Multi-Year Master Transportation Networks

A number of agencies consider the development and maintenance of a multi-year master network an efficient method for developing, storing, managing, updating and accessing the entirety of network related data. A multi-year master network file typically includes a base year network and all future year network alternatives.

Development and Maintenance of Multi-Year Master Networks

E-mail List respondents noted similar means of developing and maintaining multi-year master networks. The general basic steps employed by respondents to develop a master network are as follows:

- *Identify database* that will be used as initial starting point for developing a base year network. Conventional choices are either an existing rectified network or a GIS-based street centerline file that includes all roadway facilities (i.e. an all streets line layer).
- *Define base year network* by identifying relevant components. If the starting point is the all streets layer this may require omitting facilities such as local streets. In the case of an existing network it may require adding or deleting links to correspond to the base year transportation system. In either case, the goal is to identify and include all facilities that appropriately represent the base year network.
- *Add or modify centroid connectors* as needed to account for proper loading of trips.
- *Add new links* that represent future facilities that do not exist in the base year network. Modify or include additional centroid connectors as well for future year or alternative networks.
- *Code network attributes* for each network year. Two options were noted, either code all AB and BA link attributes by year on one link (e.g. lanes 2010 and lanes 2030) or code multiple versions of a link with one version for each year or alternative (e.g. one link with 2010 attributes and a separate link with 2030 attributes).
- *Use a selection flag or filter* to identify appropriate links for a specific year and/or alternative.

Application Procedures

The extraction of a single year network from the master network for model application purposes is accomplished through the use of a selection flag or filter to select the relevant links and attributes required for a specific model year application. One respondent noted that their process includes coding an initial year attribute to designate the year that the facility is operational. Likewise, a delete year attribute is used to disregard links that will no longer exist in a future year network. Upgrade and final year attributes account for network enhancements that occur in interim or final year networks.

One noteworthy observation was the importance of having a means of checking extracted networks for internal consistency. Once an alternative or year specific network has been extracted, it is important to have an automated process perform a sequence of tests to ascertain the integrity of the network.

Benefits

E-mail List respondents noted a number of benefits in maintaining a master multi-year network; these included the following:

- Improves network accuracy by affording effective comparisons between networks;
- Reduces amount of staff resources dedicated to network coding and network maintenance by eliminating the need to store duplicate information for each alternative;

- Provides means of eliminating network errors simultaneously in all networks;
- Ensures consistency and compatibility between network alternatives by automatically incorporating identical modifications for all affected years or alternatives, thereby eliminating unintended differences between network alternatives;
- Offers ability to rapidly develop alternative networks;
- Provides improved means of displaying model results;
- Affords straightforward development of historical records for lane configurations.

Conclusions

The task of creating and maintaining multiple networks appears to be more manageable within a multi-year master network process; a process that has been facilitated with the advent of GIS integrated modeling platforms. Individual year application is a straight forward process; year specific networks can be built by a simple query process. As noted, numerous benefits are derived from maintaining a master network, perhaps none more so than the reduction of network coding time, and the added accuracy and internal consistency among networks. This is especially relevant for large urban area networks that may include numerous alternatives and proposed improvements.