

DEVELOPMENT OF A STATEWIDE MODEL FOR HEAVY TRUCK FREIGHT MOVEMENT ON EXTERNAL NETWORKS CONNECTING WITH FLORIDA PORTS-Phase-III

PROBLEM STATEMENT

Freight transportation is essential for the growth of any global economy. Seaports generate a significant amount of freight. Proper accommodations for and planning of intermodal traffic at seaports, therefore, are necessary to facilitate economic growth. Seaport vessel freight activity can generate high volumes of daily trucks. The efficiency of freight transportation depends upon the transportation infrastructure of the port and the adjacent road network. To provide an adequate and efficient transportation system for the mobility of freight in and out of seaports, computer simulation modeling can be used to analyze the existing infrastructure to determine where inefficiencies are or where they may occur in the near future.

Recently, a methodology for modeling heavy truck traffic in and out of Florida's seaports was developed. Models were developed for the seaports in Tampa, Everglades, Jacksonville, Palm Beach, and Miami. These models accurately calculate the daily number of trucks on the access roads to these ports based on daily vessel freight data. However, providing adequate capacity for these heavy trucks on the road network that connects to these ports is also important.

The development of a methodology for modeling the routes these heavy trucks utilize to access the freight terminals in the vicinity of a port would enhance the ability of local engineers and planners to adequately maintain the transportation network for freight transportation. Determining the proper data for modeling the heavy truck traffic, therefore, is essential. Freight transportation includes various components (e.g., connecting with the vessel shipments, access to the freight terminals, and travel time (or delay) on the roads that access the port), all of which should be considered during model development. Knowledge of the routes the port generated heavy trucks use and the corresponding truck volumes can provide valuable data for highway improvements and local route planning. The percentage of heavy trucks can significantly impact the operations of a highway facility.

OBJECTIVES

The main objectives of this study include the following:

1. Develop a truck route assignment model for highway networks connecting to Florida ports. This task includes the application of predictive models to estimate the current and near-term volumes of freight movement by heavy trucks on the major roadway routes connecting to the ports.

2. Test the application of the developed methodology by utilizing the truck trip generation model, developed in Phase II of this study, to estimate a short-term forecast of port generated truck volumes for assignment to the defined highway network.
3. Establish the transferability of the developed network methodology to another Florida port.

FINDINGS

The Port of Tampa and the adjacent highway network (6 mile radius) were selected to develop the modeling methodology. Once an accurate and applicable methodology was established, Port Canaveral was chosen for the transferability testing. These ports complement each other insofar as they are strategically located on the central east and west coasts of Florida and can be linked via Interstate 4 and State Road 528.

To define the road network for simulation, researchers needed information about the port freight operations, including freight terminal locations, access roads, and possible travel routes that can accommodate heavy truck traffic. Once the links and nodes (road segments and intersection / interchanges) were determined, the computer network model coding began. The data required to build the successful road network for simulation included turning movements at each intersection or interchange, type of control at an intersection, signal timing, geometric features, and link traffic volumes. To execute the simulation model, an Origin-Destination (O-D) matrix was required. This matrix was a tabulation of external nodes identified as origins and destinations on the defined network. Any O-D pair is a route that can be selected for travel on the network by a heavy truck generated by the port's freight activity.

Two computer micro simulation packages were tested for the network modeling. Both performed equally well; however, the VISSIM (version 3.6) software was easier to use than CORSIM for building and coding the network for the modeling. VISSIM was selected for the transferability testing.

Researchers used data provided by FDOT as well as data collected in the field to calibrate the developed models. The accuracy of the model was higher with the field data. However, the FDOT data was helpful to establish an initial O-D matrix that was further enhanced by the field data. Furthermore, data for the port nodes in the O-D matrix can be obtained from the truck trip generation models developed in Phase II. These models were successfully applied for estimating current and short-term forecasts of heavy truck volumes for the port nodes. The port generated and network total traffic and truck volumes provided the factors and truck percentages to conclude the number of port generated heavy trucks on the identified network truck routes.

CONCLUSIONS

The road network models for the Port of Tampa and Port Canaveral were successfully validated at the 95% confidence level. Once the validation was completed, both models were successfully executed for short-term forecasts of heavy truck volumes on both defined networks estimated by

the port truck trip generation models. Successful applications to incident management and traffic operations were also completed for the Tampa network.

The results of the network modeling indicated an average of 720 heavy trucks generated by the Port of Tampa's freight activity travel on the defined network during the peak hour (5-6 PM). Of this total truck traffic, 55% travels between the port's freight terminals and the connecting interstate highways (I-4, I-275, I-75). Also, due to the high volumes of phosphate products handled at the Port of Tampa, Causeway Boulevard serves an estimated 250 trucks during the peak hour generated by the port's freight activity.

Of the total truck volumes generated by Port Canaveral's freight activity during the peak hour, on average, 25% of these trucks use I-95 and 18% use SR 528 for travel outside the defined network. Also, of this total port generated peak hour truck volume, local truck trips inside the defined network were considerable. Eleven percent of the total truck trips are between US 1 (rail terminal) and the port, and 22% of the total truck trips are between Industry Road (Rinker Cement Distribution Facility) and the port.

BENEFITS

Seaport vessel freight activity can generate high volumes of daily trucks. The efficiency of freight transportation depends upon the transportation infrastructure of the port and the adjacent road network. This computer simulation modeling can be used as a tool by seaports or transportation planning agencies to analyze the existing infrastructure to determine where inefficiencies are or where they may occur in the near future.

The developed methodology can be used to model the routes these heavy trucks utilize to access the freight terminals in the vicinity of a port, and thus enhance the ability of local engineers and planners to adequately maintain the transportation network for freight transportation. Knowledge of the routes used by the port-generated heavy trucks, as well as the corresponding truck volumes, provides valuable data for highway improvements and local route planning.

This data will also be useful to the Department when it explores future changes to identified major connector roadways to seaports, as well as when it identifies needed intermodal enhancements to improve freight movement to and from seaports.

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