Research Plan

5.1 INTRODUCTION

SuperPave, an acronym for SUperior PERforming asphalt PAVEments, is the overarching term used to reference one of the primary products of the asphalt research portion of the 1987-1993 Strategic Highway Research Program. Functionally, this $53 million research program was a resounding success: by changing the asphalt binder specification, introducing a new mix design method, and developing mix analysis methods as well as new performance metrics, SuperPave resulted in pavements that perform significantly better under extremes of temperatures and heavy traffic loads.

Despite this clear success, a problem developed. The problem with SuperPave was not in the product itself but rather in the speed of its adoption and implementation. The SuperPave system was formally introduced to the user community in 1992, but over 10 years elapsed before this significant technological advancement was fully adopted. SuperPave is not alone in experiencing this phenomenon: bringing technological innovation and new products into mainstream practice continues to be a difficult and incremental process within the transportation industry.

As the next-generation SHRP2 program nears completion, many promising new technologies, concepts, and practices have emerged from the four funded programs (Reliability, Capacity, Safety, and Renewal). This, together with the experiences related above of the original SHRP program and SuperPave, makes Project L17 (A Framework for Improving Travel Time Reliability) a very important capstone of the Reliability Program. This is because its most important product is a Knowledge Transfer System (hereafter referred to as a KTS) that will serve as an effective means for moving research findings and products from many different projects into mainstream practice.

An effective KTS is critical to the long-term success of the Reliability program and even the SHRP2 program as a whole: without it, our experience shows us that business-as-usual practices will tend to drag on, if for no other reason than the sheer momentum that these practices have previously built up for themselves. Fortunately, more and more people within the transportation industry are becoming sensitive to this issue and looking for ways to effect real practice change within a reasonable window of time. Further, the science of knowledge transfer/knowledge management is not a new one. Therefore, understanding the principles underlying effective knowledge transfer will be instrumental to informing the specific task activities and strategies that should be undertaken with Project L17.
Exhibit 5-1 provides a schematic overview of the knowledge transfer process. As the Exhibit illustrates, it can be thought of as an iterative process that builds upon and reinforces itself when conducted in a methodical, step-wise manner.

The process begins with new knowledge that is achieved, often in incremental bits and pieces, through basic or applied research, new experiences, and even the outcomes of trial-and-error experiments (*Learn & Capture*);

Exhibit 5-1. **The Knowledge Transfer Process**

- In order to maximize their collective value, these bits and pieces of new knowledge are brought together and inter-related with one another through a synthesis-type of activity (*Identify & Value*).

- A critical review of the synthesized information will often reveal knowledge gaps where the accumulated knowledge is not sufficient to produce a cohesive, useful, and usable product in and of itself. Where such knowledge gaps are found, they must be filled in order to avoid a premature abortion to the overall knowledge transfer lifecycle process (*Validate & Document*).

- When all critical gaps have been filled, the new knowledge set will be fully functional, useful, and usable, and so it can then be made available for use by everyday practitioners (*Publish & Share*).

- The new knowledge set enters into the mainstream of practice through awareness, acceptance, and application by the practitioners (*Transfer & Apply*).

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• At each stage in the knowledge transfer process, interaction with key audiences – both users and the key authorizers -- is needed to insure that audience context, needs and issues are addressed

• Everyday use of the new knowledge set will inevitably introduce new opportunities for learning and/or raising previously unasked questions, and thus the knowledge transfer lifecycle begins anew.

The knowledge transfer process described in Exhibit 5-1 is a logical and methodical sequence of steps that are equally applicable to the needs of Project L17. To make reliability a mainstream ingredient of transportation practice within this construct, however, each step in the process must be addressed across multiple dimensions. Specifically, it is critical that the following three dimensions be addressed more-or-less in parallel: a) the technical content that is to be included; b) the form and structure of the knowledge transfer system itself; and c) the branding, communication, and outreach strategies necessary to connect (and stay connected) with the boots-on-the-ground practitioners who are the ultimate implementers.

Further, the methods used to transfer knowledge to practitioners need to be decidedly active, not passive. We have identified a variety of approaches to convey knowledge to users as part of a formal Knowledge Transfer System, as further detailed in our work plan. In the case of the Reliability Research Program, this knowledge relates to both how practitioners can integrate research results into everyday practice and why they should do it. The Kittelson team recognizes the importance of transferring both forms of knowledge to practitioners, especially because reliability is so closely linked to transportation system operations and management (TSO&M). We have been leaders in developing both technical guidance on reliability and TSO&M and actively promoting their integration into practice.

With these thoughts in mind, the project team has reconfigured the tasks and deliverables outlined within the Request For Proposal (RFP) according to the global structure of Exhibit 5-1 and the dimensions listed above. The result, shown schematically in Exhibit 5-2, represents a conceptual outline of the organizational structure defining the project team’s Research Approach. Subsequently, another Exhibit will articulate how the project team proposes to transform this conceptual outline into an organized work flow diagram that will be the basis for the proposed Research Approach.
5.2 OVERVIEW OF KEY ISSUES

As preparation for the Research Approach that follows, Project Team members conducted a series of face-to-face brainstorming sessions in order to identify and vet key issues that will need to be directly and comprehensively addressed in order for Project L17 to achieve the desired outcomes. The most important of these issues are briefly presented and discussed below in order to set the stage for full understanding of the context in which each Task activity is discussed within the Research Approach that follows.

5.2.1 Mainstreaming TSM&O

A key issue facing the SHRP2 Reliability program is the real and ongoing challenge of mainstreaming transportation system management and operations (TSM&O) activities. Significant cultural and institutional barriers have either thwarted or significantly slowed this necessary evolution in many states and across many public transportation agencies over the past 5-10 years. Yet this is also an important prerequisite to mainstreaming the products of the SHRP2 Reliability program, principally because the primary window of opportunity for applying the many new products and strategies that have been developed is via TSM&O activities.

At the same time, it must be recognized that not all transportation agencies are equally receptive to the notion of elevating the importance and stature of TSM&O activities. At one end of the spectrum are a few states and MPO’s that have a need, understand the value, and have already started the transition process. At the other end of the spectrum are agencies that either do not have a need at the moment (perhaps because they are...
rural states with no major urban center) or do not see the need. Thus, it is useful to recognize that there is a range of agency audiences to which the L17 product might be targeted:

- **Fully engaged** - These are agencies that have integrated programs that are substantially mainstreamed and that are establishing the state of the practice in many areas.

- **Transitioning** – These are agencies that recognize the importance of TSM&O activities and the importance of reliability, and are in the process of developing/implementing comprehensive programs to address these issues.

- **Observer** – These are agencies that have some awareness of the potential of TSM&O activities to improve the effectiveness of the transportation system, but that have not yet moved beyond ad hoc implementation on a very limited basis.

- **Unaware** – These are agencies that have not yet recognized the potential relevance of TSM&O to their day-to-day activities.

This range is further complicated by additional considerations. For example, the level of engagement by a particular agency does not necessarily correlate with the actual severity of delay, congestion, and reliability issues for the transportation system it oversees. As well, the geographic jurisdiction of one agency often overlaps with that of another, but the two (or more) agencies whose jurisdictions overlap are not guaranteed to be at the same state of readiness simultaneously.

Cutting across the current agency level of capability regarding TSM&O (and not always consistent with it) is the orientation of the institutional policymakers and external stakeholders who reinforce each other to establish the “authorizing environment” for increased focus on TSM&O. This orientation has a major influence on the likelihood that agency staff will develop, maintain and improve TSM&O in terms of the level of accountability, resource support, visibility, etc. At the end of the day, change depends both on the agency leadership and its interaction with this authorizing environment. Individuals (as champions) can be key agents of change, but institutionalizing TSM&O as a formal core mission of transportation agencies depends on the support and even the demand by the policy and stakeholder community.

Thus, elevating travel time reliability and operational strategies relative to traditional construction projects requires that both audiences understand and embrace the benefits associated with the what, why, and how of this transition. Significantly, many of the individuals who should be targeted in this manner are especially difficult to engage both externally and internally. Internal key players are District Engineers who manage...
agency service delivery within a state DOT, and these are people who do not typically attend many conferences, do not have an association that looks out for their specific interests, and are busy to the point of being overwhelmed by the day-to-day activities necessary to “keep the engine running”. Policy makers – agency CEOs, elected officials (such as within a governor’s office), external interest groups who exert influence (construction industry, land developers, shippers, etc.) – are not within the transportation conventional communications orbit nor responsive to the jargon and concepts that are part of it.

Yet to be successful, this project must find ways to get the attention of these individuals, make the business case for why change is necessary within the context of their own daily activities, and then give them the tools that will allow them to direct and/or oversee the transition process.

5.2.2 Creating Brand Understanding

A recent marketing evaluation of TSM&O’s difficult integration into the mainstream of transportation agency activities concluded with a fundamental concern: “there is no definable customer for a definable product at a definable time”.

The project team believes there is considerable truth in this statement. The current definition and brand image of TSM&O is fuzzy, at least in part because TSM&O-related terminology and definitions have morphed and broadened over time. In the 1980’s the idea of using emerging technology to support system-wide traffic management was “branded” as Intelligent Transportation Systems (ITS). Over the next decade, however, this term was overwhelmed by a myriad of other acronyms used to reference more specific technological applications (for example, AVL, AVI, DMS, DLM, and on and on). Next, umbrella terms like “system operations and management”, “SO&M”, and “transportation system management and operations (TSM&O) started emerging in an effort to capture all of these specific applications under one overall theme. FHWA later attempted to brand the term “operations” when their support for SO&M was formalized in the federal aid program, and AASHTO initiated a subcommittee called SO&M. More recently, customer confusion was increased even more when the “congestion management plan” requirement was incorporated into federal planning regulations. Over the last 20-25 years, therefore, transportation industry professionals have been exposed to at least five different terms (including ITS, Operations, TSM&O, SO&M, and Congestion Management) that are meant to be a brand that is inclusive of travel time reliability. And although there is much overlap, each of these terms comes with a slightly different definition and with a focus on a slightly different target audience.

This “language and definition” confusion represents a considerable challenge for advancing the implementation of TSM&O. The marketing evaluation mentioned above
described this problem in more detail: “We are attempting to sell a wide variety of ‘products’ to a ‘customer’ that is actually a mix of decision-makers and role players, involved in a ‘buying decision’ that evolves over many months and even years. As such, there is no definable customer for a definable product at a definable time.” (emphasis added)\(^2\) To make matters more complex, what needs to be communicated to the professional audiences is quite different from that needed for the external stakeholders.

For a “reliability brand” to be successfully implemented post-SHRP2 the industry must reach consensus on the definition of the product transportation agencies are being asked to implement. Simply creating a brand name that “sizzles” is not enough--- the definition that goes with that brand name must also be clearly and memorably articulated. Creating consensus is not only the fundamental building block for the KTS, it is also the foundation for creating buy-in and commitment the implementation of the Reliability Program research post-SHRP2. Communicating this consensus – both within and without the transportation community is also a challenge.

### 5.2.3 Designing an Effective Knowledge Transfer System

The physical, logical, and operational structure of the KTS that is developed through this project must be carefully designed and planned in response to the challenges identified elsewhere in this overview of key issues. In its totality, the final product must be able to adapt itself to the distinctly different informational and communication needs of a wide range of audiences, each of whom may also come to the table with a different level of readiness with respect to embracing travel time reliability and operational strategies as key components of their mission.

This project is constrained in its ability to develop and sustain an appropriate level of interaction with each of these audiences by the very fact that this is a defined project with defined time and budget limitations. As a result, the KTS must be designed in such a way that it can live on its own long after the project has concluded, and particularly with respect to the “Transfer & Apply” step shown earlier in Exhibit 5-1. This requires that there be active as well as passive components to the KTS so that it has the ability to connect with various target audiences according to their readiness timelines, even if these timelines extend well beyond the conclusion of Project L17.

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A familiar model of effectively combining a range of knowledge transfer techniques might serve as a starting point for the L17 design process and in fact illustrates much of the initial vision of the project team. More specifically, consider the important communication techniques that are built into many local library systems, as shown in Exhibit 5-3.

Exhibit 5-3. **Library analogy to an effective KTS.**

- The library itself becomes the physical repository for the knowledge (books, tapes, videos and periodicals) that is accumulated and made available to the various audiences. The library structure is a passive component of the overall KTS in that the various audiences (school children, teens, young adults, seniors, etc.) must initiate the interaction by traveling to the physical location of the library. Thus, it does a good job of serving audiences who already know about the library, understand the value of its contents, and are prepared to invest the necessary effort to make use of the facilities. This is not unlike a web portal for a KTS that might be built under Project L17: it can be a very effective and centralized repository of synthesized reliability information, but its primary effectiveness is limited to audiences that already understand and appreciate the value of its contents.

- Bookmobiles are used by many libraries as a way of extending their influence to audiences that do not yet fully appreciate the value of what the library has to offer them. Thus, the Bookmobile is stocked with a limited but varied sampling of the main library’s offerings, and travels out to the places where the various audiences reside. It does this regularly enough so that people in the outlying
areas can browse and become familiar with the library’s offerings according to their own timeline and schedule. In the case of the KTS built under Project L17, this same function might be achieved by creating a coordinating network of existing organizations communicate a single brand and combined message using both traditional (speakers bureau, conferences) and creative technology based channels (webinars, blogs, wikis, Facebook). In this manner, the KTS could continue to interact with its target audiences, in an active way, long after the project itself has been completed.

- Book clubs are used by many libraries as a way of enhancing the value of the knowledge contained within the library, extending the range of interests of the library users, and creating a sense of community by bringing people together through their personal interactions and mutual support. The library often provides the venue for the book club meetings by making rooms available for this purpose. In the same manner, the KTS developed under Project L17 might create an additional and active way to stay engaged with its various audiences by establishing and hosting online forums on a variety of topics related to travel time reliability. The leadership of each forum would come from audience members who are not only peers of the other membership but are already firm believers in the value of elevating TSM&O activities within an agency’s mission. If online forums such as these were established, populated, and facilitated early in the life of Project L17, then it’s likely they would have the necessary momentum and history to carry on by themselves at the project’s conclusion.

It should be noted that – just as libraries, bookmobiles and book clubs are not created for publishers or librarians (but for readers); the KTS must respect the range of user audiences.

In developing the KTS, the Kittelson team will follow a structured process based on the accepted principles used throughout the knowledge and information management industries. These principles are based on developing requirements with the end users in mind, and we have allowed for multiple places for users to provide input and react to the system as it evolves. We also recognize that the KTS must be capable of standalone operation to meet current SHRP 2 needs as well as to have the ability to transition into the expected SHRP 2 Implementation Phase.

### 5.2.4 Collaboration with Users and Stakeholders

Effective outreach is going to be critically important in assuring the success of the L17 project. In this context, outreach should be read as a term describing two-way interaction; that is to say, it will be as important for the project team members to listen to the users and target audiences as it will be to inform them about the benefits of integrating travel time reliability and operations into their daily activities. The KTS will
only be effective if the target audiences consider it to be useful and usable. Their participation and ownership in the development of the final L17 products is of course bound to result in a more robust and effective tool. More than this, however, their participation and ownership is viewed as one of the most effective means of assuring continued active support and promotion of the KTS as well as the implementation of a travel time reliability program after Project L17 has been completed.

