UPDATED CAPACITY RESEARCH PLAN
STRATEGIC HIGHWAY RESEARCH PROGRAM (SHRP 2)
Providing Highway Capacity in Support of the Nation's Economic, Environmental, and Social Goals
December 2009

The overall SHRP 2 Capacity program goal as stated in *TRB Special Report 260* is:

> To develop approaches and tools for systematically integrating environmental, economic, and community requirements into the analysis, planning, and design of new highway capacity.

The scope of the Capacity program, as defined by the SHRP 2 Oversight Committee, extends from the early stages of the transportation planning process when many potential alternatives are being considered through project development. When decisions include a major highway component, further development of the highway option is within the scope. When decisions are made that lead to non-highway options, further development of the non-highway component is outside the scope.

The Capacity Technical Coordinating Committee revised the Capacity Research Plan at its October 2008 meeting and the SHRP 2 Oversight Committee approved it in November 2008. The original $18 million plan was increased to $21.5 million by the Oversight Committee. The increase was made possible by a technical correction to SAFETEA-LU. Five new projects were added (C18, C19, C 20, C21, C22) and three projects from the 2008 plan were deferred indefinitely. [1] The revised 2009 Plan consists of 20 projects as shown in Exhibit 1; the schedule is shown in Exhibit 2 at the end of the document.

One of the major products of SHRP 2 Capacity will be a new Collaborative Decision-Making Framework for additions to highway capacity. The framework will be built around key decision points in the core processes of delivering new capacity:

- Systems planning
- Pre-program studies (e.g., corridor planning)
- Programming
- Environmental review
- Design
- Permitting

The framework will also encompass sub-processes such as air quality conformity and influencing processes such as conservation planning and emerging greenhouse gas emissions analysis. The purpose of the framework is to achieve the SHRP 2 Capacity goal of integrating mobility, economic, environmental, and community needs into the planning and design of new highway capacity.

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[1] C13. Integrating Full Cost Analysis and Fiscal Impact Analysis into Collaborative Decision Making
C14. Developing a Multiagency Change Management Framework
C17. (contingency project) Sustaining Public Support for Transportation Investments

	TABLE 1: REVISED CAPACITY PROJECTS, August, 2009	Budget millions	RFP Date	Annual. Funds
	2006 Funding			$3.425
C01	A Framework for Collaborative Decision Making on Additions to Highway Capacity (Includes concepts of watershed and habitat preservation and environmental stewardship)	2.60	A	
C02	Systems-Based Performance Measurement Framework for Highway Capacity Decision Making.	$0.825	A	
	2007 Funding			$3.75
C03	Interactions between Transportation Capacity, Economic Systems, and Land Use merged with Integrating Economic Considerations n Project Development	$2.150**	J	
C04	Improving Our Understanding of Highway Users and the Factors Affecting Travel Demand (Emphasis on pricing and congestion)	$1.00	M	
C05	Understanding the Contribution of Operations, Technology, and Design to Meeting Highway Capacity Needs	$1.00	J	
	2008 Funding			$4.75
C06A	Integration of Conservation, Highway Planning, and Environmental Permitting Using an Outcome-based Ecosystem Approach	$0.70	M	
C06B	Development of an Ecological Assessment Process and Credits System for Enhancements to Highway Capacity	$0.80	M	
C07	Integrating SHRP 2 Products into the Collaborative Decision making Process	$1.65 *	M	
C08	Linking C ommunity Visions and Highway Capacity Planning	$0.80	J	
C09	Incorporating Greenhouse Gas Emissions Into the Collaborative Decision-Making Process	$0.80	J	
	2009 Funding			**$6.10**
C10	Partnership to Develop an Integrated Advanced Travel Demand Model and a Fine-Grained, Time-Sensitive Network.	$4.00	M	-
C18	Pilot Test the Collaborative Decision-Making Framework with Three DOTS, Including a Self-Assessment Method	$1.25	J***	
C19	Add Expedited-Schedule Case Studies to the Collaborative-Decision Making Framework Data Base	$0.30	M	
C20	Freight Demand Modeling and Data Improvement Strategic Plan	$0.55	M	
	2010 Funding			**$3.475**
C11	Development of Improved Economic Analysis Tools.	$0.60**	M	
C12	The Effect of Public-Private Partnerships and Non-Traditional Procurement Processes on Highway Planning, Environmental Review, and Collaborative Decision Making	$0.30	M	
C15	Integrating Freight Considerations into Collaborative Decision Making for Additions to Highway Capacity	$0.30	M	
C16	The Effect of Smart Growth Policies on Travel Demand	$0.425	J	
C21	Pilot Test the C06A&B Ecological Approach to Environmental Protection	$1.25	J	
C22	Prepare a Decision-Makers Guide to the Collaborative Decision-Making Framework (Includes resource agency decision makers)	$0.20	J	
	Total			**$21.50**

* Includes $250,000 committed by the oversight Committee from the Reliability budget to incorporate the results of Reliability Project L05 into the Collaborative Decision Making Framework for Additions to Highway Capacity being developed in C01/C07.

** The Project C03 budget includes $400,000 in 2010 funding moved to C03 from C11 by the Oversight Committee in June 2009. Additional case studies will be conducted under C03 in 2010. An RFP for C11 will be issued in March 2010.

*** Delayed by the Oversight Committee until March 2010 to allow time for the first edition of the Collaborative Decision Making web tool to be released.

Ten Capacity projects are primarily devoted to elements of the Collaborative Decision Making Framework. Project C01 is based on case studies which will be used to develop the basic framework. Other projects will add economic, environmental, visioning, and freight components of collaborative decision making. Project C07 will extend for the life of SHRP 2 for the purpose of integrating all Capacity project results into the useable, web-based, tool with a strong front-end user interface. The projects in this group develop various elements of the framework:

- C01: A Framework for Collaborative Decision Making (CDMF) on Additions to Highway Capacity
- C02: Systems-Based Performance Measurement Framework For Highway Capacity Decision making
- C03: Interactions between Transportation Capacity, Economic Systems, and Land use and Integrating Economic Considerations in Project Development
- C06A: Integration of Conservation, Highway Planning, and Environmental Permitting Through an Outcome-Based, Ecosystems Approach
- C06B: Development of an Ecological Assessment Process and Credits System for Enhancements to Highway Capacity
- C07: Integrating SHRP 2 Products into the CDMF
- C08: Linking Community Visions and Capacity Planning
- C09: Incorporating Greenhouse Gas Emissions into the CDMF
- C12: The Effect of Public-Private Partnerships and Design-build Procurements on Highway Planning, Environmental Review, and Collaborative Decision Making
- C15 Integrating Freight Considerations into the CDMF

Six projects are primarily devoted to improvements in methods. The major methods areas addressed are integrating activity-based demand modeling with a fine grained, time sensitive network through a partnership with an urban area or state; improved and more transparent estimation of the economic impacts of highway investments; understanding the fundamentals of how motorists react to highway congestion and pricing; the effect of smart growth policies on travel demand; and better allocation of all costs to the bearer of those costs. All of these methods address providing better answers to questions that the public and decision makers raise during the decision making process for adding highway

capacity. The results of these projects will be incorporated into the travel demand forecasting process, and improved sub-processes of the collaborative decision making framework.

- C04: Improving our Understanding of How Highway Congestion and Pricing Affect Travel Demand
- C05: Understanding the Contribution of Operations, Technology, and Design to Meeting Highway Capacity Needs
- C10: Partnership to Develop an Integrated, Advanced Travel Demand Model and a Fine Grained, Time Sensitive Network
- C11 Development of Improved Economic Analysis Tools Based on recommendations from Project C03
- C16: The Effect of Smart Growth Policies on Travel Demand
- C20: Freight Demand Modeling and Data Improvement Strategic Plan

Four projects added in November 2008 involve strengthening the collaborative decision making framework product and pilot testing results. Additional case studies will be collected that capture techniques for meeting expedited project schedules, and a decision-maker's view will be added to the final Capacity product. The Collaborative Decision-Making Framework was conceived as a practitioner's tool, but as it developed, the need for a view from the top became apparent.

