SHRP2 Project C32: Enhancement and Outreach for TPICS and Other Economic Analysis Tools

Prepared for:
The Strategic Highway Research Program II (SHRP2), Transportation Research Board (TRB)

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OVERVIEW - MOVING Forward with the TPICS Web Site

This chapter provides an overview of TPICS as developed under SHRP2 Project C03 and the various improvements to it that have been funded under SHRP2 Project C32. Those improvements are described in further detail in subsequent chapters of this report.

1.1 What is TPICS?

SHRP 2 Project C03 assembled a national database of pre/post case studies documenting the economic and land development impacts of highway-related transportation projects. The web tool is called TPICS, which stands for “Transportation Project Impact Case Studies.” It is available at www.tpics.us and provides access to: (1) a searchable system to find past (already-built) transportation projects and their observed impacts on economic development, and (2) a predictive tool that estimates the range of likely impacts of proposed new projects, based on results from already-built projects. There are currently over 100 projects in the TPICS database.

TPICS thus provides two capabilities, as explained on the TPICS web site.

- The case search function allows users to define a set of project characteristics. The system then screens available cases and selects those that meet the specified criteria. Users can then view the selected cases. This can “inform agency planners and public meeting attendees about past experiences with similar types of projects. The available information includes descriptions of project features and pre/post data pertaining to project impacts on the local or regional economy. It also includes detailed results from local interviews on project objectives, implementation issues and other factors affecting the nature of project impacts. Aerial photos and links to other reports are also provided. Lessons learned from these experiences can be used to improve project design and implementation processes.”

While the SHRP2 program was focused specifically on highways, the current TPICS database also include a few intermodal highway/freight rail and intermodal road/transit facilities, and there are proposals pending for its eventual extension to transit and other modes of transportation.

- The predictive feature is a form of expert system that draws from the case study database to estimate the range of economic impacts likely to results from a specific type of project in a defined setting. It provides a form of ‘analysis by analogy,’ in that
it identifies a reasonable range for expected impacts of proposed projects, based on prior experiences.”

While the current TPICS predictive feature is useful as a screening tool for early stage project assessment, it is accompanied by a warning that “neither the searchable database nor the project prediction tool provides information on the effects of changing traffic volumes, speeds, distances or safety, or effects of changing reliability, connectivity or accessibility. In real world situations, these factors can play a substantial role in determining whether the actual economic impact of a project will be at the low end, high end or outside of the normally expected range. To assess the impact of these additional factors, it is necessary to use economic impact models and tools that do measure these added factors affecting the wider economic impacts of projects.”

A follow-on project to SHRP2 Project C03 (TPICS development) was Project C11, which developed a set of spreadsheet-based tools to support analysis of “wider economic benefit” measures. These spreadsheets illustrate ways to measure reliability, accessibility and intermodal connectivity factors -- which are beyond the traditionally measured travel time, cost and safety benefit measures typically considered in transportation project evaluation. Whereas TPICS was designed to support “early stage” project planning, these spreadsheet tools support “middle stage” evaluation processes. These tools are described and presented on the web at [www.tpics.us/tools](http://www.tpics.us/tools).

The subsequent SHRP2 Project C32 funded enhancement to TPICS, as well as clarification of the wider economic benefit measures and their relationship to TPICS. These enhancements are described next.

### 1.2 New Directions for TPICS

SHRP2 Project C32 provided funding for five types enhancements to TPICS and associated economic tools, which are described in this report:

- Training course on how to develop new pre/post case studies, and appropriately use the TPICS system (discussed in Chapter 2 and shown in Appendix A);
- Improvements to the TPICS user interface and documentation, as well as outreach activities (discussed in Chapter 3 with further material in Appendix B);
- Development of additional TPICS cases, which have been added to the database (discussed in Chapter 4 and shown in Appendix C);
- Testing of TPICS case study applicability and consistency with SHRP2 Project C11 tools for calculating wider economic benefits, with further clarification of those tools (discussed in Chapter 5 and Appendices D and E); and
Recommendations for further, long-range application and enhancement of the TPICS system (discussed in Chapter 6).

The enhancements described here are also intended to assist the process whereby the TPICS system is transitioning from the now-ending SHRP2 program to being continued under the auspices of the Federal Highway Administration, with support from the American Association of State Highway and Transportation Officials (AASHTO). This will ensure long-term use of TPICS, support the development of additional case studies, and promote TPICS use and applicability for sketch level planning.
2 DEVELOPMENT OF TRAINING IN CASE-BASED ECONOMIC IMPACT ANALYSIS

2.1 Training Course Overview and Objective

To support the development of new case studies to add to the TPICS database, the study team developed an on-line course to educate and train practitioners on the fundamentals of economic impact assessment, data collection, interview processes, and other important techniques necessary to develop high caliber case studies that meet the threshold for inclusion in TPICS. The course was originally developed to be presented in person by a facilitator, following the National Highway Institute (NHI) guidelines. After it had been decided that 3rd party facilitators would not be involved in training, The project team developed a web-based instruction platform so all participating agencies can be sufficiently instructed with a mutual understanding of expectations, course content, and delivery objectives.

The training materials included Power Point slides for online training as well as supporting exercises, reference documents and worksheets. The core slide decks are shown in Appendix A.

Objective.

The purpose of the course is to train practitioners (researchers and planners) in steps needed to conduct case studies of the economic impacts of transportation investments, how they can add these cases to the TPICS database. The course reinforces the importance of understanding economic impacts for prioritizing and selecting projects. It provides step-by-step guidance for analyzing and integrating a range of information sources, including published data, case study interviews, site analysis and web-based research, to determine the economic impacts of projects.

The training has two goals: (1) to enable future additions of new cases -- by expanding the TPICS database with new cases, this web tool will also become thus making it more robust and provide enhanced capabilities for illuminating factors affecting economic impacts of projects, and (2) to expand knowledge about success factors that enhance economic impact outcomes. The course stresses both quantitative and qualitative measurement issues, and the importance of developing insights into ways that some projects effectively leverage transportation investment dollars to support broader public policies that enhance the economic impact of transportation investments.
2.2 Topics Covered

Course Elements.
The on-line course consists of:

- 13 Lesson Modules each concentrating on a specific objective;
- Supporting exercises to provide hands-on experience and test comprehension of material presented;
- Resource guides: documentation of materials used, spreadsheet templates, and glossary of terms;
- Quick Reference documents identifying sources of data;
- Interview guides; and
- A Final Exam.

Course Topics.
The course covers:

- Basic economic impact concepts;
- Components of the TPICS tool;
- Data collection sources and methods;
- Site analysis, through aerial photography and site visits;
- Interviewing techniques;
- Data analysis;
- Synthesis of research results, to develop a project narrative and project impact data; and
- Case study challenges.

Figure 1 lists the course modules; see Appendix A for details of the training material.
Figure 1: Lesson Modules and supporting Activities

- Case-Based Economic Impact Analysis
- Module 1: Introduction and Course Overview
  Objective 3
  Required Reading
- Module 2: Economic Development Concepts
  Objective 2
  Exercise 1
- Module 3: Overview of the TPICS Tool
  Objective 3
- Module 4: TPICS Case Study Basics
  Objective 3
  Exercise 2
- Module 5: Case Study Data Need and Sources
  Objectives 1 and 2
  Exercise 3
- Module 6: Conducting Case-Specific Web-Based Research
  Objectives 1 and 2
  Exercise 4
- Module 7: Using Aerial Photography for Economic Impact Assessment
  Exercise 5
- Module 8: Conducting Case Study Interviews
  Objectives 1 and 2
  Video
- Module 9: Using Site Visits to Clarify Project Impacts
  Objectives 1 and 2
- Module 10: Economic Development Concepts
  Objectives 1 and 2
  Exercise 6
- Module 11: Developing a Case Study Narrative
  Objectives 1 and 2
  Exercise 7
- Module 12: Challenges in conducting case studies
  Objectives 1 and 2
- Module 13: Course Conclusion
  Objective 3
  Final Exam
2.3 Specification of Training Course Features

Target Audience Characteristics.

The Case-Based Economic Impact Analysis course is designed for transportation and planning practitioners, including:

- State and national DOT planning staff;
- City and county transportation and land use planners;
- Regional MPO and transit operator staff;
- Local and Regional economic development practitioners; and
- University and consultant researchers.

The on-line course is designed for individuals who work on transportation project planning and development, and who are expected to consider the economic impacts of projects in their work. Participants should be familiar with the types of land use and economic impacts that are often attributed to transportation projects. Through engaging in the course, participants will enhance their understanding of how transportation projects influence land use and economic development, and will develop skills for isolating these impacts from other influences, such as land use regulations and economic incentives. The course will not cover the basics of transportation planning; therefore, participants are expected to have some background in transportation planning principles.

The success of the course will be measured by the ultimate completion of well-developed cases to enter into the TPICS database. This will greatly depend on the diligence of the new case study developer in searching out and collecting case-specific information. Each participant in the training is required to expand his or her thinking about project impacts to effectively learn how to identify and calculate project impacts. Participants must also be committed to reading all recommended background materials when suggested before proceeding on to another module or slide. The background materials are key to comprehensive learning in this course.

Performance Environment

The skills acquired by completing the Case-Based Economic Impact Analysis course can be applied in several settings. Interviewing, web searches and review of aerials may take place in an office setting, as will data collection and analysis. When possible, site visits require trips to the geographic area in which the case study project is located. Standard software such as Microsoft Word and Excel can be used for developing case studies. Some interviewing and data collection may occur in the field during case studies. Entering case studies into the TPICS database using on-line tools also requires post-processing of data input by an administrator (currently AASHTO under contract from FHWA), who will also
include a project impact assessment and application of standard economic multipliers. The administrator will also provide QA/QC for all new cases submitted using staff trained in the procedures required to assure that case data, narratives and categorizations/classifications are consistent with guidelines for case development.

**Training Environment.**

For best performance, the online course should be taken on standard hardware configuration. Minimum configuration includes the following:

- Minimum processor speed: 1.4GHz Intel® Pentium® 4 or faster processor (or equivalent) for Microsoft® Windows® XP or Windows 7; 2GHz Pentium 4 or faster processor (or equivalent) for Windows Vista®
- Operating System: Windows XP, Windows Vista, or Windows 7
- RAM: 512MB of RAM (1GB recommended) for Windows XP or Windows 7; 1GB of RAM (2GB recommended) for Windows Vista
- Internet Browser: Microsoft Internet Explorer 7 or later
- Adobe® Flash® Player 10.3 or better
- Adobe® Acrobat® Reader 10 or better

The course may be completed anytime, anywhere. Participants should have access to a quiet location and dedicated time away from their professional duties to complete the training.

**Level of Interaction.**

The course has been developed to engage the learner and allow him or her to practice applying the information whenever possible. The NHI uses the following definitions to describe the degree of interactivity:

**Table 1: Descriptions of Each Level of Interactivity**

<table>
<thead>
<tr>
<th>Level of Interactivity</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level I – Passive</td>
<td>The learner acts solely as a receiver of information. The learner progresses linearly through course reading text from the screen, viewing video or listening to audio.</td>
</tr>
<tr>
<td>Level II – Limited Interaction</td>
<td>The learner makes simple responses to instructional cues. The responses may include answering multiple choice or true/false questions.</td>
</tr>
<tr>
<td>Level III – Complex Participation</td>
<td>The learner makes a variety of responses using varied techniques in response to instructional cues.</td>
</tr>
</tbody>
</table>
This course was developed for interactivity level II. The rationale for selecting this level of interactivity is that, given funding and logistical constraints, it provides the best approach to ensuring the course materials are effectively presented with quizzes and tests throughout so that the participant can gauge his or her grasp of the material.

**Course Learning Process and Outcomes.**

The course is designed for an individual to go through it without a live instructor. This approach allows participants to take the course immediately prior to embarking on a case study while the material is still fresh.

