
# ESTIMATING THE SAFETY BENEFITS OF CONTEXT SENSITIVE SOLUTIONS

**GEORGIA DOT RESEARCH PROJECT 09-10**
**FINAL REPORT**

**OFFICE OF MATERIALS AND RESEARCH**
**RESEARCH AND DEVELOPMENT BRANCH**
**OCTOBER 2011**

TECHNICAL REPORT STANDARD TITLE PAGE

| | | |
|---|---|---|
| 1.Report No.: FHWA-GDOT-12-0910 | 2. Government Accession No.: | 3. Recipient's Catalog No.: |
| 4. Title and Subtitle:<br>**Estimating the Safety Benefits of Context Sensitive Solutions** | | 5. Report Date: November 2011<br>6. Performing Organization Code: |
| 7. Author(s):<br>Catherine L. Ross, Ph.D.; Michael Elliott, Ph.D.; Jason Barringer; Sarah M. Smith; Myungje Woo, Ph.D.; John Kent; Margaret Lilly | | 8. Performing Organ. Report No.:<br>09-10 |
| 9. Performing Organization Name and Address:<br>Center for Quality Growth and Regional Development<br>Georgia Institute of Technology<br>760 Spring Street, Suite 213<br>Atlanta, GA 30308 | | 10. Work Unit No.:<br>11. Contract or Grant No.:<br>0009677 |
| 12. Sponsoring Agency Name and Address:<br>Georgia Department of Transportation<br>Office of Materials & Research<br>15 Kennedy Drive<br>Forest Park, GA 30297-2534 | | 13. Type of Report and Period Covered:<br>Final; March 2010 – October 2011<br>14. Sponsoring Agency Code: |
| 15. Supplementary Notes:<br>Prepared in cooperation with the U.S. Department of Transportation, Federal Highway Administration. | | |

16. Abstract:
Context Sensitive Solutions (CSS), also commonly known by the original name Context Sensitive Design (CSD), is an alternative approach to the conventional transportation-oriented decision-making and design processes. The CSS approach can be used to design and implement transportation projects that not only result in safe and efficient roadways, but ones that consider and preserve the total context of community values, including scenic, aesthetic, historic, and environmental resources. The key objectives of this research are to undertake a comprehensive review of current practice of CSS programs and similar initiatives in the U.S. which incorporate the overall concept of flexible design. The purpose of this comprehensive review is to identify the state of the practice of CSS in the U.S. and provide guidance to GDOT based on this information. A secondary objective of the research is to show the benefits of the CSS approach. The literature review included in this report provides a basic overview of the historical and practical foundation of CSD, the precursor to CSS. The literature and case studies reviewed show that transportation projects can be delivered in a cost-effective and context-appropriate manner in a constrained fiscal environment. When combined with CSS principles, a practical design/practical solution approach can be a "middle-way" method for DOTs that are interested in pursuing CSS principles but find themselves in a constrained fiscal or budgetary environment.

| | | | |
|---|---|---|---|
| 17. Key Words: Context Sensitive Solutions, transportation design, safety analysis | | 18. Distribution Statement: No Restriction | |
| 19. Security Classification (of this report): Unclassified | 20. Security classification (of this page): Unclassified | 21. Number of Pages: 123 | 22. Price: N/A |

Form DOT 1700.7 (8-69)

# Estimating the Safety Benefits of Context Sensitive Solutions (CSS)

## Contract Research
## GDOT Research Project No. 4806AAN
## Final Report

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Georgia Department of Transportation

"Estimating the Safety Benefits of Context Sensitive Solutions (CSS)" was created by the Georgia Institute of Technology's Center for Quality Growth and Regional Development (CQGRD).



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## ACKNOWLEDGEMENTS

Numerous people from several organizations have contributed their time and expertise to this research project. Special thanks go to the following individuals for their contributions:

### GEORGIA

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Mark Doctor, Safety/Geometric Design Engineer, FHWA – Georgia
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# 1. Introduction

## 1.1 Research Background

Historically, the planning and construction of road systems have emphasized the efficiency and safety of the system, often in ways detrimental to the environment and our communities. As Tom Warne noted in his opening statement to "Thinking Beyond the Pavement," the conference that officially established the concept of Context Sensitive Solutions in 1998,

*"In the beginning of the Interstate era, we built the greatest freeway system in the world; but aesthetics and preserving the environment weren't part of that mission. Now we need another transformation."*

Context Sensitive Solutions (CSS), also commonly known by the original name Context Sensitive Design (CSD), is an alternative approach to the conventional transportation-oriented decision-making and design processes. The CSS approach can be used to design and implement transportation projects that not only result in safe and efficient roadways, but ones that consider and preserve the total context of community values, including scenic, aesthetic, historic, and environmental resources. In order to realize the potential effects and impacts of a project, a collaborative effort is necessary. This requires the inclusive input of not only practitioners and experts, but also regulatory agencies, local communities, and other impacted stakeholders. The collaborative effort has the added benefit of increasing the public trust and perception of the Department of Transportation, which can reduce costs and overall project delivery time by minimizing public controversy, delays, or other issues. The collaborative effort and process must also consider the full life cycle of the project, including the planning, implementation, construction and maintenance factors that will have a lasting presence within the affected communities and environments.

A successful Context Sensitive Solutions (CSS) project approach includes the incorporation of a flexible design strategy to explore and incorporate community preferences, environmental considerations, and reduction if crash frequency and severity into the project development and design. Creative consideration of these components at the earliest phase possible is critical for the development of the CSS project. In the transportation planning agencies of other states, these components have been established as early priorities in the adoption of the

CSS approach. As the best practices for successfully incorporating these components into a project emerge, a primary challenge is to better understand and evaluate the extent to which all these components may come together to provide the greatest benefit to the project. If effectively incorporated through flexible design practices, the CSS approach can result in alternative project designs and better outcomes than initially identified by project designers.

CSS strategies have been utilized by many state DOTs, with the barriers to implementation and use of CSS being addressed by the American Association of State Highway and Transportation Officials (AASHTO). Nevertheless, some concerns remain regarding the effectiveness of CSS as an approach to highway design. Concerns about crash frequency and severity, liability risk, higher costs, and the primarily aesthetic focus of CSS persist; however, in many cases these concerns are more perception than reality and research addressing these barriers continues.[1, 2] Recent State pilot efforts around the country along with more targeted research efforts and case studies suggest that CSS, when utilized from project onset as an overall approach to transportation planning, can lead to the expectations of stakeholders and designers being met and in some cases exceeded. These efforts also suggest that CSS can lead to reduced costs, better on-time delivery, stronger community relationships, and broader funding options while also reducing crash frequency and severity .[3, 4]

## 1.2 Research Objectives and Methodologies

The research methodology includes a literature review and survey with experts from around the nation. The key objectives of this research are to undertake a comprehensive review of current practice of CSS programs and similar initiatives in the U.S. which incorporate the overall concept of flexible design. The purpose of this comprehensive review is to identify the state of the practice of CSS in the U.S. and provide guidance to GDOT based on this information. A secondary objective of the research is to show the benefits of the CSS approach. The literature review included in this report provides a basic overview of the historical and practical foundation of Context Sensitive Design (CSD), the precursor to CSS. (CSS, a more all-inclusive name more commonly in used in recent years, will be primarily used in this report). The nationwide case studies included in this study illustrate the use of flexible design strategies and explore the costs

and benefits of such strategies. The expert surveys were guided by the literature review and case studies, and further examine and refine best practices in select states.

Four states were targeted for the expert interviews. These included Kentucky, Minnesota, Illinois and Tennessee. The first two were FHWA-designated CSS pilot states. While not a pilot state, Illinois also received technical assistance from the FHWA. All three of these states have a longer history of CSS initiatives and projects than the State of Georgia and therefore are able to provide insight gained through a decade of CSS initiatives. Tennessee was included because it is a southeastern state, its transportation professionals had attended training provided by Illinois, and it provides several examples of flexible design projects adjacent to Georgia.

The literature review and expert interviews provide the current best practices from around the country. These best practices were then used to evaluate select policies, procedures, and projects from the State of Georgia. This information is synthesized into project development recommendations for GDOT.

## 1.3 Report Organization

The report is organized as follows. Section 2 defines CSS, addressing relevant legislature, agency responses, and practitioner implementation. The fundamental principles, qualities, and outcomes that are associated with the CSS process are also listed. Section 3 reviews relevant flexible design initiatives, including Safety Conscious Planning (SCP), Value Engineering (VE), and Practical Design (PD). Current practices of CSS in the U.S. along with case studies are discussed in Section 4, and the efforts of employing CSS concepts in decision making of transportation planning and project development in Georgia are summarized in Section 5. Finally, Section 6 draws conclusions from the body of literature and case studies.

# 2. What Is Context Sensitive Solutions (CSS)?

## 2.1 Legislative Origin

The CSS concept has been evolving since the National Environmental Policy Act (NEPA) of 1969. The passage of NEPA "established a framework for environmental planning and decision-making by Federal agencies based on a set of fundamental objectives that include environmental protection, interagency coordination and cooperation, and public participation in planning and project development."[5] In short, we must live more harmoniously in the context of the environment and our communities. These ideals resonate at the core of the CSS concept. In years following NEPA, a growing consciousness about the impacts of transportation projects on the environment and our communities led to a variety of federal transportation legislative responses. With regards to CSS, perhaps the most notable pieces of legislature to promote the development of CSS are the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) and the 1995 National Highway System Designation Act. These acts address the importance of protecting cultural and environmental resources. ISTEA "expanded the Federal transportation focus from constructing roads to providing diverse surface transportation options with consideration of environmental enhancements and a focus on community issues and livability initiatives" and encouraged the need for public involvement in decision-making.[6] The NHS act in turn "strengthened the direction that Congress gave in ISTEA"[7] by affording more decision-making flexibility in context to the unique needs of those being affected by transportation development. Since the adoption of ISTEA, CSS has been a focal point of federal transportation policy. The more recent legislative actions of TEA-21 and SAFETEA-LU further strengthen the goals of previous legislation while confirming the momentum of CSS.

## 2.2 Definition and Process of CSS

To date the most commonly accepted definition of CSS is "a collaborative, interdisciplinary approach that involves all stakeholders in providing a transportation facility that fits its setting. It is an approach that leads to preserving and enhancing scenic, aesthetic, historic, community, and environmental resources, while improving or maintaining safety, mobility, and

infrastructure conditions." [8] The corresponding core principles were refined to address transportation processes, outcomes, and decision-making.[9] They include:

- Striving towards a shared stakeholder vision to provide a basis for decisions.
- Demonstrating a comprehensive understanding of context.
- Fostering continuing communication and collaboration to achieve consensus.
- Exercising flexibility and creativity to shape effective transportation solutions, while preserving and enhancing community and natural environments.

Accomplishing a successful CSS project requires efforts to "include effective decision making and implementation, outcomes that reflect community values and are sensitive to environmental resources, and ultimately, project solutions that are safe and financially feasible."[10] This process is complimented by the hallmark qualities of the CSS process as established by the National Peer Exchange (the aforementioned 2006 national meeting). The CSS process containing these qualities should:

- Establish an interdisciplinary team early, including a full range of stakeholders, with skills based on the needs of the transportation activity.
- Seek to understand the landscape, the community, valued resources, and the role of all appropriate modes of transportation in each unique context before developing engineering solutions.
- Communicate early and continuously with all stakeholders in an open, honest, and respectful manner, and tailor public involvement to the context and phase.
- Utilize a clearly defined decision-making process.
- Track and honor commitments through the life cycle of projects.
- Involve a full range of stakeholders (including transportation officials) in all phases of a transportation program.
- Clearly define the purpose and seek consensus on the shared stakeholder vision and scope of projects and activities, while incorporating transportation, community, and environmental elements.
- Secure commitments to the process from local leaders.
- Tailor the transportation development process to the circumstances. It should use a process that examines multiple alternatives, including all appropriate modes of transportation, and result in consensus.
- Encourage agency and stakeholder participants to jointly monitor how well the agreed-upon process is working, to improve it as needed, and when completed, to identify any lessons learned.
- Encourage mutually supportive and coordinated multimodal transportation and land-use decisions.
- Draw upon a full range of communication and visualization tools to better inform stakeholders, encourage dialogue, and increase credibility of the process.

For implementation, when developing successful solutions for a project, *NCHRP Report 480* suggests a comprehensive framework for the project development process. Initially parties must exercise careful consideration of the overall management structure and establish a thoughtful and well-rounded problem definition, which a well-informed solution development process will address. From this foundation, the parties must be open to stakeholder input, creative alternatives, and making tough decisions. Such extensive input provides the options necessary to complete the project development framework, alternatives development, and screening, evaluation, and selection phases of a project.[11] Upon implementation, the solution's results will likely reflect the projected outcomes of applying CSS, showing that they:[12]

- Are in harmony with the community and preserve the environmental, scenic, aesthetic, historic, and natural resource values of the area.
- Are safe for all users.
- Solve problems that are agreed upon by a full range of stakeholders.
- Meet or exceed the expectations of both designers and stakeholders, thereby adding lasting value to the community, the environment, and the transportation system.
- Demonstrate effective and efficient use of resources (people, time, budget,) among all parties.

## 2.3 Challenges and Benefits of CSS

CSS strategies have been pursued by various state DOTs, and many of the barriers to implementation and use of CSS have been previously addressed by AASHTO. Nevertheless, some concerns about the effectiveness of CSS as an approach to highway design remain. Concerns include:[13]

- Internal resistance to change.
- Lack of time and money to implement CSS integration.
- Lack of partner/stakeholder trust.
- Inflexible design standards.
- Tort liability/safety.
- Difficulty in moving from intellectual to implementation commitment in CSS.
- Inconsistent or incomplete CSS implementation.
- The perception that CSS is just "gold-plating" projects.

While concerns about the implications for crash frequency and severity liability risk, higher costs, and the primarily aesthetic focus of CSS persist, in many cases these concerns are more perception than reality and research addressing these barriers continues.[14, 15] Recent pilot

State efforts around the country along with more targeted research efforts suggest that CSS, when utilized from project onset as an overall approach to transportation planning, can lead to the expectations of stakeholders and designers being met and in some cases exceeded. These efforts also suggest that CSS can lead to reduced costs, better on-time delivery, stronger community relationships and broader funding options.[16, 17]

As the use and popularity of CSS has grown throughout the US, proponents of CSS tout many potential broad-based benefits including.[18, 19]

Economic Benefits:

- Design features appropriate to the context of the project.
- Improved project scoping and budgeting, improved predictability of project delivery, and improved liability and risk management protection.
- Decreased time and costs for overall project delivery.
- Help in prioritizing and allocating scarce transportation funds in a cost-effective way.

Public Trust Benefits:

- Support of broad, integrated planning and community objectives.
- Increased partnering opportunities.
- Enhanced stakeholder participation and feedback, with consequent improvements in stakeholder ownership, trust, and satisfaction.
- Decisions that reflect the value of group decisions, which are more accepted and mutually satisfactory.
- Avoided or minimized impacts to human and natural environments.
- Solving the right problem by broadening the definition of “the problem” and by reaching consensus with all stakeholders before the design process begins.

System-Wide Programmatic Benefits:

- Optimized maintenance and operations.
- Reduction of crash frequency and severity for vehicles, pedestrians, bicycles, and transit.
- Improved mobility for vehicles, pedestrians, bicycles, and transit.
- Improved and enhanced environmental outcomes.
- Improved long term decisions and investment.

As CSS becomes more integrated into federal, state, and local policies and various levels of legislature and as performance standards become more refined, the process will likely overcome the challenges it faces.

## 2.4 Measuring Benefits of CSS

Research is being conducted around the country to develop approaches to quantifying and measuring the benefits of CSS. This measurement will then further support the implementation of a CSS approach as a meaningful strategy in addressing transportation problems.[20] One of the first of these efforts is the Performance Measures for Context Sensitive Solutions: A Guidebook for State DOTs. The purpose of this guidebook is to help state departments of transportation develop their own customized and comprehensive CSS performance measurement programs.[21] The guide does not provide individual measurements but is instead designed as a framework for agencies to use in developing measures tailored to their own needs. This guideline suggests the use of nine project measurement criteria separated into process and outcome measures:[22, 23]

### Process Measures

1. Use of multi-disciplinary teams
2. Public engagement
3. Consensus on project problems, opportunities, and needs
4. Consensus on project vision or goals
5. Alternatives analysis
6. Construction and maintenance

### Outcome Measures

7. Achievement of project vision or goals
8. Stakeholder satisfaction
9. Quality assurance review

This framework provides a good guideline for state DOTs on the balance between project-based and organizational-based foci.[24] Moving forward, transportation agencies need the capacity to clearly measure, evaluate and compare CSS projects to alternatives, as well as to conventional approaches, in order to assess performance and refine project development approach.

Transportation agencies are often interested in increasing safety, mobility, access and economic development in a financially feasible and fiscally responsible manner.[25] While most agencies primarily use CSS to decrease project costs and delivery time, the most extensive work has been done on identifying CSS principles, with few efforts undertaken to measure the impact of these principles on the goals of reducing time and cost.[26, 27] However, some individual CSS

projects have been shown to produce economic benefits due to their focus on functionality, innovation and empowered decision-making.[28, 29]

Traditionally, the results of transportation projects are measured by changes in delays and safety, environmental impacts, and total project costs.[30] Measuring the benefits of approaches like CSS can prove difficult. While benefits are usually measured only in economic and quantitative terms, no systematic methods exist for assigning, measuring and comparing quantitative values of CSS benefits. Additionally, guidelines are not available for transportation agencies to first understand how the benefits of CSS are related to its principles, and also how to evaluate CSS applications compared to stated project goals or to conventional approaches.[31]

It may be possible, once the principles of CSS are tied to quantifiable benefits, to utilize measurement tools and processes from other sectors. Current practices of measuring transportation impacts are primarily limited to Level of Service (LOS) measures that are designed to provide insight into mobility. However, new methods for measuring impacts on livability and land use as well as environmental commitment are being developed.[32] Concepts such as quality management and performance-based management have been used in the business world and in other governmental and transportation undertakings; these may prove to be useful in determining goals and identifying metrics to be used in evaluating the success of CSS approaches.[33, 34] To date, however, none of these approaches have been applied explicitly to the measurement of performance of CSS based projects. The National Cooperative Highway Research Program produced NCHRP Report 642: Quantifying the Benefits of Context Sensitive Solutions.[35] This report measures benefits across the various CSS principles using semi-quantitative measurements of stakeholders and team-members' satisfaction with the process and perception of whether the project met its stated goals. Quantitative measurements analyzed whether finished products yielded favorable outcomes and many quantitative metrics assigned dollar values to project benefits. If a project was prompted by a need to correct a specific design deficiency, before and after quantitative data was used to assess the project's effectiveness. Projects that focused on other CSS principles still had indirect safety impacts, especially projects that modified road capacity, signage, signals, turn lanes, passing restrictions, or traffic congestion.

Quantitative measurements of safety benefits included:[36]

- Crime statistics,
- Hospital and EMS statistics for accidents,
- Emergency service response times,
- Crash data,
- Crashes,
- Injuries,
- Fatalities, and
- Property damage.

Qualitative measurements included:

- Focus groups,
- Walkability audits,
- Interviews of key figures,
- Windshield surveys with key figures,
- Surveys,
- Primary data from users, residents or stakeholders, and
- Demographic data of users.

# 3. Flexible Design Initiatives Related to Context Sensitive Solutions (CSS)

Several other project approaches are related to the concept of CSS. The idea of flexible design is integral to all of these project approach initiatives, which are described in the following section. One of contributions from this research to existing literature is a comparison of these flexible design approaches, which include Safety Conscious Planning (SCP), Value Engineering (VE), and Practical Design (PD), and their implications for CSS. All require the designer to look beyond the individual project at the larger context, be it a long-term cost strategy, economic development forces, enhancing the quality of life of the adjacent community, or other considerations. These project approaches prioritize inputs and outcomes differently, but all require creative thinking and flexibility toward problem solving.

## 3.1 Safety Conscious Planning

In contrast to traditional transportation planning, Safety Conscious Planning (SCP) places safety at the forefront of planning decisions. SCP addresses safety in a proactive, data-driven, comprehensive, collaborative, system-wide and multimodal context.[37]

### Background

The legislative impetus for SCP primarily comes from the Transportation Equity Act for the 21st Century (TEA-21) of 1998. Earlier federal legislation required states and Metropolitan Planning Organizations (MPOs) to address transportation safety; in particular, the Intermodal Surface Transportation Efficiency Act (ISTEA) made safety a core area to be monitored for improvement. TEA-21 extended this special focus on safety to include the planning process as well.[38]

In 2000, to implement the TEA-21 planning requirements, the Transportation Research Board (TRB) convened experts and officials from various agencies to form an ad hoc group, called the SCP Working Group. This group defined the SCP process and recommended the use of forums to promote SCP.[39]

### Goals

To promote more proactive safety planning, SCP is built upon two overarching goals. First, SCP seeks to enable decision-makers to fully understand the impact of their decisions on

transportation safety. This is to be done by explicitly making safety a priority in planning decisions and by having safety experts in all public and private planning organizations. Data and analysis are key inputs in the decision-making process. Second, SCP seeks to increase collaboration among decision-makers and agencies at all levels. The effort should involve transportation planners, engineers and operators across all modes as well as other stakeholders, including safety practitioners, politicians, developers, land use planners, urban designers and the general public.[40]

## Implementation

Forums and workshops have been a major tool for implementing SCP. The first forums were held in Florida, Maryland, Michigan, Oregon, Tennessee, and Texas.[41] These and later state forums convened experts and agency officials from all levels to identify safety issues and develop initiatives. Issues identified included differences amongst agencies' priorities concerning safety, nonconformity in data collection among agencies, a lack of research and training capacity, and an historical tendency to focus on infrastructure determinants of safety and to overlook behavioral determinants.

The Southeast Michigan Council of Governments (Detroit MPO) has successfully implemented several SCP priorities. It created a Traffic Safety Manual to improve local agency capacity to gather and analyze data and to encourage consistency among MPO members. The MPO itself has also released transportation safety statistics annually and conducted studies on regional safety issues. The MPO's focus on transportation safety has included spending discretionary funds on safety related projects and increasing public awareness of safety issues.[42]

## Transportation Safety Planning

Since the Safe Accountable, Flexible, Efficient Transportation Act: A Legacy for Users (SAFETEA-LU) was signed in 2005, SCP's scope has been widened to include SAFETEA-LU's priorities, which include a Strategic Highway Safety Plan (SHSP) mandate for states and a goal of reducing highway fatalities. This broadening of SCP has resulting in a new concept, Transportation Safety Planning (TSP).

TSP aims to improve safety by making small changes that extend through the whole transportation network, focusing on the individual project's impact on the larger context. A major

current initiative is to incorporate the goals of state Strategic Highway Safety Plans into Statewide Transportation Improvement Programs (STIP) and MPO's Transportation Improvement Programs (TIP) as well as with long range DOT and MPO plans. As TSP is a successor concept to SCP, the terms are used interchangeably. Reflecting this dynamic, the Safety Conscious Planning Working Group has been renamed the Transportation Safety Planning Working Group.[43, 44]

Safety conscious planning, with its focus on a proactive consideration of safety in transportation planning and project development, can provide important input into a CSS framework.[45] While some projects have successfully designed roadways and adjacent areas to enhance safety of system users while at the same time promoting community livability, conflict remains between those interested in promoting livability contextual factors and those interested in traditional safe design.[46] Recent research has shown both that designing roads to over capacity can encourage faster speed and less safe driving and that the inclusion of non-traditional, context specific design elements that reduce vehicular speed and promote livability often enhances safety.[47, 48] The perceived conflict between livability and safety, particularly in urban and suburban contexts, may therefore not exist.