Stated another way, one of the very important outcomes of the outreach program should be buy-in and commitment by the target audiences to the brand that is ultimately developed as well as the KTS. The project team believes the necessary level of buy-in and commitment can be achieved through three complementary actions:

1. Audience participation in the development of the content and in the design of the KTS (this is effectively the outreach program associated with Project L17);

2. Communication and branding activities that occur both during the active life of Project L17 (through a project website and presentations, for example) and also after the project has concluded (through a preplanned and choreographed post-project communication strategy, for example); and

3. Specific answers to the what, why, and how questions that will come from prospective users and organizations who want to know “what’s in it” for them (these can be provided through such things as, for example, Speakers Bureau materials, business case studies, and affirmations from organizations that are already on board).

Finally, while the KTS is focused on the needs of the transportation agency users, what they need (business cases, branding, etc) must be substantially influenced by those outside the TSM&O “community” such as key policy makers and external stakeholders who influence policy.

These observations emphasize the project team’s belief that Project L17 should be viewed as a pre-implementation activity for the SHRP2 Reliability program overall.

### 5.2.5 Project Management and Coordination

Good communication is intrinsic to the success of any project. In most SHRP projects, this is typically achieved through monthly and quarterly progress reports from the Contractor, review comments provided by ETG/TCC members on both progress reports and interim documents, and possibly one or two face-to-face meetings between the ETG/TCC members and the Contractor at key milestone points in the project timeline. Internal communication links are also very important for project team members to stay connected with one another and to take maximum advantage of each other’s capabilities to contribute creative ideas and suggestions in all phases of this project.
Toward this end, we will be using a desktop video and telephone conferencing system, regular face-to-face meetings of the project team members, and a project website to strengthen communication and coordination.

**Desktop video and telephone conferencing:** In addition to monthly and quarterly progress reports, response to review comments, and occasional face-to-face meetings, our project team will take advantage of desktop videoconferencing technology to maintain stronger and more frequent interactions between team members. KAI owns and operates a video and audio conferencing bridge that is capable of accommodating up to 40 videoconference connections and 40 audio connections (more detailed information on this system is included in Section 8: Equipment and Facilities).

With the KAI videoconference system, project team members will connect with each other individually or as a group, they can do so whenever they need to without incurring special charges, they can share their computer desktops and files with one another, and some can participate by video while others participate by telephone, according to their particular needs at the time. Exhibit 5-4 illustrates the system in the context of a videoconference conducted recently among people in several KAI offices. When combined with timely face-to-face meetings this system sets a higher standard of communication within a seamless and integrated team capable of taking full advantage of each individual’s strengths and expertise.

The protocol that KAI is applying in other SHRP2 projects is to use the video and audio conferencing system for regularly-scheduled weekly meetings of the team members, in addition to occasional one-on-one meetings as appropriate. Each of the regularly-scheduled team meetings is scheduled for 90-minute duration and is conducted around an agenda that allows discussion of team progress by individual team member, problems encountered, and agreed-upon next steps for the coming week. This format has proven to be very effective for all team members, and this project team intends to follow the same procedure.
Face-to-Face Meetings of Project Team Members: As helpful as the weekly desktop videoconferencing meetings have proven themselves to be, even more benefit can be obtained from periodic face-to-face meetings among the project team members. The effective discussion and resolution of some key issues that Project L17 will face requires more time and even more fluid interaction than can be obtained from a video conference. KAI’s typical regimen is to convene these face-to-face meetings at three to four month intervals. The meeting venues are rotated among the locations of the individual team member firms in order to minimize individual inconveniences while also maximizing the level of knowledge and interaction each team member has about all others. Each meeting lasts for 1½ to 2 days and is preceded with a carefully planned agenda. These meetings are especially effective in moving the team significantly forward in its progress toward key milestones; they also assure that all team members continue to stay intimately involved and aware of all project activities.

Project Website: The final component to help with communication and coordination will be a dedicated website for the project. The project website will provide general information regarding the project purpose, objective, schedule, among other things. A password-protected section of the site will also be used to disseminate key project deliverables among project team members and/or the ETG/TCC membership and SHRP2 staff, and will help to manage the receipt of comments from the various reviewers. Exhibit 5-5 shows an example of a similar website KAI developed to use for NCHRP 17-36 (Production of the First Edition of the Highway Safety Manual).

Exhibit 5-5. Sample Project Website
The capabilities provided by this combination of equipment, technology, and protocol will greatly increase the frequency, quality, and effectiveness of communications among project team members while simultaneously keeping associated costs to a minimum. These capabilities will also help both ETG/TCC members and SHRP2 staff to stay informed about project activities and to make key scope-related decisions in a timely manner. That is not to say that we expect ETG/TCC members or SHRP2 staff to become regular participants in project activities—that is still the responsibility and domain of the project team. Even so, their ability to gain access to project materials and even stay connected with one another will be enhanced through these elements.

Quality Assurance/Quality Control: The quality of the final products and the effectiveness of the time investments made by individual team members is assured by a combination of factors:

- The senior leadership of each team member firm is very experienced. Each of these individuals is also attuned to the needs and ongoing activities of the SHRP2 program by virtue of his/her history of involvement with the program.
- The integrated team approach described above means that every key team member knows everything that’s going on with the project at all times. That is, everyone is involved at every stage of the project, and this maximizes opportunities for critical review, feedback, and best possible outcomes. It should be emphasized that each important project activity and milestone will continue to be the responsibility of a single team member so accountability can be maintained. However, our approach of keeping everyone involved in every stage of the project ensures that the full strength of the team’s collective experience and capabilities will be brought to bear on every aspect of the project.
- Each team member firm has its own strong internal capabilities for technical/editorial review and input, and each has its own internal protocols for quality assurance/quality control. These capabilities and protocols will further benefit the project.

Coordination: It has been noted above that this project team will operate with a high degree of coordination and regular interaction. To recap, this includes:

- a weekly desktop video and/or audio conference call among all team members;
- regular 1½ - 2 day face-to-face team meetings spaced at three to four month intervals;
- web-based tools for file transfer and document sharing; and
- monthly and quarterly progress reports.
Beyond this, the project team members are collectively involved in a large body of ongoing SHRP2 research already. Going into Project L17, therefore, they have a strong understanding of the objectives and work status associated with each of these projects. KAI has taken a leadership role in coordinating and convening SHRP2 Contractor meetings in the past for the purpose of facilitating such interaction and dissemination of information, and will continue to do so under the auspices of Project L17.

Outside the realm of SHRP2-related project activity, team members have extensive ongoing professional interaction and work responsibilities with virtually every facet of the transportation industry. Collectively, project team members regularly (and currently) work with a large number of staff from FHWA, TRB, AASHTO, AAMPO, most state DOTs, and many MPOs, municipalities, and county governments. Team members also work regularly with practitioners such as District Traffic Engineers and MPO Program Managers. Finally, the individual team members are currently engaged in work activities with many other consultants, institutions, and private entities.

5.3 OVERVIEW OF TEAM QUALIFICATIONS

The research team members are uniquely qualified for this project and have joined together because of their proven track record in the areas of travel time reliability and the SHRP2 program, communications and marketing, knowledge transfer systems, and interface with everyday practitioners. The team brought together for this project includes the principal participants in many related SHRP2 and NCHRP projects, including:

- SHRP2 Project L02: Establishing Monitoring Programs for Travel Time Reliability
- SHRP2 Project L03: Analytic Procedures for Determining the Impacts of Reliability Mitigation Strategies
- SHRP2 Project L05: Incorporating Reliability Performance Measures into the Transportation Planning and Programming Processes
- SHRP2 Project L06: Institutional Architecture to Advance Operational Strategies
- SHRP2 Project L11: Evaluating Alternative Operational Strategies for Improving Travel Time Reliability
- SHRP2 Project C01: A Framework for Collaborative Decision-Making on Additions to Highway Capacity
- SHRP2 Project C04: Improving Our Understanding of How Highway Congestion and Pricing Affect Travel Demand
- SHRP2 Project C05: Understanding the Contributions of Operations, Technology, and Design to Meeting Highway Capacity Needs
• SHRP2 Project C10: Partnership to Develop an Integrated Advanced Travel Demand Model and a Fine-Grained, Time-Sensitive Network
• NCHRP Project 3-94: Systems Operation and Management Guide

5.3.1 Principal Investigator

Wayne Kittelson will serve as the Principal Investigator for the project. Wayne is the Founding Principal of Kittelson & Associates, Inc. and has for over 30 years directed and participated in a wide variety of projects related to traffic engineering, transportation planning, highway design, public involvement, and transportation research. He has been actively involved in a wide range of NCHRP, TCRP, SHRP2, and FHWA-sponsored applied research projects dealing with the development of guides and methods for the planning, design, and operational analysis of all types of transportation facilities.

5.3.2 Principal Researchers

The following individuals will serve as Principal Researchers in the project, taking leadership roles in the development of the KTS and production of the deliverables.

Brandon Nevers is the Reston, Virginia Office Manager for Kittelson & Associates, Inc., and has a lengthy track record of involvement in applied research projects as well as providing an effective interface with both public and private sector clients. He is currently a key member of the SHRP2 C-05 research project: Understanding the Contributions of Operations, Technology, and Design to Meeting Highway Capacity Needs. He is also the Principal Investigator for NCHRP 3-98: Guidance on the Use of Auxiliary Through Lanes at Signalized Intersections. Mr. Nevers was a co-investigator of a research project for the FHWA that resulted in the publication of Signalized Intersections: Informational Guide, and he led an effort to collect and analyze saturation flow rates for signalized intersections in three districts for the Florida Department of Transportation. He was a team member of NCRP 3-74: Speed Reduction Treatments for High-Speed Intersections. He has also conducted numerous corridor studies, signal timing studies, long range plans, and traffic impact analyses at the local level in Oregon, Washington, Maryland, and Virginia. He has taught Highway Capacity Manual classes for the Georgia and Florida DOTs and has guest lectured at universities.

Janet D’Ignazio, a Vice President at ICF International, has nearly 30 years of experience working with state and local transportation agencies. She has served in executive positions at the Michigan and North Carolina Departments of Transportation. Ms. D’Ignazio is the Principal Investigator for the SHRP2 Capacity Project C01 project “Collaborative Decision Making Framework for Adding Highway Capacity”. The purpose of this $4.6 million project is to design a state of the practice collaborative decision making framework and associated webtool that state DOTs, metropolitan...
planning organizations and federal environmental resource agencies can use to implement highway capacity improvements. The project includes detailed case studies examining best practice in collaborative decision making and the development of a framework that provides a “road map” for improving collaboration in state DOT and MPO decision making.

**Dr. Richard Margiotta** has 28 years of experience in the transportation field, including research, planning, and policy analysis. He served as Principal Investigator for Strategic Highway Research Program (SHRP) 2 Project L03: Analytic Procedures for Determining the Impacts of Reliability Mitigation Strategies. Currently, Dr. Margiotta is co-directing the Mobility Monitoring Program for the FHWA. He is also a Principal Investigator on the I-95 Corridor Coalition Performance Measures project, which is developing performance measures for intercity trips and bottlenecks using continuously collected vehicle probe data.

**Stephen Lockwood** offers a unique combination of policy, finance, program and technological knowledge with almost 40 years of applications experience. He has special expertise in transportation-related institutional development, serving as consultant to state governments and associations in their focus on emerging asset and systems management issues. Steve served for 3 years as the senior FHWA policy officer, 2 years as director of the Transportation 2020 Coalition and over 15 years as a principal-in-charge or project manager for highway and transit planning and project development projects for a major international consulting firm. While with FHWA, Steve was instrumental in the development of the first new national transportation legislation in over 35 years—the Intermodal Surface Transportation Efficiency Act (ISTEA). In 2003, he was selected for The Theodore M. Matson Memorial Award, in recognition of outstanding contributions in the field of traffic engineering.

### 5.3.3 Relevant Capabilities of Team Firms

The project team brings an enormous depth of seasoned research professionals who provide the team with the ability to address any project research need and, equally important, to accomplish the work within a very short time period. Specific relevant capabilities of each team firm are briefly summarized below:

**Kittelson & Associates, Inc.**

Kittelson & Associates, Inc. (KAI) focuses its work exclusively on transportation and has both national and international presence. The company has a staff of over 100, and for more than 25 years it has been actively engaged in transportation engineering, planning, and design within both the public and private sectors. It has also maintained a consistent and significant presence in the arena of applied research, including work with NCHRP, TCRP, FHWA, and SHRP2 programs. As a result, one of the company’s
great strengths lies in its ability to provide an effective interface between state-of-the-art research results and the day-to-day needs of transportation professionals and practitioners. This is evidenced by the many significant contributions the company has made to the methods, tools, guides, and reference books that are in common use throughout the profession today. Some of these include the following:

- Roundabouts: *An Informational Guide* (Federal Highway Administration, 2000)
- Transit Capacity and Quality of Service Manual (Transit Cooperative Research Program, 2003)
- Evaluation of Traffic Signal Displays for Protected/Permissive left-Turn Control Streets (National Cooperative Highway Research Program, 2003)
- Signalized Intersections: An Informational Guide (Federal Highway Administration, 2004)
- *Kansas Roundabout Guide* (Kansas Department of Transportation, 2005)
- Guidebook for Evaluating, Selecting, and Implementing Suburban Transit Services (Transit Cooperative Research Program, 2006)
- *Road Safety Audit Guidelines* (Federal Highway Administration, 2006)
- Guidelines for Selection of Speed Reduction Techniques at High-Speed Intersections (National Cooperative Highway Research Program, 2007)
- *Signal Timing Manual* (Federal Highway Administration, 2008)
- Multimodal Level of Service Analysis for Urban Streets (National Cooperative Highway Research Program, 2008)
- Access Management in the Vicinity of Intersections (Federal Highway Administration, 2009)

• *Highway Safety Manual* (NCHRP and AASHTO, 2010)

**Cambridge Systematics**

Cambridge Systematics has been at the forefront of travel time reliability since it was first identified as an important issue in transportation. These experiences range from development of measurement concepts to the procedures needed to move the concepts into practice, and include the following:

• Conducting the early defining research on travel time reliability, including performance measures and analytic methods, through our leadership on: 1) FHWA’s Mobility Monitoring Program; 2) NCHRP Project 3 68 – Guide to Effective Freeway Performance Measures; and 3) NCHRP Project 7 15 – Cost-Effective Methods and Planning Procedures for Travel Time, Delay, and Reliability.

• Leading the development of the F-SHRP Reliability Research Program, which defined what would become the SHRP 2 program. This experience is particularly relevant for the proposed research because it demonstrates the ability to define knowledge gaps and develop tangible projects to address them.

• Leading SHRP 2 Project L03 – Analytic Procedures for Determining the Impacts of Reliability Mitigation Strategies and SHRP 2 Project L07 – Evaluation of Cost-Effectiveness of Highway Design Features, both of which are foundational research for the L05 project (and several other SHRP 2 projects).

• Working to integrate our SHRP 2 Project C02 – Performance Measures Framework into the Collaborative Decision-Making Framework being developed in project C01. We also have integrated reliability measurement concepts being used in our Project L03 into these efforts. C10 (Partnership to Develop an Integrated, Advanced Travel Demand Model and a Fine-Grained, Time-Sensitive Network) is another example of a project CS is involved with. The proposed research can take advantage of these previous efforts and more efficiently develop and validate the Handbook.