Throughout the course, participants will be provided with information about different case studies and asked to develop the research tools that they learn about in the modules. They then compare their research tools and approaches to those developed by the original case study researcher. This provides an opportunity to learn from an expert without that expert being present. To reinforce learning, the participant will be asked to read background materials, complete exercises exploring existing TPICS cases, and complete several short quizzes after each module (or group of modules) to ensure that he or she grasps key concepts. Participants must take a final exam at the end of the course and receive a minimum of 70% on the exam to become eligible to enter projects into the TPICS database.

The approach presented here is well suited to professional land use, economic development and transportation professionals familiar with on-line learning and research. After completing the course, participants are expected to have developed the capacity and ability to:

1. Describe and define the different types of economic development impacts that can result from a transportation infrastructure investment.
2. Assemble data to use to estimated economic development impacts.
3. Research a range of on-line sources to develop background information and enhance project understanding.
4. Conduct successful interviews with transportation and land use planners, economic development professionals, business people, elected officials and others to collect useful information for understanding the economic impacts of transportation investments.
5. Distinguish between the role of a transportation investment, other public policies, local characteristics, and broad economic trends in economic development near transportation investments.
6. Calculate and analyze the economic development impacts of transportation projects.
7. Accurately enter new case studies into the TPICS database.
3 TPICS USER INTERFACE, DOCUMENTATION AND OUTREACH

3.1 Overview of TPICS Improvements

A series of five improvements were made to the TPICS web site:

- Updates to the home page to clarify the instructions and intended uses of TPICS;
- Updating of all dollar-denominated metrics from constant 2008 dollars to constant 2013 dollars;
- Addition of use monitoring and academic research controls (see Section 3.2);
- Addition of an online “forum” feature for user community comment and discussion (see Section 3.3);
- Further outreach activities and development of a TPICS user survey, to elicit reactions regarding product usefulness and suggestions for improvement (see Section 3.4); and
- Expanded documentation of the C11 wider economic benefit spreadsheet tool for measuring accessibility changes (see Section 3.5).

3.2 Use Monitoring & Academic Research Controls

To promote statistical research of the TPICS data, access to the all database elements (including characteristics, setting, socioeconomic data, and impacts) is available with use-monitoring and academic controls. To monitor the level of data download usage and to identify the types of organizations using the data, EDR Group developed a survey form requiring completion before access to the TPICS dataset is granted. This survey form requires the user to enter in contact information, answer a series of survey questions to gauge purpose, ease, and experience of use, and the finally agree to “research only” terms of use. An example of the contact information and survey questions are illustrated in Figure 2.
Legal language outlining “research only” terms of use was also added to make certain the data cannot be used for commercial or consulting purposes:

Data provided by this web site is intended to serve as a resource for transportation planners and others who are interested in better understanding the long-term economic impacts of highway capacity projects. This software is offered as is, without warranty or promise of support of any kind either expressed or implied. Under no circumstance will the National Academy of Sciences or the Transportation Research Board (collectively "TRB") be liable for any loss or damage caused by the installation or operation of this product. TRB makes no representation or warranty of any kind, expressed or implied, in fact or in law, including without limitation, the warranty of merchantability or the warranty of fitness for a particular purpose, and shall not in any case be liable for any consequential or special damages.

In order to download your TPICS search results in a spreadsheet format, we require the following information. Please note that by downloading this spreadsheet, you agree the data you obtain from this site will be used for research purposes only and cannot be used for any economic assessment, economic impact analysis, sketch planning, or any other commercial or consulting purposes. Any reference to this data in a report, memo, research document or any other published material must include the following citation and the date that the data was downloaded:

3.3 On-Line Forum for User Questions and Discussion

The TPICS dataset is intended to assist public agencies, researchers, and the general public in making better informed decisions about the economic implications transportation investments. These decisions can be enhanced through public discussion and dialog among users regarding findings, application, and effective methods of communications. To facilitate discussion and knowledge sharing among users, EDR Group developed an on-line forum for discussion, comments, and research dialog among users. The home page of this forum is shown in Figure 3. Administrative features in the forum enable use monitoring in order to prevent abuse by unauthorized users or inappropriate material.

After registering an email address, user identification, and a password, users are now able to post questions and answers, discussion topic regarding TPICS use, recommendations for application, and any other relevant uses. EDR Group has been monitoring the forum for posted questions or discussion; however, current plans are for this administrative responsibility to be transitioned over to FHWA.

Figure 3: TPICS Forum

Basic

<table>
<thead>
<tr>
<th>THREADS</th>
<th>LATEST POST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>TPICS data_</td>
</tr>
<tr>
<td></td>
<td>11/10/2013</td>
</tr>
</tbody>
</table>

How Do I Download The TPICS Data?
Data question

Case Submission Issues
Any questions related to new case submissions

<table>
<thead>
<tr>
<th>THREADS</th>
<th>LATEST POST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>How do I submit case_</td>
</tr>
<tr>
<td></td>
<td>10/11/2013</td>
</tr>
</tbody>
</table>
3.4 Outreach to TPICS Users

Proactive Efforts to Collect User Feedback

In support of ongoing efforts to improve the user experience for both the TPICS and SHRP C11 tools, staff of EDR Group collected information on tool usage from a number of public sector agencies and universities. TPICS feedback was collected as part of the SHRP C55 Capacity Implementation Support, under the guidance of staff of ICF International. Before the C32 project, usage of both the TPICS and SHRP C11 tools had been relatively limited; thus user feedback up to this point had been also limited. A new round of “implementation assistance grantees has provided further insight into the usability and benefits of these tools.

TPICS user feedback was also collected through interviews, using an interview guide that focused on: a) the reasons for using the product, b) details of how tool-usage may change or support evaluation processes, and c) any comments regarding tool improvement. As can be seen from the summarized responses below, TPICS and the C11 tools offer benefits both for sketch-level evaluations and for benchmarking of other more complex methods. More than one interviewee expressed interest in an expanded TPICS database to increase the breadth of available information.

The following examples illustrate the range of responses to the interviews:

- Interview 1: California DOT Official - investigated the tool for projects that involve the interface of transportation, economic, and land use issues; concluded that TPICS can be beneficial by helping planners to: (a) validate in-house economic assessment; (b) provide sketch-level indications of expected project impacts, (c) highlight approaches used by other agencies to address similar issues, and (d) facilitate inter-agency learning by identifying relevant cases that can be followed up with more in-depth inquiries.

- Interview 2: NC University Professor - used TPICS to find comparison projects to benchmark the results of a study he was performing; found the TPICS system easy to use, but could not always find comparable projects to suit his needs.

- Interview 3: Ohio DOT Modeler - reported that ODOT and RSG Inc. used the TPICS case study results database to validate results from the state’s predictive economic analysis tool.

- Interview 4: Minnesota DOT Policy Researcher – noted that TPICS had not yet been used within MnDOT for a specific project or assessment. However, in the future, anticipated uses of TPICS include supporting local governments assess smaller projects for programs with specific economic impact or economic development objectives. Noted that while TPICS provides valuable information on non-
transportation factors that influence impacts (from the case narratives), he also expressed an interest in an expanded database.

- Interview 5: New Zealand Transport Economist – used TPICS and C11 wider economic benefit tools to inform ongoing work developing new economic assessment approaches for New Zealand.

**Web Site User Survey**

In addition to outreach to TPICS users, EDR Group developed a feedback mechanism integrated within the TPICS webpage to encourage users to provide their feedback and experience using the tool. The structure of the survey is similar in nature to the Usage Monitoring survey except that all fields are optional. Questions on this optional survey inquire about features used, scale of functionality & design, primary purpose of use, problems encountered, and frequency of use as shown in Figure 4.

**Figure 4: Users Survey**

At the end of the survey, users are informed of the need for additional case studies and provided with information on submitting new cases. The following text has been added:

“The TPICS database expands its depth and breadth of information as additional case studies are added to the database. Please contact us if you are aware of a potential
case study to develop that falls within the following project types: Beltway, Bridge, Bypass, Connector, Interchange, Intermodal Passenger or Freight, Major Highway (Limited Access Road), or Widening. Please email info@TPICS.us to discuss potential case development and review the "Submit New Case" link on the TPICS home page.”

Based on user feedback, changes have been made to improve TPICS including improvements in functionality, calculations, labeling, and formatting with corresponding updates made to the User’s Guide and Technical Documentation. In addition, a white paper and instructional addendum was added to help address users better understand how to use the SHRP2 Project C11 wider economic benefit accessibility tool (see Appendix E.)

**Conference Presentations**

To increase awareness and promote usage of TPICS and the C11 tools, presentations were made at a series of conferences to showcase the relevance of these tools in the decision making process as well as demonstrating applicable use. Each presentation included similar content material addressing:

- general introduction, objectives, and features of the tools;
- characteristics and insights of TPICS case studies;
- how to use TPICS and wider economic spreadsheet tools to enhance transportation planning processes; and
- application of C11 tools to C03 case studies & interpretation of results.

Conferences where these presentations were made at:

- International Transportation and Economic Development Conference (ITED) – Dallas, TX (April, 2014)
- SHRP2 Implementation Assistance Webinar (March, 2014)
- TRB Tools of the Trade Conference – Burlington, VT (July, 2014)

The Power Point slides prepared for the SHRP2 Implementation Assistance Webinar are shown in Appendix B.

**Social Media Promotion**

Social media promotion has increasingly become an effective tool to create awareness and communicate among potential users. To this end EDR Group primarily relied upon Twitter
to communicate speaking highlights, links, and presentations regarding TPICS and C11 tools. These activities include:

- 8/11/14: EDR Group ReTweeted a tweet from Metro Library about TPics with a link to [http://www.trb.org/Main/Blurbs/169524.aspx#.U-kOuYWvYDo.twitter](http://www.trb.org/Main/Blurbs/169524.aspx#.U-kOuYWvYDo.twitter)
- 9/30/14: EDR Group Tweeted a link to the EDR GROUP webpage on Steve Fitzroy's Talk on "TPICS, TIGER and US Experience - A Focus on Case-based Ex-Post Economic Impact Assessment".
- 9/30/14: EDR Group Tweeted a link to a YouTube video of Steve Fitzroy's Talk on "TPICS, TIGER and US Experience - A Focus on Case-based Ex-Post Economic Impact Assessment". The video had been posted to YouTube by ITF.
- 11/14/14: TRB Tweeted about Steve Fitzroy's presentation and included a link to the Youtube video. EDR Group retweeted it.
4 NEW TPICS CASE STUDIES

4.1 Development of Five New Case Studies

Selecting new cases from the MnDOT C33A Report

The SHRP2 Project panel guided project selection process to pick new case studies to develop. The panel requested that case studies previously included in the MnDOT SHRP2 C33A report be further developed for inclusion into the TPICS database, insofar as they are complete and enhance the range of cases covered by the database. Overall, 14 cases were included in the C33A report and the project team evaluated each case study individually as a potential candidate for further development to meet the TPICS required content and format. Ultimately, five cases were selected that met minimum requirements and offered combinations of project type, geography, and class level characteristics to add diversity to the 100 cases currently in TPICS. These five were selected based on the completeness of available information, with an additional consideration of the need to expand the breadth of project types and settings. Projects with incomplete data, and projects that were not yet completed, were rejected.

Table 2 shows the selected new cases, categorized by project type, geographic region, and class level (urban/metro & rural). The following paragraphs describe the selection process of the 5 cases by project type.

Interchange. Although there are already 12 Interchange projects in the TPICS database, the I-94 / Opportunity Drive Interchange project was selected because the nearby industrial park development enabled transparent identification of businesses attracted to the area due to the interchange. Although the project is located in Sterns County, which is part of the St. Cloud Metropolitan Statistical Area (MSA), it is located south of St. Cloud and exhibits more of a rural environment than many of the other “Metro” or “Mixed” interchange projects. Although technically considered “Metro” in its regional setting, this case study expands the breadth of interchange projects within TPICS by contributing a more rural setting and context.