## 3.2 Value Engineering in Transportation Planning

Value Engineering (VE), also known as Value Methodology (VM), is an independent review of a project to clearly delineate design alternatives and to suggest choices based on prudence and feasibility. The review focuses on the function of the project, in contrast with other studies that focus on secondary matters such as cost or quality. VE seeks to maximize value by reducing cost without sacrificing function or alternatively by increasing function without raising costs. VE has traditionally been applied to construction, but also can be extended to planning, design, standards or processes. [49]

According to SAVE International, an organization of value engineers that promotes the process, VE has six phases:[50]

1. Information Phase: Gather information to better understand the project.
2. Function Analysis Phase: Analyze the project to understand and clarify the required functions.

3. Creative Phase: Generate ideas on all the possible ways to accomplish the required functions.
4. Evaluation Phase: Synthesize ideas and concepts to select feasible ideas for development into specific value improvement.
5. Development Phase: Select and prepare the "best" alternative(s) for improving value.
6. Presentation Phase: Present the value recommendation to the project stakeholders.

The SAVE International process has been adapted by AASHTO with little variation. States have also created similar standards as a way to determine if they have met federal mandates and to attract funding. While the study process is well outlined, there is no universal standard for implementing the recommendation of a VE study.

## Background

The VE concept originated during the Second World War when engineers made adjustments in response to resource shortages. The techniques began to gain traction in transportation in the 1970s. Caltrans was an early adaptor of VE, implementing the process for state projects in 1969. However, resistance from transportation designers meant it was not widely utilized. The Federal-Aid Highway Act of 1970 required VE on highway construction. In 1973, the FHWA created a VE training program for states and AASHTO created Guidelines on Value Engineering in 1987.[51]

In 1991, the President's Council of Integrity and Efficiency directed that VE should be more widely applied to federal projects, not just to construction. OMB Circular A-131 required in 1993 that all agencies use VE, and that larger projects must have a VE manager, monitor their progress and issue annual reports. The Highway Designation Act of 1995 made VE mandatory for all DOT project with federal aid over $25 million.

A review of VE utilization by states in NCHRP Synthesis 352 learned that states found VE to be well-defined and most valuable when applied early in a project.[52] However, its value was dependent on the quality of leadership in the project and on the VE team. In addition, the use of VE was dependent on mandates. Projects that received less than the federal aid threshold rarely utilized the process, except in California, Florida and Virginia where VE studies are more actively used.

## Value Engineering and Context Sensitive Design

Value engineering can be seen as incompatible with both safety and CSS. Attempts at cost savings using a VE approach can water down or even eliminate project design commitments made to stakeholders.[53, 54] In the 1990s, a controversy over safety in the construction of Highway 407 in Ontario exposed the potential for friction between VE and safety. After local police protested alterations that resulted from a VE study, a review of a VE study revealed that the process had not met VE standards. The study proved to be a cost cutting exercise aimed at keeping the project on budget.[55]

To overcome this potential conflict, it is important to understand the commonalities of CSS and VE. Overlapping principles of the two approaches include:[56]

- Improving value and quality while taking a wider, life-cycle view,
- Enabling a better assessment of risk and what can be accomplished through increased flexibility,
- Optimizing function that can be delivered for the cost,
- Incorporating multi-disciplinary teams and members of the public for input in all project phases,
- Using workshops and charrettes to focus assessments, and
- Emphasizing creative thinking and innovation.

Table 1 shows the similarities of steps in the VE and CSS processes.

**Table 1 - Steps in VE and CSS[57]**

| VE Steps | CSS Steps |
|---|---|
| 1.Investigation: background information (including context), function analysis, team focus. | 1.Convene team (include stakeholder). Investigate context. Understand and discuss purpose, needs and functions. |
| 2.Speculation: creative, brainstorming, alternative proposals. | 2. Listening, brainstorming, alternative proposals. |
| 3. Evaluation: Analysis of alternatives. What are the life-cycle cost impacts which deliver the highest overall value? | 3. Understand tradeoffs. Reach consensus on alternatives to delivering the most value to the public. |
| 4. Development: develop technical and economic supporting data. Present recommendations/findings. Fair evaluation. | 4. Document decisions and why they were chosen. Present agreements. |
| 5. Implementation of VE recommendations. | 5. Implementation of CSS recommendations. |
| 6. Audit: review of completed results, accomplishments and awards. | 6. Audit: review of completed results, accomplishments and awards. |

VE can be successfully integrated with other transportation planning initiatives. Even though it was created to save resources and was primarily designed as an efficiency tool, VE is compatible with CSS and safety initiatives such as SCP. VE concepts can be used to elicit functional user requirements, analyze those requirements from the abstract to the specific, and strike a balance between functional requirements and safety constraints.[58]

VE concepts most effectively enhance CSS when applying cost-saving measures and attention to the first stages of project selection and design. At this stage, focus on the core concepts of CSS is particularly imperative because of the risk of applying cost savings to improper solutions that were not initially designed correctly.[59] Recently, successful integration of VE and CSS has occurred around the country in places such as Utah, Washington and New Jersey.[60] Missouri has combined VE, CSS, and Practical Design with some success through the use of "Concept Stage" VE studies, focusing on savings in the early design and concept selection phases rather than later in the process.[61]

## 3.3 Practical Design

The principles of SCP and VE mentioned above have significant overlap with the principles of CSS. While conflicts between context-specificity, safety, and value can occur, the principles of these three approaches can be utilized together to promote transportation systems, planning and projects that are safe, reflect community values and are economically efficient and feasible. All approaches promote the concept of conceiving the project within the larger context, systems, and goals. Further research into linking CSS and practical design solutions was proposed in the NCHRP Report 642 mentioned earlier.[62]

### Background

Practical design approaches[i] to transportation planning are increasingly promising and being utilized and tested in several states (Table 2). This increasing exploration of practical design approaches by several state DOTs has been made manifest through both a peer-exchange

[i] Some state's approaches are similar in concept and application to practical design but have a different name.

workshop hosted by Oregon Department of Transportation (ODOT) in 2009[ii], and a hearing in the United States House of Representatives sub-committee on Highways and Transit regarding "Using Practical Design and Context Sensitive Solutions in Developing Surface Transportation Projects."[iii]

**Table 2 - States with Practical Design Programs**

| State | Approach | Time of Use | Information |
|---|---|---|---|
| Idaho | Practical Design | Started in 2007 | http://itd.idaho.gov/transporter/2007/080307_Trans/Practical_Design.pdf |
| Kentucky | Practical Solutions | Started in 2008 | http://contextsensitivesolutions.org/content/gen/state-profiles/KY |
| Missouri | Practical Design | Started in 2005 | http://www.modot.mo.gov/business/PracticalDesign.htm |
| New Jersey | Smart Transportation | Started in 2008 | http://www.smart-transportation.com/guidebook.html |
| Oregon | Practical Design | Started in 2010 | http://www.oregon.gov/ODOT/HWY/TECHSERV/practical_design.shtml<br>http://www.oregon.gov/ODOT/HWY/TECHSERV/docs/Practical_Design_Guideline.pdf |
| Pennsylvania | Smart Transportation | Started in 2008 | http://www.smart-transportation.com/guidebook.html |

## Goals and principles

Practical design approaches are based on developing an efficient solution by focusing on specific, performance-based project needs from the beginning rather than stripping down components of a traditional design.[63] Practical design approaches can lead to the "right-sizing" of projects – a project is designed to meet the specific needs and nothing more – leading not only to more cost-effective, context-sensitive projects, but also to a more system-wide approach to transportation investments.[64, 65] Applying practical design framework has been shown to not only

[ii] The agenda and presentations from this meeting are available on-line at http://www.oregon.gov/ODOT/HWY/TECHSERV/practical_design.shtml Last accessed, November 2010.
[iii] The hearing was held on June 9, 2010 and the proceedings can be found online at http://transportation.house.gov/hearings/hearingDetail.aspx?NewsID=1205

improve specific project outcomes, but also allow for a more system-wide distribution of limited funds and resources. This leads to an improvement of the total transportation system, such as better facility condition and transportation project cost savings.[66, 67]

Five principles have been suggested in the pursuit of achieving successful practical design solutions.[68]

1. **Target the goals/objectives of the purpose and needs statement** – The purpose and need statement should serve as the target, not the lowest threshold of acceptable performance. The goals and objectives should be specific to allow for evaluation and comparison among alternatives.
2. **Meet anticipated capacity needs** – The initial focus should be on right sizing the project based on expected and/or planned capacity, not designing to a specific LOS measure.
3. **Evaluate safety compared to the existing conditions** – This allows for the quantification and evaluation of safety gains based on the marginal improvements over the existing conditions. Additionally, this approach leads to a situation in which there is a net system-wide improvement in safety.
4. **Develop and evaluate design options and alternatives** – Design options should address the goals and objectives as simply as possible; these should be compared and evaluated on their ability to reach those objectives.
5. **Maximize design to the point of diminishing return** – The points of diminishing returns in all project elements should be considered in the aggregate to ensure the maximum return on investment.

These principles, when combined with the basic values of practical design approaches (Tables 3 and 4 below), allow for the evaluation of design options and alternatives based on objective measures of effectiveness for each project. [69]

The following sections provide some brief examples of how three states, Oregon, New Jersey and Pennsylvania,[iv] are approaching the use of practical design and summaries of information provided in their DOT handbooks.

## Implementation

### Oregon

In 2010, ODOT published the Practical Design Guidebook[v] to provide an overview of their practical design philosophy as well as guidance in applying a practical design framework to

[iv] Pennsylvania and New Jersey created the Smart Transportation Guidebook jointly

transportation planning and design. As with the approaches mentioned in earlier sections of this report, the values of practical design are similar and overlapping with the values of CSS. Following is a list of practical design values used in Oregon:[70]

- **Safety** – Overall system safety will not be compromised. Each project will either maintain safety levels or make them safer. No individual project will degrade overall system safety.
- **Corridor Context** – Each project is seen as a part of a larger corridor and is designed to fit with the context of the corridor (e.g. current and planned land use, community character).
- **Optimize the System** – Adopt an asset management approach to managing transportation infrastructure optimizing the life cycle of the different components. Allocate funding based on the combination of assets that best ensures the system is optimized for safety, mobility, and financial investment.
- **Public Support** – Work in partnership with local communities and consider the needs of pedestrians, bicyclists, transit users, freight, and mobility. Be clear about the project purpose, need, and alignment with the overall system.
- **Efficient Cost** – With limited funds for transportation investment, it is important to deliver right-sized projects – those that only meet project specific purpose and need and are not overbuilt – while redistributing cost savings to investments that will produce the most benefit to the system.

These values provide the basis for three overarching goals used by ODOT:[71]

1. Direct available dollars toward activities and projects that optimize the highway system as a whole.
2. Develop solutions to address the purpose and need identified for each project.
3. Design projects that make the system better, address changing needs, and/or maintain current functionality by meeting, but not necessarily exceeding, the defined project purpose and need of project goals.

The ODOT *Practical Design Book* provides a case study to illustrate how the values and goals can be applied to an actual project. This case study (US-197: Burnham Ave-Third Street, Maupin) is summarized as follows. The project has three major purposes:

1. Provide a project that will enhance the functionality, appearance, livability, and economic prosperity of Maupin through the reconstruction of four city blocks on the main street.
2. Provide repair of pavement and an upgrade of storm, sanitary, and water systems, and provide a safer roadway for pedestrians.
3. Incorporate access management strategies.

[v] The Practical Design Guidebook can be found online at ODOT's website. http://www.oregon.gov/ODOT/HWY/TECHSERV/docs/Practical_Design_Guideline.pdf <last accessed November, 2010>

Tourism in the town of Maupin has been increasing due to recreational activities on the Deschutes River. US-197 (Deschutes Avenue in town) has deteriorating sidewalks and unmarked crosswalks leading to an uninviting and dangerous environment for pedestrians. Curb height varies greatly along the facility from non-existent to high enough to interfere with car doors. Additionally, ODOT rated the pavement condition for the section of road as poor in 2006. Table 3 illustrates how ODOT's practical design values were incorporated into the US-197 project.

**Table 3 - ODOT's Practical Design Values[72]**

| Value | Question | Result |
|---|---|---|
| Safety | • Will the project maintain or improve safety?<br>• Are there any effective low-cost measures that can improve safety?<br>• Has a crash analysis been done to confirm improvement addressing the primary safety problems that are being experienced? | • Provided bulb-outs for pedestrian crossing.<br>• Improved sidewalks.<br>• Constructed new curb and gutter with buffer strips.<br>• Potential to improve the overall system safety. |
| Corridor Context | • What is the purpose of the corridor and/or nature of the community?<br>• How is the area currently being used for alternative travel?<br>• What is the design speed for this segment of the corridor?<br>• Is the solution in harmony with the rest of the corridor or future plans for the corridor?<br>• What can be done with this project to reduce/simplify future projects/plans in the corridor? | • Applied appropriate design criteria [Special Transportation Area (STA) Guidelines].[vi]<br>• Maintained access to businesses during construction.<br>• Accommodated freight movements used by trucking industry.<br>• Enhanced appearance, City livability and economic prosperity. |
| Optimization of the | • What is the problem?<br>• What are the possible | • Provided adequate pavement surface and drainage facilities. |

[vi] STA Guidelines are from the 1999 Oregon Highway Plan and can be found on-line at http://www.oregon.gov/ODOT/TD/TP/docs/publications/TSP/tspPart3_5.pdf?ga=t <last accessed November 2010>

| Value | Question | Result |
|---|---|---|
| System | solutions and do they solve the problem?<br><br>• Will the project be buildable and maintainable?<br>• Does the solution optimize the infrastructure life-cycle cost?<br>• Does the solution provide an operational improvement?<br>• Does the solution improve connectivity and coordination with other systems?<br>• Can we design a system that can be flexible for future expansion?<br>• Is a construction project the right solution (vs. enforcement, education, etc.)? | • Upgraded City water and sanitary sewer systems.<br><br>• Incorporated an Access Management Strategy. |
| Public Support | • Who are all the stakeholders?<br>• Has community input been considered?<br>• How will decisions be communicated after gathering public input?<br>• Do we ourselves have a good understanding of the problem?<br>• Is the problem clearly documented?<br>• Do the stakeholders define success?<br>• What kind of support exists from city/local jurisdictions and primary users of the facility?<br>• Has minimum expected value been met? | • Coordinated with multiple stakeholders.<br>• City officials<br>• ODOT (Design, construction, and maintenance)<br>• Freight and business communities<br>• Informed consent among internal and external stakeholders.<br>• Established expectations for involvement, communication, and decision making.<br>• Communicated decisions in a timely manner. |
| Cost | • Can any of the elements of the project be eliminated, | • Project stayed within and met purpose and need. |

| Value | Question | Result |
|---|---|---|
| efficiency | phased, or separated to a more appropriate project and still address the problem?<br><br>• Have we identified the alternatives and the cost/benefit (value) of each in relation to risk?<br>• What is the return on investment (quantifying time, money, economic growth, etc.)?<br>• What is the lifespan of the solution?<br>• What are the future maintenance and operations costs?<br>• Is there minimal re-work for future projects or needs?<br>• What is the minimum fix, and what would trigger a larger, more expensive fix? | • Maximized multiple funding sources.<br>• Bicycle/pedestrian funds<br>• Transportation enhancement funds<br>• Immediate opportunity funds<br>• Preservation funds<br>• City funds |

## Pennsylvania and New Jersey

Pennsylvania and New Jersey collaborated on the Smart Transportation Guidebook in 2008 to provide tools and techniques for developing transportation solutions that are context-sensitive, affordable, and receive support from the community and resource agencies.[73] The Guidebook was developed to supplement, not replace, existing processes in order to achieve "smarter" solutions while remaining consistent with applicable state and federal regulations.[74]

The Guidebook presents eight tools designed to provide a better understanding of the problem, key issues, potential solutions, community and agency opinion, and budget and timeline at the beginning of the process (Table 4). These tools will help enable the following outcomes:[75]

- Allocate financial resources to projects that address local, regional, and statewide priorities.
- Achieve consistent expectations between project proponents and communities, and entities that evaluate and fund projects.
- Achieve the optimum accommodation for all modes.

- Ensure context sensitivity in the planning and designing of projects.
- Decrease the amount of re-work in the preliminary engineering and final design phases of a project.

**Table 4 - PENNDOT and NJDOT Smart Transportation Tools[76]**

| Tool | Application |
|---|---|
| • Understand the problem and the context before programming a solution for it | • Is there a clear understanding of the problem?<br>• Has recent data been mapped and analyzed for a safety problem?<br>• Have the project team and stakeholders agreed to or adopted the project needs and objectives?<br>• What are the current and future transportation, land-use, environmental, and fiscal contexts of this problem?<br>• What alternatives should be developed?<br>• What are the order-of-magnitude costs for the potential alternatives? Are they consistent with state and regional priorities?<br>• What is the agency and community opinion of this problem and potential solutions? What issues or concerns do municipal representatives have?<br>• Do the local municipalities, utilities, or private land owners have projects scheduled that may be facilitated or harmed by the project? |
| • Utilize a multi-disciplinary team | • What are the specific issues related to this project?<br>• Do team members have the specific knowledge and skills to address the project issues?<br>• Does the composition of the team reflect the complexity of the project? |
| • Develop a project-specific communication plan | • Does the communication plan include techniques that will appeal to all intended audiences?<br>• Have the techniques proven effective in gathering input and fostering project understanding? If not, how should the communication plan be modified to better achieve this?<br>• Has the project team opened a dialog with the stakeholders, potentially interested parties, community leaders and elected officials?<br>• Is there a summary of issues and opportunities that can be easily understood by the project stakeholders and the general public?<br>• Is there project support from the community/stakeholders? If not, how will outstanding |

| Tool | Application |
|---|---|
| | issues be addressed?<br>• What municipal representatives and stakeholders should be included in the next phase of project development? |
| • Establish the full spectrum of project needs and objectives | • Are the project needs and objectives understood by the project team and stakeholders?<br>• Were agencies and the public involved in the development of project needs and objectives? |
| • Focus on alternatives that are affordable and cost-effective | • Is the total estimated cost of each alternative known before programming the project on a TIP? Is the cost known before a recommended alternative for final design is selected?<br>• Is each of the alternatives affordable given the current financial situation and state/regional priorities?<br>What are the cost/benefits of the alternatives? |
| • Define wide-ranging measures of success | • Have the alternatives been compared using a wide-ranging list of measures of success?<br>• Do all needs and objectives have corresponding measures of success? |
| • Consider a full set of alternatives | • Was the full range of alternatives developed? Were low cost, low impact alternatives considered?<br>• Do the alternatives address the needs and objectives that were agreed upon by the stakeholders and project team? |
| • Compare and test alternatives | • Have the agreed upon measures of success been used to compare and test the range of alternatives?<br>• Are the results summarized in a manner that is easily understood by a non-technical audience?<br>• Are the analyses repeatable by others? |

As shown in the examples from Oregon, Pennsylvania, and New Jersey, practical design approaches provide a framework that integrate a wide range of viewpoints into the planning and design process at an early stage, thereby ensuring a thorough look at both alternatives and criteria. In addition to the process-oriented details shown in Tables 3 and 4, practical design approaches offer a framework for integrating a performance based reduction of crash frequency and severity and operational evaluations into the CSS process, allowing DOTs to tailor solutions

to the unique needs of each project. Operational performance-based metrics have been in use in transportation planning and engineering and can be readily incorporated into a practical design framework. Predictive quantitative safety analysis will also play a role in this, but these analytical approaches are in their infancy.[77] The recently released AASHTO Highway Safety Manual[vii] will provide some guidance in this area.

## Practical Design and Context Sensitive Design

Practical design solution approaches are similar to CSS approaches in that they follow many of the same principles, but the decisions are guided more by fiscal and budgetary constraints; the aim is to reduce costs while still delivering focused benefits.[78, 79] The point of practical design approaches is to design and construct just what is necessary to meet the specific transportation need in a cost-efficient and safe manner.[80] When combined with CSS principles, practical design may prove to be a "middle-way" approach to measuring benefits for DOTs that are interested in pursuing CSS principles but find themselves in a constrained fiscal or budgetary environment.[81]

As can be seen from the various flexible design approaches, the idea of viewing a transportation project within the larger context and as part of a system-wide enhancement is a common thread throughout flexible design. All of these project approaches incorporate some or most of the original principles of CSS. Each approach seeks to emphasize a different element; however, the core concepts remain consistent.

[vii] The AASHTO Highway Safety Manual is available from http://www.highwaysafetymanual.org/Pages/default.aspx

# 4. Current Practice of CSS in the U.S.

## 4.1 Efforts to Incorporate CSS Concepts into the Federal Decision Making System

Agencies such as the American Association of State Highway and Transportation Officials (AASHTO) and the Federal Highway Administration (FHWA) have developed policies, standards, and guidelines that take advantage of the expanded design flexibility afforded by CSS legislative actions to address environmental and community impacts. The FHWA listed CSS as one of the objectives of the Vital Few Goals on Environmental Stewardship and Streamlining. In a spirit of collaborative input, the FHWA teamed up with AASHTO, the Bicycle Federation of America, National Trust for Historic Preservation, and Scenic America to produce the Flexibility in Highway Design guidebook to "[identify] and [explain] opportunities, flexibilities, and constraints facing designers and design teams responsible for the development of transportation facilities."[82] The multi-interest collaboration is reflected in the guide's emphasis on interdisciplinary and comprehensive contextual considerations. Notably, the Flexibility in Highway Design guidebook recognizes that the AASHTO Green Book, the most widely accepted transportation design standard resource, lacks the guidelines to steer thoughtful decision-making processes that foster quality of life over mobility. However, the Flexibility in Highway Design guidebook suggests changing policies in conjunction with the Green Book, which "[provides] guidance to the designer by referencing a recommended range of values for critical dimensions [as sufficient] flexibility is permitted to encourage independent designs tailored to particular situations."[83] This suggested departure from the constraints of conventional design methods in favor of comprehensive understanding and thoughtful alternatives are explicit in the core principles of CSS. As the concept continued to evolve, additional resources, like the Context Sensitive Solutions website (Context Sensitive Solutions, or CSS, is interchangeably referable to CSD) and A Guide to Best Practices for Achieving Context Sensitive Solutions (NCHRP Report 480), were created by relevant agencies to provide accessible information for the public and practitioners.

The growing relevance of the CSS concept was addressed at the 1998 "Thinking Beyond the Pavement" national conference sponsored by AASHTO and FHWA. The meeting challenged participants to "help define a process which will lead to excellence, which produces a project that

is carefully, imaginatively designed, serves traffic demand, provides safety for our customers, respects the natural and man-made environments, is viewed as an asset to those who use it, and whose design has the input of professionals and customers alike."[84] Rising to the call, the conference participants "developed an initial definition for Context Sensitive Solutions, identified qualities of excellence in transportation design, and characteristics of the process which would yield excellence, and identified barriers to implementation of CSS".[85] Additionally, a pilot program among five states (Connecticut, Kentucky, Maryland, Minnesota, and Utah) was established. Their tasks were to implement policies that reflected the newly-coined concept and share their respective experiences. The pilot program yielded significant advances in training development, defining the project development process, and establishing assessment tools.