• Developing simplified methods and post-processors for estimating reliability and its cost, most notably with the Intelligent Transportation Systems (ITS) Deployment Analysis System (IDAS), the Highway Economic Requirements System (HERS) Operations Preprocessor, and the current Development of Benefit-Cost Desk Reference to Assess Investments in Management and Operations for FHWA.
• Development of training, outreach, and promotional materials for reliability and operations, including the Travel Time Reliability Workshops, Operations Performance Measures Workshops, and the Road Weather Management Program Marketing Plan and Outreach Products.

ICF International

ICF International (NASDAQ:ICFI) is an international strategy, policy, and management consulting firm headquartered in Fairfax, Virginia, with offices spanning across the U.S. Established in 1969, ICF provides technical and management solutions to federal, state, and local governments as well as private and not-for-profit institutions. It is one of the ten largest consulting firms in the U.S., with more than 3,500 employees serving government at all levels, major corporations, and multilateral institutions.

ICF has extensive experience in branding and outreach. In 2002, the firm was ranked number one in government and social education public relations by the Council of PR Firms. ICF International also was ranked as the thirteenth largest public relations firm in the nation and second largest in the Washington, D.C., metropolitan area. Some relevant examples are Clean Air New York, (http://www.cleanairny.org/cleanairny/Home/Default.aspx), Aids.gov (http://aids.gov/), and Energy Star, which ICF developed and branded (http://www.energystar.gov/).

Parsons Brinckerhoff

PB is one of the oldest continually operating consulting, planning, engineering, and construction organizations in the United States.

The company supports federal, state, local and regional clients in the development of strategic policy, management and institutional efforts to develop more effective programs and policies – as well as efficient organizational structures and relationships. PB also has extensive experience with strategic consulting assignments that help clients identify and implement organizational changes that improve performance. These have been applied to the development and implementation of systems operations and management (SO&M) programs – including special analytics related to institutional and organizational capacity opportunities and constraints. PB provides the complete array of skills for the development and implementation of innovative service concepts and project development. Overall, PB maintains a close liaison with federal agencies, state and local governments, industry associations and funding agencies in order to provide timely policy, program, technical and financial support to our clients.

In addition to its technical focus, PB has developed a wide array of tools to communicate with the transportation-related audiences. Special skills and tools available in the area of web site design and development, which is particularly relevant to the needs of this project, include a full range of website software development tools
(for example, Adobe Illustrator, Adobe Photoshop, Macromedia Dreamweaver, and Interwoven), coding languages and scripts (for example, HTML, Javascript, ASP.net, SQL, AJAX and Flash), and proprietary resources (for example, CommentSense and Ultimate Survey).

## 5.4 RESEARCH APPROACH

The research plan described in this proposal has been developed to achieve the project’s stated goals and objectives. Exhibit 5-6 illustrates the work flow process that will guide the project team’s activities. Relative to the original RFP, this Exhibit also reflects a reorganization of the planned work activities; the project team did not undertake this reorganization lightly, but believes the changes will allow for more effective and seamless interface among the activities occurring within the three parallel tracks of KTS Content Building; Knowledge Transfer System; and Branding, Communication, and Outreach. At the same time, this reorganization also provides for a logical, sequential and integrated ordering of project activities across four distinct phases. Finally, it is important to note that all task activities and all deliverables identified in the original RFP are included and accounted for in the reorganized work flow process.

The proposal plan will be carried out within the time frame and budget allocations for this project. Detailed descriptions of the work to be performed for this project are described in Sections 5.5 through 5.7 for Tracks A through C, respectively. The deliverables resulting from each phase of work are summarized in Section 5.8: Anticipated Research Results.
5.4.1 Outreach

The L17 project is a pre-implementation activity for the SHRP2 Reliability Program. Our goal for the project, therefore, is to conduct the research specified in the scope of work and build the foundation of industry understanding and acceptance of the research products developed during the life of the SHRP2 program. The challenge is that the audience for Reliability program implementation is broad, diverse, and largely disaggregated. It represents all individuals, agencies, organizations, and groups that have an interest in reducing congestion and thus improving transportation travel time. This includes a wide and diverse range of practitioners; organizations that are currently involved in promoting and transferring knowledge about implementation of TSM&O; and academics who are actively engaged creating the practitioners of the future. An outreach program must be designed to leverage the expertise and create support from each of these groups.

From the outset of the project team will seek to engage our target audiences in ways that recognize their needs, listen to their opinions, and respond to what is learned. This means that we will continue to change, adapt, and refine our outreach methods and
materials throughout the project timeline. To accomplish this we are proposing to have three formal outreach groups: User Community, Institutional Community and Academic Advisory Team. Each of the formal groups has a part to play achieving our three outreach goals but their primary focus will be different. In addition, we will conduct interviews with Executives and Senior Managers to ensure that the products developed as part of this research effort provide practitioners and professionals with the tools they need to demonstrate the importance of reliability.

The User Community is the “go-to” group for input on our L17 product development with particular emphasis on the brand and the KTS design and content. As a secondary purpose we will encourage members to become ambassadors for the final project outcome to help instigate change in their respective agencies as well as others they may interface with in the future.

The focus of our outreach with the Institutional Community will be to begin to establish relationships with both service delivery partnership – and with key representatives who reflect the policy and stakeholder communities that are crucial to “mainstreaming” reliability-related activities in the long term.

Our Academic Advisory Team will have primary responsibility for helping identify the barriers and recommendations for educating future practitioners. As there is currently very little academic experience or material related to reliability or SO&M, relevant NCHRP and NHI studies regarding curriculum material will be reviewed during the gap analysis phase to understand the needed knowledge, skills and abilities (KSAs) and how they relate to current course materials.

Key issues that will be addressed include the following:

- How can these gaps be addressed within existing courses?
- What new courses might be needed?

Our experience to date suggests that very limited relevant course material is currently available in this topic area. Therefore, we anticipate that development of course materials and resources might be included on the list of gap filling proposals identified during Phase II.

Each of these three formal groups will have appointed members that we will work with through the life of the project.

In addition to the formal groups involved throughout the project we will create a virtual and unstructured User Network that can provide wider and more diverse input at critical points in the development of the brand and the KTS. These individuals will assist greatly in dissemination of both the brand and the research to support early adoption by the larger audience. By establishing a project website and blog as well as
using other social media, this audience can become engaged in the project from its inception. Exhibit 5-7 provides summary information about each of these groups.

The Kittelson Team considers the outreach component absolutely essential to the success of the L17 project and eventually to the implementation of the SHRP2 Reliability program. We have a strong practitioner base on our team, and we know from first hand experience that transportation professionals are stretched very thin. We will have to be focused, creative and cost effective in our outreach efforts relying heavily on virtual outreach and collaboration techniques while taking advantage of otherwise scheduled conference, workshop, and peer exchange opportunities as they arise. The advantage of this approach is that is will allow us to evaluate the effectiveness of a variety of virtual communication and collaboration strategies that may be incorporated into the final communication strategy and/or highlighted in the post-project implementation issues white paper.

<table>
<thead>
<tr>
<th>Exhibit 5-7. Proposed Outreach Participants</th>
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<tbody>
<tr>
<td><strong>User Community</strong></td>
</tr>
<tr>
<td>• Primarily practitioners from transportation agencies</td>
</tr>
<tr>
<td>• 12-15 Individuals</td>
</tr>
<tr>
<td>• Diversity across audience segments, functional roles, and geography</td>
</tr>
<tr>
<td>• Potential inclusion of 1st responder representation</td>
</tr>
<tr>
<td><strong>Institutional Community</strong></td>
</tr>
<tr>
<td>• Existing organizations with interest in TSM&amp;O</td>
</tr>
<tr>
<td>• 10-12 representatives at policy and stakeholder leadership level</td>
</tr>
<tr>
<td>• Particular emphasis on engaging those with existing TSM&amp;O brands</td>
</tr>
<tr>
<td><strong>Academic Advisory Team</strong></td>
</tr>
<tr>
<td>• Engineering / planning curricula expertise</td>
</tr>
<tr>
<td>• 8-10 representatives</td>
</tr>
<tr>
<td>• Diversity in existing support of TSM&amp;O curricula</td>
</tr>
</tbody>
</table>

| Informal User Network                      |
|• Includes broader representation of three formal groups |
|• Allows outreach to audiences not named as primary in the RFP |
|• Initial participants identified through Institutional Community members or committees |

### 5.5 TRACK A – CONTENT BUILDING

This section describes the work activities to be completed under the Content Building track of our work plan (Track A). There are three phases of activity in this track:

- Phase I: Synthesis
- Phase II: Gap Analysis
- Phase III: Gap Filling

The output from this track will feed into the development of the Knowledge Transfer System in Track B.

The deliverables from this track include:

- Synthesis Report (Deliverable #1)
• Gap Analysis Report (Deliverable #4).

5.5.1 Phase I: Synthesis

Synthesis involves gathering existing knowledge relevant to the final products. This effort will benefit significantly from the team’s substantial knowledge of reliability, thereby allowing us to devote more resources to gap identification and filling.

Task 1: Identify the objective of the “relevant” research to be synthesized

The Synthesis must provide a useful, compact, accessible summary that provides a stand-alone summary of the SHRP 2 Reliability research. However, it is essential that the synthesis be relevant to this project – not just an academic exercise. Therefore, there are three additional important considerations.

First, the synthesis content must be related to the needs of practitioners so that the KTS, the principal product of this project, can be successfully developed. The content synthesis must be developed in a structure that is responsive to the needs of the practitioners now as well as the implementation phase of SHRP 2 in the near future. This is a primary feature of our overall approach: to produce a KTS that is both usable now and is capable of transitioning and growing when the SHRP 2 Implementation Phase is initiated.

Second, the scope of the synthesis must go beyond SHRP 2 Reliability products to include other research and material that contributes to an understanding of the causes, dimensions, dynamics, impacts, and mitigation strategies of reliability to include:

• findings from the relevant SHRP 2 Capacity projects
• research and material developed by NCHRP, FHWA, RITA, I-95 Corridor Coalition, NTIMC, NTOC, ITS- A, state DOTs, and MPOs NCHRP, FHWA, State DOTs and MPOs, RITA, ITE and others

Third, it is necessary but not sufficient to synthesize technical material and other forms of guidance. That is, it is extremely vital that practitioners be convinced of the value of implementing the SHRP 2 reliability-related research. Therefore, the synthesis will also focus on the “why”, not just the “how”, in terms of the expected outcomes for both customers (travelers) and transportation agencies.

Task 2: Develop a useful structure and format for the content synthesis

Consistent with the above objectives, the synthesis must be structured to simultaneously accomplish its SHRP 2 Reliability Research Summary function, the Gap analysis but organized into a structure that directly supports the needs of practitioners to be supported by the proposed KTS. To accomplish this, we will take a topical
approach to organizing the technical material. One such structure – based on an adaptation of the Capability Maturity Model -- has been developed in SHRP2 L06 and further developed in NCHRP 3-94 by Team Members PB and CS. This structure is organized around the dimensions that must be addressed by transportation agencies to improve the effectiveness of their SO&M activities and has proved itself useful to practitioners in application. The process would work as follows.

The dimensions – potentially the “topics” of the KTS -- can be used to organize the content synthesis and gap analysis. They include program dimensions as well as the process and institutional dimensions that are needed to support effective SO&M. One potential organizational framework is:

- **Nature of reliability:** causes, performance measures, relationship of recurring/nonrecurring congestion.
- **Forecasting and evaluation including:** prediction, behavioral response, forecasting models, cost/benefit and evaluation frameworks.
- **Strategies and tactics toolbox (SO&M and capacity-related) including:** conventional and evolving applications and design features – and their relationships/effectiveness to “managing” the various causes of unreliability.
- **Business processes such as planning, programming and project management, systems architecture and technology, performance measures and measurement.**
- **Institutional factors including:** culture, mission, leaderships and organization, workforce, competencies, training, resources, costs, collaboration and partnerships.

Utilization of this type of structure will insure that both the gap analysis and inputs to the KTS are organized in a framework that relates to the realities of what is required for more effective SO&M and related to the needs of audiences.

**Task 3: Review available material**

The Team is familiar with the wide range of source material relevant to the content areas above. The material appropriate for the synthesis will include relevant research and guidance activities from SHRP 2, and the other sources cited above.

For purposes of illustrating the material available, SHRP 2 products have been combined with research and guidance from other sources under the same set of practitioners’-related categories indicated in Task 2 above. This result is summarized in Exhibit 5-8.

**Task 4: Prepare synthesis report**
The resources of the type described above will be presented in the KTS structure proposed in Task 2. This categorization will also facilitate gap analysis in audience-relevant terms. The report will clearly identify the SHRP 2 contributions and the non-SHRP materials to clearly delineate the important SHRP 2 contributions. Relevant research findings from each project that are applicable to practice will be highlighted and how they can be applied. The memorandum will be organized in a way that allows easy access and cross-referencing by the project team when the results of the synthesis effort are used later to identify gaps and also when the results are incorporated into the KTS.

A brief executive summary will be included – SHRP2 focused – for its use in other SHRP 2 discussions.
**The Nature of Reliability**
- L02: Procedures for travel data collection, processing, and management
- L10: Identification of driver behavior that affects crashes and the formation of congestion
- C04: Technical relationships for highway user behavioral responses to congestion, travel time reliability, and pricing
- C05: Quantification of the capacity benefit of operations, design, and technology improvements at the network level
- NTOC Performance Measures project


**Forecasting and Evaluation**
- L03: Reliability prediction methods for various strategies and improvements
- L04: Procedures/algorithms for producing reliability estimates from existing models
- L14: Accessibility and utility of traveler information, channels, and technologies and performance effects
- C02: Development of a performance measurement framework for collaborative decision-making process,
- C10: Integrated model–an integrated, advanced travel-demand model with a fine-grained, time-dependent network.
- R10: Tools for transportation agencies for innovative and effective project management strategies


**Strategies and Tactics Toolbox**
- L07: Design treatments to improve reliability and facilitate operations
- R11: Effective practices for executing highway renewal activities as they affect the corridors and networks


Optimizing the System (AASHTO, 2004) [http://download.transportation.org/OptimizingTheSystem.pdf](http://download.transportation.org/OptimizingTheSystem.pdf)


Integrated Corridor Management (article) [http://www.fhfrc.gov/pubs/08mar/08.htm](http://www.fhfrc.gov/pubs/08mar/08.htm)

**Business Processes**
- L01: Case studies and guidelines for implementing successful business practices to improve reliability
- L05: Guidance on integration of how reliability into technical and institutional processes for planning/programming
- L11: Identification and evaluation of innovative strategies and tactics for reliability improvement; requirements

The 21st Century Operations Oriented State DOT (NCHRP, 2005) [http://www.transportation.org/sites/ssom/docs/OpsOrientedDOT.doc](http://www.transportation.org/sites/ssom/docs/OpsOrientedDOT.doc)


Investment Opportunities for Managing Transportation Performance (Benefits) [http://www.ntoctalks.com/articles/TS_StimulusSummarv12.pdf?PHPSSESSID=b18e727cfc86b530f499b4177bafbe7c](http://www.ntoctalks.com/articles/TS_StimulusSummary12.pdf?PHPSSESSID=b18e727cfc86b530f499b4177bafbe7c)


New Federal Rule on Performance Reporting (Power point presentation) [http://www.ntoctalks.com/webcast_archive/to_feb_17_09/to_feb_17_09.pdf](http://www.ntoctalks.com/webcast_archive/to_feb_17_09/to_feb_17_09.pdf)


NTOC Performance Measures project


**Institutional Factors**
- L06: Identification of key institutional architecture issues; procedures for changing institutional architectures
- Lockwood L12: Identification of core competencies for responders; Curriculum, instruction and certification
- C01: Development of a framework for collaborative decisions on transportation capacity enhancements


Thatchenkery, Tojo. “Role of Organization Theory (OT) and Organization Development (OD) in Improving the Level of Service in Complex Infrastructure-based Transportation Operations,” School of Public Policy, George Mason University. Appendix F in this report.