Widening. In the TPICS database, there was only one Widening project in the Rocky Mountain/Far West region and one in the Great Lakes/Plains region for Metro/Urban projects; therefore, the New Mexico U.S. 54 and the Iowa 60/U.S. 75 La Mars corridor projects were selected. The MN TH 60 Expansion project, a rural project, was selected because there were previously no rural widening projects in the Great Lakes/Plains region. None of the Corridor projects in Appalachia were selected because they are already adequately represented in TPICS and because all four were built many years ago.
experience from the previous 100 cases has shown that finding adequate data for projects completed before 1985 can be difficult due to lack of pre-project data.

**Bypasses.** Because TPICS already contains over 8 Rural Bypass cases, a Metro/Urban Bypass project, the Iowa 5/U.S. 65 Beltway, was selected since there are currently only 2 other Metro/Urban bypass cases in Great Lakes/Plains region.

**Table 2: Selected New Case Study Projects**

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Location</th>
<th>Project type</th>
<th>Region</th>
<th>Setting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opportunity Dr. Interchange, I-94</td>
<td>St. Cloud, MN</td>
<td>Interchange</td>
<td>Gr Lakes/Plains</td>
<td>Metro</td>
</tr>
<tr>
<td>MN TH 60 Expansion</td>
<td>Windom, MN</td>
<td>Widening</td>
<td>Gr Lakes/Plains</td>
<td>Rural</td>
</tr>
<tr>
<td>New Mexico - U.S. 54</td>
<td>Tularosa, NM</td>
<td>Widening</td>
<td>RockyMt/West</td>
<td>Mixed</td>
</tr>
<tr>
<td>Iowa 60/US 75 Le Mars Corridor</td>
<td>Le Mars, IA</td>
<td>Widening</td>
<td>Gr Lakes/Plains</td>
<td>Metro</td>
</tr>
<tr>
<td>Iowa 5/US 65 Beltway</td>
<td>Des Moines, IA</td>
<td>Bypass</td>
<td>Gr Lakes/Plains</td>
<td>Metro</td>
</tr>
</tbody>
</table>

**Description of New Case Studies**

For each of the five new case studies, the project team conducted supplementary interviews and developed a case narrative providing details regarding the projects history, motivation, policy influence, and economic impacts. Each case study narrative is organized subsections: (1) Synopsis, (2) Background, (3) Project Description & Motives, (4) Project Impacts, (5) Non-Transportation Factors, and (6) Resources. Synopsis of these new case studies follow here; complete narratives appear in Appendix C.

**Iowa Highway 5/U.S. 65 Bypass/Beltway - Iowa**

Iowa Highway 5 (IA-5) and U.S. 65 highways, built in phases between 1994 and 2003, run along the southern and eastern sides of the Des Moines metropolitan region. Together with Interstates 35 and 80, which bound Des Moines to the west and north, IA-5 and U.S. 65 form a beltway around the city. The new highways improved access to less developed areas to the east and south. The 24-mile project is located almost entirely within Polk County, with one small segment in the south running through Warren County. The bypass was built to both support existing and encourage new development, and to alleviate anticipated future congestion in the corridor and on I-35 and I-80.

All identified net-new economic impacts to-date have accrued within Polk County. However, this case also discusses development trends and effects to the south within Warren County. Ultimately, growth to the south and east of Des Moines in the IA-5/U.S. 65 corridor proved slower than expected. Growth in the Des Moines region continued west of the City, and only more recently has begun to occur in the IA-5/U.S. 65 corridor. Congestion did not occur to a degree that encouraged people to search out alternate routes around Des Moines. The
IA-5/U.S. 65 bypass has increased the accessibility of certain communities in the region and offered time and cost savings for freight and passenger travel. It is estimated that 645 jobs were created in Polk County as a result of the bypass construction. Much of this development is associated with new retail in the City of Altoona.

**Iowa Highway 60 - Iowa**

This case study focuses on the widening of Iowa Highway 60 (IA-60) from Le Mars to the Minnesota border. The highway was widened in phases between 1999 and 2008 as part of a broader effort to develop a 4-lane corridor between Sioux City and the Twin Cities metropolitan area in Minnesota. The 60-mile project runs through four rural counties (Plymouth, Sioux, O'Briens, and Osceola counties). As part of upgrading the highway from two to four lanes, Iowa Department of Transportation (DOT) also built bypasses around each of the cities and towns along the route, including Le Mars, Alton, Hospers, Sheldon, Ashton, and Sibley. The primary objective of the highway widening was to improve interstate access, particularly for agricultural and manufacturing goods moved along the corridor. Iowa views the provision of four-lane highway access as an important way to support economic development in the state. An estimated 45 jobs were created in the Highway 60 corridor from Le Mars to the Minnesota border as a result of the widening project. This includes job growth at two vendors of agricultural equipment; a trucking company; a fuel, maintenance, and rest-stop operation; and a hotel. Existing businesses also report cost savings associated with faster and easier truck movements, as well as some improvements in labor market access.

**Minnesota Highway 60 Widening: (Worthington, MN to Windom, MN)**

Minnesota State Highway (MN-60) in southwestern Minnesota provides an alternative route for shipments between Minnesota Iowa and Nebraska. Promoted by the advocacy group “The Minnesota Highway Action Corporation” and in partnership with the Iowa Department of Transportation (Iowa DOT), the Minnesota Department of Transportation (MnDOT) committed to expanding MN-60 from two to four lanes within southwestern Minnesota. The expansion was cited as a critical need to improve safety conditions and also expand access for agricultural, food processing, and manufacturing businesses in the region. The expansion has occurred in phases to date, with additional phases planned. The widening between Worthington, MN and Windom, MN occurred between 1993 and 2002, at a cost of approximately $41.8M (2002$'s). Businesses have created an estimated 270 jobs within the counties of Cottonwood and Jackson as a result of the highway widening.

**U.S. Route 54 Widening and Relief Route (NM State line to Alamogordo, NM)**

U.S. Route 54 (U.S. 54) enters New Mexico from the outskirts of El Paso, Texas and serves as a military highway to connect Fort Bliss in El Paso to Holloman Air Force Base in Alamogordo, New Mexico. Because U.S. 54 was first built as a two lane highway, increased traffic volumes between El Paso, TX and Alamogordo, NM raised concerns about safety and
access. The highway originally bisected the town of Alamogordo, NM causing severe congestion along the downtown section of White Sands Boulevard where a large number of businesses had located. To address pedestrian safety and re-direct pass-through traffic, a relief route bypass was constructed to the West side of town, which has attracted a number of businesses to its location. Overall, the relief route bypass is credited with bringing 90 jobs to the city of Alamogordo, NM.

I-94 “Opportunity Drive Interchange” – St. Cloud, MN

In 2003, the Minnesota Department of Transportation (MnDOT) built a new highway interchange at the intersection of I-94 and Stearns County Road 75 (formally referred to as CSAH 75, or County State Aid Highway 75) in St. Cloud, MN. There previously was a highway overpass at that site. Now referred to as the “Opportunity Drive Interchange,” it cost $7.85 million. The site is adjacent to a pre-existing industrial park. Prior to the interchange construction, vehicles accessing the site had to use an interchange two miles north on I-94 and then traveled on county roads to reach the industrial park and other nearby destinations. The primary objective of the project was to attract new businesses and employment to the area. It also reduced the costs and hazards associated with tractor-trailers traveling on existing secondary roads.

Prior to planning for the interchange, only one manufacturing facility had operations within the I-94 Business Park. The interchange was promised by MnDOT to enable Minnesota to compete and win a national competition for a large new bus factory, and it subsequently enabled the City to also attract several other major manufacturers to the region. The net impact has been a gain of over 1,100 jobs to the region.

4.2 Future Case Submission and Review Process

New Case Submission Interface

To facilitate new case study submissions, a New Case Submission interface was added to the TPICS home page as shown in Figure 5.

Figure 5: Submit new case link on TPICS homepage
After clicking on the link, researchers are required to enter in their contact information before they can upload their completed data spreadsheet and narrative document as shown in

**Figure 6.** Links to download a data spreadsheet template and a narrative template are also provided on this page for researcher’s use. After the researcher submits this information, the contact info, data, and case study narrative are emailed to the administrator assigned to review the materials who will work with the researcher until the case study is acceptable for inclusion within TPICS. This review process may require several iterations of data verification, narrative editing, discussion of impacts, and other tasks between the researcher and the administrator.

**Figure 6: New Case Submission Form**

**New Case Submission**

After the completion of the first 100 case studies under SHRP C32, it was decided that the value of TPICS would be greatly enhanced by providing users the opportunity of submitting additional case studies. Adding case studies will contribute to the breadth of project types and locations that will deepen our understanding on how transportation investments translate into economic impacts from a sketch-planning perspective.

In order to add your case study to the TPICS database we request that you fill in the following contact information and attach your Case Study Narrative and Case Study Spreadsheet data. Please use the following templates: Data spreadsheet template, Narrative template.

After receiving and reviewing your submission, we will contact you to follow up on any outstanding questions or additional information that will think is necessary before adding your case study to the TPICS database.

If you have any questions about the process, please email us at tpics@hstrgroup.com

Adminstrative Process for New Case Review

After submission of new cases, the designated administrator must review and if appropriate, then process the submission for completion and entry into the TPICS database. The data review process includes:

1) Verifying that all data has been entered into the spreadsheet in the appropriate columns. All data labels highlighted in green are required to be filled. These data are presented in the TPICS webpage.
2) Identifying numbers that do not fall within the range of normally expected values (e.g., $200 for Per Capita Income would be too low of a number).
3) Identifying values that have been incorrectly entered.
4) Confirming that dollar values are in Current dollars for the most recent year (e.g., cases entered in 2014 should have values recorded in 2013 dollars)

The documentation and data for the initial TPICS cases (SHRP2 Project C03 documentation) can be referenced to identify the proper data values and ranges when reviewing data for a new case submission. After reviewing the spreadsheet, the Administrator should contact the case researcher to review any missing or incorrect data and discuss how to resolve any issues. It is during this process that the Administrator contact should ask the research to highlight any particular findings that are relevant to the case.

After receiving the Case Study Narrative, the Administrator must review it to verify:

1) The narrative follows the spreadsheet template.
2) Each section contains information relevant to the subheading.
3) It is grammatically correct.
4) Direct job impacts are clearly indicated in both section 1.0 Synopsis and 4.2 Demographic, Economic, and Land Use Impacts.
5) Total page length is between 4-5 pages.
6) Proper citations and sources of Interviews are listed.

Case narratives currently in TPICS can be used as a guideline for the proper format and content for a case study narrative.

In addition to verifying the data provided by the researcher, there are some additional data that need to be added to the spreadsheet by the Administrator.

**Project Information**

1) **Project ID** – The Administrator must assign a project identification number to each new case study.
2) **Research Firm** – The Administrator must enter an abbreviation for the firm/organization that submitted the case.

**Project Characteristics**

**Extent of Mountain Terrain** – This is a topography rating according to the U.S. Department of Interior from their U.S. Geological Survey. Ratings range from 1 (Flat Plains) to 21 (High Mountains). The administrator is responsible for identifying the corresponding topography rating associated with the county or counties that are part of the new case study. For case studies that span more than one county, a population weighted average topography value should be calculated.
Project Settings

Some of the data for project settings for the initial 100 cases are calculated for the years 2001-2006 (e.g., growth rates). Other data (e.g., distress level and population density) are for the year 2006. These enable a comparison across all projects for a standardized time period and year. However it was determined that project settings information would be more useful if it included information before the project construction period rather than for the same time period across all projects. Although more specific guidance on collecting and calculating project setting information is included in the on-line training course, categories of data included in Project Settings are presented below to assist the administrator in verifying the accuracy of the data.

1) Urban Class Level classification:
   a. Metro: If one or all counties in the case study region are in a Core Base Statistical Area (CBSA) as defined by the Office of Management and Budget (OMB), the project should be listed as a metro project. CBSA’s include metro and micropolitan areas.
   b. Mixed: For projects with more than one county, if one county is in a CBSA and another is not, then the project is classified as Mixed.
   c. Rural: If no counties are part of a CBSA then the project is classified as Rural.

