source each year. In the future, it could be used to capture the entire scope of projects the department is responsible for delivering. The program review committee recommends:

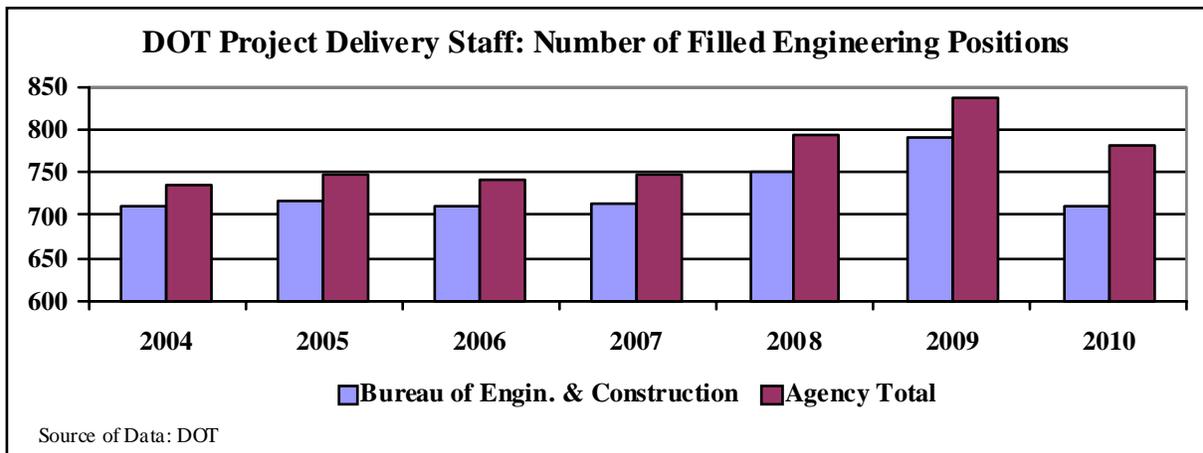
The department, as part of its effort to establish a centralized new project initiation process, develop and maintain a database that can identify and monitor the agency's complete project delivery workload.

Project Delivery Staffing Measures

Performance Measure 1: Internal Project Delivery Staffing

A broad measure of internal staff resources allocated to DOT project delivery that could be developed within the timeframe of this study is the number of filled engineering positions with responsibility for transportation improvement projects (e.g., planning, design, or implementation through construction or other means) over time.

Data provided by the agency's human resources staff on the total numbers of filled engineering positions (all classifications) that are coded to DOT projects within each bureau and agencywide each year (as of January 1) from 2004 through 2010 are summarized in the following chart.



Story Behind the Data:

Since 2004, the number of filled engineering positions agencywide grew 6 percent, from 736 to 782. The increase, however, occurred in bureaus other than the Bureau of Engineering and Construction, where the bulk of project delivery responsibilities for DOT capital improvement projects are carried out.

BEC started with 709 filled positions in 2004, a number that reflects the impact of the 2003/2004 state employee layoffs and early retirement programs. Its total then grew to a peak of 791 in 2009. In 2010, total filled engineering positions for the bureau dropped back to 710, mainly as a result of retirements triggered by the 2009 state incentive program. Thus,

current BEC professional staffing capacity for project delivery is unchanged from the low level experienced six years ago.

Past retirement incentives also have had an impact on supply of mid-level staff who have been with the department for five to 10 years. This amount of experience is considered necessary for carrying out design and construction administration functions independently or to begin supervising others. As of November 2010, almost 22 percent of the department's current engineering staff had less than 10 years of experience with DOT; only 4 percent have between five and 10 years of experience.

Further, a significant portion of the agency's experienced engineering workforce is eligible for retirement now and in the coming few years. At present, 108 (14%) of the 778 DOT engineers with project delivery duties are over age 55 and have at least 10 years of DOT employment; 223 (29%) are over age 50 with a minimum of 10 years of departmental experience.

Constrained project delivery staffing capacity combined with impending retirements is a major concern of DOT management and FHWA. As part of its annual strategic planning process, the FHWA Connecticut Division completes a risk assessment of the department's implementation of the federal-aid highway program. This process, carried out with DOT input, helps identify and prioritize potential problem areas. Adequate staffing to ensure efficient and effective delivery of federally funded improvements ranked fifth of the top ten risks incorporated in the current FHWA strategic plan for Connecticut.

It is unclear, however, what levels and types of staff are needed to carry out project delivery in an efficient and cost-effective manner. This issue was recognized by the Critelli Commission and a talent assessment of all DOT staff was recommended, but no such study has occurred to date.

Determining the department's current and future capacity is complicated by personnel changes made under recent contracts negotiated with agency engineering unions. These include: an expanded employee work week (from 35 to 40 hours); revised engineering classifications and related pay increases; and a new requirement for supervisory level positions (i.e., professional engineering licensure). In addition, in-house employee time and costs allocated to project delivery are not tracked by the department at this time. Without further information, the adequacy of current and projected resource levels cannot be assessed.

Actions to Turn the Curve:

The agency's human resources unit has been analyzing trends in age and years of service among department employees as part of a succession planning effort. To prepare for impending retirements, managers have been directed to review and update documentation related to standard operating procedures for critical positions likely to be vacated by retiring employees. Training and guidance on ways to promote continuity of operations also are being provided for department managers at all levels.

A comprehensive assessment of current staff capacity and analysis of the types of skills and numbers of employees the department needs to carry out project delivery and other major

responsibilities effectively has not been undertaken. Until this information is developed, the department cannot determine if present resources are sufficient or additional staffing is justified to ensure timely, cost-effective delivery of improvements to the state transportation systems. PRI recommends:

The transportation department seek the assistance of the Connecticut Academy of Science and Engineering in preparing a talent assessment of its existing staff capacity and projecting its future staffing needs for capital improvement project delivery implementation. The results of this assessment should be completed by July 1, 2012, and shared with the legislature’s Appropriations and Transportation Committees.

Further, the department should establish a mechanism to track the direct and indirect costs of the design, construction inspection and administration, and project management services its employees provide on a per project basis. Measures of project delivery workload, such as project dollar value per employee, also should be developed and used to monitor trends in internal staff capacity.

Performance Measure 2: Consultant Services for Project Delivery

The extent that DOT uses outside consultants for project delivery is broadly measured by data on agreements executed for professional services related to capital improvement projects. As indicated in the table below, DOT has engaged outside professional services for various project delivery tasks (e.g., planning, design, construction inspection, project management, or auditing) at annual total fees ranging from just under \$100 million to nearly \$170 million over the last five years.

Outside Professional Services Agreements for DOT Project Delivery by Type: FY 06 – FY 10					
	FY 06	FY 07	FY 08	FY 09	FY 10
Agreements	37	29	44	35	23
Supplemental Agreements	62	51	58	36	40
Extra works	134	157	187	192	195
On-calls	111	106	113	108	96
Subconsultants	117	121	140	109	146
Total Items	461	464	542	480	500
Total Fees (Amt. Negotiated)	\$99,178,559	\$148,150,172	\$169,426,549	\$168,056,805	\$125,431,427
Source: DOT Bureau of Finance and Administration					

Story Behind the Data:

Like all state transportation departments, DOT uses a variety of outside professional services to supplement its internal project delivery capacity and obtain specialized skills its employees do not possess. In addition, contracting out design, inspection, and project management tasks can help manage short-term fluctuations in workload. As the table indicates, the amount the department spends on consultant services related to project delivery, more than \$100 million a year, is substantial.

Additional information and study is needed to determine if the department's current use of consultant services is cost-effective. According to a recent GAO report, the existing research on the costs of contracting out compared to using in-house staff is inconclusive. GAO found methodological issues and other limitations prevented any reliable findings about whether consultants are more or less expensive public employees for highway projects over the long term.³²

The primary problem in such comparisons is establishing an appropriate overhead rate for in-house work. As GAO noted, most state transportation department's accounting systems cannot accurately capture all relevant direct and indirect costs and apportion them to individual projects or functional units. The life-cycle costs of public employee pensions and other benefits also are difficult to quantify. A complete cost-benefit analysis additionally should consider any differences in quality or time-savings between work done in-house and by consultants.

The committee understands fully quantifying all costs and benefits associated with public employees has been difficult for state governments historically. However, until DOT develops a method for identifying all internal staff costs, it will not be possible to determine whether agency resources are being used efficiently.

Actions to Turn the Curve:

The state Contracting Standards Review Board, in accordance with its enabling legislation, recently asked DOT to conduct a cost-benefit analysis of its bridge safety evaluation program. The intent of the analysis is to determine whether it is more cost-effective to inspect bridges using state or private inspectors. DOT requested the board allow it to complete the analysis in three steps, with the first two tasks completed before the end of 2010 and the third task done by March 2011. The board ultimately adopted a resolution calling for the bridge inspection analysis with work segmented into the components and timeframe identified by DOT.

The methodology DOT identifies in its analysis of the bridge inspection program could next be applied to determining costs associated with designing transportation projects with in-house design staff and comparing that with costs of consultant designers. Such a cost-benefit analysis could identify ways to use the department's limited resources for improving the state transportation system more effectively. To determine and apply the most cost effective methods for designing DOT projects, the program review committee recommends:

³² GAO, *Federal Aid Highways: Increased Reliance on Contractors Can Pose Oversight Challenges for Federal and State Officials* (GAO-08-198), January 2008.

The Department of Transportation conduct an analysis of transportation project design costs that compares the costs associated with work done by department employees to costs of using private design firms. The analysis should be conducted and completed by July 1, 2012, with a report of the results forwarded to the legislature's Transportation and Appropriations committees on or before that date.

II. How Well Did We Do It?

As noted earlier, aggregated data on the overall performance of DOT project delivery is lacking. The department just initiated quarterly reporting on two core project delivery performance measures – on time and on budget – for its completed construction projects. Otherwise, little information has been compiled and reported about how well the department implements the project delivery process, particularly for the design phase.

The PRI committee looked at historical trends in project delivery performance using information about DOT projects completed (i.e., final voucher dates) over the past ten years. As described below, the database used was developed for committee staff by the department. Analysis focused on two key project delivery measures: schedule and cost. *In summary, the committee found:*

On Time

- The time required to complete the transportation project delivery process – from initiation of project design through construction – increased between 2001 and 2010.
- The time to complete the full project delivery process averaged 1,918 days (5.3 years) for projects completed over the period. The project design component accounted for the largest portion of time within the overall project delivery process, averaging 1,195 days, or 61% of the full project delivery process.
- Project construction completion times determined as part of the project design process are consistently underestimated: 37% of projects were completed on-schedule. The average for 15 other states was 53% between 2001-05.
- Projects exceeded their original construction dates by an average of 223 days (median was 144 days).
- The percent of projects completed beyond their original schedules was higher for state projects than municipal projects, 68% and 44% respectively.
- The highest percentage of projects not completed within their original schedules was for those with the highest original costs (>\$20 million). Conversely, the lowest percentage of projects not completed on time was those with in the lowest original cost range (<\$5 million).
- Projects exceeding their original completion dates with original costs over \$20 million were completed an average of 852 days beyond their deadlines. This average is almost five times that of projects not completed on schedule in the “less than \$5 million” range, which averaged 174 days.

On Budget

- The percent of projects incurring cost overruns of more than 10% decreased 49% for projects completed between 2001-10.
- Just under three-fourths of projects incurred some degree of cost overrun when compared to original construction budgets; the average cost overrun for projects over budget was 23%.
- Of the projects completed below their original budgets, the average amount under budget was 8% and the median amount was 5%.
- Construction for 42% of projects was completed over original budgets by more than 10%. The average cost overrun for the projects over 110% of their original budgets was 37% and the median was 21%.
- The percent of projects incurring cost overruns of >10% was essentially the same whether the state or a municipality delivered the project: 42% and 41% respectively.

Projects Are Completed On Schedule

On-schedule performance typically focuses on the construction phase of project delivery – whether projects, once started in construction, are finished on schedule. The scope of this study, however, calls for a review of the project delivery process from initiation of project design through construction. As such, on-schedule performance of the preconstruction and construction phases is reviewed.

The information presented below analyzes the following key milestones within the preconstruction phase: project initiation through the completion of project design; project advertising through construction contract award; and award through the notice to proceed sent to contractors to begin construction. Information is also presented for the construction phase and the department's overall performance for completing construction projects within schedule.

Although the project data supplied by DOT is based on projects' final voucher dates between 2001-2010, such dates are not the most applicable to use within the scope of this study when measuring whether project construction is completed on schedule. Instead, the analysis below uses projects' "substantial completion dates" to indicate project completion. The department classifies projects as substantially complete when they are safe for public use following semi-final inspection, although additional work is necessary to fully satisfy contract terms and administrative requirements for federal reimbursement.

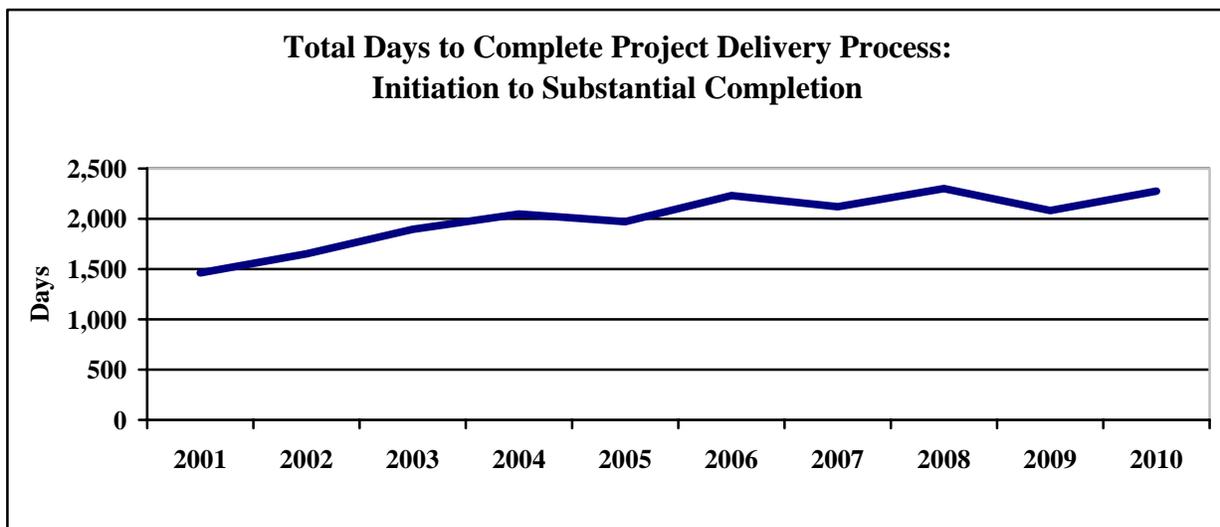
A factor making analysis of project completion challenging is the winter shutdown period for project construction, which runs from December through March. Within the analysis for the overall timeliness of the full project delivery process, construction phase was defined as from the notice to proceed date to the substantial completion date, which does not account for winter

shutdown periods. The analysis specific to the performance of the construction phase of the project delivery process accounts for winter shutdown periods.

Performance Measure 1: Project Delivery Over Time

Project data were reviewed to determine the aggregate length of time it takes to complete the project delivery process - from project initiation to when projects are deemed substantially complete. The figure below illustrates the average number days by year to complete transportation projects. Completion times for construction contracts are specified by the number of calendar days necessary to complete the contracts, which is why the time frames in the figures below are indicated in days.

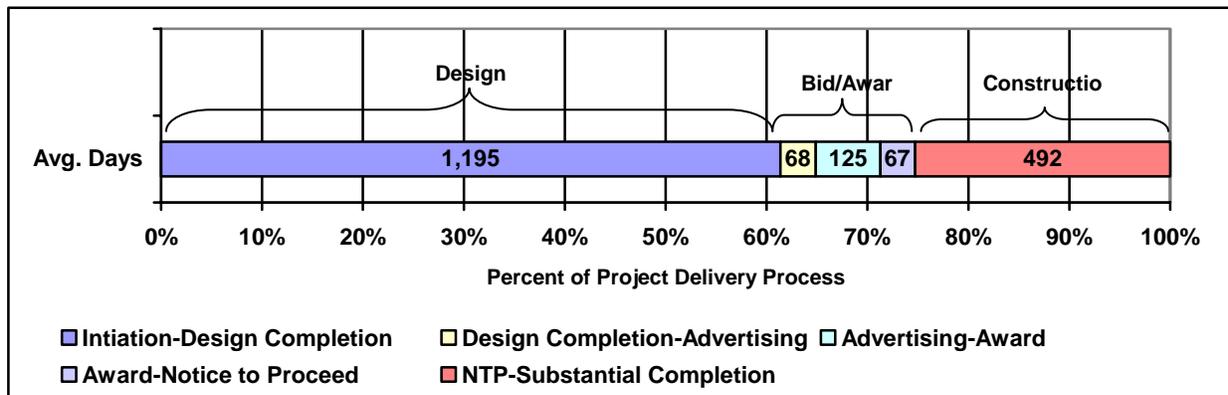
- Overall, the trend to complete the transportation project delivery process has been increasing. Process completion times steadily increased between 2001 and 2004, with alternating increases and decreases between 2005-09, only to increase again for projects in 2010. The full reasons behind the steady increase in project delivery times are unclear without more in-depth analyses. Efforts to control time overruns clearly are needed.
- The average time to complete the full project delivery process for the time period analyzed was 1,918 days (5.3 years); the median time was 1,797 days (4.9 years).
- Project delivery completion times ranged from an average low of 1,461 days (4.0 years) in 2001, to 2,301 days (6.3 years) in 2008.



Performance Measure 2: Project Delivery Completion Time by Phase

The figure below shows the amount of time it takes to complete key milestones of the project delivery process. The time frames for the individual parts of the process shown in the graph differ slightly from the overall average time to complete the full process shown above because not all the projects had complete information when each phase of the process was

examined individually. (As noted above, the time frame for the construction phase is from the notice to proceed date to the substantial completion date, which does not account for winter shutdown periods.)



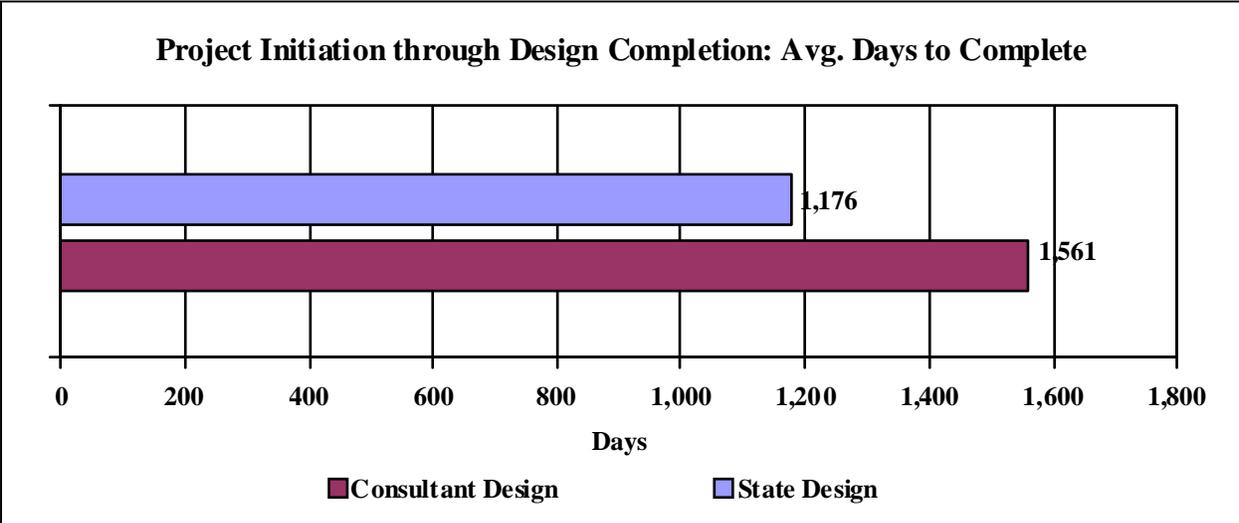
- Project design accounted for the largest portion of time within the overall project delivery process, averaging 1,195 days or 61% of the overall time to deliver projects.
- The construction phase accounted for 25% of the processing time, averaging 492 days. (Accounting for winter shutdown: the average number of “calendar days used” for the construction phase is over one year - 409.).
- The administrative processes to advertise, bid, and award projects, and issue notices to contractors to proceed with work, accounted for the least amount of time within the process, averaging 260 days, or 13% of the overall time.

Performance Measure 3: Project Design by State or Consultant

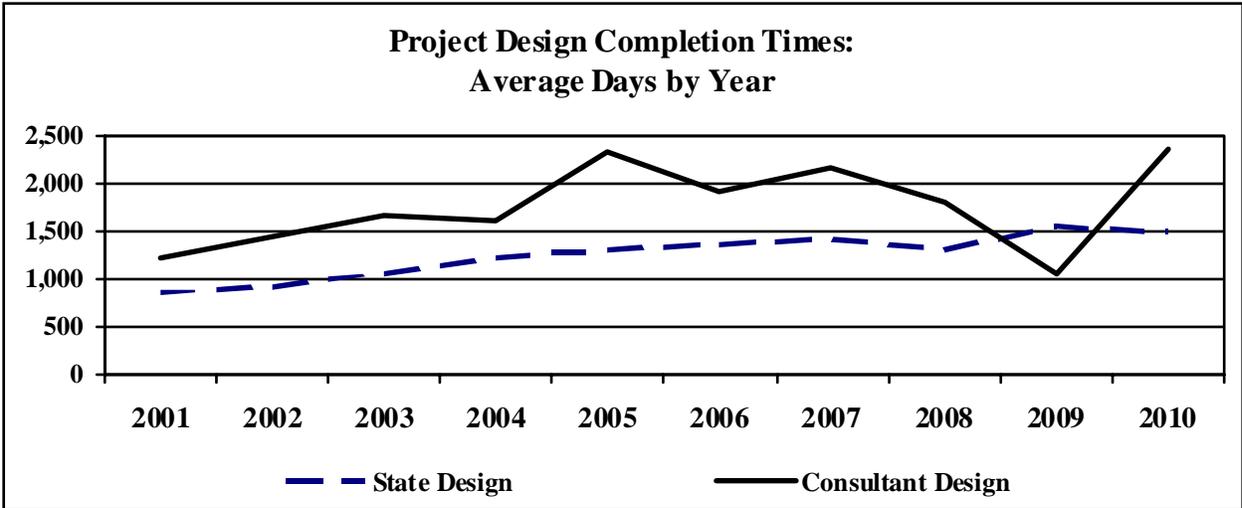
DOT uses state and consultant engineers to design projects. The department notes consultants are used for various reasons, particularly when demand for project design work and/or the overall level of expertise needed for specific project designs, exceeds the design staff resources available within the department.