NOVA Program Plan summary [http://virginiadot.org/travel/resources/ProgramPlanSummaryFinal.pdf](http://virginiadot.org/travel/resources/ProgramPlanSummaryFinal.pdf)


VDOT SO&M Program Plan (2010)
5.5.2 Phase II: Gap Analysis

Task 1: Identify Products Necessary for Implementing SHRP 2 Reliability Research

When team member Cambridge Systematics developed the original F-SHRP Reliability Program, implementation was built into the project scopes in a variety of ways. The concept was that research should not be an end in itself, but should lead to improvements in practice. When the program scope was subsequently reduced, most implementation components had to be removed. The proposed project – as well as the expected SHRP 2 Implementation Program – offers the chance to reinvigorate the implementation component.

To move implementation forward, the research team will identify several types of implementation strategies and projects, such as:

- **Information Systems** – ongoing data bases that promote the improvement of travel time reliability.
- **Software** – including modifications to existing software and development of new software products; may include newly developed predictive models and methods.
- **Application Guidelines** – users’ manuals for applying new procedures.
- **Multimedia Education and Specialized Training** – designed to meet the needs of practitioners and to foster the findings of specific research in practice.
- **Integration with Existing Standards and Design Guides** – revisions to current standards and standard practices. Two projects in the Reliability Program area – L08 and L09 – have implementation as their focus. L08 is concerned with getting reliability analysis procedures into the Highway Capacity Manual and L09’s focus is the inclusion of reliability-improvement design treatments into the AASHTO Design Guide.
- **Field Tests and Demonstration Projects** – implementation of research findings in real-world settings. Field tests are conducted largely to test the veracity of the research; demonstration projects assume the research is more fully developed and focus on the steps needed by agencies to implement the research. Evaluation must be a component of both approaches. By field testing or showcasing the research results, two things can be achieved: (1) additional insight into how the results can be implemented by agencies, thus creating more

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usable future products; and (2) the testing phase itself is a way to advertise and demonstrate the research results.

- **Model Legislation** – draft language that may be easily modified for use by individual state legislatures.

- **Knowledge Management** – assembling and disseminating knowledge gained during the research, either based on determining current based practices (both national and international) or original research into a topic.

With respect to international experience and activities, the project team is familiar with the state of play regarding reliability-related programs in other countries – especially Western Europe and Australia. We will draw on our international contacts where there appears to be experience relevant to addressing and/or institutionalizing reliability. For example, PB has offices in the UK and Australia that are developing organized approaches to reliability and SO&M for public sector clients. KAI also has an office in Australia, a permanent presence in Copenhagen, and strong academic connections in Germany. Some of the experience that will be drawn upon for this project is presented in SHRP2 LO6. In addition, the SHRP2 reliability track has had international interaction that has generated papers and presentations that will be incorporated into the gap analysis. Consideration may be given to a continuation of this formal contact where it appears that the institutional setting in other countries may yield relevant experience.

These strategies form the basis for implementing research results from the SHRP 2 Reliability Program as well as reliability-related projects from the other Program areas. Exhibit 5-9 shows our preliminary thinking on the implementation products needed for the current reliability-related SHRP 2 projects. Some of the products are ready for direct implementation and will require only training, outreach, and general support. Others are ready to be implemented, but their adoption would benefit greatly from demonstration projects. Some projects require that field tests and evaluations of the procedures be conducted, while others will require that new software or modifications to existing software packages be pursued. Finally, new research may be necessary before the results of some projects are ready for implementation. This final category is discussed under Task 2 below.

During the project we will refine and extend this list based on the team’s knowledge and input from the contractors, ETG, TCC, and SHRP 2 staff. From the general list of implementation products for each completed research project, we can develop more fully specified descriptions of the implementation projects, as discussed in Task 3 below.

**Outreach:** The User Community and the Institutional Community will have the opportunity to provide feedback on the list of potential implementation products that might be captured in the KTS.
**Task 2: Identify Remaining Gaps in Reliability: Estimation, Improvement Strategies, and Institutional Arrangements**

The next step in conducting the Gap Analysis is to consider **what additional gaps in our knowledge of reliability** (beyond the immediate products necessary to implement relatively mature SHRP 2 Reliability project results) need to be addressed to move reliability effectively into practice. The focus here will be on assembling existing knowledge, case studies, and data to be consistent with the short-term nature of this project. Clearly, there is not enough time and resources to conduct research based on original data collection. To do this, the research team will define a framework for evaluating and prioritizing knowledge gaps based on the attributes shown in Exhibit 5-9.

The list of issues in this table is by no means exhaustive, but they are a starting point. During the project we will identify additional issues that need to be addressed before the SHRP 2 reliability results can be implemented. To do this, we will review the projects’ products, especially the interim and final reports. Researchers usually provide suggestions for further research in these documents. The review will be followed up with discussions with the principal investigators where warranted; we would like to get their views on what research topics were not pursued, but would help to advance the reliability program.


<table>
<thead>
<tr>
<th>Issue</th>
<th>Available Materials</th>
<th>Example Gaps</th>
<th>Remedies</th>
<th>Priority</th>
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<tbody>
<tr>
<td><strong>Technical Background</strong></td>
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<tr>
<td>Causes of unreliability</td>
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<td>Contribution of causes</td>
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<td>Contribution of strategies</td>
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<td>Rationale for action</td>
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<td><strong>Business Case</strong></td>
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<td>Key stakeholders and business cases</td>
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<td>Hot buttons</td>
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<td>Cultural context - how to reach audience</td>
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<td>Effective examples</td>
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<td><strong>People</strong></td>
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<td>Human capital</td>
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<td>Leadership</td>
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Gaps will be identified by comparing the content of the table above with the needs and/or barriers target audiences currently face in a) understanding the value of operational strategies to improve reliability; and b) implementing these operational strategies. Thus, gaps will be identified from the perspective of the practitioner rather than from the perhaps more traditional perspective of the researcher.

The Kittelson team is already keenly aware of potential new topics because of our involvement with many Reliability and Capacity projects. In addition to conducting many projects, we also have interacted with other research activities during the course of the program. One key area we know needs attention is the assembly of convincing information demonstrating the value of reliability improvement strategies, especially operations. This effort would involve scanning not only the SHRP 2 research but the general landscape as well to identify case studies or agency testimonials on the value of operations: what benefits did the agency get from implementing a certain strategy. The key will be the packaging of this information, which can be dry and technically-oriented, so that decision-makers and elected officials will be receptive to it.

Other gaps are likely to be more technical in nature. For example:

- Induced demand effect of operations strategies – with the growing emphasis on producing a sustainable and environmental supportive transportation system (e.g., controlling green house gas emissions), accounting for the induced demand effects of improvements needs to be addressed. For operations, no research exists that estimates this effect, and there is reason to believe that demand response to reductions in nonrecurring congestion (which happens erratically) is different than that of recurring congestion (which happens every day).

- Reliability in the context of extreme but rare events – delay that happens during the once-every-10-years weather event can be tremendous, but in the context of everyday congestion over the same 10 years it may only be a small part of total delay. How should investments in each situation be evaluated and compared?

- Impact of operational-oriented institutional arrangements on reliability. How do improved interagency cooperation/agreements translate into tangible changes in the field (e.g., reduced incident duration, fewer lanes blocked)?

**Outreach:** The User Community, Institutional Community and the Academic Advisory Team will all provide input into the identification target audience needs and barriers that will be used to identify gaps.

**Task 3:** *Evaluate Content Gaps*
In this task, the research team will assemble the complete list of research gaps and turn these into tangible projects. For each project, the following information will be developed:

- Need – what research gap the project will fill.
- Objectives – what the project is expected to achieve
- Scope – the major technical tasks that need to be conducted, including products
- Relationship to SHRP 2, NCHRP, and FHWA Projects – required interactions with recent and current projects.
- Research Period and Funding Requirement – schedule and budget.

Once the project descriptions are done, we will prioritize the projects using the following categories: “Critical”, “High”, “Moderate”, and “Low”). The prioritization will take place in conjunction with the ETG and/or the TCC. We will then determine which of the projects can be undertaken within the scope of the proposed project. The remaining project descriptions will provide useful input to the SHRP 2 Implementation Phase, expected to be initiated after the next highway reauthorization legislation.

**Outreach:** The User Community, Institutional Community and the Academic Advisory Team will have the opportunity through the project website to provide feedback on the prioritization of content gaps.

5.5.3 **Phase III: Gap Filling**

The objective of this task is to carry out a series of modest-sized projects that will result in a more comprehensive, useful, and usable Knowledge Transfer System. The projects to be performed will result from the gap analysis effort conducted in Phase II and are expected to be a mix of synthesis, analysis of data already collected for SHRP 2 research, limited analytics, limited simulation, and limited additional field data collection as needed. The work plan emanating from the gap analysis effort conducted in Phase II will specify the scope, schedule, and budget for each project selected during the screening process.

One project that will receive high priority in the Phase II gap analysis effort and therefore will be a likely project to be included in this content building activity is the integration of reliability research results into TCAPP, which is the primary product of SHRP 2 Project C01. More specifically, this project would identify potential inputs to TCAPP from all reliability-related SHRP2 Capacity and Reliability Program activities; prepare a “straw man” integration proposal for review by others; convene a workshop with representatives from the User Community and the SHRP 2 C01 collaborative decision making framework design team to validate and/or revise the straw man proposal; and finally to incorporate the appropriate results into the TCAPP product.
This is an example of a synthesis activity that is expected to be undertaken during this gap filling effort, and is intended to illustrate the general scale and scope of envisioned projects that will collectively extend into the other areas of data compilation, limited analytics, limited simulation, and limited field data collection.

The product of this Phase III effort will be a final report for each project undertaken. Each final report will be focused on findings that are directly related to the material to be included in the Knowledge Transfer System. The final report for each project will be submitted to the ETG as it is completed. In this way, ETG members can perform reviews of several reports at a time rather than having to review all (there may be as many as 15 to 20 individual projects conducted as part of this effort). The project team will tailor the amount of detail in each report to the size and importance of each research. Every effort will be made to keep the reports short and concise for easier review by ETG members.

**Outreach:** Individual gap filling proposals will include a recommendation for outreach to users, organizations, academicians or other groups as appropriate. Additionally, throughout the development of web content all four outreach groups, User Community, Institutional Community, Academic Advisory Team and Users Network, will have the opportunity to provide feedback on drafts of new content material. To ensure that content is meeting the needs of the users, virtual meetings of our formal outreach teams will be scheduled to solicit input before and during content development.

### 5.6 TRACK B – KNOWLEDGE TRANSFER SYSTEM

This section describes the work activities to be completed under the Knowledge Transfer System track of our work plan (Track B). There are four phases of activity in this track:

- Phase I: Best Practices
- Phase II: Concept Development
- Phase III: Prototype KTS
- Phase IV: Build and Test KTS

This track will culminate in the development of a fully operational Knowledge Transfer System. It will receive input from Track A (Content Building) and Track C (Branding & Communication).

The deliverables for this track include:

- KTS Design and Specifications Report (Deliverable #6)
• Completed KTS (Deliverable #7)
• KTS System Documentation (Deliverable #8)
• Implementation Issues White Paper (Deliverable #9).

5.6.1 Phase I: KTS Best Practices

Task 1: Review state of play in KTS

In this task our team will identify the current state of play in terms of knowledge transfer systems (defined as below) that have been successfully applied both inside and outside of the transportation profession. It is anticipated that the Knowledge Transfer Systems will be comprised of web-based and non-web based materials.

What is Knowledge transfer -- Where intentional or not, the “transfer” of “knowledge” is a complex activity with content, structure and supporting activities components that may or may not be present with regard to any given area of interest. In some fields KTS is formally and strategically conceived by a sponsor group and can have a set of components (web, print, meetings, etc) deliberately designed as a mutually reinforcing system. In other cases and sectors, there are content resources available but without the motivation, context and peer experience features. In other words, there is an implicit KTS – whether or not it has been designed and more or less effective – or is just an accidental resultant of uncoordinated activities in a given field.

While the level of development may vary widely, any KTS may include:

• Knowledge content (information) component of any KTS relates to accessing the various types of technical information necessary for various audience segments to advance their programs, activities to improve SO&M related to reliability. Updatable information in advancing fields is key. To begin with, relevant “knowledge” goes beyond the elements of program (strategies, processes and institutional arrangements (technical information) to include a range of “soft” but important information relating to motive, context, values, business cases, peer approaches and a range and other aspects that may knowledge actionable

• Communication components on any KTS potentially includes features that go beyond static, passive approaches to provide pull functions and include the branding and look and feel aspects and the design of a web-based portal that is easy to use and intuitive. Activities and outreach components – if present at all – may be external to any repository of information – hard and soft – and include communications to support consciousness-raising, motivating, persuasive functions. There also may be real-time features – interactive peer activities – that may both lead potential audiences to the knowledge site or supplement the site
itself with related functions such as webinars workshops or structured peer consultation
Thus, knowledge transfer systems – organized or not – potentially involve synergies among these three components.

**Task 2: Review current state of play in transportation**

In the area of transportation SO&M there are currently a range of on-going knowledge transfer activities – with various Information, Communications and Activities components. However they do not take place within a single intentional framework and, as a result, key gaps exist and level of effectiveness is not explicitly considered. Furthermore, they are not targeted on specific audiences and are not easily accessible.

There are knowledge transfer entities within the transportation industry – each with their characteristic activities. These include:

- Technology transfer activities of federal agencies and national associations: FHWA, AASHTO, TRB, ITE, ASCE, and APA
- Program delivery related outreach of State DOTs and MPOs focused on their customer base
- National research programs such as SHRP2 and NCHRP
- Technology transfer and training activities such as Local Technical Assistance Program (LTAP), National Highway Institute (NHI), Technology Transfer Centers, the I-95 Corridor Coalition Operations Academy, and the University of Maryland-based CITE web courses.
- Peer information sharing entities such as National Transportation Operations Coalition (NTOC), National Traffic Incident Management Coalition (NTIMC), Travel Model Improvement Program (TMIP), and the Center for ITS Training and Education (CITE)

Types of knowledge transfer on the part of each of the above entities include websites, webinars, technical publications, and articles. FHWA, RITA, ITE, TRB provide substantial repositories of technical studies over a wide range of topics. While these sources are loosely categorized, there is no organized access, review or updating system. *Google remains the principal portal to this material.*

In addition, most of the above entities conduct real-time activities for technical outreach and often peer sharing as a means of knowledge transfer.

**Outreach:** The team will draw from the User Community, Institutional Community, Academic Advisory Team, and User Network inputs for insights into the effectiveness of knowledge transfer systems identified.
Task 3:  **Review examples from outside transportation**

The team will explore examples outside of the transportation profession in other scientific-based research industries such as health care/medicine, energy, and the environment. Key contacts in these industries will be reached within the universities of our team’s extensive network of professor partners. The very nature of the subject matter (mission-critical, dynamic, strong demand) has led to a broad array of outreach activities in some of these areas – with specific sponsorship and management reflecting the match of supply and demand – that may offer useful examples in the transportation sector.