2) Economically Distressed: A ratio of the unemployment rate at the county level divided by the national unemployment rate. The value for this cell should be the same as the Pre - Economic Distress value at the County level as per spreadsheet template.

3) Population Density (Population per square mile). The value for this cell should be the same as the Pre - Density value at the County level found in the spreadsheet.

4) Population and Employment Growth Rates: These growth rates are calculated using data from six years prior to project construction and the pre-construction year. The formula for the Compound Annual Growth Rate (CAGR) is:

\[
\left( \frac{Y}{X} \right)^{\frac{1}{Year Y - Year X}} - 1
\]

Where:
Y = Population or Employment for the Pre-Construction Year (the year before construction begins)
X = Population or Employment 5 years before the Pre-Construction year (or 6 years before construction)
Year Y = The Pre-Construction Year
Year X = 5 Years before the construction Year
(Year Y – Year X should always equal 5 years)
5) **Market Size**: The population within a Labor Market Area (LMA) or the population accessible within a 40-minute drive time (Pop 40). Pop 40 data is preferred, but often require proprietary data sources such as ESRI. If Pop 40 data is not available, then use LMA information. The Bureau of Labor Statistics (BLS) defines labor market area as an economically integrated geographic area within which individuals can reside and find employment within a reasonable distance or can readily change employment without changing their place of residence. These BLS regions are county-based.

6) **Airport travel distance**: Measure of the number of road miles from the project to the nearest airport that offers commercial service.

### Economic Impacts

Determining the number of direct, net new jobs created due to the project is the responsibility of the researcher. However, the administrator is then responsible for calculating the total economic impact of the project on the region, based on these direct job impacts.

To estimate the indirect and induced (“multiplier”) economic effects for each project, the IMPLAN input-output multipliers were used. IMPLAN is now the most widely used input-output economic modeling system in the U.S. It utilizes U.S. Commerce Department ("National Income and Product Accounts") data on inter-industry technology relationships (also known as input-output structural matrices), countywide employment and income data from the Bureau of Economic Analysis (BEA) and Bureau of Labor Statistics (BLS), and its own industry- and county-specific estimates of local purchasing rates ("regional purchase coefficients"). It is more comprehensive than most other input-output models in that it also includes coverage of public sector activity and consumer activity (reflected in its “social accounting matrix”). It covers 540 industries, as defined by the BEA, which correspond to two to five digit industry groups in the North American Industry Classification System (NAICS).

For application to TPICS case studies, all ratios and multipliers need to be aggregated into either a Manufacturing or Services industry according to the industry the jobs are located in. Any industry that is not considered Manufacturing should be classified as Services. The formulae for calculating direct income and output are:

1) **Direct Income**: Calculated by multiplying Direct Jobs by Labor Income to Job ratios for both Manufacturing and Services industries.

2) **Direct Output**: Calculated by multiplying Direct Jobs by Output to Job ratios for both Manufacturing and Services industries.

Next multipliers are applied to estimate the following categories:
1) **Indirect Jobs**: Calculated by multiplying the Indirect and Induced jobs multiplier by Direct Jobs for both Manufacturing and Services industries.

2) **Indirect Income**: Calculated by multiplying the Indirect and Induced income multiplier by Direct Income for both Manufacturing and Services industries.

3) **Indirect Output**: Calculated by multiplying the Indirect and Induced output multiplier by Direct Output for both Manufacturing and Services industries.

Finally the value for Total Jobs, Income, and Output are calculated by summing the Direct and Indirect/Induced values:

1) **Total Jobs**: Calculated by summing together Direct Jobs and Indirect Jobs for both Manufacturing and Services industries.

2) **Total Income**: Calculated by summing together Direct Income and Indirect Income for both Manufacturing and Services industries.

3) **Total Output**: Calculated by summing together Direct Output and Indirect Output for both Manufacturing and Services industries.

**Uploading Data into TPICS Database.** After adding in all of the preceding information, the next step is to upload it into the TPICS tool. To get access to the administrator features, the Web.config file needs to be updated with IP address of the administrator.

After updating the IP address for the administrator, an “Admin” tab will appear on the TPICS home page as shown below in Figure 7.

**Figure 7: Admin tab**

![Image of TPICS Admin tab](image-url)

Clicking on the “Admin” button will bring the user to the Upload page as shown in Figure 8 below.

**Figure 8: Upload page**

![Image of TPICS Upload page](image-url)

The user then clicks on the “Browse” button to select the data spreadsheet (that also includes the case study narrative in HTML format) for the new case study information or for existing case studies to override what is currently in TPICS. After selecting the file, click on...
the “Upload” button to the right and the information is automatically uploaded into TPICS. Make sure to verify that the new data or revised data is now properly shown in TPICS.

To delete any case, click on the “Delete Case” tab and select from the case study list the case to be deleted and then click on the button “Delete Case” to the right (Figure 9).

Figure 9: Delete case option

4.3 Comparison: New Case Results & TPICS Predictions

The development of five new case studies provided an opportunity to compare the actual economic impact results found in these new cases against the range of impacts predicted for those cases by the MyProjectTools feature TPICS, which draws on averages from prior cases. This offers the chance to refine and improve impact estimates. The following sections present the results of this comparison for each case including sensitivity testing, strength and weakness evaluation of MyProjectTools, and explanations for resulting variances. The highway interchange and highway bypass projects are discussed individually, results for the three widening projects are discussed together as a group because of similarities in their findings. In each case, a series of eight steps were taken to compare actual direct job impacts of the new cases (as identified via TPICS process interviews and data collection) with the range estimates predicted by the TPICS MyProjectTools module.
I-94 / Opportunity Drive Interchange, St. Cloud, MN

Step 1: Enter data characteristics of the I-94/Opportunity Drive Interchange project

- **Project Type:** interchange
- **Region:** Great Lakes/Plains
- **Urban/Class:** Metro
- **Economic Distress:** Non-distressed
- **Length of Project:** (NA)

Step 2: Adjust AADT slider to be as close to project AADT as possible. The average AADT on the bypass in 2013 was 2,800 based on AADT from closest County State Aid Highway (CSAH) 75 segment. The slider is set to 23,625 AADT—as that is the slider can be set.

Step 3: Report estimated impacts with policy levers all set to average influence (i.e. the MyProjectTools central estimate). Adjusting the policy levers in MyProjectTools to reflect average (e.g. neither positive nor negative influence) for Land Use Policies, Infrastructure, and Business Climate results in an estimate between 859 to 1,431 direct jobs.

Step 4: Compare to impacts identified in the ex post case study with the central estimate from MyProjectTools. A total of 1,100 direct jobs were identified through interviews and research as net new to the study region because of completion of the I-94/Opportunity Drive interchange. This is within the range of jobs estimates from MyProjectTools based on project characteristics. Over 2,000 workers were employed at the industrial park’s 176 acre campus; however, currently over 1,100 employees work at the park; all of them associated with businesses that moved in either after completion of the interchange or beforehand but with the promise of the interchange coming soon. Without the interchange enabling the further development of this business park in St. Cloud, these jobs would have located outside of the St. Cloud region, and in some cases elsewhere in Minnesota or another state.

Step 5: Adjust policy sliders. The I-94 / Opportunity Drive interchange identified positive support from policies relating to Land Use and Infrastructure. Specifically:

- MnDOT’s initiative to build the interchange and including local utilities within the business park provided positive infrastructure support to attract tenants.
- Rezoning of the land from agriculture to manufacturing and industrial use by the City of St. Cloud was considered a supportive/positive land use policy.
- Adjusting the slides to indicate above average “Supportive” Land Use Policies and “State-of-Art” Infrastructure, MyProjectTools predicts a direct impact of 1,039 to 1,732 jobs. The estimated 1,110 jobs, determined through interviews and research, falls within this range.

Step 6: Identify cases within the TPICS database that are similar to the I-94 / Opportunity Drive Interchange. The two interchange projects that most closely match the I-94 /
Opportunity Drive interchange characteristics are I-70 and 110th Street Interchange (1,770 direct jobs) and the Commerce Parkway Interchange (745 jobs).

Step 7: Review existing TPICS case for similarities and differences compared to the I-94 / Opportunity Drive Interchange.

I-70 and 110th Street Interchange, Kansas

- **Case Study Findings:** Between 1995 and 2001, the Kansas Department of Transportation undertook a project to improve the I-70 and 110th Street interchange and surrounding road network in Wyandotte County, KS. The project was part of a state and local effort to attract a NASCAR speedway to the region. The transportation improvements, combined with state and local tax incentives, considerable land planning, and the unification of the Kansas City, KS and the Wyandotte County, KS governments, have resulted in over 2 million square feet of new development in a 1,600-acre area. Total investment to date has topped $900 Million, with over $1.4 Billion in additional development projects underway. The development has created 5,900 jobs to date, 1,770 of which (30%) are attributed to the interchange.

- **Analysis of Differences:** The I-70 / 110th Street Interchange is different than the I-94 / Opportunity Drive interchange in scale. The I-70/110th Street interchange is a large four-way diamond interchange costing $65.3 Million (in 2013 dollars) or over 6 times what the I-94/Opportunity drive interchange cost ($9.8 Million; in 2013 dollars). While both projects were aimed at site development, the I-94/Opportunity Drive project was built to support the development of a relatively small industrial park in a semi-rural area whereas the I-70/100th street interchange was aimed at attracting a NASCAR speedway and other complimentary development. Accordingly, the impacts are somewhat higher for the I-70 / 110th Street interchange due to the construction of a major regional sports venue which was a catalyst for additional development.

Commerce Parkway Interchange

- **Case Study Findings:** The Commerce Parkway Interchange is one of three interchanges connecting Hays, KS to Interstate 70 (I-70), which is Kansas’s most important east-west travel route. After the parkway interchange was completed in 1995, its location prompted the development of the Airport Industrial Park. The construction was supported by a strong coalition of local business leaders and banks with the intention of improving access to developable land slated for industrial and residential development. During the course of a decade, the Commerce Parkway stimulated the growth of Hays’ economy, adding an estimated 745 jobs from 1995 to 2006. Additionally, an arterial route was built to connect downtown Hays with the Commerce Parkway, furthering opportunity for development within the corridor in years to come.

- **Analysis of differences:** The Commerce Parkway Interchange is very similar to the I-94/Opportunity Drive Interchange in terms of location, purpose, and job impact: a semi-rural setting focusing on providing access to developable land for industrial use.
leveraging support from local leaders within the community to diversify the regional economy. An estimated 745 jobs were attributed to the interchange as of 2008 which is only slightly less than the 1,100 estimated for the I-94/Opportunity Drive Interchange. However, based on interviews and research, additional development was expected after the completion of 22nd Street connecting to the interchange indicating that additional development linked to the interchange may have occurred.

**Step 8: Provide concluding remarks.** The job impacts identified through research and interviews for the I-94/Opportunity Drive interchange fell within the range estimated by *MyProjectTools* both when policy levers for were set to average conditions (859 to 1,431 direct jobs) and adjusted to reflect a positive influence from Land Use Policies and supporting Infrastructure (1,039 to 1,732 jobs). These ranges of job estimates are solely based on specific project characteristics from the 100 cases included within TPICS. A more comprehensive analysis and job impact estimate would require basic travel characteristic information (e.g., speed, distance, volume, and congestion) applied to an economic impact model to fully assess the scale of impacts.

Specifically, the two cases in the TPICS database most closely matched to the I-94/Opportunity Drive interchange (I-70/100th Street Interchange and Commerce Parkway Interchange) had job impact estimates that were fairly close to those estimated for the newest case study (1,700 and 745 jobs respectively) and included some similarities in geography, purpose, and local support. The I-94/Opportunity Drive interchange is expected to grow and attract more businesses as the local economy recovers because the site contains additional manufacturing capacity for over 1,500 jobs.