- C18: Pilot Test the Collaborative Decision–Making Framework at three Sites Including a Self Assessment Method
- C19: Add Expedited-Schedule Case Studies to the Collaborative Decision-Making Framework Data Base
- C21: Pilot Test the C06A&B Ecological Approach to Environmental Protection
- C22: Prepare a Decision-Makers Guide to the Collaborative Decision-Makers Framework

The following project descriptions are problem statements used as the basis for writing a request for proposal. For projects that are underway, the actual RFP language may be found on the SHRP 2 website in the Projects Database.

2006 FUNDING (3.425 million)

C01: A Framework for Collaborative Decision Making on Additions to Highway Capacity

Budget

$2.6 million

Objectives

(1) Develop a system-based, transparent, well-defined framework for consistently reaching collaborative decisions on transportation capacity enhancements and (2) identify a SHRP II research strategy for addressing gaps in supporting information systems.

Statement of the Problem

Transportation projects of all types involve decisions by a wide range of stakeholders, including transportation agencies, environmental and other resource agencies, tribal governments, elected officials, and the public. Large projects often span multiple jurisdictions and involve decisions by federal, state, and local governments. A broad array of information must be assembled and communicated to inform the decision makers and stakeholders. The stakes are high. The economic health, mobility, and safety of the nation depends on adequate transportation capacity, yet controversy over mode, alignment, environmental impacts, cultural impacts, and the fundamental value of the enterprise may delay major projects for decades.

One of the problems to be addressed by this research is how to consistently balance the many competing interests so that we can make better decisions on adding transportation capacity and make them in a timely manner. A collaborative decision framework is anticipated that includes at least these elements:

- Existing processes that influence or are influenced by transportation planning and project development (e.g., statewide and metropolitan planning, project development, project engineering, corridor planning, NEPA and permitting processes, economic development, and resource management.)
- Decision points in each process and connectivity across processes. The proposed framework should include decision points that may be external to transportation planning but can influence the outcome.
- the relationships among stakeholders – elected officials, agencies, businesses, interest groups, citizens
- strategies for interactive communication
- supporting information technology, analysis tools, and data

The second problem addressed by this research is provision of the necessary decision support for a truly systems based analysis of potential transportation solutions (alternatives). A systems-based approach must assess the transportation capacity problems, considering a range of solutions that include highway operational improvements, transit, demand management, non-highway freight options, and highway construction. In addition the economic justification for a project must be convincing, and the human and natural environment must be protected to everyone's satisfaction. More than just mitigation is required. A culture of environmental stewardship is expected. Highway agencies must work early and jointly with resource agencies to proactively improve neighborhood quality of life, watersheds and wildlife habitats. This requires analysis tools, data, data integration, and effective communication to constituencies.

Delivering a set of tools to support system-based analysis in a collaborative decision-making environment is a prodigious task, because existing tools are at various stages of maturity, data are not necessarily available, they are not of the same degree of completeness and precision, measures of performance are not universally accepted, the scientific basis for analysis is not universally accepted, and the conflict issues vary from project to project. A systems-based solutions screening process is desired that uses performance measures to assess, for each alternative, the costs, economic justification, capacity added, and impact on the human and natural environmental.

Expected research products

- Ten case studies selected to identify the decision-making elements common to successful delivery of additional highway capacity
- A state of the practice report on system-based solution screening – decision support tools.
- A recommended collaborative decision-making framework (or frameworks) and decision support system
- A special report to the Capacity TCC on the tools that could be developed under SHRP II that will have the greatest positive impact on collaborative decision making
- Dissemination materials and five outreach programs

C02: Systems-Based Performance Measurement Framework for Highway Capacity Decision Making

Budget

$ 825,000

Objective

To develop a performance measurement framework that informs a collaborative decision making process. The measures should reflect mobility, accessibility, economic, safety,

environmental, watershed, habitat, community, and social considerations. The framework will become and integral component of collaborative decision making and decision support tools.

Statement of the Problem:

Transportation agencies recognize the value of measuring system-level performance as a way to achieve consensus on controversial additions to highway capacity. Performance measures are valuable because:

- Each constituency sees a measure that relates to its concern
- Each constituency can better see the concerns of others
- The decision process is more transparent
- A better collective understanding is achieved of the transportation problem being addressed

Despite the value, many methodological, data, and analytic challenges hinder application of system-level performance measures. The goal of this project is to help collaborative decision makers develop and utilize performance measures to make the "right" decisions in transportation planning, project selection, program delivery, and asset management.

To date, agencies have generally had greatest success with operations and maintenance-related measures, such as pavement quality, bridge deficiency, and safety; and capacity-related measures such as volume to capacity ratio, or level of service rating. Well established data collection and analysis techniques have reinforced the use of these and similar measures as tools for decision making.

Success has been more elusive in other areas of system performance such as environment, accessibility, quality of life, or economic benefits. This is partly attributable to the fact that in these areas transportation agencies can not directly achieve target levels of performance through their own actions. For instance, water quality is affected by farming, households, industry, soil type and highway runoff. A highway may have a measurable effect on an adjacent stream, but not on the watershed. There is a scale issue that measures must address. For that reason in this project, both measures and indicators will be addressed. A measure can be affected directly by the action of a transportation agency through the decision process and the results measured objectively. An indicator is important, but is affected by many additional factors. It can be measured, but the condition of the resource cannot be totally ascribed to a transportation project.

Tremendous opportunities exist to broaden system-level performance measurement to include non-traditional elements of system performance. Many transportation agencies, however, are struggling to develop system performance measures in these areas. Some of the challenges that must be overcome include performance measure design, data collection, target setting, and interpretation and use of results. Better approaches are needed for quantifying transportation system performance in non-traditional ways. The ability to better understand system-level performance in terms of economic, mobility, accessibility, safety, environmental, community, and social considerations may lead to

more collaborative decision making during system planning and project development. Transportation solutions, programs and projects can be planned to optimize performance measures selected by transportation agencies and their stakeholders.

The intent of this project is to create flexible frameworks to support system performance measurement that individual agencies can tailor to meet their needs. The performance measurement framework will be incorporated into the collaborative decision making products of the SHRP II Capacity program.

Expected Research Products

- A system-based framework for transportation performance measures in a collaborative decision-making process

- An editable, knowledge-based template for a web resource for delivering the information to practitioners:
    - A performance measures library and classification system
    - Examples of best practice that can be augmented by users
    - A short and long term location and maintenance plan

2007 FUNDING ($3.75million)

C03: Interactions between Transportation Capacity, Economic Systems, and Land Use and Integration

Budget

$1.75 million plus $400,000 in $2010 funding transferred from C11 by the oversight committee in June 2009. Total C03 funding is $2.15 million)

Objectives

The project objectives are: (1) to provide a resource to help determine the net changes in the economic systems of an area impacted by a transportation capacity investment. The resource should include, in an economic context, impacts on land use, land value, and the environment; (2) to provide data and results from enough structured cases that project planners in the future can use the cases to demonstrate by analogy the likely impacts of a proposed project or group of projects (plan); (3) demonstrate how this fits into collaborative decision making for capacity expansion.

Statement of the Problem

Strengthening the economic vitality of a region (jobs and income) is one of the primary reasons for investing in highway capacity. Elements of improving economic vitality include better access to markets and labor force, reduced cost of delay, reduced congestion, improved safety, reduced pollution, and a better quality of life. However, the ways in which new and improved highway capacity influences economic vitality are complex and often indirect.

History is clear that improving transportation alone will not improve the economic vitality of a region—other positive factors must be present. This implies that the impacts of capacity enhancement vary with the region of the country, type of area (urban-rural), political attitudes, major economic drivers, economic growth forces, the nature of capacity problems, and the solutions proposed.

In addition to primary impacts, we must also consider secondary and cumulative economic impacts and environmental justice factors in order to address the net impact on regional economic vitality. What is the value of environmental resources lost or the cost of economically degrading areas bypassed by a new transportation facility? The ultimate question for governments and taxpayers is whether a transportation investment will achieve the desired economic effect. Will the region be better off economically? A convincing economic assessment methodology should anticipate both gains and losses.

