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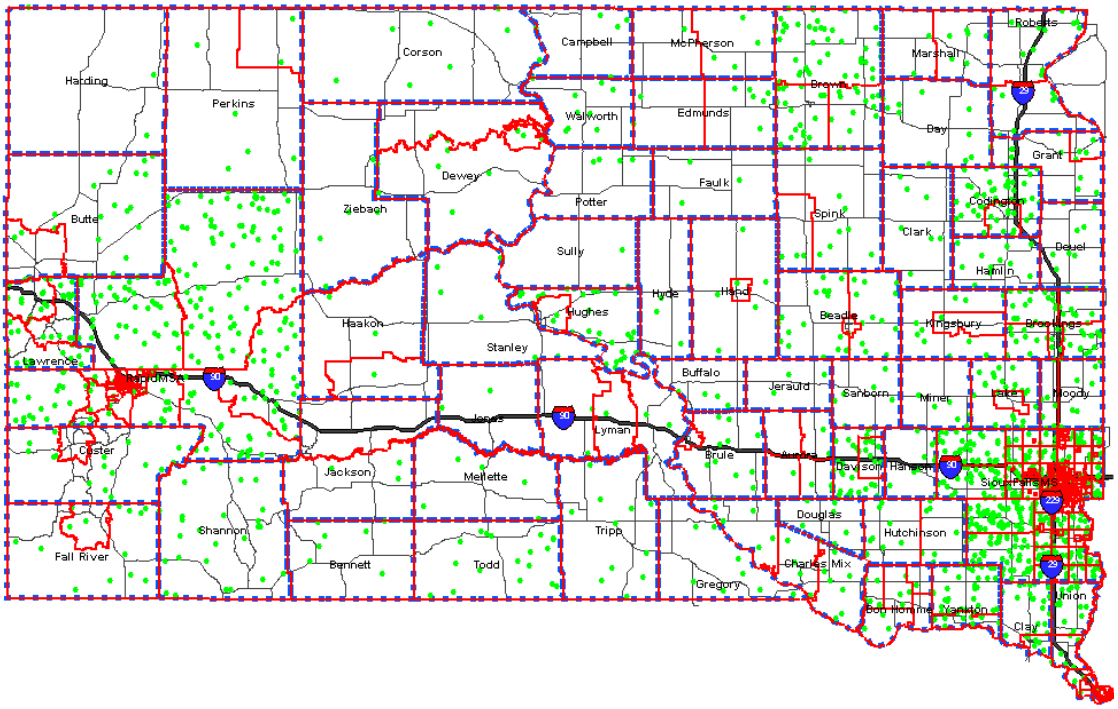

Review of Travel Demand Forecasting Requirements in the SDDOT

Study SD2006-06
Executive Summary

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16. Abstract

The purpose of this research study is to evaluate the most appropriate traffic forecasting tool that is most responsive to the needs of the South Dakota Department of Transportation (SDDOT). Like many other state agencies, the SDDOT has to do more with less funding for transportation infrastructure, operation, maintenance, and planning. The traffic forecasting functionality has to be tailored to SDDOT's needs and constraints while maximizing benefits.

The interviews of SDDOT stakeholders strongly emphasize the desire for a better forecasting approach than the current 20-year traffic forecasting procedure. The research team evaluated the uses/ needs of traffic forecasts at SDDOT against the availability of data, budget, and staff. While it is possible to build a statewide travel model (STM) of sketch planning type using available data, the applicability of such a model would fall short of meeting many of the identified uses and needs that are largely project specific. However, building a more robust 4-step STM that would satisfy many of the uses/ needs requires travel behavior data currently unavailable. Considering the advantages and disadvantages, the research team does not recommend a four-step statewide model at this stage. A more practical approach in the short-term is to enhance the current 20-year traffic forecasting procedure, use of GIS and transportation planning software, and staff training in travel demand forecasting. A sketch planning type STM is recommended in the short-medium term together with future enhancements that include a regional model option, and 4-step STM for passenger and freight.

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EXECUTIVE SUMMARY

1.1 PROBLEM DESCRIPTION

There are several reasons why a state might be interested in forecasting statewide or rural travel. These include (1) obtaining forecasts of rural, intercity, and long distance trips by passenger and freight; (2) supplementing urban travel forecasts; (3) developing project level forecasts in rural areas; and (4) satisfying mandated planning requirements—SAFETEA-LU mandates that several issues must be considered in statewide transportation plans.

Forecasts of rural and intercity travel are helpful in programming the sequence of projects and their associated costs, developing corridor preservation plans, establishing reconstruction and resurfacing strategies, and as valuable input into the overall assessments of the adequacy of the statewide transportation networks. Forecasts of freight travel are important for determining pavement thickness while passenger travel forecasts determine the future number of lanes.

Like many other state departments of transportation, the South Dakota Department of Transportation (SDDOT) is responsible for planning and maintenance of the state's transportation system. For SDDOT to effectively plan and maintain the state's transportation system, SDDOT needs planning tools to better understand travel patterns within the state and to better prioritize its limited resources.

