Annual Report 2012

TRANSPORTATION RESEARCH BOARD
JOINT TRAFFIC SIMULATION
SUBCOMMITTEE

AHB45 (1)

SimSub

Chairman's Message

George List

This past year has been an active one for the subcommittee. For the third year in a row we held a mid-year meeting – this time on June 19, 2012 in conjunction with the joint meeting of the Traffic Flow Theory Committee and the Highway Capacity and Quality of Service Committee in Fort Lauderdale, FL. In conjunction with the meeting we held a workshop on research needs which was highly productive.

The joint simulation subcommittee continues to play a valuable role within TRB. As you may know, it serves as a forum where people interested in traffic simulation can meet, share recent developments, and explore new ideas related to the theory, implementation, and use of traffic simulation.

Please join the group and participate in our activities. You will find the workshop on Sunday afternoon to be particularly valuable – with a number of researchers talking about what they are doing to advance the ability of simulation models to address safety-related issues.

SimSub Annual Meeting

Monday, January 14, 2013, 7:30-9:30PM Marriott, Washington B3

Agenda

1. Introductions - George List
2. Sponsoring Committee Chair Remarks - attending sponsoring chairs or reps
3. Annual Workshop Report (brief synopsis, future topics) – James Colyar
4. Research Needs and Resources Task Group - Mohammad Hadi
5. Calibration, Verification and Validation Task Group - Ray Benekohal
6. Liaison and Outreach Task Group – Ken Courage
7. Mesoscopic Task Group – Yi-Chang Chiu
8. Safety Simulation Task Group – Alex Stevanovic
9. Agent-Based Simulation Task Group – Monty Abbas
10. FHWA Update
11. 2012 Midyear activities
12. New Task Group(s)
13. Other Items
14. Closing

Sponsor Committees

AHB45:	Traffic Flow Theory
AHB40:	Highway Capacity and Quality of Service
AHB20:	Freeway Operations
AHB25:	Traffic Signal Systems
ADB30:	Transportation Network Modeling
AHB55:	Work Zone Traffic Control
ADC20:	Transportation and Air Quality

Contents

SimSub Web Site

Alex Stevanovic, Webmaster **http://sites.google.com/site/trbcommitteeahb45**

Organization and Activities

Motivation

The decision to create a joint subcommittee was motivated by the recognition that simulation is a problem solving tool and not an institution. A few TRB committees found it hard to ignore their overlapping interest in simulation and decided that the joint subcommittee structure was the best way to address these interests. They all agreed that forming a separate simulation committee was not a good idea.

SimSub addresses the simulation community as a whole. For example, one of our task groups organizes a Sunday afternoon simulation workshop annually at TRB. Workshops generally address a topic of broad interest to developers and users of simulation tools. We also publish a periodic newsletter with information of interest to the simulation community.

Membership:

The subcommittee membership has no numerical limitations but all subcommittee members must be active members of an appointed task group. The list of current task groups appears in the box at the right. Subcommittee members are encouraged to focus their efforts on a single task group.
Those who are interested in the work of the subcommittee but are not task group members will be designated as friends of SimSub.

Expansion of Committee Sponsorship

Recognizing that the interest in traffic simulation extends beyond the boundaries of our existing committee sponsors, we have established a formal but simple procedure for expanding committee sponsorship. There are two requirements for any committee that seeks to become a sponsor:

1. A resolution from the full committee expressing the desire for sponsorship
2. Acceptance by the chairs of all of the existing sponsoring committees

By TRB rules, Subcommittee sponsorship applies only to standing TRB committees (i.e., not subcommittees).

Role of Sponsor Committees

The chair of each sponsor committee appoints one member as a SimSub liaison. The role of the liaison member is as follows:

- Report to SimSub on the current interests and activities of their committee, including suggestions for new SimSub task groups and activities that would have cross cutting components with other sponsor committees.
- Report to their committees on the current activities of SimSub, including task group progress, reports, research problem statements and proposals for new task groups.

Each sponsor committee may nominate papers to be considered for awards by the subcommittee. Normally, these papers will have been submitted to the committee for presentation and/or publication at the annual TRB meeting. Both lectern and poster session papers are eligible. The award categories are identified in the Awards Task Group description. Committees may also make nominations for the Lifetime/ Pioneer Achievement Award.

We fit into the TRB structure as Subcommittee AHB45-1 of the Traffic Flow Theory Committee. We support, instead of competing with, the sponsor committee activities. We don't sponsor paper sessions for that reason

Current Task Groups

- Annual Workshop
- Research Needs and Resources
- Awards:
- Calibration, Validation and Verification
- Liaison and Outreach
- Safety Modeling and Simulation
- Agent-based Simulation

SimSub Activities for 2012

Annual Meeting

The annual SimSub Meeting was held in Washington, DC on Monday January 23, 2012 . The following items were discussed:

- Introductions - George List
- Sponsoring Committee Chair Remarks - attending sponsoring chairs or reps
- Annual Workshop Report (Brief synopsis, future topics) - Doug Gettman
- MULTITUDE project (Methods and tools for supporting the Use caLibration and validaTIon of Traffic simUlation moDEls) - Mark Brackstone
- Research Needs and Resources Task Group - Mohammad Hadi
- Calibration, Verification and Validation Task Group - Ray Benekohal
- Liaison and Outreach Task Group – Ken Courage
- Mesoscopic Task Group – Yi-Chang Chiu
- Safety Simulation Task Group – Doug Gettman
- Agent-Based Simulation Task Group – Monty Abbas
- FHWA Update
- 2011 Midyear activities
- New Task Group(s)
- Other Items
- Summary and Closing

Sunday Workshop

January 13, 2013 1:30PM - 4:30PM

SimSub undertakes the development and presentation of the Simulation Workshop on the Sunday afternoon of each TRB Meeting. Workshops generally address a topic of broad interest to the simulation Community. The annual workshop draws a large attendance and has been the most visible product of the subcommittee. The 2013 Workshop will focus on Analysis, Modeling, and Simulation in Support of Real-Time Operations and Management

Agenda

Introduction
James Colyar & John Halkias

Application of Real-Time Modeling and Decision-Making from Non-Transportation Industries
Brian Fox

ICM San Diego Project
Matthew Juckes & Peter Thompson

Edmonton Yellowhead Trail Project and European Experience
Thomas Bauer

ICM Dallas Project
Khaled Abdelghany & Christopher Poe

TOPL-based Projects/Case Studies
Gabriel Gomez

Real-time Road Weather Modeling Case Studies
Hani S. Mahmassani

New Task Group Formation

New task groups are our most important means of expanding the SimSub activities and interests and attracting new members and TRB committee sponsorship. Anyone can propose a new task group and the person proposing the task group generally becomes the chair of that group.

Proposals for new task groups should be submitted to the subcommittee chair. Each proposal should contain a discussion of the following items:

1. Why is this topic important?
2. What are the unmet needs and how will they be addressed?
3. What is the specific product to be developed by the proposed group?
4. Who are the proposed members? A task group must have at least three members to ensure a broad perspective.

In keeping with TRB goals, each task group should have one young member who will serve as the co-chair.

Individuals wishing to explore the formation of a task group may request time on the agenda of a subcommittee meeting. They may also submit a prospectus for publication in the newsletter to assess the interest among subcommittee members and friends. The SimSub chair may appoint a task group at any time, subject to ratification at a subcommittee meeting.

New task groups are our most important means of expanding the SimSub activities and interests.

Sample Prospectus: Coordination of Input to Wikipedia Article on Traffic Simulation

Note: This sample prospectus has been repeated from last year's Annual Report.

Why is this topic important?
Wikipedia has become a significant and readily accessible source of knowledge on a variety of subjects. It has recently developed a "Traffic Simulation" page that provides information on the nature and application of simulation, the software products that perform simulation and the relationship between simulation and the HCM. These are all topics of vital concern to SimSub. Our members have both the interest and the capability to enhance the accuracy and relevance of the information posted on this site.

What are the unmet needs and how will they be addressed?

There is minimal control over the evolutionary development of Wikipedia sites. Anyone can post their own material. The existing material is essentially accurate, but it is nowhere near complete, especially in terms of reference citations and its organization is in need of improvement. Some links simply go to product developer's websites. Others have notes from Wikipedia indicating the need for improvement. SimSub, through its sponsor committee members, has unique access to broad expert consensus on this subject. We can perform an important service to the transportation engineering profession by enhancing the material posted on this site. A task group should be formed to review, revise and expand the posted material.

What is the specific product to be developed by the proposed group?
The product will be an ongoing enhancement of the Wikipedia "Traffic Simulation" Internet site. New material will be developed for posting. Existing material posted by others will be edited to improve its accuracy, organization and relevance.

Who are the proposed members?
Unknown at this time. We are seeking volunteers for this important task.

Current Wikipedia Article Structure

Theory
- Traffic models
- Systems Planning

Applications in Transportation Engineering
- Roadway/ Ground Transportation
- Rail Transportation
- Maritime and Air Transportation
- Other

Software Programs
- Macroscopic
- Mesoscopic
- Microscopic
- Hybrid

Microsimulation

Comparing simulation results with the US Highway Capacity Manual

References

Sponsor Committee Profile

AHB45: Traffic Flow Theory and Characteristics

http://www.tft.pdx.edu/

Chair
Dr. Robert L. Bertini
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SimSub Liaison
Dr. George F. List
Department Head
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Scope and Mission:

The TRB Committee on Traffic Flow Theory and Characteristics (TFTC) serves as an unbiased focal point for promoting the development and improvement of sound theoretical, experimental and applied foundations of traffic flow phenomena; validation, dissemination and application of traffic flow theories in the planning, design and operation of multimodal transportation systems; and the study of traffic flow characteristics and the application of this knowledge in the planning, design, operation and maintenance of surface transportation systems.

Principal Committee Activities

The 2013 TRB Annual Meeting is coming up—search the interactive program for "AHB45" and you will find that we are sponsoring or co-sponsoring: 7 lectern sessions, 4 poster sessions, a popular Sunday Workshops, one committee meeting, one joint subcommittee meeting, and two doctoral student sessions. Our committee received 172 papers this year, and coordinated 634 reviews.

2012 TFT Midyear Meeting We held a very successful joint summer meeting with the Committee on Highway Capacity and Quality of Service in Fort Lauderdale, FL, June 19-22, 2012. Thanks to Mohammed Hadi for his leadership and to all participants for a fruitful summer event!

ISTTT 20: The 20th International Symposium on Transportation and Traffic Theory will be held at the Grand Hotel Huis ter Duin in Noordwijk, the Netherlands, from July 17-19, 2013. The Symposium is being organized by the Delft University of Technology. We plan a short ancillary committee meeting.

50th Anniversary Symposium/Summer Meeting 2014: We are planning a summer meeting/ symposium to celebrate the 50th anniversary of the traffic flow theory committee! Contact Robert Bertini (bertini@pdx.edu to get involved).

Subcommittees: We sponsor a wide range of subcommittees (in addition to SimSub), please visit our website at www.tft.pdx.edu and get involved!

Web Site: Our website contains a repository of historic traffic flow theory related documents including committee sponsored monographs. Take a look: http://www.tft.pdx.edu/docs.htm.

More Committee News

Please join our Friends email list—we are always looking for volunteers for reviewing papers, staffing subcommittees and launching new initiatives: http://www.tft.pdx.edu/friends.htm

Follow us on Facebook at: www.facebook.com/AHB45

Join the Traffic Flow Webinars Google Group: http://groups.google.com/group/traffic-flow-webinars

Please see the full list of events sponsored by this committee on Page 21

"The Traffic Flow Theory and Characteristics Committee is proud to join with six other TRB committees to advocate for the sound development and application of traffic simulation modeling tools, through our Joint Subcommittee on Traffic Simulation (SimSub). This includes calibration, validation, interpretation and application procedures for traffic models and related tools, as well as guidelines and identification of misuse."

The TFT Committee is pleased to partner with the Georgia Institute of Technology to offer webinars of papers presented at the TRB Annual Meeting. Contact Meead Saberi to volunteer to present or to suggest a topic. You can find 25 archived webinars at http://www.webinars.jltraffic.com/video-archives

Sponsor Committee Profile

AHB40: Highway Capacity and Quality of Service

http://www.ahb40.org

Chair
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SimSub Liaison
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Professor, Civil and Environmental Engineering
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Scope and Mission:

This committee is concerned with relationships among those physical and non-physical factors which are found to affect capacity, traffic flow, comfort, convenience, and safety; measurement techniques for obtaining data for these factors; and acceptable standards of service in terms of measurable characteristics.

Principal Committee Activities

AHB40 acts as the primary overseer for research and enhancement of the Highway Capacity Manual (HCM.) The HCM documents procedures and guidelines for the measurement, analysis, and interpretation of data quantifying highway capacity and quality of service.

