

## Updates to the Traffic Modelling Process

### Recommendation:

That the April 13, 2016, Sustainable Development report CR\_2935, be received for information.

### Report Summary

**This report provides an update on traffic modelling tools that the City utilizes and maintains for evidence-based decision making. Several initiatives are currently underway to update these tools using new technologies and best practices from industry.**

### Previous Council/Committee Action

At the September 9, 2015, City Council meeting, the following motion was passed:

That Administration provide a report outlining the updates to the traffic modelling process and the implications of new technology being used.

### Report

The primary purpose of using transportation/traffic modelling tools is to support evidence-based decision making. Modelling tools assist the decision making process by providing opportunities to foresee a wide range of likely outcomes. These opportunities can be in the form of identifying future infrastructure needs (e.g. upgrades to Anthony Henday Drive), identifying likely benefits/impacts attributable to a major infrastructure improvement (e.g. upgrading Yellowhead Trail to a freeway), and measuring the effectiveness of policy options to support Corporate Strategic Goals (e.g. Shift Edmonton's Transportation Mode).

Administration maintains three different traffic modelling tools:

- The **Regional Travel Model** is maintained for strategic or long range transportation planning. This tool is particularly useful to predict where and when (within a typical day) people will travel, for what purpose, and using what travel mode.
- The **Dynamic Traffic Assignment** modelling tool is used to analyze area-wide traffic impacts. This tool is particularly useful for situations such as road closures or construction detours, as it can identify alternate routes that the traffic may use to avoid the area.
- **Microsimulation tools** are maintained primarily to assess corridor and intersection level traffic operations and to manage and update intersection traffic signal timing plans.

### Background

#### Regional Travel Model:

The earliest version of the Travel Model was developed in the mid-1980s. A major update of the Regional Travel Model was conducted in 1996 using the 1994 Household Travel Survey. Administration uses the Regional Travel Model tool to support the identification of transportation infrastructure investments and the capital investment priority. The current version of the Regional Travel Model was updated in 2006 using the 2005 Household Travel Survey. The model's boundary covers all 24 member municipalities within the Capital region, including the City of Edmonton. Based on the anticipated population and employment growth in the City and the surrounding Region, the Regional Travel Model is primarily used to estimate future traffic volumes and to identify transportation infrastructure needs.

#### Example Applications:

- To analyze operations of interchange options along Yellowhead Trail as well as interchange construction sequencing.
- To forecast transit and LRT ridership in support of funding applications (e.g., Building Canada Fund).
- Support for infrastructure prioritization projects such as the LRT Prioritization Study which is currently underway.

#### Dynamic Traffic Assignment:

Administration started using the Dynamic Traffic Assignment tool in 2014 to assess the network traffic impacts resulting from the Stony Plain Road bridge closure over Groat Road. Currently, Administration has a working version of the Dynamic Traffic Assignment tool which covers the entire area within the inner ring road. The City's Dynamic Traffic Assignment tool is now being used to validate probable detour routes, to assess the impacts of traffic signal timing changes on travel times, and to provide information on network wide total delay. Administration is increasing the use of this modelling tool to further enhance detour planning.

#### Example Applications:

- Stony Plain Road bridge closure over Groat Road traffic impacts
- Groat Road closure traffic impacts
- NAIT LRT opening day traffic impacts
- Community Traffic Management Plans

#### Microsimulation Tools:

Since 1998, Administration has used microsimulation tools to assess network or project-based traffic operations by considering the individual vehicle movements through an intersection or a section of road. The information gathered through

using these tools is key to determine if a certain section of the roadway is congested or if traffic is being significantly delayed at an intersection. Traffic delay and waiting time to clear an intersection are measures that help Administration to determine if modifications are needed for traffic signal timing or if other actions to mitigate traffic congestion are required.

Example Applications:

- Intersection traffic signal management
- Yellowhead Trail traffic simulation
- LRT Corridor (i.e., Capital Line, Valley Line) traffic simulation

Considering the particular capability of each tool, Administration uses these tools independently in most cases. Generally, the Dynamic Traffic Assignment and microsimulation tools are used to examine existing conditions, whereas the Regional Travel Model is used to assess a future horizon. Considering the simplified assumptions on road network (i.e. local roads are not considered) and limitations related to intersection traffic control plans (i.e. no actual traffic signals are considered), the Regional Travel Model tool should not be used for traffic operational assessment.

To assess traffic operations for future years, the Dynamic Traffic Assignment and microsimulation tools must be integrated with the Regional Travel Model. To provide credible estimates of traffic operational impacts for a future project (e.g., Valley Line LRT), an integrated approach for the use of these three different tools is most valuable. This integrated approach is primarily a top-down (Regional Travel Model -> Dynamic Traffic Assignment -> Microsimulation) approach where the detailed information (Microsimulation) is progressively developed using the information from the higher level tool (Regional Travel Model):

- For a future year horizon, based on the anticipated growth in population and employment, the Regional Travel Model provides estimates of where and when (within a typical day) people will travel, the purpose of travel, and the travel mode used.
- The Dynamic Traffic Assignment tool utilizes the Regional Travel Model information and identifies likely/potential routes for travel between destinations. The Dynamic Traffic Assignment tool provides an area wide traffic congestion measure and information on traffic delay.
- Travel routes, and the amount of traffic on these routes, from the Dynamic Traffic Assignment tool and the Regional Travel Model are entered in the Microsimulation tool for detailed traffic analysis. The Microsimulation tool provides estimates of corridor traffic impacts, intersection traffic operations and corridor travel time delay.