The SDDOT has a 20-year traffic forecasting procedure that generates VMT forecasts at the county level. Since the traffic forecasting procedure was originally developed in 1999, it has not been validated. While the procedures adopted to derive these forecasting factors may still be valid and useful to some limited application, the SDDOT has recognized some shortcomings of the current forecasting procedure that include its inability to analyze from which land uses and location trips are generated, to which places trips are going, and which state routes trips are using. The inability of the current forecasting procedure to provide the desired analytical capabilities hinders the SDDOT from being able to analyze several planning needs, which include route diversion impacts prior to corridor improvements, corridor studies, site impact studies, and studies to identify the capacity and safety impacts associated with increased or diverted truck travel on state routes. The introduction of new intermodal facilities adjacent to highways creates opportunities for such diversion of truck trips.

The purpose of this research study is to enhance the current travel forecasting procedures to meet SDDOT planning needs. The challenge is to develop cost effective travel forecasting procedures with the desired analytical capabilities suitable to a rural state like South Dakota.

1.2 RESEARCH OBJECTIVES

This review of travel demand forecasting requirements in the South Dakota Department of Transportation has the following three objectives:

1. Determine the uses of and benefits of travel demand forecasting on a regional or statewide basis at the SDDOT.
2. Identify the level of travel demand forecasting functionality necessary to meet the needs of the SDDOT.
3. Determine the resources necessary to develop, maintain, and operate SDDOT travel demand forecasting capabilities on a regional or statewide basis.

The research team performed the following twelve research tasks to meet these objectives.

1.3 RESEARCH APPROACH

1. Meet with the project's technical panel to review the project scope and work plan.

The research team's principal and co-principal investigators met with the Technical Panel in Pierre on April 16-17, 2007. During this time, the face-to-face interviews of stakeholders located in Pierre were conducted with the assistance of SDDOT Office of Research staff.

2. Review and summarize existing research concerning travel demand forecasting for regional and statewide applications, including types of forecasts, methods, and data requirements.

The review examined both regional and statewide travel demand model approaches and applications. The focus of the review includes the objectives of the forecasting model, uses/applications of model (types of forecasts), model structure (particularly how freight is modeled), modes (automobile, commercial, others) model parameters, assumptions, data requirements, methodology, application software, GIS application, cost to implement and maintain, issues (model development, data, etc.), staffing, and training.

To gain an understanding of how other state departments of transportation (DOTs) develop their travel demand forecasts, the research team surveyed 10 state DOTs: Arizona, Idaho, Iowa, Minnesota, Montana, Nebraska, New Mexico, North Dakota, Wisconsin, and Wyoming.

To gain insights on regional models, travel demand models from the following 7 regional agencies were reviewed: Metropolitan Planning Organizations (MPO) of Rapid City, Sioux Falls (SECOG), and SIMPCO; Idaho Transportation Department (ITD) District 6 Travel Forecasting Methodology; Lincoln, Nebraska MPO Travel Demand Model; Travel Demand Model for the Eastern Colorado Mobility Study in Colorado; and Branson Transportation Model for the City of Branson in Missouri.

3. *Interview managers, traffic engineers, designers, planning staff, and other stakeholders within SDDOT to determine policies, requirements, uses, and benefits of travel demand forecasting.*

   The research team conducted interviews with SDDOT personnel in Pierre and those from regional offices. The research also interviewed staff from Metropolitan Planning Organizations (MPO) of Rapid City, Sioux Falls, and SIMPCO

4. *Identify processes and systems in SDDOT and other state agencies that have needs for travel demand forecasting.*

   The research team reviewed the regional models of Sioux Falls, Rapid City, and SIMPCO for model structure, data, modes, and other aspects of the models to better understand the interface of these urban/regional models to a forecasting model that encompasses the entire South Dakota state.

   The research team also reviewed the use of Geographic Information Systems (GIS) within SDDOT to identify how GIS can be effectively used as a tool for travel demand forecasting within SDDOT. Advances in GIS capabilities have made GIS a very powerful tool in planning and travel demand forecasting, in particular.

5. *Review and analyze SDDOT's existing travel demand forecasting process and identify and test a procedure to validate the forecasting factors.*

   The purpose of the review and analysis of the 20-year traffic forecasting procedure is to validate its applicability to South Dakota counties that have been experiencing growth in some areas while a decline in population in some other areas. The Technical Panel selected the following eight counties for the validation exercise: Brown County, Buffalo County, Clay County, Lawrence County, Meade County, Pennington County, Roberts County, and Todd County.

   Under this task, the input data and methodology were examined, and limitations and weaknesses of the procedure were identified. Statistical quality tests of linear regression models of historical VMT and county business data were examined. Relationship of population and employment as variables to predict VMT was also explored.

6. *Identify the type of economic, demographic, passenger, freight, or other data that could be used to develop regional and statewide travel demand forecasts, as well as the costs and other resources necessary to obtain the data.*

   The review of existing travel demand forecasting under Task 2, interviews under Task 3, and review of processes and systems under Task 4 provided valuable information as to the type of data needed for a statewide or regional SDDOT travel forecasting tool. Likewise, these tasks identified potential data sources.

7. *Prepare a technical memorandum that summarizes the work performed in Tasks 1-6 and provides recommendations on the most efficient process and resource needs to produce travel demand forecasts for the SDDOT. Discuss the costs, benefits, advantages, disadvantages, and feasibility of the recommended forecasting alternatives.*

   The research team summarized the work performed in Tasks 1-6 in a technical memorandum. A matrix comparing the costs, benefits, advantages, disadvantages, and feasibility of forecasting alternatives was prepared.