Simulation-related Activities

AHB40 maintains an active Subcommittee with the main objective to develop HCM guidance on the application of traffic simulation tools. The Subcommittee has twelve members and over 90 friends.

Final HCM2010 materials on simulation (chapters 6, 7, 24):

Three Chapters of the HCM2010 include materials on simulation and applications in capacity and level of service analyses. Discussions were held at the annual and midyear subcommittee meetings on how to best disseminate and get feedback from the user community on those chapters**.** Also it is important to get feedback from each of the HCM2010 methodology chapters, regarding how they address simulation. Ways to get feedback from the user community are presentations at ITE section meetings, presentations on software developers' user group meetings, the ITE SIMCAP (Simulation and Capacity User Group), webinars, and podium sessions.

ANNUAL MEETING, IN JANUARY 2012 The main topics addressed at the Subcommittee meeting included:

Information on FHWA related activities:
Most of the FHWA related efforts are related to the development and application of tools for evaluation of Active Transportation and Demand Management (ATDM) strategies. Ongoing efforts as part of the Analysis Toolbox include development of a Dynamic Traffic Assignment (DTA) guidebook, training courses, and guidance on simulating Integrated Corridor Management (ICM).

Research Problem Statements
The attendees then discussed HCQS research need statements (RNS). It was emphasized throughout the discussion that close coordination should be sought with the Research Subcommittee and the related subcommittees for each topic.

"The Highway Capacity Committee relies on simulation tools for the development of some of its methods, and thus it is very important for us to work closely with developers and users of these tools."

Traffic Simulation Applications Subcommittee Meeting

Sunday January 13, 2013, 11:00 AM - 12:15 PM – Marriott-Wardman Park, Park Tower Suite 8226

AHB40: Highway Capacity and Quality of Service Simulation Subcommittee Activities

Subcommittee Meeting: January 2012

The subcommittee meeting took place on Sunday January 22, 2012, at the Marriott-Wardman Park hotel. It was very well attended (more than 50 participants).

Discussion/Informational Items

The attendees discussed whether there are applications in which simulation has been used for traffic management center operations. Simulation will be used at the TMC in San Diego as part of the USDOT ICM project. Ed Lieberman also mentioned a project in New York that utilizes such application.

There was a discussion about the existence of tools to model advance management strategies including those developed as part of the SHRP 2 program that combine activity based modeling, DTA, and land use.

An update was given on the European Multitude program on analysis tools. The Multitude program has reviewed literature from around the world regarding the calibration and validation of simulation models.

The University of Florida has developed a CORSIM RTE to model variable speed limits (VSL). It was mentioned that DRCOG in Colorado has been using VSL successfully.

A task group led by Loren Bloomberg was formed to produce a discussion about the modeling of unsignalized intersections in existing tools.

MIDYEAR MEETING 2012

A Subcommittee meeting was held on June 22, 2012 during the joint midyear meeting of the HCQS Committee and the Traffic Flow Theory and Characteristics Committee in Fort Lauderdale, FL.

Discussions were held on possible outreach efforts on guidance for alternative tools. A task group consisting of Bastian Schroder, Mohammed Hadi, Ken Courage and Lee Rodegerdts was formed to look into possibilities.

Ken Courage made a presentation on developing an Analysis Modeling and Simulation Manual including rationale, structure and content. This will be discussed in the next Subcommittee meeting.

The subcommittee website is
http://sites.kittelson.com/hcqs-sim

Sponsor Committee Profile

AHB20: Freeway Operations

http://www.trb-freewayops.org

Chair
Dr. Jon T. Obenberger
Pre-Construction Group
Team Leader, FHWA
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SimSub Liaison
Dr. Panos D. Prevedouros
Professor
University of Hawaii
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Scope and Mission:

The mission of the committee is to provide leadership and serve as the TRB focal point in promoting, implementing, operating and maintaining traffic management systems and strategies including Intelligent Transportation Systems, to enhance the efficiency, safety and environmental conditions on freeways and in freeway corridors, as well as other limited-access facilities and interfaces with other transportation facilities.

Principal Committee Activities

The Committee's activities specifically include promoting research in traffic management and the application of promising results to operational systems; and fostering the cooperation, coordination, and information dissemination, between individuals and groups active in freeway traffic management and advanced technologies.

The Committee is the sponsor of the TRB Joint Subcommittee on Active Traffic Management which is sharing information, tracking active traffic management developments in operation and development, and supporting the sponsoring standing committees in identifying and championing research and outreach efforts related to active traffic management. The Committee is also actively involved in supporting the Federal Highway Administration in a significant update to the Freeway Management and Operations Handbook which is expected to be completed in 2014. The Committee continues to work with other TRB Committee's to advance proposed research and implement priorities identified in the 2006 International Scan titled "Active Traffic Management: The Next Step in Congestion Management" and the 2010 International Scan titled "Freeway Geometric Design for Active Traffic Management in Europe". Actively Managed Lanes will be the theme of the 2013 joint mid-year meeting of the TRB Managed Lanes Committee, Freeway Operations Committee, and TRB Joint Subcommittee Meeting which will occur in June of 2012 in Atlanta, Georgia. Integrated Corridor Traffic Management will be the theme of the 2014 mid-year meeting which will focus on the initial results, lessons learned and research that may be needed based on the results of the FHWA sponsored operational tests State DOTs and their partners have been conducting in the United States.

The committee has a major interest in freeway and corridor simulation with an emphasis on real world simulation applications. In 2004, the committee approved the formation of the AHB20 (2) subcommittee on Freeway Operation Simulation to serve as a link between freeway, corridor and urban simulation model developers on one hand, and promoters, users and researches of simulation on the other hand with a focus on challenges and best practices in real world simulation applications. A major objective of the subcommittee is to monitor and present state-of-the art developments in simulation model improvements and new entrants, in simulation of ITS, tolling and pricing schemes, real time traffic control operation Trends in usage of simulation models Trends in scope and methodologies of simulation modelsHB20(2) has a roster of about 70 friends, meets regularly at TRB's annual and midyear committee meetings, participates in research statements, research circular chapter preparation, and organizes sessions in AHB20-sponsored conferences.

> " Simulation is a vital tool for assessing operational improvements to freeways and freeway corridors. As budgets shrink for capacity expansion, extracting the maximum throughput from existing facilities becomes paramount. Traffic systems simulation is an essential decision making assistant in sifting through alternative improvements."

Sponsor Committee Profile

AHB25: Traffic Signal Systems
http://www.signalsystems.org

Chair
Peter Koonce
Manager, Signals and Street Lighting Division, Portland Bureau of Transportation peter.koonce@portlandoregon.gov

SimSub Liaison
Dr. Byungkyu (Brian) Park
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University of Virginia
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Scope and Mission:

This committee is concerned with provision of the safe and efficient movement of people and goods on surface streets through the use of traffic management systems. The scope includes system design, implementation, operations, and maintenance; development of traffic operations centers; development of traffic management strategies; integration and operational evaluation of surface street systems with freeway, traveler information, and transit systems; and incorporation of surface street systems into Intelligent Transportation Systems (ITS).

Principal Committee Activities

The Simulation Subcommittee was established in 2005, and hosted its first subcommittee meeting in Las Vegas in July, 2005. Since then, the subcommittee has hosted both regular meetings twice a year (i.e., one at the summer meeting and the other at the TRB annual meeting).

The main objective of the subcommittee activities is to identify and share the best practices and state of the arts simulation modeling methods and techniques relevant to traffic signal control and operations.
Throughout the years, the subcommittee had discussions on the following areas – hardware in the loop simulation, software in the loop simulation, connected vehicle technology (previously known as IntelliDrive or vehicle infrastructure integration), simulation model calibration and validation best practices, wireless communications simulators, etc.

Simulation-related Activities

At the 2012 January Traffic Signal Systems Simulation Subcommittee meeting, the following presentations were made:

Dr. Steve Shelby from Econolite presented Centracs Adaptive – Simulation and Real-World Results. In his presentation, he discussed the adaptive signal control's benefits based on the simulation results as well as field evaluations. Past studies demonstrated that adaptive controls showed sizable benefits from simulation studies, while often worse than well-configured time-of-day based timing plans. He concluded his presentation that the Centrasc Adpative control did not do any harm in real field evaluations, indicating that future enhancements would achieve more reliable benefits over the well-configured time-of-day based timing plans. His presentation can be downloaded from https://www.dropbox.com/s/6wv9crwcnmd90ia/2012%20TRB%20-%20Simulating%20Adaptive%20Systems%20-%202012-01-23.pptx.

The Traffic Signal Systems simulation subcommittee will continue to support and participate in the joint simulation subcommittee activities. The TSSC is interested in presenting the simulation related best practices and operations of traffic signal system for the transportation systems operations and management. These include issues related to simulation model calibration and validation, the use of hardware and/or software in the loop simulation, and connected vehicle technology. In particular, the subcommittee is interested in presenting wireless communications simulators and their calibration/validation issues into connected vehicle technology applications.

Dr. Joyoung Lee and Mr. Peng Su from University of Virginia made a presentation on "Calibration of Wireless Communications Simulator at an Intersection." Their presentation utilized real world communications data obtained from the living laboratory intersection at the Saxton Transportation Laboratory of the Turner Fairbank Highway Research Center. The NCTUns wireless communications simulator was calibrated against field observed packet drop rates. Their presentation demonstrated that the calibration is needed to properly model wireless communications at the intersection level. Their presentation can be downloaded from https://www.dropbox.com/s/6wv9crwcnmd90ia/2012%20TRB%20-%20Simulating%20Adaptive%20Systems%20-%202012-01-23.pptx

Mr. Kel Ova from PTV America presented Advancing Software-in-the-Loop Traffic Signal Controllers. In his presentation, he discussed various software in the loop simulations available from PTV America RBC SIL, fourth dimension D4, Econolite ASC/3, and McCain 2033. His presentation can be downloaded from: https://www.dropbox.com/s/jgg7po6plqefh1r/Advancing%20Software%20In%20the%20Loop%20Traffic%20Signal%20Controllers.pptx

At the most recent meeting on Monday, July 23, 2012 in Beckman Center Irvine, CA, the subcommittee had discussed the Hardware/ Software in the Loop Application Programming Interface Draft Standard. Special thanks to Dr. Thomas "Tom" Rioux, President of the Rioux Engineering. He became the head of the task group called the Hardware/Software in the Loop API.

The upcoming 2013 January Traffic signal systems Simulation subcommittee meeting will be held at 8 am on Monday, January 14, 2013 at the Marriott Truman Room with the following agenda:

- Opening Remarks & Self-introductions
- Update on Hardware and Software in the Loop Application Programming Interface, Tom Rioux

Invited Presentations

- Adaptive Signal Control Simulation using PTV VISSIM by Kiel OVa (PTV America)
- Simulating Transit Signal Priority through Various Software in the Loop Simulation Platforms by Milan Zlatkovic (University of Utah) and Alex Stevanovic (Florid Atlantic University)
- Discussion on simulating transit signal priority, adaptive signal control systems, and any simulations related to traffic signal systems
- Adjourn

TSSC Simulation Subcommittee meeting,: Washington DC, January 2012

Sponsor Committee Profile

AHB55: Work Zone Traffic Control

http://sites.google.com/site/trbcommitteeahb55

Chair
Dr. Gerald L. Ullman
Senior Research Engineer
Texas Transportation Institute (TTI)
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Scope and Mission

This committee is concerned with optimizing traffic flow and with minimizing hazards to work crews and road users, including pedestrians, in a cost-effective manner during maintenance, construction, and utility operations on streets and highways. These concerns include improved methods, procedures, materials, equipment, devices, and systems applicable to traffic control in work zones. They extend to the planning, design, installation, operation, maintenance, and removal of such traffic control zones.

Principal Committee Activities

In addition to the review and sponsorship of presentation and publication of papers submitted to TRB on the topic of work zone traffic control, the committee regularly organizes and sponsors conference sessions during the annual meeting on topics of high interest to the committee and to the profession.

The committee does not typically hold a mid-year meeting, but does look for opportunities to jointly meet with other committees during their mid-year meetings when a topic of mutual interest can be identified. The committee also works with the National Work Zone Safety Information Clearinghouse to identify webinar topics and secure presenters to perform those webinars.

The committee holds a best-paper competition each year of the papers it receives, the winner of which is recognized the following meeting and the paper is forwarded for further award consideration by TRB.

