SMALL URBAN AREA TRANSPORTATION STUDY

SCOPE OF WORK

This scope of work has been developed to guide the conduct of an urban area transportation study for Small Urban Area, Kentucky. Many of the following tasks can be performed simultaneously, thus expediting the completion of the study. It is estimated that the entire study will be completed in 12 months, barring any unforeseen complications or delays.

TASK 1.0 DATA COLLECTION AND MAPPING

The foundation for the study's technical analysis is built upon the quality and comprehensiveness of the data collected. At a minimum, data related to traffic volumes, socioeconomic issues, roadway characteristics and accidents will be assembled using KYTC HIS data, field data collection and other sources. GIS mapping techniques will be used to analyze and display the collected data.

Task 1.1 Socioeconomic Data

Socioeconomic considerations will include estimates of population, employment and dwelling units, and relevant Special Generator information. Accurate employment estimates are critical and the assembly of this data will rely upon Workforce Development Cabinet and ADD records that must be used in conjunction with field verification checks. Existing socioeconomic data will be reconciled and updated to a base year of ????.

Task 1.2 Roadway Characteristics

Analysis of the existing transportation system will include a review of functional classifications and geometry for area roadways. Roadway characteristic and traffic signal data will be obtained from the KYTC's Highway Information System (HIS) and the City of Small Urban Area. Roadway characteristic information will include functional classifications, numbers of lanes, and speed limits.

Task 1.3 Traffic Volumes

We will collect traffic count data automated vehicle classification counts taken at external station locations and at designated locations (e.g. screen lines and special generators) within the study area. Traffic counts will be collected over a 48 hour period at 30 locations. Directional counts will be conducted on divided facilities and constitute 2 locations, non-directional counts will be collected on undivided facilities and constitute 1 location. Additional traffic count data, where available, will be obtained from the Kentucky Transportation Cabinet (KYTC) to supplement the data collected in the field.

Task 1.4 Traffic Accidents

Accident records will be obtained from the Kentucky State Police, the KYTC and the City and/or County. Data will be collected in computer format for the most recent three

year period for processing and analysis to identify accident rates and high accident locations throughout the study area's roadway network.

Task 1.5 Base & Special Purpose Maps

A key element of the technical analysis for this project will be GIS databases, developed at the beginning of the project for continued application. Collected data will be used to assemble base and special purpose maps for display and analysis of information specific to the Small Urban Area area. Example GIS data that will be compiled include:

- **Traffic Model and Highway Network**
- **Facility Type/Functional Class**
- **Number of Lanes**
- **Speed Limit/Design Speed**
- **Traffic Signal Locations**
- **Traffic Count Locations**
- **Planned/Programmed Improvements**
- **Study Area Features**
- **Hydrography**
- **Railroads**
- **Public Lands**
- **Land Uses**
- **Traffic Analysis Zones (TAZs)**
- **Population**
- **Employment**
- **Dwelling Units**
- **Accident Data**
- **High Accident Locations or Sections**
- **Fatal Accident Locations**

TASK 2.0 COORDINATION AND PUBLIC INVOLVEMENT

This planning study effort will require a series of coordination activities between the KYTC, the consultant staff and the Small Urban Area Transportation Study Work Group, as described in the following tasks.

Task 2.1 Review Planning Studies and Committed Projects

To assure consistency in the planning process and to help identify future study issues, prior planning documents will be reviewed. For Small Urban Area, these documents should include the pending update to the KYTC's Statewide Transportation Plan (the Recommended Six Year and Long-Range Plans), the Unfunded Highway Needs Listing from the ADD Transportation Committee, and documentation on the ???? Traffic Model

Revision. Planned or programmed improvement projects will be identified, including any capital improvement projects to be undertaken by the City or County.