8. *Meet with the technical panel to review the technical memorandum and recommendations.*

   The research team discussed with the Technical Panel the Technical Memorandum prepared under Task 7.

9. *Based on SDDOT concurrence with the recommended travel demand forecasting process, develop a systems requirements document and implementation plan that addresses data collection and management, analytical tools, hardware, software, and necessary training, along with costs and implementation timeframes to either enhance the SDDOT's current travel demand forecasting process or establish a new process.*

   The purpose of this task is to develop a systems requirements document and establish cost estimates to implement the recommended, and SDDOT approved, travel demand forecasting process. The research team prepared a matrix of alternative analytical tools, software, and staffing.

10. *Meet with the technical panel to review and approve the recommended requirements document and implementation plan.*

    The BWR research team discussed the recommendations and implementation plan with the Technical Panel via a telephone conference. Comments and suggestions from the discussion were included in finalizing the research recommendations and the final research study report.

11. *Upon review and approval of the systems requirements and implementation plan by the technical panel, prepare a final report and executive summary of the research methodology, findings, conclusions, and recommendations.*

    The BWR research team prepared this final report as a summary of the research methodology employed on this project, the principal findings of the research, the conclusions drawn from the findings and the key recommendations for travel demand forecasting requirements in the SDDOT.

12. Make an executive presentation to the SDDOT Research Review Board at the conclusion of the project.

At the conclusion of the research project, the research team presented the research findings and recommendations to the SDDOT Research Review Board. Comments and suggestions during the presentation were incorporated into the final report.

1.4 KEY FINDINGS

1.4.1 Perceived Needs at SDDOT

The stakeholders' interviews provided valuable information on traffic data that is key input to roadway geometric design, requirements for a roadway including number of lanes, ramps, interchanges, intersections, and signalization, pavement design, pavement management system, safety analysis, corridor studies, corridor preservation, regional and statewide planning, and other system level analysis.

Stakeholders expressed their desire for better, more robust and credible traffic forecasts. The existing SDDOT traffic forecasting process falls short of meeting traffic data needs of many DOT programs/divisions. The current reliance on a couple of very experienced staff for traffic data analysis and forecasting is highlighted as a potential area that SDDOT needs to address.

Perceived Needs for a Better Traffic Forecasting and Analysis Tool

Perceived needs that are not met in the current traffic forecasting process include:

- Identify corridors that should be targeted for preservation, capacity expansion, multi modal development, and corridors that are crucial to the state's long term economic growth;
- Identify bottlenecks that should be targeted for capacity expansion, multi modal development;
- Identify highway segments with safety improvement needs;
- Identify existing and forecast freight movement needs and data on truck traffic;
- Analyze traffic diversion from other routes to the expressway;
- Analyze the effect of a corridor improvement on parallel corridors;
- Obtain future year Annual Average Daily Traffic (AADT) for specific roadways;
- Obtain growth factors for corridors and for different areas of the state;
- Evaluate highway capacity of all state routes;
- Determine need for projects including traffic impacts, costs, environmental, and railroads; and
- Forecast level of service (LOS) in the urban fringe area (like Sioux Falls) on roadways with 500 to 6000 vehicles per day (vpd); identify the growth in those highways to

determine if growth has caused a drop in the LOS. Such a capability would provide a better way of assessing, for example, applications for an approach driveway in those urban fringe roadways.

Staff Skills and Training Needs

Stakeholders emphasize the need to increase the number of staff involved in traffic forecasting, as well as enhance SDDOT staff's skills and knowledge in the following:

- Use and application of the Institute of Transportation Engineers (ITE) trip generation procedures
- Process and manipulate Census data for use in transportation analysis
- Basic understanding of travel demand surveys and the application of survey data
- Understand general traffic forecasting theory and the process of traffic forecasting and modeling, including quick response method of analysis
- Understand the application of forecast data

Potential approaches for a better traffic forecasting capability at SDDOT that could meet many of the identified perceived needs are presented in Chapter 6 of the report.

1.4.2 Enhancements Needed to the Current 20-Year Traffic Forecasting Procedure

The 20-year traffic forecasting procedure was originally developed in 1999 and since then it has not been validated. The traffic forecasting factors were based on a county level analysis of vehicles miles of travel (VMT) and indirectly on county level business growth.

The review and analysis of the 20-year traffic forecasting procedure validated the applicability of the linear regression technique as a valid approach to develop 20-year county level VMT forecasts. The results of review and analysis also identified several shortcomings in the current procedure. These shortcomings include the issue of data integrity, the use of a single global approach, and the lack of relationship between county VMT and county business trend. County business data is indirectly used in adjusting the 20-year factors mainly for commercial categories.

Chapter 5 of the study report describes in details the limitations of the current 20-year traffic forecasting procedure, together with the recommendations to enhance it.

1.4.3 Travel Demand Forecasting Model Options for SDDOT

One of the objectives of this research study is to determine the uses and benefits of a statewide model. The interviews of SDDOT stakeholders strongly emphasize the desire for a better forecasting approach than the current 20-year traffic forecasting procedure. The research team evaluated the uses/needs of traffic forecasts at SDDOT against the availability of data needed to

develop a robust model system for SDDOT, as well as other constraints such as budget, and staff availability.