From the overall list of examples that we identify, the team will select a set of 3-4 “best practice” systems for further evaluation. This collective set of selected systems will ideally represent the full range of features and approaches that will be considered consideration in the development of the KTS for this project and will be the focus for Task 2. The KTS database will include the following information:

- Purpose and objectives (motivation)
- Sponsorship
- Intended audiences
- Components, techniques and format
- Primary content
- Resources
- Business case information
- Best practice information
- Characteristics of usage to date (e.g., type of interaction that occurs, frequency of website hits where applicable, techniques and strategies employed to reach intended audiences, etc.).

In addition, our team will contact the owners or representatives of the related KTS to conduct interviews to understand their approach and lessons learned, which are likely to include qualitative information and relevant anecdotes.

The results of the database synthesis and interviews with owners/representatives of the KTS will be compiled into a technical memorandum. The memorandum will highlight the “best of” elements of the KTSs evaluated that are relevant to the L17 project.

**Outreach:** The User and Institutional Communities and Networks will review the draft technical memorandum and provide input to the team identifying enablers, challenges, and barriers identified.
5.6.2  Phase II: KTS Concept Development

Task 1: Identify Options for the KTS components

The phase I analysis will provide a framework for identification of key gaps in the current knowledge transfer “system” as it relates to SO&M and reliability. These gaps will be developed in a structure reflecting the three major KTS components identified in Phase I. Current state of play for each gap area will be assessed in light of apparent audience needs and best practice from other sectors. Based on that analysis the key gaps will be arrayed in a conceptual framework to indicate potential approach to the KTS for this project.

Review best practice – An initial categorization of the features to be reviewed related to the three potential KTS components identified in Phase I is shown in Exhibit 5-10. It should be noted that the KTS features go beyond static information sources (such as websites) to include other media and activities.

Exhibit 5-10. Initial Categorization of KTS Features

<table>
<thead>
<tr>
<th>Characteristic Features of KTS</th>
<th>Current State of Play In SO&amp;M Reliability</th>
<th>Non-transportation best practice</th>
<th>Key gaps</th>
</tr>
</thead>
<tbody>
<tr>
<td>Communications</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visibility</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External (non-web) prompting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Branding</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audience segmenting</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External website linkage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>functions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peer Forums</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Interactive features</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(self-evaluation, tutorials, etc.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical content</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(resident or linkages)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up-dating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portal and search</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>functions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Query response</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business cases</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Best practices examples</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External Activities/Outreach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conferencing and interactive</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>features</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speakers bureau and experts</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>directory</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuing external</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>peer interchange</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Compare transportation with other sectors -- The table above will provide the range of potential functions and activities related to KTS as a concept – as compared to best practices in other sectors. Some of these are currently being fulfilled within SO&M although not part of a managed “system”. Other functions are altogether absent. The gaps, match/mismatch will provide important insights into identifying potentially valuable functions.

Task 2: Identify functions needed for SO&M/reliability KTS

Based on the Phase I analysis, the findings of task 1 above, and the Outreach track we will identify the key set of relevant content, communications/outreach and external activities options for the KTS in terms of functions.

These functions will be reviewed in term of both the audience needs and characteristics -- and their typical knowledge acquisition habits and patterns. Differences and similarities will be examined to determine the degree to which components of the KTS must be differentially designed or delivered in relationship to the characteristics of different audiences.

A prospective list of functions in the three areas will be proposed with specific examples for consideration and review. These functions will provide the basis for Phase III.

Outreach: The User Community will be engaged to identify desirable features and functionality within the KTS. This will provide insight into what the audience wants and needs from this tool prior to design and specifications are developed.

Task 3: Prepare conceptual design of KTS

Based on the results of Tasks 1 and 2 the team will prepare a conceptual design of the KTS. The purpose is to define the framework for the KTS and identify the design needs which can be addressed in Phase III Gap Filling. The conceptual design will include the following components:

- **Objective Statement.** This will consist of a crisp definition of the objectives of the KTS and measures for assessing its effectiveness.
- **Target Audience.** The target audiences who are expected to use the KTS and their distinguishing characteristics.
- **Web Interface Specification Guidelines.** The guidelines will address the development and design of the web interface such as coding language, platform compatibility, navigation, graphical interface, color schemes, and server requirements.
• **Site Map.** The site map will show how each individual web page within the site is linked, as well as links to external sites.

• Proposed Features. Each of the proposed features of the KTS, such as tutorials, peer-to-peer forums, blogs, wiki’s, etc. will be described.

**Outreach:** User interviews will be conducted with selected individuals from each of the formal project participant groups (User Community, Institutional Community, and Academic Advisory Team) as the KTS is developed. This will provide feedback on all aspects of the KTS design.

**5.6.3 Phase III: Development KTS Prototype**

The gap filling activity incorporates consideration of the Phase II and Phase III products of all three tracks of this proposal. That is, the KTS must incorporate content, communications and branding and outreach in the appropriate relationships with the intent of developing them as a mutually reinforcing “system” – branding and communications both persuading and motivating use of technical and guidance content materials and outreach (non-web) activities designed to work with and reinforce (and perhaps update) the content.

**Task 1: Review gap filling materials from other tracks**

While the gaps identified and filled as per the other tracks cannot be specifically anticipated at this time, this proposal suggests (in figure IIA-2 and in. Some of the gaps identified from other tracks will have specific implications for the KTS. This relates to

- types of knowledge
- level of detail
- technical vs. non-technical
- audience appropriateness
- audiences information gathered in conventions
- updating
- push versus pull

Some technical guidance and resources can be accommodated easily within web-site conventions. While Material related to motivation can be presented – but may not reach the appropriated audience through the web alone.

Consideration will also be given to the direct relationships between elements of the KTS including the relationships among all the potential components of a KTS

- Web portal
• Conferencing and interactive features
• Speakers bureau and experts directory

Continuing external peer interchange organization and activities.

**Task 2: Determine content structure of web-based component**

A web-based portal will not alone constitute the KTS. It will certainly be the central element of the KTS for technical information. Even within a web-based environment there exist many potential tools and format options. Careful analysis and evaluation is needed to identify the appropriate format options for the KTS. On one hand, particular attention should be paid to new and emerging technologies that offer the potential to increase interaction and the ability for users to produce content (such as a blog or wiki). On the other hand, the team will be mindful of the capital and maintenance costs associated with web-based tools and seek to invest resources where the greatest value and impact can be achieved.

This task will establish the types of content that will be incorporated in the KTS. Each content type will include a list of known content based on the results of the Phase I synthesis results from the Content Building track.

Exhibit 5-11 highlights the content types that are likely to be embedded within the KTS. The content will include material that is static (manuals and guidebooks), active (postings for upcoming conferences and webinars), interactive (peer-to-peer forums), and dynamic (new content such as a wiki, best practices, or archived data).

**Exhibit 5-11. Potential Content Types for the KTS**

<table>
<thead>
<tr>
<th>Documents</th>
<th>Software and Spreadsheet Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speakers Bureau</td>
<td>Peer-to-Peer Forum</td>
</tr>
<tr>
<td>Tutorials</td>
<td>Presentation Materials/Business Cases</td>
</tr>
<tr>
<td>Resources and Links</td>
<td>Best Practices</td>
</tr>
<tr>
<td>Search Engine</td>
<td>Data Archive</td>
</tr>
<tr>
<td>Wiki</td>
<td>Self Assessment</td>
</tr>
</tbody>
</table>
Outreach: The User Community, Institutional Community, Academic Advisory Team and User Network will be used to validate and/or refine the selected content types.

Task 3: Website considerations and specifications

In this task the research team will establish

An established and effective web presence is critical to successful information delivery. The Team has had considerable experience in developing transportation websites for FHWA, AASHTO, State DOTs and other transportation entities.

Examples of portal-based online Knowledge Transfer Systems developed by Team Members are shown below:

- [http://www.choosingviz.org/](http://www.choosingviz.org/)
- [http://environment.transportation.org/](http://environment.transportation.org/)
- [http://climate.dot.gov](http://climate.dot.gov)

In our ever-increasingly busy and media-savvy culture, where “free time” is at a premium and consumers/stakeholders expect timely information in an easily-digestible format, the web as a communication and information-delivery tool provides convenience, economy and single point of delivery. The site must be tailored to its role in the overall KTS. However, good practice considerations will play a major role. Essential to the success of web content delivery is a user-friendly, intuitive user interface with an emphasis on usability and functional consistency, and meaningful, timely content. A number of existing and emerging state-of-the-art web technologies allow for an engaging, interactive experience that facilitates quick and accurate information delivery.

The KTS the web delivery will be provided through a portal, where users can self-select the path by which they will obtain relevant information. The user interface design will provide both navigational and visual cues to facilitate movement throughout the Knowledge Transfer System.

Web Technology, Features and Functions -- There are an abundance of web technologies that will facilitate both general communication and technical information to a diverse audience with varying needs and interests; specifically, functionality that
helps users interpret and/or visualize information not easily explained. A summary of website features/functionality recommended for integration with the portal follows.

**User Interface (UI) Redesign.** A compelling and artful design that reflects the caliber of target user groups and the technical veracity of web-based content is important in creating a user’s first impression and ultimate “experience”. The design supports how content is accessed and delivered, and serves to engage users with different learning styles. UI design includes logo and branding development, the graphic look-and-feel of the page display, and graphic elements that will support navigation and custom applications.

**Flash Animation.** To ensure delivery of an engaging learning experience and more importantly, to facilitate access to information, The Kittelson Team has the capability to utilize flash animation which provides a rich and robust custom programming environment that facilitates information delivery. Graphics, text, audio, video and database-driven content can be integrated into websites to create intuitive user interfaces, interactive tools, and online multimedia presentations. Some of the key features might include:

- National Case Studies Locator Map
- Historical Timeline
- Animated Trends/Statistics Display
- Streaming Video Library

**Software Applications.** The website can serve as an excellent vehicle for information exchange due to its accessibility and convenience. The Kittelson Team’s software engineers can design and execute custom, web-based software applications that facilitate the delivery of information, the collection and/or exchange of information, and education. Some of the key functionalities which may be supplied include:

- Filterablesortable Database Applications (e.g., document library, research repository)
- Online Survey/Data Query
- Meeting/Events Calendar
- Annotated Glossary
- Blogs/Discussion Forums
- Comment/Feedback Data Form
- Mailing List Signup Data Form
- User Subscription/Registration Service (website updates, industry updates)
- Advanced Search Engine
• RSS Feed

**Streaming Media.** Maximize the delivery power of by offering streaming media via the website. Media interviews, regional footage and/or historical clips in support of the project can be easily delivered. Advancing technology allows us to encode and compress movie clips into web-compatible formats that support varying connections speeds.

**Content Management System.** Website excellence and repeat visitation is assured when content is current. An approach involving automated, template-based, content management system—powered by the third-party engine can allow authenticated users to manage specific website content and instantly view uploaded information. This file upload system provides for HTML conversion on the fly (the language of the web), allowing designated staff to view all information uploaded to the site without using the native application software with which it was originally created. Use of this form-based administration up-load function does not require specialized application software or technical knowledge. New information can be added and viewed instantly. The CMS may be used by authorized web master staff and/or its designees. A content management system could be applied to some or all website content areas.

Individually and/or in tandem, these features will improve information delivery access, establish the portal as the “go to” online resource for all information pertaining to SO&M activities, promote user interactivity, facilitate stakeholder input, and lead to increased website visitation.

**Potential Web Content Areas** – The actual content areas will depend on the results of the gap analysis in the four research tracks. However there is a broad pallat of potential areas which the Team has employed in recent websites developed for transportation clients. These include:

• Glossary & Acronyms
• Technical Guidance (online decision-based “smart” document)
• Literature Review (database)
• Research Repository (database)
• Case Studies (interactive map-based information access)
• Comments/Feedback (data form; optional database tracking/management)
• Video/Presentation Library (delivery of industry webinars/presentations)
• Related Web Links

**Look and feel** -- The key challenge in delivering web-based information is to facilitate use by all target audiences. Given the potential volume of content and variety of information available through the Portal, the varied needs and interests of target user
audiences, information should be easily accessible and manageable by these users in multiple ways. Key to effective website use is an intuitive, navigable information architecture that is accessible from all locations within the website; and, a minimum of user effort required to access desired information, with limited page scrolling. Some of the key look and feel considerations include:

- Accessible design incorporating elements such as cross-browser and platform compatibility, text-based navigation, appropriate color contrast for readability, resizable fonts and correct character encoding (for possible internationalization), print-friendly pages that are also fast loading, and such things as metatags, alt tags, title tags, and tooltips where appropriate. This will allow a majority of users, including those with disabilities and limited internet experience to access the information within the KTS.

- Content organization based on a clear coherent structure, with time-saving conventions, persistent navigation features, and ‘pathway’ (breadcrumbs) techniques. The project team’s attention to these issues will result in a consistent underlying architecture that will make on-line content easier for visitors and content managers to find and use; it will also translate into improved transparency and information management, ultimately resulting in a more positive visitor experience.

Examples of portal-type websites for transportation programs developed by team members are shown in Exhibit 5-12.

Exhibit 5-12. Examples of Portal-Based Websites Developed by Team Members
A Framework for Improving Travel Time Reliability

Research Plan

Section 5

SHRP2 L17 Proposal

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Feedback from potential users of the KTS from the proposed Outreach process, will serve as the foundation of the graphical user interface and information architecture. Mock ups of proposed landing and interior page templates, and for custom applications (e.g., Flash animations, database tools, etc.) will be provided for discussion and review. The designs will be evaluated for usability and web accessibility prior to finalization. For custom software engineering/programming applications, a technical specification detailing application features, functions, requirements and constraints will be developed.

**Administrative control** – Control of the of site content will focus upon the assignment of content creation, editing, updating, archiving, and deleting capabilities; management of user groups and permissions; creation and delivery of informative information to any or all groups of site users; creation and archiving of data; uploading and downloading capabilities, in-house control of options; and oversight of member forums, calendars, and events. All of these administrative functions can become costly to use and maintain unless care is taken at the outset to design them for efficiency and effectiveness.

**Outreach:** Information collected from User Community, Institutional Community, and Academic Advisory Team during the overall testing of materials during this phase will contribute to the specific design of the KTS. The project website will be monitored for additional information on the desires of the audience.

### 5.6.4 Phase IV: Build and Test the KTS

**Task 1:** Incorporate synthesis and gap-filling content that was previously developed into the settled-upon KTS structure

In this phase of the project, the Kittelson team will begin to populate the KTS. Our approach is based on the concept that knowledge is much more than information. Information might be thought of as facts or data (e.g., reports, databases); but knowledge has to do with flexible and adaptable skills -- a person’s ability to use and apply information. Further, knowledge can be both tacit and explicit, requiring that a variety of methods be used to transfer it effectively. Tacit knowledge is accumulated by individuals over the course of many real world experiences. It cannot be easily expressed and requires extensive personal contact to convey to others. Explicit knowledge is easily codified, can be embedded in procedures (e.g., technical analyses), and represented in documents. Therefore, the SHRP 2 reliability must be enabled by a variety of technologies, including databases, collaboration tools, content management, parsers, search engines, and portals.

All of the existing SHRP2 reliability products – as well as those completed as part of the gap-filling effort in this project – will be catalogued in the KTS. Beyond simply storing
these products, the KTS must take an active approach to knowledge transfer. A few specific mechanisms for accomplishing this include:

- **Best Practice Compendiums:** Several SHRP 2 projects relate directly to best practices. Further, as experience is gained by agencies adopting SHRP 2 research, additional best practices will emerge that need to be captured in the KTS.

