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September 8, 2003

Cheryl D. Soon
Director
Department of Transportation Services
City and County of Honolulu
650 S. King Street, 3rd Floor
Honolulu, Hawaii 96813

Dear Cheryl,

SUBJECT: Proposed In-town BRT for the City and County of Honolulu

In a recent testimony to the transportation committee of the Council of the City and County of Honolulu, the City referred to my traffic simulations of portions of the in-town BRT as "simplistic". This characterization is entirely inappropriate. My four-point response is as follows.

(1) I used the simulation software called INTEGRATION. It is a sophisticated traffic simulation model and entirely suitable in the context in which it was used. Page 3 provides a summary of the capabilities of INTEGRATION.

(2) All traffic data were used without alterations. They came from past Traffic Impact Studies conducted by reputable consultants. These TIS have been accepted by the City and County of Honolulu.

(3) I have been involved with several sophisticated computer tools for traffic analyses and I was a reviewer of draft documents for the 2000 edition of the Highway Capacity Manual (HCM2000). I have worked with INTEGRATION for over 10 years and I have contributed to its improvements. A large number of international publications on traffic software routinely cite my work on traffic software applications, comparisons and recommendations for improvements. As an example, the Houston office of Parsons Brinckerhoff, the same lead consultant that conducted the Honolulu BRT study, used INTEGRATION for assessing the traffic impacts of lane and ramp closures of the planned Katy Freeway reconstruction in Houston. Not only did they choose INTEGRATION to assess the traffic impacts, but also two of their 12 citations are samples of my past work with INTEGRATION. (Please see page 4.)

(4) The City's insistence for taking the uncertain outputs of a planning model and using them into a basic HCM2000 analysis for traffic intersection level-of-service assessment is inadequate for a project such as the proposed BRT which has significant local and regional effects to traffic flow.

The evaluation of traffic conditions with HCM2000 is not in tune with the current state of the art in the US which is traffic simulation (please see page 5). HCM2000 explicitly recognizes that its "methodology does not take into account the potential impact of downstream congestion on intersection operation. Nor does the methodology detect and adjust for the impacts of turn-pocket overflows on through traffic and intersection operation." The HCM2000 procedure is recommended for individual intersections, but it is replaced or supplemented by traffic simulation models when networks of intersections are involved.

The traffic assessments in the FEIS are likely to be optimistic, not only because of the use of an one-intersection-at-a-time traffic analysis method, but also because of the uncertainty of forecasts used in the traffic analysis. It has been established that forecasts from planning models are both uncertain and biased, as demonstrated in page 6.

The City's unqualified dismissal of my traffic analyses (Attachments 1 and 2) as "simplistic" is consistent with the absence of appropriate application of contemporary traffic engineering system management and control in Honolulu. Two prime examples are as follows:

- Honolulu is a great example of sluggish and congestion-causing peak-period traffic signal operations in the nation.
- Honolulu has one of the most underutilized traffic surveillance systems in the world. Only after pressure from other transportation authorities, police, and post 9/11/01 security concerns, the City's Traffic Control Center has started to offer some benefits to motorists.

It comes as no surprise to me that the in-town BRT is being pushed forward despite its large negative impacts to traffic flow. If the multimillion in-town BTR is built, like the multimillion fully-actuated traffic signal system and the multimillion surveillance system, it will continue the City's tradition of providing a poor benefit-to-cost ratio to taxpayers and motorists.

Sincerely yours,

Panos D. Prevedouros, Ph.D.
Associate Professor (Transportation Engineering)

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Council Members, City and County of Honolulu

INTEGRATION

INTEGRATION is a microscopic tool originally developed in 1984. The tool simulates the interaction of freeways and surface streets, traffic assignment, static and dynamic controls, and routings, in an integrated fashion. INTEGRATION represents the movement of individual vehicles in a time-stepping fashion, based on user specified speed-flow relationships for each link and dynamically considers multi-path vehicle routes in response to any traffic congestion that may develop during the course of a simulation run. This is one of the only tools currently in use that has some “intelligent vehicle” capabilities. INTEGRATION has the capability to evaluate weaving sections and arrival and departure of vehicles in toll plaza lanes.

Data requirements include link capacities, link speed-flow relationships, traffic signal timing plans, ramp metering cycle lengths and green times, HOV designation, real-time link surveillance, traffic volumes, origin-destination data, and roadway configuration and geometry. The visual output of the tool is an animation of individual vehicle movements and signal control settings that are superimposed on a graphical representation of the network. This graphical interface permits the user to query the status of individual vehicles or links. A series of statistics on travel time, distance, number of stops, queue sizes, fuel consumption, and vehicle emissions are logged during each run to permit extensive post-processing of selective results. INTEGRATION network outputs include total link travel time, total network travel time, average network speed, average trip length and time per vehicle, and total and average network stops.