While it is possible to build a statewide travel model using available data, the applicability of such a model would fall short to meet many of the identified uses and needs. The lack of travel behavior data to reflect rural tripmaking characteristics in South Dakota would be one significant shortcoming of a statewide travel model (STM). Geographical coverage with very low traffic dictates coarse or large traffic analysis zones, which practically limits, if not render worthless, the STM for project level analysis.

The review of needs and resources indicates that a statewide model development process for South Dakota is lacking the following:

- Foremost is funding constraint where there is very limited funding available for model development,
- Availability of primary data sources mainly on travel behavior data,
- The level of expertise of SDDOT staff is an issue, as well as shortfall in the number of staff, and
- There is no major new highway or project planned in the short-term, at least within the next three years, that will provide an impetus for model development.

Considering the advantages and disadvantages, the research team does not find the current and short-term need for travel forecasting to justify the substantial cost to build, maintain, and update a four-step statewide model that requires Origin-Destination data. Instead, a statewide model of sketch planning level type is recommended as a starting model following enhancements to the existing traffic forecasting procedures. As a practical statewide model option, demand estimation and link factoring can be readily developed using the enhanced 20-year traffic forecasting procedure and GIS networks.

1.5 RECOMMENDATIONS

The purpose of this research study is to evaluate the most appropriate travel demand forecasting tool that is most responsive to the needs of SDDOT. Like many other state agencies, the SDDOT has to do more with less funding for transportation infrastructure, operation, maintenance, and planning. The travel demand forecasting functionality has to be tailored to SDDOT's needs and constraints while maximizing benefits.

Figure ES-1 presents a schematic of the recommended changes to the current SDDOT traffic forecasting process. The recommendations are grouped into four general categories that correspond to implementation timeframes. For example, recommendation **R1** includes changes requiring immediate implementation. Proposed implementation timeframes for each recommendation are outlined in Table ES-2 on pages ES-17 to 18.

R1. Recommended Changes to the 20-Year Traffic Forecasting Procedure

A. Enhancements to the 20-Year Traffic Forecasting Procedure

B. Increase the Number of Staff Trained in Traffic Forecasting

C. Develop and Implement "Traffic Use Procedures" Guidelines

D. Develop a Database of Travel Forecasting Data

R2. Short-Medium-Term Enhancements

A. Use GIS for Simple Network and Land Use Mapping

B. Use of a Standard Transportation Planning Package for Simple Network and Mapping

C. Invest in National Household Travel Survey Add-on Sample

R3. Statewide Sketch Planning Model Option

R4. Future Enhancements

A. Regional Model

B. Freight/ Truck Statewide Model

C. Statewide Passenger Car Model

These recommendations are the most practical changes that can be implemented considering largely the SDDOT's budgetary constraint. The recommended changes represent an incremental process towards building a statewide travel forecasting capability at SDDOT when the need for one is justified.

According to NCHRP 358, many states found it useful to stage the development of the model, adjusting capabilities as the budget permitted. California, New Jersey, Ohio, Oregon, and Virginia are examples of states with a deliberate staging process—building a limited model to address immediate needs and expanding upon this model to address a greater range of issues.

A similar staging approach is followed by New Mexico and Iowa. Both states are currently in the development of their statewide models. New Mexico is starting with a simple network type passenger car model that would link to existing and proposed microsimulation and sketch planning tools. Iowa is starting with a 4-step passenger car and truck model.

The South Dakota DOT has a strong GIS capability with good coverage of the state highway and local roadway systems. The research team recommends making use of the Department's GIS to enhance travel demand forecasting and traffic analysis and transportation planning in general at SDDOT. Options to link GIS to a standard transportation software package for use in small-scale or project-level traffic analysis is also recommended. Future enhancements are also included.