At times, single projects will be designed by a combination of state and consultant design engineers, making comparative analysis between the two difficult. When applicable, project data were analyzed to determine the time the design phase took to complete for projects designed by state engineers or consultant engineers. Caution must be applied when interpreting the data because the analysis does not include an evaluation of the types of projects designed or the relative size or complexity of the projects designed, which likely affect design completion times.

The adjacent figure provides a basic analysis of the length of time to complete the design phase of the project delivery process by type of designer. Projects designed by state engineers averaged 1,176 days to complete, and projects designed by consultants were completed in an average of 1,561 days.



The flanking figure illustrates the average design completion times by state engineers have steadily increased since 2001, but overall have remained lower than completion times by consultants for all years except 2009. The average completion times for design consultants fluctuated over the period analyzed. Again, the graph shows aggregate results; additional analysis is required to more fully understand the reasons behind the differences.

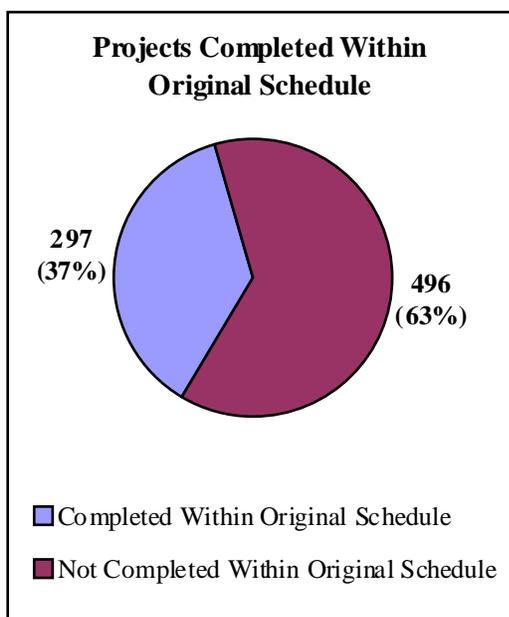


Performance Measure 4: Projects Constructed On Schedule

Project completion typically equates to the time it takes to complete the construction phase and whether projects are constructed within the schedules established in construction contracts. An added challenge in analyzing performance of the construction phase of the project delivery process is how to account for the winter shutdown policy used by the department.

The data received from the department for project construction contains information for: 1) original deadlines; 2) time extensions granted to account for unforeseen or changed conditions, delays in utility work, design changes, or weather conditions; and 3) the actual calendar days used to complete projects, which incorporates winter shutdown periods. The analysis below is based on the data provided by DOT and focuses on: 1) the percent of projects constructed on schedule; 2) construction timeliness based on project size; and 3) timeliness of state and municipal projects.

The project database was reviewed to determine if projects were completed within the original schedule dates set out in construction contracts. The figure below illustrates the number and percentage of projects completed on schedule or not on schedule according to their original contract deadlines.

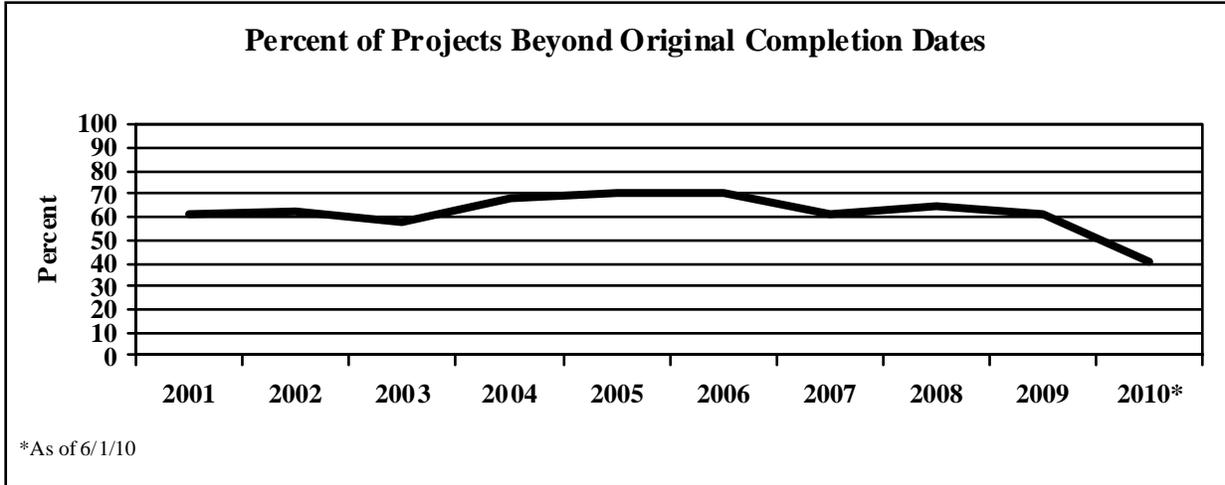


- Of all the projects, 37% were completed within the original schedules specified in their construction contracts, while 63% were not.
- The average length of time projects exceeded their original completion dates was 223 days; the median time was 144 days.
- Of the 297 projects completed within their original schedules, 221 (74%) were completed in less time than the original completion dates specified in the contracts – an average of 40 days before their original deadlines.

- All 496 projects exceeding original completion dates were granted extra time for completion; only 15 of the projects exceeded the extra time allowed.

Project information was analyzed to identify trends in the percent of projects not completed within their original schedule. The figure below shows the results for the projects exceeding their original completion deadlines.

- The trend in the percent of projects delivered after their original completion dates has fluctuated somewhat over the period analyzed, with a noticeable decline in 2010. Overall, the percent of projects not completed on time remained relatively constant between 60-70%; conversely, roughly one-third of projects were delivered on time in any given year (except 2010). At minimum this indicates the project construction completion times determined as part of the project design process are consistently underestimated.



Projects were analyzed to examine the relationship between completion times and original project cost. Projects were classified according to three budget levels: over \$20 million; \$5 million to \$20 million; and less than \$5 million, as indicated in the table below.

Original Cost	Total Projects	Projects Completed Beyond Original Schedule	Average Days Past Original Date	Median Days Past Original Date
Over \$20 million	24	21 (88%)	852	566
Between \$5 million and \$20 million	72	49 (69%)	371	317
Less than \$5 million	697	426 (61%)	174	120

- The analysis clearly shows the highest percentage of projects not completed within their original schedules was for projects with the highest original costs (>\$20 million). Conversely, the lowest percentage of projects not completed on time was those with in the lowest original cost range (<\$5 million).
- Projects exceeding their original completion dates with original costs over \$20 million were completed an average of 852 days beyond their deadlines. This is almost five times that of projects not completed on schedule in the “less than \$5 million” range, which averaged 174 days.

The DOT project information identifies municipal projects receiving federal funding and overseen by the state. The information was analyzed to compare the level of time overruns for

projects delivered by municipalities and the state, as shown in the table. (Again, additional analysis is necessary to fully understand the reasons behind these differences.)

Level	Total Projects	Projects Completed Beyond Original Schedule	Average Days Past Original Date	Median Days Past Original Date
State	617	418 (68%)	239	160
Municipal	176	78 (44%)	134	82

- The percent of projects completed beyond their original schedules was higher for state projects than municipal projects, 68% and 44% respectively.
- The average number of days overdue was 78% higher for state projects (239 days) than municipal projects (134 days). At the same time, the average cost for state projects was \$4 million and \$765,000 for municipal projects.

Story Behind the Data: On-Time

- DOT does not have an automated project management system to adequately track projects through the design phase of the project delivery process. As a result, the department does not have aggregate information to base its overall performance of designing projects in accordance with established time standards. The department's ability to measure the project delivery process against specific standards also is limited because few performance standards exist for determining overall process timeliness or effectiveness. (Information about the few standards that are in place is provided later.)
- Project-specific data for major milestones within the design process were not available for the length of time to select design consultants, completion times for the preliminary engineering and preliminary design components, or the time necessary to complete the rights of way process. As such, the parts of the design process taking the longest time to complete or where areas for streamlining may be found, were not identified.
- Errors or omissions in project design can impact the overall ability to construct projects on a timely basis. The link between construction timeliness and preconstruction performance, however, is inadequate to determine what affect design errors/omissions have on construction timeliness. The department acknowledges more focus is needed in this area and is taking efforts to make improvements.
- A full analysis of consultant agreements to determine whether design consultants deliver their work in accordance with specific schedules included in the agreements was not conducted within this study due to time constraints. Thus, consultants' overall performance in meeting any established time frames within agreements is unclear.

- FHWA recently conducted a process review of the department's consultant selection process for projects using federal funds. The purpose of the review was to see if the process was in compliance with applicable federal laws and regulations. FHWA made several recommendations for improvement, but mostly found the department's process operated in conformance with federal requirements.
- A high percentage of transportation projects are granted extensions beyond the original completion deadlines specified in construction contracts. If time equals money, then the mere extension of a construction project is costing more than originally estimated. This fact makes the overall accuracy of the department's project design function to determine how long project completion will take that much more critical to an efficient project delivery process.
- The results of a 2007 AASHTO study show, for 15 states, an average of 53% of transportation projects were completed on or before their original schedule for 2001-05.³³ This compares to 37% of projects in Connecticut completed on or before their original schedules (for the time period of 2001-10).

Actions to Turn the Curve

Although efforts are needed by the department to decrease the overall number of projects not completed according to their original schedules contained in contracts and better estimate during the design phase how long projects should reasonably take, including building in time for unforeseen circumstances, the department is implementing specific efforts to help minimize projects not completed on time. Key initiatives currently implemented (or under consideration) to ensure projects are delivered on schedule and to make certain the results are transparent are outlined below.

- DOT just developed a performance measure for completing construction projects within schedule, and is beginning to report quarterly progress on the agency website as of October 2010. The department's first quarterly report shows:
 - 45% of the 29 total projects completed during the second calendar quarter of 2010 were completed on time (this is somewhat better than the 10-year average of 37% discussed above.)
 - The reasons cited for project time overruns are:
 - Changed Conditions: 25%
 - Utility Delay: 23%
 - Extra Work: 19%
 - Design Change: 14%

³³ AASHTO, *Comparing State DOTs' Construction Project Cost and Schedule Performance: 28 Best Practices from Nine States*, May 2007.

- Third Party: 11%
 - Weather: 7%
 - Permits: 2%
- Missing from the department’s new performance measure is the overall length of project delays and how much time the specific reasons for time extensions add to overall project delays.
- The department is currently considering developing another performance measure around project delivery. Specifically, the department’s five-year capital plan would be used to determine which projects the department would deliver (i.e., put to bid) in a given year. The department’s performance as to which projects were actually delivered would then be matched against which projects its capital plan said would be delivered.
- The department’s quality assurance office has begun working with project design engineers to help ensure the overall efficiency and effectiveness of the designers’ efforts to adequately estimate the completion times for projects. The office is also in the process of mapping the numerous steps associated with the project design function, which should provide the department with a work-flow schematic of the full project design process. This work is dovetailing OQA’s effort on developing a “design development guide” to ensure all the steps of the various design milestones are fully documented.
- In response to concerns raised by FHWA, the Bureau of Finance and Administration has undertaken a series of efforts to improve administrative efficiency in processing contracts and agreements related to DOT projects. These include aggressive monitoring of all processing times, regular interagency meetings to improve communication about reasons for delays and how to address them, better interagency communication (e.g., memoranda of understanding with the Office of Attorney General about contract reviews), and development of standardized legal documents, such as a master agreement with utilities and ARRA project construction contracts. The bureau also has drafted a master agreement to use with municipalities for project delivery, now under review by the attorney general’s office, and is working on a template for consulting engineering contracts.
- Additional project delivery process performance measures reported by DOT indicate success in these streamlining efforts. Specifically, between July 2008 and the second quarter (April-June) of 2010:
 - recent efforts by the department have been able to almost triple the percent of construction contracts awarded within 60 days of bid opening – from 30% to 86%; and
 - the percent of agreements (all types) executed in under 60 days increased from 28% to 47%.

To improve on-time performance, the program review committee recommends the following actions:

- **The Department of Transportation should continue to examine ways to streamline the time it takes to complete major milestones within the project delivery process. Once the agency's new integrated project management system is fully operational, targets for completing each major step of the design process should be set and monitored by the engineering bureau, with the assistance of the performance measures unit. Attention should be paid to: 1) the degree to which design consultants and staff engineers meet established deadlines for designing projects; 2) the process used by project designers to estimate the amount of time necessary for project completion to ensure such estimates are realistic; and 3) the advertising and contract bidding processes.**
- **The department should continue to fully focus on the link between project design and time extensions to project construction due to design errors or omissions, with the specific goal of increasing the department's performance for completing projects in accordance with their original schedules.**
- **DOT should set a yearly performance goal for delivering transportation projects within schedule for construction purposes, rather than continuing to use its recently-established standard of "maximizing percent of construction contracts completed on time." The department's performance toward achieving the new goal should be part of its current initiative to measure project completion performance. The goal should be realistic and re-evaluated at least annually.**
- **The department should add the following components to its current measure for on-time project delivery performance: 1) the aggregate times projects are taking to complete beyond their original deadlines; and 2) the aggregate amount of time each reason for scheduling extensions (as identified in the department's current measure) adds to the overall time for completing projects.**
- **The department should begin benchmarking its performance for delivering transportation projects on schedule with the performance of other states for comparative purposes. DOT should identify best practices used by states with better project completion performance, and determine whether to implement such practices within its project delivery process.**
- **DOT should include on its website a "watch list" of all projects approaching time overruns for the design and construction components of the project delivery process.**

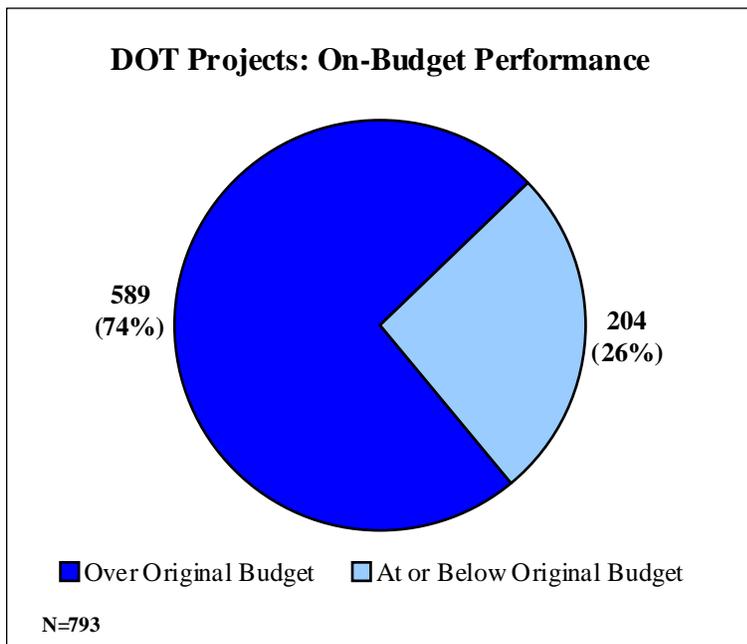
Projects Are Completed Within Budget

The following analysis uses two primary methods to determine whether projects are delivered within budget. Using the same data base of 793 transportation projects with final voucher dates between 2001-2010, a comparison was first made between a project's original cost (i.e., contractor's bid amount) and the project's final construction cost – this is referred in the analysis below as the strict measure of on-budget performance. If the comparison showed either a zero or negative difference from the original cost, the project incurred no cost overrun and was completed within its original budget. Conversely, if the final project cost was more than the original budget, the project incurred a cost overrun, which happens through change orders made to the project.

Second, according to general industry practice, a contingency may be added to the original contract amount before a project is considered over budget (DOT uses a ten percent contingency, which is a common standard). The contingency is to cover unanticipated overruns, which may occur because of unknown issues encountered during project construction not predicted during the project design phase. Incorporating the ten percent contingency into the analysis of on-budget performance is referred to below as the lenient measure.

Performance Measure 1: On-Budget Performance (Strict Measure)

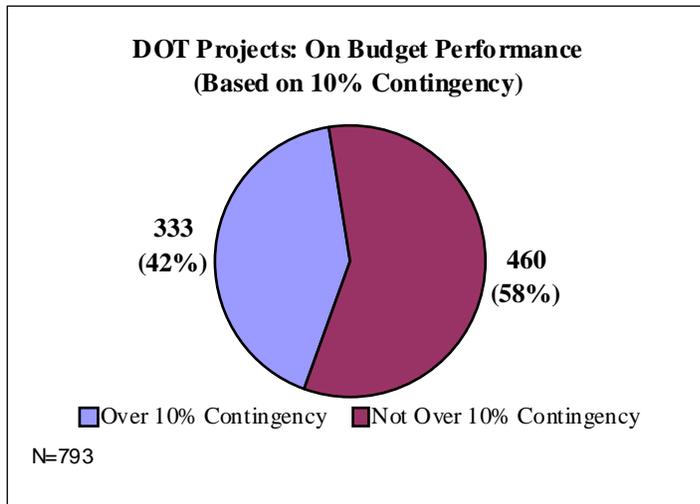
Information from the database was examined to determine if the projects were completed within their original budgets. The figure illustrates the number and percentage of projects experiencing cost overruns using the strict measure that any project with final costs over its original contract amount incurred a cost overrun.



- 589 projects (74%) incurred some degree of cost overrun when original construction budgets were compared against costs.
- The average cost overrun for projects over budget was 23% and the median was 12%.
- Another 204 projects (26%) did not incur any cost overruns – meaning they either met or were below their original budgets. Of those projects completed *below* budget, the average amount under budget was 8% and the median amount was 5%.

Performance Measure 2: On-Budget Performance (Lenient Measure)

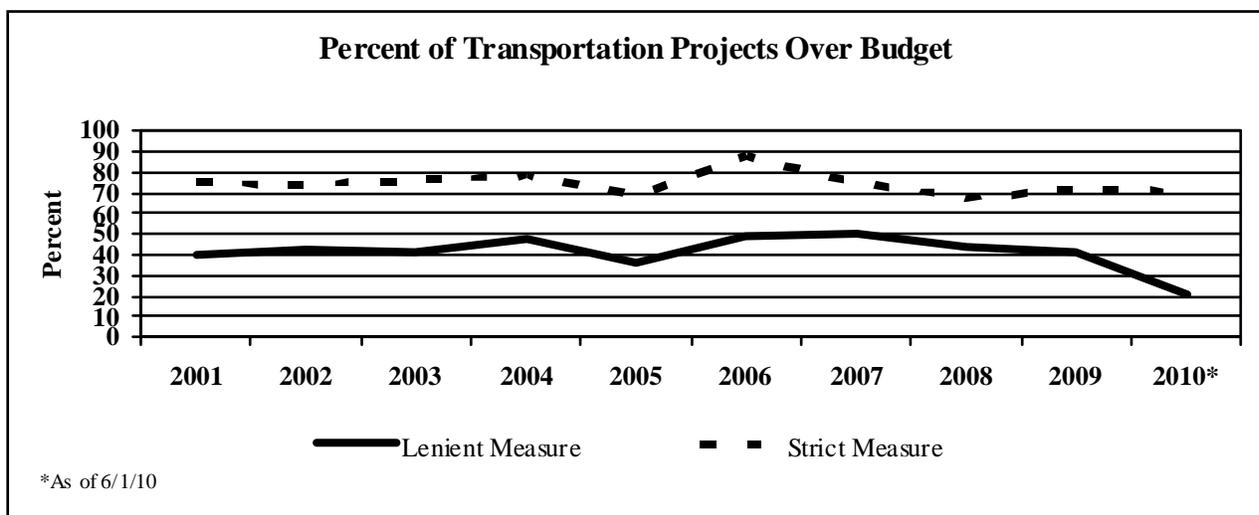
As noted above, Connecticut builds a 10% contingency into its transportation project budgets. The contingency is intended to help offset costs associated with project construction not anticipated as part of original project design. According to DOT’s construction manual, the reasons why projects may go over budget are unforeseen condition, change in project scope, contract revision, quantity adjustment, or other adjustment.



- 333 projects (42%) were over their original budgets by more than 10%.
- The average cost overrun for the 333 projects over budget was 37% and the median was 21%.
- 460 (58%) projects were completed within 110% of their original project budgets. The amount *under* budget was very small (0.6% average and 1.1% median).

Performance Measure 3: Trend in Projects Over Budget

Project information was analyzed to identify trends in the percent of projects incurring any cost overruns using both the strict and lenient measures. The committee believes the results shown in the figure provide a truer picture of project budget overruns over time when both measures are compared. Overall, the trend in projects incurring cost overruns for both measures is mixed for the period analyzed. However, using the lenient measure, the percent of projects experiencing cost overruns over 10% has substantially decreased since 2007.



*As of 6/1/10

- On average, 42% of projects over the period incurred cost overruns of more than 10% of their original costs and the percent of projects incurring cost overruns of more than 10%, decreased 49% overall, with the sharpest decline occurring in 2010.
- The highest percentage of projects with cost overruns of more than 10% of their original cost occurred in 2007 (50%), and the lowest percent occurred in 2010 (21%).
- Each year, roughly one-third more projects are over budget when applying the strict measure.

Performance Measure 4: Projects Over Budget by Project Size

The original budgets of transportation projects were analyzed to identify the variation in cost overruns based on project size. Projects were classified according to three budget levels: over \$20 million; \$5 million to 20 million; and less than \$5 million. This analysis represents projects with final costs more than ten percent over their original contract amounts (i.e., lenient measure).