In 2012, the Grant D. Mickle Award winner was a paper sponsored by AHB55 that utilized traffic simulation analyses to assess the effectiveness of a forced detour strategy at a freeway work zone (Gallo, A.A., L.E. Dougald, and M.J. Demetsky. Effectiveness of a Control Strategy for Forced-Detour Traffic in Continuous Lane Closure Within a Rural Work Zone. In *TRR2272*, 2012, pp. 19-26)

Simulation-related Activities

During the Annual Meeting of the committee, creating a sub-committee on Work Zone Traffic Simulation was discussed and approved. There was enthusiastic support and interest among the members and friends of the committee to participate in the sub-committee activities. The sub-committee is exploring pertinent issues and means of offering assistance to the simulation community.

Members and friends of the Work Zone Traffic Control committee have been using traffic simulation for work zone analyses for many years. However, since the committee is a relative newcomer to SimSub, traffic simulation committee activities to date have been limited to the review and sponsorship of papers on the topic at each year's TRB annual meeting.

SimSub Liaison
Dr. Rahim F. Benekohal
Professor of Civil and Environmental Engineering
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The formal co-sponsorship of SimSub by the Work Zone Traffic Control Committee offers new opportunities for us to elevate the visibility of the many challenges pertaining to work zone simulation. We look forward to finding new ways to collaborate with members of other co-sponsoring committees in improving the state-of-the-art and state-of-the-practice in this area.

It should be noted that the FHWA Work Zone Safety and Mobility rule (23 CFR 630 Subpart J) has increased the prominence and importance of simulation as a means of properly planning for traffic impacts caused by all types of roadwork activities. This has translated to an increase in research on various work zone traffic simulation issues (methods of calibration and validation, appropriate representation of various work zone operational strategies, computation of effects of work zones on nearby routes, etc.), and methods of resolving those issues. It is hoped that the committee's involvement in SimSub will further promote high-quality research in this area.

In 2013, the committee is sponsoring 1 podium session and 2 poster sessions of papers that include several pertaining to traffic simulation evaluations:
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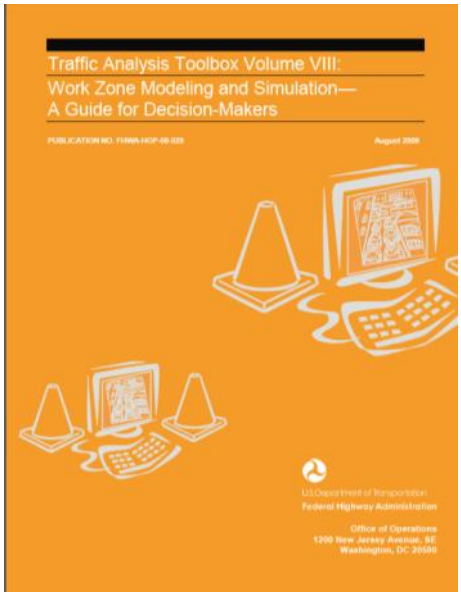
- • *Session 339, Modeling Work Zone Safety and Operations (Poster)*
- • *Session 400,* Driver and Worker Behavior in Work Zones (Poster)
- Session 579, Work Zone Intelligent Transportation Systems: Where Are We Now?
- Session 625, Recent Work Zone Safety and Mobility Research

All sessions will occur in the Marriott.



Traffic Analysis Tools Volume VIII: Work Zone Analysis A Guide for Decision-Makers

This document is intended to provide guidance to decision-makers at agencies and jurisdictions considering the role of analytical tools in work zone planning and management. It is often unclear what kind of analytical approach may be of most value, particularly in light of complex data requirements and staff training.

The decision to create an analytical capability to support decision making can be a significant investment, and deserves careful consideration. In the end, work zone analysis should never be used to make key decisions but instead developed as a trusted resource for understanding the potential mobility impacts and using this information to inform key decisions.

Sponsor Committee Profile

ADB30: Transportation Network Modeling

http://www.nextrans.org/ADB30

Chair
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SimSub Liaison
Dr. Henry X. Liu
Assistant Professor
University of Minnesota

Scope and Mission:

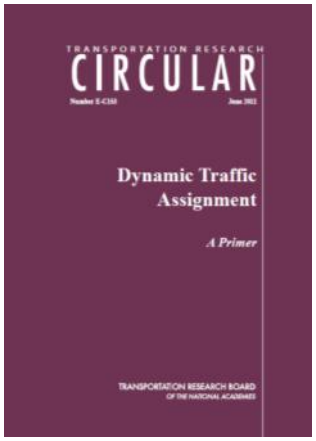
The committee will promote research and information exchange in transportation network modeling, an interdisciplinary field spanning Computer Science, Logistics, Mathematics, Operations Research, Telecommunications, and Transportation Science. The committee will also focus on: the understanding and modeling of the technological and behavioral factors affecting the performance of transportation systems; modeling the interactions between the infrastructure and transportation networks; and the development and use of models to evaluate the quantity and quality of transportation facilities and services. The committee will serve as a focus for the development, adaptation, and implementation of quantitative and computer-based methodologies for the above purposes. The committee will cut across traditional modal boundaries, seeking unifying conceptual and methodological frameworks, yet highlighting modal differences. As such, it will foster effective and rapid sharing of information and experiences among researchers, practitioners, regulators and decision makers.

Principal Committee Activities

The most important activity of the committee is to review and select high-quality papers for presentation at the annual conferences of TRB and publication in the Transportation Research Record. Not only the ADB30 committee has been recognized as one of the most selective committees of TRB for scientific excellence, the committee has also been commended by TRB for reviewing more than 150 papers annually in the last two years. . It is the winner of the 2013 TRB Blue Ribbon Committee Award for "Contributing to TRB and the Transportation Community." The committee has also taken a leading role for organizing the seminar on Doctoral Student Research in Transportation Modeling at the annual TRB conferences.

Simulation-related Activities

The committee has developed a dynamic traffic assignment (DTA) primer that is officially published by TRB in June 2011. The DTA primer can be downloaded from our website: http://onlinepubs.trb.org/onlinepubs/circulars/ec153.pdf. The main goal of this document is not to set the standards for DTA, but to present and depict the concept of DTA as defined by literature, to discuss general modeling issues and to present, with respect to adoption of DTA, decision-making considerations for both novice and experienced transportation modeling practitioners.



The committee has a special interest in all aspects of simulation techniques because simulation is arguably the most important modeling tool for transportation networks. Our committee is proud to be one of the sponsoring committees for SimSub, which serves as a focal point for simulation modeling and application activities at TRB.

Sponsor Committee Profile

ADC20: Transportation and Air Quality

http://trbairquality.org/

Chair
Dr. Jie (Jane) Lin
Associate Professor
University of Illinois, Chicago
janelin@uic.edu

SimSub Liaison
Dr. Yi-Chang Chiu
Associate Professor
Department of Civil Engineering and Engineering Mechanics
The University of Arizona

chiu@email.arizona.edu

Scope and Mission:

To examine the full range of relationships between transportation and air quality including regulatory and policy considerations, modeling practices, health effects, new technologies and transportation management strategies.

Principal Committee Activities

Among its many activities, the ADC20 identifies, stimulates and disseminates important research related to transportation and air quality. Our scope is to examine the full range of relationships between transportation and air quality including regulatory and policy considerations, modeling practices, health effects, new technologies and transportation management strategies

- Provides for a mutual exchange of information among committee and task force members
- Identifies research needs
- Stimulates needed research
- Advises on research priorities and procedures
- Evaluates and interprets research findings
- Reviews papers for presentation at TRB meetings and for publication
- Encourages the adoption of appropriate research findings into practice
- Arranges special programs, conferences, and workshops.

Simulation-related Activities

On Sunday January 13, 2013, ADC20 is co-hosting a half-day workshop titled "Assessing the future of Freight: Energy and Environmental Modeling in the Freight Sector". The freight sector is a fast growing part of transportation energy use and emissions, and new models are required to quantify, assess, and mitigate these impacts. In particular, this workshop will focus on new analytical tools, models, and applications related to goods movement, energy use, and the environment, infrastructure, fuels, technology, operations, logistics, and demand. Such tools and models may include simulation based approaches to goods movement. The outputs of those models produce the travel activities necessary for the energy and air quality models. In addition, the workshop will identify where models fall short with respect to critical modeling needs.

In Summer 2013, ADC is hosting the Conference on Transportation, Land Use Planning, and Air Quality again. This year's theme is on "Developing Healthy and Livable Communities". Paper solicitation is due on February 8th, 2013. The focus of the papers should be related to innovative research and strategies leading to the integration of transportation planning, land use and air quality.

It is part of the scope and mission of ADC20 in modeling and analysis of transportation system planning and operations related to air quality impact.

The committee has recognized that simulation of traffic movement has become increasingly important as a tool for the analysis of transportation system operations.

Therefore it is the committee's interest in becoming a co-sponsor of SimSub and building the bridge between the two.

For more information about the ADC20 activities and news, please visit http://trbairquality.org/

Task Group Reports

Research Needs and Resources
(Mohammed Hadi)

In the period, we participated in the TRB Back to the Basic initiative activities through the Traffic Flow Theory and Quality of Service Committee representation in these activities. The goal of this Back to the Basic initiative is to provide the TRB standing committees with the knowledge and tools to 1) identify research needs within their scope of coverage, 2) increase the probability that research addressing these needs will be conducted, and 3) disseminate information on relevant ongoing and completed research in a timely and effective manner. This initiative will be very useful in providing information and resources that support the Research Needs and Resource Task Group activities.

During the joint summer meeting of the TRB HCQS and TFT committees in Fort Lauderdale in June 2012, a research workshop of the TFT committee and SimSub was conducted to discuss methods to identify research needs; to increase the probability that the needed research will be conducted; and to enhance the sharing of information on needed, on-going, and completed research projects. The program of the workshop included panelists' discussion and an open discussion. Research issues and next steps were identified in the workshop.

This task group provides support to research in the area of surface transportation system simulation and to facilitate the use of the results from this research to advance the state-of-the-art and state-of-the-practice in transportation system simulation modeling.

Calibration, Validation and Verification (Ray Benekohal)

CVV Task Group, met during the TRB meeting and discussed the future activities and possibility of 2nd webinar on calibration and validation.

During the annual meeting of CVV, a representative from the MULTITUDE project presented ongoing work on developing guidelines for calibration, verification and validation in MULTITUDE project. He also discussed technical issues and preliminary finding from the survey conducted.

Some members of the CVV reviewed the draft copy of Guidance on the Level of Effort Required to Conduct Traffic Analysis Using Microsimulation and provided feedback.
Some members of CVV participated in the questionnaire distributed by the Multitude project.

CVV will meet on Monday night immediately after SimSub meeting end (around 9:30)

The objective of this task group is to enhance the understanding of the role of and effects of calibration, verification and validation in simulation.

Liaison and Outreach
Ken Courage

This Annual Report is the principal product of the Liaison and Outreach Task Group. I appreciate the support of all who contributed to the content.

Other task group activities included maintenance of the "organization and activities" document presented on Page 2, and coordinating the expansion of committee sponsorship to include additional TRB committees with an interest in traffic simulation. Discussions were held with The Pedestrian Committee (ANF10) after their interest in simulation was noted. ANF10 has formed their own simulation subcommittee , which will meet this year at TRB

2012 is my last year as the Chair of this task group. I thank everyone for their support and cooperation and wish the Subcommittee every success in its future undertakings.

.The scope of this task group includes maintenance of a document describing SimSub organization and activities, publication of a periodic newsletter and pursuing additional TRB Committee sponsorship.

Task Group Reports

Safety Modeling and Simulation

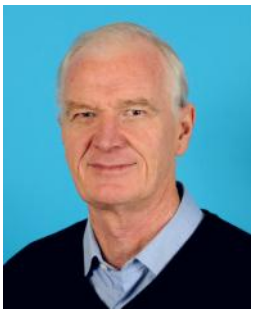
During the TRB annual meeting in January 2011, there was extensive discussion of how simulation models can be modified and used to support the prediction of the safety performance of a modeled. It was concluded that there is need to form a task force of SimSub to explore this topic further. The *Safety Modeling and Simulation* Task Force was formed in January 2011 for this purpose. In 2011, the group organized a very successful workshop on the use of simulation to assess safety performance.

The workshop was presented at the TRB meeting in January 2012, with presentations on the following topics

- A Profiling Based Approach to Safety Surrogate Data Collection
- Calibration of Micro-Simulation Models to Account for Safety and Operation Factors for Traffic Conflict Risk Analysis
- A Practical Approach to Modeling Crash Occurrence with Micro-simulation
- Surrogate Safety Assessment Module (SSAM) and its Use
- Simulating Crashes and Creating SSAM Files with TEXAS
- Stochastic Acceleration Choice and Changes in Model Parameters linked to Road Geometric Features
- Simulating Crashes for Evaluating Network-level Impact of Safety Enhancement Strategies: A Fast Dynamic Traffic Assignment Approach

This group became inactive in 2012 with the resignation of its chairman, Doug Gettman, whose professional responsibilities took him to other areas. The Subcommittee thanks Doug for his efforts in launching this task group and making it a visible contributor to the simulation community.

