LTRC Technical Summary Report 402

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Louisiana Transportation Research Center

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Modeling Hurricane Evacuation Traffic: A Mobile Real-Time Traffic Counter for Monitoring Hurricane Evacuation Traffic Conditions

Introduction

Currently, the Louisiana Department of Transportation and Development (DOTD) has permanent traffic counting stations around the state that are used to measure traffic demand at specific locations. In addition, DOTD has recently partnered with the United States Geological Survey (USGS) to couple traffic counters with hydro-watch stations located at over 80 locations near Louisiana waterways. These stations will be capable of providing near real-time traffic counts. However, the USGS stations are stationary and restricted to the locations of the current hydro-watch stations. While these stations have the potential to provide valuable sources of information under evacuation conditions, there is still a pressing need to determine traffic conditions at locations that may fall outside of the current hydro-watch sites. This creates an immediate need to rely on mobile traffic counters that provide the required degree of flexibility in the selection of measurement locations.

Currently, models of hurricane evacuation demand do not incorporate dynamic treatment of traffic conditions on the evacuation network. To develop dynamic demand models, one must observe traffic conditions during the evacuation period at representative locations. In achieving this goal, mobile traffic monitoring devices are required to provide the accuracy and flexibility of collecting high-resolution data during emergency evacuation conditions and under adverse weather conditions. This phase of the project attempts to achieve the goal of identifying and acquiring a suitable traffic measurement device that is capable of streaming real-time information from evacuation locations to a central traffic management facility.

Objectives

The objective of this part of the research study was to select and acquire a mobile traffic counter capable of providing traffic flow and average speed data in intervals of time no greater than 15 minutes and transmit the data back to a central location at the termination of each time interval. The counter must be able to operate on at least 95 percent of the locations on public roads in the state of Louisiana, and thus, wireless communication capabilities will be deemed necessary.

Scope

This research project is part of a more comprehensive study addressing other topics related to evacuation planning. These topics are addressed in separate LTRC reports. Specifically, LTRC Technical Report 408 addresses the estimation of time-dependent hurricane evacuation demand and reports on the development of a sequential logit model that estimates whether a household will evacuate or not and, if the residents decide to evacuate, when they will choose to leave. LTRC Technical Report 400 addresses contraflow as a means of increasing evacuation capacity and reports on research conducted on the effectiveness of alternative initiation and termination configurations of contraflow evacuation systems. The development of

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a methodology to establish hurricane evacuation zones in a systematic and reproducible manner was also conducted as part of this study and is reported in Transportation Research Record 1922. The procedure uses postal Zone Improvement Plan (ZIP) areas as basic building blocks in a GIS-based process that progressively combines these blocks into evacuation zones of similar flooding potential.

Research Approach

The study thoroughly reviewed the technical features and capabilities of a set of state-of-the-art traffic monitoring devices produced by different manufacturers. The selection criteria included cost, degree of mobility, ease of installation and calibration, resilience to adverse weather conditions, and real-time communication options. The comparative evaluation showed that the Remote Traffic Microwave Sensor (RTMS) meets all selection criteria when combined with a trailer for mobility and a cellular modem for real-time wireless communication. The mobile RTMS system was acquired and assembled at the Louisiana Transportation Research Center (LTRC) facility and is intended to collect traffic measurements in future hurricane related studies.

Conclusions

Based on a review of the technical specifications and cost of procurement and operation of the set of traffic monitoring devices presented in this report, the research team concluded that the RTMS device, combined with a mobile trailer and cellular wireless communication devices, is most appropriate for data collection and acquisition during emergency evacuation conditions. As a result, a SECO-portable traffic monitor, a trailer, and batteries with a charger and cable were purchased; a detailed description of the technical specifications can be found in the appendix attached to this report. Shortly thereafter, the RTMS mobile counter system was acquired and field tested. The process of assembling and calibrating the system was relatively simple and fast (roughly 30 minutes or less for experienced users). The system was also supplemented with a wireless cellular modem and a cellular antenna that facilitate communication with the RTMS device in real-time using a dial-up service over wireless data connection.

Recommendations

This research project examined a set of possible devices with various underlying technologies to determine the best portable traffic counter possible. Based on technical and cost assessments of all traffic monitoring devices presented in this report, the research team recommended the use of the RTMS device, combined with a mobile trailer and cellular wireless communication devices, for data collection and acquisition during emergency evacuation conditions. The device, currently housed at the LTRC parking facility, was acquired and tested for immediate and future use.