Original Project Budget	Total Projects	Projects with final costs over 10% of original budget	Average % Overrun (w/ 10% contingency)	Median % Overrun (w/ 10% contingency)
Over \$20 million	24	17 (71%)	25%	19%
Between \$5 million and \$20 million	72	46 (64%)	28%	21%
Less than \$5 million	697	270 (39%)	39%	21%

- A greater percentage of the largest transportation projects were delivered over budget accounting for the 10% contingency. Seventy-one percent of projects with original costs exceeding \$20 million were over budget, compared to 64% of projects with original costs between \$5 million to \$20 million, and 39% with costs of less than \$5 million.
- On average, the cost overrun percentage was highest for projects with original budgets under \$5 million (39%) followed by projects between \$5 million to \$20 million (28%), and then projects over \$20 million (25%), although there was little difference in the median cost overrun (19-21%). This signifies that from a percentage standpoint, design estimates were closer to projects' original budgets as project size increased.

Performance Measure 5: Project Budget Performance by State or Local Project

The transportation project data base identifies municipal projects receiving federal funding overseen by the state. DOT has a stewardship agreement with FHWA to oversee such municipal projects to ensure the funding is appropriately used and projects meet federal standards. The information was analyzed to compare the level of cost overruns for projects delivered by the state or municipalities.

Project Category	Total Projects	Projects with final costs over 10% of original value	Average % Overrun (w/ 10% contingency)	Median % Overrun (w/ 10% contingency)
State	617	260 (42%)	35%	19%
Municipal	176	73 (41%)	43%	22%

- The results show the percent of projects incurring cost overruns was almost the same whether the state or a municipality delivered the project. Overall, 42% of state projects had final construction costs over ten percent of their original budgets, while 41% of municipal projects had cost overruns of more than 10%.
- The average percent overrun for municipal projects was slightly higher than that of state projects, 43% and 35% respectively. The median percent overrun for the two entities was closer, with 22% for municipal projects and 19% for state projects.

Performance Measure 6: Cost of Project Budget Overruns

In addition to analyzing budget performance for the volume of transportation projects delivered, the overall costs associated with budget overruns for projects were examined. The analysis differentiates cost overruns based on the strict and lenient measures.

Strict Measure (cost overrun with no contingency)			
Original Project Cost	Total Original Project Costs	Total Project Overrun Amounts	Overrun as % of Original Project Cost
Over \$20 million	\$999,391,323	\$198,271,173	19%
Between \$5 million and \$20 million	\$665,804,104	\$153,267,055	23%
Less than \$5 million	\$674,696,355	\$140,095,194	21%
Totals	\$2,339,891,782	\$491,633,416	21%

- In total, cost overruns exceeded original project costs by \$491.6 million (21%) for the period examined.

Lenient Measure (cost overrun over 110% of original budget)			
Original Project Cost	Total Original Project Costs	Total Project Overrun Amount	Overrun as % of Original Project Cost
Over \$20 million	\$766,216,783	\$186,593,876	24%
Between \$5 million and \$20 million	\$485,041,980	\$142,679,093	29%
Less than \$5 million	\$387,764,420	\$125,101,591	32%
Totals	\$1,639,023,182	\$454,374,560	28%

- When accounting for the 10% contingency, the total cost overruns totaled \$454.3 million, or 28% of the total original value for such projects.

Performance Measure 7: Construction Claims

Another factor leading to construction cost overruns for transportation projects is claims brought against the department by contractors for a variety of reasons, including errors and/or omissions in project design plans. The claims information presented in the table below is provided for general descriptive purposes only, since it is difficult to fully analyze claims based on the limited information obtained by committee staff.

Year Contract Awarded	Total Amount Bid	Projects	Claims	% w/ Claims	Total Amount Claimed	Total Amount Settled	Settled/Claimed Amount
2005	\$271,249,045	45	4	9%	\$7,226,853	\$1,769,808	24%
2006	\$229,882,885	67	3	5%	\$2,517,991	\$1,520,000	60%
2007	\$341,342,126	42	3	7%	\$1,407,541	\$0	0%
2008	\$649,933,486	73	2	3%	\$922,373	\$85,185	9%
2009	\$933,581,289	69	1	1%	\$715,250	\$0	0%
2010	\$194,852,723	49	0	0%	\$0	\$0	0%

Notes: 1) "Year" represents the year a construction contract was awarded; 2) "# of claims" represents the number of claims received on those contracts awarded in that year, not when the claim was received (example: 3 claims were received in 2010 for contracts awarded in 2005, 2008, and 2009); and 3) "settled amount" is subject to change because the department may not have settled all the claims indicated.

- The number of claims was not large. Of the 345 contracts awarded between 2005-10, 13 claims have been filed against the department, or an average of under 4% for all the contracts.

- The total amount of the claims was \$12.8 million, with final settlements of \$3.4 million, or just over 26% of the original claims amount.

Story Behind The Data: On-Budget

- Project costs for individual transportation projects are examined within the department by project teams and as part of broader monthly project status meetings involving upper management. The department, however, has not routinely analyzed its entire project delivery system from a macro perspective to determine the level of cost overruns for transportation projects in comparison with projects' original budgets inclusive of design and construction. Data availability on project cost also varies by bureau, type of project, and funding source.
- Cost information, particularly when trying to isolate full project costs associated with state-designed projects, could not be identified, making it difficult to determine how much the in-house design function accounts of the project delivery process. As a result, overall performance information for how well the department does delivering projects within budget is not known for the complete project delivery process.
- The department has several systems in place to oversee project management and track project budgets. SiteManager and CORE-CT are two of the central automated systems used by DOT to track project progress and budgets.
 - SiteManager is an automated construction management reporting tool consisting of several integrated forms and reports to track projects in construction. Project records are maintained in a central database and accessible by the entire department; records hold important information for measuring performance. This system, however, automates only part of the project delivery process; additional automation of the project design component of the project delivery process is necessary. DOT is currently close to implementing such a system, which should allow it to fully capture relevant performance data applicable to project design.
 - Core-CT is the state's centralized financial management system. Within DOT, the system is used to track project costs on an individual basis for accounting and payment purposes, and has been fully operational for roughly two years. Additional work is necessary to ensure the system captures complete project financial information useful for measuring project performance.

- A recent joint effort between FHWA and DOT to examine cost overruns occurred in 2004.³⁴ The effort appropriately points out cost overruns “have a dramatic affect on the Department’s ability to fund and schedule transportation improvement projects.” Several key findings of the study include: 1) Connecticut faces a significant issue with respect to construction cost overruns; 2) depending on project cost, overruns for larger projects (over \$5 million) range between 20-40%; 3) projects of similar scope and complexity in the region experience cost overrun of generally 10%; and 4) eliminating all cost overruns may be unrealistic given the level of complexity of large transportation improvement projects. The committee developed numerous recommendations, many of which the department has/is implementing including the creation of a Quality Assurance/Quality Control unit responsible for ensuring quality design plans and specifications are developed, which should help lessen cost overruns experienced during construction.
- Engineers in the department’s Office of Quality Assurance develop their own project cost estimates. The office then compares its estimates with those of the lowest bids submitted by contractors. The table shows between FY05 and FY08, the OQA engineers’ project estimates were lower than the low bid totals by a range of 1.2% to 7.2%. This trend changed in FYs09 and 10, when engineers’ estimates exceeded the total of contractors’ low bid amounts – undoubtedly a sign of the overall economic conditions experienced the last two years and the challenge the department faces in predicting contractors’ bids in a difficult market. In addition, it is unclear as to the differences, if any, between the project cost estimates developed by OQA, and the estimates developed by the design engineers, because the information currently is not tracked.

Fiscal Year	# of Contracts	Total Engineers’ Estimates	Total Low Bid Amounts	Percent Low Bids Were Above/Below Engineers’ Est.
2005	46	\$212,631,411	\$223,826,249	5.26%
2006	56	\$213,425,354	\$228,817,622	7.21%
2007	64	\$448,002,649	\$453,524,034	1.23%
2008	64	\$515,027,817	\$532,638,179	3.41%
2009	70	\$948,027,074	\$918,727,952	-3.09%
2010	59	\$437,385,526	\$292,428,198	-33.14%
Averages	60	\$462,416,639	\$441,660,372	-3.18

- The department’s quality assurance office is examining contingency rates used by other states and how Connecticut compares with those states. As part of that review, an analysis will be conducted to determine whether different contingencies should be applied based on project cost and type (PRI endorses such an analysis by the department). It is unclear at this time when the results will be completed.
- When compared to the results of a review conducted by AASHTO in 2007, Connecticut’s performance for delivering projects within budget fared less favorably than the

³⁴ Construction Cost Overruns: Process Review, Federal Highway Administration/Connecticut Department of Transportation, June 2004.

performance of 20 other states included in the review.³⁵ The AASHTO analysis showed an average of 46% of projects were completed between 2001-05 at or below their original budgets, and 81% completed within 110% of original budgets. Projects completed in Connecticut based on the analysis presented above shows 26% of the projects were completed at or below their original budgets, and 58% of the projects were completed within 110% of original budgets.

- Available on-budget performance information from Massachusetts provides some additional context to Connecticut's performance³⁶ (although the committee cautions making direct comparisons without additional analysis). Massachusetts' performance for completing highway projects within original budget was 32 percent (FY06), 35 percent (FY07), and 20 percent (FY08). This performance is somewhat better than Connecticut's. Massachusetts defines on-budget as projects completed without the need for additional funds beyond the contract bid amount, which is the same as Connecticut's strict measure for on-budget performance.
- As noted earlier in the report, not having the authority for creative contracting may hinder the department from finding additional ways to deliver projects in more cost effective ways. Earlier committee recommendation to broaden the department's ability to use creative contracting methods is intended to allow DOT to deliver certain projects more in line with original budgets and avoid cost overruns.

Actions to Turn the Curve

The DOT project delivery process, in particular its ability to deliver projects within budget, is not administered in isolation of the department attempting to make improvements. Although the committee believes efforts are needed by the department to collect and analyze additional information related to on-budget performance, the department has put forth efforts to help ensure projects are delivered in a cost effective manner and to track the department's performance. PRI recognizes many of these efforts have recently been implemented and will need time before their success can be determined. Outlined below, are the key initiatives implemented within the department (or under consideration) to ensure projects are delivered within budget and to make certain the results are transparent.

- During the course of this study, DOT published an on-budget performance measure for construction projects and is beginning to report quarterly progress on the agency website as of October 2010. The department's first quarterly report shows the following:
 - 69% of 29 total projects completed during the second calendar quarter of 2010 met their original contract budgets (defined as the awarded value plus 10% contingency).

³⁵ See: *Comparing State DOTs' Construction Project Cost and Schedule Performance*, American Association of State Highway Transportation Officials, May 2007.

³⁶ See MassDOT Scorecard Archive, Massachusetts Department of Transportation-Highway Division.

- The reasons cited for cost overruns are:
 - Quantity adjustments: 53%
 - Unforeseen conditions: 19%
 - Contract revisions: 16%
 - Other adjustments: 8%
 - Changes in project scope: 3%

- Although capturing on-budget information is a positive step toward assessing overall project delivery performance, the department is reluctant at this time to establish a formal standard for its on-budget performance. As a result, the only goal is to improve from the previous quarter; information could be added to measure on-budget performance, including actual cost data, to broaden the measure and make it more meaningful.

- DOT conducts “constructability reviews” for its projects based on AASHTO best practice guidelines. A constructability review, as defined by AASHTO, “is a process that utilizes construction personnel with extensive construction knowledge early in the design stages of projects to ensure that the projects are buildable, while also being cost-effective, biddable and maintainable.”³⁷ The reviews are conducted by engineers within the department’s Office of Quality Assurance-Constructability Review Unit or on-call consultants with experience in conducting such reviews for complex projects (for the largest projects, construction industry personnel will be used for reviews.) The unit participates in all phases of development and construction of projects, from project scoping and initiation through construction. Engineers examine project designs with the intention of reducing construction costs which may lead to budget overruns, reducing delays and time extensions, reducing change orders due to design-related issues, improving contractor productivity, improving communication between project construction and design, and improving the quality of contract documents resulting in bids. DOT notes it is now conducting constructability reviews sooner in the project design phase to take advantage of any cost saving measures as early as feasible.

- A practice required by federal regulation as a way to help projects from incurring cost overruns is value engineering. Value engineering is a process conducted during project design that systematically reviews certain projects using a multi-discipline approach to identify potential cost savings for highway projects estimated to cost \$25 million or more and bridge projects with estimated costs of \$20 million or more. Additional objectives of the value engineering include: maintaining project function and scope; minimizing life cycle costs; and encouraging innovation. Value engineering may be applied to other projects as DOT deems necessary.
 - The value engineering program has been centralized within the department’s recently-established Office of Quality Assurance. The office has developed formal guidelines to administer the program. The office is now responsible for tracking proposed and/or implemented value engineering recommendations and

³⁷ Constructability Review Best Practices Guide, AASHTO Subcommittee on Construction, August 2000.

projected and realized cost savings from applying value engineering, with the goal of leading to more effective project designs and cost effective projects.

- The department has a process in place for districts to first notify the department's Office of Construction-Claims Unit via a specific form when any potential problems occur that may be caused by design errors, omissions, or oversights. The form is required when a construction issue is anticipated to increase the cost of a project by the lesser of five percent or \$100,000, or is deemed a significant issue by the Assistant District Engineer.
- Although the current process does not incorporate and/or report a comparative analysis of design estimates with final cost amounts, the department's quality assurance office is beginning to analyze and compare design estimates with bid amounts and final construction costs. The results of the analysis should help the department identify the degree to which construction estimates determined in the design phase are aligned with bid amounts and final construction costs. As described earlier, the department is close to implementing a new automated project management system which will allow it to capture design-related cost estimate data.
- AASHTO is putting together a new multi-state database which will include information about states' performance for delivering project within budget. The results should provide DOT with project delivery performance information from other states the department can then use to gauge its performance with other states.
- In the past, Connecticut's transportation department has not had a formal fiscally-constrained plan for developing and delivering transportation projects. At times, projects have been designed that the department could not realistically deliver within existing resources. This has changed with the department's recent five-year capital plan. The plan's purpose is to identify only those priority projects the department has the intention of delivering over a certain time horizon and within available resources. PRI believes such a plan will undoubtedly enhance the department's project delivery process.
- Several projects (e.g., the "Q Corridor" mega-project) are incorporating unique management methodologies not previously used in Connecticut to help ensure projects are completed within established budgets. The department is monitoring the relative success of such practices.

Based on the above analysis and findings, the program review committee makes the following recommendations intended to enhance the department's on-budget performance within the transportation project delivery process:

- **The Department of Transportation should begin analyzing its project delivery process with the goal of developing a system through which the department can fully determine the project costs associated with each major milestone of the project delivery process. The system should allow DOT to identify the level to which projects are completed within established budgets for each milestone. The results should be reported as part of the department’s performance measure for delivering projects on-budget.**
- **The department should establish a goal of having the lowest responsible bid amount be no greater than the design engineer’s estimate. Progress toward achieving such goal should be measured at least annually.**
- **DOT should set a yearly goal of delivering transportation projects within budget for construction purposes, rather than continue using its recently-established standard of “maximizing percent of construction contracts completed on-budget.” The department’s performance toward achieving the goal should be part of its current initiative to measure on-budget performance. The goal should be realistic and re-evaluated at least yearly.**
- **The department should add the following components to its current measure for on-budget performance: 1) the total dollar amount of construction cost overruns; and 2) the amount each reason for cost overruns (as identified in the department’s current measure) adds to overall project costs.**
- **DOT should sharpen its focus for analyzing project design cost estimates with bid amounts and final project costs to link the cost estimating process with overall project construction costs. The results should be included in the department’s performance measures as an indicator of estimating accuracy for transportation projects, and for use to continually improve the project estimating function.**
- **The department should continue researching whether it should set different contingency standards for projects based on project cost and/or type of project. Any changes to the current contingency level should continue to move the project delivery process toward delivering projects within original budgets.**
- **The department should include on its website a “watch list” of all projects approaching cost overruns (including applicable contingencies).**
- **The department should begin analyzing its performance on delivering transportation projects within budget with the performance of other states for comparative purposes. The results also should be used in helping develop appropriate benchmarks and standards for delivering cost effective projects.**

III. Is Anyone Better Off?

Successful project delivery is an important factor in whether the public receives the benefits expected from an implemented transportation system improvement in a timely, cost-effective manner. Delays, cost overruns, poor quality control and other delivery problems also can diminish expected positive impact of completed projects, such as safer travel reduced congestion, increased mobility, stronger economic growth, or better environmental quality. At the same time, a project can be delivered efficiently and effectively, but desired improvements still may not be realized. This could be due many factors outside project delivery, including changed conditions or problems with initial plans (e.g., the wrong approach for achieving the desired improvement was selected).

In summary, the PRI committee found:

- Overall timeliness of project delivery is just beginning to be tracked and reported by DOT.
- Cost-effectiveness cannot be determined; complete costs of projects from design through final delivery and data on project end results are not easily available.
- Customer satisfaction with DOT project delivery performance is not measured in any comprehensive way.

Project Delivery is Timely and Cost-Effective

Performance Measure 1: Project benefits achieved on time or sooner than scheduled

- As discussed earlier in this report, the full time to deliver transportation system improvements from initiation to final completion is not tracked and routinely reported

Performance Measure 2: Project implementation is cost-effective

- To determine cost effectiveness, it is necessary to know what it costs to deliver projects, examine the costs of project alternatives, and be able to quantify the end results of projects delivered. The data and other resources necessary for such analysis are not available.

Story Behind the Data

DOT is not unique in lacking the information needed to determine cost effectiveness. State agencies rarely have complete cost information or quantitative outcome data regarding their major programs and functions.

One of the goals of the state CORE-CT accounting system is to improve agency financial reporting in ways that permit better identification of all costs associated with agency programs and services. The transportation department's ongoing efforts to customize CORE-CT reporting should produce better cost data about the DOT project delivery process in the future. Implementation of the agency's new project management information system, and previous committee recommendations requiring DOT to analyze its internal and outside staffing resources, also will help.

The department collects and analyzes information about many aspects of the safety, efficiency, and condition of the state transportation system. For example, data about traffic safety, as required by the federal government, is gathered, analyzed, and reported by the department. Each year a small number of projects undertaken with the goal of improved safety are selected for in-depth evaluation of accident and other safety data, pre and post project completion.

DOT also maintains extensive databases about the use of state highway and public transportation systems as well as air quality conditions, primarily for federal reporting purposes. Periodically, agency staff use these data to analyze trends in a variety of outcomes, such as traffic congestion, bus and rail ridership, and tons of greenhouse gas emissions, following implementation of significant improvement projects.

Outcome data for individual completed projects, however, are not examined systematically by the department. This is due to several factors. One is the long implementation timeframe of most transportation projects. It is challenging, and sometimes expensive, to collect data that compares conditions before and after a multi-year project is delivered. Also, it takes significant resources to gather and analyze outcome data. Few state agencies, including DOT, have sufficient internal capacity to meet all their research needs. The use of external resources for research projects also has been curtailed significantly by ongoing state budget constraints.

Finally, there are no good tools for measuring some of the results expected from transportation projects. The only generally accepted method of assessing the economic impact of transportation system improvements is limited to job creation. A standard way of measuring environmental impact, which will just address air quality, is still in development by state and federal transportation organizations. The need for considerably more research in both these areas is well recognized.

Customer satisfaction. There is one relatively simple way to measure transportation project delivery results: ask for feedback from stakeholders. Research on transportation agencies with effective strategic performance management shows they focus on measuring and addressing customer satisfaction.³⁸

In a number of states, transportation agencies use surveys, focus groups, and sometimes even public opinion polls to gauge customer satisfaction. Stakeholders are asked to assess agency performance overall, and within major areas like project delivery. These state agencies use input from their customers to: help target resources to outcomes the public values and

³⁸ See, for example, AASHTO, *Strategic Performance Measures for State Departments of Transportation: A Handbook for CEOs and Executives* (NCHRP Project No. 20-24(20)), August 2003.

considers most important; improve relationships with stakeholders; and build transportation agency credibility. Several also have established performance measures and targets related to customer satisfaction.

DOT is viewed by federal agencies and many stakeholder groups as having a strong public participation program for planning. It is considered a leader in a recognized best practice for successful community planning called Context Sensitive Solutions (CSS). In contrast, feedback from the public, outside contractors and consultant, municipal/regional officials about project delivery or other aspects of agency performance is not regularly gathered or formally reviewed.

The department's written vision and values emphasize customer service and performance that exceeds customer expectations. At this time, however, DOT has no formal mechanism for assessing overall customer satisfaction and none of the agency's current performance measures address customer satisfaction.

Actions to Turn the Curve

The department has established some ways to obtain stakeholder feedback on a limited basis. At present, periodic surveys of rail service user satisfaction are conducted by the public transportation bureau. The bureau has used the results to target resources for rail system improvements. Also, the Bureau of Finance and Administration recently created an on-line survey for obtaining comments from outside contractors about its payment procedures.

DOT planning bureau personnel hold regular meetings with the state's regional planning groups throughout the year. Engineering and construction bureau staff have joint meetings with construction industry representatives, generally on a quarterly basis. Both efforts are used to obtain stakeholder feedback about a variety of issues including how well the agency is delivering projects and other aspects of DOT performance. The department also uses its website "contact us" feature as a way residents to provide comments about any problems or concerns they have related to the state transportation system.

In keeping with best management practices, the department should better coordinate its current efforts to obtain customer feedback. It also needs to elevate the importance of customer satisfaction for performance measurement. PRI recommends:

The DOT performance measures unit identify existing sources of customer feedback information throughout the agency and become a repository for all data related to customer satisfaction. Unit staff also should help managers in each bureau develop low-cost ways, such as focus groups and on-line surveys, to regularly obtain and use input from stakeholders to assess project delivery and other critical performance areas.

In addition, the department should establish and report on measures of customer satisfaction as part of the ongoing development of its performance measurement system.

Overarching Issues: Committee Findings and Recommended Actions

Project delivery performance by the state Department of Transportation is difficult to assess at present. As the above report card indicates, the quantitative data needed to address RBA questions about the outputs, efficiency, and outcomes of the department's project delivery process are limited, rarely centrally collected, and sometimes not available. DOT is not unique in this regard; good quality efficiency and effectiveness information is lacking for most state programs and agencies.

A further complication is DOT project delivery is not a discrete agency program with a single, cohesive management structure. As discussed in the October 2010 staff interim report, it is a complex, multi-phase process. Major aspects of project delivery are carried out by different units and offices located within all four operating bureaus and both administrative support bureaus of the department.