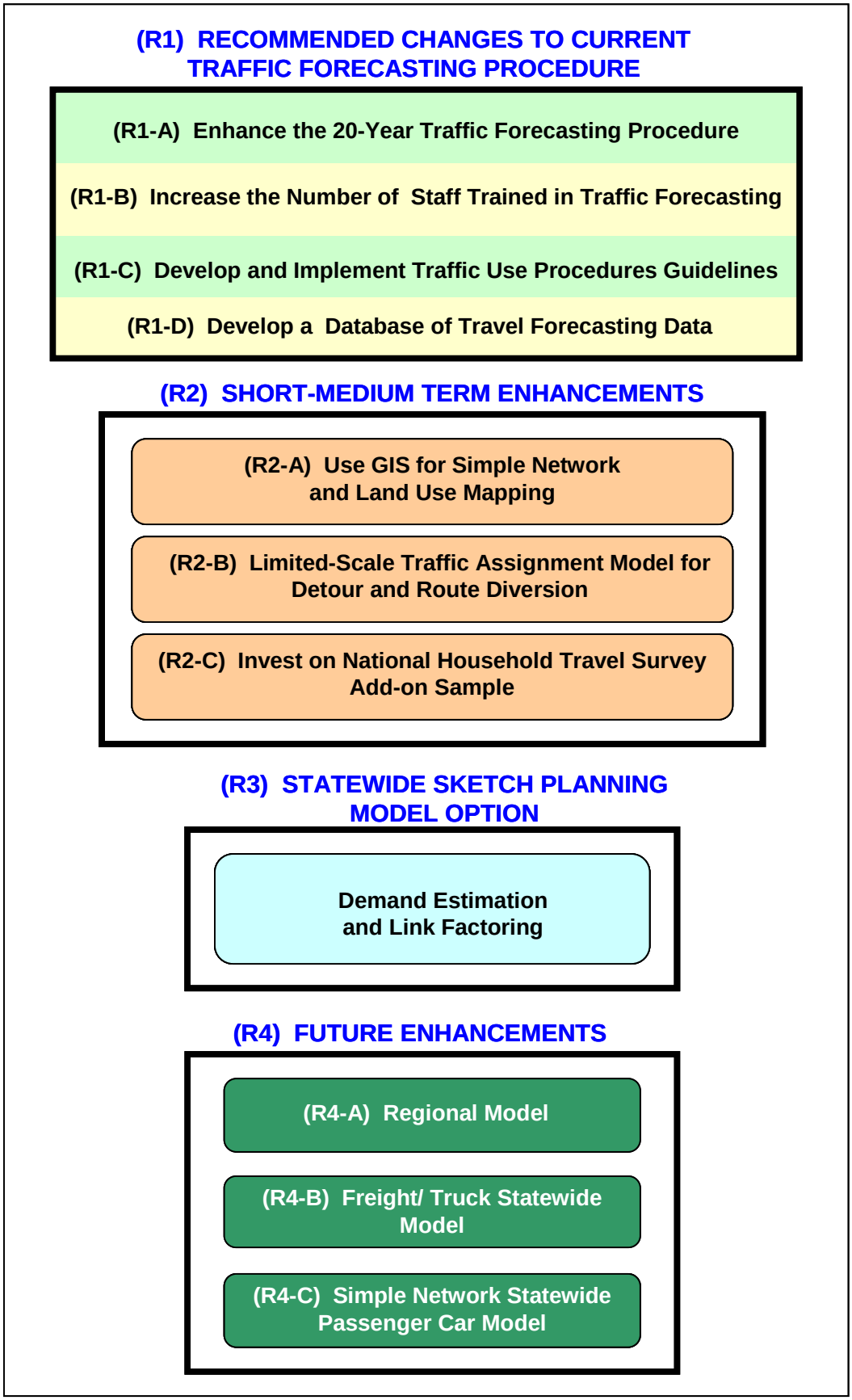

Figure ES-1 Recommended Changes and Enhancements to Current SDDOT Traffic Forecasting

1.5.1 Recommended Changes to the 20-Year Traffic Forecasting Procedure (R1)

R1-A Enhancements to the 20-Year Traffic Forecasting Procedure ()

The study recommends the following changes to enhance the current traffic forecasting process:

(1) Ensure data integrity

The detailed review and analysis of historical VMT data demonstrates the need to ensure a quality data set for use in the 20-year traffic forecasting procedure. It is imperative that historical VMT data should be reviewed to remove data outliers and make necessary adjustment for shifts in VMTs due to reclassification.

Apply the method outlined in Section 2.2.1 *(Method 3: Linear Projections of VMT by Functional Class, with Adjustments to Correct for Changes in Functional Class Categories)* to adjust the shifts in VMT due to reclassification. This method has been applied in this analysis to adjust for the interstate VMTs in Lawrence, Meade, and Pennington counties, as well as the statewide arterials and interstate VMTs.

(2) Year to use as a starting point for the regression analysis

After making the necessary adjustments to the historical VMT data, the starting year for the regression analysis should be reviewed. As shown in the historical VMT plots, some categories show sharp increases at some point and then moderating or leveling later. Typical of this trend is exhibited by Class 10-13 commercial where sharp increase in VMTs occurred in 1994. There are a couple of reasons for the sharp increase in VMT. After 1994, VMT has been calculated using HPMS data. Moreover, VMT data by county was not broken down by functional class until 1994. These changes in VMT calculation and aggregation have created some shifts, as exhibited by Class 10-13.

The regression analysis should use 1994 as a starting point rather than going back to 1986 for trucks. Starting year for other categories, such as *Other* class, should be reviewed as well.

(3) Apply different procedures to derive 20-year factors for VMTs

SDDOT should consider using different procedures to forecast VMTs based on the amount of historical and expected growth.

(a) Use constant growth rate in counties with only marginal increase in VMTs. Linear projection of VMT based on estimated growth factor (Method 1) outlined in Section 2.2.1 can be applied for categories such as Class 5-9 and *Other* class.

(b) Use linear regression or a combination of techniques. The technique used should be one that best fits the data. Use linear regression method for categories that exhibit a good linear fit. Use a combination of techniques, for example, a Moving Average to "smoothed" the data prior to applying a linear regression. Use other functions, for

example an exponential function if this provides a better fit to the data. It is important, however, to ensure that the long term forecast is within reasonable expected growth.

(4) Aggregate categories

If appropriate, aggregate some categories to obtain a good linear fit. For example, Class 5-9 generally has poor linear fit. By combining the two commercial categories, an estimate for Class 5-9 can be derived. Aggregating data is a common practice. For example, it is common to start the VMT estimate at the statewide level since there is higher confidence in VMT data on the state highway system. Based on a statewide growth, estimate of growth at the county level is allocated based on population, or other socioeconomic data. Further, the VMT growth is allocated by functional class, for example interstate and non-interstate.