The "Thinking Beyond the Pavement" conference also kick-started a series of initiatives that expanded CSS awareness among practitioners and citizens alike. They include other informative conferences, extensive literature and guides, as well as the launch of the FHWA-sponsored CSS website. Nearly a decade later, FHWA and AASHTO's Center for Environmental Excellence sponsored national meetings that addressed the implementation of the CSS concept among transportation agencies. These symposiums gathered practitioners who refined the definition and principles of CSS, as they are best known today.

## 4.2 CSS Programs in State DOTs

As stated before, CSS has gained tremendous momentum in the last decade. While not all states have official CSS programs, all are aware of the concept and strive to develop some level of application within their respective DOTs. In 2006, AASHTO performed a survey to evaluate the status of CSS usage among states. The direct results of the survey as reported by AASHTO are as follows:

- 47 states have held seminars, workshops and/or provided CSS training to staff,
- 23 states offer CSS training to consultants,
- 14 states established CSS-related partnerships with university engineering departments for development and/or delivery of CSS training programs,
- 35 states issued formal policies related to CSS,
- 19 states developed CSS manuals or related website content,

- 37 states are undertaking steps to incorporate CSS into their project development process,
- 25 states developed or are developing public involvement plans or practice early stakeholder involvement,
- 25 states have taken specific steps to incorporate CSS into their agency culture,
- 8 states have formed CSS-dedicated internal committees or teams, and
- 6 states have included CSS in their agency strategic plans.

In addition, states were asked if they had any "best practices" or other resources they would like to share with other State DOTs. Thirty-eight states offered examples of best practices they would like to share including:

- Formal CSS policies,
- Case studies of successful CSS practices,
- Project development guidelines,
- Public involvement manuals,
- Performance measurement tools, and
- Successful CSS programs.

When asked if states have encountered barriers to full implementation of CSS principles, 45 states indicated that they are facing challenges in this area. The following are the three most common barriers:

- 25 states encountered resistance to change,
- 19 states indicated that CSS is perceived to cost more in time and money, and
- 18 states indicated that DOT leadership, staff, and the public do not have a clear definition of what constitutes CSS.

Survey results indicated that a majority of states (34) would like to improve their CSS implementation processes. Learning from their peers through workshops, meetings, and training courses was judged the most effective way to gain information.

- 21 states indicated a preference to meet with DOTs that have similar concerns, and/or with DOTs successful in integrating CSS;
- 19 states indicated a preference for training opportunities through workshops, seminars, and national conferences; and
- 18 states indicated a preference for using website information and/or computer-based tools.

Topics of most interest were:[86]

- Successful training tools/guidelines, including design flexibility and maintenance issues,
- Effective public involvement processes,

- Performance Measures – only 11 State have performance measurement tools, but most states consider this to be important,
- How to deal with the perception of higher costs, and
- How other states deal with the liability concerns.

The specific information of CSS programs for 17 states and Washington D.C. that have official policies in place is provided in Appendix A.

## 4.3 Implementation Strategies from Select States

### Background of FHWA and State Initiatives:

Over the past fifteen years the Federal Highway Administration (FHWA) has undertaken several efforts to promote the use of the CSS approach by the state Departments of Transportation (DOTs). These efforts have been facilitated by the FHWA Resource Center, the outreach branch of the agency which offers technical assistance to states nationwide. In 1997, five states (Kentucky, Utah, Minnesota, Maryland and Connecticut) were designated by the FHWA as CSS pilot program states and received assistance from the FHWA to begin integrating the CSS approach into their project development process. FHWA also had a target goal for all of the states to adopt the CSS approach by 2007.[87]

Beginning in 2007, the FHWA Resource Center attempted to comprehensively determine the level of CSS approach implementation that had been achieved by each state, according to Jeff Shaw, a former member of the FHWA Resource Center Safety and Design Team. The Resource Center prepared a questionnaire for the states to complete, interviewed the State FHWA Division Office personnel, and worked with the state DOTs. According to Jeff Shaw, the FHWA consolidated all the results and determined where the states were along a continuum of being an “early,” “intermediate,” or “mature CSS adopter” state. The FHWA then approached individual states and offered additional technical assistance to help them mature their programs, beginning in 2008.[88] As part of this effort, nine state DOTs (California, Florida, Hawaii, Illinois, Maine, Massachusetts, New Hampshire, New Mexico, and Oregon) received specialized technical assistance over a period of two and a half years.[89] The technical assistance was customized to the specific needs and requests from the states to FHWA.[90]

## Strategies for Overcoming Barriers:

Transportation experts from two of the pilot states (Kentucky and Minnesota) and one specialized technical assistance state (Illinois) have provided best practices that have proven to be successful in the implementation of the CSS approach in their states. These states have offered strategies to eliminate or minimize the barriers that often impede the implementation of the approach. The common categories of barriers that have emerged through the interview process include institutional barriers, barriers due to lack of incentives, and external barriers.

### Institutional Barriers

Based on the literature review and the expert interviews, the most frequently occurring institutional barriers include: an internal lack of understanding about the CSS process, a lack of political support and understanding of the process, weak or inconsistent leadership and directives, misperceptions regarding the impact of the CSS approach on the cost and schedule of a project, and the lack of a realistic timeline for the implementation of the CSS approach within the state. Other institutional barriers are created by inflexibility within the state design standards. In this scenario, the designers must comply with the State standards. Finally, a common fear that designers have is exposure to tort liability and risk when attempting to reconsider the intent of the standards or creatively apply the standards. According to the experts, related to this fear of risk is a lack of understanding regarding the inherent flexibility that does exist within the standards. All of these barriers can prevent successful implementation of the CSS approach.

### Overcome Institutional Barriers through Training

One strategy to overcome an internal lack of understanding about the details of the process is by establishing a strong training program within the state Department of Transportation (DOT). This includes both formalized training through structured classes, as well as establishing training opportunities through other, less structured formats. As described by the transportation experts in other states, each training course should be developed for a specific target audience and the length, frequency, and materials presented in the training courses will vary accordingly. The series of courses typically developed by others states are customized for the following audiences: the actual designers using the CSS approach in their plans, higher level executive decision makers within the organization, technical professionals from other regulatory agencies,

individuals responsible for the construction and maintenance of a project, stakeholders, and the general public, among others. Additionally, politicians and other state and city officials should be included in the training program, which can help build political support for and understanding of the CSS approach, an aspect of implementation which is critical to success. All of those who participate in the process of moving a project forward should receive CSS training. The following sections describe effective training courses and structures that have been developed, tested and refined over the last decade in other states.

## Internal Department of Transportation Training Needs and Opportunities

Several of the state transportation experts interviewed were closely involved with the development and implementation of the formalized training programs in their respective states. The experts offer details on each course that has been developed to serve a different and specific purpose. Sharon Philips, District Project Engineer with the Illinois Department of Transportation (IDOT), describes the highly technical two-day course developed by IDOT which is offered to actual design practitioners. This course is available to both internal Department of Transportation employees and consultants. The course covers the technical aspects of the Context Sensitive Solutions approach, and also includes exercises designed to help engineers learn how to facilitate public meetings, how to engage in active listening, and how to practice sensitivity. Effective use of these non-traditional skills is critical to the implementation of the CSS project approach. However, these are difficult skills to master, and should be seen as skills that require training similar to other technical design skills. According to Pete Harmet, Chief of Programming for IDOT District 1, “Training for communication skills and managing a meeting process is critical. The other element of that is to be able to speak in non-engineering jargon, speak to the layperson, you have to be able to explain to them in plain English what the project is, how it will benefit them, how it might impact them and to what degree, as well as being able to listen to stakeholder responses to these ideas.” These skills allow for maximum public involvement, a crucial goal of the CSS project approach. Similarly, Minnesota has developed a highly technical training course to address the institutional barrier of inflexible state design standards, and the designers’ misconception that flexibility will expose them to tort liability. This course, “Advanced Flexibility of Design,” is offered by MnDOT and teaches internal engineers and technicians how to

create a flexible design by gaining a holistic understanding of the context of the project and then working within the existing flexibility of the standards to create a solution that is truly a best fit for the site.[91] A similar training course taught in Kentucky by the Kentucky Transportation Cabinet (KyTC) targeted to actual practitioners also encourages design flexibility by teaching project designers how to use the AASHTO Green Book to defend design choices that may be more flexible than a typical design solution.[92] This creativity allows for the designer to find the best project solution after consideration of all of the contextual aspects. Philips of IDOT also describes a short course which has been developed as an introduction and overview of the CSS approach. This half-day executive program, "Awareness Class," is designed for decision makers, elected officials, and those individuals who approve funds. The course also briefly describes the fundamentals of the CSS documentation process so these individuals can be familiar with this aspect of the approach as well. In Minnesota, Scott Bradley, Director of CSS at the Minnesota Department of Transportation (MnDOT), agrees that in order to maintain the CSS vision, executives across the entire MnDOT organization have participated in a similar training that he developed, which was "CSS executive-level… action planning… that involved 35 of the top managers in the organization across all the functions [of the DOT] to understand where we are, what we are missing, and what our opportunities might be… [Everyone] needs to be able to connect to or understand… what it is they can relate to" to maintain the "ongoing visioning piece" of CSS implementation. Through the inclusion of executives, decision makers, leaders and elected officials (both within and outside of the state DOT), several additional institutional barriers such as weak or inconsistent leadership and a lack of political support and understanding of the process can be successfully overcome. The CSS approach is built on a foundation of thoughtful consideration of the project within the larger context. Therefore, early input and coordination from other disciplines, regulatory agencies, and local departments is critical. It is important to incorporate these individuals in the training. To accomplish this objective, a third class has been developed by IDOT which targets local agencies. The training course for local agencies explains how a state DOT CSS project will impact individuals at the local level by describing how CSS applies to local policies. For example, the course explains "if a state project is implemented in

their local county, how will CSS apply to local policies and how will CSS apply to local officials - the mayor, county engineers, public work directors, and others," according to Philips. In Minnesota, a three-day CSS workshop has been developed to include case study examples where a multidisciplinary group or a group representing multiple interests is brought together to find solutions. This type of interaction and cooperation between local agencies in a formal course trains participants in design flexibility. A group of varied individuals asked to collectively provide a context-sensitive solution to a problem will have to engage in creative thinking, which is not a traditionally encouraged skill, but is a skill that the CSS approach requires. According to Jack Broz, Project Director and Consultant with HR Green in Minnesota, MnDOT's three-day CSS workshop provides an overview of the CSS approach, but "the value of the class is the actual hands-on interdisciplinary groups working towards applying the lecture concepts to a case study." This "break-out group exercise format" constitutes half of the workshop, whose participants include "not only MnDOT staff, but also external [agency] people, consultants, [and] stakeholders." According to Broz, "that's the fundamental key to CSS, as you really apply it – it is the interdisciplinary team." Scott Bradley, Director of CSS at MnDOT, agrees, stating, "We try to have a mix of multiple disciplines… to have a more real-world perspective and flavor in the discussion [of the interactive case studies]." In Minnesota, a number of initiatives have also been undertaken to ensure that the CSS approach is incorporated internally into all the functions of the DOT. According to Jack Broz, MnDOT also conducts training targeted "to reach the construction, operations, and maintenance staff, because… they have to construct, operate, and maintain the solution." Jim Grothaus, Director of Training and Technical Assistance at the University of Minnesota Center for Transportation Studies, maintains that incorporating "the planning people, the pre-design people, the design people, the construction people, and the maintenance people" into CSS training is fundamental to the success of wide-spread CSS approach implementation. MnDOT actually conducted a field site visit to a sensitive construction project site and invited "the design staff from that project, other design staff within the DOT, construction people from the DOT, and maintenance workers from the DOT," says Grothaus, which allowed for a "cross-functional" discussion of decision-making throughout the entire CSS process, from conception

through design, construction and maintenance. These types of all-encompassing trainings allow state DOTs to overcome an internal lack of understanding about the details of the process and provide attendees with the ability to carefully consider all perspectives and issues when developing initial project alternatives.

It is also critical to educate the general public and stakeholders about the CSS approach to projects. For example, in Minnesota, stakeholders and the general public are included in the three-day CSS workshop. According to Bradley of MnDOT, these trainings meant to include stakeholders and the public serve as a more "tailored approach… [so that] we might be most effective in reaching and engaging them in terms of outreach and training." This serves a dual function. According to Jeff Shaw, the stakeholder training sends a signal to both the stakeholders that their voice is considered important to the internal DOT staff, and simultaneously a message is sent to the DOT internally that the stakeholders have a legitimate voice that should help shape projects. "This is about reaching out to these people before the real design begins, during design, screening alternatives and identifying impacts, and also during construction," Shaw states. These activities also build public trust and increase customer satisfaction with the DOT.

Less formalized opportunities for training include the participation of junior staff at public meetings. Research shows that this is likely the first exposure junior engineers have to planning and public involvement activities, since university engineering programs are unlikely to include these skills in coursework or curricula. (This issue will be further discussed below.) In addition to gaining valuable training in meeting facilitation and communication skills, these junior staff members can facilitate the developing relationship between the public and the state DOT. According to Ron Krall, Consultant Project Manager with IDOT, members of the public sometimes gravitate towards individuals who seem similar to themselves, in terms of age or other factors. Therefore having a variety of ages and experience levels represented at a public meeting can help facilitate the inclusion of the most diverse public involvement and input, an inclusion that underlies the overall successful CSS strategy.

The training courses should also be developed to address as many individual conditions across the state as possible. The concerns of the DOT in different parts of the state may vary

dramatically from rural or agricultural areas to large urban metropolitan areas. The DOT training courses should be customized to address the specific needs and issues across diverse conditions, and to engage these different interests across the state, particularly if a wide diversity of conditions exist. According to Sharon Philips of IDOT, "in Illinois, a variety of different conditions exists across the state from the rural farmland to the Chicago metropolitan area. IDOT engages with all the individual Districts to address problems that are unique to specific areas across the state, and strives to incorporate and address these concerns as part of the training." Engaging all local interests in the CSS training, particularly if they have a wide variety of concerns, is essential to the success of the state projects and being able to address all contextual issues.

The training also must evolve over time. Dr. Nick Stamatiadis, Professor of Civil Engineering and Transportation at the University of Kentucky, has said that material presented in the early Kentucky Transportation Cabinet (KyTC) CSS trainings have to be "updated and reorganized" to remain current. Jim Grothaus of Minnesota agrees, stating that MnDOT has "literally changed the training every time" it was administered; though the core principles of CSS remain the same, "the way that we develop [the training], the way we deliver it, the way we develop case studies, the way that we try to engage people in the training… that's obviously changed over the years because those things need to change to stay current."

### Lack of political support and understanding

According to Jeff Shaw, Safety Engineer from the FHWA – Illinois Division, the need to train elected officials is critical so that "an elected official has a total understanding of how a project moves from idea to construction. The CSS approach training provides an educational opportunity for them [which] has proven to be very valuable." The previously-described, half-day "Awareness Class" designed by IDOT for elected officials also has overcome the challenge of weak or inconsistent leadership and directives. IDOT has addressed this issue by developing the course to educate politicians, and therefore to garner political will for the implementation of the process. The course developed for this audience must also be repeated to correspond with the election cycle and "[maintain] the training for these key individuals," which is "critical," according to Shaw.

This issue was also recognized in Minnesota and an effective strategy was implemented to overcome this barrier. According to Jim Grothaus, the audience members for the first MnDOT training courses were specifically invited by MnDOT. The invitation was signed by the Minnesota Department of Transportation Commissioner, the Federal Highway Administration Division Administrator for Minnesota, and the director of the Center for Transportation Studies at the University of Minnesota. The invitation explained to each key individual that "we want you here because you're the key people within the division, [and] within the other state agencies that can really make [wide-spread CSS implementation] happen," says Grothaus. Individuals from certain state agencies were also invited, including high level personnel from the state Department of Natural Resources and the Pollution Control Agency as well as other state leaders and officials. Using this strategy to populate the audiences of early training sessions was a deliberate effort, says Gorthaus, because "as you start to enlist more people, these people became advocates for the approach, and so forth… That was a very targeted way to get buy-in, to get some champions, to get the right people in the audience."

### Training Opportunities Available through the FHWA Resource Center

The FHWA Resource Center is also available to provide specialized technical assistance to state DOTs. According to Mark Doctor, Safety/Geometric Design Engineer with the FHWA, the FHWA has developed a CSS Training Guide, as well as a CSS Training Course through the National Highway Institute. The Resource Center can evaluate where the strengths and weaknesses are in the individual state program, and provide customized technical assistance for CSS implementation through the state's FHWA Division Office, according to Jeff Shaw.

### Training through Higher Education

Other states have established a close relationship with academic institutions to provide support for training programs. Academic institutions can provide logistical support and objective assistance in the implementation of sensitive issues. According to Jim Grothaus of the University of Minnesota Center for Transportation Studies (CTS), the CTS has worked with "consultants within the Minnesota transportation community to help develop and deliver the training material" to MnDOT, so that the task of training development does not have to be completed within the DOT itself. Through the use of a six-year Master Contract Agreement between the MnDOT and

the CTS, MnDOT has been able to gain external support for CSS implementation and training from the university. CTS's support of MnDOT is the product of a close working relationship; it is directed through work orders and coordinated through regular interagency staff meetings. CTS support includes developing training materials, coordinating training delivery, directing the logistics of training delivery (i.e., identifying and inviting expert lecturers, tracking attendees, securing locations for the training, etc.) and consulting on CSS implementation. Scott Bradley, Director of CSS at MnDOT, says that this partnership of the university with the DOT has been both "successful and cost-effective" for MnDOT.

The benefits of MnDOT forming a partnership with the University of Minnesota CTS extend beyond cost-effectiveness, however. According to Grothaus, utilizing a university team to deliver training is valuable due to the university's expertise in delivering effective adult education. Additionally, the University's participation can help to strengthen the public trust in the DOT's training efforts – Grothaus mentions that the involvement of the University aids in building a positive public perception of the training courses. Grothaus also cites the importance of the university's neutrality as a political entity to overcome any partisan differences, especially when training executives, decision-makers and elected officials.

Additionally, since most engineering students will eventually work for the state DOT either directly or via a consulting firm, an introduction to the idea of a flexible and context sensitive design into civil engineering degree programs can help with continued future incorporation of CSS principles. Other state training recommendations include introducing students to public meeting facilitation techniques and three-dimensional visualization techniques to aid in communicating design to the layperson.

Although the University of Minnesota has no civil engineering courses that deal directly with CSS, its incorporation into the curriculum is a priority for the coming years, says Grothaus of the University of Minnesota CTS. Scott Bradley of MnDOT says that he is often asked to do "brown bag presentations" for civil engineering students, which helps expose them to the principles in preparation for possible future work with MnDOT. This also can help foster a strong partnership between new engineers and the state DOT, which, when considering Grothaus'

observation that “one third of the people who graduate [from the University of Minnesota civil engineering program] end up eventually working at the DOT at some point,” could prove to be a very productive relationship.

In Illinois, the inclusion of the CSS approach and principles into the civil engineering programs has been identified as a future objective. According to Sharon Phillips, “The strategy that has been identified includes speaking to universities, and having a professional speaker series in the senior engineering classes to describe the CSS project approach. Another on-going goal is to develop a portable training module, potentially on-line, to use as a training tool for the engineering students.”

Through the efforts of Dr. Nick Stamatiadis, the undergraduate coursework at the University of Kentucky has a CSS component. Stamatiadis’ Geometric Design class devotes about 20% of class time to understanding “more than just basic geometric design aspects of any particular project,” says Stamatiadis. He manages to cover topics such as basic CSS concepts, flexibility in design, and the importance of public involvement, safety, liability, and environmental concerns. From a very early stage in a young engineer’s career, Kentucky is able to work directly against the barrier of lack of understanding about the details of the CSS process through this integration of CSS into undergraduate coursework.

### Weak or inconsistent leadership and directives

Weak or inconsistent leadership and directives has been identified as a barrier through the course of the literature review and expert interviews. Clear directives and support within the organization have been identified as critical to the successful implementation of the CSS Approach. The states have employed a variety of strategies and efforts which illustrate the structure required for clear directives and internal support within the Department. Ideally the successful implementation of the CSS approach would include both top-down directives and mid-level staff support for the CSS approach statewide. The transportation experts from other states have offered a variety of strategies and examples to achieve strong internal and external leadership and directives.

It is also important to assign responsibilities related to the implementation of CSS to specific individuals within the organization. This can be accomplished either by creating new staff

positions specific to the implementation of the CSS approach, or if that is not feasible due to limited resources, assigning certain clear and specific CSS related responsibilities to existing personnel. For example, in Minnesota, an individual has been assigned to the role of "Statewide CSS Project Director." Scott Bradley, who currently occupies this position, oversees all CSS-related training and outreach, and ensures consistency across the state. According to Bradley himself, his position was created so that he could be "responsible for whatever it takes over time to get the CSS philosophy and principles integrated in the various functional areas of MnDOT." He also is the principle contact for the relationship between the Center for Transportation Studies (CTS) at the University of Minnesota and MnDOT. Jim Grothaus, Director of Training and Technical Assistance at the CTS, echoed the importance of identifying these key individuals within the organization; he suggests that the DOT should "find that group of champions, and they have to be key people. Scott Bradley [Director of CSS at MnDOT] was the key person, and he has a strong history in wanting to do these types of things, and he was able to get FHWA-level support from the FHWA Division Administrator. They were able to get key support from our Chief Engineer in the DOT."

According to Grothaus, the state of Minnesota also established a CSS Advisory Board, which "included key, top DOT staff like Chief Engineer or Assistant Engineer for the DOT, Scott Bradley and some of his key design people, other agencies such as the local division of FHWA, as well as some other key state agency people." Grothaus further states that the Advisory Group was effective in that it served several functions including creating the curriculum for the training, taking a leadership role in developing the description of what the CSS Approach meant for the overall department as a policy, and giving overall guidance. He states, "By having the key, top people in it, it also showed that MnDOT was serious about this, and that the Chief Engineer or the Assistant was promoted to championing this, so therefore it was important."

Grothaus further states that the Advisory Board led the initiative for the first three to four years. In order to preserve the consistency of these functions, "a core group of people continue to meet monthly to help plan and deliver the yearly CSS efforts. That group of people includes myself and one of my staff members representing the University, Scott Bradley and a couple of

his people from the DOT, the key trainers that we use to deliver the training, and a couple of the training people that help support the training from the DOT. There's probably, in a given meeting, about five to eight people in there, talking about what's on the agenda for next year, what's the budget look like for CSS." This strong commitment, both individually and Department-wide, has resulted in clear leadership, decision, and directives to further the implementation of the CSS approach.

Scott Bradley of MnDOT describes the balance within his state in the evolution of both the top down and mid-level support efforts in the following manner: "When we became a pilot state, we basically had one Assistant Chief Engineer who was very supportive of the emerging Context Sensitive Design concept, so he served as an initial advocate or champion from the top." However, through the Advisory Board, as the process moved forward, "it also became something that was being pushed from really the middle of our organization." Another CSS supportive position, a Public Participation Consultant, was recently created at MnDOT; this individual is responsible for implementing the public involvement portion of MnDOT CSS efforts. Grothaus states that this individual does deliver training, but also is available for one-on-one advising to project groups within MnDOT. According to the University of Kentucky's Dr. Nick Stamatiadis, the Kentucky Transportation Cabinet has created similar public outreach positions "for each Transportation District. The person's role… is to coordinate public meetings, coordinate public efforts to make people aware of what the projects are, to organize campaigns and answer questions."