### Current Status:

Administration is currently updating and improving the functionality of each of the above modelling tools. The improvements to each tool, and the anticipated functionality these improvements will bring, are briefly outlined below.

### Regional Travel Model Update:

A multi-year update program for the Regional Travel Model began in Fall 2015. The new version of the Regional Travel Model will be developed based on the 2015 Household Travel Survey and is expected to be complete by 2018. Administration is seeking to collaborate with Alberta Transportation and the Capital Region Board as part of the update program. It is well recognized by several internal clients and external stakeholders that the current version of the Regional Travel Model (last updated using the 2005 Household Travel Survey data) requires a major overhaul to accurately estimate travel patterns, particularly to better understand transit behaviour, including park and ride utilization and long term regional growth. The updated Regional Travel Model will better assess the effectiveness of *The Ways* plans and provide better transit ridership forecasts.

In 2015, Sustainable Development, jointly with Transportation Services, established the Spatial Forecasting Unit to estimate the long term population and employment growth through the initiation of the Growth Modelling Framework. In collaboration with Alberta Transportation and the Capital Region Board, among other stakeholders, this business unit is expected to estimate regional growth currently identified through an external consultant. In the future, this population and employment growth modelling process and the Regional Travel Model will be integrated and be considered as one tool to ensure better reliability in the forecasting process.

### Dynamic Traffic Assignment Development:

The City's current Dynamic Traffic Assignment tool applies to the area within the inner ring road. A City-wide Dynamic Traffic Assignment model is currently under development. It is also well recognized that reliable measures of network wide traffic impacts are critical to the success of a major transportation project like LRT Network expansion or Freeway/Arterial Roadway Corridor improvements. Once developed and validated with the recent traffic count data and the 2015 Household Travel Survey data, this City wide Dynamic Traffic Assignment model will be available to use for both short term and long term transportation planning projects. It will provide reliable estimates of traffic congestion and travel time delay and thus Administration can better assess the user benefits and plan mitigation measures if needed.

### Microsimulation Tools:

Administration maintains up-to-date microsimulation tools. Current tools and the related processes are stable, and Administration will continue to use these tools. However, for complex projects, the microsimulation tool will be integrated with the Dynamic Traffic Assignment tool to provide reliable forecasts.

Prior to the introduction of the Dynamic Traffic Assignment tool in 2014, Administration followed a different modelling approach to assess the anticipated traffic operational impacts for future year projects. At the time, no intermediate tool was available (such as the Dynamic Traffic Assignment tool), and therefore there was no direct way to convert the Regional Travel Model information into travel routes that can be entered into the microsimulation tool. Before the Dynamic Traffic Assignment tool was available,

preparing traffic impact estimates was a challenging process, and estimates were sometimes unreliable. To address this issue, Administration adopted the Dynamic Traffic Assignment tool in 2014 to establish a robust modelling process to provide reliable traffic impact estimates for future year projects. Recent applications (e.g. Groat Road Closure traffic impact assessment) of the Dynamic Traffic Assignment tool were very positive. Administration is now pursuing an integrated approach where all these modelling tools will be interactively and progressively used.

In parallel with the Regional Travel Model Update Program and the City Wide Dynamic Traffic Assignment tool development (both programs currently underway), Administration is also keeping pace with advancements of the software platforms for each of these tools. With enhanced computational power, software platforms are much more dynamic and robust at processing large volume of data with greater accuracy. New platforms are faster and provide more opportunities to realistically estimate the travel pattern and traffic impacts.

Irrespective of a robust modelling process, the validity of the assumptions and the input data (e.g., population and employment growth) also play a major role in establishing the credibility of model forecasts. The model system should be considered as a live system and must be continuously refined. Should there be any changes with the original assumptions, forecasts must be updated and communicated to build reliability in the output and confidence with the forecasting process. Administration expects the integrated approach of using the City's three modelling tools interactively, in combination with newly emerging technology and data, will establish a robust process that Council and the public can confidently rely upon for evidence-based decision making.

### **Policy**

*The Way We Move*, Edmonton's Transportation Master Plan:

- Strategic Action 4.1(b): Encouraging land uses that are compatible and complementary to the surrounding transportation network.
- Strategic Action 4.1(c): Designing the transportation network to ensure it is compatible and complementary to the surrounding land uses.

### **Public Consultation**

Administration does not typically undertake public consultation when considering improvements to the City's modelling processes. However, a number of key stakeholder interviews have been undertaken to understand user needs and the output required from the models to ensure that the tools provides good value for users. Updates to the City's modelling process are being undertaken to respond to the needs of users and to enhance value across the corporation and externally. Also, as a regional stakeholder, there have been multiple engagement sessions with Alberta Transportation and Capital Region Board.

### **Budget/Financial Implications**

Currently, the Regional Travel Model update program is funded through the operating budget. Large-scale updates to the model are in progress in associated with the Household Travel Survey program, which is currently conducted every 10 years. Smaller-scale updates to the model are also undertaken on an as-needed and ongoing basis with project-related traffic analysis work.

Work is currently underway to review the merits of converting the Regional Travel Model to a Capital Asset. Implications of this conversion are under review and may be brought forward as part of future capital budget discussions.

The Dynamic Traffic Assignment and Microsimulation tools are updated and maintained through the operating budget.

### **Others Reviewing this Report**

- T. Burge, Chief Financial Officer and Treasurer, and General Manager, Financial and Corporate Services
- D. Wandzura, General Manager, City Operations
- A. Laughlin, General Manager, Integrated Infrastructure Services