Since simulation of safety is an idea that is gaining momentum and we see more and more research papers in this field, we feel that we should not discontinue this group but find a leader who would continue the activities initiated by Doug. With this in mind, we have appointed Prof. William Young of Monash University in Victoria, Australia to lead the group. Prof. Young has extensive experience in this area, and has authored some of the best reports and papers in this field. We feel that he is the best candidates for this role and we welcome him onboard.



Professor William Young
Chairman designate

.Mission: To provide a clearinghouse for research and development topics related to the modeling of traffic safety with simulation systems.

Scope: To generate research problem statements; coordinate workshops and synthesis of state-of-the-practice.

Road Safety and Simulation - International Conference

October 22-25, 2013
Rome, Italy

RSS 2013

More details on Page 24

Simulation Related Events in 2012

Here is a summary of some of the group's activities in 2012:

Throughout the Year - **SimCap-NC Technical Task Forces throughout North Carolina** – The North Carolina Section of SimCap currently has three active task forces: (1) *Queuing and Saturation Flow Task Force*: This Task Force evaluates local traffic flow conditions, and travel behaviors to develop traffic model parameters customized to North Carolina studies; (2) *Roundabout Calibration Task Force*: The purpose of the calibration research is to provide recommended calibration parameters for software packages to be used by practitioners/analysts for increased accuracy in evaluating roundabouts in North Carolina; and (3) *Traffic Analysis Tools Task Force*: This Task Force is intended to provide a peer-to-peer exchange on various traffic analysis tools with the goal of promoting understanding and tool selection for application in North Carolina. For more information on the NCSITE SimCap Task Forces, please contact Bastian Schroeder at Bastian_Schroeder@ncsu.edu.

February 2012 – **ITE Toronto Section Model Calibration; A Practitioner's Perspective, Toronto, Canada** – ITE Toronto Section hosted a 'SimCap' (Simulation and Capacity Analysis) breakfast seminar on the challenges of calibrating capacity analysis software at MMM Group's Thornhill office on Wednesday February 29, 2012. Five panelists from the public and private sector were invited to speak about their experiences using capacity analysis models such as Synchro and the Canadian Capacity Guide. The panelists included: Luigi Nicolucci – The City of Toronto, Pierre Vandall – The City of Toronto, Vi Bui – York Region, Nixon Chan – MMM Group, and Matthew Davis – IBI Group. The discussion centered around the methods of calibrating capacity analysis models and the need for calibration in general. Matthew Davis of IBI Group capped off the discussion with a brief presentation on model calibration gained from his experience working with the FHWA in the United States.

August 2012 - **Traffic Study of the Future Workshop in Atlanta, GA** – In conjunction with the ITE Annual Meeting in Altanta, SimCap and the ITE Traffic Engineering Council were proud to sponsor a panelist-led workshop and discussion on the 'Traffic Study of the Future'. This workshop focused on new and emerging trends in traffic analysis and simulation. This workshop was held on Monday, August 13, 2012 at the ITE Annual Meeting in Atlanta. The panelists included John Albeck of Albeck and Associates, Inc., Jim Dunlop of the North Carolina Department of Transportation, Jim Sturrock of the FHWA Resource Center, and Michael Hunter of Georgia Tech. For more information on the takeaways and discussion items, please contact Dave Petrucci at dpetrucci@borton-lawson.com.

(Continued on next page)

What is SimCap

The Simulation and Capacity Analysis User Group (**SimCap**) is an international, volunteer user group and committee of the Institute of Transportation Engineer's (ITE) Traffic Engineering Council. Throughout the United States and Canada, many ITE Sections and Districts have organized local **SimCap** user groups who are actively engaging the profession on a wide-range of topics in the arena of simulation and capacity analysis work. Traffic engineering studies are confronted with several new and emerging tools, including but not only the 2010 Highway Capacity Manual, but also innumerous changes and enhancements in the world of commercial microsimulation software. **SimCap** groups are busy throughout the continental United States and Canada, helping to connect practitioners with the latest guidance and best practices.

Simulation Related Events in 2012

(Continued)

August 2012 – **SimCap-NC: NCSITE Technical Retreat in Asheboro, NC** – The North Carolina Section of SimCap co-sponsored the inaugural Technical Retreat for the North Carolina Section of ITE (NCSITE). The two-day event was held at the scenic Caraway Conference Center outside of Asheboro, NC was geared at entry-level to mid-level transportation professionals, and provided a series of hands-on training modules, as well as team building activities. Technical presentations included "Altered States: Decision-Making and Transportation", "Land Use and Transportation Planning", "Selecting Alternative Intersections and Interchanges", "Isolated Traffic Signal Design", "Intelligent Transportation Systems", "Corridor Signal Timing", and "Hands-On Traffic Signal Equipment". For more information on the NCSITE Technical Retreat, please contact Bastian Schroeder at Bastian_Schroeder@ncsu.edu.

December 2012 – **Multimodal Analysis Session at the Penn State Transportation Engineering and Safety Conference in State College, PA** - On December 6, 2012, SimCap was proud to sponsor a local session on the multimodal analysis research, data requirements, and methodologies of the 2010 Highway Capacity Manual. This session feature three presenters who discussed the research behind development of the methods now in the 2010HCM, project examples and data requirements, and related local policy changes developed by the Pennsylvania Department of Transportation. For more information on the takeaways and discussion items, please contact Dave Petrucci at dpetrucci@borton-lawson.com.

Upcoming in Spring 2013 – **SimCap State of the Practice Survey, Nationwide** - SimCap and the ITE Traffic Engineering Council, with support from SimSub and other TRB committees, will be releasing a survey on the selection and use of simulation and capacity analysis tools and methods. With continued acceptance, agency guidance, and use of new tools and methods, practitioners desire to understand the current state of the practice. This activity is in part a follow up to previously-completed surveys by various ITE sections and groups throughout the country, and the recent Traffic Study of the Future Workshop in Atlanta, GA.

SimCap develops and shares guidance and best practices in the application of various simulation and capacity analysis methodologies and tools. **SimCap** provides a resource for transportation professionals, both government agency and private consultants, to advance the state of the practice. Using several communication tools such as web-based forums, regional workshops, and user group meetings, we anticipate transportation professionals and software users will be able to share experiences, provide lessons learned, ask questions and work together toward that common goal.

For additional information and involvement, please contact

- **SimCap Founder Matt Davis: matthew.davis@ibigroup.com,**
- **Co-Chair Orla Pease: ohpease@urbanengineers.com,**
- **Co-Chair Dave Petrucci: dpetrucci@borton-lawson.com.**

Simulation Related Events in 2012

This joint meeting presented a significant opportunity for transportation researchers and practitioners to interact and identify research findings that would benefit the existing highway capacity analysis procedures; to formulate goals for updating the United States Highway Capacity Manual; and to identify research needs related to traffic flow and highway capacity analysis.

The program included the following segments:

- Workshop on predictive traffic flow methodologies for ATDM Workshop
- TFT and SimSub meetings
- Workshop on Research Needs. Two concurrent HCQS Workshops
- Joint TFT/HCQS workshop discussion
- Plenary sessions and technical presentations
- HCQS subcommittee meetings
- Full HCQS committee meeting

Joint Meeting of the Transportation Research Board Highway Capacity and Quality of Service (AHB40) and Traffic Flow Theory and Characteristics (AHB45) Committees
Fort Lauderdale, FL, June 19-22 2012

Simulation Related Events in 2012

MULTITUDE Project Enters its last year

Submitted by Mark Brackstone

The MULTITUDE project (Methods and tools for supporting the Use, caLibration and validaTIon of Traffic simUlations moDEls, www.multitude-project.eu), being undertaken in Europe, has now entered its last year and is set to culminate with a range of outreach activities and documents, in addition to finalising technical work on a number of issues which include:

- Continuing work on the Sensitivity analysis of three simulation models (AIMSUN, VISSIM, MITSIM), a mesoscopic model (AIMSUN), and several car-following models on a range of simulation scenarios (City of Zurich, A44 motorway in Portugal and 5 simple toy networks). Sensitivity analysis is being performed on both the model parameters and the traffic demand, and applied using different techniques (variance based, elementary effects and metamodel based). The intention is to complete the exploration of models' behaviour, and to identify parameters requiring calibration in different simulation conditions (Contacts: biagio.ciuffo@ext.jrc.ec.europa.eu, vincenzo.punzo@jrc.ec.europa.eu).

- Working on the identification of conceptual and methodological principles for the calibration and validation of traffic simulation models (jaume.barcelo@upc.edu) as well as dealing with the uncertainty management in traffic/ transportation applications (Christine.BUISSON@entpe.fr, vincenzo.punzo@jrc.ec.europa.eu).

- Performing a Benchmarking of OD estimation and prediction algorithms (Costas Antoniou, Antoniou@central.ntua.gr), where a common framework has being developed, so that a number of algorithms can be implemented and tested under the same conditions. The framework uses the AIMSUN traffic simulator for the function evaluation/assignment. Tests include extended Kalman filter variants (in which case the problem is formulated as a state-space model) and direct optimization algorithms (in which case the problem is formulated as a standard optimization problem).

The project is also set to produce two documents during the summer. The first of these is a '**Simulation Primer**' intended to cover the core topics of simulation and focus on issues that, in earlier surveys, were found to be poorly understood by practitioners. The second, will be a '**Case for Calibration and Validation Guidelines**', which will review existing documents and undertake a gap analysis of the area, and, based on the findings of a web survey performed in 2012, propose a road map for developments in the area. Findings of this web survey will be available on the project website after TRB (mark.brackstone@iomi.eu, peter.vortisch@kit.edu).

In order to disseminate these findings, the project will be conducting three activities. The first of these, will be a training school on ITS joint with the NEARCTIS project to be held in Berlin in April. The second, will be a training school dedicated to simulation and focussing in part on the 'Simulation Primer', to be held on the Island of Chios in Greece in September (Costas Antoniou, Antoniou@central.ntua.gr) together with the University of the Aegean. The school will provide training on methods and tools for the calibration and validation of traffic simulation models, including sensitivity analysis and uncertainty management. Lastly, the project will conclude with a final conference in Naples, Italy, in December 2013 (vincenzo.punzo@unina.it; see the project website for more information: www.multitude-project.eu).

MULTITUDE
Methods and tools for supporting the Use caLibration and validaTIon of Traffic simUlation moDEls

cost
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

Future Simulation Events

AHB45 Events at the 2013 Annual TRB Meeting

Submitted by Robert Bertini
Chair, TRB Committee on Traffic Flow Theory and Characteristics

Happy new year and I hope you had a restful and enjoyable holiday season. 2013 represents the 50th anniversary of our committee, and we begin the year with the TRB Annual Meeting with a wide array of activities. We hope you will join us! Here is a summary of the high points (for details, please use the TRB interactive program and enter "AHB45" to find our events):

Committee Meeting: all members and friends are welcome at our committee business meeting, Tuesday, January 15, 2013 1:30 - 5:30PM Marriott, Wilson B & C.

SimSub Meeting: please support the efforts of the Joint Subcommittee on Simulation by participating in our meeting on Monday, January 14, 2013 7:30 - 9:30PM Marriott, Washington B3

Sunday Workshop: we have a wonderful workshop lined up--*Workshop 149 Analysis, Modeling, and Simulation in Support of Real-Time Operations and Management*, Sunday 1:30 - 4:30PM at the Marriott. Get there early since there is always a big crowd for this popular workshop.

Doctoral Student Workshops: we are co-sponsoring two doctoral student workshops
- 103 *Transportation Operations and Traffic Control* on Sunday 9:00AM - 12:00PM at the Marriott,
- 181 *Transportation Modeling* on Sunday 1:30 - 5:30PM at the Hilton

Lectern Sessions:
- 213 Urban Networks Monday 8:00 - 9:45 AM at the Marriott
- 666 Car Following Tuesday 7:30 - 9:30 PM at the Marriott
- 828 Simulation and Calibration Thursday 8:00 - 9:45 AM at the Marriott
- 841 Macroscopic Models and Freeway Networks Thursday 10:15 AM - 12:00 PM at the Marriott

Special Lectern Sessions:
- 769 Calibration of Traffic Simulation Models (top papers from our special call for papers), Wednesday 2:30 - 4:00 PM, Marriott
- 807 Operation of Buses on Highways or Exclusive Lanes (top papers from special call for papers), Wednesday 4:30 - 6:00 PM, Marriott

Poster Sessions:
- 497 Traffic Flow Theory and Characteristics Part 1, Tuesday 8:30 - 10:15 AM Marriott
- 726 Traffic Flow Theory and Characteristics Part 2, Wednesday 8:30 - 10:15 AM Marriott

Special Poster Sessions:
- 398 Calibration of Traffic Models (response to special call for papers), Monday 4:15 - 6:00 PM, Marriott.
- 404: Innovations in Traffic Flow Theory and Characteristics, and Highway Capacity and Quality of Service (papers from Summer Meeting in Fort Lauderdale), Monday 4:15 - 6:00 PM, Marriott.
- We are co-sponsoring a session on Transport Data Program Development: International Best Practices, Wednesday 2:30-4:00 PM at the Hilton.