### U.S. 65/IA-5 Bypass – Iowa

**Step 1: Enter data characteristics of the Highway 60 widening project in Iowa**

- **Project Type:** beltway
- **Region:** Great Lakes/Plains
- **Urban/Class:** Metro
- **Economic Distress:** Non-distressed
- **Length of Project:** 24 miles

**Step 2: Adjust AADT slider to be as close to project AADT as possible.** The average AADT on the U.S. 65 IA-5 bypass in 2012 was 21,113; therefore, the slider is set to 20,907 (the most approximate point).

**Step 3: Report estimated impacts with policy levers all set to average influence (i.e., the *MyProjectTools* central estimate).** To reflect the average effect of this type of project, policy levers were adjusted to reflect neither a positive nor negative influence from infrastructure investment, land use policies, or the business climate. Using these settings, *MyProjectTools* predicts direct impact of 20,532-34,205 jobs for this type of beltway.
Step 4: Compare impacts identified in the ex post case study with the central estimate from MyProjectTools. A total of 645 direct job were identified through interviews and research as net new to the study region because of completion of the Des Moines beltway with US 65/IA 5. This is much lower than the estimate from MyProjectTools. According to interviews conducted as part of the case study, development has been slower than expected and is only now beginning to materialize. It is anticipated that future job growth will increase the attributable economic impact of the highway. However, the delay in development still does not entirely account for the difference in the scale of impacts.

Step 5: Adjust policy sliders. The U.S. 65/IA-5 project has seen positive policies related to infrastructure and financial incentives implemented to support development. Nevertheless, as a sensitivity test, we can test the influence of negative settings for the policy slider on the total economic development impacts from MyProjectTools.

Adjusting all policy sliders to their lowest levels (to represent policies that constrain development) results in a downward adjustment of MyProjectTools forecast of expected impacts to between 7,152 - 11,920 direct jobs. This is still far larger than the actual impacts to date, as identified in the case study.

Step 6: Identify cases within the TPICS database that are similar to the US 65/IA-5 bypass/beltway. There is one case study in the database that matches all the US 65/IA 5 project characteristics: The Fort Wayne, Indiana, I-469 Bypass.

Step 7: Review existing TPICS case for similarities and differences compared to US 65/IA-5
Fort Wayne, Indiana, I-469 Bypass

- **Case Study Findings:** The I-469 bypass is a 30 mile expressway built around the eastern part of the Fort Wayne metropolitan area. Together with I-69, I-469 completes a full beltway around Fort Wayne. Like IA-5/U.S. 65, I-469 also provides access to the airport. Unlike IA-5/U.S. 65, I-469 does not provide travel time savings for traffic passing through the metropolitan region. Rather, the interstate is used primarily for local and regional trips. AADT on the interstate in 2007 was 30,000. An estimated 1,300 to 1,400 jobs have been created because of the highway project. The scale of the project’s economic impact has in part been limited by the lack of utilities in rural areas through which I-469 runs. Job impacts attributable to the project come from a new General Mills distribution center and warehouse near the airport, a number of traveler-serving establishments, and a manufacturer of HVAC equipment.

- **Analysis of Differences:** In some ways, the I-469 bypass is very similar to the IA-5/U.S. 65 case. It is slightly longer (30 miles, compared to 24), and serves higher volumes of traffic (30,000 AADT, compared to 21,113), but is nevertheless within a similar range. Both bypasses complete the eastern side of a metropolitan beltway, serving a less developed part of the region. There have been constraints on development in both cases. For I-469, a lack of utilities served as an impediment in certain areas. In Des Moines, on the other hand, development has materialized more slowly than expected partially because a lack
of congestion in the region makes the bypass less attractive, and because development in the Des Moines area continued on its historical westward trajectory until recently when land became scarcer to the west. Future additional development impacts are expected along US 65/IA 5.

**Step 8: Provide concluding remarks.** The impacts found in the Fort Wayne, Indiana, I-469 Bypass case study are significantly closer to the identified impacts for U.S. 65/IA-5 than are those predicted by MyProjectTools. Nevertheless, the impacts found in the U.S. 65/IA-5 case study are about half as large. Since the US 65/IA 5 corridor project is newer, there has been less time for economic impacts to accrue. In addition, there are subtleties particular to the Des Moines area in terms of what can be considered “net new” to the region. The metropolitan area of Des Moines has experienced overall robust growth in the last decade. Companies with long histories in the area want to remain in their established communities. While U.S. 65/IA-5 has opened up new areas for growth and made it easier to find large parcels of land for companies looking to expand, existing companies have proactively sought to stay in the region and the highway is credited with retaining several of these businesses by making it easier to find locations to remain. Although helpful to the regional economy, these retained jobs are not counted as new jobs in this study.

### Analysis of Three Widening Projects

Three widening projects were included as new case studies: Iowa Highway 60, Minnesota Highway 60, and U.S. Route 54 in New Mexico. They are each analyzed separately but discussed together in the text below.

**Step 1: Enter data characteristics of each widening project into MyProjectTools.** The inputs for MyProjectTools were:

- **Project Type:** widening (all three projects)
- **Region:** Great Lakes/Plains (IA Hwy 60 and MN Hwy 60), Southwest (US 54 in NM)
- **Urban/Class:** Rural (all three projects)
- **Economic Distress:** Non-distressed (IA Hwy 60 and MN Hwy 60), Distressed (US 54 in NM)
- **Length of Project:** 60 miles (IA Hwy 60), 28 miles (MN Hwy 60), 70 miles (US 54 in NM)

**Step 2: Adjust AADT slider to be as close to project AADT as possible.** For the Iowa Highway 60 case study, the average AADT on Highway 60 in 2010 was 4,007; therefore, the slider was placed at 4,032 (the closest approximation). For the Minnesota Highway 60 case study, the average AADT on Highway 60 in 2010 was 6,270; therefore, the slider was placed at 6,250 (the closest approximation). And, for the U.S. Highway case study in New Mexico, the average AADT on Highway 54 (Junction with NM-506) in 2007 was 8,221; therefore, the slider was placed at 8,226 (the closest approximation).

**Step 3: Report estimated impacts with policy levers all set to average influence (i.e. the MyProjectTools central estimate).** To reflect the average effect of this type of project,
policy levers were adjusted to reflect neither a positive nor negative influence from infrastructure investment, land use policies, or the business climate. Using these settings, MyProjectTools predicts the following direct jobs for each project:

- Iowa Hwy 60: 12,742-21,236 jobs.
- Minnesota Hwy 60: 6,191 – 10,318 jobs.
- US Hwy 54 in New Mexico: 8,930 – 14,883 jobs.

**Step 4: Compare impacts identified in the ex post case study with the central estimate from MyProjectTools.** The following job impact estimates were identified for all three of the new widening case studies:

- Iowa 60: 45 direct jobs
- Minnesota 60: 270 direct jobs
- New Mexico 54: 90 direct jobs

All of the job estimates were identified through interviews and research as net new impacts to the study region. They represent only a very small fraction of the jobs predicted by the MyProjectTools.

**Step 5: Adjust policy sliders.** Because of the variance between the MyProjectTools job estimates and the job estimates developed by the case study researcher, all three of the policy sliders (Infrastructure, Land Use, and Financial Incentives/Business Climate) in MyProjectTools were adjusted to their lowest levels, thereby representing policies that constrain development, to assess how much of the variance could be reduced between the estimates. By adjusting all policy sliders to their lowest levels, it can be determined whether the relatively small impacts identified in the new case studies through interviews and research are within the overall range of impacts forecast by MyProjectTools. The results of the adjusted MyProjectTools job estimates for each of the new case studies are:

- For Iowa 60, between 4,440-7,400 direct jobs. This is still between 99 and 164 times larger than the actual impacts identified in the case study.
- For Minnesota 60, between 2,157-3,596 direct jobs. This is still between 8 and 13 times larger than the actual impacts identified in the case study.
- For U.S. 54, between 3,112-5,186 direct jobs. This is still between 35 and 58 times larger than the actual impacts identified in the case study.

**Step 6: Identify cases within the TPICS database that are similar to the three new widening projects.** There are no case studies in the database that uniquely match any of the new highway widening project characteristics. However, there are two rural widening cases located in distressed areas: 1) I-70 Glenwood Canyon, and 2) Corridor J, Appalachia.

**Step 7: Review the existing TPICS cases for similarities and differences to the three new widening projects**
Prior Project: I-70 Glenwood Canyon Project.

- **Case Study Findings:** I-70 through Glenwood Canyon is a 12.5 mile section running through the economically distressed county of Garfield, Colorado. Glenwood Springs is the closest town to the canyon. I-70 through the canyon was the final section of I-70 to be constructed. The project replaced a dangerous two-lane highway built in 1938 with a new highway that provided 4-lane access while avoiding damage to the surrounding environment. AADT on I-70 was 10,762 in 1992 when the project was completed. The TPICS case study identified approximately 2,400 new jobs in Glenwood Springs and Garfield County. These jobs are largely associated with recreation and tourism.

- **Analysis of Differences:** The I-70 Glenwood Canyon case differs from the three new widening cases in a number of ways that may help account for differences in the scale of economic impacts. First, as one of the few interstates to traverse the Rocky Mountains, I-70 serves as a vital corridor for freight transportation and recreational/tourism access. It also has been more frequently used (17,000 AADT) than the three new widening projects (1,800 to 5,800 AADT). Second, Garfield County was economically distressed prior to the widening project, meaning that the incremental benefit of highway access may be higher, as compared to the impact on the non-distressed study area along Highway 60 in Iowa and Minnesota. Finally, the section of I-70 that traverses through Glenwood Canyon and the city of Glenwood Springs has distinct outdoor recreation (river rafting and fishing) and environmental features (natural hot springs) that attract tourists throughout the year. Once access was made easier and safer, visitor frequency increased resulting in additional economic growth. The regions along Highway 60 in Iowa and Minnesota differ in their industry profile and are mostly associated with agriculture and manufacturing. U.S. 54 connects El Paso, TX to Alamogordo, NM which is primarily a military town supported by nearby Holloman Air Force Base and White Sands Missile Range. In comparison, the I-70 Glenwood canyon project experienced a higher degree of constrained access prior to the project than was identified among the three widening projects and therefore responded with a higher degree of economic development once access was improved. Although not a deciding factor in scale of economic impacts, it is important to note that the I-70 Glenwood Canyon project cost was greater than all other three combined ($873 Million, compared to $275 Million for Highway 60 in Iowa, $54 Million for Highway 60 in Minnesota, and $78 Million for U.S. 54 in New Mexico).

Prior Project: Corridor J, Appalachia.

- **Case Study Findings:** Corridor J is a 243.5 mile segment of the Appalachian Development Highway System. The case study assesses impacts for only a portion of the entire corridor, covering a 102.7 mile segment in Kentucky and includes impacts in the small urban communities of Somerset and London, as well as in Clinton County. Thirty two miles of KY 80 were reconstructed and widened to a four-lane expressway between Somerset and London as part of the Corridor J project. The KY 80 connection is also part
of the Kentucky-designated National Truck Network and provides a critical link across southern Kentucky between two toll roads. In addition, a 50-mile segment of KY 90 serving Clinton County was also widened to four lanes. The case study identifies 1,500-2,000 new jobs in London associated with the highway. These jobs are from a Wal-Mart distribution center, two major call centers, and an automotive parts supplier. The case also identified 1,700 new jobs in two industrial parks in Somerset. Finally, the case points to 1,400 jobs in Clinton County from a new chicken processing facility. Of these 4,600-5,100 jobs, the influence of the Corridor widening and other improvements is assessed at 50%, resulting in an attribution of approximately 2,425 jobs to the Corridor J widening.