(5) Adjustment to the 20-Year VMT Factors

It is recommended not to apply the current adjustment approach. Ensure that a good linear fit exists; if not, use a different forecasting technique as outlined above.

(6) Explore socioeconomic explanatory variables

(a) Further explore the relationship of employment data and VMT, particularly for smaller counties. The present analysis indicated some significant relationship. Commercially available forecast socioeconomic data at a county level, for example, Woods & Poole economic data, is readily obtained at a modest cost. VMT projections using sound forecast socioeconomic data usually produce better factors.

(b) Explore the applicability of using total business pattern, particularly for larger counties. The results of analysis indicate that total business data has some significant relationship for some categories.

(c) Further explore the applicability of population as a variable in counties where a linear relationship exists. Population forecasts are more easily obtained than other socioeconomic data.

(7) Update the traffic forecasting annually using updated VMT and socioeconomic data.

(8) Develop standardized spreadsheet templates with graphic capability to facilitate analysis and interpretation of data trend.

R1-B Increase the Number of Staff Trained in Traffic Forecasting

As highlighted in the SDDOT stakeholders' interviews, there is a need to increase the number of staff with skills in traffic forecasting. Likewise, there is a need to provide training to enhance knowledge and skills in the following:

- Use and application of the Institute of Transportation Engineers (ITE) trip generation procedures

- Process and manipulate Census data for use in transportation analysis
- Basic understanding of travel demand surveys and the application of survey data
- Understand general traffic forecasting theory and the process of traffic forecasting and modeling, including quick response method of analysis
- Understand the application of forecast data

R1-C Develop and Implement "Traffic Use Procedures" Guidelines

In view of the recommended changes in the SDDOT traffic forecasting procedure and the desire to increase the number of Department staff who would be trained in traffic/travel forecasting, it is imperative for SDDOT to develop "traffic use procedures" guidelines. A "traffic use procedures" guideline would provide guidance on traffic data collection, processing and data editing procedures, outlining procedures on VMT adjustments and "smoothing" of historical VMT data, systematic guidelines for traffic forecasting, and thorough documentation.

The guidelines can also serve as a manual to facilitate training. Systematic guidelines for traffic forecasting can improve the development and documentation of a forecast to ensure accuracy and repeatability. Thoroughness of documentation ensures the quality of traffic forecasts with results repeatable and justifiable to others besides the responsible engineer. Standardize forecasting procedures and data sets ensure that forecasts are easier to review, interpret, and update.

R1-D Develop a Database of Travel Forecasting Data

Developing a database of travel forecasting data at SDDOT enables the Department to build incremental datasets that will be useful for developing regional models and later a statewide model. Such a database will serve as a repository of travel related information that can readily assist in various types of analysis and mapping. Information that can be stored in the travel forecasting database include, but are not limited, to the following:

- Socioeconomic data
- Data on travel characteristics
- Land use data, such as parcel level datasets
- Data collected and used in project-specific models or any non-MPO traffic models. A good example is the model developed for the City of Watertown
- Data on special trip generators or trip generation rates
- Traffic impact studies data
- Intersection controls and access management related data

1.5.2 Short-Medium-Term Enhancements (R2)

Other options to enhance travel demand forecasting and traffic analysis and transportation planning in general at SDDOT include the use of the Department's GIS capability. GIS can also

be linked to a standard transportation software package for use in small-scale or project-level traffic analysis. A medium-term enhancement would be an investment to obtain good travel data from a household travel survey.

R2-A Use GIS for Simple Network and Land Use Mapping

The SDDOT GIS would provide a useful tool for many of the uses and needs identified by stakeholders. GIS mapping provides a handy tool for showing existing and future land use. Parcel level data would be very useful to show proposed developments, particularly commercial developments that would likely impact the state highway system. Demographics and socioeconomic data can be easily mapped over the highway system.

R2-B Use of a Standard Transportation Planning Package for Simple Network and Mapping

The strength in GIS capability at SDDOT can be augmented with a standard transportation planning software described in Chapter 6, Section 6.3, in the main report. GIS is very much at the heart of transportation planning tools providing links to data that drives the models. Figure ES-2 depicts an example using TransCAD that shows a map of mean travel time and mode of travel in South Dakota counties. Software packages have been developed to the point that they are more user-friendly than they were in the past, although knowledge and understanding of travel demand forecasting theory and modeling concept is required.

Area engineers would largely benefit from having a transportation software package to link with GIS. Such a tool would be handy for project level analysis and traffic impact studies. Once trained, area engineers and other SDDOT would be able to use the software package on limited or small-scale traffic assignment model for detour and route diversion analysis.

SDDOT already owns a TransCAD license, which is currently kept under Project Development.