Given this structure, project delivery results tend to be tracked on a project by project basis and monitored by phase of delivery. Most current performance data about project delivery is reported by implementation status (e.g., initiation/authorization, design, construction, contract award, or close-out), and mainly for federal funding purposes. Extensive information about each project that DOT plans and implements is collected throughout the delivery process but little is aggregated. Efforts to measure and report about the department's overall project delivery performance in terms of time, cost, and quality are just beginning within the department.

Best practices. Based on PRI staff interviews with agency managers, federal officials, and contractor and consultant associations – plus review of DOT manuals and other written documents – it appears the department has adopted many project delivery best practices identified in a recent AASHTO study cited earlier.³⁹

For example, PRI staff observed progress and status meetings, attended by project design and construction staff and top managers, which are held regularly to discuss project schedule and budget performance. Reasons for cost and time overruns during construction are tracked for individual projects and analyzed using project management software. As discussed later, constructability reviews and value engineering, which help identify ways to reduce costs and expedite delivery, are carried out by agency quality assurance staff for selected projects. The Office of Quality Assurance (OQA) also provides support to design staff to improve estimating accuracy. In some cases, DOT has used financial incentives for early project completion by contractors.

Department efforts to expedite projects, contain cost overruns, and ensure quality with these best practices and other tools are described in the following performance measure discussions. The extent that project delivery best practices are being used in all bureaus or how well they are being implemented, however, could not be determined during this RBA assessment.

³⁹ Ibid, AASHTO, May 2007.

Sustaining Best Practices and Reforms

PRI identified several overarching challenges to successful DOT project delivery that need greater attention. Specific areas of concern, described more fully below, are: controlling project initiation; inadequate project management information; evolving quality assurance functions; the inability to use creative contracting approaches; and inefficient coordination of environmental matters. Current department efforts to address these challenges and PRI committee proposals for additional improvements also are discussed.

In general, these are problem areas recognized by current department leadership. They also reflect, to some degree, recurring themes cited in prior state and federal studies of the agency such as: the 2008 report of the Governor's Commission on Reform of the Connecticut Department of Transportation (the Critelli Commission); the 2007 independent consultant audit of operational failures for the I-84 construction project (the Hill report) that led to formation of the commission; and two recent reviews conducted by FHWA, one concerning preconstruction cost estimating (2002) and another concerning construction cost overruns (2004).

Major agency changes. It is important to note several broad initiatives the Department of Transportation has undertaken in recent years, primarily in response to the reforms called for by Critelli Commission and FHWA recommendations, have strengthened accountability for project delivery results. Chief among these agencywide changes are:

- clarifying the agency mission, vision, values, and priorities, as well as establishing a five-point strategic action plan in the last state transportation master plan (January 2009);
- centralizing financial functions, including all project payment processing and accounting, within the Bureau of Finance and Administration;
- establishing engineering and construction as a separate bureau focused on project delivery implementation;
- combining, expanding, and elevating quality assurance functions in a new office within the engineering and construction bureau; and
- instituting a performance measurement system.

Performance measures. The agency's current performance measurement system was established about two years ago. The purpose was to support better management decision-making based on data and linked to newly developed strategic goals and objectives. At present, DOT performance measurement efforts are led by the strategic planning division of the Bureau of Policy and Planning, and staffed by a four-person unit. Training and support have been provided to managers in all bureaus to assist them in creating and using relevant quantitative measures to assess their most important activities.

Since the agency published its first performance metrics report, "On The Move," in January 2009, progress reports have been issued each quarter and posted on the agency website. The performance measures unit continues to refine current measures and add new ones, in consultation with managers throughout the agency. Based on conversations with planning

bureau staff and heads of other bureaus, performance measurement seems well accepted by most department staff and valued by top managers.

The department also has begun to actively participate in the Appropriations Committee RBA process. For the first time, DOT has prepared program report cards using the committee's standard template and addressing two major public transportation programs, the statewide bus system and the Connecticut commuter rail system. Both will be used in the upcoming budget process.

Asset management. The department is shifting to another recognized best practice, using transportation asset management for investment decisions. Asset management, as described in a December 2008 report the Connecticut Academy of Science and Engineering (CASE) prepared for the department, is a strategic and systematic process for resource allocation based on well-defined objectives, performance measures, and quality data.⁴⁰

Under this approach, management decisions about acquisition, construction, repair, and preservation of assets are made from a systems and life-cycle cost perspective rather than a class-specific, worst-first philosophy. According to DOT, the goal of asset management is to make investments that reflect optimal performance of the whole transportation infrastructure compared to the resources required to operate and maintain it.

The CASE report found states that are leaders in the use of transportation asset management are seeing steady improvement in the condition of assets and more coherent, cost-effective allocation of resources. Connecticut DOT has been using an asset management approach with success for its roadway pavement and bridge maintenance system programs in recent years.

Sustaining improvement. With its many new best management practices and recent restructuring, DOT is moving in a positive direction for more successful project delivery. Much of the progress made to date is related to the agency's current commitment to performance measurement and establishment of a strategic, deliverable capital plan. A recent national report attributed the success of states considered models of effective project delivery practice, such as Washington, Virginia, Missouri, and Florida, to a combination of strong project delivery management and robust performance measurement systems.⁴¹

Strong performance measurement – in combination with strategic asset management and effective quality assurance – is the basis for ensuring DOT delivers projects on time, on budget, and in compliance with all relevant standards. A focus on results is also needed to position the department to respond to new requirements for federal funding. Much federal public transportation funding now is provided through competitive grants and FHWA funding is expected to be more performance-based in the future. While reauthorization of federal transportation aid legislation is still pending in Congress, it is clear states will be required to

⁴⁰ CASE, *Applying Transportation Asset Management in Connecticut*, December 2008.

⁴¹ Scan Team Report 07-01 supported by the National Cooperative Highway Research Program, (NCHRP Project 20-68A), *Best Practices in Project Delivery Management*, October 2009.

demonstrate they can deliver projects efficiently and effectively to maximize the funding they receive.

Upcoming changes in agency leadership, ongoing state budget constraints, and another large wave of retirements could pose challenges to sustaining strong performance measurement efforts. One way other states' transportation agencies have institutionalized performance measurement is to establish a forum for regular review of performance measure results by senior management including the chief executive officer. To ensure progress toward data-driven management of the state transportation system continues and becomes embedded in DOT, the program review committee recommends:

DOT create a performance measurement results steering committee comprised of top managers representing each bureau. It should meet quarterly with performance measures staff and the commissioner to review and discuss current results data, identify successes and problem areas, and direct actions to improve outcomes.

The committee believes the RBA approach offers another way to focus agency management on results and strategies for achieving them from a system perspective. Much of what the department is doing now to measure and manage performance is consistent with RBA principles. For example, its current quarterly performance measure reports, in essence, are program report cards. Similarly, efforts by DOT and other state transportation agencies to address national performance standards and their broad, population-level indicators of progress, parallel the quality of life results accountability aspect of Results Based Accountability.

The department plans further development of its performance measurement system with more and better data about project delivery and other agency results. A stronger connection between performance, funding decisions, and strategic goals also is intended. This is the same purpose of the RBA process carried out by the Appropriations Committee. The committee believes the department's current RBA and performance measurement efforts could be combined to reduce duplication of effort and promote a better partnership with the legislature. The PRI committee recommends:

The department incorporate RBA as a primary tool for promoting performance measurement and management for results throughout the agency.

Project Initiation

One of the department's most important steps toward improved project delivery was the creation of a fiscally constrained five-year capital plan in January 2010. For the first time, DOT prepared a capital improvement program that prioritizes project implementation based on available resources and asset management principles.

In its constrained capital plan, the department: outlines anticipated total funding for 2010 to 2014; identifies ongoing projects with committed funding that must be completed; and recommends the small balance of uncommitted funding be applied to what it believes are the

state's most critical highway system preservation and public transit projects over the next five years. The plan also includes the agency's extensive list of needed preservation and modernization projects that cannot be funded within the next five years, as well as another list of major long-term initiatives currently without any identified funding sources.

By developing a fiscally realistic program of capital improvements, the department addressed a major obstacle to successful project delivery: past overprogramming. Up until this time, transportation projects often have been authorized to begin design without full consideration of the resources needed to support them through final delivery. As a result, more projects have been initiated than can be funded and completed within reasonable timeframes. The constrained five-year plan establishes a more manageable and deliverable capital program for the agency.

The current plan is a first step in the department's effort to control project initiation. Proposed initiatives traditionally have come from many internal and external sources with differing priorities, including the managers of each bureau, the agency's planning office and the regional planning groups it works with, safety and traffic research, and municipal and state officials. At present, DOT has no formal process or standard criteria for determining which proposed improvements to the state transportation system should be implemented and when.

The agency's lack of a consistent approach to defining, approving, and designing projects has been an ongoing concern of FHWA and DOT leadership. According to both federal and state agency staff, this contributes to extended completion times, inefficient use of staffing resources, and unmet public expectations because too many non priority or undeliverable projects are initiated.

New process. During this study, the department began a project to create a central clearinghouse for project initiation and scoping. The head of the Bureau of Engineering and Construction is leading this effort, with the help of quality assurance office staff and in consultation with other top agency managers.

According to department staff, project initiation will be a joint effort of the financial, engineering, and planning bureaus in the future. The goal is to better coordinate projects with cash flow and allocate resources, both staff and funding, according to state priorities for the transportation system.

Written guidelines will be established to define roles, procedures, and policies for selecting and scheduling all DOT capital improvement projects. By establishing a formal initiation process, the department expects to better control the flow of new projects to match available funding and ultimately improve project delivery performance.

Under current plans for the new process, all proposed projects would go on a central "Needs List." Every project on the list would be required to have a detailed total budget and financial plan covering all phases of its implementation. Summaries of each project outlining costs, the nature of the improvement, and possible funding sources also would be prepared. Engineering staff would have primary responsibility for developing the total budget and scope information for the projects on the needs list.

On an annual basis, the commissioner, with other top managers, would identify priority projects from the needs list to be initiated as new work. Criteria for and techniques to assist in prioritizing projects on the needs list would be developed by the planning bureau staff responsible for performance measurement and asset management. Using the required total project budget data, the finance bureau also would analyze all priority projects from the needs list and make recommendations for final selection based on the agency's overall financial resources and budgetary goals.

Major changes to its design development approval process also are under consideration by DOT. In conjunction with a federal initiative to improve completion times and contain costs, the department is examining adoption of a two-step process for project initiation. Projects could be authorized to begin design but additional approval to proceed would be required once plans reach the 30 percent phase. At this point in design for most projects, the impact of rights-of-way and environmental issues are more clearly known and there is a better sense of the cost commitment required for completion. If a project seems too costly or a better investment is possible, DOT can decide not to proceed with further design.

PRI believes the new project initiation process and alternative approach to design development are major steps in the right direction for better project delivery results. Improving project initiation and design development will result in a capital program that can be more effectively managed and measured. Prioritizing projects with broad strategic objectives in mind also should promote a more programmatic, cross-bureau approach to investment decisions. The PRI committee recommends

The department continue developing the centralized project initiation process and have it in place through a formal department policy statement by July 1, 2011. This process should be used to maintain and regularly update the agency's five-year capital planning document.

Project Management Information

Best practice research demonstrates successful project delivery requires dogged attention to schedule, budget, and quality, from design through final completion. Current automated systems at DOT do not support strong project management and oversight throughout the entire delivery process for its transportation system improvements.

Information systems within DOT for managing design development are especially weak. Effective coordination between the preconstruction and construction phases also is impeded by the agency's lack of up-to-date project management tools and technology.

Current systems. At present, the data needed to track a project's progress from initiation through completion are not integrated. Information about the size, scope, purpose, and implementation status of projects is maintained in a number of different automated systems. In addition, a variety of databases for specific tasks involved in project delivery (e.g., contractor claim processing, execution of contracts and agreements, and environmental permitting) that supplement these existing systems have been created by various managers throughout the

department. Some aspects of the project delivery process still are not captured by any computerized system (e.g., timeframes for consultant selection).

Most funding and general descriptive information for active DOT projects is centralized in CORE-CT, a computerized financial/administrative information system used by all state agencies. However, detailed information related to the design or construction status of a project must be extracted from at least three other electronic sources. These include:

- the agency's federal obligation plan, a database maintained by the finance bureau that includes funding and work schedule information for active capital projects receiving federal aid;
- the design staff's engineers job log, an in-house software program than can provide certain scheduling information related to design milestones and submittals and more descriptive information about projects in design; and
- SiteManager, a commercial (AASHTO) software product used by the DOT construction office, to track time, cost, and work quality information for projects it administers.

Currently, there is no software program like SiteManager to systematically track the timeliness or costs of the design process. A former DOT mainframe system used for project accounting for federal funding purposes served as the primary tool for tracking implementation of projects during the design phase. That system was retired when the department completed the transition of all financial processes and data to the CORE-CT system in 2008.

Originally, it was thought CORE-CT could perform the design phase monitoring function, but that has not proved feasible. Despite the department's ongoing efforts to customize it for a variety of transportation project reporting purposes, CORE-CT cannot be used to manage construction projects during preconstruction.

The agency's current preconstruction process involves many steps that can take significant amounts of time to complete. According to the department staff, just designing a typical project of average complexity to the point of final plans can take one to two years. Rights-of-way activities, if needed, may take up to a year and environmental issues can add at least six to nine months to the preconstruction phase. The Bureau of Finance and Administration reports, at best, it takes six to nine months to completely process an agreement for outside professional services. This is from the time permission to hire a consultant is received from the commissioner, through the selection and negotiation processes, to the point all external approvals of an executed contract are complete.

At present, there is no systematic way to track a project through the preconstruction process to determine if delays are occurring and how the department should address them to expedite delivery. In addition, the department's current software program for preparing estimates, as well as the existing data warehouse for supporting item price estimation, bid monitoring and evaluation, and vendor and market analysis, are outdated and underutilized.

In general, the department has devoted more attention and resources to managing projects while they are in construction than during the design phase. This is understandable given the significant costs and direct public impact of transportation construction projects. DOT estimates design accounts for about nine percent, on average, of total construction project costs.

An efficient and effective design process, however, is the foundation for successful delivery of a completed project. The longer the time between design completion and the start of construction, the less reliable preconstruction estimates of construction costs and completion times become. Outdated or inaccurate estimates are poor guides for controlling construction budgets and schedules.

A disconnect between DOT design and construction processes for projects completed over the past ten years is evident. PRI staff analysis presented in the following section shows there has been little relationship between original budgets and schedules set during project design and the actual costs and times to complete projects. The department, partly in response to FHWA concerns, is working to improve the accuracy of its project cost and time estimates and better control the design phase of project delivery.

New information system. Many of DOT's project management deficiencies should be addressed by implementation of a new integrated information system for the preconstruction and construction phases of delivery. Planning for this new system, with the help of an AASHTO consultant, began in 2008. First, an analysis was conducted of: all existing systems and software products; selected reports they generate; and current workflow and information exchange among DOT units with project delivery roles.

Through a Request-for-Information process, it was determined the best approach would be to upgrade and expand current products with "Trns*Port AASHTOware Suite," a comprehensive automated project management system in use by many state transportation agencies. Implementation of system upgrades and new components was expected to begin during 2009. Due to state budget constraints, the department was directed to postpone the project.

At this time, the department is authorized to proceed and is updating the project's scope. The current plan is to start phasing in the new system over an 18-month period beginning at the end of 2010 or in early 2011.

According to the department, the new system will consolidate planning, estimating, preconstruction engineering and design, contract letting, and construction support processes for all capital improvement projects. It will eliminate a number of manual processes as well as permit automated project management of all types of projects, whether state or federally funded, during every part of the preconstruction and construction phases of project delivery.

Two important additional benefits of the new system are:

- significantly improved quality and consistency of project estimates prepared either by consultants or in-house staff; and
- utilization of electronic bidding.

The department estimated that anticipated savings produced by the new system, primarily from improvement to the bidding function, outweigh system implementation costs (\$1.5 million) by a 4:1 ratio.

States that are strong project delivery performers have project management systems that integrate performance information from every phase of project delivery and support effective oversight of design and construction. They also set targets and monitor times for completing each critical component of the preconstruction and construction process. Several state transportation agencies set goals for getting projects through design and ready for bid, as well as for completing construction once a contract is awarded.

Implementation of the integrated project management information system is essential to improving DOT project delivery performance. Once in place, it will allow the agency to track all the critical milestones of project delivery so it can more quickly identify and address problems that may cause delays, increase costs, or compromise quality. It also will provide much-needed support for better project planning, scoping, and estimating. The PRI committee recommends:

Implementing the new integrated project management system as scheduled be a top priority of agency leadership. Also, the department should ensure the new system will be able to track all major steps of the preconstruction process, including: consultant hiring; agreement execution; rights-of-way and utility relocation milestones; and timeframes for environmental reviews and permitting.

Quality Assurance

A strong quality assurance function is central to successful project delivery. Quality assurance is commonly defined as systematic examination or verification that policies and procedures for controlling project quality are implemented effectively.⁴²

Over the past two years, DOT has taken many steps to strengthen its quality assurance effort. Most significantly, it created a high level Office of Quality Assurance within the Bureau of Engineering and Construction, currently staffed by 36 positions. While its role, responsibilities, and resources are still evolving, the quality assurance office appears to be positioned to become an effective support for better project delivery results.

The office carries out a number of well-accepted quality assurance and continuous quality improvement activities. Specifically, it is responsible for constructability reviews, value engineering, and checking the quality of all plans, specifications and estimates prior to bidding. The office also conducts analysis of all bids and provides support for project development, helping design staff with project scoping and estimating. As noted earlier, it has a central role in developing the agency's new project initiation process.

⁴² Based on quality assurance and quality control guidance documents published by FHWA, AASHTO, and the Construction Management Association of America.

One division of the office is focused on supporting the application of engineering and construction technology to the agency's project delivery process. To date, it has established electronic design standards and supports for computer-aided engineering and construction applications. Progress is being made toward fully digital design deliverables and intermediate submissions (e.g., preliminary and final designs, specifications, as-built plans), which should greatly enhance the efficiency of the design process. The technical division also is overseeing implementation of the department's new integrated project management system, an essential tool for better project delivery as discussed above.

Process reviews. The committee believes one of the most valuable functions of the quality assurance office is performing process reviews. Office staff can be assigned to take an objective and systematic look at of any aspect of the project delivery process to identify ways to improve efficiency and effectiveness. Analysis and better documentation of all processes essential to project delivery has been directed by FHWA. Process mapping of all core agency activities for streamlining and improved accountability also was a central recommendation of the Critelli Commission and one the program review committee endorses.

At this time, no staff are dedicated to the office's process review function. Efforts are occurring on an ad hoc basis by some of the office managers in addition to their other duties. For example, an OQA staff person who works on scoping, estimating, and bid analysis support also is examining the design process and preparing a guide for design development. This process review should make a significant contribution to better management of the time, costs, and quality of design phase of construction projects. It will also produce the documentation the design phase of the process that FHWA is seeking.

Lessons learned. The quality assurance office is using the results of its constructability reviews and information gathered through change order analysis and post-construction reports to identify lessons learned about practices that promote success and ways to correct and overcome delivery problems. A database of lessons learned is being developed and will be accessible to all staff on the agency website in a few months. It will be regularly updated, more complete, and easier to use than the running list that is currently available.

The office's constructability staff receive and review the post construction report forms that are prepared for every completed project. These forms provide the project field staff's: 1) assessment of contractor compliance and workmanship during construction; and 2) perspectives on any major issues that impeded delivery and ways they were addressed. OQA staff try to use the forms as the basis of a feedback loop between construction and design. When design errors or omissions, unclear specifications or plans, or poor communication seem reasons for project failures, quality assurance staff try to facilitate discussions between design and construction staff to find ways to address similar matters in the future.

The quality assurance office is supportive of expanding opportunities for sharing lessons learned and using the results to improve project delivery. It notes, however, that staffing for this purpose is limited at present. PRI believes the office should apply its resources to one new type of lessons-learned activity based on a successful FHWA practice.

As part of the FHWA process review of the DOT construction cost overruns completed in 2004, the study committee conducting the review asked each district to pick five recently completed projects of different sizes that were representative of typical issues encountered during the normal construction process. The committee then selected three from each district for more in-depth review. Project personnel representing each district met as a group with the committee to make brief presentations about each project and have discussions about problems and common themes. The group then had a brainstorming session to identify major concerns that were considered to be main drivers of cost overruns. Possible strategies for addressing them also were discussed and a list of recommended corrective actions was developed.

The committee believes this approach to lessons learned would be a valuable exercise for the quality assurance office to conduct at least on an annual basis. The process could be used to focus on different aspects of project delivery that the quality assurance office or others in the department have found to be problem areas, such as effectively addressing environmental matters, or highlight successful innovative practices, like the project management team approach used for the department's current "megaproject", the I-95 New Haven Harbor Crossing Corridor Improvement ("Q Corridor") program.

Lessons-learned meetings could include invited members of the public, for at least a portion of the group discussion, to get customer feedback about project delivery success. They could even be used to evaluate, at least informally, benefits produced by the completed projects. The program review committee recommends:

The quality assurance office organize and sponsor a lessons learned event to evaluate project delivery success for a sample of completed projects at least annually.

Performance measures. Data needed to assess the impact of quality assurance office functions, such as accuracy of design estimates and cost-savings from constructability reviews and value engineering, are just beginning to be compiled and reviewed. Beyond lessons learned, information about the level of work quality or compliance with environmental and other standards during the construction process is not regularly compiled and reviewed.

Some potential sources of project quality data have yet to be tapped. For example, contractor and consultant evaluations containing ratings of their project delivery performance are prepared at the completion of every project. Contractor performance ratings were recently added to the SiteManager database of active construction projects maintained by the Construction Office. However, neither the contractor nor consultant performance evaluations are systematically used as measures of completed project quality.

Although stronger coordination is planned, quality assurance efforts are not yet well integrated with the agency's performance measurement system. This is partly because both the quality assurance office and the performance measures unit are relatively new and still developing their organization and operations. A good connection between the two, however, is needed to promote effective continuous quality improvement and better accountability for project delivery results. At minimum, the program review committee recommends:

The quality assurance office work with the performance measures unit to develop quantitative measures of compliance and quality for projects the department delivers. As a first step, quality assurance and performance measurement staff should compile, review, and summarize the results of evaluations of contractor and consultant performance to share with top agency managers.