- **Critical Event Interviews:** This might take the form of taped interviews with personnel who dealt successfully with a major transportation event or disruption (e.g., hurricane evacuation, surprise snowstorm).

- **Expert Interviews:** This might take the form of webinars with SHRP 2 researchers or early implementers of SHRP 2 research.

- **Testimonials:** Similar to Expert Interviews, these focus more on the “why implement reliability research results” rather than the “how to do it”. These will help build the motivation for using the research products.

- **Expert Systems:** Some SHRP 2 research products may be best embodied by an expert system.

- **Knowledge Audits or Self-Assessments:** Many operations-oriented self-assessments already exist. However, several of the SHRP 2 research projects should reveal additional topic areas for self-assessments. Two topics that come to mind are the use of operations performance measures and the responder checklist from Project L12.

- **Knowledge Maps:** Basically, metadata about reliability knowledge. These would catalog information/knowledge available both within SHRP 2 and from external resources and where it is located. A good example would be a guided front-end application for the Reliability Data Archive (Project L13). In fact, guided front-ends to all of the SHRP 2 reliability products should be developed. This will allow users to find their desired information quickly.

**Computer-Based Training:** If the Gap Analysis indicates that training be accomplished, one option is to build computer-based training into the KTS. This will largely depend on the content and the intended audiences. Even if computer-based training is not developed as part of the proposed project, the KTS should still be designed with this in mind as it is likely to be a feature of the larger SHRP 2 Implementation Phase.

**Task 2:** Develop website component of the KTS

The Knowledge Transfer System will be physically built in this task effort. All necessary website code, interfaces, and links will be constructed according to the finally-approved
KTS design concept developed in Phase IV, Track A. The key considerations indicated above will be taken into account in developing the final product.

As noted in Phase I, the team will conduct an early and comprehensive needs analysis and detailed requirements gathering process as part of Phase I. This will help ensure the highest quality service and solution and a rapid implementation, and will minimize risk and cost escalation. This process will also help ensure that the final website solution(s) can accommodate the changing requirements and needs of the program. The goal of this process is to clearly define the information architecture for the website program, assess required interactivity and functionality, define usability requirements and visual aesthetics, and establish a clear vision of the overall interface requirements, all within the context of the intended target audience(s).

Key steps in this task would include:

- Review user audience(s) requirements and evaluate web site components in terms of value to consumer and needs of the SHRP II team (e.g., target audience, objectives, content, frequency of updates, etc.)
- Develop an information architecture/navigation functional concept, which identifies all content requirements and features (essentially a site map)
- Identify functional/interactive features that will best serve user information requirements and facilitate website management/maintenance.
- Develop user interface design concept in tandem with branding concept that reflects the vision, messaging and “essence” of the SHRP II program
- Construct HTML templates and pages
- Program and test custom applications
- Populate content

**Task 3: Beta test the KTS**

A functional website prototype for preview will be prepared to be mounted on the Team’s secure servers. Website pages will be populated with all available content. The Team will also ensure Section 508 accessibility compliance and usability to the extent feasible and required. With approval of the prototype, a partially populated website could be released for immediate use while development of additional features/functions is underway. As additional pieces of the website program are completed, they would be previewed in a secure location, and could then be transferred to the “live” website.

The beta tests will be conducted by releasing a beta version of the software to a limited number of persons and agencies outside the programming team. An online forum will be created to enhance the level of interaction with beta testers and increase the amount
of feedback that is received from them. Additionally, comments and questions posed by a beta tester will be responded to; our experience is that this degree of timely response to beta testers maintains a higher activity level and increases their level of participation and feedback. It takes time to conduct a thorough beta test, and so the schedule can accommodate up to three months for this task activity in order to maximize the value obtained.

Two important elements to the beta testing process will be addressed:

• *Who* will participate in the beta testing process; and
• *How* will the beta testing be conducted?

The paragraphs above answer the “who” question by suggesting a limited number of persons and agencies outside the programming team, and they also answer the “how” question by suggesting an online forum to enhance interaction and increase feedback levels. Beyond this, additional value can also be achieved by allowing for mini beta testing activities to occur throughout the development process and by engaging the Informal User Community, the user network identified earlier. Because this user group is continuously changing, it reflects the most likely future interface of practitioners with the KTS. The formal beta testing process described above will still be performed with those who ask and/or have the commitment level to see it through; however, many other people can also contribute significant feedback in informal settings and without individually committing to this level of effort and interaction through the entire duration of the development process. A beta test version of the KTS will be available by January 2012.

**Outreach:** All project audience participants will be provided access to the beta version of the KTS to provide feedback on the design and functionality. This will assist with the identification of any issues with the technology that must be addressed at this point. It will also provide input on audience desires for future updates of the KTS.

**Task 4:** *Develop KTS documentation*

Both user and system documentation of the KTS will be prepared in this task. User documentation may be considered as something of a prototype for the website; that is to say, it will be the means through which users can see and understand the website layout and it will also provide introductory/tutorial information about how the various target audiences should enter the site and use it most effectively. This documentation will be online and available through the website itself in order to maximize its accessibility to the website users.
The user documentation associated with the KTS will be prepared in a careful and organized manner, with specific focus on the following activities:

- **Audience analysis:** Documentation has no use if does not answer the questions that people ask. Therefore, the user documentation will be written with both the target audiences and the tasks they typically undertake in mind.

- **Task analysis:** Each target audience is likely to have a different purpose for visiting the site and different tasks that need to be undertaken. For each target audience, the user documentation will include a set of procedures aimed at helping the particular audience successfully achieve the expected tasks in an efficient and effective manner.

- **Structure and content:** The structure and content of the user documentation will be guided by the characteristics and expected needs of the target audiences. For example, documentation on similar activities will be grouped together. Information will be organized so that discussions of frequent tasks come before the discussions of infrequent tasks. Finally, information that is more use-oriented will be provided in the most accessible locations, while information that is more reference-oriented will be provided in areas that are still accessible but outside of the mainstream information flow.

System documentation will be prepared for use in a primarily offline environment. Pseudo-code, storyboards, information flow charts, and similar techniques will be used to capture, in a clear and concise manner, the underlying logic that defines the underlying organization and interaction of the various components of the KTS structure.

**Task 5: Prepare implementation white paper**

The implementation White Paper will be a report to the ETG and, perhaps, future project participants regarding possible next steps. Specifically, recommendations will be included on KTS content, structural, and user interaction characteristics that should be monitored and considered for change/update over time as the needs of the target audiences continue to evolve.

This White Paper will be prepared in conjunction with the work in Tasks 1-3 above, but will not be completed or transmitted to the ETG for review and comment prior to the completion of all three tasks. Deliverables (Task 1-5): Technical memorandum summarizing (a) the potential format options and web-based tools for the KTS along with a cost-benefit analysis to estimate which tools are likely to provide the most value; (b) the recommended content types for the KTS; and (c) a conceptual design of the KTS including Information Architecture/Navigation Flow Chart, User Interface Design Concept and Revised Concepts; a Partially Functional Prototype and Populated Beta...
5.7 TRACK C – BRANDING AND COMMUNICATION

The development of the “reliability” brand is not only an essential element to the successful completion of the L17 project; it is a primary driver for advancing the implementation of transportation system management and operations (TMS&O) improvements across the country. There are a number of existing initiatives aimed at promoting and communicating the benefits of TSM&O some of these have attempted to create a brand name.

The branding and communications phase of this project is intended to rationalize and enhance the existing branding and communication efforts. It has two objectives. The first is to develop a product definition and a brand name that clearly and memorably describes range of activities that contribute to “travel time reliability.” This definition and brand name will be a key component of the KTS. However, branding alone will not resolve the confusion in the market place. The second goal for branding and communication track of this project is to develop a communications strategy that will encourage practitioners and partners to support the KTS and encourage the implementation of TSM&O activities. This communication strategy must build on all past initiatives and go beyond the traditional methods and strategies that have been used to-date. Given the wealth of efforts and information already in the market place it is essential that the L17 branding and communications approach be driven by the eventual users of the KTS and integrated with the development of both the technology and content of the KTS.

We are proposing a four phase approach to the Communications and Branding track:

- Phase I: Establishing the Baseline
- Phase II: Product and Brand Definition
- Phase III: Brand and Message Testing
- Phase IV: Communication Strategy and Sample Materials Development

The User Community, Institutional Community, Academic Advisory Team and the User Network play a significant role in the creation and/or validation of all products in this phase.

The deliverables from this track include:

- Reliability Definitions and Branding Report (Deliverable #2)
- “Making the Case” Primer (Deliverable #3)
5.7.1 Phase I: Establishing the Baseline

Task 1: Identification and summary of existing TSM&O related branding and communications

The primary goal of the baseline phase for branding and communications will be to mine all existing resources currently being used to brand or communicate about TSM&O. These resources include written and electronic resources developed by FHWA, national organizations (such as NTOC, the I-95 Coalition, AASHTO, AMPO, ITE etc); individual state DOTs and MPOs; others identified within the project. Existing efforts to develop a brand for a reliability concept and to communicate this to the transportation audience will be a primary resource for developing the brand. In particular, the 2007 NTOC report and the AASHTO “Transportation at the Crossroads” marketing campaign proposal will be heavily consulted. In addition to these national efforts, the team will survey individual DOT websites and 511 sites to identify potential brands and communication strategies that are being used to promote TSM&O related services. We will identify state DOT successes in branding of any product or service and will assess through a literature review, supplemented by telephone interviews if necessary, how the brand was developed, why it has taken hold and what benefits have resulted. Public sector branding efforts outside of the transportation industry will also be helpful in providing innovative concepts for developing the reliability brand. For example, Energy Star, a brand developed for EPA by members of this team, has become synonymous with energy efficient appliances. The consultant team includes experts in strategic branding, marketing, and communication across all service sectors. These experts bring an awareness of successful recent branding campaigns as well as essential strategies to include in communicating this brand. The team will develop an initial list of topics or themes that will be used to create the resources summary. For example, guidance documents, reports, and websites will be mined with regard to the following topics:

- Definitions or descriptions of “reliability”, “operations”, “TSM&O” or related concepts
- Intended audiences
- Format
- Distribution outlets
- Supporting organizations, agencies and ad hoc / formal groups
- Existing business case benefits
Our product of this synthesis will be a comprehensive summary of all relevant branding and communication information and materials targeting implementers and partners for SM&O strategies.

Essential to the development of the brand is the synthesis of the definitions and product descriptions along with the targeted audiences of all current branding and communication materials. These elements are fundamental to rationalizing the “many voices” currently in the market place. This can provide us with information to help respond to the NTOC assessment that there is “no definable customer for a definable product.” We will create a matrix that shows which groups or agencies are trying to market, what audience they are targeting, and what “product” they are trying to market. This information will be a primary input into the development the language and branding of travel time reliability report. The information about materials, distribution and business case benefits will be an input into the development of communication strategy messages and mechanisms.

**Outreach:** The User Community and Organization Community will be formed while the synthesis of existing information is underway. While we will not hold the first meeting until after the synthesis is completed, the individual members will be asked to provide references for reports, communication materials, websites, etc that should be included in the initial synthesis.

**Task 2:** Identification and summary of current academic community supports for TSM&O

In order to understand the existing academic support for an increased emphasis on TSM&O within transportation agencies, the team will also collect information on academic curricula for both planners and engineers. This information will both establish a state-of-the-practice for academic support as well as identify the institutions that are currently leading the effort to develop the skills needed. NCHRP research, both completed and active, will be used to direct this effort as well as the current knowledge within the project team. Specific individuals within those colleges and universities that are identified as leaders will be included as potential candidates for the Academic Advisory Team.

The overall product from the Synthesis phase of branding and communication will be a Resource Summary Report. The information will be summarized and formatted in a way that will allow it to be used as a primary resource to the Define the Product and the Brand phase of this track. This report is also the Communications and Branding input into Deliverable 1 Synthesis Report.

**Outreach:** The Academic Advisory Team (AAT) will be formed while the synthesis of existing information is underway. While we will not hold the first
meeting until after the synthesis is completed, the individual members of the AAT will be asked to provide reference for reports, communication materials, websites, etc that should be included in the initial synthesis.

5.7.2 Phase II: Product and Brand Definition

The NTOC marketing analysis study identified the greatest threat to TSM&O marketing efforts as “there is no definable customer for a definable product at a definable time”. This phase of the research will directly address this risk by defining both the customer and the product. The “customer” is represented by the audience segments and the “product” is the defined brand.

The target audience of this research is multi-faceted. At the core are the agencies responsible for implementing transportation improvements across the country: primarily state DOTs and MPOs. As discussed previously, at the agency level this audience can be segmented into four groups: Fully Engaged, Transitioning, Observer, and Unaware. Each of these market segments has some common perspectives on the value of TSM&O within their agency. These perspectives, or business cases, answer the question “why should I care?” at a strategic or policy level. For example in the Unaware audience segment, this may translate into “Because I am not experiencing severe congestion, I have no compelling reason to care at this time.”

Below agency level, the primary audience for this research is the practitioner within transportation agencies responsible for the day to day decisions that support or reject TSM&O. These practitioners may also be unaware that their day-to-day decisions are advancing or blocking implementation of TSM&O. This audience is comprised of various functions within the state DOT responsible for planning, programming, and operating the system as well as the MPO staff and the first responder community. Each of these target audience segments has an interest in the reliability brand based largely on the role they play within decision making. At the practitioner-level, this interest represents the business case. It is essential to communicate to each practitioner-audience segment through their individual business case and ability to implement change. One example of a key target audience segment is the state DOT division engineer. This role has significant responsibility for a portion of the transportation system as well as the ability to make or support decisions with regard to the strategies considered to address congestion.

In order to create an incentive for individual transportation agencies to adopt the perspective that using TSM&O to enhance travel time reliability and manage congestion is reasonable, necessary, and implementable, the research must be able to communicate to both the agency-level and practitioner-level audience.
We will develop a business case to advance the implementation of TSM&O at the agency level for Transitioning, Observing and Unaware organizations. However, the primary focus in developing the brand and communication strategies will be placed on the practitioner target audience. Branding will be led by an understanding of the needs and interests of the audience segments as articulated in the business cases along with a clearly defined product. The development of a User Community (UC) that represents this audience will be the foundation for the outreach effort in order to ensure both acceptance and further dissemination of the full message that the brand implies. The following tasks outline how the team will accomplish this goal.

**Task 1: Target audience segmentation**

Because the agency-level segmentation (Fully Engaged, Transitioning, Observing and Unaware) has largely been identified at the outset of this project, the purpose of this task is to identify our primary practitioner-level audience segments in order to develop individual business cases that speak to each. This effort begins with an analysis of the information collected in the Synthesis phase concerning who has been a target audience for individual messages in the past and whatever real or anecdotal evidence is available on the success of that communication. This information will be used to facilitate a User Community discussion in order to truly frame the audience segments correctly. Although there may be many practitioner roles that make up the full audience, the goal will be to identify similarities that allow some prioritization or hierarchy. A large number of audience segments can lead to confusion; therefore, the focus will be on the key audiences that have the ability to support TSM&O through allocation of resources, approval of strategies, or changes to policies and procedures. In short, those who have the power to support the brand through concrete actions.

In order to focus the User Community on the specific individuals that must be engaged at the practitioner-level, the project team will use the Decision Guide of key decisions developed within the SHRP 2 C01 project. The key decisions at which operations should be considered were identified by the original C01 practitioner team and using this information will allow the User Community to identify specifically “who’s at the table”. From this discussion all essential audience segments can be identified.