Task 2.2 Develop Local Interest and Structure for Local Input

An effective public involvement effort will be both proactive and utilize different mechanisms to obtain public input. We will develop a public involvement plan to provide a framework for the public involvement activities. We will work with the KYTC and local leaders to identify and plan for these activities, which will include:

- Transportation Study Work Groups
- Public Meetings
- Public Input Questionnaire
- Advertisement and Distribution of Project Information

The consultant will develop a Transportation Plan Public Input questionnaire to be distributed to Work Group members and other interested citizens. The purpose of this questionnaire is to afford citizens an opportunity to provide written input on transportation needs in the area. Returned questionnaires will be summarized and tabulated by the consultant.

Task 2.3 Advisory Committee/Work Group Meetings

A Transportation Study Work Group will be established to afford local representatives an opportunity to provide input to the study process. Members of the Work Group will include city and county officials, representatives from the Area Development District (ADD), community leaders, business representatives, and interested citizens. At the beginning of the study effort, the consultant will meet informally with key community leaders to discuss the study process, purpose and objectives, and to solicit their initial input and participation. Additionally, the consultant will work with these individuals to identify a tentative list of Work Group members, who will be contacted by mail and asked to participate in future meetings. It is envisioned that a total of five Work Group meetings will be held through the course of this study. The consultant will be responsible for notifying participants of these meetings, providing handouts and exhibits, and documenting the meeting minutes.

Consensus on the plan recommendations will be achieved based upon the recommended program's ability to achieve the goals established by the Transportation Study Work Group. At the initial Work Group meeting, a set of study goals and objectives will be proposed for review and approval by the participants. From previous urban area studies in Kentucky, study goals have typically included the following:

- Improve Transportation System Safety;
- Enhance Community Development and Economic Opportunities;
- Balance Environmental and Developmental Concerns;
- Develop an Efficient Transportation System; and
- Provide Multimodal Transportation System Enhancements.

Through the identification of these goals, the public will be able to help guide the development of future improvement alternatives and gain a sense of local ownership for the plan to be ultimately developed. Each alternative highway improvement considered as part of the transportation plan will be evaluated based upon its ability to achieve these goals.

Task 2.4 Public Meetings

As part of the public involvement process we will conduct two public meetings. The first public meeting will review existing conditions and identify potential improvement alternatives. The second public meeting will review the alternatives and receive input on the recommended transportation plan. We will be responsible for scheduling and advertising the public meetings, preparing exhibits and presentation materials, and documenting the public input received through the meetings. In order to minimize time and travel expenses the public meetings will be held on the same day as two of the Work Group meetings. All information will be reviewed with the Cabinet prior to its public dissemination.

TASK 3.0 ANALYSIS OF EXISTING SYSTEM

Development of a long-range transportation plan for The Small Urban Area will begin with an analysis of the existing transportation network and conditions. The identification of high accident and delay locations will provide a starting point for the development of an improvement plan.

Task 3.1 Identification of High Accident Locations

Using the five-year accident summaries provided by the KYTC, system-wide accident analyses will be conducted to identify locations where accident data suggest specific patterns related to safety deficiencies. A spot or section of roadway is considered to have a high accident rate when the actual annual accident rate is higher than the critical accident rate, or the rate developed for similar facilities throughout the state. This analysis will be based on the methodology described in the *Analysis of Traffic Accident Data in Kentucky (1993-1997).*[1] Identified high accident spots or segments will be graphically depicted using the developed base map of the area.

Task 3.2 Identification of Congestion/Delay Locations

Base year daily traffic volumes for the Small Urban Area transportation study network will be obtained through the KYTC or from traffic counts conducted for the study. Using this and other assembled data, level of service (LOS) will be the primary measure of system-wide performance. Operational levels of service provide a qualitative representation of traffic conditions and will be calculated for the study network using a planning-level analysis of traffic volumes, average speeds and capacities. Individual levels of service characterize these conditions in terms of factors such as speed and travel time. Like the accident data, operational conditions will be displayed using area base map figures.

[1] *Kentucky Transportation Center Research Report KTC-98-16*.

Task 3.3 Develop Operational Improvement Plan

Many transportation improvements identified through the study process and public involvement activities will involve local operational and safety improvement needs. We will examine identified locations though site visits and identify causative factors and corrective measures. A summary of these improvements will be provided with the development of a operational improvement plan to address the identified deficiencies with relatively low-cost options to improve capacity, safety and system management. Cost estimates and a prioritization scheme will also be included in the operational improvement plan.

