APPENDIX F

Pivoting Process

PIVOTING PROCESS

This memorandum describes a pivoting process used to estimate intersection turning movements for different transportation network and land use scenarios with traffic data generated by the Chittenden County MPO's Regional Transportation Model.

The transportation model is calibrated to existing conditions for the entire County and is often calibrated within corridors or sub-areas for analysis of specific projects. At these levels, the model is calibrated when it predicts traffic volumes on road segments that are reasonably close to actual traffic counts. Regional models are not calibrated to specific turning movements (left, through, right) at intersections because their values are often too small and the level of detail in the model is too coarse. Therefore, it is not advisable to use raw turning movement data from the model for analysis. However, for most transportation planning and engineering studies it is necessary to understand how the components of a scenario (new roads, road widening, new transit service, more development, etc) may affect the operation and design of intersections.

The pivoting process is based on the concept that an existing ground count is the best starting point for estimating scenario traffic volumes at an intersection. It uses the change in volumes estimated by the model to adjust the ground counts. This approach ensures that intersection detail not included in the model (which does not always include all legs of an intersection) is carried forward in scenario volumes and corrects for any anomalies or significant differences between actual turning movements and the turning movements estimated by the model.

There are three inputs to the pivoting process:

- Intersection turning movements from ground counts adjusted to the AM or PM peak hour for a base year (Base Ground);
- Model generated turning movements that correspond to the AM or PM peak hour ground counts (Base Model); and
- Model generated turning movement for the scenario being analyzed (Scenario Model).

In its simplest form, the pivoting process adds the difference between the Scenario Model and Base Model runs to the ground counts as follows:

> **Simple Pivot:**
>
> **Final Turning Movements** = **[**Base Ground Turning Movement**]** plus **[**(Scenario Model Turning Movements) – (Base Model Turning Movements)**]**

The "simple pivot" is used when each turning movement (left, through, right, etc) in the final turning movement is a positive number.

Scenarios that are modeled often reduce traffic through a particular intersection. In some cases, the reduction between the Scenario Model and Base Model volumes may be greater than the Base Ground count for a particular movement or for an entire approach. If the simple pivoting approach is used, the result is a negative turning movement and/or approach. The following methodologies are used for these cases.

When a simple pivot results in a negative number for an entire approach, "proportional pivoting" is applied as follows:

Proportional Pivot:

Final Turning Movement = [Base Ground Turning Movement] multiplied by ratio of [Scenario Model Movement Volume/Base Model Movement Volume]

When a simple pivot results in a negative number for a specific movement, but the entering volume for an entire approach is positive, "super pivoting" is applied to each movement on the approach as follows:

Super Pivot:

Final Turning Movement = [Movement Volume Calculated from Proportional Pivot] multiplied by ratio of [Simple Pivot Approach Volume/Proportional Pivot Approach Volume]

The super pivot is applied to movements calculated using the proportional pivot because its value will always be positive. The super pivot adjustment maintains the total volume entering an approach developed with the simple pivot, but redistributes the traffic so that each movement remains positive.