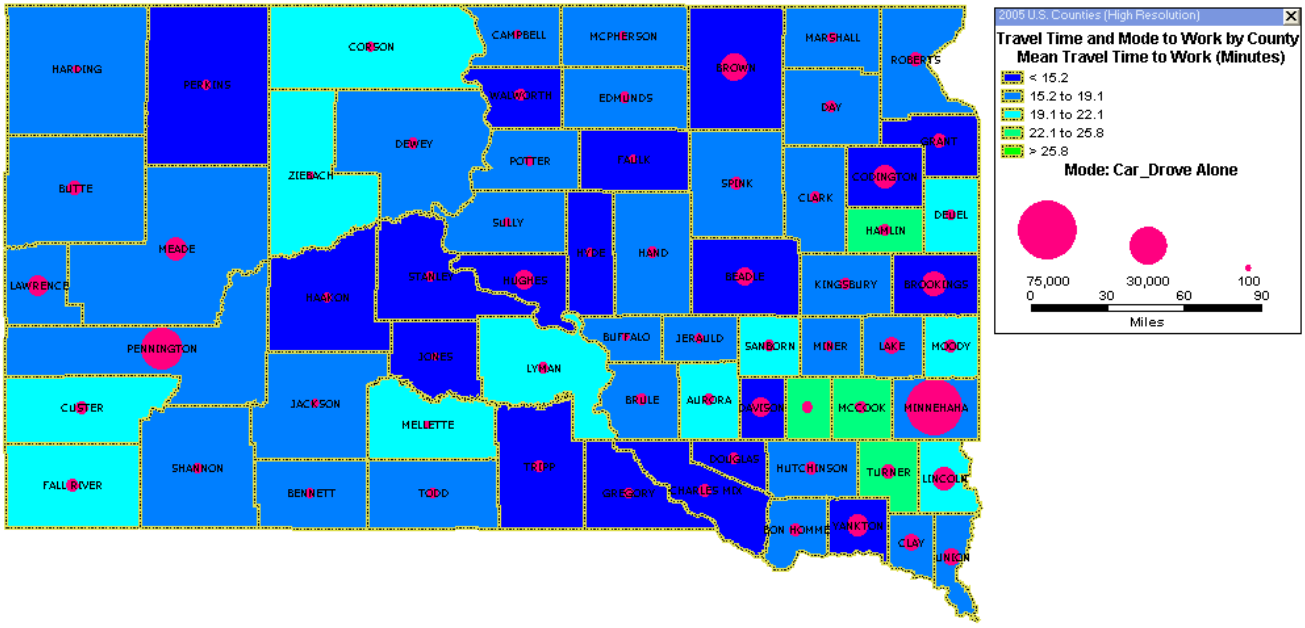

Figure ES-2 Example of the Use of TransCAD for GIS-Based Mapping/ Analysis

R2-C Invest in National Household Travel Survey Add-on Sample

The review of data availability and requirements for use in travel demand model development highlighted the need for good data on tripmaking characteristics of South Dakotan. An efficient approach to obtaining quality travel data from a travel survey is to purchase an add-on sample through the National Household Travel Survey. The 2008 add-on sample costs $175 per completed survey and requires a minimum of 1,500 samples.

The next NHTS schedule is fast approaching in 2008. It is not feasible to participate for this survey since sampling frame would need to be drawn and submitted to NHTS. It is already late for this coming 2008 survey schedule. However, NHTS has plans to conduct a more frequent survey than the current five-yearly interval. Considering budgetary constraint at SDDOT, the NHTS schedule appears fitting for SDDOT.

1.5.3 Statewide Sketch Planning Model Option (R3)

The review of data needs and available resources suggests that a demand estimation and link factoring approach can be developed as a statewide model option. The enhancements recommended to the 20-year traffic forecasting procedure would pave the way to extend the capability to incorporate socioeconomic and other potential explanatory variables. Population and employment are found to have some explanatory power for some categories in some counties. For those categories that do not show a good linear fit, aggregation of categories could be explored. Growth rates from population and employment data can also be assumed for those categories with marginal annual VMT growth.

Demand estimation and link factoring method was used in the Arizona DOT MoveAZ Plan. This method was used to update future HPMS travel forecasts. Factoring traffic volumes is less resource intensive than other approaches, but assumes that the underlying travel behavior in a region will not change. This approach is valid if the underlying trip distribution pattern is unlikely to change, if minimal changes in auto occupancy or mode split are expected, and if congestion on existing roads or the opening of new roads is not likely to result in a change in route choice. The VMT forecast for the MoveAZ Plan is based on population and employment forecasts as well as historical traffic counts.

1.5.4 Future Enhancements (R4)

Many states found it useful to stage the development of the model, adjusting capabilities as the budget permitted. In addition, experiences in many states and planning agencies indicate where many models were initiated because of a very specific issue or project that provides the impetus or triggers. Implementation of future enhancements suggested in Figure ES-1 would be largely driven on a needs basis. Table ES-1 below outlines potential triggers.

Table ES-1 Potential Triggers for Future Enhancements

Enhancement	Potential Triggers
Regional Model	• Future new major projects • Development pressures with regional impacts
Freight/ Truck Statewide Model	• Future expansion of ethanol plants • Capacity and safety impacts associated with increased or diverted truck travel on state routes that intermodal facilities adjacent to highways creates
Statewide Passenger Car Model	• Statewide long range planning requiring linkages with economic models • Corridor planning and bypass studies • Data on travel behavior and forecast socioeconomic data, and most importantly, funding availability

R4-A Regional Model

As outlined in Section 6.4.4, SDDOT could emulate the approach now being implemented at ITD District 6. To assist smaller communities in dealing with traffic growth in their areas, which could later pose problems with the state highway system, SDDOT could take the lead in coordinating regional transportation planning. The database set up as part of the recommended changes to traffic forecasting would allow SDDOT to build regional models when a need for it arises.