Scott Bradley of MnDOT also states that along with the middle and top down advocacies of the approach, the individual or group of individuals assigned as CSS champions should cross functions and areas of expertise within the Department. According to Bradley, "The ultimate key is that the majority of the people in the organization, or ideally everyone, feels some *connection or ownership* in the action plan or action planning that is concurrently happening in all the districts. The people advocating or representing CSS should look like the rest of the organization. It shouldn't be [differentiated] like, 'there's an engineer, there's a landscape architect,' because there is a downside to how that can be perceived by others."

Bradley goes on to state that, in the pilot states, the top-down directives can change as the administration changes. However, he feels that the implementation of the approach can be sustainable through a "slow and steady approach" at all levels which can achieve the required "buy-in within the organization that takes time and builds over time." This gradual internalization of the change within the organization results in individuals throughout the organization embracing the new approach, including both junior and mid-level staff.

In Kentucky, Dr. Nick Stamatiadis reiterates the importance of clear and consistent directives in his state. According to Stamatadis, "It needs to come from the administration. The administration needs to stay on the goal. As governments come and go, once an agency makes a decision to make that change, it should stick to that plan, regardless of who's going to be at the top. The commitment of the DOT to stick to its plan, that's very important. Once you make the decision to get on that path, stay on it and don't go back and forth."

Over the years, establishing these key positions in other states has been critical to the success of the implementation of the process. Individuals who would be well-suited to certain CSS-related positions and responsibilities should be a natural fit for the role. They should demonstrate an enthusiasm and understanding of the CSS process, and should understand the benefits of creative transportation solutions in terms of a better project for a community as well as the departmental cost savings and building of public trust aspects of the approach.

### Lack of a realistic timeline

As discussed previously, another barrier is the lack of a realistic timeline for the wide-spread implementation of the CSS approach within the state. Experts from all the states have repeatedly stated that the timeline for the implementation of the CSS approach is a multi-year process, as the CSS approach represents a change from the way that projects have traditionally been conceptualized, designed and built. According to Sharon Philips, Project Engineer at IDOT, after four years of conducting the specialized trainings, IDOT has only now reached the goal of training almost all of the internal DOT staff. Thus, even after a customized training program is developed, the process of teaching the course to all the desired targeted audiences is lengthy. Even after training is completed, full integration of the ideas into project procedures can also be a lengthy process.

Several strategies have been recommended by the experts from other states. For example, a CSS Strategic Plan has been developed in Illinois to help guide the implementation process. This Plan divides the implementation process into manageable tasks and includes clear objectives, goals, and timelines to accomplish implementation goals. The Plan also includes assigning specific tasks to specific individuals, which encourages accountability, much like described in the earlier sections. In Illinois, each specific objective was assigned to an internal champion within the Department to establish clear ownership and responsibility for tasks.

Finally, it is critical to define a means to measure the progress towards achieving those objectives. The IDOT plan includes a scorecard to monitor progress in implementing the CSS approach; this scorecard breaks up tasks into four general objectives: “Policy Development,” “Training,” “Program Delivery” and “Communication.” Each objective was then broken into underlying initiatives, and these initiatives were assigned to individuals within IDOT. For example, the “Policy Development” section was organized into targets such as, “The IDOT CSS policy and procedures/guidelines are consistent with state and federal requirements,” “IDOT CSS policy and procedures/guidelines are readily available to all employees across the Department,” and “IDOT accommodations for bicycles and pedestrian traffic are improved,” and these were each organized into smaller tasks that people were designated to manage. These individuals were then able to provide information regarding the status of completion for each task. Dr. Nick Stamatiadis of Kentucky agrees that it was “very important” for the Kentucky Transportation Cabinet’s CSS implementation to “develop a mechanism to quantify, and if nothing else, catalogue the steps for going through that kind of project.”

It is also important to be aware of a realistic timeline for a particular organization. Sensitivity is needed in the implementation of the new approach; not all organizations will be able to widely implement CSS within the same time frame. For instance, Jim Grothaus of MnDOT comments that in Minnesota, “administrative turnover within the Department” caused implementation of CSS to slow down; however, this slowing did not cause MnDOT to give up on carrying out their CSS plan. Although the process does take time, eventually the states have found success in thoroughly integrating the approach throughout the organization. According to

Michael Hine, Engineering Team Leader at FHWA-Illinois, and Matt Fuller, Environmental Programs Engineer at FHWA- Illinois, “IDOT has an extensive training process for the state staff, Federal Highways staff, all the consultants, and the local agencies to make them aware of what the process is, and how it’s a change from what had been going on prior to that. I would say that they have put several hundred people through those classes. There was a very large effort to get everyone through the classes. Basically, if you want to do CSS in Illinois, you have to go through these classes. Because of this, there is now a much wider acceptance of the CSS project approach. I think it’s been accepted as the way that IDOT is going to be doing business from here on out.”

### Misperceptions regarding the impact of the CSS approach on the project cost and schedule

Another common barrier to the implementation of the CSS approach is the fear that approach will negatively impact the project cost and schedule. The states offered best practices to overcome this barrier, including redistributing time and cost expectations, expanding the context of the project, and citing clear benefits to CSS implementation, such as time and cost savings, easier right-of-way (ROW) acquisition, and reduced likelihood of oppositional lawsuits.

The CSS approach contains an in-depth public involvement process which includes identifying the stakeholders, engaging the stakeholders, establishing whether there is a problem, developing alternatives, and refining alternatives. As Jack Broz of Minnesota says, this “meaningful dialogue with stakeholders” is a necessary first step to successful CSS implementation, and it requires more hours in the beginning of the project to engage in that dialogue. In order to better reflect the shift from the traditional model of “Design, Announce, Defend” – more of a back-end time- and cost-heavy model – to the front-end intensive model, represented by the CSS approach, the Project Development Process should be reallocated to address these early public involvement and cooperative design costs. Similarly, these activities require project hours early in the design development process, and the project schedule should reflect this reality. As the new model presented by the CSS approach is integrated into the Project Development Process, this barrier can be overcome.

Another strategy to address the misperceptions regarding cost is to show how flexible design can actually save costs over the length of the project and across the entire transportation system. As the scale of the project is expanded to include all elements within the larger context, the relationship between an individual project and the larger system of projects becomes clear. This can sometimes reveal a method to save costs on one project, by spending in a different way or on another project. Jim Rosenow, State Geometrics Engineer at MnDOT, says that there "needs to be a bit more of a global perspective about, in the grand scheme of things, does this make sense?" Also, looking at solutions creatively can result in ideas that are less costly; for instance, the creative and flexible design might be below the traditional standard but might be a better, less expensive fit for the context. Scott Bradley of MnDOT agrees, stating, "While we are looking at project context, we also need to be thinking about system level context, with some balance in mind so that we are not overbuilding or overinvesting, without very good return on the investment at a project level, at the expense of much less public benefit at a larger level."

By considering the larger context, other revenue generating opportunities can also result. For example, projects may serve as catalysts to stimulate economic development opportunities in the area. Unlike in traditional project approaches, the CSS approach reaches beyond the scale of the individual design; in this example, although the context sensitive solution can be seen as a cost in itself, it is also an investment that results in an increase in the tax base. Essentially, the CSS approach can impact many facets of the project, including the scale of the conception of the project to include the larger context, such as economic development, funding strategies across the entire system, how the project can contribute to system wide multi-modal options, and how individual projects have a larger impact. According to Rosenow at MnDOT, "Fundamentally, what we are talking about with Context Sensitive Solutions is a values-based approach to public works engineering. If you asked on a project or overall in general what are we trying to do, it goes beyond trying to solve particular problems – traffic problems or reducing crash frequency and severity. It's a larger idea of improving quality of life and you do have to incorporate a values-based approach into that too."

Other best practices and results that emerged from the interviews included the ease of property acquisition for DOT projects. The right-of-way (ROW) acquisition process can be very costly and time-intensive. In the states that were interviewed, because the affected individuals were aware of the project, aware of the route of the project, and had participated in the decisions regarding the route of the project, in certain situations they proactively approached the DOT to sell their property for ROW acquisition, which resulted in huge cost and time savings for the Departments.

Another benefit of the CSS approach that can result in a cost savings is the reduced likelihood of a project becoming caught in a cycle of oppositions and lawsuits. This reduction results from the increased time investment at the beginning of projects to resolve issues from the outset, rather than during construction, for instance. This decrease in legal opposition can also save time and money, especially on controversial projects. Jack Broz, Project Director and Consultant of HR Green in Minnesota, has experience that supports this conclusion: "I have been able to deliver projects, several of which had 60-year-old unresolved issues blocking the delivery of the project, some significantly controversial projects, some with lawsuits needing resolution. I've been able to not only deliver those projects into built infrastructure that moves transportation, but with some significant cost savings, over $200 million in the last 10 years, which is to me a key element of CSS." Other states offered that the CSS approach provides an opportunity to inform the public of the details of a project in order to avoid the development of negative situations.

The approach does change the traditional time distribution, but overall the results have shown that there is no net increase in cost or time because the investments in the beginning of the project will result in savings at the end of the project. If the CSS approach is done well, there can actually be time savings in the project development process. As project issues surface early in the public involvement process, they can be effectively dealt with at this phase of the project, much earlier than in the traditional project approach. This is especially true regarding environmental impact documentation. According to Michael Hine and Matt Fuller of FHWA-Illinois, "Because of all the CSS work that the DOT is doing, some of the issues that would come up before are just not there because they are doing all the work ahead of time and resolving these

[environmental impact] issues before they come up in the environmental review process, so that's been a huge benefit." This results in the issues surfacing prior to the publishing of the Draft Environmental Impact Statement (EIS), which means that no supplemental form is required for submission, resulting in time savings. Additionally, when the CSS approach is used to look at the environmental context of the design problem, it results in a more comprehensive early consideration of environmental impacts, which then garners earlier approval from agencies such as the EPA. According to Hine and Fuller of Illinois, through the use of CSS, an IDOT project's EIS "got a 'Lack of Objection' [rating], which is the best possible rating you can get" from the EPA.

As the DOT begins to build a history of successful case studies and projects which clearly demonstrate the cost and time savings that occur as a result of the CSS approach, these barriers will be reduced. However, this process will be a multi-year effort; the reality of this timeframe for implementation can be another barrier to the implementation of the approach. According to Jeff Shaw, Project Engineer at FHWA-Illinois, "Initially there was a great deal of resistance to the CSS approach. There was a great deal of concern about the impact of the CSS approach on costs, project schedules, and safety because there was an immediate concern that we were losing our control to make decisions regarding a project development. So in time, with training, with a lot of very strategic discussions and policies and everything that eventually came along, all those barriers were overcome, it just took a long time."

### Design standards are inflexible

The process required for a design exception can represent another barrier to flexibility and creativity. If the design exception process is unnecessarily lengthy, designers can be discouraged from asking for or pursuing creative solutions that might include one. Although the documentation process and review of a request for a design exception is mandated and controlled by the Federal government, and is critically important for project safety, the state specific design exception review process should not add an administrative hurdle to the project. The experts in other states described their efforts to review and streamline the design exception process in close coordination with their FHWA Division Office. If the documentation process for design exceptions is slow or is perceived to be slow, creative solutions will be less attractive as they will be seen as potentially adding to the project delivery time and costs.

Design exceptions are not always required to find a creative and flexible design. Dr. Nick Stamatiadis of the University of Kentucky states, “There’s enough flexibility in the Green Book and in our state manual and guidelines that allow people to get to the appropriate ranges without people having to complete any design exceptions.” However, inflexibility of state design standards represents another institutionalized barrier to the successful implementation of the CSS approach. For example, some states have a Design Manual that is less flexible or specifies a smaller range of acceptable design values than AASHTO’s Policy on Geometric Design of Highways and Streets (the Green Book). In this scenario, the State design standards or ranges of values are the rule. As part of their effort to fully integrate flexibility into the design process, the experts from the interviewed states were reviewing and revising their state standards to determine if the values specified in their states could include additional flexibility. This process included comparison of the state standards to the Green Book standards as well as to the guidance newly available in the AASHTO Highway Safety Manual. In Minnesota for example, a specific individual has been assigned the task of reviewing the state design standards in this way.

The states have offered their strategies for reviewing and revising the state design standards and design exception process procedures to allow for flexibility. Jim Rosenow, State Geometrics Engineer at MnDOT, recommends, “If we can relax our standard design values, that tends to guide people to more reasonable solutions as a matter of routine.” He further describes several scenarios where this can be accomplished without compromising safety: “The most robust, conservative design does not always result in a clear positive benefit of increased safety, yet it can have a very clear negative impact on a community.” Additionally, according to Stamatiadis, the Kentucky Transportation Cabinet (KyTC) has found that “the projects with design exceptions had pretty much the same safety record as projects without design exceptions.” He illustrates this in his paper, “Safety Implications from Design Exceptions,” which was prepared for the 2003 annual TRB meeting. In this paper, Stamatiadis et. al. document the past design exceptions in the state of Kentucky and evaluate the possible safety consequences. The research concluded that the “use of the design exception process did not have any negative effects on highway safety.” [93]

Related to this barrier is the perception that flexible design choices will expose the designers to tort liability. According to the other states, designers have uncertainty regarding the implementation of a flexible or creative solution in terms of the relationship between risks and benefits. However, many experts stated that because the CSS process is so comprehensive, it can actually be more rigorous than traditional problem-solving; according to Rosenow, with CSS, "You have to think your way through these things, and a lot of times, do more analysis than you would otherwise do."

The strategy employed by the experts interviewed in other states included establishing a close relationship and close coordination with the state Attorney General to establish and clarify the risk reduction strategies, including a consistent documentation process for all decisions. The state attorneys participate in the development of a section of the CSS training course, specifically to develop information on liability as it relates to design. The attorneys should be available during the training session to provide the opportunity to answer questions and discuss specific issues or scenarios. They should also be available for the interactive case study portion of the training session. According to experts from other states, the attorneys need to reassure the designers that the ultimate decisions are still made using professional judgment by the engineers, not the public, and that reality is supported by the legal system. As stated by Sharon Philips of IDOT, "The training course offered by IDOT includes a section on tort liability. This section was developed through close collaboration with the Illinois Chief Counsel Office. One of their attorneys served as the instructor for that section of the course. The attorney reassured the audience that the engineers are still making the decisions, the public is not making the decisions."

Some states advocated a more intensive documentation procedure. This would go beyond the federally-required documentation procedure necessary for design exceptions for the 13 controlling criteria, which includes all decisions and all justifications for choosing a certain value over another. This documentation process should establish the reason that certain trade-offs might be beneficial and preferable for a particular project. According to Rosenow, documentation that shows that the "most reasonable judgment" was made with the information at hand is important to avoid liability issues.

## Barriers due to lack of incentives

Expert interviews have also revealed barriers related to lack of incentives to adopt the new approach. There are several causes for this, including internal resistance to change – and related to this issue, a lack of training and incentives for consultants, including no CSS requirements or language in Requests for Proposals (RFPs) – and a lack of political will or mandate to support the implementation of the CSS approach.

People are resistant to a new way of doing things unless there is clear illustration and understanding of its benefits. To overcome internal resistance to change, the states offered several strategies. The first was to build success internally. Jack Broz of Minnesota agrees, stating that although many people will resist, "once you find that win-win, that's… where the lessons are learned." As a series of successful CSS projects are implemented over time, they can illustrate the benefits of the CSS approach in terms of time and cost savings, as well as customer satisfaction. These successes must be catalogued and documented as case studies which build a record of the benefits of using the approach. Case studies will drive the acceptance of the new approach internally; with each internal success, momentum can build in support of the new approach.

The Department should also continue to have a formalized dialogue and exchange of ideas internally in order to overcome internal resistance to change. In other states, this has been accomplished through a "Peer Exchange." The internal DOT personnel has found a Peer Exchange to be extremely helpful to identify "what's working, what's not working and what issues are emerging," according to Jim Rosenow of MnDOT. The Peer Exchange should include all disciplines across the Department, as well as operations and maintenance personnel. Rosenow also suggests these Peer Exchange teams could even be across state lines to help combat resistance to change in other state DOTs. This kind of idea exchange can also help with internal employee satisfaction; says Scott Bradley, MnDOT Director of CSS, "there are… engineers and [people from] other disciplines who, with some time at this and some self-discovery, will tell you that they are having more fun and are more satisfied with the job they are doing under this new approach."

Another barrier to the implementation of the CSS approach is due to a lack of incentives for contracted consultants to use CSS. This can be addressed through changes in the language of the RFP issued by the DOT. Bradley says that at MnDOT, there is language in the RFP "that references our policy or our principles that need to be applied to their project the same way they are applied within the organization." Other states offered the strategy to have the consultants attend the training; for instance, the consultants might pay for the training, but receive CE credits. They could also then be prequalified or certified in the CSS Approach. This certification can then be required in order to be considered as a consultant for CSS projects.

Though another barrier towards CSS implementation is the lack of political will or mandate to enforce the use of CSS procedures, there are national incentives that can overcome this lack. If the CSS Approach is successful, there are also opportunities for a state DOT to become known as a national leader. Since the implementation of the CSS Approach is a critical initiative for the FHWA, the Agency offers awards to states that show CSS excellence in projects.

## External Barriers

The implementation of the CSS approach can also be opposed by barriers outside of a state DOT. These external barriers can include the public lack of trust in the DOT, difficulties in striving for consensus on controversial CSS projects, the lack of input from other disciplines, and lack of consideration of construction and maintenance concerns from the outset of the project.

### Building Trust in the DOT

Stakeholder involvement in project design is a crucial element of successful CSS implementation. However, this stakeholder involvement can be severely limited if public perception of the state DOT is unfavorable. This negative perception can limit public trust in the DOT; resulting hostility can build to create a negative perception of project and the public involvement process for both the project engineer and the stakeholders.

In order to build stakeholder trust in the DOT and motivate public engagement, several strategies were suggested by experts in other states. Stakeholders were involved in initial decisions, including whether a problem even existed that required an engineering solution; this will be discussed further later in this section. Another trust-building strategy consisted of creating

a multi-faceted public engagement plan, including interactive, web-based interaction opportunities that may even utilize social media outlets. A project-specific website that is accessible and targeted to stakeholders can act as a library for all project documents and references, which encourages public engagement in the process while also promoting DOT transparency.

The most successful implementation of CSS principles in other states began with a thorough identification of stakeholders. Stakeholders with varied backgrounds and opposing views were sought out specifically, so as to spur discussion, debate and diverse ideas. In order to facilitate this discussion and diversity of ideas, the DOT employees that led public engagement meetings were also similarly diverse, with different genders and ages, for instance. This encouraged increased public trust in the DOT not only through more comprehensive discussion, but also due to the increased public perception that the DOT was made up of people who were relatable on multiple levels.

In order to promote a constructive, cooperative atmosphere, public engagement meetings in other states begin with the establishment of several "ground rules" for public input. With these rules, personal attacks and other disrespectful comments can be avoided so as to encourage the most beneficial discussion possible. As stated previously, stakeholders are then involved in the decision of whether there is even a problem that the DOT must address. If stakeholders decide that one does exist, this problem is fully articulated in a "Problem Statement," which includes an outline of the major arguments garnered through initial public input. In some states, this is also the opportunity for stakeholders to delineate the project's statement of "Purpose and Need," which guides project design throughout the process. This inclusion of the public in the demonstration of "what needs to be done for a project to become a project, and what steps need to be taken," allows for more transparency in DOT decisions, which substantially increases public trust in the DOT, according to Dr. Nick Stamatiadis of the University of Kentucky. Additionally, once the public engagement forum establishes that there is, indeed, a problem that the DOT should address using the CSS principles, the stakeholders can jointly conduct a Context Audit, which determines the background (cultural, historical, environmental, etc.) of the area affected by the proposed project. According to Jack Broz of Minnesota, "You have to first get [stakeholders]

to understand what their problems are; then they can look at and evaluate the options based on their problem."

In other states, successful CSS endeavors allow public involvement to determine the connection between the purpose and need statement and the proposed solution. This solution is also determined through stakeholder input; for instance, if discussing a new road, stakeholders are each encouraged to draw alternative concepts for the placement of the road. The ensuing discussion of all of the stakeholder-determined alternatives creates a productive exchange of solutions that consider a wide range of contextual elements. According to Stamatiadis, the deviation from the traditional "Design, Announce, Defend" model of non-CSS public involvement meetings allows for people to better understand issues behind DOT decision-making, and this understanding "gains public acceptance for the DOT."

In some states, stakeholder involvement was not limited to the public engagement forum. Stakeholders were also encouraged to contact DOT employees for one-on-one meetings to address more specific concerns. For example, Ron Krall, Consultant Project Manager at IDOT, states that the success in their CSS projects comes from the willingness of IDOT to "lend itself to be anywhere anytime." He describes the attitude of IDOT towards one-on-one stakeholder involvement to be, "We will meet with you, we will listen to what you feel some issues are or might be, we will try to work them out with you, we will explain them." According to Krall, "this gives the opportunity to engage people who might not have (otherwise) felt like they were really engaged in the transportation planning process".

Stakeholder involvement was also extended to the realm of formal training. Inviting stakeholders to formal CSS workshops, along with internal DOT employees, sends the dual messages to both stakeholders and the DOT that their voices, together, are important in this process. Experts suggest that to build public trust over time, state DOTs should strive to establish stakeholder involvement on every project.

### Consent or Dissent Rather than Consensus

Another external barrier to implementing the CSS approach comes during the solicitation of public involvement. With different stakeholders and their varied viewpoints, it is uncommon that everyone should agree; however, experts have said that though disagreements may not be

resolved, this should not stop the project's progress. According to Dr. Stamatiadis of the University of Kentucky, "In public meetings, even the people who don't agree, at least they can see the value of the issue that was brought up, and eventually they can… provide their informed consent," even if a general consensus on one solution cannot be established. Scott Bradley of MnDOT agrees, stating, "What's most important [is to] at least agree to disagree [in order to] move forward and do something, even if it's not necessarily what we would like." This emphasis on informed consent or dissent rather than consensus shows stakeholders "what is negotiable, what's on the table, and what is or can't be," which, according to Bradley, shows that there is "integrity to the process," even if a general consensus is not reached.

## Multi-Disciplinary Team

Interviews with experts from other states have emphasized the importance of establishing multi-disciplinary relationships from the initiation of a project. Jack Broz, Project Director and Consultant with HR Green for MnDOT, states that this is the source of the strength of CSS; he asserts, "In CSS, the synergies come from the interdisciplinary approach." In some states, these multi-disciplinary inputs begin within the DOTs themselves; for instance, personnel from other agencies may work within the DOT to provide direct technical assistance on transportation projects. According to Broz, the Department of Natural Resources has a liaison that works at MnDOT; though he is not allowed to review any MnDOT projects, "he is actually embedded in the DOT as a partner to advise – from the initiation of the project – the feasibility of their projects from the DNR perspective." This incorporation allows for environmental concerns to be voiced with every project from within the DOT from the earliest phase of the project.

Additionally, a project team which includes multiple disciplines should be established for each project from the earliest phase of the project initiation. The individuals included on the team should include people of different disciplines, and should also be tailored to the specific project. For instance, according to Dr. Nick Stamatiadis of the University of Kentucky, in "a bridge replacement project… I might need to have a design engineer, a bridge engineer maybe, an environmentalist, [and] a landscape architect depending on where it goes," as well as the construction, maintenance and operation people who would only traditionally be involved after the design process. According to Stamatiadis, the most successful CSS projects are those that

assemble this team from the outset; the contributions of each individual member may change throughout the course of the project according to the individual's expertise, but "they should be involved from the beginning in order to raise any potential red flags on the design."