Creative Contracting Authority

Design-build and other innovative alternatives to traditional design-bid-build contracting have become widely accepted tools for expediting delivery of transportation projects. Design-build, as well as cost-plus-time bidding (A+B), lane rental, and warranty clauses, are contracting methods endorsed by FHWA. Creative contracting alternatives like design-build are recommended as ways to make good projects better, in a recent AASHTO publication on successful project delivery.⁴³

All but three other states currently use design-build contracting in some form for their transportation construction projects. At present, DOT does not have statutory authority to use design-build or any other types of creative contracting to carry out its capital projects.

Under the design-build method, the design and construction phases of a project are combined into one contract and awarded on either a low-bid or best-value basis. With a single contracting process, procurement time is reduced. Responsibility for cost efficiencies and construction risks rests with the contractor rather than the state agency. With the contract price fixed and typically schedule-driven, creativity and a cooperative working relationship between the designer and contractor is encouraged. There are potential cost savings from innovations fostered by the team environment and from reduced construction claims and litigation.

The benefits of the design-build approach are well documented by national and other state studies. A 2006 federal report showed design-build project delivery, compared with design-bid-build: reduced overall duration by 14 percent, lowered total costs by 3 percent, and maintained the same level of quality.⁴⁴ Cost-savings, however, varied by type, size, and complexity, indicating the importance of having a good methodology for deciding when to use design-build.

A June 2010 report prepared for the department by the Connecticut Academy of Science and Engineering evaluated the design-build method potential benefits for DOT project delivery.⁴⁵ The evaluation found design-build offered the following primary advantages: shortened project delivery times; greater price assurance (e.g., reduced change orders); and the potential for innovative design. The main disadvantages were high costs for proposer bid preparations and, if best value rather than low bid is used, a subjective contract award process. In addition,

⁴³ AASHTO, *Smart Solutions: 50 Ways America Just Got Better: Highlighting America's Transportation Awards*, 2009.

⁴⁴ FHWA, *Final Report: Design-Build Effectiveness Study – As Required by TEA-21 Section 1307(f)*, January 2006.

⁴⁵ CASE, *The Design-Build Contracting Methodology for Transportation Projects: A Review of Practice and Evaluation for Connecticut Applications*, June 2010.

environmental permitting could be a significant challenge with simultaneous design and construction activity.

CASE concluded, however, that the department should be able to use design-build contracting. It was noted design-build is not suitable for all projects and a careful selection process would need to be developed to ensure effectiveness. Department staff, as well as state contractors and design firms, would need training in alternative contracting techniques. Resources dedicated to proper oversight and support of design build projects also would be required.

The committee believes the ability to use creative contracting methods offers opportunities for significant savings in the time and costs of DOT project delivery. Over the past several years, the department has requested but not received legislative approval for statutory changes to its contracting authority. As noted in the CASE report, the main obstacle to giving the department authority for alternative contracting methods has been the legislature's lack of confidence in the agency's ability to properly implement them.

Phasing in authority for design-build and other approaches could be a way to address legislative concerns. In discussions with PRI staff, the department management indicated the best approach for implementing creative contracting at DOT would be to start with using design-build with on a pilot basis. Given current resources and DOT staff's lack of experience with alternatives like design-build, the agency would most likely use an outside expert to manage the pilot project and provide training to department The PRI committee recommends:

Legislation be enacted to permit the department to use design-build and other alternative contracting approaches on pilot basis. Prior to project initiation, the department shall submit a project, and the criteria used to select it as a pilot for design-build or other alternative contracting method, to the legislature's Transportation Committee for review and approval. DOT also shall evaluate the delivery success of the pilot project in terms of timeliness, cost, and quality, and report the results to the Transportation Committee within three months of project completion.

Environmental Matters

Research indicates the following components can add significant time to transportation project delivery: environmental review and permitting processes, rights-of-way acquisition, and utility relocation. Committee staff focused its efforts on examining the environmental process, which is a key component of project delivery. Transportation projects are subject to two environmental processes before construction: review to determine the level of environmental documentation necessary before project design can begin, and environmental permitting prior to construction.

Environmental reviews. The department's Office of Environmental Planning (OEP), within the Bureau of Policy and Planning, is responsible for reviewing proposed transportation projects to determine their potential impact on the environment. OEP has five full-time staff

responsible for conducting environmental reviews, and uses consultants when necessary for either limitations due to workload or help with more technical reviews.

As discussed in the committee staff’s interim report, environmental reviews establish the level of documentation necessary to determine the anticipated environmental impact based on the initial scope of the project. The results of environmental reviews are classified according to three levels:

- categorical exclusion: no significant environmental impact;
- environmental assessment needed: initial environmental impact cannot be determined without additional assessment, resulting in either a finding of no significant impact or initiation of a detailed environmental study; or
- full-scale environmental study needed: required according to the Connecticut Environmental Policy Act (CEPA) or the National Environmental Policy Act (NEPA).⁴⁶

Information obtained from DOT on the number of environmental reviews conducted and the number of projects by environmental review classification, is shown in the table below. As the table indicates, 650 (98%) of the 663 environmental reviews conducted by OEP between FYs 2005-09 resulted in categorical exclusions – meaning the project, as currently planned, would have no significant impact on the environment. Less than 3 percent of all DOT proposed projects reviewed by OEP were classified as needing a full environmental review under CEPA or NEPA, meaning very few proposed projects require extensive environmental study.

DOT Environmental Reviews: 2005-09.						
	2005	2006	2007	2008	2009	Totals
Env. Reviews Requested	73	119	133	107	234	666
Env. Reviews Completed	73	116	133	107	234	663
Categorical Exclusions	70	112	128	106	234	650
Environmental Assessments	0	1	3	1	0	5
Full-Scale Environmental Review: EIE (CEPA)	3	4	3	3	0	13
Full-Scale Environmental Review: EIS (NEPA)	1	1	1	0	0	3
Source of data: DOT Office of Environmental Planning						

Upon classifying the project, DOT (or private consultant) conducts the appropriate level of environmental review. Committee staff received DOT data regarding the overall time

⁴⁶ Projects requiring a full-scale environmental review and receiving federal aid must follow the requirements under NEPA, while state-funded projects follow the CEPA requirements. The results of any NEPA review satisfy the CEPA requirements. Outcomes for environmental reviews conducted for projects solely funded with state funds result either in a categorical exclusion or an environmental impact evaluation.

necessary for OEP to complete environmental reviews. Information from the department, however, is approximate completion times. Overall, environmental reviews averaged:

- Categorical Exclusions: 8 weeks
- Environmental Assessments: 78 weeks (1.5 years)
- Environmental Impact Evaluations (CEPA): 78 weeks (1.5 years)
- Environmental Impact Statements (NEPA): 156-260 weeks (3-5 years)

Environmental permits. Transportation projects may require one or several environmental permits issued through the Department of Environmental Protection (DEP), U.S. Army Corps of Engineers (ACE), or the State Historic Preservation Office. The bulk of the permitting process for transportation projects occurs within DEP's Inland Water Resources Division and the Office of Long Island Sound Programs.

The DOT Office of Environmental Planning located within the Bureau of Policy and Planning is the department's central clearinghouse for transportation project permit applications. Although the actual information contained in permit applications comes from state or consultant design engineers, depending on who has lead responsibility for project design, OEP is responsible for determining whether environmental permits are necessary and coordinating the permit applications with DEP.

There has been discussion within DOT as to where OEP's function best fits within the department's organization. Some believe environmental planning should be within the Bureau of Engineering and Construction to ensure full access to and coordination with the design and construction functions located in that bureau. Others in the department believe the function should be at arms-length from project design and construction, and is best located in the planning bureau, as it is currently.

A formal policy statement issued by the department last month states OEP is within the Bureau of Policy and Planning, and will have primary jurisdiction in preparing and administering DEP and ACE permit applications for all transportation projects throughout the project delivery process. The policy also states protection of the environment is of paramount concern during all phases of department activity, and all pertinent offices within the department must coordinate early and often with OEP when environmental issues are involved.

The program review committee believes this policy is an important tool for coordinating and better managing environmental matters within DOT's project delivery process. The policy clarifies all activities involving environmental issues must be coordinated with, and processed through, OEP. The policy further sharpens the focus of OEP, making the office clearly accountable for providing guidance and assistance to the department on all environmental issues and responding to environmental submissions in a timely manner.

Permit timeliness. Data from DEP were reviewed to determine the overall time necessary to process permit applications. While analysis is necessary to fully capture the many factors influencing the length of time it takes to make permit decisions, the information below provides basic DEP time frames for processing permits for DOT projects.

The following table shows for calendar years 2008-10, DEP issued an average of 48 permits for DOT transportation projects. The average time to issue a permit over the three years was 278 days. The average amount of time to issue permits has steadily decreased from 439 days in 2008 to 177 days in 2010 – almost a 60% decrease in processing time.

Environmental Permit Processing Times for DOT Projects Calendar Years 2008-10				
	2008	2009	2010*	3-year Avg.
Number of transportation project permits issued	44	54	45	48
Average time to process transportation project permits	439 days	231 days	177 days	282 days
*As of 12/8/10 Note: The Inland Water Resources Division and the Long Island Sound Program within DEP receive funds from DOT for staff to process transportation project permits for their respective areas. The data used in the table is a combination of both DEP programs. Source of data: DEP				

There has been significant work recently in the state to examine and improve the environmental permitting processes across agencies in Connecticut. The results of these efforts, however, need time for full implementation before determining if the desired outcomes have been achieved.

For example, the governor issued Executive Order 39 this past February creating a Permitting Task Force. The task force was primarily charged with examining processes for issuing environmental permits and developing recommendations to streamline, simplify (including permit repeal), and shorten approval time frames. An additional goal of the review was to reduce unnecessary burdens, costs, and inefficiencies in the permitting process while maintaining appropriate public health, safety, and welfare, and the orderly conduct of business. The task force issued its report in April 2010, which included the key recommendation of creating a timetable for DEP to complete the initial permit processing phase (i.e., sufficiency review) in 60 days and the second review phase (i.e., technical review) within 180 days.

The 2010 legislature passed legislation requiring DEP to conduct an analysis of its permit processing performance, and ways to streamline the process.⁴⁷ The department issued its report in September 2010 identifying ways to make the DEP permitting process more efficient. At the same time, DEP has been undergoing an internal review since 2008 using LEAN, a structured approach to identify and correct inefficiencies, streamline duplicative procedures, and make the overall permitting process more time efficient and less costly.

Another way the two agencies have tried to expedite environmental permit processing is through additional staff within DEP funded by DOT. Information about funds exchanged for

⁴⁷ See P.A. 10-158

this purpose since 2006, shows DOT has transferred almost \$2 million to DEP to augment permitting for transportation projects. A relatively informal agreement between the two agencies existed until early 2008, when a formal Memorandum of Understanding (MOU) was created. The MOU sets out specific criteria as to an annual amount forwarded to DEP by DOT, conditions for how the funding should be used, and reporting requirements indicating how the funds have been used. At present, DOT is to provide DEP an annual budget transfer of \$400,000. The funds currently pay for six full time staff within DEP to expedite the permit process for DOT projects. It is the committee's understanding the funds transferred to DEP come from state bond allocations.

Although the current arrangement between the two departments seems to fulfill the needs of each, it is not clear to the committee exactly what DOT is getting in return for the funds provided DEP or how the arrangement has increased the overall efficiency of the project delivery process. The MOU calls for DEP to submit a quarterly report to DOT, beginning with the first quarter of 2009, concerning work performed in the prior quarter. Each report is to include names of the DEP staff who worked on DOT projects, the amount of time spent on DOT projects, and the general nature of the work performed. To date, two summary reports were submitted to DOT in May 2010 showing permit information (e.g., date application received, date permit issued) for FYs 09-10. Although the departments agreed on the format of the two reports, the information submitted does not fully meet the requirements of the MOU. The program review committee recommends:

DOT and DEP re-evaluate the requirements of the current memorandum of understanding regarding support for permit staff to ensure they include realistic reporting requirements of how the funding is used, how it makes the transportation project permit processing function more efficient, and what benefits DOT (and the state) receives from its funding of DEP positions. Any revisions to the MOU should occur by October 1, 2011.

Interagency coordination. The practice for transportation projects is to have project design be roughly 90 percent complete before DOT submits permit applications to DEP for its review. DOT maintains if DEP requires changes to a project's design for environmental purposes, time and expense are added to the design process because projects are almost fully designed by the time environmental permit applications are submitted to DEP. DEP's position is that it is difficult to determine if projects meet permit requirements without project design near full completion.

The committee understands the positions of both departments. Although past attempts between the two agencies have been made to ensure coordination during the project design and environmental permitting processes, it seems those efforts have been inconsistent. For example, the departments used to hold monthly permit update meetings, but committee staff has been told such meetings have not occurred within the past six months. In addition, meetings involving the two departments during project design also have been inconsistent.

On the surface, these issues do not indicate a total lack of coordination between DOT and DEP, yet consistent and timely interaction between the two agencies is vital for an efficient and effective project delivery process. Moreover, there seems to be a disconnect between the departments because their underlying goals appear to work at cross-purposes. It is clear additional coordination is necessary to ensure the most efficient and effective process for delivering transportation projects while protecting the environment to the greatest degree possible. The PRI committee recommends:

The commissioners of DOT and DEP establish an interagency workgroup to meet and discuss ways to fully achieve a balance between expediting transportation project delivery and ensuring proper protection of the environment. Issues to be discussed within the workgroup should include maximizing environmental permitting coordination and streamlining, involving DEP in the transportation project design phase as early as reasonable, examining alternative mitigation strategies, assessing the implementation of creative contracting methods, including design-build, and identifying ways to fully attain and maintain efficient and effective communication. The workgroup should be established by July 1, 2011. Relevant information from the workgroup, including agendas and meeting minutes, should be posted on each agency's website.

It also is clear DOT does not track its overall performance regarding environmental activities within the overall transportation project delivery process. There is little analysis as to how efficient the department is at processing environmental review documents or permit applications, how effective design engineers are at developing environmental permit applications, or the length of time it takes to process permit applications within DOT. Implementation of the new project management system discussed earlier could be an important part of measuring performance for environment-related activities. As currently designed, however, the new system is not anticipated to track any environment-related information, including permit processing times. PRI recommends:

The Office of Environmental Planning begin to fully track its performance for processing environmental review documents and permit applications for transportation projects. The office should determine its main performance measures and frequently gauge its performance against those measures. The results should become part of the department's overall performance measurement system. The department also should determine whether its new automated project management system could contain information to better track and measure environment-related activities within the transportation project delivery process.

APPENDICES

- A.** Agency Response: Department of Transportation
- B.** RBA in Connecticut: Background
- C.** Best Practices Summary
- D.** Key Indicators
- E.** NEPA Process
- F.** DOT Performance Report 2nd Quarter 2010

APPENDIX A



STATE OF CONNECTICUT

DEPARTMENT OF TRANSPORTATION

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Office of the
Commissioner

An Equal Opportunity Employer

February 25, 2011

Ms. Carrie E. Vibert
Director
Legislative Program Review and Investigations Committee
State Capitol, Room 506
Hartford, CT 06106

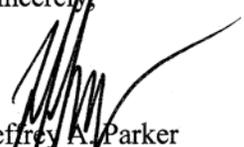
Dear Ms. Vibert:

In response to your February 16, 2011 letter, enclosed please find the Department of Transportation's (Department) response to the draft Legislative Program Review and Investigations Committee's final report titled RBA Pilot Project Study 2010: DOT Project Delivery.

Project delivery is a very important part of our business and we take this report and its recommendations seriously. We agree with the vast majority of the study and have responded sincerely with what we believe will best serve the Department and the public in the project delivery area.

The Department is a large, complex organization and we appreciate the time and enthusiasm your staff brought to this effort. Thank you for the opportunity to comment on the study. If there are any questions regarding the Department's response, please contact Ms. Cheryl Malerba, Director of Organizational Development, at (860)594-3607.

Sincerely,



Jeffrey A. Parker
Interim Commissioner

Enclosure

PRI Results-Based Accountability Project Delivery Recommendations

Connecticut Department of Transportation Draft Response

- 1. Amend existing statutory language to replace the department's current master plan requirement with an annual transportation system progress reporting process based on Results-Based Accountability principles. Each year, by January 15th, the Department of Transportation shall submit to the legislature, and publish on its website, an RBA framework that includes the quality of life results statement for the state transportation system and an assessment of progress toward those results based on key indicators.**

The Department agrees that the current statutory requirement to prepare a master transportation plan is duplicative of other reports and is an ineffective use of staff time. However, we do not support the proposal to replace the master plan requirement with another statutory reporting requirement. The Department can and will adjust its existing program management practices and performance measurement practices to ensure that we comply with the principles of results based accounting. We are also prepared to provide some form of annual RBA reporting. However, we want to develop an RBA system that complements the extensive performance measurement reporting system we already have. We do not want an RBA system that is entirely separate from and competing with our performance management system. It is important that the performance management system serve our agency asset management and program management needs, as well as meet the requirements of our major federal funding programs.

- 2. The framework, results statement, indicators, and annual progress reports should be prepared jointly with the Transportation Strategy Board, with input from major partners and stakeholder groups.**

The Department is not opposed to working with our major partners and stakeholders to develop and improve an RBA framework and reporting system. However, we do not believe that the special emphasis given to a single stakeholder, such as the TSB, is appropriate. The function of the TSB, as defined in legislation, is to identify longer-range strategic needs of the state and recommend a strategic program of projects to meet those needs. The monitoring of Department performance is not a role the TSB is charged to do. Further, Governor Malloy's budget proposal recommends the elimination of the TSB.

- 3. As part of an RBA data development agenda, DOT, in consultation with its partners, should review the adequacy of current indicators and related data resources for assessing progress toward desired results for the state transportation system. Together, they should determine whether there may be more appropriate alternatives for primary indicators and what additional secondary indicators are needed to provide greater public accountability. Preference should be given to indicators that are compatible with the national performance measures.**

The Department is fine with this recommendation and already follows this thought process with our measures. It is important that we mirror the national measures being developed so that Connecticut is well positioned and in alignment with other states.

- 4. DOT create a performance measurement results steering committee comprised of top managers representing each bureau. It should meet quarterly with performance measures staff and the commissioner to review and discuss current results data, identify successes and problem areas, and direct actions to improve outcomes.**

The existing performance measures group has officially become a standing committee for the Department (signed into effect 1/28/11 by Commissioner Parker). The charter and membership of this standing committee is clearly defined and matches this recommendation.

- 5. the department incorporate RBA as a primary tool for promoting performance measurement and management for results throughout the agency.**

The Department supports using the RBA model as a way of expressing our performance measures and outcomes, while we continue to be mindful of the national performance measures which ultimately dictate to our agency those measures that must be maintained to secure funding and support on a national level. CTDOT will continue to follow the federal lead on national performance measures, which ultimately will dictate to our agency those measures that must be maintained to secure federal funding, and support on a national level. The Department will also support the RBA program in as much as we will continue to maintain and update the RBA program report cards on statewide bus and commuter rail services, as well as any new program report cards assigned by the Office of Fiscal Analysis and the Appropriations Subcommittee.

- 6. the department continue developing the centralized project initiation process and have it in place through a formal department policy statement by July 1, 2011. This process should be used to maintain and regularly update the agency's five-year capital planning document.**

The Department will develop a formal project selection process for its capital program. Initial efforts will focus on highways and bridges representing the largest modal share of capital funds by far. The process will involve performance goals, targeted funding strategies, measurement toward stated goals and adjustment of funding strategies over time to attain goals. A comprehensive process will be developed over time. An initial rollout outlining the framework and major unit responsibilities is expected to be completed by March 2011. The Department will consider a formal Policy Statement concerning a performance oriented, capital investment strategy (with a July 1, 2011 target completion). It is not anticipated that the documented capital project selection process will be a Policy Statement because it will be a living, changing document.

- 7. implementing the new integrated project management system as scheduled be a top priority of agency leadership. Also, the department should ensure the new system will be able to track all major steps of the preconstruction process, including: consultant hiring; agreement execution; rights-of-way and utility relocation milestones; and timeframes for environmental reviews and permitting.**

Implementation of an integrated and comprehensive project management and cost estimating system is a priority of agency leadership. The Department is in the initial stages of implementing the American Association of State Highway Transportation Officials (AASHTO) Project Management software. This system will be implemented over the next 15 months. The Department believes this integrated solution will improve the efficiency of our workflow and cost estimating capabilities. The Department is keenly aware of the benefits of tracking and measuring project milestones, including some of those mentioned. The Department is in the process of determining the best system and method to track this information.

- 8. the quality assurance office organize and sponsor a lessons learned event to evaluate project delivery success for a sample of completed projects at least annually.**

The Offices of Quality Assurance, Construction, and Engineering recently held a meeting to discuss improving the dissemination of lessons learned. The Bureau of Engineering and Construction fully endorses this effort and we recognize the benefits of this collaboration. Although this effort is primarily focused on issues encountered during construction, it can be expanded to also include an analysis of project delivery (schedule) success.

9. **the quality assurance office work with the performance measures unit to develop quantitative measures of compliance and quality for projects the department delivers. As a first step, quality assurance and performance measurement staff should compile, review, and summarize the results of evaluations of contractor and consultant performance to share with top agency managers.**

The Quality Assurance Office, in conjunction with the offices of the Chief Engineer and Consultant Selection, will examine our current processes to see if there is greater value that can be achieved in how we disseminate consultant performance lists within the Department.

10. **legislation be enacted to permit the department to use design-build and other alternative contracting approaches on pilot basis. Prior to project initiation, the department shall submit a project, and the criteria used to select it as a pilot for design-build or other alternative contracting method, to the legislature's Transportation Committee for review and approval. DOT also shall evaluate the delivery success of the pilot project in terms of timeliness, cost, and quality, and report the results to the Transportation Committee within three months of project completion.**

The Department continues to bring forward legislation to assist in expanding its choice of available contracting tools, with the goal of having options available that allow for efficiencies and savings specific to individual projects on a case by case basis.