Many analytical tools exist for estimating economic impacts, but there is a general sense of dissatisfaction with the results among decision makers and the public. There is also an impression that the public does not appreciate or understand the critical role of highway

capacity in sustaining the economy, enabling economic growth, and improving economic efficiency. Finally, planning processes do not generally reflect the economic effects of highway capacity on land use, and the economic effects are not well integrated into the highway capacity decision making process.

This project will strive to resolve these issues. The products will support the collaborative decision making framework being developed in SHRP 2 Project C01. That collaborative framework will provide the forum for balancing transportation, economic impact, and environmental concerns.

Expected Research Results

- A critique, from a decision maker point-of-view, of the methods and results of economic impact analysis for new highway capacity.
- A categorization (typology) of conditions affecting the economic impact of highway capacity, e.g., section of the country, urban high growth, suburban, rural, very rural, transitional, port city.
- Improved methods and tools, including case study-based tools, to better represent the primary, secondary, and cumulative contribution of highway capacity to the economic vitality of different types of regions, including the impact on land use and land values.
- Guidelines for convincingly communicating economic impacts to the public and elected officials.
- Recommendations for better integrating economic development impacts into systems planning, project development, and the collaborative decision making framework being developed under SHRP 2 Project C01.

C04: How Highway Congestion and Pricing Affect Travel Demand

Budget:

$1.0 million

Objective

Develop mathematical descriptions of the full range of highway user behavioral responses to congestion, travel time reliability, and pricing. The mathematical descriptions of behavior should be in a form that can be incorporated into various travel demand modeling systems in use or being developed. Examine network assignment practices needed to support models that simulate behavioral responses to congestion, travel time reliability, and pricing.

Statement of the Problem

Motorists experience more hours of congested conditions every year, but planning models rely on relatively thin behavioral information to take congestion into account.

Highway operations and road pricing strategies are being employed to address congestion, but the planning process is not well equipped to describe the effective capacity available when roads are congested or to describe the relief obtained by improvement strategies.

Variable tolls are being considered to encourage motorists to shift travel time out of congested periods, to use less congested roads, or to change mode. Variable tolls have been introduced on a few High Occupancy Toll (HOT) lanes, and tolls are being considered on approximately 20 additional highways around the country. Planners are being asked by decision makers to predict what congestion relief will be obtained by adding pricing to a roadway, how much revenue will be generated, and what side effects will be experienced. These are very difficult questions to answer with confidence given our current state of knowledge on motorist behavior when faced with congestion or tolls.

The Federal Highway Administration, state DOTs, and Metropolitan Planning Organizations have funded extensive stated preference and revealed preference surveys of priced roadways. Diversion studies, attitude studies, and equity studies have also been done. Revenue forecasts for tolled facilities are being made regularly as part of planning studies. The essence of the problem facing such studies and forecasts is the poorly explained heterogeneity of behavior. Predicting a response to congestion or tolls requires knowledge of at least:

- Traveler characteristics (income, age, gender, etc.)
- Trip purpose
- Time of day
- Travel time for the trip
- Consistency (reliability) of that travel time
- Travel time on alternative routes
- Actual price of a trip (if a toll is in place)
- Other modes available
    - Price, travel time, etc. on other modes

Current travel models are not capable of simulating all of these factors, because they do not include disaggregated models of choice behavior for a range of users under various choice conditions. A disaggregate approach is required that deals directly with the choices (decisions) faced by individuals rather than large groups of people.

The intent of this project is to use appropriate data to examine commonalities and differences in behavioral response to congestion, travel time reliability, and price, and develop reliable descriptions of behavior. In short, we would like to replace (or at least significantly reduce) calibration constants or limited model structures in current models with explanatory variables sensitive to congestion, travel time reliability, and price.

This project is to “mine” and, if necessary, enhance the data sets that have already been collected that contain information necessary to develop mathematical descriptions of fundamental motorist behavior in the face of congested conditions and tolls. The intent is

that this information can be incorporated into existing modeling practices or those that are in development.

In addition to highway user behavior on the demand side of modeling, there is another equally important area that must be addressed—network loading or operations. It is well known that static equilibrium link-based assignment of travel is flawed and inappropriate for portions of the network that operate in an over-capacity demand situation. Further, for pricing and reliability response, time of day acuity below the hourly distribution is likely to be needed. This project will also examine network capabilities required to simulate highway user behavior in the presence of congestion and road pricing.

SHRP 2 Project C04 does not include commercial vehicles. The National Cooperative Freight Research Program is starting research to improve models of commercial vehicle travel. SHRP 2 Project C-15 will wait until 2010 in order to build on NCFRP work and will then investigate how to incorporate commercial vehicles into the collaborative decision-making process for adding highway capacity.

Expected products

The product of this project will be mathematical representations based on stated preference and revealed preference data on how non-commercial vehicle drivers react to congestion delays and pricing. The results will be presented in a form that can be incorporated into travel demand models to better support decision making on highway capacity.

C05: Understanding the Contribution of Operations, Technology, and Design to Meeting Highway Capacity Needs.

Budget

$1.0 million

Objectives

The objectives of Project C05 are to: (1) quantify the capacity benefits, individually and in combination, of operations, design, and technology improvements at the network level for both new and existing facilities; (2) provide transportation planners with the information and tools to analyze operational improvements as an alternative to traditional construction. (e.g., determine what operational improvements will give the same capacity gain as an additional lane); (3) develop guidelines for sustained service rates to be used in planning networks for limited access highways and urban arterials.

Problem Statement

The development of an integrated, systems-oriented approach to planning and project development requires a comprehensive perspective on how to increase the capacity of highway and arterial networks. The public demands that capacity be utilized effectively

in both existing and planned facilities. Experience suggests that new road space is unlikely to be added at the same rate as the growth in traffic and truck freight because of physical, environmental, and financial constraints. This implies continual degradation of performance unless existing road space is used more effectively.

This project focuses on the gains in capacity that can be achieved from managing roadway networks through improved operations and design, and the application of new technologies. (For this project "network" refers to a system of highways and arterials in a region of interest.) Examples include:

Roadway Operation

- Traveler information
  - Pre-trip
  - During trip
    - Roadside
    - In-vehicle
- Variable speed limits
- Ramp metering
- Network optimization/adaptive signals
- Express lanes—separated/non-separated/toll
- Electronic toll collection
- Reversible lanes
- Lane controls
- Use of shoulder lanes
- Use of narrower lanes to increase the number of lanes

Capacity implications of geometric design changes

- Improving bottleneck locations
- Improving weaving areas
- Providing left and right turn lanes
- Intersection improvements for capacity
- Access controls on arterial streets

Vehicle Technology

- Navigation aids
- Radar and adaptive cruise control
- Collision avoidance
- Vehicle-to-vehicle communications
- Probe value of GPS-equipped vehicles

(Note: Spot improvements, turning lanes, upgraded shoulders and similar minor construction are within the scope. Adding continuous lanes or major reconstruction is outside the scope.)

While some of these strategies have shown their potential, a systematic assessment of the network implications of these strategies taken individually or in combination is needed. Network throughput is not well understood because of variable controlling conditions, such as level of demand, composition of the traffic, or degree of control in place. Benchmarks with sensitivity ranges are needed on the capacity effects of operations, design, and technology improvements to demonstrate the limits of what can be done without adding lanes. The problem addressed by this project is how to measure the capacity value of combinations of management strategies so such strategies can be evaluated side-by-side with adding lanes.

Extensive work has been published by FHWA and others on the effectiveness of highway management strategies, especially ITS deployments. Tools have also been developed and made available to analyze clusters of ITS strategies, produce various performance measures, and estimate benefit-cost ratios. This project is intended to build on such work, but focuses on the regional/network capacity gains that can be achieved from operations strategies, improved design, and applications of technology. While related to travel time, travel time reliability, incidents, vehicle hours of delay and other such measures, this project targets how to achieve capacity gains in the highway and arterial network without adding lane miles.

"Capacity" is a word that is easily misunderstood. The 2000 Edition of the *Highway Capacity Manual* (HCM) defines capacity of a facility as "the maximum hourly rate at which persons or vehicles reasonably can be expected to traverse a point or uniform section of a lane or roadway during a given period of time under prevailing roadway, traffic, and control conditions." The HCM goes on to say that "Capacity is not the maximum flow rate observed on a facility." Project C05 is concerned with increasing capacity under congested conditions, which means that the nominal capacity as defined above is seldom reached. The emphasis here is not on nominal capacity but sustained service rates at a system level. "Sustained service rate" is defined for this project as the highest flow rate that can be sustained over a peak demand period with a low probability of breakdown. The purpose of implementing operational, design, and technological strategies is to prevent breakdown and improve the sustained service rate.