Another way that multiple disciplines can be involved in the CSS approach is through incorporating people from many subject areas into formal CSS training. For instance, though construction personnel would not traditionally be concerned with design issues, incorporating construction and maintenance people into CSS training is important because, according to Broz, "they have to construct, operate, and maintain the solution." Educating these types of individuals and getting their input from the beginning of the process is imperative so that the DOT does not "make a commitment to do something and then it turns out that [the DOT] won't build it, or [the DOT] can't maintain it."

According to the experts, this involvement from multiple disciplines should also extend to the public involvement process. In addition to the benefits associated with varied stakeholder participation (already discussed previously), input from the perspectives of multiple disciplines can help to avoid problems with project approval later in the process. According to Stamatiadis, "The advantage of this whole process is that you involve the various stakeholders and the public and resource agencies… from the beginning. Once you do that, a lot of the landmines can be identified early on in the process, and you don't wait for these issues to come up in the future." For instance, clear integration of the environmental regulatory agencies, and a robust public involvement process, can expedite the environmental document approval process. The CSS approach then provides an avenue to explore and address comments from environmental regulatory agencies early in the development of the project, prior to the submittal of the environmental draft documents; this can save time, as just responding to comments from environmental regulatory agencies on draft documents can be very time-intensive. In Illinois, for instance, Michael Hine and Matt Fuller of FHWA-Illinois credit the multi-disciplinary approach and inclusion of environmental regulators with "doing all the work ahead of time and resolving these issues before they come up in the environmental review process," which turned out to be "a huge benefit."

The expert interviews, case studies, and literature review show four primary barriers to the implementation of the CSS/CSD approach by DOTs. They include: institutional barriers, inflexible standards and liability concerns, lack of incentives, and external resistance to change. A detailed review of these barriers provides a clear understanding of the issues faced by other states, both in the states that have been targeted by the FHWA as initial pilot states in 1997 and in the states targeted in 2008 for additional technical assistance from FHWA. These states have been grappling with the implementation process for in some instances more than ten years, and have developed a wealth of strategies that can be applied to GDOT policies and projects for effective CSS implementation.

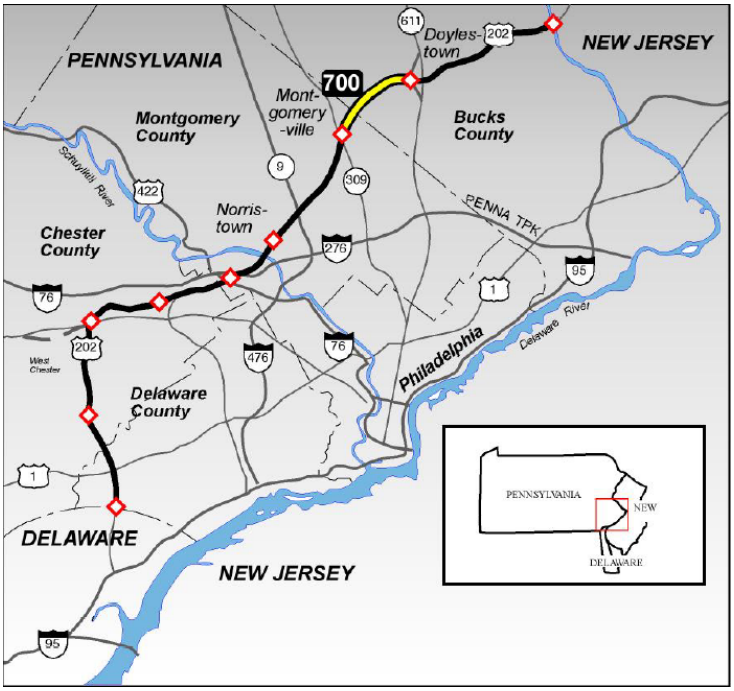
## 4.4 Case Studies of CSS in the U.S.

The CSS barriers and strategies used to overcome them are illustrated in the following case studies. These case studies also show effective use of CSS in project development and implementation. These case studies are geographically diverse, and represent a wide range of project type. Several case studies are included with project examples from the states targeted in the previous section.

### US Route 202 Parkway, Pennsylvania

The US Route 202 Parkway is an 8.5 mile expressway under construction in suburban Philadelphia. It will supplant the two-lane road that is currently designated Section 700 of Route 202, between Montgomeryville, PA and Doylestown, PA (Figure 1, below). The new parkway has both two-lane and four-lane segments in a new, parallel alignment situated about a quarter mile to the southeast of the current Route 202. The current road abuts commercial and residential development and has over 50 intersections. The new parkway will feature berms and plantings to act as a barrier between the road and the community; the majority of intersections will be limited to bridges and underpasses, and the number of at-grade intersections will be limited to less than 10.[94]

**Figure 1 - US Rte. 202 Project Area**




Source: US 202 Environmental Evaluation Report. Executive Summary. Slide 2. http://www.us202-700.com/pdf/EER_ExecSum_Pages1to10.pdf

In Pennsylvania, US Route 202 stretches 59 miles from Delaware to New Jersey.[95] The road runs around Philadelphia to the west, at a distance of approximately 25 miles, serving as a major commuter route and commercial link.[96] The roadway is comprised of a series of local roads, but the path has long been identified as a right-of-way for a major ring-road highway. In the 1960s, an expressway proposal planned to transform Route 202 into a multilane, limited access expressway running from the Delaware to New Jersey border. Several sections of the expressway were built, but the concept of a continuous highway was never realized due to a lack of funding, local opposition and environmental impacts.[97]

Continued congestion along Section 700 led PennDOT to propose a four-lane expressway bypass along the right-of-way reserved for the original expressway. The FHWA approved the proposal in 1998 after an Environmental Impact Statement process. The concept received mixed responses from the public. Residents east of the proposed road opposed the bypass over traffic concerns and initiated legal challenges. The project eventually prevailed, but the cost had escalated from $225 million to $465 million.[98]

In 2004, PennDOT shelved the project due to budget constraints and the lack of community consensus over the project.[99] PennDOT decided to reassess Section 700 and develop a new solution with a cost cap of $200 million. A multidisciplinary taskforce was created with politicians and county, municipality and MPO officials participating, including those who opposed the previous proposal. To help reach consensus, the task force adopted CSS principles.

In 2005, after reviewing alternatives, including several options that would widen existing roads, and a mass transit alternative, the task force selected the parkway proposal as its preferred alternative.[100] A 2007 traffic study determined that the parkway proposal was the option that would result in the largest reduction the congestion on local roads.[101]

After years of abortive attempts at resolving the neighborhood's congestion, the CSS planning process saw a concept into construction in only three years. Construction began in 2008 and is expected to be completed in 2011 at a total cost of $206 million, with savings of almost $260 million. The project will be fully funded by the state. The parkway will feature bike lanes and a multiuse trail. All bridge and barrier surfaces will be given a traditional stone appearance and the parkway will feature a landscaped median.[102]

### Saint Anthony Falls Bridge, Minneapolis

The Minnesota Department of Transportation oversaw the replacement of the collapsed I-35W Mississippi River Bridge in Minneapolis, Minnesota in less than 13 months after the tragedy. The new St. Anthony Bridge serves 10 lanes of traffic, supports future transit and/or pedestrian use, and incorporated the aesthetic desires of the community. Despite an accelerated construction schedule, the project utilized CSS principles to achieve its goals ahead of schedule and within budget.[103] The planning process is notable for successfully incorporating CSS into design-build construction.

The previous bridge carried 140,000 vehicles across 8 lanes near downtown Minneapolis every day; after the collapse, the bridge's absence was estimated to cost society $400,000 daily.[104] Speed of project delivery was a priority for the Minnesota DOT which decided to award the construction contract to a firm that would design and build the bridge simultaneously to expedite its completion. The contract included $27 million in incentives if the project finished ahead of schedule, as well as penalties if it fell behind.[105] The contract was awarded to Flatiron-

Manson, who had submitted the most expensive bid, $234 million. The evaluation criteria were created with stakeholder input and were made public.[106]

Despite the focus on quick completion, MN/DOT remained committed to CSS principles and public input. A Visual Quality Advisory Team (VQAT) comprising of experts and stakeholders provided feedback to both MN/DOT and the design-build contractor. Early public meetings revealed significant support for incorporating light rail infrastructure into the new bridge[107]; the transit element won political backing from the governor and Minneapolis mayor. It was ultimately included in the final design even though MN/DOT was concerned it would add costs and delay completion and recommended against including light rail.[108]

The VQAT organized a charrette involving 84 citizens and civic leaders on October 24, 2007, which selected design elements for the bridge, including pier shape, railing style, color, aesthetic lighting and retaining wall building material.[109] See Figure 2, below, for the design completed using CSS principles.

**Figure 2 - St. Anthony Fall's Bridge (I-35) - Completed**

Source: The New I-35W Bridge. Slideshow. http://www.cssnationaldialog.org/documents/StPaul/CSS-National-Dialog-StPaul-I-35W-Bridge-Reconstruction-PartB.pdf Figg, Linda (2010, April 22).

The planning process was able to meet public expectations and deliver a structure sensitive to the context of the project. The site along the Mississippi River included a disaster recovery, industrial superfund site, and historic and environmentally sensitive land. Bridge

construction incorporated recycled materials and innovating LED lighting. The design-build team kept the public informed, leading public tours and erecting informative signs on the nearby 10th Avenue Bridge.[110] The Saint Anthony Falls Bridge opened on September 18, 2008, 3 months ahead of schedule, without running over the initial cost estimate.[111]

### 12300/12600 South Reconstruction, Utah

A six mile stretch of Utah State Route 71 was widened and improved between Draper and Riverton, approximately 15 miles south of Salt Lake City. As the area's major commercial corridor, the Route runs along 12300 South and 12600 South between the two cities, intersecting with I-15 in the middle. The reconstruction widened the road from two to five lanes, upgraded the junction with the Interstate from a two intersection simple diamond interchange to a Single-point Urban Interchange, created an underpass at an at-grade railroad crossing, and added a pedestrian overpass to allow young students safe access to their elementary school (Figure 3, below).[112]

The Utah Department of Transportation identified economic development and addressed congestion reductions as primary goals in the 12300/12600 reconstruction. Route 71's interchange with I-15 often backed up and furthered congestion of I-15 itself. The at-grade rail intersection was less than a mile to the west and a passing train tended to exacerbate the I-15 congestion problem.

**Figure 3 – Completed 12300 South Interchange with 1-15**

Source: CSS Exchange. (2006, September 6-8) 12300/12600 South Design-Build Project. Slideshow. http://environment.transportation.org/pdf/css_peer_exchange/design_build_utah.pdf

To quicken construction, increase accountability, and allow for more innovation and flexibility on the part of the contractor, UDOT chose a design-build delivery system for the project.[113] CSS principles were employed from the start. A Community Coordination Committee (CCC) comprised of stakeholders was set up for both Draper and Riverton. These committees were empowered by the state to allocate incentives and additional funding to the design-build contractors. $400,000 was available for landscaping and aesthetic treatments; up to $2 million was available as an incentive bonus, to be awarded to the contractor if it were to meet predetermined criteria created by the CCC and UDOT. Six neighborhood groups were established to consult with the contractor on project details and to notify them of any issues the community had with construction.[114]

The widening of the Route 71 affected hundreds of properties. To assist in right-of-way acquisition, a team of experts was assembled to help both project personnel and property owners. This "turn-key" program reduced conflict and fostered public satisfaction with the project.[115]

Construction began in 2002 and finished in 2004, three years ahead of the original schedule. The project cost $115 million, with a cost savings of $10 million.[116] The finished project contained numerous cultural, environmental, aesthetic, safety and multimodal CSS elements. The new right-of-way features center medians, shoulders, bike lanes and sidewalks that were absent from the old road. A bridge extending the road over the Jordan River was rebuilt, and additional land was purchased along the river to preserve wetland and create a riverside trail. The pedestrian bridge incorporated artwork made by students at the nearby elementary school.[117] The project also improved corridor aesthetics by burying utility lines under the road.[118]

### US-285, Colorado

The Colorado Department of Transportation widened a 14.7 mile segment of US-285 from two to four lanes. US-285 leads southwest from Denver and is the secondary route into the mountains after I-70, which runs about 20 miles to the north. The reconstruction project was designed to improve safety and capacity while preserving the region's scenic and environmental

integrity. Significant stakeholder involvement early on enabled planners to utilize value engineering to minimize delay, cost and the impact of the construction on the area.[119]

The project area ranged from suburban Conifer in Jefferson County to rural Bailey in Park County. Expanding this portion of the road had not been part of the long term transportation plan, resulting in limited available funding despite the apparent need for road improvements. In 2002, CDOT completed a widening of US-285 to four lanes from Denver to Conifer, bringing increased traffic pressures on the unexpanded part of the road to the west. Studies were underway to expand I-70, which would affect US-285 traffic via mountain passes connecting the two highways.[120] Inconsistent speeds and lane configurations, mountainous terrain, winter weather and frequent intersections posed serious safety hazards for drivers.[121]

Planners faced several hurdles in addition to budget constraints. US-285 weaves through scenic and environmentally sensitive land, which includes mountain vistas, abundant wildlife, and wetlands that are part of the South Platte River watershed. Previous road improvement attempts along other parts of the corridor had dissatisfied the local and environmental community, making them wary of reconstruction.[122] Both community members and officials were concerned about the impact of road widening on land use, as the Denver Regional Transportation District promoted transit oriented development and planners did not want to induce more sprawl.[123]

The CSS process was a key to overcoming potential hurdles. In 2002, a feasibility study of potential improvements to US-285 recommended widening the highway from Foxton Road in Conifer to Bailey. This effort incorporated extensive public involvement and collaboration with agencies and stakeholders, and considered more than the typical analysis of traffic patterns and projections. The study outlined important budgetary and environmental limitations to the project and helped solidify early public support and understanding. This early adoption of the CSS method was rewarded when the proactive approach enabled CDOT to downgrade documentation from an Environmental Impact Statement (EIS) to an Environmental Assessment. By identifying environmental issues and community preferences early on, the project team was able to develop alternatives that mitigated impacts.[124]

Planners established a Value Engineering Team to review alternatives and recommend changes that would reduce costs and meet stakeholder interests. Adjustments included removing interchanges near towns that preferred to forgo the access in order to preserve a less obtrusive road profile, and using a depressed median to increase safety and provide haven for animals crossing the highway. Wildlife crossings and culverts were added early in the plan. The Value Engineering Team considered removing one of the wildlife underpasses to reduce costs, but the environmental community successfully pushed for it to remain.[125]

The CSS planning process has generated considerable savings and public goodwill. Avoiding the EIS saved planners eight months of development time; total savings are estimated at approximately $60 million.[126]

### Cemetery Road, Bowling Green, Kentucky

Cemetery Road (also known as Kentucky 234) runs east from Bowling Green, intersecting with I-65 about two miles outside of the city. In 2002, the Kentucky Transportation Cabinet widened Cemetery Road along this stretch from two to four lanes and added an interchange with I-65 to improve access from the freeway to Bowling Green's downtown. The reconstruction included a bike and pedestrian path and a landscaped median, which converts to a fifth traffic lane as it approaches Bowling Green.[127]

A previous attempt to add an exit off I-65 at Cemetery Road had failed in the 1980s. Residents opposed the proposal, expressing concern that the widened road and increased traffic would turn the rural and residential corridor into a commercial strip.[128]

To reverse opposition, the project team created a multidisciplinary team with members from planning, construction, landscape architecture and environmental disciplines. Early stakeholder involvement was essential to earning public support.[129] To counter concerns about the future character and land use of Cemetery Road, the project team proposed a boulevard concept and incorporated a recommendation by a Greenbelt Advisory Committee to incorporate bike and pedestrian trails.[130]

The plan had three elements: road improvements, non-road improvements and land-use development. Aesthetic considerations included a stonework appearance on the bridge over I-65 and reaching memoranda of understanding with local governments concerning maintenance and

landscaping along the corridor. Land was purchased along the roadway to create a green space and berms were built to shield homes from the noise of the road.[131]

To discourage growth and commercialization along the corridor, access to the boulevard was limited and stakeholder views were solicited on the fit between zoning and the desired context. The completed project has helped revitalize Bowling Green and the new alignment has resulted in a reduction of crash rates that is estimated to have saved the community over $3 million.[132]

### Bridgeport Way, Washington

Bridgeport Way is a main thoroughfare in University Place, Washington. A 1.5 mile stretch of the road was redesigned on a "road diet" to increase safety and create a community environment (see Figure 4 for before and after, below). The five-lane arterial was converted into a four-lane street with landscaped medians, a bike lane, sidewalks, pedestrian friendly crosswalks and buried power lines.

The city of University Place incorporated in 1995. Bridgeport Way had a high number of crashes and redesigning the road was a chance to both improve safety and create a main street atmosphere for the new city's town center. The design process involved significant contributions from stakeholders and the public. The Chamber of Commerce and the local electric utility Tacoma Power were key stakeholders, with the utility contributing 50 percent of the cost of burying power lines along the street.[133] Two charrettes were conducted, including one that targeted local high school students. Public meetings were held to discuss alternatives. City representatives also met individually with those who owned property along Bridgeport Way.[134]

Roundabouts, which were proposed in one of the charrettes, were a point of public interest and disagreement. Two main alternatives had emerged from the community involvement process: a two-lane road with roundabouts a four-lane road with signaled intersections. The local press was critical of the roundabout proposal and a citizen's group formed in opposition to roundabouts. Ultimately, the four-lane alternative was selected. As a demonstration project, roundabouts were installed on another street; since then more roundabouts have been built in University Place, but not on Bridgeport Way. During the design phase, team members educated

the public on terminology and proper driving techniques for roundabouts. In all, the community involvement portion of the process took fewer than five months.[135]

**Figure 4 - Bridgeport Way Before (left image) and After (right image)**


Source: National Research Council. (2004, July). Transportation Research Circular Number E-CC067: Context-Sensitive Design Around the Country, Some Examples. Washington, D.C: Transportation Research Board. Bridgeport Way.

Construction began in 1998 and was completed by 2002, at a cost of approximately $9 million.[136] Reviews of the project have not revealed any cost or time savings; however the project was completed on schedule. Through the use of CSS principles, the reconstruction did achieve its main goals of creating a safer, more community-oriented environment: crashes declined by more than 50 percent, operating speeds reduced by 2 MPH and, despite initial concerns by the business community about redesigning the road, business revenues increased.[137]

## Elgin O'Hare-West Bypass Study, Chicago, Illinois

The study of transportation issues in an area west of the O'Hare Airport (Chicago, IL) began in 2007. This 127 square mile region, named the Elgin O'Hare-West Bypass (EOWB) study area, is a dense mixture of residential, commercial and industrial uses.[138] The EOWB study area, which is bordered by I-90 to the north, 1-294 to the east, 1-290/US-20 to the south, and the western end of the current Elgin O'Hare Expressway, has historically experienced major traffic congestion and mobility issues.[139] (See Figure 5 below.)

These issues and possible solutions have been identified through a CSS-driven two-tier process. Tier One, completed in June 2010 and documented in the FHWA and Illinois DOT (IDOT) "Tier One: Record of Decision," focused on identifying the transportation needs of the

area, determining alternative solutions to address these needs, and establishing their expected social and environmental impacts. The Selected Alternative Plan as defined by the Tier One Record of Decision includes:

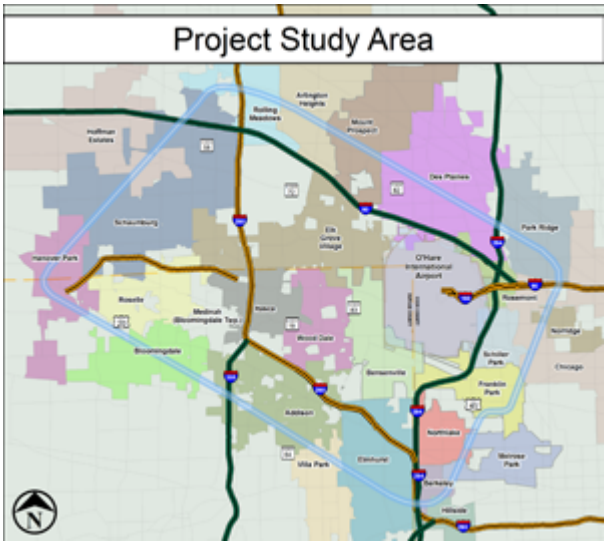
- Widening the current Elgin O'Hare Expressway from Gary Avenue to I-290,
- Extending the Elgin O'Hare Expressway to the east from I-290 to O'Hare Airport,
- A new bypass of O'Hare Airport to the west, connecting I-90 and I-294,
- Improvements to the connecting roadways,
- Stipulations for bus or rail transit in the Elgin O'Hare Expressway median and the new western bypass,
- Connections to a proposed multi-modal transit hub at O'Hare Airport, and
- Extensive pedestrian and bike amenities.[140]

Tier Two is currently underway, and will build on Tier One by studying in greater detail the environmental footprint of proposed improvements and what will be necessary to mitigate those impacts. Tier Two and its accompanying EIS decisions are expected to be completed in 2012.[141]

From the outset, CSS principles have been incorporated into the process, beginning with extensive stakeholder participation. According to IDOT officials, over 130 meetings were held throughout the course of Tier One, including meetings with regional stakeholders, elected officials, and various regulatory and transportation agencies.[142] Other efforts included outreach programs and door-to-door notification of residents and businesses along the affected major transit corridors. These collaborative meetings produced much of the alternative solutions proposed for final consideration, and helped to address stakeholder concerns regarding road placement, traffic and airport noise, environmental impact, and adverse community impact.[143]

Due to this flexible planning design, Tier One and an accompanying Environmental Impact Statement (EIS) were completed in 2.5 years, fully 6 months ahead of schedule.[144] The Tier One EIS was granted a "Lack of Objection" rating by the EPA, which is the best EIS rating possible. Illinois DOT officials credit the CSS process, especially stakeholder involvement, with this unprecedented success.[145]

**Figure 5 - Elgin O'Hare-West Bypass Project Study Area**




Source: Illinois Department of Transportation. (2010) Elgin O'Hare West Bypass. http://www.elginohare-westbypass.org

## Paris Pike Reconstruction Project, Kentucky

Paris Pike, a two-lane, scenic, traditionally rural route, connects Lexington, Kentucky, with the more northern Paris, Kentucky. As Paris Pike was increasingly used as a commuter route rather than a scenic corridor, safety and mobility concerns arose. Though similar in accident rate to comparable two-lane roads in Kentucky, Paris Pike experienced an overwhelmingly increased fatality rate compared to analogous routes. When investigated, it was found that factors including narrow lane width, lack of paved shoulders, steep ditches, and insufficient passing sight distance were responsible for this high fatality rate.[146] A project to expand 13.5 miles of this route from two lanes to four lanes was proposed to address these major issues associated with the road.

The CSS process was necessary when considering this expansion not only in the context of safety, but also in the context of cultural and environmental preservation as well. Paris Pike passes through the Bluegrass Region of Central Kentucky, and so environmental resource protection was a stakeholder priority.[147] Additionally, Paris Pike's cultural and historical value was a primary consideration; Paris Pike was established along a historical trail dating back to early Native American migration, thus directing early Kentucky settlement and was one of the first

roads built west of the Alleghany Mountains.[148] Preservation of this historical importance, and also of the aesthetics of the scenic horse country corridor, had to be maintained along the length of the project.