11. **DOT and DEP re-evaluate the requirements of the current memorandum of understanding regarding support for permit staff to ensure they include realistic reporting requirements of how the funding is used, how it makes the transportation project permit processing function more efficient, and what benefits DOT (and the state) receives from its funding of DEP positions. Any revisions to the MOU should occur by October 1, 2011.**

The Department agrees that this recommendation is valid and warrants further review. The Department plans on taking a closer look at the efficiency, accountability and benefits of the current MOU. The Department will also look at the benefits of paying an application fee for each application rather than providing a fixed amount (currently \$400,000) which is all state funds. An application fee would enable the cost to be charged to the specific project which may allow for possible federal participation.

12. **The commissioners of DOT and DEP establish an interagency workgroup to meet and discuss ways to fully achieve a balance between expediting transportation project delivery and ensuring proper protection of the environment. Issues to be discussed within the workgroup should include maximizing environmental permitting coordination and streamlining, involving DEP in the transportation project design phase as early as reasonable, examining alternative mitigation strategies, assessing the implementation of creative contracting methods, including design-build, and identifying ways to fully attain and maintain efficient and effective communication. The workgroup should be established by July 1, 2011. Relevant information from the workgroup, including agendas and meeting minutes, should be posted on each agency's website.**

The Department supports this recommendation and has the intention of pursuing this recommendation.

13. **The Office of Environmental Planning begin to fully track its performance for processing environmental review documents and permit applications for transportation projects. The office should determine its main performance measures and frequently gauge its performance against those measures. The results should become part of the department's overall performance measurement system. The department also should determine whether its new automated project management system could contain information to better track and measure environment-related activities within the transportation project delivery process.**

The Office of Environmental Planning currently tracks the progress of permits and environmental review documents and maintains data bases of their status. Although there are steps in the process that can easily be tracked, performance measures are extremely difficult to develop for permits and environmental review documents. The variability and complexity of projects, as well as outside influences, do not allow for establishing performance measures that would be meaningful in gauging the efficiencies within the Department. The Office of Environmental Planning will continue to explore new ideas to achieve measureable success and to streamline the permitting and document reviews.

14. **the department, as part of its effort to establish a centralized new project initiation process, develop and maintain a database that can identify and monitor the agency's complete project delivery workload.**

The Department needs and desires to maintain a comprehensive project database for a myriad of reasons. Recognizing financial, manpower and contracting constraints, the agency will continue to seek out ways to achieve this end. The strategic Capital Project Selection Process can and will be implemented independent of an agency wide project database.

15. **the transportation department seek the assistance of the Connecticut Academy of Science and Engineering in preparing a talent assessment of its existing staff capacity and projecting its future staffing needs for capital improvement project delivery implementation. The results of this assessment should be completed by July 1, 2012, and shared with the legislature's Appropriations and Transportation Committees.**

There have been studies already completed on this issue and while the agency appreciates the intent, to employ another study is likely redundant and an added expense. The agency has a good sense of its capabilities and limitations and is committed to working closely with both the Governor's Office and the legislature to ensure we have the resources needed to get our work done.

16. **Further, the department should establish a mechanism to track the direct and indirect costs of the design, construction inspection and administration, and project management services its employees provide on a per project basis. Measures of project delivery workload, such as project dollar value per employee, also should be developed and used to monitor trends in internal staff capacity.**

This is an issue the agency is starting to review beginning with the bridge inspection role and will be expanded on to other key areas

17. **the Department of Transportation conduct an analysis of transportation project design costs that compares the costs associated with work done by department employees to costs of using private design firms. The analysis should be conducted and completed by July 1, 2012, with a report of the results forwarded to the legislature's Transportation and Appropriations committees on or before that date.**

This was done in a limited scope many years ago by the Department. We are currently re-visiting this analysis with the intention of an update – included in this review will be an evaluation of the time needed to perform this study, due to the complexities of this analysis and resources available, we believe the date of completion should be reflected as a goal that the agency will strive to meet.

18. **The Department of Transportation should continue to examine ways to streamline the time it takes to complete major milestones within the project delivery process. Once the agency's new integrated project management system is fully operational, targets for completing each major step of the design process should be set and monitored by the engineering bureau, with the assistance of the performance measures unit. Attention should be paid to: 1) the degree to which design consultants and staff engineers meet established deadlines for designing projects; 2) the process used by project designers to estimate the amount of time necessary for project completion to ensure such estimates are realistic; and 3) the advertising and contract bidding processes.**

The Department is continually evaluating existing processes and determining options to streamline them. Many times these processes are the result of either state or federal requirements. With staff resources fully committed to delivering the Department's Capital Program and meeting state and federal requirements, we are challenged with not having the resources we would like devoted to the analysis of the project delivery process. Despite that, the advertising and bidding timelines are currently being monitored as a performance measure and the Department has made great strides in the number of projects awarded within the normal timeline (60 days). The Department will evaluate including some portion of this recommendation (tracking major milestones) as part of its implementation of the project management system (see related response to No. 7).

19. **The department should continue to fully focus on the link between project design and time extensions to project construction due to design errors or omissions, with the specific goal of increasing the department's performance for completing projects in accordance with their original schedules.**

The recommended goal of increasing performance in completing projects in accordance with their original schedules, through a continued focus on the link between time extensions due to design errors and omissions, is complex and challenging. The Office of Construction has already increased its focus in this regard by initiating a regular series of joint meetings with key representatives of the Engineering and Quality Assurance Units. In addition, the "Design Issues Procedure" (the Department's formal mechanism for pursuing design errors and omissions) has been revised and updated recently. These steps have been taken to ensure that these issues are fully addressed and that the "Lessons Learned" are fully vetted between units. Copies of the January 20, 2011 Performance Measures "Lessons Learned" Report of Meeting and the reissued "Design Issues Procedure" memorandum are attached to this response.

20. **DOT should set a yearly performance goal for delivering transportation projects within schedule for construction purposes, rather than continuing to use its recently-established standard of "maximizing percent of construction contracts completed on time." The department's performance toward achieving the new goal should be part of its current initiative to measure project completion performance. The goal should be realistic and re-evaluated at least annually.**

The recommendation to set a yearly performance goal for deliverance of projects within schedule, in lieu of simply maximizing the percentage completed on time, has been the subject of numerous discussions, even prior to the PRI Study. The Office of Construction has been very reluctant to set a percentage goal because of the vast fluctuation in the types, sizes, and locations of projects completed per quarter, as well as a myriad of other factors not directly under our control, such as utility relocations, permit restrictions, and the availability of accurate subsurface information, which greatly affect the ability to meet original completion dates. It will be especially difficult to explain to the public why a set goal has or has not been met in "easy-to-understand" terms. The Office of Construction recently held a meeting with representatives of the Division of Infrastructure Performance Management, and it was determined that it was better to hold off on setting a numerical percent goal until additional quarterly data has been obtained. We will, however, modify the present goal to read "increase the percent of construction contracts completed on time."

21. **The department should add the following components to its current measure for on-time project delivery performance: 1) the aggregate times projects are taking to complete beyond their original deadlines; and 2) the aggregate amount of time each reason for scheduling extensions (as identified in the department's current measure) adds to the overall time for completing projects.**

This recommendation, to add the aggregate times projects are taking beyond their original schedules, as well as the aggregate amount of time per reason for extensions, is reasonable and aligns well with the setting of a yearly goal, in addition to current quarterly tracking efforts. The challenge will be to keep the data from being overly complicated, which could take away from its openness and transparency. This subject was discussed and resolved in the meeting referenced in the response to Recommendation No. 20. It was determined that the current performance measure will be revised to reflect yearly aggregate results, as well as quarterly results.

22. **The department should begin benchmarking its performance for delivering transportation projects on schedule with the performance of other states for comparative purposes. DOT should identify best practices used by states with better project completion performance, and determine whether to implement such practices within its project delivery process.**

CTDOT has monitored, and will continue to monitor, project delivery performance of other states by viewing the content of other states' published online performance measures. Benchmarking for the project delivery realm is not as straight forward as benchmarking for bridge conditions or highway fatality rates. Project delivery reporting varies for each state. Currently there is no national standard for on-time and on-budget monitoring and reporting. This may change in the future if the federal government requires national performance reporting for project delivery. Specific states for which to benchmark against will have to be carefully selected to ensure that common methods of time and budget accountability are being used. Benchmarking is a potential future activity that will be addressed after 2011.

23. **DOT should include on its website a "watch list" of all projects approaching time overruns for the design and construction components of the project delivery process.**

Because of the nature of our business, it would not be in the Department's or State's best interest to post the information mentioned here and in recommendation No. 30. Sometimes projects delays and/or cost overruns can become matters of claims disputed or litigation. It, therefore, would not be appropriate or prudent for the Department to post this type of information.

It should be noted, however, that the Department does post major projects and their overall status which the Department continues to update quarterly and/or by phase of completion. We are also committed to growing this list as time goes on. Further, we speak and meet regularly with the Transportation Committee which has cognizance of all matters relating to the Department, including highways and bridges, navigation, aeronautics, mass transit and railroads; and to the State Traffic Commission and the Department of Motor Vehicles. The Department also meets with the Legislature twice a year to answer any transportation concerns and to share information. Additionally, there is the ability to have special sessions on particular projects that allow for frank discussion on key projects and the opportunity to look at issues in full detail.

24. **The Department of Transportation should begin analyzing its project delivery process with the goal of developing a system through which the department can fully determine the project costs associated with each major milestone of the project delivery process. The system should allow DOT to identify the level to which projects are completed within established budgets for each milestone. The results should be reported as part of the department's performance measure for delivering projects on budget.**

The Department tracks project costs for each of the major milestones (design, rights of way, and construction). The Department will evaluate implementing a performance measure for completion of the entire project (design, rights of way, and construction) within budget. However, it may be difficult to analyze at this level and it is probably more appropriate to analyze each of the three milestones individually. The Department currently has a performance measure for completion of the construction phase within budget.

25. **The department should establish a goal of having the lowest responsible bid amount be no greater than the design engineer's estimate. Progress toward achieving such goal should be measured at least annually.**

The Department is continually working on improving estimating capabilities. A good estimate is essential for financial planning purposes and allows the Department to predict the Capital Program and to determine if adequate financial resources are available to meet the transportation requirements of the State. The Department has tracked engineer's estimates prior to advertising against low bids received since 1988. For financial planning purposes, it is also critical to measure the project estimate during the course of the design phase as compared to the low bid – this is a measure that we are working towards. During certain economically competitive times (such as now), it can be difficult to appropriately "estimate" the market conditions but the Department does adjust unit prices based on recent bid history.

26. **DOT should set a yearly goal of delivering transportation projects within budget for construction purposes, rather than continue using its recently-established standard of "maximizing percent of construction contracts completed on-budget." The department's performance toward achieving the goal should be part of its current initiative to measure on-budget performance. The goal should be realistic and re-evaluated at least yearly.**

Please see the Department's response to No. 20. The response to this recommendation is virtually the same as the response to Recommendation No. 20, provided that "within budget" is substituted for "within schedule."

27. **The department should add the following components to its current measure for on-budget performance: 1) the total dollar amount of construction cost overruns; and 2) the amount each reason for cost overruns (as identified in the department's current measure) adds to overall project costs.**

Please see the Department's response to No. 21. This response is virtually the same as the one provided for Recommendation No. 21, provided that "costs" are substituted for "time."

28. **DOT should sharpen its focus for analyzing project design cost estimates with bid amounts and final project costs to link the cost estimating process with overall project construction costs. The results should be included in the department's performance measures as an indicator of estimating accuracy for transportation projects, and for use to continually improve the project estimating function.**

Please see the Department's response to No. 25. Estimates are prepared on the basis of items and quantities contained within a project. Ideally, the items and quantities at low bid would be the same at project completion. However, in some circumstances they aren't due to change orders. Addressing the issue of change orders is not reflective of an estimating deficiency, but is indicative of the opportunity to implement lessons learned and cost containment and mitigation strategies.

29. **The department should continue researching whether it should set different contingency standards for projects based on project cost and/or type of project. Any changes to the current contingency level should continue to move the project delivery process toward delivering projects within original budgets.**

The Department is conducting this analysis. A review of contingency standards and policies is consistent with our goal of improving estimating capabilities in general.

30. **The department should include on its website a “watch list” of all projects approaching cost overruns (including applicable contingencies).**

Please see the Department’s response to No. 23.

31. **The department should begin analyzing its performance on delivering transportation projects within budget with the performance of other states for comparative purposes. The results also should be used in helping develop appropriate benchmarks and standards for delivering cost effective projects.**

As noted earlier, CTDOT has monitored, and will continue to monitor, project delivery performance of other states by viewing the content of other states’ published online performance measures. Benchmarking for the project delivery realm is not as straight forward as benchmarking for bridge conditions or highway fatality rates. Project delivery reporting varies for each state. Currently, there is no national standard for on-time and on-budget monitoring and reporting. This may change in the future if the federal government requires national performance reporting for project delivery. Specific states for which to benchmark against will have to be carefully selected to ensure that common methods of time and budget accountability are being used. Benchmarking is a potential future activity that will be addressed after 2011

32. **the DOT performance measures unit identify existing sources of customer feedback information throughout the agency and become a repository for all data related to customer satisfaction. Unit staff also should help managers in each bureau develop low cost ways, such as focus groups and on-line surveys, to regularly obtain and use input from stakeholders to assess project delivery and other critical performance areas.**

The Department agrees with the premise of this recommendation and looks to research and identify thoughtful and reasonable options to reach out to our customers and say “how are we doing?”.

33. **In addition, the department should establish and report on measures of customer satisfaction as part of the ongoing development of its performance measurement system.**

As noted in No. 32, as the Department defines its processes, it will gather the data recovered to be used as a tool to identify areas of improvement and focus for the Department.

APPENDIX B

RESULTS-BASED ACCOUNTABILITY IN CONNECTICUT: BACKGROUND

Results-Based Accountability is defined under P.A. 09-166 as “... the method of planning, budgeting, and performance measurement of state programs that focuses on the quality of life results the state desires for its citizens...” The RBA approach was developed in the 1990s by a nationally known public policy and administration consultant (Mark Friedman) to help managers and policymakers focus on end results – positive outcomes for clients – of the public programs, agencies, and service systems they oversee.

RBA uses data to measure progress and, most important, to develop the corrective actions needed to improve performance and achieve better results for clients. The goals of data collection and analysis are to: establish a baseline that shows trends in performance; understand the reasons for current results (i.e., the “story behind the data” in RBA terminology); and identify what changes, based on review of results data and relevant research, could improve trends in performance and outcomes (“turn the curve”) over time.

Unlike some other evaluation tools, RBA requires examination of two levels of accountability: population and program. Population accountability involves the well-being of whole communities and achieving quality of life results. Responsibility for success is shared by many entities, public and private, and depends on their forming partnerships. Progress is tracked with high-level indicators of the condition of the entire target population.

Program accountability, which is the scope of most traditional PRI work, centers on the well-being of clients served by a program, agency or systems. Primary responsibility for effective performance (achieving intended client outcomes) rests with those managing the program (or agency or system). RBA program performance measures the following three questions: How much did we do? How well do we did it? Is anyone better off?

Typically, the first step of an RBA assessment is to determine why the program or agency under review exists. Specifically, what ultimate state goal, framed as a positive statement about desired quality of life results, is it intended to help achieve? Next, key indicators for tracking progress, the primary strategies for achieving the population-level results, and the main contribution made by the program or department – and all other significant partners – are identified.

Once this overall framework is created, the measures critical for assessing and addressing program-level performance can be determined and evaluated. The information developed through this process then can be used for RBA’s main purpose: taking action to improve performance to achieve better results for clients. Following RBA principles, recommended changes should address the following questions: What will happen if we don’t do something different? What would it take to achieve success? What do we know works, or could work, to do better? What actions – including low-cost/no-cost ideas – will we take to make a difference (i.e., “turn the curve”).

Information produced through an RBA approach is presented primarily in charts, often in a report card format. Trends in indicator data and program performance measures are identified and explained. The story behind the data – reasons for good or poor performance – is discussed in order to understand the trends and determine how to improve them.

Another essential element of RBA is creating agendas that outline and prioritize development of additional or improved data required to evaluate and improve program or population level outcomes. More details about the concepts and process of Results Based Accountability, and examples of report cards for program, agency, system, and population level performance, can be found in the program review committee's 2009 RBA Pilot Project Study final report to the Appropriations Committee on *Selected Human Services Programs (DCF Family Preservation and Supports)*.¹

¹ The Final Report and all related documents from the committee's 2009 RBA Pilot Project Study are available electronically at the PRI committee staff office website: http://www.cga.ct.gov/pri/2009_RBA.asp

APPENDIX C

BEST PRACTICES SUMMARY: STATE TRANSPORTATION AGENCY PROJECT DELIVERY

Broad interest among state and federal transportation agencies in improving project delivery performance has prompted extensive research about best practice for completing improvements on time and on budget while maintaining quality and safety standards. A number of studies have focused on ways to expedite design and implementation of construction projects, particularly those related to highways and bridges.

A recent Federal Highway Administration (FHWA) initiative, “Every Day Counts,” is aimed directly at measuring and improving state transportation project delivery results. A “toolkit” of recommended innovative practices for shortening project delivery is one of the results of this project.¹ In addition, the American Association of State Highway and Transportation Officials (AASHTO) has been working with the federal Transportation Research Board (TRB) for a number of years to develop effective comparative performance measures as a way to share data and knowledge about best practices.²

An AASHTO report issued in 2007 compared construction project cost and schedule performance data from nine states.³ The 28 suggested best practices identified through that study are summarized below. A second comparative study of state transportation project delivery performance based on more recent data from about 40 states, including Connecticut, is expected to be completed during 2011.⁴

Cost Performance Suggested Good Practices

- Past performance motivates improvement (e.g., harsh criticism spurs agency to overhaul cost-tracking systems and processes)
- Leadership; controlling costs clearly a top priority of chief executive office and career managers (e.g., agency leaders attend monthly production meetings, financial bonuses provided for outstanding cost control performance)

¹ See the U.S. DOT “Every Day Counts” website: <http://www.fhwa.dot.gov/everydaycounts>

² National reports on best practices include: TRB, National Cooperative Highway Research Program (NCHRP) Project 20-24(37) Series, *Measuring Performance among State DOTs: Sharing Good Practices* (completed series reports A through H available at: <http://144.171.11.40/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=543>); TRB, NCHRP Report 660, *Transportation Performance Management: Insight from Practitioners* (2010); Scan Team Report, NCHRP 20-68A, Scan 07-01, *Best Practices in Project Delivery Management* (October 2009); AASHTO, *Effective Program Delivery in a Constrained Fiscal Environment* (2008).

³ AASHTO: Comparing State DOTs’ Construction Project Cost and Schedule Performance: 28 Best Practices from Nine States (May 2007)

⁴ Updates regarding the study available at the following website: <http://mydotperformance.org>

- Attention to accurate cost estimates (e.g., well coordinated pre-construction and construction processes, multidisciplinary project teams, estimates based on project characteristics not only historic cost data)
- Measure on-budget performance monthly or quarterly
- Track causes of cost overruns; overruns linked to reason and addressed with effective feedback loop
- Use production meetings hold staff accountable (e.g., reasons for overruns explained by managers at monthly meetings)
- Track on budget performance throughout construction at each major milestone not just at completion
- Link performance to pay (e.g., monetary rewards provided to staff who keep cost overruns at low level such as 1% or less)
- Legislatively mandated targets set for cost overrun (e.g., cost overruns of 10 or 15% triggers an outside review by an independent board or commission)
- Employ value engineering techniques (e.g., contractors who identify valid cost savings during construction can share in those savings)
- Maintain regular dialog with contractors (e.g., hold quarterly meetings with contracting community, work with contractor representatives on collaborative solutions)
 - Also, hold contractors accountable (e.g., disqualify from future bidding if record of frequent cost overruns)
- Encourage team-based project development process (e.g., during planning and design, seek input from experts in different disciplines who may notice more problems earlier)

Schedule Performance Suggested Good Practices

- Carefully develop schedule estimates with input from project managers; use generic production times for rough estimates but conduct project-specific reviews by project engineers and others to establish specific construction timeframes
- Recruit and retain skilled staff
- Employ advanced geo-technical survey techniques that can better determine unpredictable conditions (e.g.,
- Use accurate unit production times (based on research that scrutinizes past projects)
- Conduct overall constructability reviews that verify plans and specifications are biddable and realistic (can be built)
- Measure on-schedule performance regularly (e.g., monthly, at major milestones)
- Track causes of delays (as with cost overruns, like costs, link delays to reason and address with an effective feedback loop)
- Use monthly reports to keep staff accountable for time (e.g., as with project budgets, discuss schedules at production meeting or other regular monthly meeting)

- Pay for utility relocations (e.g., in some states, legislation authorizes payment or utility relocation costs for certain priority projects to expedite completion)
- Give contractors a “sliding window” for completing projects; Set the specific amount of work days (45 days, for example) but allow a certain time window for completion (e.g., three months from start date to finish date)
- Make pre-bid meetings mandatory for large projects to
- Seek contractor input on specification and set up pilots with contractors to test new specifications
- Give contractors incentives for early completion
 - Also, hold contractors accountable (e.g., for delays, like cost overruns, disqualify from bidding if fail repeatedly to meet completion expectations)
- To the extent possible, take care of rights-of-way, permit, and utilities matters before construction starts to minimize delays

APPENDIX D
QUALITY OF LIFE RESULTS KEY INDICATORS
RBA FRAMEWORK FOR DOT PROJECT DELIVERY

The RBA Framework developed for the program review committee study of DOT project delivery includes five key indicators of overall progress on broad, quality of life results desired from the state transportation system. The department, as part of its own performance measurement system, currently collects, analyzes, and reports on data related to four of these five key indicators. Copies of the agency’s latest quarterly progress reports that addressed the key framework’s indicators related to safety, efficiency, state of good repair, and economic vitality are presented in this appendix. As noted in the list below, the information available for these four indicators is contained in eight separate DOT performance measure reports. Data corresponding to an environmental quality indicator were still in development by the agency at the time of the program review committee’s study and, therefore, unavailable.

DOT planning bureau staff is working to coordinate its methodology for measuring environmental performance with the nascent national standards related to transportation system impact on environmental quality. As of December 2010, a final decision about the initial national standard, which is expected to be based on current federal practice for quantifying greenhouse gas emissions from transit sources, was pending.