- **Analysis of Differences:** The defining factors that differentiate Corridor J from the three new widening projects are the length of the project, economic strength & industry profile, scale of use, and period of analysis. The 102.7 mile segment of Corridor J is longer than any of the highway segments for these three new case studies (Iowa: 60 miles, Minnesota: 28 miles, and U.S. 54: 70 miles) and therefore provides access and connection to a greater geographic region. Corridor J was also economically distressed before the project, meaning that the economic importance of a highway access was likely magnified, in contrast to the regions surrounding Highway 60 in Iowa and Minnesota which were not economically distressed. U.S. 54 in southern New Mexico was also categorized as economically distressed before the project however employment in Alamogordo is uniquely linked to employment at Holloman Air Force Base and the White Sands Missile Range and therefore is not as affected by regional economic trends. As previously mentioned, agriculture and manufacturing are the primary industries surrounding Highway 60 in Iowa and Minnesota while Corridor J attracted warehousing & distribution, industrial parks, and food processing. U.S. 54 is unique in that it primarily serves traffic between El Paso and Alamogordo whereas Highway 60 and Corridor J enhanced regional access which attracted businesses to the region. Use of Corridor J was estimated to be 21,218 AADT which is considerably higher than the range of 1,800 to 5,800 AADT for the new widening projects. Finally, a considerable amount of time has passed since the construction of Corridor J (1970 to 1984) and the post construction study year (1995) indicating a longer period for economic impacts to accrue when compared to the economic impacts occurring between 5 and 8 years after construction for the three new widening cases.

**Step 8: Provide concluding remarks.** Before adding these three new widening cases, the TPICS database contained just two rural widening projects and both were major trunk highways on the national highway network. One was an interstate highway and the other was an expressway. Both cases had traffic levels and economic impacts that were more than ten times higher the corresponding figures for the three rural highways represented by these new cases. In addition, both of the existing cases (Corridor J and I-70 Glenwood Canyon) were uniquely identified as catalysts enabling new development that was previously constrained. This differs from the context of Highway 60 in northwest Iowa and
southwest Minnesota where the economy was relatively stronger and still had some degree of access prior to the project. The third new case, U.S. 54 in New Mexico, was motivated largely by safety rather than economic development considerations. Therefore, it is not entirely surprising that the MyProjectTools feature in TPICS provides a high range of job impacts than found for the new rural widening cases. The integration of these new cases will provide a lower scale of impact projections that reflect a wider cross-section of widening projects.
5

RELATIONSHIP OF WIDER ECONOMIC BENEFIT TOOLS WITH TPICS

5.1 Use of TPICS Cases to Judge Accuracy of C11 Tools

The TPICS database of project impact case studies that was developed by SHRP2 Project C03, and the tools for estimating wider economic benefits (W.E.B.) that were developed by SHRP2 Project C11, have two very different objectives. The former (TPICS) is based on pre/post observation of already-built projects, while the latter provides a means of improving the measurement of potential W.E.B. impacts for proposed (but not yet built) projects. However, the two together can also enable another type of analysis, which is to use the observed results of actual projects from TPICS as a benchmark for judging accuracy of estimated impacts as projected by the C11 (W.E.B.) tools. In some cases, the comparison can also serve to identify shortcomings of the case study approach. This chapter reports on the comparison process and its findings.

While the Project C11 tools do provide a means for calculating project impact metrics and their direct effect on economic productivity, it is important to clarify that they cover only categories of benefit that are not being captured by traditional user benefit (travel time, cost and safety improvement) measures. The C11 tools were designed to enhance existing benefit-cost analysis and economic impact analysis tools, but not replace them.

Specifically, the C11 tools generate estimates of direct productivity impacts associated with changes in travel time reliability, market access, and intermodal connectivity. Market access and intermodal connectivity are assessed using an elasticity which produces estimates of the change in value added (GDP) from revenue growth. Reliability is assessed using per-hour cost factors applied to estimates of buffer time for freight, business, and, in certain cases, commuting trips.

The productivity impacts predicted by any of the three C11 tools should therefore be less than the total economic impacts of a transportation investment because they concentrate only on impacts that are not normally measured. For that reason, the economic impacts projected by the C11 tools should, in most cases, also be smaller than the total economic impacts identified by the TPICS case studies. However, because the TPICS case study methodology is best suited to the identification of specific localized economic development and land use changes in the vicinity of a highway project, there may be special cases in which dispersed economic impacts resulting from a highway project are not fully captured in the TPICS economic impact measurements. In these cases, the TPICS case narrative
includes discussion of dispersed impacts associated with broad transportation performance changes in a region.

In addition to only capturing a portion of overall economic impacts due to changes in “wider benefit” measures, the C11 tools are also subject to certain limitations because they were designed to estimate aggregate economic impacts. They are not to be regarded as substitutes for full economic modeling. In particular:

- The elasticities of business response to improvements in market access or intermodal connectivity are high-level empirical estimates of aggregate economic response. They do not account for the ways in which one industry’s response to certain types of market access might differ from another, nor do they account for differences in the characteristics and size of a regional economy (e.g. differentiating responses for large urban areas versus dispersed rural regions). To perform this type of differentiated analysis requires a full economic modeling framework with detailed sector-specific data and response elasticities.

- Similarly, the per-buffer-hour cost factors used to assess reliability are based on an average valuation of travel time and operating cost factors for truck transportation, along with a reliability ratio which accounts for the average relationship between the value of time and the value of reliability. The actual response of a particular industry to reliability improvements can be higher or lower than these estimates. Certain sectors are more sensitive to reliability than others. For these sectors, unreliability imposes additional costs (beyond driver hourly costs) such as stock-out costs, labor cost for workers at distribution and warehousing facilities, and costs associated with late delivery of perishable goods or goods critical to just-in-time production processes. These costs also have multiplier effects within the economy, as they affect the cost of doing business along the supply chain.

Despite these limitations, the C11 tools are important to the suite of available options for project evaluations (for either benefit-cost or economic impact assessments). They are particularly suited to middle stage analysis when planners seek to understand the key drivers and scale of project impacts. At a later stage of detailed evaluation, other more advanced tools can be used to fully capture detailed economic impacts. With advanced modeling comes the ability to address market segmentation as well as indirect and induced effects related to supplier industries or the tracing of wages through the economy.

The subsequent sections of this chapter discuss overall results of nine applications of the C11 tools—three each that address market access, reliability, and intermodal connectivity. Recommendations for future refinement of the C11 tools are then provided in the next chapter. Case study analysis details are reported in Appendix D.
5.2 Findings from Application of C11 Tools

Analysis Process

While the TPICS database of case studies provides information on the observed pre/post changes in economic and land development associated with each transportation project, it does not contain detailed information on changes in transportation conditions – volumes (measured as change in AADT or annual average daily traffic), travel times (measured by change in VMT or vehicle hours of travel), etc. However, the case studies do contain links to external reports on the projects including in various project justification, financing and environmental impact documents and in some cases other studies of post project impacts on travel conditions. The external reports do sometimes contain information on pre-project and sometimes also post project traffic volumes (measured as AADT or annual average daily traffic), travel times (measured by VHT or vehicle hours of travel), etc. State DOTs often can often also provide information on post-project AADT, VHT, etc.

The project team combed the TPICS database to identify cases where it was possible to assemble pre/post data on traffic volumes, travel speeds and congestion data sufficient to enable the calculation of reliability, accessibility and/or intermodal connectivity measures using the C11 tools. Nine cases were selected – three that enabled use of the C11 reliability tool, three that enabled use of the C11 accessibility tool and three that enabled use of the C11 intermodal connectivity tool.

For each of the nine TPICS cases, the relevant SHRP2 C11 tools were applied to calculate wider economic benefits. In some cases, data was also available to calculate the traditional user cost savings for affected business-related travel. When both sources of information were available, it was possible to add them together to estimate the direct productivity impact on affected businesses (in terms of value added or GDP). Those results were then compared with the TPICS case study results which provided a measure of the actual, observed direct economic impacts.

In some cases, information was not available to fully calculate the traditional user benefits. In those situations, results of the C11 tools were applied to calculate wider economic benefits, but those impacts were then compared with the TPICS case study results with the understanding that the C11 tools were calculating only a portion of the total direct impact and hence should yield numbers substantially different from the case study results.

Findings from these comparisons are summarized in the remainder of this chapter. Details of the analysis for each of the nine individual project cases is presented in Appendix D. For each project in that appendix, there is (a) a general overview of the selected TPICS project, (b) discussion of the data collection process for the selected C11 tool, (c) a summary of tool inputs, (d) presentation of the tool results, and (e) a discussion of how the C11 tool results relate to the ex post economic impacts identified in the TPICS case study.
Findings on Comparison of C11 Tool Results with TPICS Case Studies

Overall Findings. In each of the nine cases, the result of calculating wider productivity benefits via the C11 tools was compared with direct economic impacts found from the TPICS case studies. These comparisons yielded two classes of results:

(a) cases where the C11 results were found to be compatible with the TPICS case study observations of actual economic impacts (either similar in magnitude or different but fully explainable because of benefits missed by the C11-based calculation process)

(b) cases where the C11 results and TPICS observations were not compatible because of special factors affecting the TPICS case study or its form of data collection.

Cases where the C11 wider benefit results and traditional user benefit results were both available, and their combined numbers were roughly similar to TPICS case study findings:

- In the **Corridor Q** case, enough data was available to estimate both accessibility benefits and benefits to businesses from travel time and mileage savings, which together comprise the major sources of economic impact. Together, these impacts summed to a GDP increase of between $308-378 million, which is roughly comparable to the $448 million in direct GDP impacts reported in TPICs.

- Cases where the C11 results were smaller than TPICS case study findings but appeared consistent with them, since traditional business travel-related benefits were not measured:
  - In the case of **Arizona State Highway 101**, the benefit of improving reliability as calculated by the C11 tool was $23.8 million per years (in 2008 dollars). As expected, this is quite small relative to the $4.3 billion total impacts found in the TPICS case study. In general, reliability effects are an important component of the economic impacts of highway projects, but only account for a small part of the overall story.
  - The **I-15 Reconstruction in Salt Lake City, UT** caused a $612 billion direct impact in GDP terms, according to the TPICS case study. The results of the C11 assessment point to the much smaller reliability benefit of $5.4 million per year (2008 dollars). As expected, reliability is but a small part of the complete picture. In this case, the majority of TPICS impacts are attributed to new distribution, manufacturing, and warehousing businesses that moved to the region because they highly value access to the transportation network.
  - Application of the C11 Intermodal Connectivity tool to the **Bayport Terminal, TX** case yielded an estimated GDP increase from improved connectivity of $83.4 million per year (2008 dollars). As expected, this is only a portion of total impacts: the TPICS case identified impacts in the amount of $112.5 million in GDP.
• The **SH-170 Road and Alliance Logistics Park** caused $830 million in direct impacts (GDP), according to the TPICS case study. This is much larger than the $25.1 million connectivity impact estimated using the C11 tool. The construction of SH-170 was only one small part of the overall Alliance Logistics Park freight project and therefore only accounts for a portion of the total economic impacts of the entire facility which includes the rail intermodal center, the freight airport, and nearby large-scale new commercial developments.

• **US 281 in San Antonio, TX** is estimated to have yielded $178.6 million per year (2008 dollars) in connectivity improvements, according to the C11 tool. This is less than the total impacts identified in TPICs ($392.8 million in direct GDP). This finding is logical, since U.S. 281 provides more benefit than just airport access. It also provides a critical north-south thoroughfare in San Antonio. The highway has spurred development along the corridor, allowed direct access to San Antonio, saved travel time by reducing congestion growth, and provided greater capacity for economic activity along the transportation network.