TASK 4.0 TRAFFIC MODEL DEVELOPMENT AND CALIBRATION

As part of the study, a travel demand model will be developed to simulate existing travel characteristics, forecast future traffic volumes, and allow for system-wide analysis of alternative transportation improvements. In developing this model, we will utilize the TransCAD model package. Components of the existing Small Urban Area model, updated in ????, will be reviewed with the Cabinet to determine its suitability for providing trip rates or other factors to be applied for the new calibrated base year model. Because of the time duration since the development of the previous model, it can be generally anticipated that a new model update will be required. Throughout the model development process, the consultant will work with the Cabinet to ensure that our modeling techniques and applications adhere to the Cabinet's desired standards. It is expected that frequent coordination between the consultant and the Transportation Cabinet's user division will be necessary for the model development components of this project.

Task 4.1 Develop Traffic Assignment Network

We will develop a traffic model network that will convert the primary road system into a computerized format composed of links, nodes and centroids. Each link will contain information regarding its length, travel speed, capacity and other characteristic attributes. Once the internal and external trip tables have been established using the base year traffic data, trips can be distributed throughout the coded network using an iterative process.

Task 4.2 Develop Base Year Internal Trip Table

The scope of the traffic model update includes the development of calibrated internal trip generation equations and the applicable trip table. Trip ends for internal traffic analysis zones will be developed using a KYTC accepted methodology for small urban model development. Trip generation equations will be developed for home-based work (HBW), home-based other (HBO) and non home-based (NHB) trips. For special generator zones for which the standard equations do not adequately reflect the trip making characteristics, revisions to the trip generation equations may be made based upon traffic counts or other accepted trip generation estimates for the land use within the special generator zone.

Trip productions and attractions will be distributed by the gravity model with impedance based upon vehicle travel times. Travel time friction factors will be used for internal trip purposes.

Task 4.3 Develop Base Year External Trip Table

A simulated external trip matrix will also be developed using conventional KYTC procedures or procedures approved by KYTC to estimate external to external (E-E) and external to internal (E-I) trips. E-E trips will first be estimated for external zones using an acceptable distribution regression methodology from Pigman or NCHRP 365 to estimate through trips. E-I trips result from the difference of the total trips minus the E-E trips at each external station. The distribution of E-I trips will also be determined using a standardized regression equation. The development and adjustments of the trip equations will be closely coordinated and reviewed with the KYTC throughout the model development process.

Task 4.4 Calibrate Base Year Model

Using the above discussed trip generation and distribution procedures, trips will be loaded onto the highway network using a capacity restrained assignment technique or other accepted procedure. Traffic assignments will be compared to available traffic counts to assess the overall accuracy of the model. The percent deviation in traffic assignments on identified calibration links within the model will be compared to the NCHRP 255 curve and on an overall basis to assess the model's accuracy. The model calibration results will be reviewed with the KYTC and adjustments made to model trip generation and link attributes as appropriate to better calibrate the results of the model assignment.

TASK 5.0 FORECASTS

It is understood that future year model development and analysis of transportation plan alternatives will not be undertaken until the base year model is approved.

Task 5.1 Forecast Socioeconomic Data to Target Year

Year 2020 forecasts of future population, dwelling units and employment will be prepared by updating the TAZ information contained in the existing model using forecasts available from the ADD or other acceptable sources (State Data Center). It will be particularly important to gain local input on anticipated areas of future growth and development in The Small Urban Area and surrounding communities.

Task 5.2 Develop Target Year Traffic Model

Using the calibrated base year model, future year 2020 socioeconomic data will serve as inputs for developing traffic assignments under future travel conditions. A model network of existing plus committed (E + C) highway conditions will be prepared and future traffic forecasts will be assigned to the network to identify system deficiencies.

TASK 6.0 ANALYSIS OF FUTURE CONDITIONS

This task will involve the use of the calibrated traffic model in conjunction with estimates of future socioeconomic conditions to identify future highway system conditions and potential deficiencies.