Through Context-Sensitive Design, this wide range of considerations could be taken into account and acted upon by the Kentucky Transportation Cabinet (KyTC) and contractors. In response to the concerns and preferences voiced by the surrounding horse industry, the unique silt loam topsoil of the area was stripped, stockpiled and returned to original thickness after grading and drainage work was completed. This allowed for the maintenance of the iconic Kentucky Bluegrass that supports the adjacent horse farms.[149] The KyTC also stipulated landscaping with local plant species and changing road placement to minimize impact to existing trees. An endangered species found in the area, the Running Buffalo Clover, was moved to a protected easement bought for that purpose.[150] Grass shoulders were created along the new road to increase safety and aesthetics; timber guardrails and stone façade bridges were also constructed to increase the aesthetic value of the improved road. To preserve the historical resources, archaeological digs were created in the area, and the artifacts found have been placed on display within the community.[151] By considering the multiple facets of the design problem and incorporating stakeholder interests into the design, KyTC was able to achieve its safety, historical, cultural, and aesthetic goals on Paris Pike.

# 5. Employment of CSS Concepts in Georgia

## 5.1 Promotion and Benefits of the CSS Approach in the Georgia Department of Transportation (GDOT)

Like many other states, the Georgia Department of Transportation (GDOT) is making an effort to integrate CSS principles into its project development process. GDOT initiated its commitment to CSS in 2005, in step with the nation's growing awareness of the concept. According to the GDOT Context Sensitive Design Online Manual, CSS workshops and the development of the online manual are the most significant steps that GDOT has taken thus far.[152]

### Educating Practitioners

In 2004, the Context Sensitive Design Symposium took place in Atlanta. FHWA, GDOT, Metropolitan Atlanta Rapid Transit Authority (MARTA), Association County Commissioners of Georgia (ACCG), Georgia Municipal Association (GMA), Atlanta Regional Commission (ARC), Urban Land Institute, Atlanta District Council (ULI-Atlanta), Georgia Tech's Center for Quality Growth and Regional Development (CQGRD), and Post, Buckley, Schuh & Jernigan, Inc. (PBS&J) sponsored the conference. More than 100 engineers, urban designers, city planners, municipal and state officials, community and nonprofit representatives, and others met with national experts to learn more about CSS.[153] Some of the key topics covered included project development and community expectations, maintenance issues, addressing the understanding of context, the relevance of place in CSS, and legal issues associated with CSS. Regional experts from Maryland shared case studies that reflected their experience with CSS. This event is perhaps the most comprehensive effort to educate local and state practitioners about the CSS movement.

### Guiding Reference

Likewise, the GDOT Context Sensitive Design Online Manual is the most comprehensive reference tool created for Georgia. The Manual was created to serve as the state's primary resource about CSS, its corresponding policy guidelines and procedures, and to share examples of successful implementation. According to the manual, "CSS is an important part of future planning and design projects in Georgia, and our goal is that GDOT will be among the transportation leaders in the exchange of CSS ideas and concepts."[154]

The manual addresses CSS in three parts: setting clear direction, putting CSS into practice, and highlighting examples of best practices. The manual initiates setting clear direction by sharing the history of CSS. From there, the manual expresses five principles that GDOT has adopted with regards to CSS:

1. Exercising an interdisciplinary approach to project development and decision making,
2. A commitment to public involvement by focusing on the community and stakeholders,
3. Exercising sensitivity to the environment when designing,
4. Recognizing flexibility in reaching solutions, and
5. Realizing that CSS should be considered a process.

From the practical standpoint, GDOT identifies a complimentary five-step guide to successful context sensitive solutions:

1. Initiate effective decision-making,
2. Understand community input and values,
3. Achieve sensitivity to social and environmental concerns,
4. Integrate stakeholder interests through context sensitive design alternatives, and
5. Ensure project solutions that work.

The corresponding best practices section shares both Georgia-specific and national case studies. The variety of examples is intended to exhibit how CSS is applicable in diverse situations and scales.

GDOT has not matched the Context Sensitive Design Online Manual's extensive guidance on CSS principles with explicit requirements for how they should be followed, nor has it set minimum standards that must be met when applying CSS to a project. CSS principles that encourage design flexibility can conflict with preexisting design criteria and guidelines. Context sensitive design approaches that deviate from established standards require the approval of the GDOT Chief Engineer, who could grant an exception or variance for such cases.[155] The following section includes some specific recommendations to implement the ideas introduced in Georgia's CSD Manual.

## 5.2 Georgia Department of Transportation (GDOT) Policy and Program Recommendations

As previously mentioned, the CSS program in the State of Georgia is currently guided by the CSS implementation techniques described in the Context Sensitive Design Online Manual. This Manual was prepared April 21, 2006. The following recommendations are intended to guide the CSS program in Georgia from the initial implementation strategies outlined in the Manual to the realities of 2011.

### Application of Best Practices and Strategies to Current GDOT Policies and Projects

The Georgia Department of Transportation (GDOT) has made major strides in recent years to incorporate Context Sensitive Solutions and flexible designs into their policies and project development processes. This has been accomplished through the creation of the previously mentioned manual and other internal initiatives. However, the review of recent literature and the evolving lessons and best practices offered by other states provides guidance on some opportunities for GDOT to further integrate the CSS approach. These opportunities are described in the following section and include recommendations at both the departmental level through policy changes and within the project development process itself. The adoption of these recommendations will aid GDOT in its efforts to increase public support, public trust and public appreciation of GDOT projects, and will help Georgia to protect precious financial, environmental, and cultural resources. Through further integration of context sensitive solutions, GDOT can also continue to elevate its role in developing and maintaining the transportation system of the state, for all users and all modes. This will keep Georgia competitive with neighboring states by fostering a high quality of life that draws both individuals and businesses alike to the state, and that creates conditions that attract and retain strong economic development.

### Department-Wide Recommendations for CSS Policy Integration

The CSS approach can be used to its full advantage if there is an internal understanding of the process. This includes both top-down directives and mid-level champions and initiatives. The transportation experts from other states have provided strategies to achieve both types of

support. For the top-down support, key politicians and high-level individuals must be made aware of the critical elements of the approach and the potential benefits that the approach can provide, particularly in terms of the cost savings and the building of public trust.

## Training

One strategy to overcome an internal lack of understanding about the details of the process is by establishing a strong training program within the Department of Transportation (DOT). In order to fully integrate CSS into all aspects of the organization and project development, all of those who participate in the process of moving a project forward should receive CSS training. This includes both formalized training through structured classes, as well as establishing training opportunities through other, less structured formats. As described by the transportation experts in other states, each training course should be developed for a specific target audience and the length, frequency, and materials presented in the training courses should vary accordingly. The series of courses developed by others states are typically customized for the following audiences: roadway designers using the CSS approach in their plans, higher-level executive decision makers within the organization, technical professionals from other regulatory agencies, individuals responsible for the construction and maintenance of a project, stakeholders, and the general public. Additionally, politicians and other state and city officials should be included in the training program, which can help build political support for and understanding of the CSS approach, an aspect of implementation which is critical to success. The following sections provide training recommendations taken from the literature review and expert interviews.

In Georgia, the State Transportation Board is appointed by the Governor and "exercises general control and supervision of the Department."[156] The Transportation Board members also serve on committees. Several committees would potentially have a role in assisting with the implementation of the CSS approach including: the Statewide Transportation Planning/Strategic Planning Committee, the Administrative Committee, and the Program Delivery/Consultant Services/Contractors Committee. Key Board members representing these committees should be included in a CSS overview training course.

Training initiatives should be strongly supported and encouraged by high level individuals. However, although successful implementation requires a clear commitment and directive from the top, it is also necessary to establish initiatives tailored to achieve mid-level staff support, so as to ensure buy-in across the organization. The following training sessions should be developed and offered in the State of Georgia. An effort should be made to reduce the personal impact of attending the training sessions for internal DOT employees.

## General Training Recommendations:

1. Develop customized training courses to target specific audiences.
2. Invite those targeted audiences to DOT training with the endorsement of high-ranking individuals, to emphasize the importance of implementing the CSS approach and to establish clear consistent leadership and directives. For example, including the support of the Governor, the State Transportation Board, the Commissioner or the Deputy Commissioner in the invitation can help increase training attendance and further the integration of the CSS values.
3. Keep training current through updates and revision as successful GDOT case studies accumulate.
4. The GDOT CSS Manual identifies typical stakeholders that should be contacted prior to a project initiation, as well as a number of public involvement and meeting facilitation techniques. Incorporate this resource into the training course curriculum. Everyone in the organization should be made aware that this Manual is available to assist with stakeholder identification and public facilitation techniques.

## Leadership Training Recommendations:

1. Develop a short overview course to outline the basic concepts of the CSS approach. This course should emphasize the benefits that the approach provides, particularly regarding cost savings, increases in public trust, and the development of better communities.
2. Present this overview course to high-level decision makers, members of the State Transportation Board, and others who make decisions regarding funding for projects.

3. Modify the course as conditions change, and offer the course repeatedly as the audience changes (due to elections, for example).

## Interdisciplinary and Stakeholder Training

Key stakeholders within the state should be invited to participate in the training so that a typical stakeholder viewpoint can be included in the process of developing the transportation solution. The inclusion of stakeholders in the training course is critical for two reasons. It sends the message to stakeholders that their input is important to GDOT, and also emphasizes to GDOT personnel that stakeholder input should be considered a priority in successful CSS projects. The CSS training also needs to span across functions within the internal GDOT structure to include a complete cross-section of responsibilities and perspectives.

## Interdisciplinary Training Recommendations:

1. Develop an interdisciplinary training course that includes relevant local case studies. This course should include design problems to be solved during the course. These case studies should be easily accessible to people of different professional backgrounds as well as stakeholders from the general public.
2. Include individuals representing a wide range of diverse views, such as key stakeholders, construction and maintenance individuals, environmental experts, and project designers in this multi-disciplinary problem solving training.

## Designer Training

In order for transportation engineers and designers to thoroughly understand and apply flexible design and the CSS approach to projects, a highly technical training course should be offered. This course should include the specifics of creative problem solving, flexibility in the Georgia Design Manual as it relates to the Green Book, liability concerns, and designing for the larger context. Both formal and informal training can be used to teach public involvement and communication strategies.

## Designer Training Recommendations:

1. Develop an intensive longer training course specifically for designers which illustrates the existing available flexibility within the standards, and how to use that existing flexibility to the best advantage. Include a section from the in-house counsel to address liability issues and concerns.
2. Continue the existing GDOT job shadowing program. Rotate new GDOT engineers among different parts of the organization for maximum exposure to multi-disciplinary considerations.
3. Encourage these new engineers to attend the public meetings and engage with stakeholders, as part of hands-on training in the CSS implementation process to build public communication skills and develop creative problem solving skills.

## Academic Institutions as Training and Educational Resources

It is recommended that GDOT maintain a strong relationship with academic institutions, to provide policy and program implementation support, logistics, and data analysis and management. These institutions can provide objective third party material and recommendations for the DOT, as well as offering expertise in adult education and training. Not only can the academic institutions provide direct support for the implementation of the CSS approach, but also many engineering students attending state engineering schools will ultimately work for the DOT either directly or through engineering consulting firms. Therefore the ideas of CSS should be integrated into the course curriculum or otherwise presented to the students.

## Academic Involvement Recommendations:

1. Partner with local academic institutions in order to benefit from the unique support these institutions can provide; for example, a university – which specializes in educating adults – may be a good resource for developing CSS training workshops.
2. Include academic institutions in the development of training courses, webinars, conferences, and cross-state workshops. Allow the institutions to help with logistics, including hosting these various training sessions. Benefits of this approach include the

university's neutral space to unify multi-disciplinary individuals, as well as the university's expertise in adult learning and curriculum development.

3. Utilize an academic institution to provide GDOT with continuing CSS-related research.
4. Encourage the integration of the CSS approach into engineering curricula in Georgia schools to maximize exposure of Georgia engineers to these crucial CSS principles, such as flexibility in design and public involvement strategies.
5. Have DOT CSS leaders speak to civil and transportation engineering students at local universities to offer real-world examples.
6. Encourage local engineering students to intern at the DOT and work on CSS projects so that new engineers are exposed to the CSS principles early in their career.

## Address Diverse Conditions across the State through Training

Georgia is a large state with a wide diversity of conditions, from mountains to flat coastal areas. This diversity of conditions forms the context in which all transportation projects are located. These diverse conditions are represented locally by seven local DOT Districts. The local area offices are each responsible for several counties within their District. The CSS training needs to span across functions within the DOT and to include the local offices in order to attain wide-spread CSS implementation.

## Cross-Functional Training Recommendations:

1. Tailor training workshops and courses for individual, local areas/offices by addressing issues and concerns specific to the local area.
2. Offer the training sessions locally to reduce the burden on regional personnel.

## Current Training Policy

Georgia primarily relies on the National Highway Institute training courses for CSS training. While this is an excellent resource, the training should be more tailored to the conditions, concerns and issues that are unique to Georgia. This includes the challenges presented by the wide diversity that exists in the state, in terms of urban to rural conditions, varied demographics, and political preferences, among other issues. The FHWA Resource Center is also available to

provide assistance in developing customized training materials and technical assistance for Georgia. Additionally, the existing Context Sensitive Design Manual that was developed by GDOT in 2006 should be included in these Georgia-specific training workshops. This Manual identifies typical stakeholders in the State of Georgia, and strategies for facilitating public involvement.

## Training Policy Recommendations:

1. Establish a series of customized training courses that are specific to the unique conditions in Georgia to facilitate an internal understanding about the details of the process.
2. Utilize the resources available from the FHWA Resource Center to create customized training.
3. Integrate the existing GDOT Context Sensitive Design Manual into Georgia-specific training.
4. Add customized training to GDOT's existing training repertoire that includes NHI material.

## Expectations and Perceptions

Although GDOT has incorporated some aspects of the CSS approach into the project design through an enhanced public involvement process and by incorporating aesthetic elements into the designs, an organizational structure and project approach that fully integrates the CSS approach will be a multi-year process. There needs to be an awareness and educational process across all functions of the Department that the CSS Approach is a new way of conducting and conceiving of all projects. The Department should consider establishing a CSS Advisory Committee to develop a CSS Strategic Plan to guide the implementation process.

Additionally, the CSS approach can build customer satisfaction over time, which can lead to greater job satisfaction within the Department. Because of this, it is important to change any internally or externally held perception of the CSS process as being one which seeks unnecessary public input to the perception that CSS allows for positive public input which offers

solutions not previously considered. GDOT should address the perceptions and expectations of CSS in order to ensure the successful implementation of the approach.

### Expectations and Perceptions Recommendations:

1. Track and make available examples of successful projects completed using the CSS approach. Track in terms of costs/time savings.
2. Establish a record of examples of positive public involvement on projects.
3. Host a Peer Exchange to involve practitioners from other states. This Exchange can include discussion of best practices from other areas, as well as strategies and issues that have emerged in the "mature adopter" states.
4. Emphasize that the implementation of the CSS approach is a long term commitment. It will be a multi-year and multi-project process before the framework and procedures are fully in place.
5. Develop a CSS Strategic Plan to establish objectives, goals, and a realistic timeline for the integration of CSS principles. Establish measurement methods to determine progress towards goals.

### Establish both top-down directives and mid-level staff support

The successful full implementation of the CSS approach in Georgia will require both top-down directives and mid-level staff support for the CSS approach statewide. Jeff Shaw of FHWA Illinois states, "If tasking an individual would be too much in Georgia, then at least finding a critical mass of specific individuals who clearly have the CSS process implementation identified as a collateral duty so that the expectations are very clear who's supposed to be moving this forward, and who's empowered to make decisions on behalf of the GDOT." [157] The following recommendations may help to achieve strong internal and external leadership and directives.

### Staff Support Recommendations:

1. Hire new positions and/or establish new responsibilities. These may include:
    a. CSS Project Coordinator, who oversees all training and outreach, ensures consistency across the states, develops a CSS database to track results over

time, creates an interactive website showing CSS projects across the state, and becomes involved with national initiatives (through FHWA, Transportation Research Board (TRB) etc.).

b. Public Involvement Coordinator, who offers project-specific assistance on public involvement issues. The individual would closely coordinate with the GDOT District Communication Specialist.

c. Internal DOT Training Instructors, who can offer training to local DOT employees.

2. Establish a CSS Advisory Committee, which determines CSS objectives, and assigns responsibilities to individuals or groups of individuals to accomplish goals. This Committee can also conduct an internal peer exchange to evaluate what's working and what's not across the state. Individuals willing to undertake these tasks can be identified in the initial training sessions.
3. Assign internal CSS "Champions," to help encourage and/or train others in CSS adoption.
4. GDOT currently funds several positions at the Department of Natural Resources (DNR) and the State Historic Preservation Office (SHPO). Encourage close inter-agency cooperation throughout all phases of the project. Consider embedding non-DOT personnel in the Department (i.e., embedding DNR liaison into GDOT for environmental review) to further facilitate this cooperation.
5. Task an individual with continuing to review the state design standards for flexibility. This individual would be responsible for comparing standards and flexibility between the Georgia Design Manual and the AASHTO Green Book, and incorporating the new information available in the AASHTO Highway Safety Manual (2010).
6. Offer GDOT awards as an internal incentive for projects that are innovative and creative or otherwise illustrate the ideas of the CSS approach.
7. To ensure top-down incorporation, consider supporting a legislative mandate requiring a CSS approach to projects.

### Improving Customer Service and Building public/stakeholder trust in State DOT

To build public trust over time, and to fully integrate the CSS approach at an organizational level, the approach must be established at some level on every project. This could potentially include engaging stakeholders on additional projects than is currently the practice at GDOT. However, the effort should be scaled to reflect the size of the project. GDOT should eliminate the public perception or internal reality that input is sought only on select projects. The following public involvement strategies are recommended in addition to those provided in the CSD Manual.

## Public Involvement Recommendations:

1. Start the public involvement process early, before concepts or alternatives are developed.
2. Allow the stakeholders to participate in determining if there is a problem, and what the problem is based on the unique conditions found specifically in that community. Through this process work with the stakeholders to develop a "Problem Statement": a written statement that incorporates all the public's concerns and ideas.
3. Seek out opposing views to include in the public involvement process in the earliest phase possible. Bringing these views to the forefront as soon as possible can build a strong and positive process in which potential future conflicts can be avoided.
4. Bring variety of staff to meeting (different ages, gender etc.)
5. Establish ground rules for public engagement meetings, such as maintaining respect for one another and upholding the spirit of cooperation at all times.
6. Review the typical stakeholder list (in the GDOT CSS Manual) in reference to each individual project. Make sure that internal staff are aware of this list.
7. Incorporate the strategies identified in the GDOT CSS Manual for a successful public facilitation into the standard public meeting procedures.
8. Allow stakeholders to participate in conducting a Context Audit to determine the background of the area affected by the project (culturally, historically, environmentally, etc.).

9. Once the public has determined that there is a problem, and looked at its context, allow the public to take an active role in the development of the Purpose and Need statement which can be directly linked to possible solutions.
10. Charge the public with thinking of solutions. For instance, if deciding highway placement, allow the public to physically draw the road alignment on a map.
11. Create a multi-faceted public engagement strategy, including web-based interaction opportunities, utilize social media outlets.
12. Develop a project website, which can become a library for documentation and reference materials for the project. Make this clearly accessible to the stakeholders to increase transparency.
13. GDOT should be as accessible to the public as possible, including opportunities for the stakeholders to have one-on-one meetings with transportation experts.

## Flexibility in Design

The Georgia Design Policy Manual should be reviewed and potentially revised to fully incorporate the ideas of the CSS Approach throughout the Design Manual. The Design Manual currently only includes one general paragraph describing the CSS Approach, and refers users back to the CSS Manual for specifics on design flexibility.[158]

This strategy will assist the engineers and designers with their ability to incorporate the flexibility that already exists in the State Design Policy Manual to the best advantage for a specific project. Additionally, any fear that utilizing the flexibility that CSS affords will expose a designer to tort liability must be addressed. To do this, the idea of CSS should be more thoroughly integrated with the Design Manual. The FHWA Highway Safety Manual is another resource which offers new research on the relationship between a reduction in crash frequency and severity and design standards. Integrate the FHWA Highway Safety Manual, 2010 recommendations and findings with the GDOT Design Policy Manual and incorporate the CSS Design Manual recommendations.

## Flexibility in Design Recommendations

1. Integrate the FHWA Highway Safety Manual (2010) recommendations and findings with the GDOT Design Policy Manual and incorporate the CSS Design Manual recommendations.
2. Review the Georgia liability laws to establish the risk/benefit relationship within the design standards through close coordination with the State Attorney General's office or the GDOT in-house counsel.
3. Establish a relationship with state Attorney General (AG) office to reassure designers regarding liability. Request that the attorneys prepare a presentation to address these concerns and include them in the development of CSS training.
4. Establish a system to document decisions that were made to use certain design values to reflect the context of the project, and to show why this trade off might be uniquely beneficial for a particular project.
5. Utilize the available FHWA training course," Geometric Design Flexibility and Risk Management," which reviews this issue in depth for design practitioners.

## Provide Incentives for Consultants

Though CSS may be implemented within a state DOT, full CSS implementation cannot be achieved until all aspects of the project are considered with regards to their larger context. This includes work done by consultants outside of the DOT. This need can be addressed through changes in the language of Request for Proposals issued by the DOT and other methods, recommended below.

## Consultant Recommendations:

1. Involve the consultant community in the development of training materials, which results in buy-in from the consultants from the very beginning.
2. Consider establishing a system for consultants to become prequalified or certified in the CSS project approach by attending the training.
3. Include language in the RFP clearly specifying that the project is a CSS approach project. Require examples of relevant work experience and incorporate this relevant work experience into the point system for evaluating a proposal.

## Project Specific/Project Development Process

The Concept Project Report is used by GDOT to document the decisions made at the beginning of the project. This is an excellent tool to begin the documentation process and to encourage flexible and creative problem solving. A robust documentation process which includes justification for all decisions can be a critical tool for the CSS approach in that it provides protection from liability risk. It can also be used to clearly demonstrate to the public that their concerns were heard and incorporated into the design. GDOT is currently revising the procedure for the development of this report. As part of the revisions, GDOT should clearly show and require that the public involvement process begins prior to the development of any conceptual design or design alternatives and the public should participate in decisions regarding the transportation challenge to be solved, including whether the local community feels there is a transportation challenge at all. The Concept Project Report could be an opportunity to formally achieve several CSS objectives including: developing a Context Analysis with the assistance of local stakeholders and writing the problem statement with stakeholders.

## Seamlessly integrate the CSS Approach into the Project Development Process

As previously mentioned, the CSS approach is most successful when it is applied to all projects. The process can vary according to the scale and type of project, but the ideas should be incorporated into all project development processes at some level. Even if a project appears to be minor and straightforward, the CSS process can sometimes reveal public concerns that should be addressed. Other project-specific benefits of incorporating CSS principles are based on the comprehensive inclusion of stakeholders, DOT employees, decision makers, regulatory agencies, etc., in the process.

The CSS approach can save money and time over the entire length of the project, but the hours and costs are distributed differently to reflect the comprehensive contextual consideration from the outset of the project. For example, the right-of-way (ROW) land acquisition process is typically a time intensive and costly project necessity. As an example of a cost saving opportunity, through the use of CSS, property owners have in other states proactively approached the DOT to sell their land for ROW acquisition. CSS can also reduce the likelihood of a cycle of opposition

and lawsuits developing for a controversial project due to the inclusive public discussion in the project development processes.