Don't forget to visit our website **http://www.tft.pdx.edu** and "Like" us on Facebook: **https://www.facebook.com/AHB45/likes**

Special thanks to all paper reviews, call-for-papers organizers, paper review coordinators, subcommittee chairs, members and friends for the incredible job in putting this meeting together - I look forward to seeing you in Washington, and in the meantime, safe travels and best wishes,

Future Simulation Events

Conference on Agent-Based Modeling in Transportation Planning and Operations
September 30-October 2, 2013
The Inn at Virginia Tech and Skelton Center

Conference Website: http://www.cpe.vt.edu/abmconf/index.html

-Call for Abstracts-

The Conference on Agent-Based Modeling in Transportation Planning and Operations provides an international forum on the latest technical developments and research in the field of transportation planning and operations using agent-based approaches. Researchers, academicians, practitioners, and industry and government agencies are invited to this conference to discuss their research and applications pertaining to agent-based modeling in transportation planning and operations. The conference is supported by the Mid-Atlantic University Transportation Center Program and by Virginia Tech.

The conference has the following objectives:

- Present the current state of the art/science in agent-based modeling in transportation.
- Provide the lessons learned from the current research efforts in this field.
- Define where the future lies in this type of modeling effort and what steps and research agendas need to be taken to ensure its success.

Submission Guidelines, Important dates, and Registration

The submitted abstracts should be between 1,000 words and 2,500 words in length. Authors should submit their contributions electronically in PDF format at: http://www.manager.cpe.vt.edu/conferenceDisplay.py?confId=5

The important dates for submission are:

- Abstract submission: March 8, 2013
- Notification of acceptance: May 24, 2013
- Final revised submission: August 2, 2013

Topics of interest in agent-based modeling include but are not limited to:

- Developing the daily activities of travelers
- Spatial markets simulations (housing, demographics, firm-graphics)
- Routing of travelers in a dynamic traffic simulation
- Large scale microscopic traffic simulations
- Impact of hybrid and plug-in-electric vehicles on mode choice and transportation system performance.
- Integrated Transportation Planning and Operations Applications
- Traveler willingness to pay for toll roads/HOT lanes
- Evacuation planning and emergency management
- Acceleration and braking behaviors of individual drivers
- Car following and lane changing behaviors in traffic models
- Aggressive vs. defensive drivers in the context of eco-driving
- Driver behavior in the environment of co-operative vehicle-highway systems
- Modeling heterogeneous vehicle to vehicle networks including driverless fleets
- Applications in freight transportation modeling

All abstracts accepted for the conference will be included in the conference proceedings that will be compiled on a flash drive and be given to all participants at the time of registration.

Authors of selective outstanding abstracts will be asked to submit full papers to be considered for publication in the special issue of Transportation Research: Part C dedicated for this conference.

Future Simulation Events

The 20th International Symposium on Transportation and Traffic Theory (ISTTT), organized by Delft University of Technology will be held at the Grand Hotel Huis ter Duin, Noordwijk, The Netherlands from July 17 to July 19, 2013.

The ISTTT series is the premier gathering for the world's leading transportation and traffic theorists, and for those who are interested in contributing to or gaining a deeper understanding of the field.

The symposium covers all scientific aspects of transportation and traffic, spanning all modes of transport, including freight, air, and maritime modes, as well as private and public transport.

Sample topics welcomed by the symposium include but are not limited to:

- Traffic flow theories and their implications
- Traffic management and control
- Dynamics of transport phenomena, especially when coupled with observation
- Intelligent Transport Systems
- Travel behavior processes and demand modeling
- Vehicular interactions in mixed-mode traffic Congestion pricing and other policies
- Scheduled modes (public transport, air networks): system planning, service design and
- operations)
- Pedestrian and crowd modeling
- Transport safety
- Network modeling and dynamics Routing and scheduling in transportation systems
- Freight transport modeling, logistics, and supply chains
- Terminal design and operation
- Transportation policy

As in past symposia, paper review will be a two-stage process. An extended abstract (around 1000 words) can be submitted electronically to the organizers through the website www.isttt20.org between August 15, 2011 and January 15, 2012 for the first-round review.

Since for the ISTTT series the principal criterion is the scientific contribution of the work, we emphasize that the extended abstracts need to provide sufficient (theoretical, mathematical or empirical) evidence to allow the reviewers to assess this contribution. Please note that the official language for the ISTTT is (UK) English.

Accepted papers will be published both in the symposium book (Elsevier Procedia series) and in Special Issues of the Transportation Research series.

Given the high standards of the ISTTT series, only 36 papers will be selected for podium presentation and publications in the conference proceedings. In addition, around 24 papers will be selected for a poster presentation. These papers will be made available via the symposium website only.

The 20th International Symposium on Transportation and Traffic Theory (ISTTT) will be held at the Grand Hotel Huis ter Duin, Noordwijk, The Netherlands from July 17 to July 19, 2013.

Web Site: http://www.isttt.net/isttt20/

Future Simulation Events

Web Site: http://www.rss2013.org/

TRB 2013 Preview

Sessions with Simulation Content

Here is a summary of the simulation-related activities at the 2012 TRB annual meeting. The material is organized by sponsor committee. All committee events, including simulation subcommittee meetings, lectern sessions and poster sessions are covered.

SimSub Activities	
Monday 7:30PM-	Traffic Simulation Models Joint Subcommittee of AHB45, AHB40, AHB25, AHB20, ADB30, AHB55, ADC20
Sunday 1:30PM- 4:30PM	Workshop 149 Analysis, Modeling, and Simulation in Support of Real-Time Operations and Management

AHB45: Traffic Flow Theory and Characteristics		
103	Sunday 9:00AM- 12:00PM	Doctoral Student Research in Transportation Operations and Traffic Control
149	Sunday 1:30- 4:30PM	Analysis, Modeling, and Simulation in Support of Real-Time Operations and Management
181	Sunday 1:30- 5:30PM	Doctoral Student Research in Transportation Modeling
213	Monday 8:00- 9:45AM	Urban Networks
398	Monday 4:15- 6:00PM	Calibration of Traffic Models
404	Monday 4:15- 6:00PM	Innovations in Traffic Flow Theory and Characteristics, and Highway Capacity and Quality of Service
497	Tuesday 8:30- 10:15AM	Traffic Flow Theory and Characteristics, Part 1
	Tuesday 1:30- 5:30PM	Traffic Flow Theory and Characteristics Committee
666	Tuesday 7:30- 9:30PM	Car Following
726	Wednesday 8:30- 10:15AM	Traffic Flow Theory and Characteristics, Part
769	Wednesday 2:30- 4:00PM	Calibration of Traffic Simulation Models
798	Wednesday 2:30- 4:00PM	Transport Data Program Development: International Best Practices, Part 1
807	Wednesday 4:30- 6:00PM	Operation of Buses on Highways or Exclusive Lanes
828	Thursday 8:00- 9:45AM	Simulation and Calibration
841	Thursday 10:15- 12:00PM	Macroscopic Models and Freeway Networks

AHB40: Highway Capacity and Quality of Service		
	Saturday 1:00- 2:45PM	Workshop on SHRP2 L08 - Travel Time Reliability in the HCM
	Saturday 5:00- 6:15PM	Active Traffic Management Subcommittee, AHB40(1.4
	Sunday 11:00- 12:15PM	Traffic Simulation Applications Subcommittee, AHB40(1.2)
149	Sunday 1:30- 4:30PM	Analysis, Modeling, and Simulation in Support of Real-Time Operations and Management
	Monday 8:00AM- Noon	Highway Capacity and Quality of Service Committee
341	Monday 2:00- 3:45PM	Research on Highway Capacity and Quality of Service for Uninterrupted Facilities: Freeways and Two-Lane Highways
403	Monday 4:15- 6:00PM	Highway Capacity and Quality of Service for Interrupted Facilities: Intersections and Urban Arterials
404	Monday 4:15- 6:00PM	Innovations in Traffic Flow Theory and Characteristics, and Highway Capacity and Quality of Service

TRB 2012 Preview

Sessions with Simulation Content

AHB20: Freeway Operations

114	Sunday 9:00AM- 12:00PM	Customer Perspectives: New Options and Expectations for a Performance-Oriented Transportation System
149	Sunday 1:30PM- 4:30PM	Analysis, Modeling, and Simulation in Support of Real-Time Operations and Management
	Sunday 8:00PM- 9:30PM	Freeway Simulation Subcommittee, AHB20(2)
211	Monday 8:00AM- 9:45AM	Managing Freeway Corridor Operations with Real-Time Systems
337	Monday 2:00PM- 3:45PM	Freeway Incident Management and Impact of Freeway Traffic Congestion
402	Monday 4:15PM- 6:00PM	Freeway Active Traffic Management and Travel Time Reliability
	Tuesday 8:00AM- 12:00PM	Freeway Operations Committee
	Tuesday 7:30PM- 9:30PM	Freeway Operations Committee(Part 2 of 2)
	Wednesday 8:00AM- 9:45AM	Active Traffic Management Joint Subcommittee of AHB20, AHB35
768	Wednesday 2:30PM- 4:00PM	Active Traffic Management: Technology, Data, and Users

AHB25: Traffic Signal Systems

149	Sunday 1:30- 4:30PM	Analysis, Modeling, and Simulation in Support of Real-Time Operations and Management
	Monday 8:00- 9:00AM	Simulation of Traffic Signal Systems Subcommittee, AHB25(3)
	Monday 1:30- 5:30PM	Traffic Signal Systems Committee
430	Monday 7:30- 9:30PM	Emerging Technologies for Intelligent Signal Control
496	Tuesday 8:30- 10:15AM	Multimodal Traffic Signal Control
541	Tuesday 10:45AM- 12:30PM	Advances in Signal Timing

ADB30: Transportation Network Modeling

189	Sunday 1:30- 4:30PM	Route Choice Modeling and Availability of Data Sets
181	Sunday 1:30- 4:30PM	Doctoral Student Research in Transportation Modeling
231	Monday 8:00- 9:45AM	Network Modeling Applications and Origin-Destination Estimation
	Monday 1:30- 3:15PM	Route Choice and Spatio-Temporal Behavior Joint Subcommittee of ADB10, ADB30
393	Monday 3:45- 5:30PM	Network Models for Transit and Facility Location
451	Monday 7:30- 9:30PM	Network Traffic Assignment and Equilibrium Models
	Monday 7:30- 9:30PM	Speed Data Needs and Methodologies
	Tuesday 10:15- 12:00PM	Network Equilibrium Modeling Subcommittee, ADB30(2)
688	Tuesday 7:30PM- 9:30PM	Route Choice, Behavior, and Traffic Information in Networks
	Wednesday 8:00AM-Noon	Transportation Network Modeling Committee
733	Wednesday 8:30- 10:15AM	Finding Our Way: Modeling Route Choice
800	Wednesday 2:45- 4:30PM	Advances in Network Modeling
832	Thursday 8:00- 9:45AM	Sustainable Networks, Electric Vehicles, and Congestion Pricing
844	Thursday 10:15- 12:00PM	Shortest Paths, Stochastic Routing, and Network Design

TRB 2012 Preview

Sessions with Simulation Content

ADC20: Transportation and Air Quality

128	Sunday 9:00AM- Noon	Effective Practices to Develop Environmental Research Needs Statements and Funding Opportunities
175	Sunday 1:30- 4:30PM	Assessing the Future of Freight: Energy and Environmental Modeling in the Freight Sector
187	Sunday 1:30- 4:30PM	On-Road and Off-Road Diesel Emissions Modeling, Monitoring, and Innovative Controls
331	Monday 1:30- 3:15PM	Powering the Future: Implementing the Vision of Clean Transportation and Energy Technologies
	Monday 3:45- 5:30PM	Project Level Air Quality Analysis Subcommittee, ADC20(1)
	Monday 5:45- 7:15PM	Regional Air Quality Analysis Subcommittee, ADC20(2)
557	Tues. 10:45AM- 12:30PM	Current Issues in Transportation and the Environment
585	Tuesday 1:30- 3:15PM	Emissions and Air Quality Analysis, Management, and Regulation of Transit Facilities
	Tuesday 3:45- 7:15PM	Transportation and Air Quality Committee
714	Wednesday 8:00AM- 9:45AM	Ecodriving: Empirical Study and Modeling

AHB55: Work Zone Traffic Control

339	Monday 2:00- 3:45PM	Modeling Work Zone Safety and Operations
400	Monday 4:15- 6:00PM	Driver and Worker Behavior in Work Zones
	Tuesday 8:00AM-Noon	Work Zone Traffic Control Committee
573	Tuesday 1:30- 3:15PM	Work Zone Intelligent Transportation Systems: Where Are We Now?
625	Tuesday 3:45- 5:30PM	Recent Work Zone Safety and Mobility Research

ANF10: Pedestrians

Monday 8:00- 9:45AM	Pedestrian Modeling and Simulation Subcommittee, ANF10(2)
Tuesday 8:00AM- Noon	Pedestrians Committee

Recent Research Results

Integrated Corridor Management in the U.S. Analysis, Modeling and Simulation

Submitted by Vassili Alexiadis, Cambridge Systematics, Inc.