One way to frame the freeway component of the question is to ask what package of strategies can provide the same increase in sustained service rate as adding a new lane. Under highly congested, stop-and-go conditions, freeway lanes are observed to carry as few as 1200 vehicles per hour. On a six-lane freeway under congested conditions, if each lane could be sustained at, say, 1600 vehicles per hour using management strategies, that would prevent breakdown to 1200, resulting in a net gain of 1200 vehicles per hour in the peak direction. (Three lanes x 400 vehicles per lane gain compared to stop-and-go conditions.) This is the same benefit as adding a lane. One might term this, "hitting the sweet spot."

Expected Products

Handbook on integrating effective capacity decisions into transportation systems planning and supporting tools.

2008 FUNDING ($4.75 million)

C06: Integration of Conservation, Highway Planning, and Environmental Permitting through Development of an Outcome-based Ecosystem-Scale Approach and Corresponding Credit System

Total budget

$1.5 Million

The ETG for this project met in February 2008 and decided to break it into two pieces:

C06A Integration of conservation, highway Planning, and Environmental Permitting using an Outcome-Based Ecosystem Approach

Budget: $700,000

C06B Development of and Ecological Assessment Process and Credits system for Enhancements to Highway Capacity

Budget $800,000

The overall objectives are the same, but the ETGs added detail.

Objectives

(1) Integrate conservation thinking early in the highway planning process to better conserve the environment. (2) Develop a method to evaluate environmental functions and their sustainability as a basis to award environmental credits and permits at an ecosystem scale rather than resource-by-resource, site by site, and project-by-project. (3) Improve planning links to NEPA review to reduce environmental-related delays

Statement of the Problem

Ecosystem approaches to environmental conservation are now widely accepted and increasingly practiced by federal, state and local resource agencies. From a highway perspective, the FHWA document *Eco-Logical* provides conceptual groundwork for integrated conservation plans and mitigation activities that transcend individual agency jurisdictional boundaries and encourages an outcome-based ecosystem approach to conservation. However, current practice still dictates that resources are regulated individually with required compensatory mitigation or conservation activities being in-kind compensatory mitigation for the particular resource being impacted. This lack of integration of ecosystem functions, goods, and services (such as: clean air and water,

flood protection, healthy wildlife communities) is a challenge that will have to be overcome through substantial outreach and a commitment to collaboration.

There are numerous challenges to achieving such integration. Among them are:

- An approach that can be used in the planning stages to demonstrate a commitment to multi-purpose conservation and avoidance of sensitive environmental areas
- A method to evaluate and define the environmental functions and quality and sustainability of wetlands and assign corresponding credit values
- A method to evaluate and define environmental functions and their sustainability to serve as a basis to assign credits for ecosystem and habitat creation or preservation
- A method to designate flexible service areas for mitigation activities (multi-purpose banking) so that critical mass habitats and ecosystems can be developed, preserved, or enhanced.
- A method to demonstrate that the ecosystem approach and credits satisfy the various statutes and regulations that apply

Resolving these challenges will greatly improve our ability to reach consensus decisions on adding highway capacity.

Expected Research Products

- A document synthesizing ecosystem-based environmental functions and sustainability as a basis for crediting and trade-offs
- Proposed solutions to underlying scientific/technical problems standing in the way of implementing ecosystem approach and credits.
- A proposed method for implementing the principles described in *Eco-Logical,* including a framework for an ecosystem-based approach as a basis for a crediting system that can be used for planning and delivering highway projects, that individual jurisdictions would adopt and customize to their specific region or service area

C07: Integrating SHRP 2 Products into the Collaborative Decision-making Process

Budget

$1.65 million (The Reliability Focus Area added $250,000 to the original $1.4 million allocated by the Capacity TCC. The purpose of the added funds is to incorporate the results of L05, *Incorporation of Reliability Performance Measures into the Transportation Planning and Programming Process*, into the web-based Collaborative Decision Making Framework.)

Objectives

The objectives of this research are (1) to integrate the results of SHRP 2 Capacity research into the collaborative decision-making and performance-measurement frameworks, especially Projects C02, C03, C06A&B, C08, C09, C12, and C15, and L05; (2) Incorporate into the Collaborative Decision-making Framework the results of NCHRP 25-25 (27) and related work linking outputs from the highway planning and programming to project management

Statement of the Problem:

Two fundamental research initiatives were authorized in the first funding cycle of the SHRP II Capacity Research program. C01 is to develop a collaborative decision-making framework, an improved process for planning and developing highway capacity improvements. C02 is to develop a performance-measurement framework to support collaborative capacity decision-making. As other projects are completed that cover particular components of the framework in more detail, the results must be incorporated into the framework.

Expected Product

The product will be a complete collaborative decision making framework that will encompass all of the relevant SHRP 2 Capacity research.

A Community Visioning Approach to Support the SHRP 2 Collaborative Decision-Making Framework for Additions to Highway Capacity; Revised March 17, 2008

Budget

$800,000

Objective

The objective of this research is to develop a community visioning process to support the collaborative decision-making framework for additions to highway capacity that is being developed in SHRP Project C01. The visioning process should be based on the dynamics of primary and secondary effects of highways on communities and neighborhoods.

Statement of Problem

Note: The Technical Coordinating Committee for SHRP 2 Capacity research recognizes the many sources of concern associated with adding new highway capacity, and has framed the entire research program around achieving a Collaborative Decision-Making Framework. This means that all affected parties should be heard in developing a capacity expansion project or program of projects The Capacity research program is composed

of research addressing various aspects of the highway decision making process as described in this SHRP 2 Capacity Research Plan.

Capacity improvement projects are built to improve safety, mobility, and the regional economy, but public opposition often arises. Opposition may arise due to memories of past negative impacts, impacts of specific proposed alignments, loss of neighborhood connectivity, traffic speed, cost, environmental concerns, noise, emissions, and others. While communities can perceive the direct negative effects of highway expansion it is very difficult to perceive secondary and long term affects. Hindsight tells us that such effects may have caused more damage in the past to some communities than the primary impacts,

There is a need to understand the disruptive effects of the past so in the future we can maximize the positive and minimizing the negative impacts of new roadway. For example, arterial street design elements such as total width, lane width, clear zone, sidewalks, on-street parking, signalization, traffic calming, medians, pedestrian barriers, bicycle lanes, or bus lanes can play a role in providing comfortable spaces for pedestrians and businesses. For freeways, a full range of alternatives must be examined before settling on a preferred approach to adding capacity. An alternative to freeway expansion may be enhanced arterial street capacity, connectivity, or signal performance.

Once we better understand how highways and arterial streets positively or negatively affect communities, we need a method (or methods) to reach a collective vision of what a community wants to be. The method should identify what the community is, provide for identifying and understanding tradeoffs between dissimilar things, and clarify who benefits and who is hurt by different strategies. In short, a stakeholder driven, consensus-building process is needed to support the broader collaborative decision making framework being developed by SHRP 2 Capacity research.

Visioning, a collective term for such consensus-building processes, has taken many different forms in past applications with varying degrees of success. Even the most successful forms have had trouble connecting long-term, broad visions to decision-making processes that support transportation planning and project development. This is understandable given the challenges inherent in visioning:

1. The long timeframes associated with visioning are difficult to reconcile with shorter term priorities and requirements.
2. The tools, technologies, and analysis used in the visioning process can be difficult to link with the decision support tools used in traditional planning efforts.
3. Integrating land use, transportation, environmental and other elements of a vision involves multiple jurisdictions (and agencies) each with their own planning process, objectives, and requirements. When a regional vision of the future is needed, boundaries must be overcome.