Future new major projects or development pressures with regional impacts would provide a strong catalyst for such a regional model.

R4-B Freight/ Truck Statewide Model

A simple network model approach applied in the Eastern Colorado Mobility Study and in the North Dakota DOT freight studies could be a potential model option for South Dakota when a need arises in the future to justify developing a statewide model for freight/ truck. Future expansions of ethanol plants would provide strong impetus for such a model. Likewise, the capacity and safety impacts associated with increased or diverted truck travel on state routes that intermodal facilities adjacent to highways creates would provide additional catalyst for a statewide freight/ truck model.

SDDOT could engage university research centers to develop a statewide freight/truck model similar to the freight studies undertaken by the Upper Great Plains Transportation Institute (UGPTI) for NDDOT. In developing the economic model to analyze, UGPTI has developed a simple network type model that includes trucks and passenger cars.

R4-C Statewide Passenger Car Model

Typical experiences in other states and planning agencies indicate that many models were initiated because of a very specific issue or project. For example, the need to evaluate corridor plans triggered the development of statewide models in Indiana and Missouri. Potential economic impacts associated with widening much of the state's two-lane highway system to four lanes provided the drive for the Montana statewide model. On the other hand, most statewide models were initiated because of a realization of system-wide forecasting needs. The need to evaluate and respond to air quality conformity analysis or system environmental impact statement provided impetus in other states for a statewide model. The Iowa DOT realized its needs for a statewide model as an important tool for forecasting auto and truck travel in the state, as well as other major planning efforts such as corridor analysis and policy evaluations.

When the need arises in the future to justify developing a statewide model for passenger car, a simple network model approach adopted by the New Mexico DOT could be implemented for South Dakota as a starting model. Impetus for developing such a statewide model may arise in response to the following needs:

- Corridor planning – assess the need for corridor level economic development studies and/ or intercity corridor and statewide planning. A need for a better forecasting tool for use in corridor planning is already a current issue identified by stakeholders.
- Bypass studies – stakeholders identified the need for a better forecasting tool for use in bypass studies.
- Respond to management and legislative requests for statewide travel statistics, as well as support for statewide system policy plans and investment analyses.
- Availability of good data on travel behavior and forecast data and most importantly, availability of funding.

1.6 IMPLEMENTATION PLAN

Table ES-2 summarizes the staffing requirements, opinions of cost, and implementation timeframes of the recommended changes to traffic forecasting at SDDOT.

Table ES-2 Staffing Requirements, Opinions of Cost, and Implementation Timeframes

Recommendation	Staffing Requirements	Opinions of Cost	Implementation Timeframe
(R1) Changes to the 20-Year Traffic Forecasting Procedure			
(R1-A) Enhancements to the 20-Year Traffic Forecasting Procedure	Implementation of the recommended changes to the current 20-year traffic forecasting procedure will not require new staff. However, more staff time from the Transportation Inventory Management program will be needed.	Staff time plus $400 if purchasing Woods & Poole socioeconomic data	Immediate
(R1-B) Develop and Implement "Traffic Use Procedures" Guidelines	This will only require staff time from the Transportation Inventory Management program.	Staff time	Immediate
(R1-C) Develop a Database of Travel Forecasting Data	This will require staff time from the Transportation Inventory Management program and the Bureau of Information and Telecommunications.	Staff time	Within one year and on-going
(R2) Short-Medium-Term Enhancements			
(R2-A) Use GIS for Simple Network and Land Use Mapping	This will not require additional staff, but will require more staff time largely from the GIS section.	Staff time	Within one year and on-going
(R2-B) Use of a Standard Transportation Planning Package for Simple Network and Mapping	This will not require additional staff, but will require more staff time. User of such standard transportation planning package is most strategically located under Project Development. The other option is the GIS section with supervision from a planner from Project Development.	$995 (annual software maintenance cost)	Within one year and on-going
(R2-A) Invest in National Household Travel Survey Add-on Sample	This will not require an additional staff, but would require staff time to devise the household survey sampling frame.	$262,500*	Medium-term that coincide with the next NHTS survey, most likely within the three to 5 years.

Recommendation	Staffing Requirements	Opinions of Cost	Implementation Timeframe
R3 Statewide Sketch Planning Model Option	This will not require additional staff, but will require more staff time from the Transportation Inventory Management program.	$25,000-$50,000	Short to medium-term
R4 Future Enhancements			
(R4-A) Regional Model	This will require an additional staff (0.25 to 0.5 FTE)	$150,000-$350,000	Long-term (not in the next 5 years)
(R4-B) Freight/ Truck Statewide Model	This will require an additional staff (0.50 to 1.0 FTE)	$150,000-$350,000	Long-term (not in the next 5 years)
(R4-C) Statewide Passenger Car Model	This will require an additional staff (0.50 to 1.0 FTE)	$$350,000-$600,000	Long-term (not in the next 5 years)

** This is only a minimum estimate based on the minimum of 1,500 samples required by NPTS. For a statewide sample, it will likely require more than the 1,500 minimum samples.*