<p><u>Indicator 1: Safety</u> <i>Rate of Annual Highway Fatalities</i> SOURCE: DOT 2010 Q1 PERFORMANCE MEASURE REPORT (October 2010), Measure SS 1-01</p>
<p><u>Indicator 2: Efficiency</u> <i>Percent of Road Network Over Capacity (Congestion)</i> SOURCE: DOT 2010 Q1 PERFORMANCE MEASURE REPORT (October 2010), Measure QL 4-02,</p>
<p><u>Indicator 3: State of Good Repair</u> <i>Condition of Infrastructure Components</i> SOURCE: DOT 2010 Q1 PERFORMANCE MEASURE REPORT (October 2010): Percent of state roads with good quality ride, Measure PR 2-01 Percent of state bridges in good condition , Measure PR 2-03 Reliability of state rail cars (mean distance between failures), Measure PR 2-04 Reliability of state buses (mean distance between road calls), Measure PR 2-05 Percent of state airport pavement rated good or excellent, Measure PR 2-07</p>
<p><u>Indicator 4: Environmental Quality</u> <i>Green House Gas Emissions Related to Transportation System</i> SOURCE: NOT AVAILABLE (currently under development by DOT Policy and Planning Bureau)</p>
<p><u>Indicator 5: Economic Vitality</u> <i>Jobs Created Through Transportation System Investments</i> SOURCE: DOT 2010 Q1 PERFORMANCE MEASURE REPORT (October 2010), Measure AT 5-06</p>



Performance Measures



Objective:
Safety and Security

Program:
Highway Safety

Measure:

Rate of Annual Highway Fatalities

Report Date:

October 1, 2010

Data Frequency: Annual

Current Reported Value: 0.83 fatalities per 100 million vehicle miles traveled (VMT)
7.5 fatalities per 100,000 population

Performance Target Value: Less than or equal to 1.0 per 100 Million Vehicle Miles Traveled (VMT)
Less than or equal to 7.7 per 100,000 Population

Source: Bureau of Policy and Planning
Mr. Joseph Cristalli



Note: Initial fatality counts published by NHTSA are preliminary as of April 30th for the previous calendar year. Final counts are published one year later, for the same calendar year. (For example, calendar year 2008 data are published initially in April 2009, and finalized in mid 2010.) The latest data set used for this posting, covers the time period from 1/1/2008 through 12/31/2008.

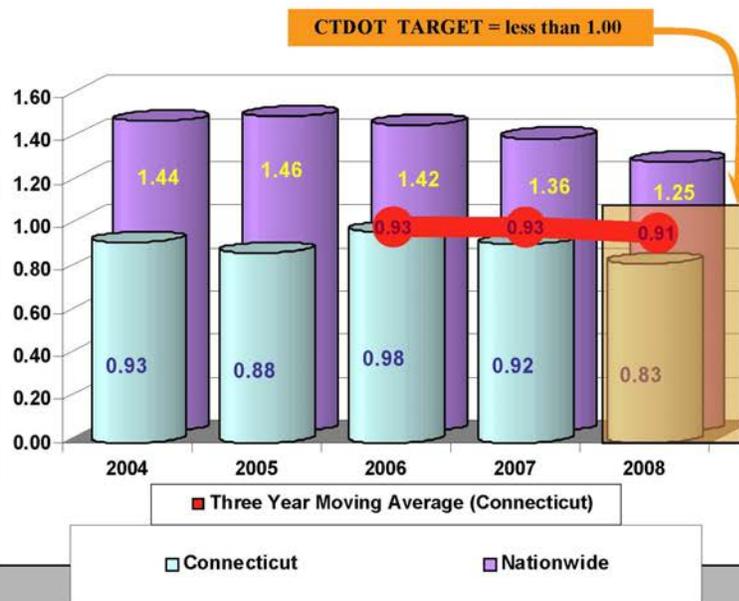
Purpose/Description of measure:

This measure tracks the fatality rate on Connecticut's roadways. By tracking fatality rates, the Department is able to gather information necessary to develop effective programs that ensure the safety and security of the traveling public.

Discussion of trend:

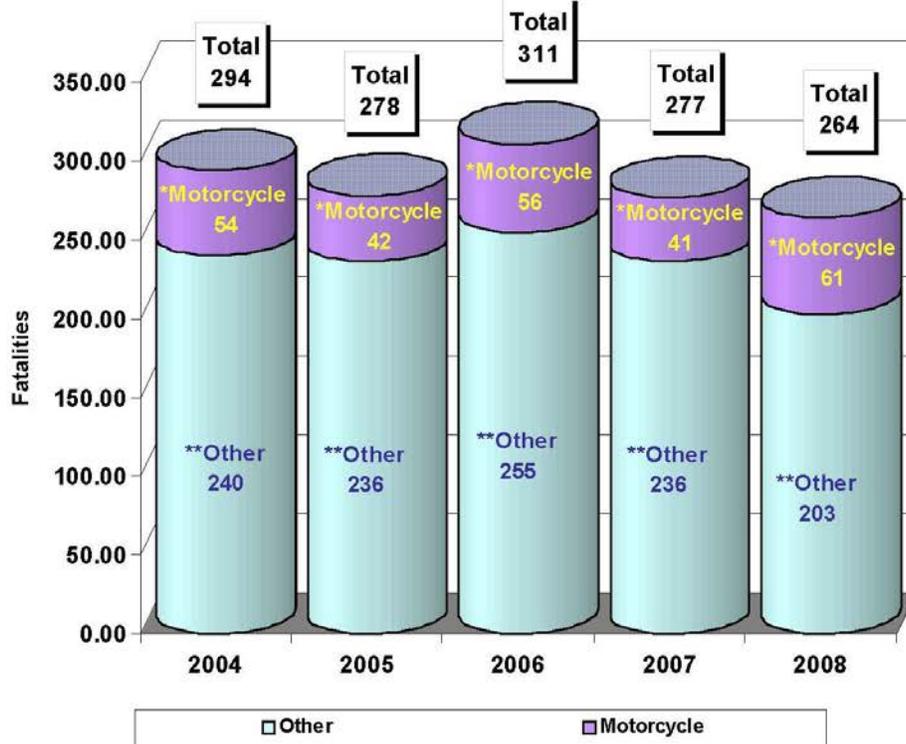
In 2008, Connecticut's fatality rate was 0.83 fatalities per 100 million vehicle miles traveled compared with the national figure of 1.25* fatalities (see Figure 1).
(continued)

Figure 1. Fatalities Per 100 Million Vehicle Miles Traveled



*From NHTSA Traffic Safety Facts CT 2004-2008, FARS 2004-2007 Final and FARS 2008 Annual Report File. (http://www-nrd.nhtsa.dot.gov/departments/nrd-30/nca/STSI/9_CT/2008/9_CT_2008.htm)

Figure 2. Annual Highway Fatalities



* Includes: Operator and Passenger
 ** Includes: Driver, Passenger, Pedestrian, Bicyclist

Discussion of trend (continued):

In 2008, there were 248 fatal motor vehicle crashes in which 264 persons were killed. This 264 figure includes operators, passengers, motorcycle operators, pedestrians and cyclists. In 2008, a total of 61 motorcycle operators and passengers were killed on Connecticut roadways, representing 23.1 percent of the state's total traffic fatalities. Based on 94,441 registered motorcycles, the fatality rate per 10,000 registered vehicles was 6.0, a substantial increase from the 2007 rate of 4.8 per 10,000. Preliminary data indicates that this trend will not continue in 2009.



Performance Measures



Objective:
Quality of Life

Program:
Congestion Management

Measure:
Percent of Road Network with Traffic Volumes Greater than Capacity

Report Date:
October 1, 2010

Data Frequency: Annual

Current Reported Value: 8.80% miles over Capacity

Performance Target Value: Reduce Congestion Throughout the State

Source: Bureau of Policy and Planning
Mr. Michael Connors



Note: Data for this measure becomes available for reporting annually in September for the previous Calendar Year. The latest data set used for this posting covers the time period from 1/1/2009 through 12/31/2009.

Purpose/Description of measure:

This measure tracks the congestion on Connecticut state roadways. Highway congestion is caused when traffic demand approaches or exceeds the available capacity of the highway system. Traffic demands vary significantly, depending on the season of the year, the day of the week, and even the time of day. Congestion can also be measured in a number of ways – level of service, speed, travel time, and delay are commonly used measures. CTDOT is continuously in the process of looking at new ways to monitor and alleviate congestion. Travelers, however, have indicated that more important than the severity or magnitude of congestion is the reliability of the trip travel time. People in a large metropolitan area may accept that a 20 mile freeway trip takes 40 minutes during the peak period, so long as this predicted travel time is reliable and is not 25 minutes one day and two hours the next. The state is in the process of looking at new ways to monitor congestion management.

Discussion of trend:

Demand for highway travel continues to grow. Construction of new highway capacity to accommodate this growth in travel has not kept pace and is not likely to in the near future. Between 1980 and 1999, route miles of highways increased 1.5 percent, while vehicle miles of travel increased 76 percent.

Figure 1. Percent of Miles Approaching or Above Capacity



2010 Data not available until September 2011



Performance Measures



Objective:
Preservation

Program:
Road Condition

Measure:

Percent of Roads with Good Ride Quality

Report Date:

October 1, 2010

Data Frequency: Annual

Current Reported Value: 44% of NHS roads with Good Ride Quality

Performance Target Value: Increase the percentage of roads with Good Ride Quality

Source: Bureau of Engineering and Construction
Mr. Edgardo Block, P.E.



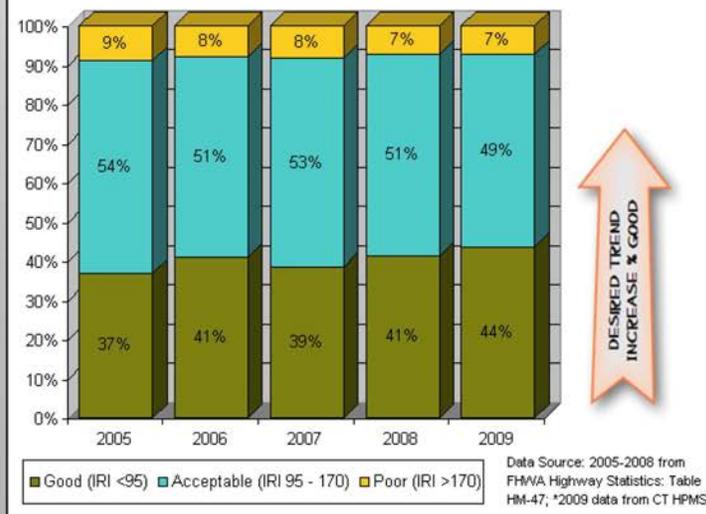
Note: Data for this measure becomes available for reporting annually in June for the previous Calendar Year. The latest data set used for this posting covers the time period from 1/1/2009 through 12/31/2009.

Purpose/Description of measure:

This measure tracks the roughness (complement of smoothness) of pavements on Connecticut's state-maintained roads. The general public's perception of a good road is one that provides a smooth ride. Roughness is an important pavement characteristic because it affects not only ride quality but also vehicle delay costs, fuel consumption and both vehicle and roadway maintenance costs. The Department uses a worldwide standard for measuring pavement smoothness called the International Roughness Index, or IRI. This index provides a consistent and comparable measure of pavement in terms of the number of vertical bump inches per mile driven. IRI is reported as inches per mile. The lower the IRI number, the smoother the ride. The Federal Highway Administration (FHWA) requires that all states measure and submit IRI data annually for the National Highway System (NHS). The NHS includes interstate and other routes identified as having strategic defense characteristics, as well as routes providing access to major ports, airports, public transportation and intermodal facilities.

(continued)

Figure 1. Ride Quality on National Highway System (NHS)
Roads in Connecticut for 2005 - 2009



(cont.) Discussion of trend:

Figure 1 on the previous page shows that ride quality on Connecticut's NHS routes has gradually been improving. The percentage of NHS Routes rated good has increased from 37 percent in 2005 to 44 percent in 2009, while the percentage of roads rated poor has decreased slightly to 7 percent over the same period. The goal is to continue to increase the percent of roads in good condition by implementing pavement preservation principles and fully utilizing CTDOT's Pavement Management System. Figure 2 (Right) compares the ride quality on Connecticut's NHS routes with the other New England states and New York for the year 2008.

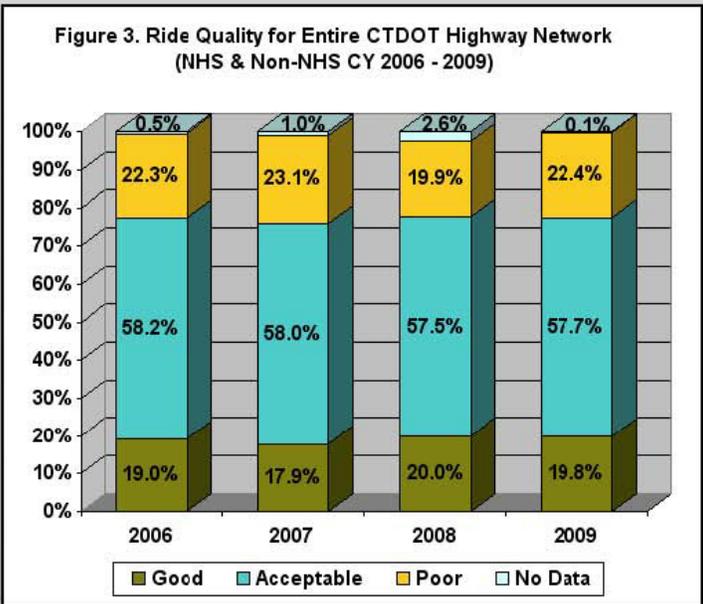
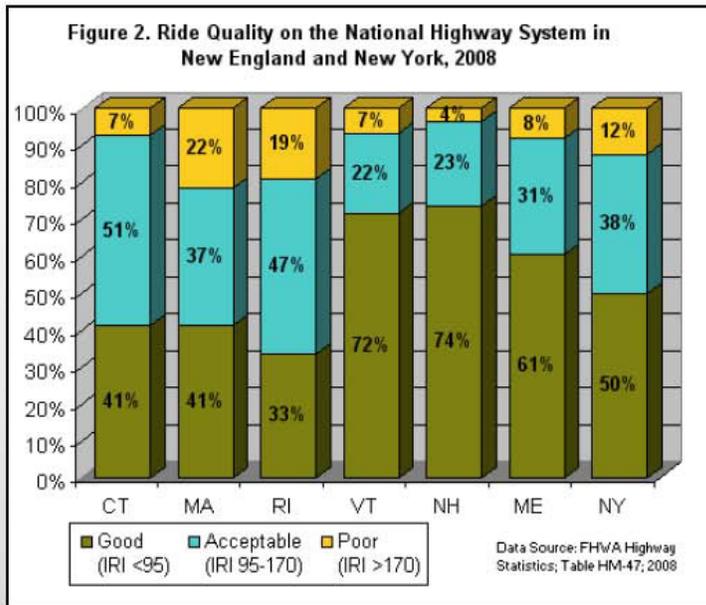


Figure 3 (Left) shows the ride quality of Connecticut's entire state maintained roadway network (approx. 3,744 miles) for calendar years 2006 through 2009. The entire roadway network includes both NHS and non-NHS roadways that are the maintenance responsibility of the Connecticut DOT. As shown in this graph, when the non-NHS roadways are factored in, the percent of the roads with good ride quality is reduced significantly.

NOTE: The ride quality for the entire network was not reported in previous quarters.



Performance Measures



Objective:
Preservation

Program:
Bridge Condition

Measure:
Percent of CTDOT Roadway Bridges in Good Condition

Report Date:
July 1, 2010

Current Reported Value: 34% of bridges in good condition

Performance Target Value: Increase percentage of bridges in good condition

Source: Bureau of Engineering and Construction
Mr. Robert Zaffetti, P.E.

Data Frequency: Annual



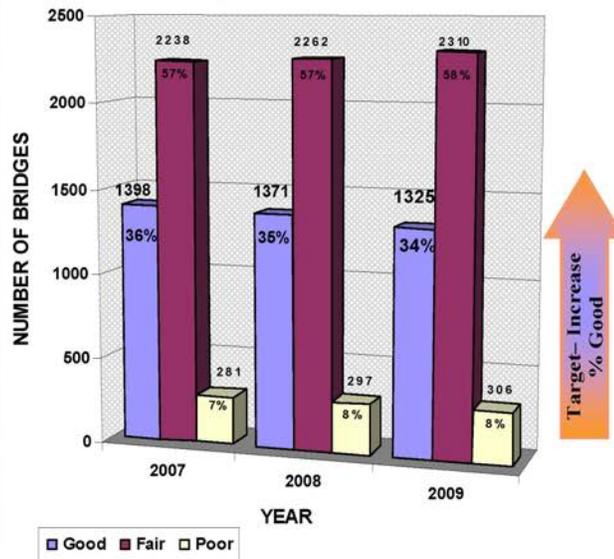
Note: Data for this measure becomes available for reporting annually in July for the previous Calendar Year. The latest data set used for this posting covers the time period from 1/1/2009 through 12/31/2009.

Purpose/Description of measure:

This measure tracks the condition of roadway bridges maintained by the Connecticut Department of Transportation (CTDOT). The Department is directly responsible for almost 4,000 bridges, including all Connecticut National Bridge Inventory (NBI), Connecticut Non-NBI, Adopted and Orphan bridges. The Department also inspects and maintains several special structures (i.e. Tunnel and Pedestrian Bridges) which are not included in this measure. Almost 1,300 additional bridges owned by Connecticut's Municipalities or the Connecticut Department of Environmental Protection or located on Private Property are inspected by CTDOT but are not considered in this measure since they are not maintained by CTDOT.

(Continued)

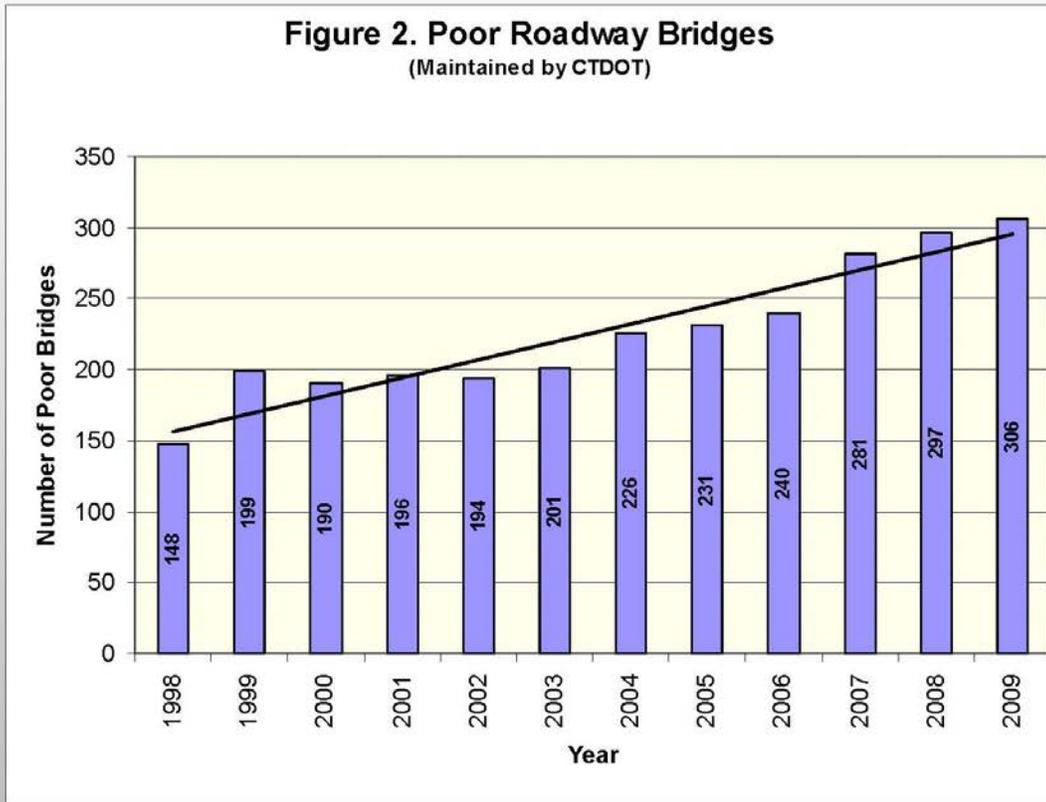
Figure 1. ROADWAY BRIDGES MAINTAINED BY CTDOT (Good - Fair - Poor)



Note: Roadway Bridges Maintained by CTDOT include State NBI, State Non-NBI, Adopted, and Orphan.

Purpose/Description of measure: (Continued)

The condition of all bridge decks, superstructures and substructures are rated on a scale from 0 (failed condition) to 9 (excellent condition). The lowest rating becomes the bridge's overall rating. Whenever the condition rating of a bridge falls into the "Poor" category (4), the Department further reviews its condition, assesses the inspection frequency, adds the structure to the Bridge Program List and initiates a project to address the needs.



Discussion of trend:

Figure 1 shows that the percent of bridges in good condition declined by one percent from 2008 to 2009. As indicated in figure 2, the number of bridges rated "Poor" has been increasing since 1998 due in part to the aging infrastructure. The Department has recently allocated additional resources into bridge maintenance projects to reverse CTDOT's trend and align the Department with national trends of yearly increases in the number of bridges rated "Good".