The preliminary audience segmentation will be presented to the TCC through technical memorandum with a conference call meeting for validation. This will allow the TCC to clearly understand the rationale for the identified audience segments and provide the opportunity for TCC feedback before final approval. The final outcome of this task will be an approved list of audience segments that will guide the brand development, communication materials, and KTS development. Through our virtual Users Network of practitioners we will solicit input from representatives of each audience segment throughout the project to ensure that products meet the intended need and messages resonate with the intended audience.
Outcome: Approved list of audiences for the brand

Outreach: The User Community will provide input and validation of the target audience segmentation. The User Network member list will be initiated during this phase to provide an expanding segment of the future audience to provide input and the available members will be asked to provide input on the target audience segmentation.

Task 2: Identify Business Case by Target Audience

The Synthesis report developed in Phase I will provide valuable information about the rationale and benefits currently adopted by a variety of organizations and agencies to support the implementation of TSM&O. Obviously too many messages can result in audience confusion. Therefore, there must be a thoughtful balance between the robust presentation of supporting information and inundating the audience with concepts. It is possible the confusion is one of the barriers to widespread change toward TSM&O. Rather than attempting to combine this information into a single perspective, the project team will first separate out individual and distinct messages so that these can be associated with the audience segment that will be most receptive to the message. The purpose within this task is to relate the identified audience segments to a business case that meets their need.

Executives and senior managers (the agency-level audience segments) will respond primarily to policy-related business cases that can be developed from messages representing the national perspective. FHWA, AASHTO, and other organizations have used these messages for several years, and these will be adapted to create the core group of agency-wide business cases. Because the Institutional Community comes to this research project with past experience in communicating at this level, they will be the first group to consider the initial business case menu. This group brings some clear understanding of what works and what does not with Executives and senior managers who represent the agency level audience. This experience will be considered in a conference call meeting to share ideas and consider approaches. From this discussion, the project team will refine the business case list, being careful not to discard ideas that may prove valuable in the future.

The more specific business cases suitable for the practitioner-level will emerge from this initial work. Information gathered during the Synthesis phase and understanding of the practitioner target audience will add to this understanding and allow the project team to draft business cases appropriate to the practitioner target audiences. These draft business cases will be discussed and refined by the User Community.

The project team will then construct a matrix of audience segments and individual messages. Using the Synthesis Report, the Institutional Community input, and the TCC
initial discussions as input data, the team will develop a preliminary match between the audience and business cases. This “strawman” matrix will be communicated to the User Community for consideration and further refinement. It is anticipated that this interface with User Community participants will be iterative in order to reach an appropriate number of individual messages that apply to the identified audiences. When the final iteration has occurred, the information will become an input to the subsequent tasks needed to develop the brand.

At this point the Business Case Primer can be drafted and initial outreach materials in the form of PowerPoint presentations can be developed and made available through the project website. Both the Primer and the presentations will be refined throughout the life of the project to reflect new insights and information that are added in later phases. The final Primer and business case presentations will be content incorporated into the KTS and will be integrated into the communication strategy.

**Outreach:** The Institutional Community will provide input to the business cases and associated target audience followed by review and input from the User Community.

**Outcomes:**

- Matrix of audience segments and related business cases
- Draft Business Case Primer and associated PowerPoint presentations

**Task 3: Developing the Brand**

As discussed previously, the “brand” consists of two elements: the product definition and the associated brand image, name, and/or logo. The project team will engage both the TCC and the User Community to first construct the project definition and from this identify the brand name.

Our approach to branding has four objectives:

1. Attain understanding and agreement with the TCC about the product it wants “branded”
2. Identify the critical target audiences that must be convinced to implement this product
3. Create a consistent set of messages that will garner support for the initiative and promote implementation
4. Develop a conceptual theme (the brand) that supports and deepens the ability of the SHRP program implementing agency to consistently deliver those messages to the priority target audiences.

The following four steps describe how we propose to meet these objectives.

**Step 1: Working Group Meeting** - Both the target audience and the individual business cases have been outlined in the previous tasks. The next step in Task 3 is to develop a definition of the product this brand will represent, a preliminary brand name, and key messages needed to support it.

During a half-day work session with the TCC and the User Community the project team will facilitate a discussion to explore the issues and information needs of the priority target audience segments from the perspective of the target audiences. This discussion will focus initially on the essential elements that must be included in the brand definition. After reaching consensus on these essential elements, the participants will be guided through the creation of short phrases or tag lines that capture individual parts of the essential elements. Through the continuing discussion the project team will facilitate the group to an increasingly narrow group of concepts needed to articulate the project definition. Following the workshop the project team will synthesize these concepts into a clear and concise product definition.

Once consensus has been reached on the concepts needed for the project definition, concepts for the brand name will be brainstormed. The goal is to create a brand name that is not only descriptive of the product definition, but also has “sizzle”. Hopefully, the discussion of the product definition will have focused the group to enable the identification of a small number of potential brand names post-workshop. These names will be given to the project team communication experts will also have the opportunity to review the product definition and develop potential brand names. They will review the completed list of potential names in order to identify potential conflicts or unintended references as well as to identify what has the greatest potential to resonate with the intended audience. The draft product definition and the shortlist of potential brand names will be considered by the User Community and TCC in a facilitated polling exercise via conference call. From this exercise the preliminary brand name will be selected to undergo user testing and feedback.

During the workshop discussion the project team also will collect information on additional topics that are meaningful for future communication activities. These may include:

- Barriers that must be overcome to inspire the audience to support the program and change behavior
• Specific actions that the TCC wants the audiences to undertake as a result of its communications

• The concise and memorable phrase (a value proposition) that answers the questions, “Why should I adopt TSM&O? What’s in it for me if I change my behavior to implement TSM&O?”

The intent is to coordinate the timing of this workshop with a regularly scheduled TCC meeting. If this is not possible the in-person workshop may be replaced with a facilitated virtual workshop. It is the intent of the project team to create the best interface possible between the TCC and User Community to encourage a full sharing of perspective and information.

**Step 2: Follow-Up Communications Research.** To validate the themes and core messages that result from the workshop and ensure that we frame these messages to resonate with the target audiences, we will conduct in-depth telephone interviews with six to eight representatives of up to four prioritized audience segments. Individuals for these interviews will be drawn from participants in the User Network. Our interview guide will be designed to explore the attributes, needs, and wants; “user test” the value proposition developed during the workshop; and identify hurdles in communicating and developing meaningful relationships with these audiences. In addition, we will interview 4-6 executives or senior managers of State DOTs and MPOs to evaluate whether or not the product and brand developed in the workshop resonates with them. Within two weeks of completing the interviews the project team will prepare and submit a Summary Report that will include the essential guidance gained from the interviews.

**Step 3: Communications Message Briefing.** Using the insights from the workshop and the in-depth interviews, as well as ideas solicited from the Users Community and Institutional Community we will develop at-a-glance target audience positioning guides for the key audiences. Each guide will specify attributes of the audience, their perceived unique value of implementing TSM&O, messages that will resonate with the audience, barriers to reaching them, effective communications channels, strategies, and opportunities. These guides will become the foundation of the communications strategy and will serve as a primary resource for the development of sample materials during the project and more extensive creative materials post-project.

**Snapshot: ENERGY STAR Labeled Products and Buildings**

During the development of the ENERGY STAR campaigns, ICF gained insight into the messaging subtleties required to reach consumer versus business versus commercial audiences. For example, messages about reductions in monthly utility bills did not resonate with commercial real estate audiences, which typically pass those costs on to tenants. Instead, demonstrating the link between energy efficiency and increased asset value of their portfolio was a strong motivator.
Throughout the life of the project the team will be gathering information on potential communication mechanisms to support the development of the communication strategy during the Product Development Phase. The identification of effective communication channels will be expansive. The means of communicating to a large audience is changing rapidly with the advancement and common use of technology. The widespread use of social platforms such as Facebook and Twitter provide the opportunity to incorporate communication strategies that can be adapted to ongoing change. The project team contains individuals that are communication experts using both traditional and innovative means to connect with a variety of audiences. Drawing on these experts will allow the project team to include communication mechanisms that are comfortable and acceptable to today’s audience while providing recommendations for future adaptation as technology advances. This approach will enable the future SHRP2 implementing agency to select the communications methods that will ensure success for some time to come.

**Step 4:** Developing the Creative Concept. Guided by the results of the audience research, the project will create an umbrella concept theme and general design treatment for the product brand. This concept and theme will be used as the basis for the KTS web design and will be adaptable to the development of sample communication materials during the next phase of the project and supporting communications materials post-project. This design treatment should serve as a unifying thread to promote a consistency of the product understanding and brand recognition.

**Outcome:** Report on travel time reliability definitions, shared language, communications, and branding. D2 Primer and outreach materials on “Making the Case for Improving Travel Time Reliability” suited for use by the target audiences. D3

**Outreach:** Beginning with the TCC-User Community Working Group meeting, this task will involve ongoing interaction with our audience participants. Both the Institutional Community and the User Network will add input to the preliminary brand and supporting materials.

**Task 4: Develop the Status Report on Academic Curricula**

Background information from past and ongoing research gathered during the Synthesis phase concerning academic support for TSM&O will be used to select participants for the Academic Advisory Team and develop a preliminary understanding of the state of the practice with regard to curricula for engineers and planners. The initial meeting of the Academic Advisory Team (AAT) will occur in this phase and will be focused on validating the information gathered as well as providing a contextual understanding of this information. The meeting will be conducted as a facilitated discussion using a
conference call format. Particular attention will be given to identifying the barriers associated with curricula change to support and encourage engineers and planners with an interest in this topic. This information will be used to inform the Interim Report.

**Outcome**

Short-term knowledge gap analysis with respect to academic curricula. D4 Information on barriers to academic curricula support for TSM&O and recommendations for overcoming them to be included in the Interim Report. D5

**Outreach:**

Initial conference call meeting with the Academic Advisory Team will be held.

**Task 5: Inputs to the Interim Report**

The branding and communication inputs to the Interim Report will be from the summaries of the User Community and TCC interactions within the project. This will include brand definition, essential elements to guide communication, brand name and associated logos, themes, or messages that have been identified.

The project team brings to the research an awareness of some potential barriers based on their own experiences assisting transportation agencies and participation in many of the organizations and groups that support transportation decision making. To supplement our experience the project team will use a facilitated brainstorming format to identify potential challenges and barriers with each of the three formal outreach teams, the User Community, Institutional Community and the Academic Advisory Team. As this list is refined and consolidated an effort will be made to begin the identification of ways to address and overcome barriers. Throughout the remaining project period the project team and participants will return to this list to re-consider and/or validate those actions identified to address individual barriers. The Interim Report will document this perspective and provide a tool for continued consideration of changes and adaptations that are needed for success.

A section on KTS Business Model Insights will be included in the Interim Report. As well, a User Participation Plan will also be included that will describe the manner in which some type of high profile workshop will be conducted to introduce and vet the KTS.

**Outcome**

Information on barriers to academic curricula support for TSM&O and recommendations for overcoming them to be included in the Interim Report. D5

**Outreach:**

The User Community, Institutional Community, and the Academic Advisory Team will be used to provide input on challenges and barriers through a facilitated discussion.
5.7.3 Phase III: Product and Brand Testing

The purpose of this phase of the project is to begin to build consensus and momentum around the brand and messaging developed in the previous phase. This includes two primary tasks 1) gathering User Network reaction to the brand definition, brand name, business case and messages and 2) a proactive consensus building with the Organizational and User communities to create partners and champions for the KTS and the Reliability Program implementation that will outlast the life of L17.

Task 1: Gathering User Network reaction to Product and Brand Definition

The User Network represents a growing virtual audience that is separate from the project participant communities and as such can validate the branding without the internal bias of ownership. The preliminary brand and associated product definition and messages will be provided to this group through the project website. The project team will develop a preliminary design content to add to the website as a “demonstration portal” so that the User Network can get the look and fill of the brand and its supporting information. This portal will contain a short survey to solicit initial reaction to the branding materials. The User Network email list will allow a follow-up to determine the detailed perspective as needed.

Outreach: Virtual interface with the User Network to solicit response to the preliminary brand through the project website.

Task 2: Creating consensus and commitment for long term implementation

One goal of our project approach to outreach is to create visibility and a long term commitment for the KTS and Reliability Program post-L17. The significant number of current organizational “voices” supporting TSM&O has created the confusion of “no definable customer for a definable product.” The goal of the previous phase, Product and Brand Definition, is to respond to this challenge by creating a preliminary brand (definable product) with associated target audiences (definable customers). Simply creating these products, however, will not resolve the confusion. Until we achieve consensus from industry’s “many voices” L17 will not achieve its desired outcome. The creation of the Institutional Community is in part intended to provide us with the forum to create consensus among the current supporters of TSM&O and to achieve commitment and buy-in to support the brand and KTS that are products of L17.

The L17 brand and messages do not necessarily have to replace current efforts, but it is essential that they be endorsed by existing organizations, and that these recognized groups be incorporated into the long term communication and implementation strategy for the KTS and the brand.

There are three components to creating commitment from these organizations:
• They must have meaningful participation and input into the development of L17 products
• They must be comfortable that the L17 brand and messages do not conflict with their current product definition and communication
• They have to know “what’s in it for me?”

Meaningful Participation and Input

Our organizational partners must see their participation during the life of this project as truly value added: not just within the project, but also the long-term success of the brand. From the initiation of the project the project team will be working to understand the brands, messages and perspectives of the organizations that currently support implementation of TSM&O. It is during this phase, however, that we will proactively and openly work with these organizations individually and with the Institutional Community as a whole to build consensus. We will begin this task with a joint meeting of the User Community and the Institutional Community to review the products of the joint User Community-TCC work completed during the previous phase. The User Community, which helped to create the preliminary brand and messages, will lead the discussion presentation and discussion with their organizational counterparts. This direct interface will provide the opportunity for a more meaningful dialogue concerning the Institutional Community’s perspective on the pros and cons of the preliminary brand. Following this meeting the project team will interview Institutional Community members individually to determine their comfort with the preliminary brand and messages. For organizations that have had an active “voice” in the industry with their own brand or messages regarding TSM&O, we will solicit directly their views on the commonalities and disconnects between the L17 preliminary products and their current efforts and their suggestions for rationalizing any divergent brands or messages. Where there are commonalities we will also solicit their ideas for coordinating communication and outreach between the L17 communication strategy and their communication plans. The project team will summarize the discussions from the joint meeting and the individual interviews and provide it as a part of the feedback in the report on the results of the brand and message testing phase to the TCC.

This approach provides significant opportunity for individual members of the Institutional Community to participate in shaping the final foundational products of the L17 research. This participation is a reinforcing message that they matter: their input is both necessary and appreciated.

Coordinating Brands and Messages

Many of the organizations that will be participating in the Institutional Community have been supporting TSM&O implementation since the concept first emerged in the
1980's. If they are to become champions of the L17 brand and KTS we cannot position our work as supplanting or replacing their years of effort to build their brand and serve their membership. It is critical, therefore, that the project team engages these groups to understand how the L17 brand will work with their long standing efforts. Where the L17 brand and messages are entirely consistent and organization may choose to adopt the L17 products in their entirety. Others, however, may have legitimate and specific reasons for retaining their own brand—for example, their communications may be targeted to a small subset of the audiences identified for L17 or their membership may wish to maintain a measure of autonomy. While universal adoption of the L17 brand and messages is an excellent long term goal, it is not likely to be achievable in the short term.