The Collaborative Decision-Making Framework being developed by SHRP 2 Project C01 needs a visioning “front end” that effectively incorporates visioning into decision

making. The visioning approach should embody the findings of community impact analyses so that participants in the process can "see" the positives and negatives as they work through choices. The approach should embody appropriate new technologies such as maps overlaid on aerial photographs, renderings of new roads overlaid on photographs, electronic voting, and web meetings for the whole community. The approach should embody some form of real-time modeling or estimation of impacts so that the participants can "see" the traffic, land use, air quality, green house gas, and aesthetic implications of choices. It is not expected that this project will build a visioning system from scratch, but it should identify systems in use or in development and show how an agency could build their own system from the available "parts."

Products

1. A review of the decision-making case studies assembled under project C01 for insights into community impacts and the practice, benefits and short comings of visioning efforts.

2. Identification of the gaps in the understanding of the secondary and cumulative impacts of highways on communities. This includes the longer term erosion of community and neighborhood vitality caused by speeds of traffic in communities as well as secondary and cumulative effects of severing and bisecting communities.

3. Supplemental research and case studies to fill the gaps identified in number 2 above.

4. Guidelines for effective community visioning to improve decision making for adding capacity. (i.e., effective practices such as the level of participation and documentation required to ensure that decision makers downstream pay attention to the vision.)

5. Recommendations for methodological and technological approaches to community visioning that can support the Collaborative Decision-Making Framework being developed by SHRP 2 Capacity research.

C09: Incorporating Greenhouse Gas Emissions into the Collaborative Decision Making Process

Budget

$800,000

Objective

Develop the component of the Collaborative Decision-Making Framework that considers the consequences of greenhouse gas emissions.

Statement of the Problem

Greenhouse gases are now considered an environmental threat that must be confronted. About 25% of the greenhouse gas emissions in the United States are from transportation sources, and such gases are generated in proportion to fuel consumed. Steps to mitigate greenhouse gas emission are similar to steps taken to reduce fuel consumption. The question is, to what extent does additional highway capacity exacerbate the problem and what can be done to mitigate it?

The public is alarmed over this issue. For most proposed expansions to highway capacity, the public wants to know what effect the capacity expansion will have on greenhouse gas emissions. Part of this question is technical. The outputs of travel-demand models are inputs to the EPA MOVE Model, which estimates emissions. The MOVE model is a substantial improvement over the prior MOBILE series, but its demands strain the ability of travel demand models to produce inputs at sufficiently fine detail. One of the objectives of Project C10 is to address the technical component.

Another part of the problem is procedural. How do we address this issue early in the planning process and give it a sense of proportion along with other factors such as coping with congestion induced by population growth and maintaining economic vitality? To what extent are solutions within the realm of highway capacity planning and to what extent are they in the realm of other policy areas – CAFÉ standards, cap and trade agreements, more rapid deployment of hybrid (or other) engines, etc? Planners and engineers need a strategy to address greenhouse gas emissions that will be produced by the traffic using expanded facilities. The purpose of this project is to provide strategies for incorporating this issue into the collaborative decision-making process.

Expected Products

- A process for considering GHG issues in designing solutions and establishing consensus about highway expansion decisions? What are the Key Decision Points (KDPs) at which this should be considered and how do you do it?
- Identification of the GHG consequences of highway capacity decisions and the boundaries (limits) of the solutions that can be expected from highway planning and operations.
- A demonstration or example of the process -- a highway capacity project alternatives analysis and regional plan review.

2009 FUNDING ($6.1 million)

C10 Partnership to Develop an Integrated, Advanced Travel Demand Model and a Fine-grained, Time-Sensitive Network.

Budget

$4.0 million

Objectives

(1) Work with one or two states or MPOs to operationalize an integrated, advanced travel demand model with a fine-grained, time dependent network (integrated supply-demand model). (2) Incorporate SHRP 2 Capacity products (especially those of project C04 and C05) into the model capabilities. (3) Conduct an extensive series of tests to analyze the performance of the model and time-dependent network. (4) Use the outputs of the integrated model as inputs to EPA's MOVES model for estimation of greenhouse gas emissions

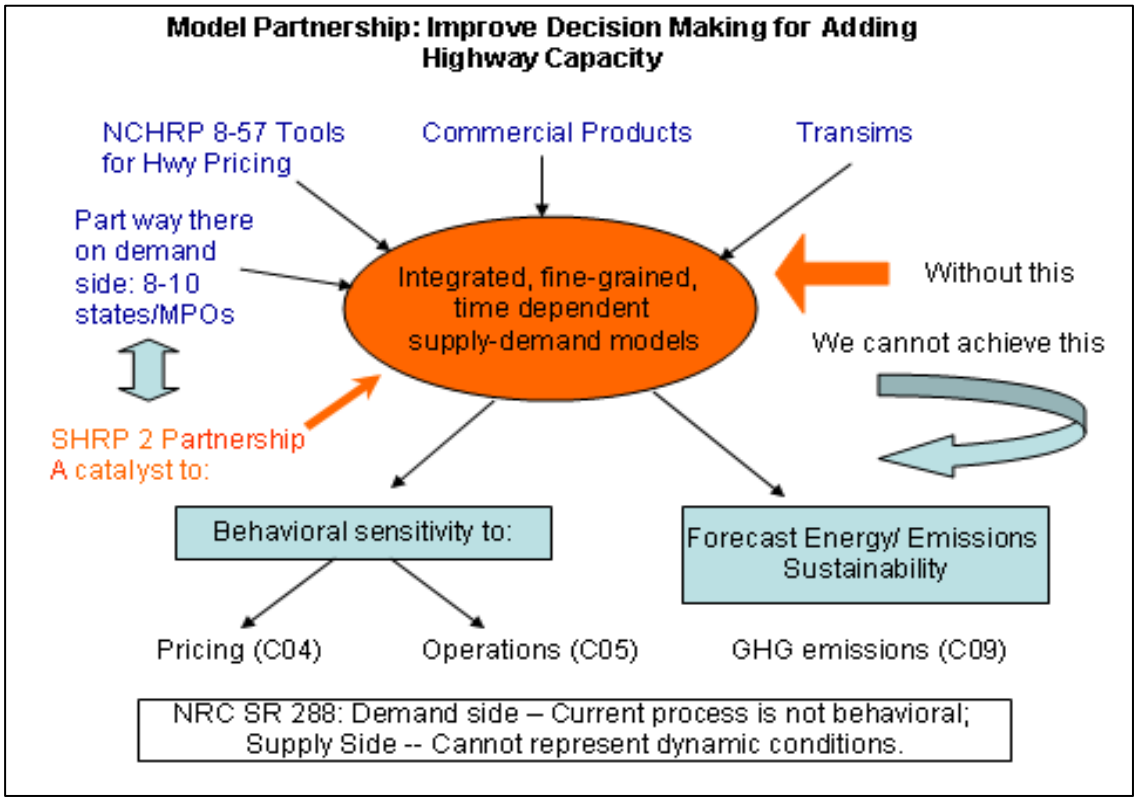
Statement of the Problem

Highway capacity may be added by managing facilities to achieve greater throughput or by adding lanes. Managing freeway capacity implies inducing motorists to change driving behavior – change in time of day, change in route, and change in mode. If management techniques are successful, throughput actually increases compared to congested conditions. Therefore, highway agencies need to be able to analyze the effects of management strategies. Such strategies include:

- Variable road pricing
- Ramp metering
- ITS strategies—customer information on road conditions, travel time, incidents, etc.
- Reversible lanes
- Polices affecting the time of travel demand such as parking pricing, transit pricing and scheduling flexible work schedules, reversible lanes, HOV lanes and HOT lanes.
- Variable speed limits (potentially)
- Bottleneck improvements (reduction in lane width to add a lane, geometric improvements to ramps, etc.)
- Shift to non-highway mode

In order to fully model the impact of the above changes on travel, not only must travel models be able to reflect immediate changes in traffic operations but also how these changes affect underlying behavior such as time of day of travel, mode choice and destination choice. Exhibit 3 depicts the relationships.