Cases where there were noticeable and unanticipated differences between the impacts estimated using the C11 tools and those found in the TPICS ex-post evaluations:

• In the TPICS case for the **Big “I” Interchange in Albuquerque, NM**, no specific impacts resulting from business attraction were identified by the economic development community as a result of the interchange improvement. This stands in contrast to both the recurring and reliability savings estimated using the C11 tools, as well as the considerable congestion improvements referred to in the TPICS case narrative. The reason for the lack of observed local impact is simple – the area around the Big I was essentially built-out long before the interchange redesign began in 2000. As a result, the Big I replacement project did not significantly alter nearby land use patterns. All TPICS interview findings point to the same conclusion – that this project did not cause new development to occur, but enabled existing economic growth patterns to continue. In other words, the project prevented the prospect of economic stagnation from congestion, but did not attract specific businesses. This highlights the fact that ex post assessments of localized economic development impacts, such as those undertaken as part of the TPICS case studies, may not fully identify dispersed regional economic impacts associated with travel time or reliability savings.

• Evaluation of the **I-43 Project in Wisconsin** using the C11 Effective Density tool yielded an estimated impact from market access effects alone that is larger than actually reported by TPICS, even without considering the expected further effects of travel time and cost savings. This points to a number of issues to consider in further investigations including: a) predictions from the C11 Effective Density tool are
aggregate in nature and do not account for the availability of land in the study region for new development, and b) further research is needed into the scale and scope of long-distance buyer-supplier connections promoted by projects like I-43, given that traditional estimates of elasticities were derived for research on urban areas.

The preceding comparisons highlighted the limitations of available transportation performance data for already completed projects. While it would be ideal to incorporate before-and-after information on transportation performance into future iterations of TPICS, there are many cases in which data on network performance is only available for either the base or the build case, or is available only at a high level of aggregation.

Need for Adjustment to the Impact Base. The comparison of C11 and C03 results also highlighted the need to dig more deeply into the definition of the affected area and affected industries when assessing productivity changes. For example, when assessing improved connectivity to an airport or intermodal facility, it is important to determine the percentage of travelers/freight in the selected study region that would actually use the highway facility to access the terminal. In the case of U.S. 281, it is estimated that only one third of the region benefits from the U.S. 281 improved airport access. While the time savings for a trip to the airport are significant for those who use U.S. 281, not all travelers within Bexar County will use the highway to get to the airport.

Similarly, research indicates that not all industries are equally responsive to different types of access and connectivity improvements. For example, service-providing industries are more sensitive to passenger air access and to labor market access than are goods-producing industries. Goods-producing industries, on the other hand, tend to be more sensitive to buyer-supplier market access improvements and improved access to intermodal freight facilities. In the case of Alliance Logistics Park, Transportation & Warehousing and Manufacturing sectors were identified as the primary industries that use the new State Highway 170 to access the rail intermodal center. The analysis of productivity improvements is therefore confined to these sectors. While there is still more to learn from research on sector-specific productivity responses, confining one’s analysis to consider only the most sensitive sectors and geographies will reduce the risk of overestimating impacts.

Findings on Applicability of the Market Access (Effective Density) Tool

Beyond the above mentioned importance of selecting the appropriate industries likely to respond to either labor market or buyer-supplier market access improvements, the application of the Market Access Effective Density tool for this study revealed a number of tool-specific clarifications and caveats.

First, as a technical clarification, note that this tool can only be used to calculate GRP (regional GDP) within the tool itself if employment is chosen as the activity variable. If
population is the appropriate activity variable (as in the case of a labor market assessment), productivity calculations must be done outside the tool, using the SHRP2 C11 accounting framework. This clarification has been addressed in documentation updates subsequently issued for this tool.

Second, the development of input data for the TPICS cases focuses attention on the limitations of operating without a network model. Without a model, it can be difficult to identify zone-to-zone impedances with and without the project. Sketch level estimates can be based either on known route alternatives or aggregate statistics from other planning studies about corridor-level time savings. In particular, effects related to congestion reduction on parallel corridors may not be adequately captured when a network model is unavailable.

Third, regarding the nature of projects that improve market access, note that within a study region, certain zone-to-zone connections may not improve because of the selected highway project. However, the economic impact within each zone is the result of improved connections across the region—even if one zonal pair does not provide any tangible improvement, other pairs most likely will.

**Findings on Applicability of the Reliability Tool**

Findings from use of the Reliability Tool include data collection guidance, clarifications for tool usage, and conclusions about the interpretation of tool outputs.

Application of the C11 Tools to existing TPICS cases required data collection for already completed projects. The websites of State Departments of Transportation typically have historical AADT and information on the percentage of traffic volumes by truck and by car. If the information is not readily available online for the year in question, a phone call or email inquiry is necessary. Capacity information is a critical input to the tool. Barring the availability of local engineering data, capacity values can be estimated using the Highway Capacity Manual. Additionally, the tool enables the analyst to account for improvements not only from changes in the volume-to-capacity ratio of a piece of infrastructure, but to also evaluate improvements in incident management. For the case assessed here, web-based research revealed information on accident and congestion ITS management strategies. From this information, assumptions were developed about changes in incident duration and incident frequency.

The Reliability Tool offers some flexibility to analysts in how outputs are used and interpreted. For example, the user can choose to use the value of recurring and incident delay reported by tool or, if desired, he or she can calculate values using their own per-hour value factors outside the tool. The value of time input in the reliability tool is per vehicle-hour, and therefore the output is reported in vehicle hours saved. Vehicle-hours can manually be converted into passenger and crew hours (using occupancy rates) if the analyst wishes to use their own per-passenger-hour and per-crew-hour cost factors. The tool also
provides options for defining different time horizons. In this analysis, the tool was used to estimate reliability improvements for a project in the year after construction was completed, and five years later. This offers a picture of how benefits continue to grow, as traffic volumes increase over time. The traffic growth rate was calculated using actual AADT data for these two years. Five years was chosen as the length of time typically required before economic impacts begin to materialize from a project.

Another finding from the tool’s application is the fact that the tool is best used to assess changes in congestion-related reliability in cases where there is no significant change in overall daily average traffic volume. The tool is not set up to appropriately assess cases in which traffic volumes change between the base and build case. The tool reports results in terms of vehicle-hours which reflect both the volumes input into the tool and the amount of per-vehicle delay calculated by the tool (based on capacity and volume information). This can lead to limitations for projects that result in additional demand on a corridor (whether from true induced trip-making or from re-routing from other parallel corridors). Entering volumes in the Reliability Tool that include additional trips in the build case, but not including them in the base case, means underestimating the savings in terms of vehicle-hours and effectively assuming that the added traffic volumes experienced zero delay in the base case.

To address this issue, the tool can be run one of two ways: 1) Holding volumes constant to match base case conditions (e.g., prior to the project) on the corridor, or 2) Holding volumes constant to match build case conditions. Constraining volumes to remain at their lower initial value in a base and build case when running the tool means underestimating the amount of delay experienced by each vehicle in the build case, when volumes (and therefore volume-to-capacity ratios) are known in reality to be higher. Alternately, running the tool with post-project volumes for both the base and build cases potentially overestimates the benefits of congestion reduction due to the project. This is because limitations of the tool require the assumption that the same volume of traffic in the build case would remain on the corridor if the project were not built (base scenario). Although, in reality, if the attracted trips were located on alternative routes in the base case, they likely were experiencing some level of congestion or delay to the degree that travel on the improved corridor became more attractive relative to their current route. Thus, accounting for them in the analysis was deemed preferable, even if it resulted in slight overestimations of benefit.

Application of the Reliability tool for this study also revealed a number of points regarding interpretation of the tool’s outputs. From the comparison of C11 tool results and TPICS case study results, it is clear that reliability savings are, in most cases, just one small fraction of the total economic impacts of a project. The magnitude of reliability savings (i.e., savings in incident delay) also tend to be small relative to total travel time savings. Additionally, when interpreting tool results, it is important to recognize that the tool generates aggregate estimates of reliability costs for passenger car and truck movement. The average per-hour
factors used do not account for specific industry or commodity sensitivities to unreliability. In reality, not all freight movements and types of passenger travel will be equally sensitive to unreliability. Thus, the tool results are an aggregate approximation of costs incurred by the economy due to unreliability, not a detailed assessment that recognizes variation across industries.

Findings on Applicability of the Connectivity Tool

Application of the Connectivity Tool to existing TPICS cases revealed certain limitations in the design of the tool itself and its ability to capture multiple drivers of intermodal connectivity improvement. Generally speaking, there are two scenarios in which a project serves to increase intermodal connectivity within a region: 1) the access time to a terminal may be reduced. This was the case for the U.S. 281 project in San Antonio, or 2) the connectivity characteristics of a facility may themselves change. This was true of the Bayport Terminal addition to the Houston, TX marine port. The new terminal changed the total level of activity at the port, and, therefore, the port’s connectivity value.

The first case, where access times are improved, is easier to implement within the Connectivity Tool framework. The tool can simply be run twice (or one with the same terminal selected twice), once with a higher travel time per vehicle in the base case, and once with the lower travel time in the build case. The difference in weighted connectivity scores between the base and build case will reflect the difference in access times. However, even this way of using the tool does completely match the tool’s design and initial intended use. The C11 intermodal connectivity tool was first designed and implemented as a planning tool to prioritize investments in reducing travel time to different intermodal facilities. It calculates a score based on each facility’s overall level of activity, the value of goods moved through the facility, the terminal’s degree of connectivity to origins and destinations, and proposed travel time savings per vehicle. The tool was not structured to assess changing conditions at the same facility between a base and a build case—and the input field labeling reflects this.

The tool was also not designed to enable customization of terminal characteristics. This makes modeling of the second case of connectivity improvements a bit more involved. For each facility, the tool has a pre-loaded connectivity raw score that is the product of the volume moved, the value per ton for cargo, and the number of unique origins and destinations reachable from the terminal. A change in any of these factors should result in a change in the overall weighted connectivity score of the terminal, which is then associated with an economic impact, via an elasticity measure. However, the tool does not allow direct modification of these factors. The Facility Connectivity Raw Values are hard-coded into a pre-loaded database. To overcome this hard-coding and update facility characteristics, the user must conduct an off-tool calculation of the new Facility Connectivity Raw Value and a manual override of this new value in the build-case parameters. Moreover, when this manual override is implemented, there is no way to recalculate the relative measures included in the tool (Relative Activity, Relative Value, Relative Origins and Destinations,
Relative Facility Connectivity Index). This reduces the utility of the tool for evaluating how facilities rank in comparison to others across the nation.

Finally, the structure of the weighted connectivity score leads to movement in different directions depending on which input variable is changed. Any increase in connectivity characteristics (increased activity, value, or origins/destinations) results in an increased connectivity score. Improved highway access (decrease in travel time), on the other hand, reduces the connectivity score. This reduction was addressed by using an absolute value of the percent change to drive productivity calculations. This work-around is feasible but only as long as projects change either access times or connectivity characteristics, but not both. To assess a change in both access times and connectivity characteristics would require a restructured weighted connectivity score that consistently increases with increases in accessibility and activity levels at a terminal. An alternate structure of the score is proposed in the following section.

Further recommendations for future refinement of the C11 tools are shown in the next chapter.
RECOMMENDATIONS FOR FUTURE IMPROVEMENT

This chapter presents lessons learned and recommendations for future improvement to both the SHRP2 Project C03 product (the TPICS system) and the SHRP2 Project C11 product (Wider Economic Benefit tools). It draws from findings of two analytic exercises described in earlier chapters: the Chapter 4 findings from development of new case studies for TPICS and then applying the existing *MyProjectTools* feature to them, and the Chapter 5 findings from applying the new C11 tools to predict existing TPICS case studies. The resulting recommendations cover two main subjects:

1. Enhanced development of future TPICS case studies, and
2. Improvement in the functionality of the C11 tools.

6.1 Recommendations for Future TPICS Case Studies

Research Guidance

Accurate ex post assessments within the TPICS framework are contingent upon intelligent collection and interpretation of local knowledge. The success of a case study depends both on the researcher’s ability to draw from a number of primary and secondary sources, and on his or her ability to interpret narrative from a variety of perspectives.