Introduction

This summary documents the analysis methodologies, tools, and performance measures used to analyze Integrated Corridor Management (ICM) strategies; and presents high-level results for the successful implementation of ICM at three Stage 2 Pioneer Sites, including 1) the U.S. 75 corridor in Dallas, Texas; 2) the I-15 corridor in San Diego, California; and 3) the I-394 corridor in Minneapolis, Minnesota.

Overall findings resulting from the Analysis, Modeling and Simulation (AMS) efforts include:

- ICM improves mobility: travel time, delay and corridor throughput are improved after ICM implementation. ICM also helps improve the reliability of travel time, and reduce fuel consumption and mobile emissions. Table 1 below provides a summary of expected annual benefits in each of the three Pioneer Sites. An important finding of this analysis is that ICM strategies produce more benefits at higher levels of travel demand, and during nonrecurrent congestion.
- The ICM AMS effort helped improve analysis tools and methods. New tools were developed for analysis of transit, congestion pricing, high-occupancy toll (HOT) lanes, ramp metering, and active traffic management. The AMS effort helped develop improved model calibration and data analysis methods.
- In two out of three Stage 2 Pioneer Sites, transit excess capacity is better utilized overall, and particularly under incident conditions, drawing additional travelers to the transit facilities without overwhelming them. Parking expansion to accommodate this additional utilization appears to be a critical enabler of this benefit.

This analysis effort offers the following benefits:

- **Invest in the right strategies.** The analysis offers corridor managers a predictive forecasting capability that they lack today to help them determine which combinations of ICM strategies are likely to be most effective under which conditions.
- **Invest with confidence.** The analysis allows corridor managers to "see around the corner" and discover optimum combinations of strategies, as well as conflicts or unintended consequences that would otherwise be unknowable before implementation.

Improve the effectiveness/success of implementation. With this analysis, corridor managers can understand in advance what questions to ask about their system and potential combinations of strategies to make any implementation more successful.

- The analysis provides a long-term capability to corridor managers to **continually improve implementation** of ICM strategies based on experience.

TABLE 1: ANNUAL BENEFITS OF PIONEER SITES

	San Diego	Dallas	Minneapolis
Annual Travel Time Savings (Person-Hours)	246,000	740,000	132,000
Improvement in Travel Time Reliability (Reduction in Travel Time Variance)	10.6%	3%	4.4%
Gallons of Fuel Saved Annually	323,000	981,000	17,600
Tons of Mobile Emissions Saved Annually	3,100	9,400	175
10-Year Net Benefit	$104M	$264M	$82M
10-Year Cost	$12M	$14M	$4M
Benefit-Cost Ratio	10:1	20:1	22:1

Analysis Methodology

This section describes the analysis methodology employed in the AMS for the three sites including model calibration methodology, analysis for different operational conditions, performance measures, analysis plans, and calculation of ICM benefits.

AMS Framework

At the outset of this effort, existing candidate AMS tools were evaluated and compared for their ability to model ICM strategies and other requirements. Findings from this evaluation reveal that existing models share certain common features, but vary widely in their implementations and data requirements.

- Every tool type represents a tradeoff between geographic scope and level of resolution (scale vs. complexity). Less detailed tool types are tractable for large networks, while more detailed tool types are restricted to smaller networks. Depending on corridor size and the types of analyses required, all tool types are potentially valuable for ICM AMS.
- "Improve operational efficiency…" refers to system optimization strategies, such as freeway ramp metering and arterial traffic signal coordination. Microscopic simulation models are effective at analyzing these strategies.

Mesoscopic simulation models are less effective, and travel demand models do not have this analysis capability.

- Travel demand models are better than other existing tools in estimating mode shift, but microscopic and mesoscopic simulation models are better at estimating route shifts. In fact, mesoscopic tools can estimate regional dynamic diversion of traffic, while microscopic tools can estimate route shift at a smaller geographic scale. Also, all travel demand models are capable of analyzing mode-shift, while this capability is very limited in macroscopic simulation models and non-existent in mesoscopic simulation models.
- Finally, mesoscopic simulation tools are better at analyzing traveler responses to congestion pricing, but the ICM AMS desired analysis capability is more than what is offered by existing tools.

Three findings emerged from the analysis of capabilities found in existing AMS tools:

1. Each tool type has different advantages and limitations, and is better than other tool types at some analysis capabilities. There is no one tool type at this point in time that can successfully address the analysis capabilities required by the ICM program. An integrated approach can support corridor management planning, design, and operations by combining the capabilities of existing tools.
2. Key modeling gaps in existing tool's capabilities include: a) the analysis of traveler responses to traveler information; b) the analysis of strategies related to tolling/HOT lanes/ congestion pricing; and c) the analysis of mode shift and transit.
3. Interfacing between travel demand models, mesoscopic simulation models, and microscopic simulation models presents integration challenges that were addressed by identifying interface requirements that focus on: a) maintaining the consistency across analytical approaches in the different tools, and b) maintaining the consistency of performance measures used in the different tool types.

The AMS methodology encompasses tools with different traffic analysis resolutions. Three classes of simulation modeling approaches – macroscopic, mesoscopic, and microscopic – were considered essential components of a general AMS methodology. Fig. 1 presents a graphical depiction of the geographic scope and interrelationships between these tools. The modeling approaches developed for different corridors involved significant tailoring of the general methodological approach. Depending on the scope, complexity, and questions to be answered within each corridor, there was more or less emphasis on each of the three general model types and their interaction.

The AMS methodology includes macroscopic trip table manipulation for the determination of overall trip patterns, mesoscopic analysis of the impact of driver behavior in reaction to ICM strategies (both within and between modes), and microscopic analysis of the impact of traffic control strategies at roadway junctions (such as arterial intersections or freeway interchanges). The methodology also includes a simple pivot-point mode shift model and a transit travel time estimation

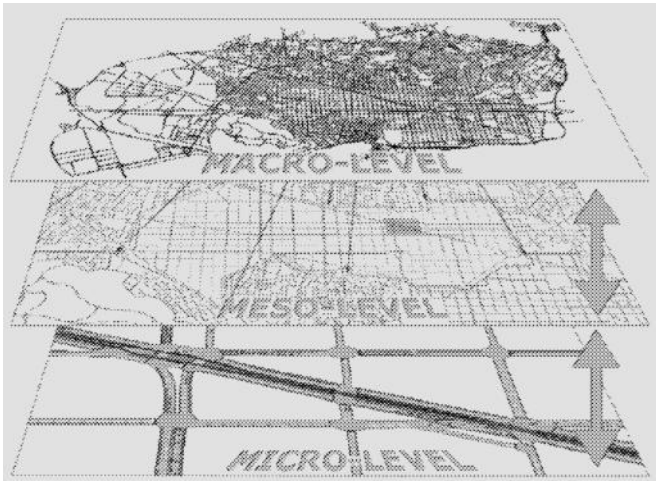


Figure 1. Geographic Scope in Traffic Analysis Tools

module, interfaces between different tools, and a performance measurement/benefit-cost module.

In the AMS framework, macroscopic, mesoscopic, and microscopic traffic analysis tools interface with each other, passing trip tables and travel times back and forth until convergence is achieved between consecutive iterations that produce travel times and number of trips that differ less from one iteration to the next. Once convergence is achieved, performance measures are calculated and benefits (such as travel time savings) are evaluated and compared to deployment costs to produce benefit -cost ratios associated with each scenario/alternative.

Model Calibration

Accurate calibration is a necessary step for proper simulation modeling. Before modeling ICM strategies, model calibration ensures that base scenarios represent reality, creating confidence in the scenario comparison. Before ICM strategies were analyzed, model validation/calibration criteria were identified for the modeling effort. The highway model validation/ calibration criteria are shown in Table 2.

Because of transit presence in two of the Stage 2 AMS corridors, model validation and calibration criteria were established for the transit component of the analysis and modeling. Example transit model calibration criteria from U.S. 75 are shown in Table 3.

Model calibration criteria were also established for traffic conditions during an incident, as follows:

- **Freeway bottleneck locations.** Should be on a modeled segment that is consistent in location, design, and attributes of the representative roadway section;
- **Duration of incident-related congestion.** Duration where observable within 25 percent.
- **Extent of queue propagation.** Should be within 20 percent.
- **Diversion flows.** Increase in ramp volumes where diversion is expected to take place.

- **Arterial breakdown when incident.** Cycle failures or lack of cycle failures.

TABLE 2: HIGHWAY MODEL VALIDATION AND CALIBRATION CRITERIA FOR THE ICM CORRIDOR AMS

Validation Criteria and Measures	Acceptance Targets
Traffic flows within 15% of observed volumes for links with peak-period volumes greater than 2,000 vph	For 85% of cases for links with peak-period volumes greater than 2,000 vph
Sum of all link flows	Within 5% of sum of all link counts
Travel times within 15%	≥85% of cases
Visual Audits *Individual Link Speeds: Visually Acceptable Speed-Flow Relationship*	To analyst's satisfaction
Visual Audits *Bottlenecks: Visually Acceptable Queuing*	To analyst's satisfaction

TABLE 3:TRANSIT MODEL VALIDATION AND CALIBRATION CRITERIA FOR U.S. 75 ICM – DALLAS

Validation Criteria and Measures	Acceptance Targets
Light-rail station volumes within 20% of observed volumes	For 85% of cases
Light-rail park-and-ride lots	
Parked cars in each lot	Within 30%
Total parked cars for all lots combined	Within 20%

Overall, the microscopic and mesoscopic simulation models used accurately captured travel characteristics for the selected baseline years on all three Stage 2 AMS corridors, including freeways, arterials, and transit.

Analysis for Different Operational Conditions

The Analysis Plans for the AMS efforts described tools and procedures capable of supporting the analysis of both recurrent and nonrecurrent congestion scenarios. The corridor's nonrecurrent congestion scenarios entail combinations of increases of demand and decreases of capacity. The overall premise is that key ICM impacts may be lost if only "normal" travel conditions are considered; the proposed scenarios take into account both average- and high-travel demand, with and without incidents. The relative frequency of nonrecurrent conditions also is important to estimate in this process – based on archived traffic conditions.

For example, Table 4 shows the distribution of the number of days in baseline year 2003 by incident type and by travel demand level during the AM peak period in the I-15 corridor. Demand is measured in terms of vehicle miles traveled (VMT); and demand levels are divided into three categories – low, medium, and high – based on their percentage of median VMT. Incident severity was marked as major if incident duration was more than 20 minutes, whereas other incidents are defined as minor incidents.

TABLE 4: DISTRIBUTION OF NUMBER OF DAYS IN 2003 BY INCIDENT TYPE AND BY DEMAND LEVEL

Number of Days in a Year		Incident			Total
		Major	Minor	No Incident	
Demand	High	38	5	128	171
	Medium	17	4	60	81
	Low	31	1	81	113
Total		86	10	269	365

Performance Measures

A consistent set of performance measures was developed to assess the impacts of ICM at the three Stage 2 Pioneer Sites. The performance measures focus on the following key areas:

- **Mobility.** Mobility describes how well the corridor moves people and freight. The mobility performance measures are readily forecast. Three primary types of measures were used to quantify mobility, including travel time, delay, and throughput. Travel time and delay are fairly straightforward to calculate using model outputs. Throughput was calculated by comparing travel times under the incident scenarios to those under no incident – by comparing the percentage of trips under the same threshold travel time in both the pre- and post-ICM scenarios, the relative influence of ICM on reducing extreme travel times can be estimated.