EXHIBIT 3



The National Research Council published a report in the summer of 2007 that is very pessimistic about the capability of traditional "four step" travel demand models and networks that are not time sensitive to address the impact of management strategies. Here are a few quotations from the report (italics added):

- The conventional model structure is *inherently incapable* of accurate treatment of choices made in response to congestion and other indicators of system performance. (p.2)
- Factors influencing travel behavior-such as the value of time and value of reliability- are *impossible* to model using the four-step process. (p.3)
- The four-step model does not produce accurate, disaggregate, estimates of time-specific volumes or speeds on specific routes. These estimates are needed to evaluate improvements in traffic operations, modes of access to transit stations, time shifting of travel in congested networks, and freight policies, as well as to calculate air quality emissions.(p.3)
- The current widely-used four step metropolitan travel demand forecasting process *cannot* adequately characterize (the effect of the management strategies listed above) without the use of off-model adjustments. (p.46)

Without belaboring the point, the NRC report says that we cannot analyze the capacity-related policies that cities and states are considering with the current models and networks.

Similarly, the new EPA MOVES model for estimating emissions (including greenhouse gasses) requires travel speed and other fleet operating characteristics that are not available from most travel model sets today. Improved models are on the critical path to estimating the air quality implications of transportation alternatives.

SHRP 2 Capacity is conducting research to improve our ability to analyze road management strategies, the results of which can be most useful if imbedded in a travel demand model set. Specifically, C04 will mine current stated preference and revealed preference data to develop better mathematical descriptions of motorist responses to congestion and pricing. C05 evaluates roadway performance under congested congestions and the capacity improvements that may be achieved from applying management strategies. To use the results of these projects in a meaningful way, they must be incorporated into models. But if the models and networks are "inherently incapable" of analyzing the very issues with which we are concerned, SHRP 2 capacity research cannot have much impact.

While implementation of a new generation of demand models and networks is not the charge of SHRP 2 Capacity, new models and networks are on the critical path to success of SHRP 2 Capacity research. If deployment of the new models and networks were advancing nicely, we could ignore the issue and just wait. However, deployment is not advancing rapidly for a number of reasons outlined in the NRC report. Among them are skepticism due to lack of evidence that new models and networks will do any better than the four-step process; cost of implementation; and fear of law suits to stop projects justified with the "old numbers" if new models produce different results.

About 10 states or MPOs are in the process of designing and implementing activity-based models (NRC p. 71) but these have not faced up to the difficult issue of implementing time dependent networks to capture time-of-day-effects. Without the time dependent networks, much of the temporal disaggregation gained in the activity-based model is lost in network assignment. "Properly integrating … advanced supply models with demand models may require coding a more detailed highway network that includes facilities carrying local traffic and intersection control information."(NRC p. 68)

Given that models and networks currently in use cannot analyze the time-related solutions that SHRP 2 is researching, that some SHRP 2 products will require improved models and networks to be successfully implemented, and that deployment of advanced models and networks is moving slowly, it is proposed that SHRP 2 invest in a partnership with a state or MPO to provide a catalyst for deployment of **integrated** advanced models and networks, provide a place to test the products of C04 and C05, and provide a test bed to demonstrate the benefits of deploying advanced models and networks. This proposal is still in the realm of research because **integrating** new models and networks has not been done anywhere and this is necessary to test the efficacy of C04 and C05 products.

The successful participant(s) will be required to conduct tests on integrated model/network set. Theses tests will fall into three categories: a) comparison between measures associated with existing models and those produced by the new model (screen

counts, etc.) b) Comparison between the model results and measures which can not be produced by current methods (e.g. travel by time of day). c) Sensitivity tests to determine whether model responses to changes in input are reasonable. d) using outputs of the travel demand models as inputs to MOVES for the purpose of estimating greenhouse gas emissions.

Products

The products of this effort would be an integrated supply-demand model with a fine-grained, time-dependent capability; documentation and software so the model can be adpted by others or further developed; the results of tests that demonstrate whether or not the model can analyze traveler responses to freeway management and pricing policies; a document that describes the results.

C18: Pilot Test the collaborative Decision Making Framework in Three Sites Including a Self-Assessment Method.

Budget

$1.25 million

Objective

The objectives of this project are to test a prototype of the flagship product for Capacity Research while there is still time in the SHRP 2 program to react to user input and modify the product; develop and exercise one or more self-assessment methodologies so the testing organizations can determine if they are better off for using the Collaborative Decision Making Framework.

Statement of the Problem

A prototype electronic version of the Collaborative Decision-Making Framework will be available by the summer of 2009. At that point it would be appropriate to seek sites to conduct a pilot test of the CDMF. It will not have all of its content until all of the research is done, but there will be enough to test elements of the framework. In July of 2009 we would issue a request for proposals from state DOTS and MPOs (as appropriate) to exercise the CDMF. An Expert Task Group would be formed that includes several members of the TCC to prepare the request and review the expressions of interest. The request would require submitters to address:

- Commitment from management
- A testing plan that describes the key decision points the that they would address:
- What business processes they propose to investigate and change
- How consultants would be used. Who are they?
- An evaluation method. How do they know if they are better off?
- Preferred contracting method

At least three sites would be selected. A July RFP would lead to a contract by January 2010. Work would have to be completed by March 2012 to fit within the SHRP 2 time schedule.

Products

The products of this effort will be:

- Feedback on the Collaborative Decision-Making Framework so that it can be revised as needed under project C07.
- Assessment methodologies and assessment results from states and MPOs
- Creation of champions for further implementation of the framework
- Guidance on the degree of technical assistance that will be needed for successful implementation.
- Reports on the pilot tests

C19: Add Expedited-Schedule Case Studies to the Collaborative Decision-Making Framework Data Base

Budget

$300,000

Objective

The objective of this project is to add case studies and real life experience to the Collaborative Decision Making Framework regarding expedited schedule projects.

Statement of the Problem

Project C01, the Collaborative Decision-Making Framework, is the cornerstone of the SHRP2 Capacity Program Area. One of the more compelling reasons that DOTs and other transportation agencies may be interested in adopting the CDMF is that it could lead to expediting schedules for major capacity projects. The case studies already assembled under C01 focus on the benefits of collaboration to correctly identify the nature of a transportation problem (which is often not what it seems) and find the best transportation, environmental, and community solutions. Successful collaboration can also support faster completion because there is less opposition to the project. The cases sought under this project should be consistent with the principles of collaborative decision making but also identify streamlining steps that can be taken within this context. This project will specifically address expediting the completion schedule for major capacity projects. Case studies will be used to understand how major projects such as Maryland's Inter-County Connector were delivered in a much shorter time frame than would have been possible without collaborative decision-making.

The case study lessons will be compiled in a free standing report and electronic version of the cases will fit into the web-based tools being developed under project C07. The C07 Integration contractor will provide guidance on formats

Products

Products from this project will include:

- Case study write-ups
- A summary analytical report
- Electronic material that will be used by the C07 Integration contactor to build the final web-based Collaborative Decision Making Framework.

C20 Freight Demand Modeling and Data Improvement Strategic Plan

Budget

$550,000

Objective

The objective of this research is to develop a multi-sponsor strategic plan for improving freight demand forecasting and collecting the supporting data. Improved forecasts are needed to plan the infrastructure needed to carry the growing volume of freight.

Statement of the Problem

Freight demand makes up a large and growing proportion of total travel demand; freight VMT growth is outpacing passenger VMT growth. Logistics costs now make up around 10 percent of the overall US economy SHRP 2 Project C04 is aimed at improving our understanding of highway travelers and how factors such as congestion and pricing impact travel demand. The freight side of travel demand is not being examined at all by C04 because of the fundamental differences between passenger travel demand and freight demand. One of thee fundamental differences is that passenger travel decisions ultimately rest with the driver while freight transport decisions are usually made to meet the specific needs of a shipper or receiver and will often be subject to carrier company policy. An individual passenger car driver may quickly decide on his or her own to re-route around an incident or recurrent traffic jam, to forgo or postpone a trip, to shift modes, or to pay a variable congestion toll; in the freight realm, such decisions are much more complex in that customers may have tight delivery time windows or carriers may have negotiated fixed cost agreements. Further, there are distinct differences within the highway freight transportation marketplace (e.g. between low value commodities and high value commodities and between short-haul urban freight/deliveries and intercity trucking). In general, our understanding of freight demand and how it can be effectively modeled at a detailed level is in a primitive state.