Local and regional news articles prove useful in providing context on selected transportation projects and their motives. For example, news sources helped explain the origins of funding for the MN-60 widening project. The widening of MN-60 occurred in phases over time and was, for a while, suspended due to lack of funding. However, following the high-profile collapse of the I-35W Bridge, the state legislature passed a $6.6 Billion transportation funding package that made completing the widening possible. In addition, experience shows that a given “project” may not be understood in the same way by a Department of Transportation as by a local community. When preparing for interviews, it is important to familiarize oneself with the viewpoints of the community. This eliminates confusion and allows the researcher to anticipate the focus and perspectives of interviewees. IA-60, for example, was a project that occurred over many years and included both widening and bypass elements. Stakeholders would not differentiate these two distinct functional changes unless prompted to do so. The distinction is important because a bypass affects economic development through different mechanisms than does a widening—and the TPICS framework seeks to untangle these causalities.
Having established background knowledge of a project based on news sources and readily available planning documents, the core of the case study process focuses on interviews. For this, it is important to contact the right people and to be smart about the manner and timing of outreach. Recent case study experience points to the following set of most helpful contacts:

- **City, County, or Regional Economic Development Agencies** are the single most effective initial point of contact. Not only can these agencies offer a high-level perspective on development trends and the role played by various types of infrastructure (transportation, water, sewer, electricity) and policies (zoning, incentives), the agency staff often have an extensive knowledge of individual development projects and relevant agency or developer contacts.

- **Chambers of Commerce** offer a business-oriented perspective on development and the particulars of the site selection process for their community. Because of their working relationship with the business community, chambers are in a position to direct the researcher to the most effective contacts within a company.

- **City Planning Departments and Metropolitan Planning Organizations** provide important insight into the initial process of project conceptualization, planning, and funding. Depending on the depth of interviewee and institutional memory, planning agencies can help the researcher understand the reasons for pursuing a particular highway project. They can also offer insight into whether the conditions initially anticipated (e.g. levels of development, congestion, and traffic volumes) actually materialized, and the bearing these changes had on the overall’s project’s success.

- **State Departments of Transportation (DOTs)** serve as the repository for technical project data as well as planning and environmental impact studies. District offices are more likely to have detailed project information (project cost, timing, and length) as well as knowledge on local history of the project. This was the case for the I-94/Opportunity Drive Interchange, where the DOT district office was able to describe how the State Economic Development agency originally promoted the project and MnDOT subsequently supported the project coming to fruition. Planning offices within a DOT are more likely points of contact for obtaining old planning documents that are not available through a simple web search. They may also offer a broad perspective on how a highway project fits within the state plan or vision.

- **Individual Company Representatives** are the most knowledgeable and defensible resource for understanding a company’s location (or re-location) decision and the motivations/incentives that played a role.

In addition to identifying a targeted list, a researcher must also be strategic about the process of contacting potential interviewees. Most people, particularly at public sector agencies, are willing to volunteer their time once acquainted with the objectives of TPICS. Nevertheless, all interviewees are volunteers and will have other work that takes
precedence over these conversations. The following guidelines provided the highest success rate in scheduling successful interviews:

- **Identifying a point of contact**: Interviewees need not be the head of an agency, business, or community organization. In fact, executives may have less flexibility and availability for calls. Instead, try to find someone whose job description either most closely aligns to the information required, or whose name has appeared on websites or document related to the project (e.g. on project websites or in newspaper interviews and press briefings).

- **Initial point of contact by email**: Researchers should send an initial email in which they introduce themselves, explain the overall case study effort and its objectives, and summarize the reasons for focusing on a particular project. The researcher should be as specific as possible about the types of information he or she is hoping to get from the interview. It often helps to identify project details that seem relevant from the initial literature review process. Conclude this initial email by proposing specific days and times for a phone call.

- **Follow up with a phone call**: In many cases, a potential interviewee will not immediately respond and may require a follow-up the following week. Rather than sending another email, it is more effective to call and leave a message, referencing the initial email and leaving contact information.

- **Contact alternatives within the same agency or company**: If outreach efforts fail to elicit a response, consider reaching out to another member of the same agency or company. To avoid internal confusion, reference the prior point of contact in the new introductory email.

- **Requests for additional contacts**: A highly effective method for identifying additional potential interviewees is to ask at the end of every conversation whether there are other people that should be contacted for further information. If possible, request specific contact information.

### Recommendations for Identifying Attributable Development

The primary challenge in developing a TPICS case—beyond the time and effort required to collect information and conduct interviews—is to intelligently untangle what economic development can reasonably be considered attributable to a project. While there will always be an element of “art” and a degree of uncertainty in this process, the following suggestions should help a researcher to arrive at an internally consistent and defensible narrative regarding economic development impacts:

- **Contact businesses directly**: Even if a company has already been identified by a government agency as having located to an area because of a highway project, direct contact with businesses often provides more specific and current information. The key questions to ask are, “Would you be here (in the study region) if the project
was not built? Would your scale of operations be the same, had the project not been built?” The answer may not be a binary yes or no. For example, a business may have relocated from elsewhere within the study region but not changed in size. This would not be considered net new growth. On the other hand, the business may have expanded operations as a result of the move, in which case the increment in size is net new. Alternately, the business may have moved into the study region from another area, but may or may not have pivoted that decision on the completion of the highway project.

- **Identify impacts for a specific post construction analysis year:** It is important to remember that impacts identified in TPICS are for one snap-shot in time and cannot account for future anticipated growth or for the possibility that jobs may not be sustained into the future (due to other economic circumstances). For example, if a company indicates that they have relocated to a new highway-adjacent site to enable future employment growth, the researcher cannot attribute the anticipated as-of-yet unrealized growth to the project. It is, however, useful to note the company rationale within the TPICS case narrative as a signal of likely future growth.

- **Consider the role of other non-transportation factors:** One of the most difficult issues in identifying transportation-attributable development is untangling causality with other infrastructure investments, policies, or other non-transportation incentives that support development. For “greenfield” and “brownfield” sites, transportation access is often only one piece of the puzzle, along with provision of other utilities, land availability, and financial incentives. The key issue and challenge, is to determine what portion of new jobs are attributable to the highway project. There are multiple ways of getting at this question: one can ask a company representative to identify the location factors considered, and offer a percentage that captures the portion of a project “attributable” to each factor (e.g. 70% transportation access, 30% financial incentives). Alternately, one can probe the nature of the “world without the project” by asking interviewees: a) whether the company would still have located where it did without the highway project (but with the other infrastructure or incentives), and b) to identify alternate locations considered and describe whether the differentiating factor among alternatives was transportation access alone, or included other considerations. Because of the inherent uncertainty of this process, it is helpful to note a range of attributable impacts with the TPICS case narrative, even though only one midpoint number can be used in the actual quantitative reporting of impacts.

- **Acknowledge avoided job losses:** Related to the issue of attributable jobs, is the question of jobs that are added to a regional economy versus jobs that are saved. For example, in the case of the U.S. 65/IA-5 Bypass of Des Moines, there was an industrial laundry facility on a site that would not accommodate the growth necessary to continue serving Central Iowa. The laundry considered locating outside
of Polk County (the study region), but instead chose a site made newly accessible by the bypass’s completion. Thus the construction of the bypass is reported to have saved jobs in Polk County. Nevertheless, the TPICS case study conservatively does not count these jobs within the final count of job impacts, but does acknowledge them within the case narrative.

- **Seek to understand causal transportation factors:** A key limitation of the current TPICS case study process is its inability to full capture and describe the transportation factors that are the underlying drivers of economic development. While TPICS does differentiate highway project types and provides general information on traffic volumes, it is up to the researcher to dig more deeply into factors that dictate the scale and type of economic impacts. For example, the prior level of congestion affecting a corridor where a capacity project is implemented will affect the degree to which the project “unlocks” previously suppressed economic development. Similarly, the extent to which a corridor serves pass-through versus locally generated traffic affects the type and presence of economic impacts.

### 6.2 Recommendations for Refinement of C11 Tools

Based on the experience of applying C11 tools to selected TPICS cases, this section offers a number of methodological and tool refinements for consideration in future endeavors.

- **General Clarification Regarding Impact Base.** Moving forward with the C11 tools and other similar methods, we recommend that adjustments be made in the evaluation process to account for the portion of a region that is actually subject and sensitive to market access and intermodal connectivity improvements. In the case of intermodal connectivity, efforts should be made to identify the portion of a study region that actually uses the facility and the access route being analyzed. This percentage can then be used to adjust downward the amount of regional economic activity (measured as GRP or GDP) that is subject to productivity improvements from improved terminal connectivity.

For both connectivity and market access analyses, the analyst is encouraged to identify subsets of the study area economy that experience the most benefit from the intermodal facility of interest or the type of market access being assessed. Manufacturing and transportation sectors generally are more reliant on access to buyers and suppliers within one day’s travel and access to freight terminals. Service sectors, on the other hand, are more reliant on labor market access and on access to passenger terminals such as airports. Confining analysis to the most affected industry sectors will limit the risk of overestimation of economic impacts. In the future, additional research could help further refine our understanding of industry-specific responses to improved access and connectivity.
Future Improvement to the Market Access (Effective Density) Tool. Apart from general recommendations outlined above, future use of the Market Access (Effective Density) Tool for assessments of economic impacts would benefit from additional research into the relationship between the elasticity values and the decay parameter. Existing empirical research is concentrated in urban areas. It is unclear the degree to which elasticities from that research apply to more rural areas or larger regions. Both Corridor Q and I-43 improved longer-distance regional market access. Their economic contexts differ considerably from urban areas; therefore, a great deal of uncertainty exists regarding the magnitude of predicted productivity impacts in these and similar contexts. Such uncertainty could be incrementally reduced with further research.

Future Improvement to the Reliability Tool. Recommendations for the reliability tool relate both to its user interface and to adjustments that would expand functionality for users in a variety of analytical situations. On the interface side, it is not entirely clear from the tool that the requested capacity data is for all lanes, in one direction, and therefore should be calculated based on the number of one-way lanes and the number of passenger cars per lane per hour. Additional labeling may prevent potential confusion. The interface would also benefit from highlighting more clearly the minimal inputs required from the user, in contrast to those inputs that can be auto-filled by the tool using defaults.

Going forward with this or related reliability tools, a number of additional functionalities would prove useful. The previous section described how the tool cannot adequately assess projects that generate increased traffic volumes on a corridor. A step towards enabling this would be to allow users to extract per-vehicle travel times on a corridor, rather than only total vehicle-hours. Another useful option would be to allow users to enter their own vehicle occupancy rates and per-passenger/crew-hour cost factors, rather than per-vehicle hour factors. Finally, the tool as currently structured is best suited to single sections of road or highway. Application to less typical capacity projects such as an interchange redesign (e.g., the Big I Interchange) or the building of a relief corridor (e.g., Arizona Loop 101) are more challenging. The Big I interchange was analyzed based on the addition of lanes on I-25 and I-40 leading into the interchange. Arizona Loop 101 was modeled as a capacity improvement on an entire corridor spanning multiple highway routes. These approaches only yield approximate results. To more completely capture such projects would likely require further tool refinements or more advanced analytical approaches.

Future Improvement to the Connectivity Tool. The Connectivity Tool could be further refined in the future for use in assessing potential economic impacts of projects that improve intermodal connectivity characteristics of the facility. Desirable functionality would include the ability to edit terminal characteristics,
rather than relying on a static pre-loaded database. The weighted connectivity score itself also merits some further refinement. For instance, the connectivity score could be structured more like accessibility metric, with some function of the level of terminal activity in the numerator, and some function of impedance (i.e., access time) in the denominator. In that case, the connectivity index could be used more effectively to assess changes in terminal characteristics and in access times simultaneously. Increased activity at a terminal would increase the connectivity score. So too would a decrease in access time (since access time is in the denominator).

If the index were constructed in this way in the future, then improvements in the two primary drivers of intermodal connectivity would both move the score in the same direction (upwards). Finally, future research could help improve understanding of the relative value of the different components of the connectivity index. As currently structured, the index assumes that 1% improvement in highway access will result in the same productivity response as a 1% increase in terminal connectivity score (e.g. facility characteristics).