The project team will focus on brand and message consistency from the very beginning of the project. Our goal during the Synthesis Phase will be to ensure that we collect as much background information about current communication and branding efforts. During the Product and Brand Definition Phase our comparison of existing product definitions and messages will enable us to anticipate which organizations will feel that their brand and messages are validated, or potentially excluded, by the preliminary brand and messages for L17. This information will be used as an input into the one-on-one interviews conducted during the Brand and Message Testing Phase. One of the objectives of these interviews will be to build consensus to encourage these organizations to adopt or officially endorse the L17 brand and messages.

The project team will identify a range of actions that partnering organizations can take to show they are supporting the L17 brand and messages. For example we can create a “partnering organization” web page, initially on the project website and ultimately on the KTS, to prominently display the logos of partnering organizations.
We can also consider the development of a “widget”--a compartmentalized data source that can be located external to the project website and/or KTS site but which allows access to transfer information pertinent to the brand and the KTS. This allows information related to the KTS to be available to individuals “where they live” – on the internet sites they visit frequently. The widget will contain a link to the KTS so that users can easily access the breadth of information and functionality that this tool offers. The long term vision of the widget is to connect to individual DOT or MPO intranets or websites. Due to security requirements and constraints, this may not be possible; but the project team hopes to be able to test the concept with the community participants.

Establish “What’s In It For Me?”

Within the Institutional Community there are several key groups whose buy-in and continued participation are considered essential for long-term success. For example, FHWA, AASHTO, AMPO, and NTOC represent many of the interests of both the agency-level and practitioner-level audience. It will be necessary to validate that these groups are willing to incorporate the brand into their individual means of communication as well as encourage the movement of agencies from Transitioning, Observer, and Unaware to Fully Engaged through pilot tests, conferences and peer exchanges, and other opportunities. This support will sustain the momentum of the brand without specific reliance on the SHRP2 program implementation support.

The project team will use several methods to test and validate that this level of support exists for a selected number of key organizations. We anticipate that several will
readily adopt the L17 products. The “what’s in for me” has already been answered by their participation and on-going support for the SHRP2 Reliability Program research. If in spite of all efforts to work with the key organization they are still reluctant to endorse the brand and message, the project team will work with them individually to develop a tailored a business case for endorsing the L17 brand and messages. This “what’s in it for me?” message will validate to the organization that there is recognition and understanding of their individual goals and mission and that the TSM&O brand can accentuate and enhance that mission. If the project team has made every effort through meaningful participation, acknowledgement and efforts to rationalize of brands and messages and one-on-one meetings to develop a tailored business case, a key organization is not prepared to support the KTS and its underlying brand and messages, the project team will include a short assessment of the potential risk to the overall acceptance of the KTS and its associated brand into the Brand and Message Testing Report.

The information gathered during the Brand and Message Testing Phase will provide the TCC with confirmation that the research is meeting the intended purpose. If there is a positive reaction to the preliminary brand and messages it will indicate that the brand should be well established prior to project completion with next steps identified toward implementation. The TCC will be provided a quarterly summary of brand acceptance and website analytics. The brand and communication message acceptance information will be closely monitored. If users are not responding to the branding information and/or the communication messages and mechanisms the project team will reengage the User Community and the TCC with recommendations for corrective action. By the end of the testing phase, the TCC will be asked to approve the final brand and communications messages to be incorporated into the KTS and the communications strategy during the final phase of the project.

**Outcome:** Brand and Message Testing Evaluation Report.

**Outreach:** Throughout this task there will be extensive and ongoing interface with the Institutional Community both as a full participant audience and with individual essential organizations. This level of outreach will support the necessary commitment for post-project communication. A specific area of the project website will be used to support the Institutional Community involvement. The User Community will be re-engaged along with the TCC to consider corrective actions identified for the brand during testing.

5.7.4 **Phase IV: Communication Strategy and Sample Materials Development**

The Product Development Phase must not only provide communications support for the roll out of the KTS, but also it must strengthen the commitment and buy-in of both
users and organizations to support the implementation of the Reliability Program research post-SHRP2. To support the roll-out of the KTS tasks conducted during this phase will create communication and branding related content for the KTS and sample communications materials based on the branding and message testing. However, the communications strategy will go beyond simply supporting the KTS roll-out to include on-going strategies to formalize and propel the partnership with users and organizations into post L17, and hopefully post-SHRP2, Reliability Program implementation.

During the final phase of the project the team will have an accepted brand as well as communication messages that have been tested and refined. Final development of the KTS will incorporate content and linkages to support ongoing communication to the full target audience. The project website will be maintained until the project has been completed in order to continue the “buzz” associated with the brand and what the KTS has to offer.

**Task 1: Development of Web content to support KTS**

The KTS will have three primary aspects that require specific content development:

- Business case description and assessment support
- Access to related research and case studies
- Communication and user audience engagement

Web content will be drawn from project reports and memos but will be edited to be relevant and engaging for use on the web. During the development of the conceptual design for the KTS the team will construct a site map of the tool that will identify the individual content features that will be offered. This step allows the development of the content database for the KTS.

The project team has considerable experience in developing content for other websites. Through our reliance on a user-focused design throughout the research project, the KTS content development will become an extension of that process. Content will be drawn from previously created documents for increased efficiency. The team communication experts will be relied upon to provide recommendations for initial approaches as well as response to user interview comments.

The use of social media is an important aspect of engaging the target audience from the beginning of the project and is expected to strengthen the project timeline. The methods and platforms used within the project will inform this aspect of the tool. Recommendations will be made on improvements that may be considered in the future, and the tool will be developed with sufficient flexibility to incorporate changes desired.

**Outcome:** Input to the KTS and to the Communications Strategy D10
Outreach: Each of the representative audience groups (User Community, Institutional Community, and Academic Advisory Team) will be engaged during development of the KTS to provide feedback and recommendations. The User Network will be engaged through changes in the project website to mirror the look and feel of the KTS. The project blog will be used to discuss content topics.

Task 2: Developing Communications Samples

Throughout the research the project team will be developing and using communication samples in order to discover what is successful at relaying the reliability concepts to the various audiences in a wide variety of settings. Because the project has been largely conducted through virtual meetings and forums, the web-based resources are expected to be very well defined at this point in the project. However, their will also be a need for traditional communication materials such as handouts and slide presentations to support conference and meeting participation.

While some materials may be appropriate for the all audiences, it is possible that specific audience segments will need only a subset of communication materials. For this reason the project team will create differentiated sample materials as needed for up to four key audience segments identified during the Product and Brand Definition Phase. If additional key audiences are identified during the Product and Brand Testing Phase new target audience positioning guides will be developed and incorporated into the Communication Strategy and referenced in the implementation issues white paper. These guides will provide a summary of communications related information that will provide an implementing agency a roadmap for development of additional communication materials.

Outcome: Input into the implementation issues white paper on communications samples. D9

Outreach: Communications materials will be provided to all outreach groups for consideration and input as these are developed.

Task 3: Report on the state of academic curricula

During the previous phase information related to academic support for the reliability concept and associated strategies will have been synthesized and analyzed to identify where courses, internships, and other opportunities for students to become knowledgeable and interested in this area of the transportation profession may be needed. Through interface with the Academic Advisory Team a summary report will be developed that addresses the lessons learned and recommendations for
improvement. The AAT members will be asked to champion this change by disseminating the report and encouraging their peers to interface with the KTS.

The Communication Strategy will also include communications messages and mechanisms for reaching the academic community. With an identified and accepted brand in place, support for TSO&M within transportation agencies will grow; potentially requiring a larger number of planners and engineers with the necessary skills to meet this need. From the understanding of the state-of-the-practice with regard to academic curricula associated gaps in academic support can be identified. The resulting perspective may be communicated to the universities and colleges: essentially identifying the associated business case for incorporating TSO&M into the academic curriculum for planners and engineers.

Outcome: Academic curricula support needed for the brand reported in an implementation issues white paper D9

Outreach: The final meeting with the Academic Advisory Team will conducted to provide input on recommendations and next steps for changes to the existing academic support for TSO&M. AAT members will be encouraged to take an active role in championing this effort.

Task 4: Development of the Communications Strategy

The Communications Strategy should provide a road map for using the products and relationships developed in L17 to support implementation of the KTS and the Reliability Program research long term. The communication strategy will include communication strategies (messaging, mechanisms, materials, etc) for supporting the KTS roll-out and building market recognition of the brand. To create long term momentum, however, it must also include strategies to solidify and institutionalize the partnerships with users and organizations that have been at the core of the L17 project.

The communication strategy will be built from the products of this work through the first three phases including the validated business cases at both the agency and practitioner segments and the branding. It will identify communication mechanisms and tactics for agency level (Executives and senior managers) and practitioner audience segments. In addition, it will promote the KTS, its benefits and features to the appropriate target audiences.

There is a second tier of potential audiences that have an interest in the outcomes of the increased reliance on TSM&O strategies to address congestion. These are those that are regularly affected by congestion but not part of the decision making process: local government, freight suppliers, the driving public, and others. As identified earlier, some members of these audiences will be made aware of TSM&O as members of a
MPO. However, at some future time it may be necessary to target these audiences in a more direct way. The Communication Strategy will provide some identified “next steps” to address these second tier audiences.

The project team feels strongly that pilot testing of the concepts and resources produced in this research would be advantageous. In particular, the potential for moving agencies up the continuum toward full engagement in TSM&O should be a goal. To support this, the Communication Strategy will include a conceptual design and problem statement for conducting a pilot test of the KTS and relevant components of the communication strategy. The purpose of this pilot test design will be to create additional buy-in and commitment for the KTS and the Reliability Program overall.

This “messages and mechanisms” portion of the Communications Strategy will begin as an annotated outline following selection of the brand and the supporting outreach during the Product and Brand Definition Phase. This internal document will be revised throughout the project as more information is collected concerning the messages that resonate and the mechanisms that are determined most effective for reaching each of the identified audiences.

Through our various outreach groups L17 will create the coordinated structure of users and organizational partners that can promote the coordinated brand, the KTS and the overall Reliability Program research. This nascent partnership represents an opportunity for long term support and coordinated institutionalization of TSM&O. There is a high risk that these relationships and partnerships will fade away as soon as L17 ends. Our communication strategy, therefore, will include strategies and mechanisms for maintaining the partnership and tapping their collective voice for at least the mid-term until an implementing agency is identified and operational. We will leverage the KTS, but will include other strategies as appropriate.

**Outcome:** Final Communications Strategy submitted D10

**Outreach:** Individuals within the User Community and User Network will be engaged as necessary to provide input to the Communications Strategy. This will be limited to interface through the project website since the individual aspects of the Strategy have been reviewed during their development.

### 5.8 Anticipated Research Results

As described above, the primary product of this project will be a Knowledge Transfer System (KTS) that will serve as an effective means for moving research findings and products from many different projects within the Reliability, Capacity, Safety and Renewal program areas into mainstream practice. The KTS will include knowledge...
(information) content, communication components, and activities/outreach components. The KTS will be personified via a web portal that will host information (including links to other relevant websites and resources) and a variety of communication vehicles (e.g., Speakers Bureau materials and online forums). This product will be ready for review by the TCC/ETG by Month 13 with final refinements occurring throughout the remainder of the project based on feedback from reviewers and beta testers.

Another important product of this project is the Implementation White Paper that will be prepared as part of the Task 5 activities in Phase IV of Track B. This paper will be a report to the ETG and, perhaps, future SHRP programs focused on deployment and implementation. It will include specific recommendations regarding KTS content, structural, and user interaction characteristics that should be monitored and considered for change/update over time as the needs of the target audiences continue to evolve.

In addition to the KTS and the Implementation White Paper, the project will produce an Interim Report which will be produced at the culmination of Phase II, and the Final Research Report which will be submitted prior to completion of the project. All report deliverables will be submitted in electronic and/or hard copy form as directed by SHRP 2 staff.

Exhibit 5-14 summarizes the deliverables, the corresponding work plan element, and the completion date.

<table>
<thead>
<tr>
<th># (from RFP)</th>
<th>Description</th>
<th>Corresponding Work Plan Element</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Synthesis Report</td>
<td>Track A, Phase I</td>
<td>Month 3</td>
</tr>
<tr>
<td>2</td>
<td>Reliability Definitions and Branding</td>
<td>Track C, Phase I</td>
<td>Month 3</td>
</tr>
<tr>
<td>3</td>
<td>&quot;Making the Case&quot; Primer</td>
<td>Track C, Phase I</td>
<td>Month 6</td>
</tr>
<tr>
<td>4</td>
<td>Gap Analysis Report</td>
<td>Track A, Phase II</td>
<td>Month 6</td>
</tr>
<tr>
<td>5</td>
<td>Interim Report (to include Deliverables #1-4)</td>
<td>Tracks A-C, Phase I &amp; II</td>
<td>Month 6</td>
</tr>
<tr>
<td>6</td>
<td>KTS Concept Design and Specifications</td>
<td>Track B, Phase II</td>
<td>Month 10</td>
</tr>
<tr>
<td>7</td>
<td>Completed KTS (Beta version)</td>
<td>Track B, Phase IV</td>
<td>Month 13</td>
</tr>
<tr>
<td>8</td>
<td>KTS System Documentation</td>
<td>Track B, Phase IV</td>
<td>Month 16</td>
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<tr>
<td>9</td>
<td>Implementation Issues White Paper</td>
<td>Track B, Phase IV</td>
<td>Month 16</td>
</tr>
<tr>
<td>10</td>
<td>Communication Strategies and Materials</td>
<td>Track C, Phase IV</td>
<td>Month 16</td>
</tr>
<tr>
<td>11</td>
<td>Draft Final Report</td>
<td>All tracks and phases</td>
<td>Month 16</td>
</tr>
<tr>
<td>12</td>
<td>Final Research Report</td>
<td>All tracks and phases</td>
<td>Month 18</td>
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</tbody>
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5.9 APPLICABILITY OF RESULTS TO SHRP 2 OBJECTIVES

As the capstone project for the SHRP 2 Reliability program, Project L17 will play a critical role in integrating the findings, methods, and recommendations of all other Reliability projects; it will also provide a bridging interface from (and to) key elements of the SHRP2 Capacity program.

The four core research themes within the Reliability program area (analysis and metrics; institutions and human factors; planning, programming, and project delivery; and innovation promotion) are addressed through Projects L1-L9, L11, L12, and L14; collectively, these projects aim to do all that’s possible to improve transportation system efficiency through the means of operational strategies and increased travel time reliability. The results and products of these projects will become the foundational knowledge content that is integrated into the reliability framework of Project L17. Thus, the project will play a critical role in consolidating/synthesizing the work of other projects in the reliability program. More than this, it will also play a pivotal role in mainstreaming these work products into the everyday activities of the transportation professional. The KTS developed in this project will also be an important venue for presenting and/or applying significant products from the Capacity program area (notably, Projects C01, C02, C05, C10, C15, and C20).

By definition, this is a very practice-oriented project in that all of the tasks focus on developing a KTS to meet the needs of practitioners and decision makers. Getting more value out of the existing transportation infrastructure is one of the most important advances that this profession can take in positively affecting our communities’ overall quality of life. By expanding and improving the available tools to include the latest research results as well as computational software and more examples, this project will exert a significant influence on alternatives analysis and decision-making by planners, designers, engineers, and administrators.