There are also many participants in freight research: TRB's Cooperative Freight Research program is now underway; Federal Highway Administration and AASHTO sponsor freight research; industry associations sponsor freight research; and states sponsor freight research. Much and perhaps most of the research sponsored by these groups is not about forecasting freight demand and its impact on highways, but some of it is. It is clear given numerous research sponsors and stakeholders, fragmentation of resources, and the very large size of the effort required to improve freight demand forecasting that a strategic approach is needed.

This project will develop a very forward-looking strategic plan for dramatically improving the state of freight demand modeling and data quality. Phase 1 is intended to identify gaps and needs and prepare the future research agenda. Phase 2 (Not currently funded and not part of Project C20) will be designed to start filling those gaps and needs. This research topic is a close companion piece to projects C04, C10, and C15. The plan will build on work by NCFRP and FHWA.

Products

The products of this project will include:

- A project report
- A multi-sponsor roadmap or strategic plan of future freight demand research and data collection
- A structure for integrating the work of many researchers over time into an body of knowledge useable by freight demand modelers

2010 FUNDING ($3.475 million)

C11 Development of Improved Economic Analysis Tools Based on Recommendations from project C03

Budget

$0.6 million (The original budget was $1.0 million. The Oversight Committee transferred $400,000 to project C03 in June 2009.)

Objective

Based on the work of C03 case studies (100) develop analytical methods to fill gaps in current economic impact methodologies.

Statement of the problem

This new Project C11 seeks to build directly on the database and findings of Project C03 to develop improved economic analysis tools that are responsive to actual planning needs and based on empirical observations. The goal is to avoid jumping to the development of new macroeconomic model systems that share the cost, complexity and rigidity of past models, and instead work incrementally to build a new generation of individual analysis tools that can be more responsive to planning and decision-making needs.

Specifically, this project seeks to leverage the available Project C03 database of 100 case studies to develop improved analysis methods that are responsive to differences in the range of project types, spatial scales and steps in the planning process faced by transportation planners. It also seeks to develop or refine impact accounting methods so that estimates of economic development impacts can be integrated with other planning analysis elements such as benefit-cost assessment, project prioritization, travel forecasting and land use forecasting.

Thus, the analysis tools to be developed in this study will have intrinsic use by themselves, and also represent building blocks of what can become a new generation of planning and prioritizing systems incorporating more realistic and transparent assessment of economic and development impacts. The term "tools" is used here to denote work products that define specific measurement, calculation and presentation methods to be used by transportation planners and decision-makers. These methods will not require any particular software (beyond commonly available office software such as spreadsheets), yet may be incorporated into systems and processes used by transportation planners and decision-makers.

This new Project C11 seeks to develop a new generation of improved analysis tools that offer both enhanced accuracy and enhanced usefulness for planning and decision making. Such tools cannot eliminate either the need or the value of the case examples and meta-analysis (of overall impacts) that comes from Project C03. However, they can help to

improve the accuracy of impact estimates for complex situations and the tailoring of impact measures for alternative perspectives and applications. These improvements come from two sources:

The first source of improvement is the adoption of multivariate statistical analysis applied to the available case data, to refine and enhance our understanding of relationships beyond the basic tabular analysis of averages, ratios and ranges that comprise the Project C03 meta-analysis findings. These statistical analysis results, by incorporating interactions between factors, nonlinear relationships and threshold effects, can be used to enhance estimation of the potential economic impacts of proposed new projects and application tools.

The second source of improvement is the design and development of analysis inputs and outputs in a form supportive of the needs of planners and decision makers. This can be achieved by defining analysis inputs to reflect the types of project alternatives that often confront planners, and by providing analysis outputs in a form that can be used to help inform decision making.

The following are examples of specific analysis tools that could be developed through C11:

- A Matrix of Customer Market Segments and Feature Benefits
- A Tracking Tool for Enhanced Accounting of Economic Impacts
- An Analysis Tool for Measurement of Access and Connectivity Impacts
- An Analysis Tool for Measurement of Highway Use and Performance Impacts
- A Tool for Integration of C03 Data with Other Types of Decision-Support Systems

Product

Economic analysis product that integrates existing approaches and C03 case studies.

C12: The Effect of Public-Private Partnerships and Design-Build Procurements on Highway Planning, Environmental Review, and Collaborative Decision Making

Budget

$300,000

Objective

The objective of this project is to determine how long-range transportation planning, environmental review, and collaborative public decision making should address public-private partnerships for highway development that occur at various stages of the current process or arise outside it.

Statement of the Problem

Public-Private Partnerships have been conducted successfully around the US, generally under the Special Experimental Program provisions for Federal Aid. Private funds are attractive in situations where funding constraints would not allow a needed facility to be built for many years. In notable cases, existing Interstate Highway facilities have been sold or leased to private companies to generate cash now to build other roads and to provide a funding mechanism for future renewal. Design-build contracts have been used to reduce delay between the design and construction. Design can often be commenced before the NEPA process is completed. When the NEPA process is completed, early construction activities can sometimes begin before the final design is completed. Design-build can be used under the traditional highway ownership model or it can be a component of a public-private partnership.

There are enough combinations of techniques, dangers of lawsuit if the NEPA process is not followed correctly, and debt to create concern and confusion. When properly executed, innovative procurements seem to work well. There is concern, however. Some states have expressed concern about the practice and The House Committee on Transportation and Infrastructure has issued a cautionary letter to states about "selling off" the state's assets. The issue is clearly not settled.

This project would focus on creating a public decision process for dealing with public-private partnerships that addresses the concerns of State and local governments. Among their concerns are the following:

- Legal, right-of-way, and eminent domain issues
- Financial issues
- Planning, environmental review, and decision-making processes
- Contract issues
- Long and short term risks

All of these issues do not arise in every case. Sometimes a road that is privately funded is in the TIP and STIP, and the DOT has purchased right of way and conducted all of the NEPA work prior to turning to a private funding arrangement. In other case an unsolicited proposal comes out of the blue, and in yet other cases an existing facility may be sold or leased. How do public decision makers sort all of this out?

Product

Recommendations for incorporating various forms of public private partnerships into the public decision making process.

C15 Integrating Freight Considerations into Collaborative Decision Making for Additions to Highway Capacity

Budget

$300,000

Objective

The objective of this project is to identify which key decision points in the collaborative decision-making framework need to address freight issues and recommendations on how it should be done.

Statement of the Problem

Freight transport occupies a growing portion of the nation's highway capacity. This fact cannot be ignored in addressing the objective of SHRP 2 Capacity, which is to "develop approaches and tools for systematically integrating environmental, economic, and community requirements into the analysis, planning, and design of new highway capacity." The AASHTO *Freight Bottom Line Report* notes that the US economy is forecast to grow at 2.9% per year for the next 30 years, population will increase from 300 to 380 million (over 80% residing in urban areas), and the demand for freight transportation will double. The same report notes that whereas today 2,100 mile of interstate highway carry more than 25,000 trucks per day, in 2035, 16,700 miles (40%) will carry this volume. An FHWA study reports 243 million hours of annual delay to freight trucks, most of it at urban interchanges. In summary, we are headed for a freight capacity problem of epic proportions and the heart of the problem is in cities.

There are numerous proposals to address this, including doubling interstate highway mileage, a network of truck lanes allowing longer vehicles, increase in inter-modal rail facilities, truck only toll roads, and time-of day pricing on roads and bridges. However, the planning and engineering community is not well versed in freight economics. Decisions on highway capacity enhancements made without understanding how the movement of freight is likely to react have great potential for unintended consequences.

The time and manner of freight transportation are determined by either the shipper or receiver of goods, not the carrier. Some large commercial shippers employ private fleets and others contract for service. In either case, freight shipments are part of an optimized supply chain. In order for public sector highway planners and engineers to use public policies to have an effect on freight transportation with the intent of enhancing peak-period highway capacity, it is necessary to understand the economics of supply chains for various enterprises. The transportation-related cost factors in supply chains include travel time, speed limits, truck size and weight, fuel cost, toll cost, and cost of delay. How decisions on the transportation of freight react to changes in these elements depends on the overall effect on supply chain costs and the method of payment.

Because of new research on freight transport that the National Cooperative Freight Research Program is starting in 2007 and Project C20 on a freight travel demand strategic plan will start in 2009, SHRP 2 will not start this project until 2010, allowing time for new research to develop products on which SHRP 2 can build.