The light version of the tool is capable of handling a network with up to 10,000 vehicles, 100 links, 50 nodes, and 10 zones. The standard version of the tool has been used for networks of several thousand links, 500 zones and nearly 500,000 vehicles.

Source: Transportation Research Board, National Research Council, Traffic Analysis Software Tools, Circular E-CO14, Washington, D.C., September 2000.

APPLYING STATE-OF-THE-ART TRAFFIC MODELING TECHNIQUES TO SUPPORT LARGE URBAN FREEWAY RECONSTRUCTION PROGRAM

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Abstract
This paper introduces a procedure to use the advance traffic simulation modeling techniques to support the large-scale urban freeway construction program. **The microsimulation software, INTEGRATION**, along with O-D matrix generation software, QueensOD, and signal timing software, Synchro, were used to study the AM and PM peak hour major traffic impacts during the reconstruction of the I-10 Katy Freeway. A large-scale transportation modeling network with integrated features of freeway and surface street system was constructed. Using the modeling network and O-D matrices based upon the regional travel demand model, the simulation model was calibrated to a known base year. The model was then used to forecast peak traffic conditions for a future year deemed to represent the reconstruction time frame. **Through the use of Dynamic Traffic Assignment and microsimulation of INTEGRATION, the traffic impacts of seven different construction scenarios were studied**.

CONCLUSION AND RECOMMENDATIONS

Through the case study of the traffic impact analysis of I-10 Katy Freeway reconstruction program, it demonstrated that advanced traffic modeling techniques could help solve the complicated traffic impacts of a large-scale freeway reconstruction program. The following conclusion and recommendation are summarized:

1. Large-scale integrated freeway and surface street system can be modeled using traffic simulation software. Using a calibrated traffic simulation model, **traffic simulation can provide system-wide performance measures and identify the bottlenecks**.
2. INTEGRATION has the capability to do the Dynamic Traffic Assignment and simulation together. It also provides a mechanism for linking a regional planning model to the simulation process through the use of planning model O-D demand. This has the advantages of being able to predict the future measures of effectiveness of the modeled networks.

REFERENCES

10. Prevedouros, P.D., H. Li, Comparison of Freeway Simulation with INTEGRATION, KRONOS, and KWAVES, Fourth International Symposium on Highway Capacity, pp 96-107, Maui, Hawaii, 2000.
11. Prevedouros, P.D., Y. Wang, Simulation of a Large Freeway/Arterial Network with CORSIM, INTEGRATION, and WATsim, Transportation Research Record, 1678, pp 197-207, 1999.

Traffic Analysis Tools and Models

Traffic models will help engineers and managers to:

- Evaluate the various ITS strategies and courses of action
- Aid in decision process of alternative evaluation of design and operational improvements
- Decrease cost, time, and disruption to traffic
- Understand/manage traffic by analyzing simple or complex problems and scenario building
- Test new and innovative transportation management systems concepts without the inconvenience of a field experiment.
- Currently, there is a variety of traffic and transportation engineering analysis tools for professionals to use for evaluating and improving congested roadway facilities. The use of these tools or models in the design and evaluation of transportation facilities will result in safer, more efficient, and cost-effective transportation systems.

Numerous traffic models have been developed to simulate traffic (e.g., emulate real-time traffic conditions), **evaluate and determine traffic operations (e.g., provide a detailed analysis of proposed designs and operational improvements),** and optimize signal timings (e.g., develop signal timing plans to improve traffic flow on arterials and networks and reduce unnecessary stops, delay and fuel consumption).

Source: U.S. DOT, Federal Highway Administration, Program Tools for Mitigating Congestion – Traffic Analysis Tools,
http://ops.fhwa.dot.gov/Travel/Traffic_Analysis_Tools/traffic_analysis_tools.htm

In a paper submitted for un upcoming (January 2004) International Transportation Conference, Alon Elgar and Shlomo Bekhor write:

"Since the late 1980's there is a growing awareness to the fact that forecasting procedures used by the planners for the evaluation of new transit (mostly rail) construction projects, are systematically overestimating transit ridership. Pickrell [1] and Flyvbjerg [2] are some of the publications that strongly confronted this issue. They showed that **there was a systematic bias in the forecasting procedures, which tended to exaggerate by tens (and even hundreds of percents) the foreseeable transit riders as a result of introduction of new urban rail systems**, in comparison to actual figures."

1. Pickrell, D.H. A Desire Named Streetcar: Fantasy and Fact in Rail Transit Planning. *Journal of the American Planning Association*, 58(2), 1992, pp. 158-176.
2. Flyvbjerg, B., Bruzelius, N. and W. Rothengatter. *Megaprojects and Risk.* Cambridge University Press, 2003.