Performance Measures



Objective:
Preservation

Program:
Rail Condition

Measure:
Mean Distance Between Failures (Rail)

Report Date:
October 1, 2010

Data Frequency: Quarterly

Current Reported Value:
 Locomotive — 27,970 mi (2010 Q2)
 Coach — 371,192 mi (2010 Q2)
 M2 EMU — 122,919 mi (2010 Q2)
 M4 EMU — 40,337 mi (2010 Q2)
 M6 EMU — 92,905 mi (2010 Q2)

Performance Target Value:
 Locomotive — 35,000 mi
 Coach — 260,000 mi
 M2 EMU — 80,000 mi
 M4 EMU — 65,000 mi
 M6 EMU — 60,000 mi

Source: Bureau of Public Transportation — Mr. Eugene Colonese



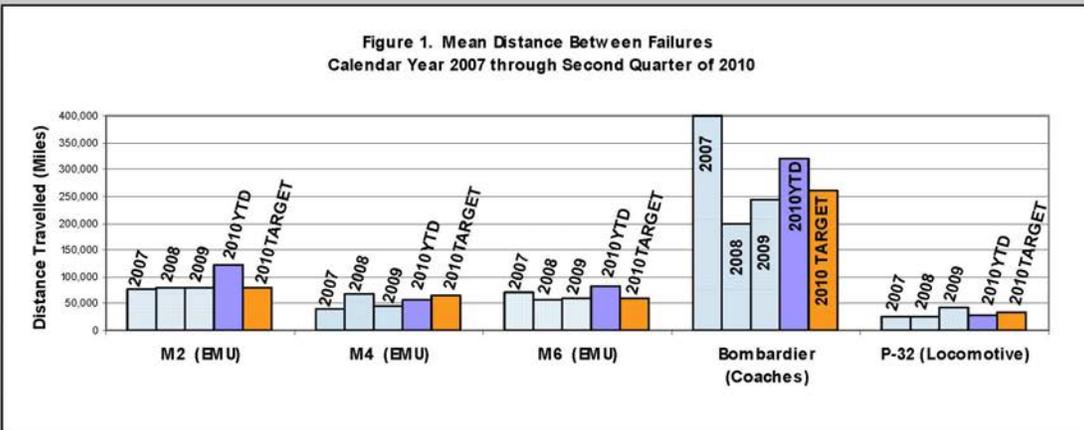
Note: Data for this measure becomes available monthly. The data set used for this posting covers the 2010 calendar year second quarter (4/1/2010 through 6/30/2010).

Purpose/Description of measure:

This measure tracks the reliability of MetroNorth train service on the New Haven Line. Mean Distance between Failures (MDBF) is an industry standard for measuring the reliability of a rail car fleet. It is calculated by dividing the total miles operated by the total number of confirmed primary failures, by car or locomotive fleet. A confirmed primary failure is defined as a failure of any duration for mechanical cause that occurs to a revenue train that is reported late at its final terminal by more than 5 minutes and 59 seconds. Generally speaking, the greater the MDBF, the better the on-time performance of train service.

Discussion of trend:

Figure 1 shows a graphic of MDBF for five types of rail vehicles for 2007 through the second quarter of 2010. The same information is presented in tabular form in Figure 2. In 2001, the Department began an M2 Electric Multiple Unit (EMU) Critical System Replacement (CSR) program, which has dramatically improved the MDBF for the M2 fleet. In 2004, the MDBF for M2 cars was just under 50,000 miles. For 2009, the MDBF for M2 rail cars averaged over 80,000 miles. (cont.)



Mean Distance Between Failures (Rail)

The 2010 target for the MDBF for M2s was raised to 80,000 miles (from 73,000 miles in 2009) to reflect the increases in recent measured performance. On the other hand, the targets for the M4s, M6s and Bombardiers were reduced in response to the aging condition of these fleet vehicles. As can be noted from Figures 1 and 2, all vehicles with the exception of the locomotives and M4s exceeded the 2010 targets during the second quarter. Three hundred new M8 model EMUs will replace and complement the existing EMUs in the coming years. CTDOT took delivery of the first model M8s during late 2009. These first arrivals are being rigorously tested before being placed into service. It is hoped to have the first 22 of the M8s in passenger revenue service by the end of 2010.

**Figure 2. Table of Mean Distance (Miles) Between Failures
for Locomotives, Coaches and EMUs
(2007 through 2010)**

Equipment Type	2007	2008	2009	2010 YTD	2010 Target Value
Locomotives					
P-32 (Genesis Dual Mode)	25,590	25,188	41,831	28,777	35,000
Coaches					
Bombardier	400,405	199,493	244,120	320,763	260,000
EMUs					
M2	76,892	79,887	80,837	122,941	80,000
M4	39,773	67,924	45,505	55,649	65,000
M6	70,680	56,976	59,393	80,949	60,000



Performance Measures



Objective:
Preservation

Program:
Transit Condition

Measure:

**Average Miles Between Road Calls
(Bus)**

Report Date:

October 1, 2010

Data Frequency: Quarterly

Current Reported Value: 4,008 Mi.—SFY 2010 Q4 (CY 2010 Q2)
4,371 Mi.—SFY 2010 (July 1, '09-Jun 30, '10)

Performance Target Value: 5,000 — Miles Between Road Calls

Source: Bureau of Public Transportation
Mr. Michael Sanders



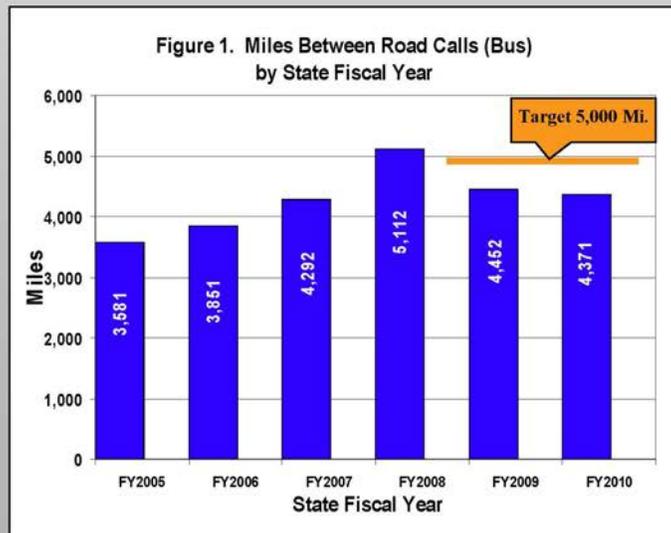
Note: Data for this measure becomes available for reporting quarterly based on state fiscal year (July 1 through June 30). The latest data set used for this posting covers the time period from April 1, 2010 through June 30, 2010, which is quarter 4 of State Fiscal Year (SFY) 2010.

Purpose/Description of measure:

This measure tracks the reliability of CTTransit bus service. Miles between road calls is the industry standard performance metric used nationally by bus operators to measure availability and reliability of equipment. Road calls are traditionally counted when a bus misses one of its scheduled trips. In any given year, the number of road calls can be affected by the age of the fleet, the occurrence of fleet-wide defects on a certain model or model year of buses, the weather, and other factors.

Discussion of trend:

During the second quarter of calendar year 2010, the miles between road calls for CTTransit buses in the Hartford, New Haven and Stamford Divisions (CTTransit's largest operating divisions) averaged 4,008. Figure 1 shows the trend for state fiscal years (SFY) 2005 through 2010, for these same groups of buses. The decline since FY2008 is due primarily to the increased average age of the bus fleet. This trend should begin to reverse as older buses are replaced and supplemented with new ones, which are being purchased with federal stimulus funds.





Performance Measures



Objective:
Preservation

Program:
Airport Condition

Measure:
Percent of Airport Pavement Rated Good or Excellent

Report Date:
January 1, 2010

Data Frequency: Annual

Current Reported Value: General Aviation Airports—90% Good or Excellent
Bradley International Airport—100% Good or Excellent

Performance Target Value: 100% Good or Excellent

Source: Bureau of Aviation and Ports



Note: Data for this measure becomes available for reporting annually in December for the current Calendar Year. The latest data set used for this posting covers the time period from 1/1/2009 through 12/31/2009.

Purpose/Description of measure:

This measure tracks the overall pavement condition of CTDOT's Airports. For all the General Aviation Airports (GAA) combined (total pavement area 897,000 square yards (SY)), 90 percent of the pavement is rated as good or excellent. For Bradley International Airport (total pavement area 1,378,167 SY), 100 percent of the pavement is rated good or excellent. A detailed breakup is provided below.

Waterbury-Oxford Airport (213,000 SY)
12% poor 67% good 21% excellent
Good or Excellent=88%

Groton-New London Airport (267,000 SY)
23% poor 56% good 21% excellent
Good or Excellent=77%

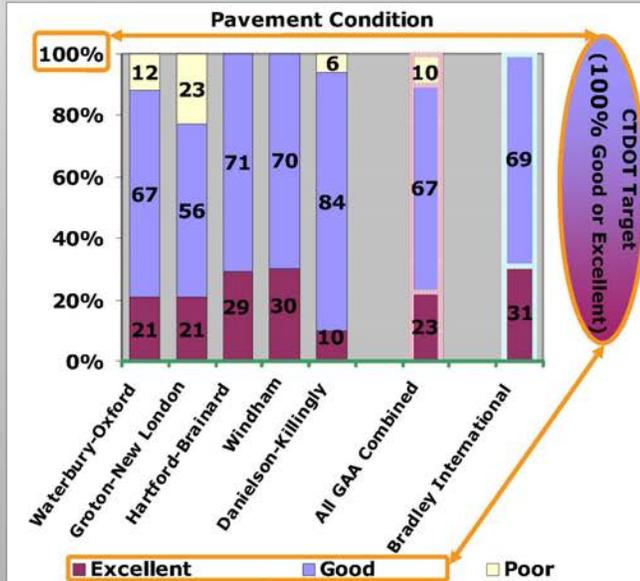
Hartford Brainard Airport (209,000 SY)
0% poor 71% good 29% excellent
Good or Excellent=100%

Windham Airport (151,000 SY)
0% poor 70% good 30% excellent
Good or Excellent=100%

Danielson-Killingly Airport (57,000 SY)
6% poor 84% good 10% excellent
Good or Excellent=94%

All General Aviation Airports (combined)
10% poor 67% good 23% excellent
Good or Excellent=90%

Bradley International Airport (1,378,167 SY)
0% poor 69% good 31% excellent
Good or Excellent=100%



Discussion of trend:

The goal of the Bureau of Aviation and Ports is to bring the percentage of the good and excellent pavements at the General Aviation Airports to 100%. The percentage of the pavement ranked poor has been steadily decreasing in the recent years, going down to 10% this year, and is now limited to lightly used aprons in most cases under lease to private operators.



Performance Measures



Objective: **Accountability & Transparency**

Program: **Economic Revival**

Measure: **CT RECOVERY**
Number of Jobs Created/Sustained

Report Date: **October 1, 2010**

Data Frequency: Quarterly

Current Reported Value: 16,158 Jobs Created/Sustained

Performance Target Value: Increase Jobs Created/Sustained

Source: Office of Commissioner
Mr. Philip Scarozzo



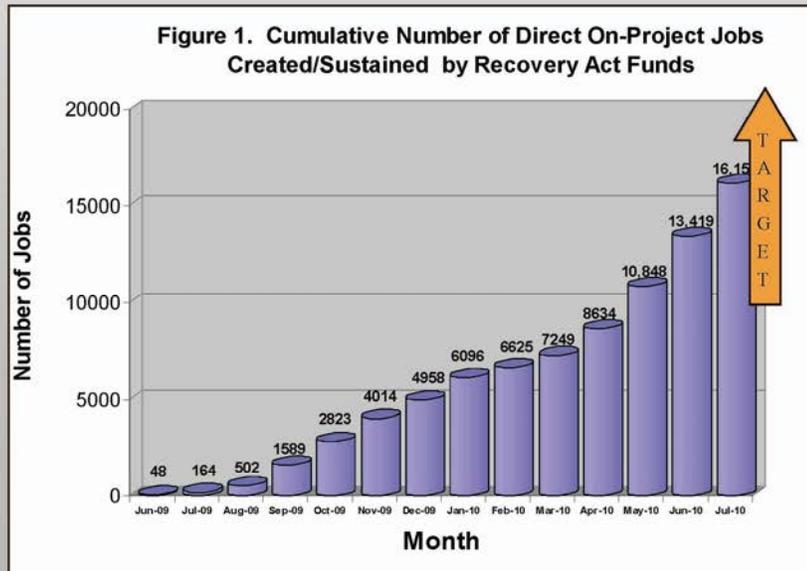
Note: Data for this measure becomes available monthly. The data set used for this posting covers the time period from June 1, 2009 through July 31, 2010.

Purpose/Description of measure:

This measure tracks the number of jobs created and/or sustained in Connecticut on transportation projects as a direct result of the American Reinvestment and Recovery Act (ARRA) 2009. This measure includes jobs created/sustained with ARRA dollars spent on highways, bridges, transit, rail, and enhancements on CTDOT and Regional Planning Agency projects. This listing is for direct jobs only, and does not include indirect jobs created as a result of material manufacturing and delivery to projects, or jobs that may be created in the local economy as a result of ARRA project employed workers. The statistics for number of jobs created/sustained are supplied by the contractors who employ the workers on active projects. Additional information on CTDOT Recovery projects can be accessed on the website at www.ct.gov/dot by clicking on the CTRecovery icon.

Discussion of trend:

As of July 31, 2010 16,158 jobs have been created or sustained in Connecticut on ARRA funded projects. This also represents 539,831 total job hours created or sustained at a payroll of \$21,085,922 for the job hours created/sustained with Recovery Act funds. The numbers reported in Figure 1 have not been converted to Full-Time Equivalent positions.

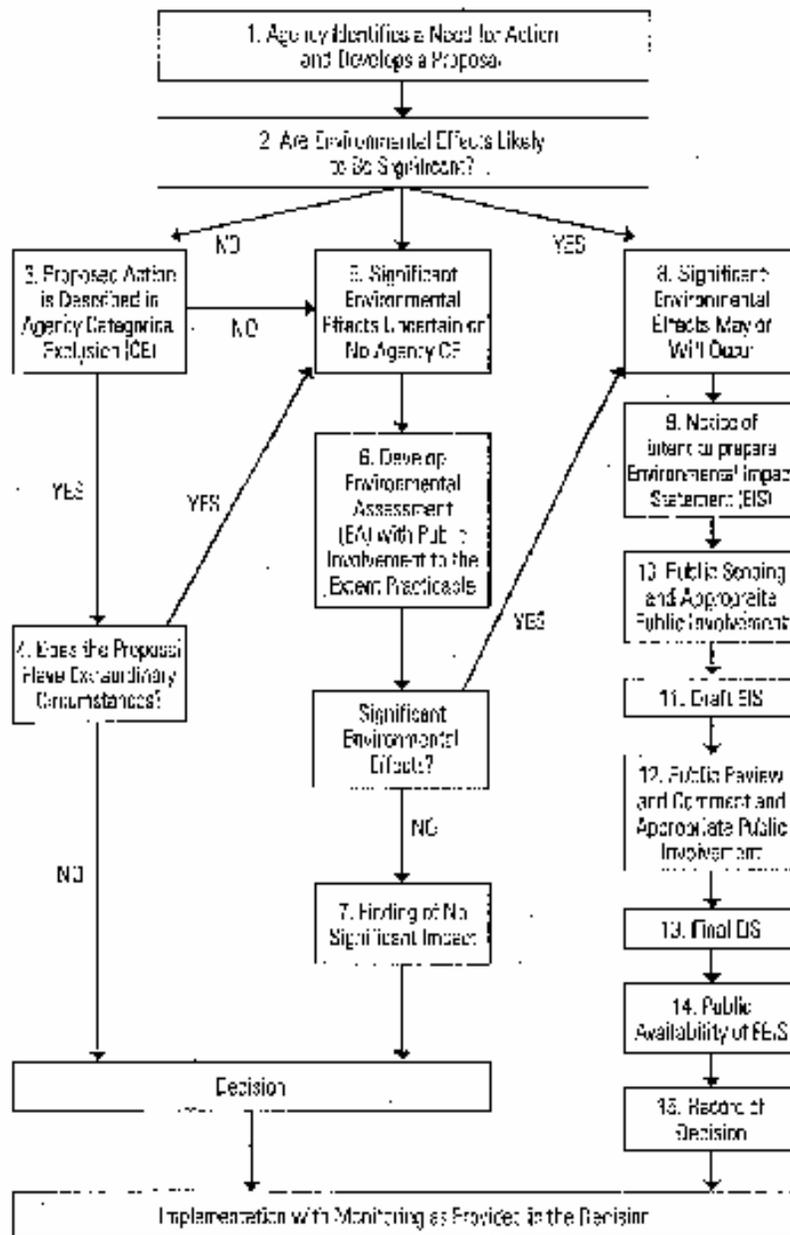


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Revised: 9/14/2010

APPENDIX E

The NEPA Process



Significant new circumstances or information relevant to environmental concerns or substantial changes in the proposed action that are relevant to environmental concerns may necessitate preparation of a supplemental EIS following either the draft or final EIS or the Record of Decision (CERCLA Regulations, 40 C.F.R. § 22.02.96(c)).

Source: Council on Environmental Quality: A Citizen's Guide to NEPA., December 2008.

APPENDIX F

SUMMARY OF CTDOT PERFORMANCE MEASURES						
2010 QUARTER 1 (JANUARY 1 TO MARCH 31)						
Revised: 06/06/2010						
ID	Status	Measure	Current Value (January 1, 2010 to March 31, 2010)	Target Value	Trend	Target Met
Safety & Security (SS)						
SS-01	▲	Rate of Annual Highway Fatalities	0.83 fatalities per 100 million vehicle miles traveled (VMT) 7.5 fatalities per 100,000 population	Less than or equal to 1.0 per 100 million vehicle miles traveled (VMT) Less than or equal to 7.7 per 100,000 population	↗	✓
SS-02		Percent of Seat Belt Usage	86% Seat Belt Usage	90% Seat Belt Usage	↘	
SS-03	●	Number of Motorcycle Riders Trained	n/a			
SS-04	▲	Number of CHAMP Motorist Assistants	4,516 Assistants	Maintain ability to assist at least 20,000 motorists per year	↗	
Preservation (PR)						
PR-01	▲	Percent of Roads with Good Ride Quality	44% of RIG made with Good Ride Quality	Increase percentage of roads with Good Ride Quality	↗	✓
PR-02	▲	Number of Bridge Work Items Completed	Executed=332 Completed=266 Backlog=3629 BMM's=1946	Maximize completion of work items and reduce the backlog	↗	
PR-03	▲	Percent of CTDOT Roadway Bridges in Good Condition	34% of Bridges in Good Condition	Increase Percentage of Bridges in Good Condition	↘	
PR-04	▲	Mean Distance Between Failures (Rail)	Locomotive—29,674 mi; Coach—281,140 mi; M2 EMU—122,954 mi; M4 EMU—87,972 mi; M6 EMU—71,166 mi	Locomotive—35,000 mi; Coach—260,000 mi; EMU M2—80,000 mi.; M4—65,000mi; M6—60,000mi.	↗	✓
PR-05	▲	Mean Distance Between Transit Failures (Buses)	4,782 mi. — 2010 Q1	5000 Miles Mean Distance Between Failure	↗	
PR-06		Average Age of Bus Fleet	State 7.6 yrs. Transit District 5.8 yrs.	Average Fleet Age of 6.0 years	↘	
PR-07		Percent of Airport Pavement Rated Good or Excellent	Gen. Aviation=90% Good or Excellent Bradley Int.=100% Good or Excellent	100% Good or Excellent	↗	✓
Efficiency & Effectiveness (EE)						
EE-01	▲	Number of Rail Passengers	8,530,501 - NIL 134,451 - SLE	8,287,224 - NIL 137,200 - SLE	↘	✓
EE-02	▲	Percent of Rail On-Time Performance	97.2% - NIL 97.4% - SLE	97.0% - NIL 95.0% - SLE	↗	✓
EE-03	▲	Number of Bradley International Airport Passengers	1,178,055	Maintain or Exceed 2009 Q1 Value 1,260,473	↘	
EE-04	▲	Revenue Generated from Bradley International Airport Parking	\$4,655,910	Maintain or Exceed 2009 Q1 Value \$4,930,000	↘	
EE-05	▲	Cost Savings from Photolog Usage	\$324,165	\$500,000 per quarter (\$2,000,000 per year)	↘	
EE-06	●	Percent of Statewide Roadway Network Digitized	n/a			
EE-07		Percent of Rights-of-Way Purchases Attained by Agreement	91 Percent for SFY 2009	Greater than 90 percent per year	↘	✓
EE-08	▲	Number of CTtransit Passenger Trips	6,068,375 passenger trips	6,250,000 passenger trips per quarter	↗	
Quality of Life (QL)						
QL-01		Amount of Recycled Material Used in Projects	Demolition Debris 482,710 Tons Wood 991 tons Steel 1,140 Tons	Maximize Recycling and Reuse of Materials	↗	✓
QL-02		Percent of Road Network with Traffic Volumes Greater than Capacity	8.79% miles over Capacity	Reduce congestion throughout the state	↗	✓
QL-03	▲	Average Highway Incident Duration Time	Cars: 48 minutes Jackknifed Tractor Trailers: 84 min Overturned Tractor Trailers: 8hr 3min	Cars: <45 minutes Jackknifed Tractor Trailers: < 180 min Overturned Tractor Trailers: <5 hours	↘	✓
QL-04	▲	Average Highway Incident Response Time	2 minutes, 17 seconds	5 minutes (or less)	↗	✓
QL-05		Percent of Funds Expended for Bicycle/ Pedestrian Access	1.9 Percent Expended for Pedestrian and Bicycle Access in SFY 2009	Expend at Least One Percent of Total Funds Received, on Facilities that Improve Bicycle and Pedestrian Access	↗	✓
Accountability & Transparency (AT)						
AT-01	▲	Percent of Agreements Executed in Under 60 Days	59% — SFY 2010 Q3 (CY 2010 Q1)	Increase % of Agreements Executed in Under 60 Days	↗	✓
AT-02	▲	Percent of Construction Contracts Awarded within 60 Days of Bid Opening	92% — SFY 2010 Q3 (CY 2010 Q1)	100% awarded within 60 days	↗	
AT-03	▲	Number of Project Closeouts	56 — SFY 2010 Q3 (CY 2010 Q1) 255 - SFY 2010 YTD	250 projects closed in SFY 2010	↗	✓
AT-04		CT RECOVERY Percent Funds Obligated	Highways 100% 03/02/10 Transit 100% 03/05/10	Highways 50% by 7/1/09, 100% by 3/2/10 Transit 50% by 8/1/09, 100% by 3/5/10	↗	✓
AT-05	▲	CT RECOVERY Percent Dollars Expended	21.2 % (\$96,508,062)	100 % (\$465 million)	↗	
AT-06	▲	CT RECOVERY Number of Jobs Created/Sustained	10,048 Jobs Created/Sustained	Increase Jobs Created/Sustained	↗	✓
AT-07	▲	CT RECOVERY Percent of Stimulus Projects Completed On-Time	90 Percent Completed On-Time (Ten Projects Completed by May 31, 2010)	Maximize % of Stimulus Proj. Completed On-Time	↘	