Product

Recommendations and procedures for better incorporating freight movements into the collaborative decision-making process for capacity expansion.

C16 The Effects of Smart Growth Policies on Travel Demand

Budget

$425,000

Objectives

The objective of this project is to determine (1) to what extent smart growth policies can relieve pressure on peak period highway capacity by reducing peak period travel demand; (2) if there is potential, how many acres of smart growth development are needed to produce a desired traffic reduction? (3) necessary preconditions (such as transit access, land-use mix) associated with successful highway travel demand reduction.

Statement of the Problem

Smart growth polices include walking-scale housing developments, zoning provisions to allow commercial services near housing, public transit services and transit-oriented developments, bike lanes and facilities, improved connectivity of sreets, better connectivity of neighborhoods and commercial districts, and other strategies to reduce the need to travel by car. There is no question that such policies create urban places desirable to some people and have been shown to reduce auto trips per day for some households. However, for smart growth to be a component of congestion relief planners need to know how much of it is needed, in what kind of urban areas it can be successful, the necessary connectivity characteristics to achieve the benefit, and when the trips do not occur. By and large there is adequate off-peak highway capacity in most cities. If travel demand is reduced in off peak hours it may help air quality and energy consumption, but does not help the peak period capacity problem. Similarly, a smart-growth development in a large city that can support a subway or LRT may have very different trip-reduction characteristics than the same style of development in a smaller city. How should smart growth fit into collaborative decision making for additions to highway capacity?

Product

Guidelines on the effectiveness of smart growth policies in reducing peak period travel demand in various urban settings, and how much smart growth development is needed to eliminate the need for a freeway or major arterial lane in the peak period.

C21: Pilot Test the C06 A&B Approaches to Environmental Protection

Budget

$1.25 million

Objective

The objectives of this project are to test a prototype of the ecological assessment method, the credits system, and the business case for environmental stewardship while there is still time in the SHRP 2 program to react to user input and modify the product.

Statement of the Problem

Capacity projects C06A&B will produce an ecological assessment method, a multi-resource credits system, and a business case for environmental stewardship (going beyond mitigations). This is both difficult and revolutionary within the context of current legislation. Taking the results of this research to the field is essential to see if the results are actually accepted in practice. Developing a working method is one thing; having it consistently used in practice is another.

The contractors are required to develop liaison committees with representation from all federal agencies that have environmental jurisdiction, selected state environmental agencies, and environmental NGOs. The intent of the research is to develop products that all regulatory agencies can accept. The next step is to test that acceptance in practice.

Projects C06 A&B will not end until the spring of 2011, and SHRP 2 work must be completed by 2012 unless there is an extension. Therefore, this project will need to be overlapped with C06 A&B to meet the deadline. Work on this project would have to be completed by March 2012.

Products

The products of this effort will be:

- Feedback on the ecological approach tools so that they can be revised as needed
- Creation of champions for further implementation of the framework
- Guidance on the degree of technical assistance that will be needed for successful implementation.
- Reports on the pilot tests

C22: Prepare a Decision Makers Guide to the Collaborative Decision Making Framework

Budget

$200,000

Objective

The objective of this project is to make decision makers aware of when they must personally engage in the Collaborative Decision-Making Framework to ensure that the right people are involved in project delivery at the right time with the right information.

Statement of the Problem

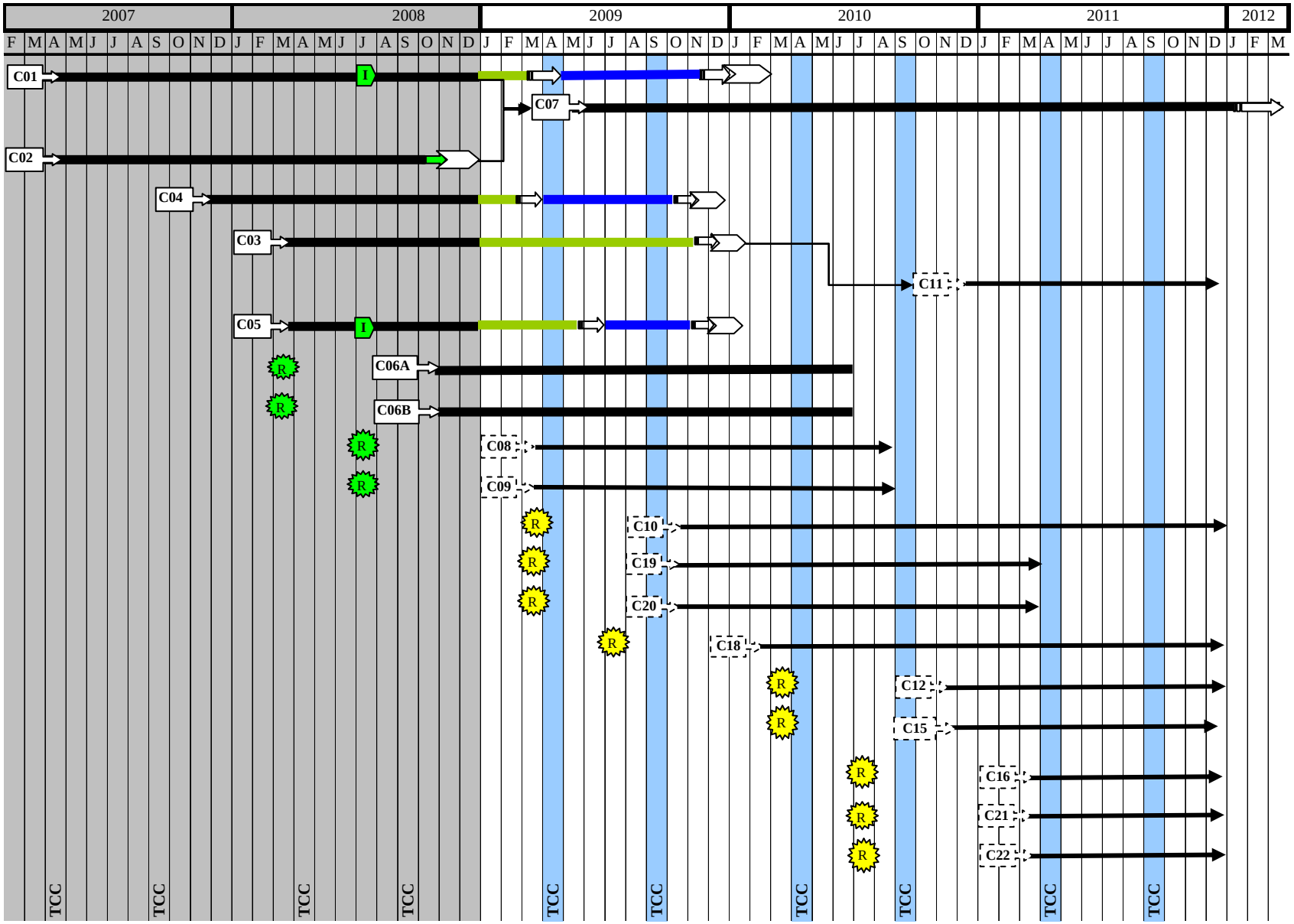
Project C01, the Collaborative Decision-Making Framework, is the cornerstone of the SHRP2 Capacity Program Area. At this point, the C01 products (especially the web-based framework tools) are aimed at practitioners. However, it is very clear that the CDMF cannot hope to succeed in practice without support from upper level managers and CEOs within DOTs, other transportation agencies, and environmental resource agencies. They will need to be the champions for process change in the form of the CDMF. This project will be an important addition to C01 in that it will develop the business case for the CDMF for framework champions as well as simplified tools for them so that they understand the importance and functioning of the CDMF.

Products

The product will be a Decision Makers Guide to the Collaborative Decision Making Framework, linked to the key decision point structure in the web tool developed under C07.

Capacity Project Schedules

Exhibit 2 illustrates project schedules.



Version 3 - 12/08/08

LEGEND

RFP Advertisement

Phase Report (Draft Submission, Review, Final)

Final Report and Review

I - Interim Report
A - Approval Required

Follow-on Projects

Expected Project Start

Changed from orginal date

Completed as planned

Color change indicates change in Phase