- **Reliability and Variability of Travel Time.** Reliability and variability capture the relative predictability of the public's travel time. Unlike mobility, which measures how many people are moving at what rate, the reliability/ variability measures focus on how mobility varies from day to day. Travel time reliability/variability is reported in terms of changes in the Planning Index and changes in the standard deviation of travel time.
- **Emissions and Fuel Consumption.** Estimates were produced by using emissions and fuel consumption rates based on variables, such as facility type, vehicle mix, and travel speed.

- **Safety.** Available safety analysis methodologies are not sensitive to ICM strategies. At best, available safety analysis methods rely on crude measures, such as V/C, and cannot take into account ICM effects on smoothing traffic flow. Clearly, this is an area deserving new research. As such, no safety analysis was conducted as part of this effort.
- **Cost Estimation.** Planning-level cost estimates were prepared, including life-cycle costs (capital, operating, and maintenance costs). Costs were expressed in terms of the net present value of various components. Annualized costs represent the average annual expenditure that is expected in order to deploy, operate, and maintain the ICM improvement; and replace (or redeploy) the equipment as they reach the end of their useful life.

ADAPTIVE TRAFFIC SIGNAL CONTROL OPERATIONAL PERFORMANCE EVALUATION

Submitted By:Perry Craig, P.Eng., Senior Principal, Delcan Corporation

1. INTRODUCTION

The City of Surrey, which is currently the 12th largest city in Canada by population, has been the fastest-growing municipality in British Columbia over the past decade, and is on pace to surpass Vancouver as BC's largest city sometime over the next twenty years. This rapid population growth will quickly strain the existing transportation system, and traffic congestion in many areas of the City will degrade to unacceptable levels unless appropriate strategies and plans are put in place.

On major traffic corridors within the City, the signalized intersections are currently coordinated by time-based coordination (TBC); that is, pre-determined signal timing plans that are developed from historic traffic flows and scheduled for implementation on a time-of-day basis. With the continued rapid growth of the City and the installation of an increasing number of signalized intersections, there is a growing need for a better, more cost-effective method to more efficiently manage the traffic demand.

To address this need, the City applied for, and successfully secured funding from Transport Canada to deploy an Adaptive Traffic Signal Control (ATSC) Pilot Project. The City and Delcan Corporation agreed to implement and evaluate the ATSC Pilot Project using Delcan's "Multi-criteria Adaptive Control" system.

The scope of the ATSC Pilot Project was to demonstrate the integration of traffic adaptive control with the City's existing traffic signal control infrastructure, and to evaluate the benefits of adaptive control. As part of this project, a customized PARAMICS-based micro-simulation environment was developed to test and verify the ATSC algorithms, calibrate the parameters used in the algorithms, and evaluate system performance.

2. PILOT PROJECT ARTERIAL STREET NETWORK

The arterial street corridor selected for the Pilot Project was 72nd Avenue, between 120th Street and King George Boulevard. This section of 72nd Avenue contains seven closely spaced signalized intersections. These signalized intersections operate under coordinated TBC operations during the weekdays, and as fully actuated during the weeknights and weekends, with no significant traffic operational problems. For the actuated operations, the City of Surrey employs vehicle loop detectors at the intersection stop lines for all traffic movements.

3. PARAMICS MICRO-SIMULATION TEST ENVIRONMENT

For the evaluation of the ATSC Pilot Project, a custom micro-simulation environment was developed to test and verify the development of the adaptive control algorithms, calibrate the parameters used in the algorithms, and evaluate system performance. A simulation environment similar to the real-time production system environment was created, which includes the following hardware:

- PC computer (running the micro-simulation model);
- Seven controller interface units (i.e., "MAC Adapters"); and
- Central Traffic Signal Management System (running the MAC adaptive control algorithms).

Figure 1 illustrates the framework employed for integrating the adaptive control algorithm with the Quadstone PARAMICS micro-simulation model. The function of each element is described below.

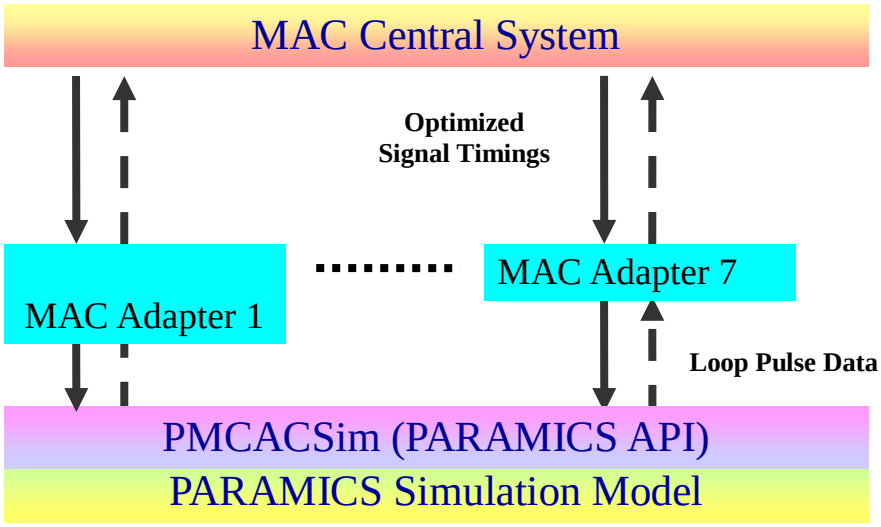


Figure 1 – Framework for Simulation Environment

Simulation Model

PARAMICS is the micro-simulation model that was employed to replicate the street network. This model consists of nodes, links and zones. The loop detectors installed in the corridor are also coded in the base model. The main role of this model is to simulate pulse loop data and implement the optimized timings.

PARAMICS Application Programming Interface (API)

As part of the features of PARAMICS, Quadstone promote that the micro-simulation model can be interfaced with real-time traffic signal management system. The interface provides for simulated raw loop detector data to be output from the PARAMICS simulation model, and for optimized signal timings to be input back into the model.

To build the proposed simulation environment, Delcan developed a plug-in application programming interface (API) called PMCACSim. This API is used to obtain simulated raw loop data from the PARAMICS simulation model, and to send the latest optimized phases green time and offset values to the PARAMICS simulation model.

MAC Adapter

On a per cycle basis, the seven MAC Adapters transform the raw detector loop data generated by PARAMICS into aggregated detector data (i.e., count, speed, saturation flow rate, speed, etc.) and send the aggregated detector data to the central ATSC system.

Adaptive Control Algorithms

Based on the prevailing traffic demands, the adaptive control algorithms optimizes the traffic signal operations, and then sends the appropriate signal timing parameters to each MAC Adapter for use in PARAMICS in the simulation of the next controller cycle.

After the micro-simulation environment is developed, several scenarios are created to represent typical test cases of varying traffic demands. Existing time-of-day timing plans are separately modeled for comparison with the adaptive control operations. The simulation outputs from both traffic signal control strategies are processed to obtain Measures of Effectiveness (i.e., travel time and intersection throughput) for performance evaluation.

4. ATSC OPERATIONAL PERFORMANCE

On-street operations were simulated for the AM peak period between 6:45 am and 9:30 am. Measures of Effectiveness (MOEs), such as travel time, vehicle stops and intersection throughput, were obtained from the simulation outputs and compared for both the TBC and ATSC control strategies. The PARAMICS micro-simulation test environment produced traffic patterns similar to on-street traffic observations. Consequently, vehicle travel times and vehicle throughputs at signalized intersections recorded in the micro-simulation model were considered to be appropriate.

Corridor Travel Times and MOEs

Under the AM Peak Period, a key difference between TBC and ATSC were the network cycle lengths, with ATSC adjusting the cycle lengths to reflect the current traffic volumes. The resultant MOEs showed that, under ATSC, westbound travel time was better than under TBC (see Figure 2). Travel time eastbound, which has lower traffic volumes in the AM Peak (i.e., its peak demand is in the afternoon), was almost as good as TBC in the morning peak (see Figure 3).

MOE's for travel along 72nd Avenue during the AM peak hour from 7:45 am to 8:45 am showed similar results. As shown in Table 1 below, although eastbound traffic flow incurred some dis-benefits, the westbound traffic flow incurred significant benefits; with the result that the overall network performance along 72nd Avenue was improved with respect to vehicle delays, stop times and travel times.

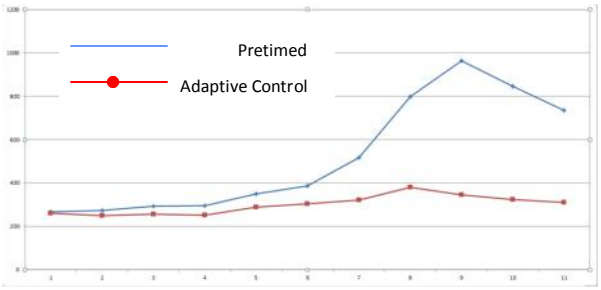


Figure 2 – Westbound AM Peak Period Travel Time (between 6:45 am and 9:30 am)

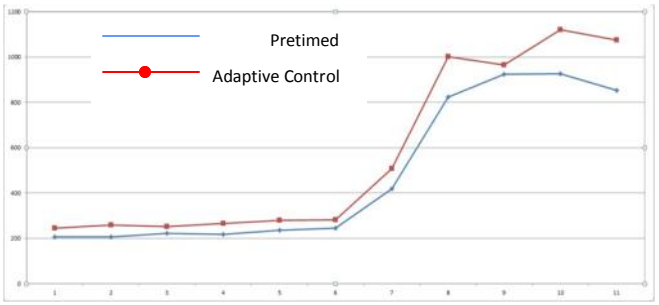


Figure 3 – Eastbound AM Peak Period Travel Time (between 6:45 am and 9:30 am)

Vehicle Throughput

For westbound traffic, the total vehicle throughput is higher, and almost the same for eastbound traffic (see Figure Nos. 4 and 5).

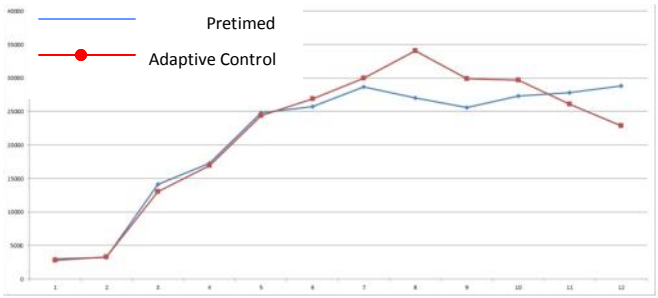


Figure 4– Westbound AM Peak Period Throughput (between 6:45 am and 9:30 am)

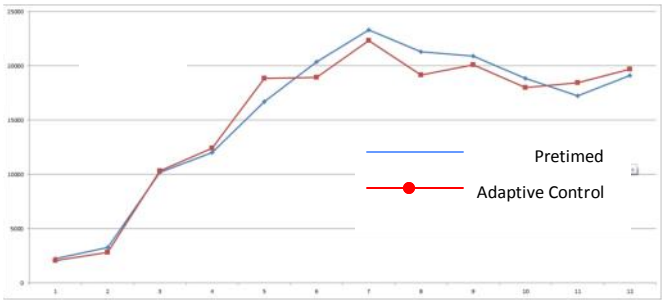


Figure 5– Eastbound AM Peak Period Throughput (between 6:45 am and 9:30 am)

Network Performance

The resultant MOEs for the total study area network, provided in Table 2, show that total network delay was less under ATSC than under TBC, while total network stops was very slightly increased.The total network throughput was basically the same for both TBC and ATSC. It is considered that this MOE is a reflection of the actual vehicle demand in the study area; that is, there are no significant capacity constraints under either TBC or ATSC that are restricting vehicle demands; and hence, the vehicle throughputs are the same in both cases.

AM Peak	Average Delay (s)				Total Delay (s)			
72nd Ave	TBC	ATSC	Diff	Diff (%)	TBC	ATSC	Diff	Diff (%)
EB	62	75	13	21%	46,393	58,745	12,352	27%
WB	133	92	-41	-31%	125,839	85,677	-40,162	-32%
Combined	195	167	-28	-14%	172,232	144,422	-27,810	-16%

AM Peak	Average Stop Time (s)				Total Stop Time (s)			
72nd Ave	TBC	ATSC	Diff	Diff (%)	TBC	ATSC	Diff	Diff (%)
EB	25	25	0	0%	18,673	19,236	563	3%
WB	34	27	-7	-21%	32,628	25,295	-7,333	-22%
Combined	59	52	-7	-12%	51,301	44,531	-6,770	-13%

AM Peak	Average Travel Time (s)				Total Travel Time (s)			
72nd Ave	TBC	ATSC	Diff	Diff (%)	TBC	ATSC	Diff	Diff (%)
EB	291	305	14	5%	219,136	237,872	18,736	9%
WB	360	318	-42	-12%	341,589	296,570	-45,019	-13%
Combined	651	623	-28	-4%	560,725	534,442	-26,283	-5%

Table 1 – Traffic Performance along 72nd Avenue in AM Peak Hour

Measure of Effectiveness	TBC	ATSC	Difference	
Total Network Delay (s)	53,222	45,976	-7,246	-14%
Total Network Stops	991	1010	19	2%
Total Network Throughput (veh)	17,135	17,214	79	0%

Table 2 – AM Peak Period Total Network Performance

5. CONCLUSIONS

In conclusion, the micro-simulations demonstrated the potential for ATSC to outperform the best optimized TBC timing plans by reducing vehicle delays and improving travel times along the 72nd Avenue corridor, while at the same time reducing the total network delay.