### Integration Recommendations:

1. Expand the scale of the conception of the project to include the larger context, including: economic development, funding strategies across the entire system, how the project can contribute to system wide multi-modal options, and how individual projects have larger impact.
2. Continue to and consider expanding the re-distribution of project hours to include more comprehensive front-end public involvement efforts.
3. Consider tax base enhancements that could occur as a result of the project, as well as job creation (both long-term and short-term).

## Include other disciplines on project team

Having other disciplines represented on the project team results in the inclusion of input from as many perspectives as possible and facilitates ease of coordination later in the project. GDOT does already fund several positions at DNR and SHPO. Include these diverse perspectives as early as possible in the project development process. As was explained in the "Best Practices" section, having a multi-disciplinary team established early can result in savings of both time and money, and can result in the most creative and successful solution alternatives. For example, the use of the CSS approach has been shown in other states to reduce the number of comments on environmental documents from the environmental regulatory agencies, which can save time on the project; this is because the CSS approach can be used to raise all the potential environmental issues and public involvement issues early in the process. The multi-disciplinary team should also be included from the initiation of the public involvement process.

### Multi-disciplinary Team Recommendations:

1. Consider embedding other agency personnel in the DOT to provide detailed technical input on transportation projects. GDOT currently sponsors a SHPO position and DNR position. Fully utilize these individuals on a project team from the initiation of a project.

2. Public involvement issues can surface earlier than with a traditional project approach. The use of the CSS approach can reduce the number of comments from the environmental regulatory agencies. The CSS approach can be used to raise all the potential environmental issues early in the process. This clear integration of the stakeholders and a robust public involvement process can expedite the environmental document approval process.
3. Include individuals with other non-traditional areas of expertise on the project team at the earliest phase possible, particularly to aid in verbal and graphic communication to the layperson. This includes public relations experts, public meeting facilitators, and design individuals to create three dimensional renderings of project alternatives so the public can "see" the alternatives in a more accessible way.
4. Consider construction and maintenance issues from project initiation, by including individuals responsible for and with expertise in construction and maintenance early in the project development process.
5. Continue to utilize a public relations expert for all phases of the project. These individuals can be involved during the construction phase of the project and can work with the affected community to reduce possible public anger and frustration with GDOT during this phase of the project.
6. Strive for informed consent rather than consensus during discussions. Allow for everyone to be heard, but make it clear that ultimately GDOT will be making the decisions that require professional expertise. However, through the course of the CSS process the public might present a viable idea or solution that the engineers would not have considered. The public also might consent to an option that the engineers would never expect.

In conclusion, by continuing to build on the momentum that Georgia has established, and with further refinement of the policies and the project development process employed by GDOT, Georgia can begin to establish itself as a national leader in the implementation of the CSS approach. Georgia can also take a leadership role by submitting fully integrated CSS projects to

FHWA for consideration as national examples of best practices which will draw positive national recognition to the state.

## 5.3 CSS Projects in Georgia

### CSS Completed Projects in Georgia

The following projects are updated CSS case studies from the "Leading with Best Practices" section, described in the GDOT "Context-Sensitive Design Online Manual ver. 1.0" of 2006, which highlight some recent examples of context sensitive designs from GDOT.

### I-16/I-75 Interchange, Bibb County

The I-16/I-75 Improvement Project includes the widening and renovation of I-75 from Hardeman Avenue to Pierce Avenue, and I-16 from I-75 to Walnut Creek. The goal of this project is to improve the operational efficiency of the I-16 interchanges at Spring Street, Second Street, and Coliseum Drive located in the City of Macon in Bibb County, Georgia. This increase in efficiency was designed to occur with limited impacts on floodplain, wetlands and public utilities. Six alternatives were developed with public involvement, and the preferred concept was chosen in 2000; however, in 2003, the City of Macon requested that GDOT reconsider, due to the perceived excessive scope of the proposed project. After listening to community input regarding the large scale of the project, GDOT incorporated this public input into the project by designing several alternatives that limited the project's scope, thus mitigating the negative impacts of the project on the community and the environment. The preferred concept was selected in 2005, and between 2005 and 2007 preliminary environmental and engineering studies were conducted. Input from the surrounding Pleasant Hill community was again solicited through community meetings, project newsletters and a project website, and this input was incorporated into environmental impact mitigation plans. Preliminary design was finished in 2008, and the FHWA approved a "Finding of No Significant Impact" in June 2010. Right-of-way acquisition began in 2011, and construction is scheduled to begin in 2018.[159]

### Connecting Savannah Public Involvement Process, Savannah

The Connecting Savannah Project included a public involvement-driven process to define major community transportation issues, and to propose solutions for these problems. During the

process, several major concerns were identified by Savannah stakeholders including congestion, the lack of east-west connectivity, the lack of alternative modes of transit, and the need to become more bicycle and pedestrian friendly. Several specific problems were also identified such as Bay Street congestion and truck use, and a high volume of traffic on DeRenne Avenue. In order to addresses these issues, an extensive public engagement process was initiated which included a stakeholder conference in October 2004 followed by five smaller group workshops. Each group workshop established important community assets and identified community problems and needs. Once these priorities had been determined, citizen groups were able to discuss and propose potential solutions from a list of concepts. Through this process, effective public involvement strategies to solve transportation issues in Georgia have continued to grow.[160]

### 14th Street Bridge, Atlanta

The 14th Street Bridge Project included reconstruction of the bridge to allow for a new I-75/I-85 northbound exit ramp and underpass. The project was initiated to address the high crash rate and congestion on the existing 14th Street Bridge, and to allow for easier access to Atlanta's Midtown area. Construction began in 2007 and was completed in 2010, when the last ramp to 17th Street was opened for traffic.[161] This project was made possible through extensive public engagement from the surrounding community.[162]

### 5th Street Bridge, Atlanta

The 5th Street Bridge Project was initiated in response to the needs of the surrounding community. For this project, the context of the project was particularly important since it connects the main campus of the Georgia Institute of Technology located to the west of I-75/I-85 to Technology Square, located on the east side of I-75/I-85. As such, involving Georgia Tech in the planning of the bridge, as well as the other stakeholders in the surrounding community, was paramount, and guided the bridge design and construction. To enhance student and pedestrian use, the new bridge has wide sidewalks, bicycle lanes, planters and landscaping to hide the interstate below, a trellis for shade, and benches on both sides of 5th Street.[163]

### Dr. Martin Luther King, Jr. Boulevard, Savannah

In order to relieve the pressures of neighborhood decline in the area, the City of Savannah is revitalizing the streetscape on Dr. Martin Luther King, Jr. Boulevard from River

Street to 52nd Street. The revitalization plans include new sidewalks, pedestrian crosswalks, ornamental light posts and landscaping in the median and around tree lawns.[164] The improvements to the corridor have been designed to integrate the road visually with downtown Savannah, increase safety and walkability, and calm traffic in the area, ensuring commercial viability for the surrounding business owners through increased pedestrian traffic.[165]

### Rockdale County Citizen Involvement Process

The citizen involvement process developed by Rockdale County provides an example of an effective method to engage the public in decisions made by the county. Citizens are encouraged to participate and inform the county Board of Commissioners by serving on citizen advisory panels; citizens are also encouraged to attend town hall meetings and schedule talks with County officials to discuss issues facing the community.[166] The Rockdale County government has an entire department devoted to fostering public involvement known as the Department of Community Affairs and Innovative Programs. This Department develops public education programs, organizes county outreach events, and manages the publication of town hall discussions through the *Rockdale 23* informational cable television channel.[167]

### Talbotton Road, Columbus

A plan to widen Talbotton Rd/State Road 982 from 7th Avenue to Woodruff Rd/Hilton Avenue was originally proposed in the early 1990s; this plan included two 12-foot travel lanes in each direction separated by a 20-foot, raised concrete median, 5 foot sidewalks on both sides, and 12-foot wide shoulders. In 1999, upon considering the context of the road and its proximity to properties eligible for the National Register of Historic Places, the width of the travel lanes was narrowed to 11 feet, and the median was narrowed to 16 feet. After environmental and engineering issues were considered, the amended plan was presented to the public first in 2004 and then, after further revision, again in 2008. The 2008 plan included revised access points that garnered public opposition; the opposition was acknowledged by GDOT and revisions were again made to the plan which addressed the public's concerns. A "Finding of No Significant Impact" was approved by the FHWA in 2008, and funds for right-of-way acquisition were approved in 2009.[168]

In the fall of 2009, owners of the surrounding businesses who opposed the relatively large scale of the project hired an independent traffic engineer to evaluate the GDOT traffic

projections for the affected section of Talbotton Road. The engineer challenged the Department's projections, and upon re-evaluation of the engineer's findings, GDOT lowered the traffic estimates for the area. This allowed for the scale of the road widening plan to be reduced, so that the median could be redesigned as a 12-ft, flush median instead of a 16-ft, raised concrete median; and in some places, the median was eliminated altogether. This new plan minimized the impact of the project on adjacent properties and was presented to and approved by the public in August of 2010.[169] Right-of-way acquisition is now underway, and construction is expected to begin in 2013.[170] Through an extensive public involvement process over the course of 10 years, a project design was developed that was supported by the community, fit within the context of the community, and reduced the impact of the project on historic resources.

## GDOT Projects Under Consideration

Ultimately the CSS approach should be fully integrated into the project development process, but this requires education, new skills, and overcoming internal and external barriers. Based on the case studies and research from other states, the implementation of a new CSS approach will only be successful if implemented gradually. The timeline should be envisioned as a multi-year process. As GDOT moves further along in the full integration of the CSS approach, certain types of projects are especially strong candidates as fully integrated pilot CSS case studies. These projects include high profile or controversial projects, projects with an anticipated lengthy right-of-way or land acquisition process (particularly as part of a congestion mitigation plan), projects with an economic development component that are initiated to reduce the crash frequency and severity of a high crash location, or a congestion mitigation project on a state route.

A project designated as a fully integrated pilot case study should be in the earliest phase possible; ideally, a project should be in the concept development phase or earlier. At this early phase, the public involvement process can be initiated with complete flexibility, prior even to the development of a design concept.

The following two active projects have been identified for analysis by GDOT. Although these projects are beyond the earliest phase of concept development, they meet the other criteria

established for a fully integrated pilot case study. The current project development process implemented for these two projects has been analyzed.

## Active GDOT Projects for Analysis

An effective methodology for establishing a system to document, guide and measure the benefits of the CSS approach on a project has been developed by The National Cooperative Highway Research Program (NCHRP) and published in the previously described NCHRP Report 642, "Quantifying the Benefits of Context Sensitive Solutions." [171] This method includes developing a clearly defined system of Principles, Benefits, and Measurement Tools (metrics) for projects to evaluate whether the CSS approach has been effectively and fully implemented in the development of a completed or on-going project. This methodology can also serve as a framework to guide the course of future or on-going projects to be successful, fully integrated CSS projects. GDOT has provided two projects to be analyzed using the framework, which are consistent with the previously established ideal pilot project criteria. The criteria include projects that meet any of the following conditions: projects that are high profile or controversial, projects with an anticipated lengthy land acquisition process, projects initiated to reduce the crash frequency and severity of a high crash location, or a congestion mitigation project. The methodology has been applied to two projects which meet the criteria to determine the degree of application of the CSS approach to these projects as well as to offer guidelines to improve the process and more fully integrate the CSS approach in these projects as they move forward. The projects include one with an anticipated lengthy land acquisition process and one with an objective to reduce the crash frequency and crash severity at a specific location.

Five Principles have been established in the Context Sensitive Design Manual for Georgia from 2006. Since this is currently the guiding document for GDOT regarding CSS integration, these Principles are used in the methodology. These principles should be reviewed internally by GDOT and further refined by a CSS Advisory Committee as described in previous sections, so they can be tailored to reflect the current specific priorities of the state.

Of the five Principles developed by GDOT, four are closely related to the actual project development process. The fifth Principle, "CSS is a Process," is more closely aligned with the organizational change recommendations and has therefore already been addressed in the Policy

Recommendations section of this document. Therefore, this Principle has been omitted from this Project Development Process analysis framework.

Please note, this framework is intended only as a guide. It is not a rigid standard or checklist. The major advantage of the CSS approach is the flexible and creative problem solving that is required, which results in innovative design solutions.

The following table illustrates the four Principles and associated benefits. The benefits have been drawn from several sources including the GDOT CSD Manual, the research conducted for this report, and some of the benefits identified by the Report 642. The source of the benefit is listed in the Table, along with the Principle that each one is associated with. CSS projects in Georgia will be reviewed through this suggested framework.

**Table 5: GDOT Principles of CSS and their Associated Benefits**

| Associated Benefits | GDOT Principles: Interdisciplinary Teams | Community and Stakeholder Focus | Environmental Sensitivity (natural and built) | Design Flexibility |
|---|---|---|---|---|
| **Benefits described in the GDOT CSD Manual:** | | | | |
| Design process results in the best of all possible alternatives and outcomes | • | • | • | • |
| Community residents can identify local concerns | | • | | |
| Community residents can identify regional issues | | • | | |
| Community residents can identify neighborhood values | | • | | |
| Community can offer guidance on balancing needs of the community and the project | | • | | |
| The effects on important resources can be avoided or minimized | • | • | • | • |
| Existing resources can be enhanced | • | • | • | • |
| Flexibility allows for the unique natural contexts to be incorporated into the design | | | • | • |
| Flexibility allows for the unique social contexts to be incorporated into the design | • | • | • | • |
| Stakeholders and community members can disseminate information about the project to the community | | • | | |
| **Additional Benefits Identified Through Research:** | | | | |
| Multiple perspectives bring all issues to the process from earliest initiation of the project, can avoid later conflicts | • | • | | |
| Avoid conflicts and litigation | • | • | • | • |
| Expedite NEPA document approval process | • | • | • | |
| Constructions and maintenance issues can be addressed early | • | | | |
| Avoid cost and time delay if construction and maintenance personal are engaged | • | | | |

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|---|---|---|---|---|
| Historic resources can be identified and considered | • | • | • | • |
| Community resources can be identified and considered | • | • | • | • |
| Environmental resources can be identified and considered | • | • | • | • |
| Build public trust in DOT over time | | • | | |
| Stakeholders identify design alternative not previously considered | | • | | • |
| Stakeholders agree to unexpected alternatives | | • | | |
| Project can be considered in the system-wide context | • | | | |
| Adjacencies and connections between project and surrounding context can be considered | • | | • | • |
| Existing pedestrian network and gaps can be considered | • | | • | • |
| Right-of-way land acquisition process is expedited, shortening project schedule and reducing project costs | | • | | • |
| Existing bicycle network and relationship to the project – adjacencies, connectivity, and gaps can be considered | • | | • | • |
| **Benefits Identified by NCHRP Report 642:** | | | | |
| Improved long term decisions and investments | • | | | • |
| Increased risk management and liability protection | • | | | • |
| Increased stakeholder/public participation, ownership, and trust | | • | | |
| Decreased costs for overall project delivery | • | • | • | • |
| Decreased time for overall project delivery | • | • | • | • |
| Reduction of crash frequency and severity (for vehicles, pedestrians, and bikes) | • | | | • |
| Improved multi-modal options (including transit) | • | • | • | • |
| Improved community satisfaction | | • | | |
| Improved quality of life for community | • | • | • | • |
| Improved speed management | | | | • |
| Improved opportunities for economic development | • | • | | • |

The following Table shows the previously listed Benefits that are associated with each of the four Principles identified by the CSD Manual. Each benefit has been assigned a measurement tool (metric) that can be used to assess the full integration of the CSS approach into the project development process.

**Table 6: Benefits of CSS and Associated Metrics**

| Benefits described in the GDOT CSD Manual: | Metric: |
|---|---|
| Design process results in the best of all possible alternatives and outcomes | Assessment of opinion externally and internally |
| Community residents can identify local concerns | Number of local concerns identified by stakeholders through a Context Audit |
| Community residents can identify regional issues | Number of regional issues identified by stakeholders |
| Community residents can identify neighborhood values | Number of neighborhood values identified by stakeholders |
| Stakeholders can offer guidance on balancing needs of the community and the project | Number of stakeholder/public responses |
| The effects on important resources can be avoided or minimized | Identify and measure impacts on sensitive land |
| Existing resources can be enhanced | Assessment and incorporation of existing |

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| | resources |
| Flexibility allows for the unique natural contexts to be incorporated into the design | Number of design alternatives which reduce impacts on natural resources, take advantage of topography in alternatives |
| Flexibility allows for the unique social contexts to be incorporated into the design | Number of design alternatives which reduce negative impacts and enhance social resources |
| Stakeholders and community members can disseminate information about the project to the community | Number and types of outreach efforts by the stakeholders to the larger community |
| **Additional Benefits Identified Through Research:** | **Metric:** |
| Multiple perspectives bring all issues to the process from earliest initiation of the project, can avoid later conflicts | Number of disciplines represented on team from initiation of the project, number of individuals from resource agencies represented on team |
| Avoid conflicts and litigation | Historic comparison of conflicts and litigation for projects with a CSS approach as compared to a traditional project |
| Expedite NEPA document approval process | Number of months required for NEPA approval and number of comments as compared to a traditional project |
| Constructions and maintenance issues can be addressed early if construction and maintenance personal are engaged, which can avoid cost and time delay | Number and cost of change orders/scope changes, number of revisions resulting from the Constructability Review |
| Historic resources can be identified and considered | Number of historic resources identified and considered |
| Community resources can be identified and considered | Number of community resources identified and considered, number of individuals from local government represented on team |
| Environmental resources can be identified and considered | Number of sensitive environmental resources identified and considered, including number and acres of wetland impacted by the design, number and length of stream impacted by the design, number of threatened and endangered species impacted by the design |
| Build public trust in DOT over time | Assessment of opinion externally and internally to gauge level of trust for the DOT |
| Stakeholders identify design alternative not previously considered | Number of alternatives considered that are generated by stakeholders |
| Stakeholders agree to unexpected alternatives | Assessment of opinion externally and internally to determine whether stakeholders agreed to any unexpected alternatives |
| Project can be considered in the system-wide context | Identify diversity of land use type adjacent to the project, number of schools adjacent to the project, number of community facilities adjacent to the project |
| Adjacencies and connections between project and surrounding context can be considered | Identify adjacencies and connections between project and surrounding |

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|---|---|
| | context, evaluate new and/or expanded modal choices, modal connectivity (count/volume) |
| Existing pedestrian network and gaps can be considered | Identify existing pedestrian network to identify gaps and new modal connectivity (count/volume), number of modes represented and considered for the design |
| Existing bicycle network and relationship to the project – adjacencies, connectivity, and gaps can be considered | Identify existing bicycle network and relationship to the project – evaluate new and/or expanded connectivity and modal choices (count/volume) |
| Right-of-way (ROW) land acquisition process is expedited, shortening project schedule and reducing project costs | Length of typical ROW acquisition process as compared to ROW process for a CSS project |
| **Benefits Identified by NCHRP Report 642:** | **Metric:** |
| Improved long term decisions and investments | Survey to assess opinion to gauge improvement of long term decisions and investments |
| Increased risk management and liability protection | Number and cost of legal action taken against the project |
| Increased stakeholder/public participation, ownership, and trust | Measure stakeholder sentiment through surveys, assign score ranking satisfaction to measure stakeholder/public participation, ownership, and trust |
| Decreased costs for overall project delivery | Decreased dollar cost amount for project delivery estimated/actual |
| Decreased time for overall project delivery | Number of months by project phase and total duration compared to traditional project |
| Reduction of crash frequency and severity (for vehicles, pedestrians, and bikes) | Change in crashes, crash rate, and severity |
| Improved multi-modal options (including transit) | New and/or expanded modal choices, modal connectivity (count/volume), modal reduction of crash frequency and severity |
| Improved community satisfaction | Measure stakeholder sentiment through surveys, assign score ranking satisfaction |
| Improved quality of life for community | Survey assessment of opinion to determine perception of quality of life. |
| Improved speed management | Operating speed (expected/actual) |
| Improved opportunities for economic development | Measure tax revenue |

Finally, these metrics have been applied to the two projects provided by GDOT to determine the level of integration of the CSS approach for each project.

## Project 1: Lengthy ROW Acquisition Process is Anticipated

**SR 61 FM S of CR 467/Dallas Nebo Road to SR 6/Dallas Bypass**

**Project location:** SR 61 from SR 120 Connector/Hiram Sudie Rd to US 278/SR 120/SR 6/Dallas Bypass in Paulding County

**Project description:**

As described by GDOT's Transportation Project Information website, "Project No.STP-018-1(59) consists of widening and reconstruction of SR61 from CR 467/Dallas Nebo Road to US 278/SR 120/SR 6/Dallas Bypass in Paulding County. The existing roadway is a 2-lane/3-lane section with 12ft lanes and 4ft grassed shoulders. The proposed typical section is a 4-lane section with 12 ft. lanes, 10 ft. outside shoulders with 4 ft. paved, and a 20 ft. raised median. The double 5' X 5' culvert at Mill Creek and the two single 4' X 4' box culverts are to be extended. The project is 4.1 miles long. The existing bridge structure over the Silver Comet Trail will be widened from 38ft to 92ft. Right of way would vary to approximately 200 ft."[172]

**County:** Paulding

**Project Type:** Reconstruction/Rehabilitation

**Project Status:** Construction Work Program

**Need and Purpose:** According to the Revised Project Concept Report provided by GDOT, "Project NH-018-1(59) provides additional capacity required for future growth in the area as SR 61 is the only continuous north-south corridor in Paulding County linking Dallas to both Cartersville (north) and I-20 (south). The purpose of this widening project is to ease traffic congestion and increase safety along this busy stretch of roadway."

## Project 2: Reduce the Crash Frequency and Severity of a High Crash Location

**SR 316/US 29 @ SR 81**

**Project location:** SR 316 at the intersection of SR 81 in Barrow County

**Project description:**

As described by GDOT's Transportation Project Information website, "This project is for the grade separation of the existing at-grade signalized intersection of SR 316 at SR 81. The proposed grade separation will include provision for a full diamond urban interchange providing access to and from SR 316 to the cross road SR 81. The interchange will be designed to accommodate the future widening of SR 316 from existing two general-use lanes in each direction to three lanes in each direction including a barrier separated HOV lane in each direction."[173]

**County:** Barrow

**Project Type:** New Construction

**Project Status:** Construction Work Program

**Need and Purpose:** As described in the Need and Purpose Statement prepared by the Parsons Transportation Group for GDOT, "The project need is for safety and operational improvements to

intersection of SR 316 @ SR 81. This is based on analysis of crash data for year 2006 through year 2008 and base year (2012) and design year (2032) evaluation of traffic. The purpose of this project is to reduce crash frequency and severity, and improve traffic operations by grade separating the intersection 316 and SR 81. This project will also support the state and regional economic goals by improving safety and traffic operations."[174]

The metrics are applied to each project below. The metrics are organized according to the primary Principle that they are associated with, along with the description of the Principle as provided by the GDOT CSD Manual:[175]

## Principle #1 –Interdisciplinary Teams

Description from the CSD Manual: "It is important to consider and create an interdisciplinary approach to project development and decision –making."