Task 6.1 Target Year Deficiency Analysis

Using the results of the target year traffic model, future operational levels of service will be calculated to identify deficiencies along highway facilities in the study network. In

addition, system-wide measures of effectiveness (MOE's), such as total vehicle delay, can be used to gain a relative estimation as to the rate at which levels of congestion will be increasing over time throughout the study area.

Task 6.2 Alternatives Development and Analysis

The identified network deficiencies will be used in coordination with the study's goals and objectives to guide the identification of candidate transportation improvements. Alternative project scenarios incorporating the candidate improvement projects will be coded as model network alternatives, and evaluated using future year model assignments. Network deficiencies and system-wide measures of effectiveness can be evaluated under the alternative scenarios to determine their ability to reduce congestion and improve operational conditions. Operational levels of service will be measured for three scenarios: 1) future year traffic on the E+C network; 2) future year traffic on the alternative networks; and 3) future year traffic on the recommended plan network.

TASK 7.0 DEVELOPMENT OF RECOMMENDED PLAN

The product of this study will include a transportation plan report that will serve as a guide for the programming and further development of future transportation improvements in the area. It is important that the recommended plan: 1) reflect a local consensus on the priorities and needs for highway improvements within the area; and 2) adhere to the Cabinet's programming requirements for projects included in future updates of Kentucky's short and long-range highway plans.

Task 7.1 Select Recommended Improvements

Recommended improvement projects will be selected based on the results of the alternatives analysis, input from Work Group members and citizens, and the satisfaction of established project goals and objectives. A range of project evaluation criteria will be established, including economic development benefits, environmental concerns, community issues, traffic and safety concerns, and project cost estimates.

Task 7.2 Develop Project Cost Estimates

General unit costs for planning-level analyses will be developed using the Highway Performance Monitoring System (HPMS) data, previous cost estimates for similar highway improvements, and other available cost data provided by the KYTC. We will work with local district staff to develop planning-level estimates for design, right-of-way, utility/relocation and construction costs for proposed improvements. The final plan must be cost feasible, reflecting the fiscal constraints of limited funding opportunities and current funding commitments.

Task 7.3 Develop Priorities

Project priorities will be developed based on the results of the alternatives analysis and cost estimate figures, along with input from the KYTC, Work Group members and citizens. The prioritized system plan will then be developed into a phase plan for implementation of project improvements.

Task 7.4 Develop Phase Plan and Identify Funding Sources

It is anticipated that the implementation of the prioritized improvements will be phased in over time relative to available funding. For this reason, several phases of implementation will be established for the identified improvements and priorities. Where applicable, a limited number of new sources and strategies for defraying the costs of projects will be examined on the basis of local conditions and community acceptance. Based on the cost of the improvements and the anticipated financial constraints, the most effective combination of improvements will be selected.

TASK 8.0 REPORT PREPARATION

Results of the Small Urban Area study will be documented in two major reports: a Technical Memorandum, documenting the traffic model development process, and a Final report, providing a study overview and the recommended transportation plan.

Task 8.1 Traffic Model – Technical Memorandum

A report documenting the traffic model development and calibration will be submitted in draft form for review by the Cabinet as early in the conduct of the study as possible (and no later than eight months from the initiation of the study). Traffic model computer files will be provided at the same time in a form that is compatible with the Cabinet's most current modeling software (TransCAD). Following the review and reconciliation of the Cabinet's comments and the incorporation of future year data, a final technical document will be prepared. Ten (10) copies of the final document, along with a print-ready copy, will be submitted to the Cabinet.

Task 8.2 Transportation Study – Final Report

An Urban Area Transportation Study Report will be submitted in draft form for review by the Cabinet as early in the conduct of the study as possible. The Recommended Transportation Plan will not be finalized until the draft report is approved by the Cabinet. Thirty-five (35) copies of the Final Report, in conjunction with a print-ready copy, will be provided to the Cabinet at the conclusion of the study. Recommended Plan projects will be presented in a format that is consistent with the KYTC Long Range Plan and Six Year Plan databases.