The micro-simulation test environment produced traffic patterns similar to on-street traffic observations, and as such, it provided a "bird's eye view" of the whole network; excellent for reviewing network traffic flows, intersection offsets, vehicle queues, etc. Output from the model was therefore effective in the off-line configuration and fine-tuning of the ATSC algorithms as well as in the performance evaluation of ATSC.

Ex-Post Validation of a Large Simulation Model Developed to Quantify Regional and Long-Term Impacts of a Major Construction Project

Submitted by Kaan Ozbay, Bekir Bartin, Hong Yang, Sandeep Mudigonda, Shri Iyer
Rutgers Intelligent Transportation Systems (RITS) Laboratory

Introduction

Rutgers Intelligent Transportation Systems (RITS) laboratory conducted a traffic simulation study in 2011 to estimate the regional and long-term traffic impacts of Newark Bay – Hudson County Extension (NB-HCE) bridge deck reconstruction project located in a critical area of the Northern New Jersey highway network, and within 1-mile of the Holland Tunnel, one of only three heavily used roadway connections between New Jersey and Manhattan.

Google Map® in Figure 1 shows the study area and the developed simulation model which consists of NB-HCE (I-78) and the Jersey City urban network around it, as well as one of the main connections to Manhattan namely, Holland Tunnel. As part of the construction work, a long-term one -lane closure was proposed for the westbound direction of the NB-HCE between the junction with 14th Street and Route 139 in the east, and the Grand Street onramp in the west (Figure 1).

OBJECTIVE
Estimate the potential impacts of the long-term one-lane closure and the potential disruptions such as accidents and incidents not only on the local level, but also on the regional level using a microscopic traffic simulation model.

The unique feature of this study is that the predictions of the simulation model are validated by creating a two weeks long lane closure demonstration even before the actual construction started. *The idea behind this unique field test was to validate the simulation model predictions in terms of the impact of lane closure on the Jersey City network as well as on the Holland tunnel traffic under various traffic conditions including highest demand and presence of accidents.* The advantage of this approach was the ability of removing the lane closure demonstration in case the network failed in a way simulation model may not predict.

Development of Simulation Model

RITS lab team developed the microscopic traffic simulation network model of NJ Turnpike (NJTPK) in PARAMICS in 2003 and has been constantly updating it since then. The simulation model of NJTPK includes not only the mainline, but also all operational toll plazas. RITS developed its own toll plaza algorithm to accurately simulate vehicles' complex lane selection decisions [1]. As part of this study, the previous simulation model of NJTPK was extended to include the road network of downtown Jersey City and several key alternate routes to the NB-HCE as well as the Holland Tunnel connection to Manhattan. The extended simulation model has four special characteristics:

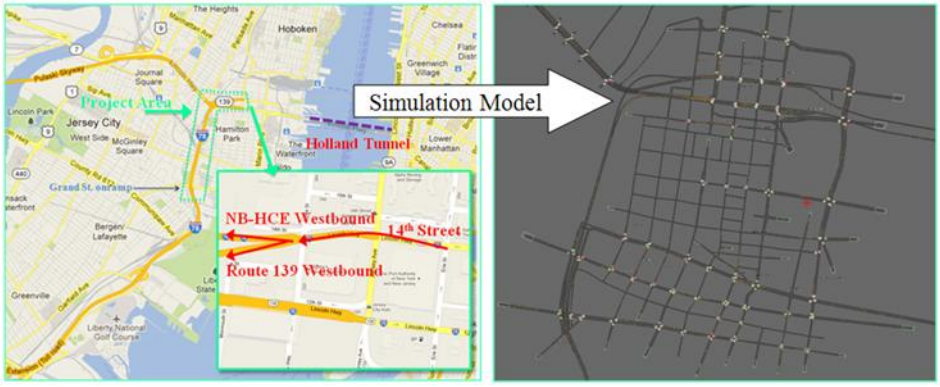


Figure 1. Regional Highway Network (Left: Google Map®) and Developed Simulation Model (right)

1. **Large Scale:** The simulation model is very large and complex especially due to the very high demand generated by NY City traffic as well as complex arterial network of Jersey City and its interaction with the NJTPK and its toll plaza operations. The Jersey City network portion of the overall study network consists of 55 signalized and 124 unsignalized intersections.
2. **Detailed and Realistic:** The selection of roadways to include in the extended model was based on the most realistic alternatives that westbound commuters were likely to choose in the event of congestion.
3. **Enhanced Capability:** Customized application programming interface (API) was developed to meet the need to assess the potential impact of the lane closure during construction on the Jersey City network as mainly due to the possibility of vehicles diverting around the long-term work zone.
4. **Ex-Post Validation:** During 2 weeks lane closure demonstration, extensive amount of field data was collected to validate the predictions of the simulation model. At the end of this unique field testing period, the observed traffic conditions was found to be in agreement with the simulation models' predictions.

Ex-Post Validation of the Developed Simulation Model

The simulation model was calibrated based on the observed counts and travel speeds of major roadways in the network. *The most important work making this study unique is that the ex-post validation was conducted to verify the performance of the calibrated simulation model before using its predictions to make final recommendations.* GPS travel time data collected during the lane closure demonstration periods were compared with simulation results. Figure 2 shows examples of the validation on two major roadways. It was found that the simulated travel times based on the calibrated model are closely correlated with the travel times of individual GPS runs. Based on the observed traffic flows, it was also concluded that commuters did not divert from the mainline to Jersey City network to avoid the impact of lane closure. This observed behavior was thus correctly predicted by the developed simulation model.

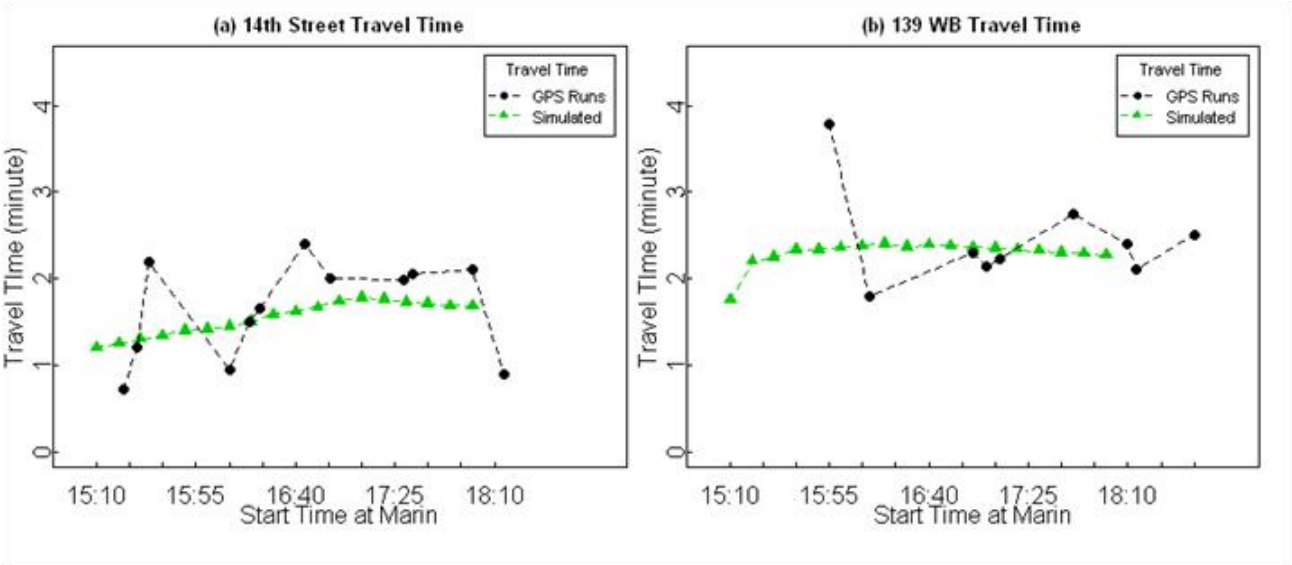


Figure 2. Example of Using GPS Travel Time to Validate the Simulation Model

Simulation Scenarios & Assumptions

The calibrated simulation model with verified performance was then applied to simulate different lane closure scenarios. Since the westbound direction is busier during the afternoon peak period, RITS lab conducted the simulation analyses for this time period. The scenarios tested were:

- A long-term one-lane closure on I-78/NB-HCE westbound
- Worst-case scenarios such as accident and/or capacity loss, simultaneous impacts from other major projects in the area and higher traffic demand.

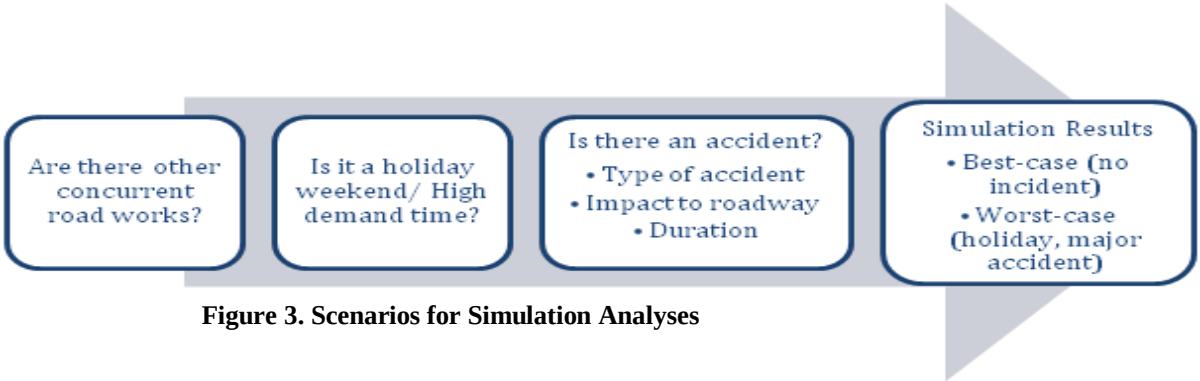


Figure 3. Scenarios for Simulation Analyses

Simulation Results

The simulation model was first run to estimate the impact of the proposed lane-closure on the traffic network, estimating delays on major routes and intersections, and also potential diversions to other routes. Table 1 shows the diversion to other routes in different scenarios. The results showed slight delays along the 14th Street corridor, which includes the Holland Tunnel and intersections in the vicinity of 14th Street in Jersey City. However the level of delay predicted is low enough to not observe diversions away from 14th Street to other routes. The model estimated that the increased congestion along 14th Street was not large enough to make alternative routes viable options.

Due to the prevalence of incidents and accidents within the study area, in addition to the simulation of the proposed lane-closure RITS lab team simulated the impact of short-term incidents on either the NB-HCE westbound through the work zone or on Route 139 westbound. The results of diversion percentages for 30 and 45-minute accidents on NB-HCE are shown in Table 1.

Diversions to Other Routes	Work Zone	30-Min Accident	45-minute Accident
Diversions to Local Streets	-	7.6%	8.1%
Diversions to Rt. 139 S	-	2.1%	2.1%
Diversions to Lincoln Tunnel	-	2%	2%

Table 1. Diversions to Other Routes

Lessons Learned

Micro-simulation models are commonly used for traffic impact analyses. Most users recognize the importance of the calibration and validation processes when using these simulation models. Although there are a large number of studies focused on calibrating simulation models, very few studies conducted ex-post validation of the calibrated models. This study is thus an attempt to just do that. The lane closure demonstration provided the team with opportunities to verify the accuracy of the predictions of the calibrated models. After comparing the results obtained from the highly customized and carefully calibrated simulation model with the real-world data collected for the same scenario, it was clear that this type of simulation model can be an invaluable tool to analyze future scenarios with very high fidelity.

Reference

1. Mudigonda, S., Bartin, B. and Ozbay, K. (2009). "Microscopic Modeling of Lane Selection and Lane Changing at Toll Plazas." Presented at the Transportation Research Board 88th Annual Meeting, January 2009.