**Table 7: GDOT Principle 1 Metrics applied to Projects 1 & 2**

### GDOT Principle 1 – Interdisciplinary Teams

| Metric | Applied to Project 1: SR 61 | Applied to Project 2: SR 316 |
|---|---|---|
| Assessment of opinion externally and internally | Follow up with stakeholders who attended public meetings, measure their satisfaction with the process, assign a score to satisfaction levels. Survey project team to assess the satisfaction of the team internally. | |
| Number of disciplines represented on team from initiation of the project, number of individuals from resource agencies represented on team | Disciplines and specialized skills were utilized from the initiation of the project: these individuals included the Public Involvement Coordinator, NEPA Analyst, and other DOT representatives. | For the CE document, the project was evaluated by an interagency group which included FHWA, EPA, EPD, and the MPO. |
| Number of months required for NEPA approval and number of comments as compared to a traditional project | If NEPA approval is required, document for future comparison. | Document for future comparison. |
| Number and cost of change orders/scope changes, number of revisions resulting from the Constructability Review | A Constructability Review meeting was held on October 23, 2008 – review results to analyze number and cost of changes. Compare with future projects over time. | A Constructability Review has not been conducted yet, because construction funding is long range. Once Constructability Review is conducted, document results for future comparisons. |
| Survey to assess opinion to gauge improvement of long term decisions and investments | None completed. | |

## Principle #2 –Community and Stakeholder Focus

Description from the CSD Manual: "CSS requires an early and continuous commitment to public involvement"

**Table 8: GDOT Principle 2 Metrics applied to Projects 1 & 2**

## GDOT Principle 2 – Community and Stakeholder Focus

| Metric | Applied to Project 1: SR 61 | Applied to Project 2: SR 316 |
|---|---|---|
| Number of local concerns identified by stakeholders through a Context Audit | It appears that the public meeting included "displays of the proposed project," and stakeholders were given an opportunity to comment on the proposal. It does not appear that the stakeholders actively participated in developing the proposals or conducted a Context Audit with DOT personnel. | The Categorical Exclusion (CE) document states, "A Public Information Open House (PIOH) is not required. However, a PIOH will be held prior to the construction of the project."<br><br>It appears that the public meeting included "displays of the proposed project," and stakeholders were given an opportunity to comment on the proposal. It does not appear that the stakeholders actively participated in developing the proposals or conducted a Context Audit with DOT personnel. The comments from the public were overwhelmingly in favor of the project. However, one individual did state that the DOT had already made the decisions without public input. |
| Number of regional issues identified by stakeholders | The project is in compliance with the 2025 Regional Transportation Plan (RTP) generated by the Atlanta Regional Commission (ARC). | |
| Number of neighborhood values identified by stakeholders | Not collected. | |
| Number of stakeholder/public responses | A project information open house comment card was distributed, unclear how the responses were tabulated or incorporated into the design. | |
| Historic comparison of conflicts and litigation for projects with a CSS approach as compared to a traditional project | No litigation appears to be associated with either project. | |
| Assessment of opinion externally and internally to gauge level of trust for the DOT | Follow-up with stakeholders who attended Public Information Open House, collect survey to measure level of trust. Incorporate this information in future Comment Cards to be distributed to stakeholders so this information can be consistently collected. | |
| Number of alternatives considered that are generated by stakeholders | Appears to be none. | |
| Assessment of opinion externally and internally to determine whether stakeholders agreed to any | Appears that alternatives were developed internally then shared with the stakeholders and public. | |

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| unexpected alternatives | |
| Length of typical ROW acquisition process as compared to ROW process for a CSS project | Unclear how the ROW acquisition process has been initiated or is progressing for this project. |
| Number and cost of legal action taken against the project | No litigation appears to be associated with either project. |
| Measure stakeholder sentiment through surveys, assign score ranking satisfaction to measure stakeholder/public participation, ownership, and trust | Follow-up with stakeholders who attended Public Information Open House, collect survey to measure level of trust. Incorporate this information in future Comment Cards to be distributed to stakeholders. Establish trends over time. |
| Measure stakeholder sentiment through surveys, assign score ranking satisfaction | Not collected. |
| Survey assessment of opinion to determine perception of quality of life. | Not collected. |

## Principle #3 – Environmental Sensitivity in Design

Description from the CSD Manual: "understand the natural and built environment, since the roadway is part of the landscape, and understand the existing valued resources within the landscape."

**Table 9: GDOT Principle 3 Metrics applied to Projects 1 & 2**

### GDOT Principle 3 – Environmental Sensitivity in Design

| Metric | Applied to Project 1: SR 61 | Applied to Project 2: SR 316 |
|---|---|---|
| Identify and measure impacts on sensitive land | Evaluate environmental impacts and fully incorporate into the design. | The Categorical Exclusion (CE) document includes an Effects Evaluation form which itemizes social environment, cultural environment, natural environment, and physical environment. It does not appear that this inventory was completed with input from the public. Fully incorporate into the design alternatives. |
| Number of design alternatives which reduce impacts on natural resources, take advantage of topography in alternatives | Alternatives were considered based on revised traffic forecasts, not on context driven impacts. | The CE document identifies that 71 linear feet of a stream will be affected by the project. The project will include an addition to the existing box culvert. According to the CE document, efforts were made to minimize impacts to this stream. |
| Number of design alternatives | None. | The Categorical Exclusion |

| | | |
|---|---|---|
| which reduce negative impacts and enhance social resources | | (CE) document includes an Effects Evaluation form which itemizes the social environment. It does not appear that this inventory was completed with input from the public. |
| Number and types of outreach efforts facilitated by the community | None. | |
| Number of historic resources identified and considered | Allow the public an opportunity to provide input for this inventory. Protect sensitive data. | The Categorical Exclusion (CE) document includes an Effects Evaluation form which itemizes the cultural resources, including historic and archeological. Allow the public an opportunity to provide input for this inventory. Protect sensitive data. |
| Number of community resources identified and considered | No documentation of community resources inventory, unclear how incorporated into the design. | The Categorical Exclusion (CE) document includes an Effects Evaluation form which itemizes the social and cultural environment. It does not appear that this inventory was completed with input from the public. This form does not include schools, or integrating alternative modes of transportation into the system. |
| Number of sensitive environmental resources identified and considered, including number and acres of wetland impacted by the design, number and length of stream impacted by the design, number of threatened and endangered species impacted by the design | Allow the public an opportunity to provide input for this inventory. Protect sensitive data. | The CE document identifies that 71 linear feet of an adjacent stream will be affected by the project. The project will include an addition to the existing box culvert. According to the CE document, efforts were made to minimize impacts to this stream. GDOT has identified a barn swallow nest in the culvert located on the project. Construction will be coordinated so as to not impact the nest. Allow the public an opportunity to provide input for this inventory. Protect sensitive data. |
| Identify diversity of land use type adjacent to the project, number of schools adjacent to the project, number of community facilities adjacent to the project | No documentation of adjacent land use inventory, community facilities or schools - unclear how incorporated into the design. | Effects Evaluation includes a section on Land Use changes in compliance with the GDOT Environmental Procedures Manual. The information is presented fairly generally. It |

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|---|---|---|
| | | does not appear to be fully integrated into the proposed alternatives. The adjacent land uses do not appear to be illustrated graphically. Specific community facilities do not appear to have been documented or considered in the design alternatives. The project will impact approximately 25 acres of farmland and undeveloped land (project site only). |

## Principle #4 –Design Flexibility in Reaching Solutions

Description from the CSD Manual: "ensure flexibility in roadway design standards where it is feasible."

**Table 10: GDOT Principle 4 Metrics applied to Projects 1 & 2**

### GDOT Principle 4 –Design Flexibility in Reaching Solutions

| Metric | Applied to Project 1: SR 61 | Applied to Project 2: SR 316 |
|---|---|---|
| Assessment and incorporation of existing resources | Allow the public an opportunity to provide input for this inventory. Protect sensitive data. | According to Need and Purpose, "no eligible historic or archaeological resources were identified as part of the cultural resources investigation of the project area." |
| Identify adjacencies and connections between project and surrounding context, evaluate new and/or expanded modal choices, modal connectivity (count/volume) | No alternative modes appear to have been considered, adjacencies and connections do not appear to have been considered. | No alternative modes appear to have been considered, adjacencies and connections do not appear to have been considered. The project does include the accommodation of a future planned HOV lane on SR 316. |
| Identify existing pedestrian network to identify gaps and new modal connectivity (count/volume), number of modes represented and considered for the design | No alternative modes appear to have been considered, adjacencies and connections do not appear to have been considered. | |
| Identify existing bicycle network and relationship to the project – evaluate new and/or expanded connectivity and modal choices (count/volume) | No alternative modes appear to have been considered, adjacencies and connections do not appear to have been considered. | |
| Decreased dollar cost amount for project delivery estimated/actual | Estimated construction costs: $31,595,000.00<br>Monitor in future. | Estimated construction costs: $15,820,476.00<br>Monitor in future. |
| Number of months by project | Estimated construction time: 30 | Long-range project, has yet |

| | | |
|---|---|---|
| phase and total duration compared to traditional project | months. Monitor in future. | TBD. Monitor in future. |
| Change in crashes, crash rate, and severity | Monitor changes in the future. Review over time. | |
| New and/or expanded modal choices, modal connectivity (count/volume), modal reduction of crash frequency and severity | Not collected/unclear how incorporated into the design. | |
| Operating speed (expected/actual) | Posted/design speed for this project: 45 mph | Posted/design speed for SR 316: 65 mph/65 mph<br>Posted/design speed for SR 81: 45-55 mph/55 mph<br>Posted/design speed for SR |
| Measure tax revenue changes | Establish baseline, measure over time to determine economic impacts of the project. | |

## Project 1: SR 61 Recommendations

### Principle #1 - Interdisciplinary Teams

Description from the CSD Manual: "Consider and create an interdisciplinary approach to project development and decision making."

**Recommendations based on current project status and materials provided by GDOT:**

1. Involve the multi-disciplinary team members in the identification of project stakeholders.
2. Include other disciplines in the public meeting process.
3. Include a representative from construction and maintenance early in the design process. This individual can provide information to the stakeholders related to the feasibility of various alternatives.

### Principle #2 –Community and Stakeholder Focus

Description from the CSD Manual: "CSS requires an early and continuous commitment to public involvement"

**Recommendations based on current project status and materials provided by GDOT:**

1. Public Information Open House Comment Card was distributed with a letter introducing the project. A stakeholder satisfaction survey was distributed, though it is unclear at what intervals this survey was circulated. Survey should target different stakeholders at different points throughout the project development process. Stakeholder satisfaction should be assigned a numerical score, and an average should be calculated. These scores should be tracked and can be compared across projects over time.
2. Actively involve stakeholders earlier.
3. Proactively approach those property owners of parcels affected by ROW acquisition process as early as possible in the process.
4. Consider the location of the Silver Comet Trail in the design. This is a major regional bicycle route; engage the cycling community as stakeholders to determine the opportunities and needs that could be considered in association with the project.

5. Consider Paulding County High School which is located along the project corridor. Coordinate with the State Safe Routes to School State program to review potential routes to Paulding High School that might include crossing SR 61. Incorporate school access via multiple modes into the design.

### Principle #3 – Environmental Sensitivity in Design

Description from the CSD Manual: "understand the natural and built environment, since the roadway is part of the landscape, and understand the existing valued resources within the landscape"

**Recommendations based on current project status and materials provided by GDOT:**

1. Create an inventory of the natural and built environment. Allow the public an opportunity to contribute to this inventory. Provide this opportunity as early in the alternatives development process as possible, while still protecting sensitive environmental data

2. Consider the larger context. Seamlessly integrate the project into the surrounding to creatively enhance the surrounding resources.

3. Review the location of adjacent community resources such as Paulding County High School and incorporate into the design.

4. Consider how the road improvements can contribute to a regional system of multiple modes of travel.

### Principle #4 –Design Flexibility in Reaching Solutions

Description from the CSD Manual: "ensure flexibility in roadway design standards where it is feasible"

**Recommendations based on current project status and materials provided by GDOT:**

1. Use flexibility in decisions to incorporate context into the design.

2. Include opportunities for multiple modes into the design.

3. Integrate natural and cultural resources.

## Project 2: SR 316 Recommendations

### Principle #1 - Interdisciplinary Teams

Description from the CSD Manual: "consider and create an interdisciplinary approach to project development and decision making"

**Recommendations based on current project status and materials provided by GDOT:**

1. Project team should meet regularly and include local government representatives and team members with expertise in environmental issues, among others. Continue to strengthen coordination efforts to streamline the environmental review process.

2. Construction and maintenance individuals should be represented on the project team.

### Principle #2 –Community and Stakeholder Focus

Description from the CSD Manual: "CSS requires an early and continuous commitment to public involvement"

**Recommendations based on current project status and materials provided by GDOT:**

1. One stakeholder asked that "proposals be available online prior to the public meeting." This comment indicates that the public was not engaged in the development of the alternatives, and became engaged with it only after the alternative was selected and presented. Engage the public in the development of alternatives. Make the alternatives available to the public and to stakeholders prior to the meeting.

2. Appears from the public comments that the owners of the parcels directly impacted by the project did not receive individual notices of the public meeting. Proactively engage those directly affected by the project in the alternatives development process.

3. Appears that the primary methods used to advertise the meeting included radio, newspaper, signs, and word of mouth. Other methods to target stakeholders would be through email to general stakeholders. The stakeholder groups identified in the CSD Manual should be directly targeted.

4. Appears that only one Public Information Open House (PIOH) was held. Include the stakeholders and the public in the process prior to this project phase.

5. ROW acquisition costs are determined by acreage. The number of property owners to be contacted is not shown on acreage calculation. On the project Fact Sheet from February 4, 2010, it is stated that 12 parcels are affected. The efforts and outreach undertaken to contact and engage the 12 property owners should be extensive and documented. This information can be used in the future to measure the cost saving opportunities for future outreach efforts. Over time, targeted methods for property owner outreach can be developed. These methods could result in individuals pro-actively selling ROW to DOT, which saves the Department money.

## Principle #3 – Environmental Sensitivity in Design

Description from the CSD Manual: "understand the natural and built environment, since the roadway is part of the landscape, and understand the existing valued resources within the landscape"

**Recommendations based on current project status and materials provided by GDOT:**

1. According to the statement of Need and Purpose, the primary land use along the 316 corridor is commercial/industrial. There are also single-family residential homes and mobile homes along the corridor. The development of this intersection as described in the selected Preferred Alternative will encourage the development and conversion of greenfield land to low-density sprawl type development. This consequence of the intersection improvement should be considered. The opportunity presented by this type of transportation project to influence surrounding development should not be underestimated. Consider the impact of this project on the historic town center of Winder. Instead of drawing development to the 316 interchange, this project should help foster a system of deliberate compact development nodes, which preserves existing agricultural and greenfield areas.

2. According to the statement of Need and Purpose, "no eligible historic or archaeological resources were identified as part of the cultural resource investigation of the project area." The project and alternatives should be considered in terms of a cultural resource investigation of the project within the larger system, i.e. within the overall network of the area that the project could indirectly impact.

3. The CE document states that approximately 25 acres of farmland and undeveloped land will be displaced by this project. However, the project should be considered in the larger context, in that the increased capacity provided by this project (although not the project's primary goal) will place development pressure on farmland and undeveloped land in close proximity to this project. The impacts of the project should be managed so that the development can be encouraged in the most desirable locations while preserving undeveloped agricultural land.

4. The CE document indicates the occurrence of two protected species in Barrow County. The document further states that the individual project location will result in "no effect" on the Bald Eagle as there are no nests located within one mile of the project. The report also documents that the Pink Ladyslipper plant is located in Barrow County. However, when the project impacts are considered more holistically, the increased road capacity will place development pressure on adjacent land, which will reduce habitat for this threatened species as well. Consider the larger impacts of the project on the surrounding context.

### Principle #4 –Design Flexibility in Reaching Solutions

Description from the CSD Manual: "ensure flexibility in roadway design standards where it is feasible"

**Recommendations based on current project status and materials provided by GDOT:**

1. According to the Capacity Analysis shown in the Need and Purpose statement, in the design year (2032), the intersection will be operating at Level of Service (LOS) F. The Need and Purpose statement capacity analysis further shows that the LOS for the eastbound ramp of the intersection will drop to F in 2017, soon after the opening of the project. The LOS for the westbound ramp of the intersection will drop to F in 2019, six years after the opening of the project. Therefore, although this project will reduce the frequency and severity of crashes located at this intersection (which is the primary goal of the project), as well as decrease traffic congestion in the short term, ultimately none of the alternatives can solve the long-term problem of traffic congestion. The long-term traffic congestion problem is caused by a continuously increasing volume of vehicles. These levels of traffic congestion will ultimately have a negative impact on the economic development goals of the state and region.

   This project should consider ROW acquisition and other measures which allow for alternative modes of future travel in order to prepare to build these alternatives incrementally. An incremental preparation for future alternative infrastructure modes within the existing roadway network system is absolutely essential for the future economic success of the region.

## 5.4 Promotion of CSS by Atlanta Regional Commission (ARC)

While GDOT is the primary agency that has adopted CSS, other organizations are following suit. ARC included a CSS subcommittee in its Envision 6 regional transportation plan. The subcommittee produced "Context Sensitive Solutions: A Report on Planning Trends for the Atlanta Region." This report is based on their investigation of "new strategies to engage the Georgia Department of Transportation (GDOT) and local governments to focus on cost effective CSS for all transportation improvements, as well as review the use of design variances and

exceptions."[176] The report contains information pertaining to CSS processes and resources available at the national level. It also evaluates the status of existing CSS practices in Georgia and how applicable they are to the Atlanta region. The subcommittee also conducted a survey of state and local utilization of CSS. The following summary of the survey's results were synthesized for the report:[177]

## Transportation Projects and CSS

According to the Atlanta Regional Commission's 2007 Land Use Coordinating Committee report, Context Sensitive Solutions: A Report on Planning Trends for the Atlanta Region, the following CSS related statistics were true:

- "About 73% of respondents have used the GDOT Pedestrian & Streetscape Guide. Only 29% have referenced GDOT's CSD On-Line Manual.
- The dominant features of CSS projects included wider sidewalks, landscaping and pedestrian lighting, and enhanced crossings. 84% of projects include a unique or high quality design element to improve visual aesthetics.
- Almost 50% of CSS projects are on city roads, 30% on state routes, and 15% on county roads. However, cities maintain most of those roads.
- Primary implementation issues included financial constraints and ROW constraints. Utilities and AASHTO/GDOT design standards were also identified as significant barriers.
- These issues were generally resolved through meetings with stakeholders or GDOT. About 53% required scope changes.
- About 50% of projects required design variances, primarily for narrowed travel lanes. This process took 6-12 months. Scope changes were not generally required to obtain the variances."[178]

## Land Use Policy and CSS

- "Approximately 78% of respondents have codes that support CSS. The majority of these codes were updated in the last 5 years to incorporate CSS.
- 71% of recipients completed a study to develop new regulations.
- 86% used their zoning ordinance to enforce CSS concepts. Local governments also incorporated CSS as part of Comprehensive Plans and in overlay districts.
- Incentives are rarely used to encourage developers to support CSS concepts."[179]

Based on the report's overall finding, the following recommendations were determined a priority in relation to applying CSS to the Atlanta region in a cost effective manner:

- "Identify what CSS-related documents have been used as guidance and what has been formally adopted as policy.
- Complete a pilot study that identifies corridors in the Atlanta region, and compares functionality, the use of traffic calming elements and accident data of pedestrian-oriented cross-sections versus automobile-oriented cross-sections.

- Identify a simplified process for defining realistic projects. Determine a method to make guidelines and polices more accessible. Research national examples that use design thresholds or models to determine acceptable elements and standards that must be met. Research other Plan Development Process (PDP) manuals and their impacts on CSS project implementation.
- Establish methods to improve the environmental approval process for CSS projects. This can include identifying examples supporting the statement mentioned on contextsensitivesolutions.org that CSS streamlines the NEPA and PDP, and evaluate potential application and impacts of FHWA's streamlining and stewardship goals under SAFETEA-LU and FHWA's Negotiated Timeframes Wizard software.
- Expand the committee to include representatives from key decision-making agencies such as GDOT, GRTA, and FHWA, as well as representatives from the Transportation Coordinating Committee (TCC). Continue committee meetings as necessary to assist with implementation and to monitor progress."[180]

# 6. Conclusions

In the United States, CSS has emerged as a strategy for expanding and incorporating community preferences and environmental considerations into project development and design. Simultaneously, increasing attention has focused on the reduction of crash frequency and severity as a key component in the transportation planning and engineering process. These concepts have continued to be high priorities and have increasingly been adopted by transportation planning agencies. Not surprisingly, both concepts generate considerable discussion. A primary challenge is to better understand and evaluate the extent to which these two approaches may be mutually beneficial in project development.

To date the most commonly accepted definition of CSS is "a collaborative, interdisciplinary approach that involves all stakeholders in providing a transportation facility that fits its setting. It is an approach that leads to preserving and enhancing scenic, aesthetic, historic, community, and environmental resources, while improving or maintaining safety, mobility, and infrastructure conditions."[181] Accomplishing a successful CSS project requires efforts to "include effective decision making and implementation, outcomes that reflect community values and are sensitive to environmental resources, and ultimately, project solutions that are safe and financially feasible."[182]

While CSS strategies have been pursued by many state DOTs, concerns about the effectiveness of CSS as an approach to highway, road and street design remain. These concerns about reduction of crash frequency and severity, liability risk, higher costs, and the primarily aesthetic focus of CSS have proven to be barriers to the implementation of CSS outcomes. In many cases, these concerns are more perception than reality and research addressing these barriers continues. Recent State pilot efforts around the country combined with more targeted research efforts and case studies suggest that CSS, when utilized from project onset as an overall approach to transportation planning, can meet and at times exceed stakeholders' and designers' expectations. These efforts also suggest that a CSS approach can reduce costs,

increase safety, improve on-time delivery, and build stronger community relationships and broader funding options.

Recent research being conducted around the country has led to the discovery and development of approaches to quantifying and measuring the benefits of CSS. Transportation agencies are often interested in increasing safety, mobility, access and economic development in a financially feasible and fiscally responsible manner. Moreover, most agencies use CSS primarily to decrease project costs and delivery time. While extensive work has been done on identifying CSS principles, few efforts have been made to measure each principle's impacts on the goals of reducing time and cost. However, as shown in the comprehensive review of the CSS approach provided in this report, CSS's focus on functionality, innovation and empowered decision-making has yielded economic benefits in numerous CSS projects. This research can also provide GDOT with guidance in furthering the integration of the CSS approach in the project development process and policies.

The principles of Safety Conscious Planning (SCP) and Value Engineering (VE) discussed in this review have significant overlap with the principles of CSS. While conflict exists between context-specificity, safety, and value, this conflict appears to be unnecessary. The principles of these three approaches can be utilized together to promote transportation systems, planning and projects that are safe, reflect community values and are economically efficient and feasible. The integration of these principles has recently led to unique approaches by some states that are referred to as Practical Design or Practical Solutions.

Practical design/practical solution approaches are based on developing an efficient solution by focusing on specific, performance-based project needs from the beginning rather than stripping down components of a traditional design. Practical design/practical solution approaches follow many of the same principles as CSS, but decisions are guided more by fiscal and budgetary constraints, emphasizing cost reduction while still delivering focused benefits. The point of these approaches is to design and construct just what is necessary to meet the specific transportation need in a cost-efficient and safe manner. Applying this framework has been shown to not only improve specific project outcomes, but also allow for a more system-wide distribution

of limited funds and resources leading to an improvement of the total transportation system such as better facility condition and transportation project cost savings.

The literature and case studies reviewed in this report show that transportation projects can be delivered in a cost-effective and context-appropriate manner in a constrained fiscal environment. When combined with CSS principles, a practical design/practical solution approach can be a “middle-way” method for DOTs that are interested in pursuing CSS principles but find themselves in a constrained fiscal or budgetary environment.

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