Time Period Conversion Methodology

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Background

The Moter Vehicle Emission Simulator (MOVES) provides hourly greenhouse gas (GHG) emission rates by speed, vehicle type, and roadway type. The Air Pollution Control Division's (APCD) GHG database combines these emission rates with modeled roadway outputs to estimate annual GHG emissions and evaluate compliance with Colorado's GHG Rule for Transportation Planning.

Because the APCD's GHG database requires hourly roadway volumes and speeds, DRCOG accommodates the regional travel model's 10 time-period outputs into 24 hourly values for each roadway link. DRCOG establishes and documents a methodology for this hourly assignment so that regional travel model outputs can be consistently applied within the APCD's GHG database for GHG emissions calculations.

Methodology

The DRCOG regional travel demand model produces link-level traffic volumes and speeds for ten time periods. Because the MOVES require roadway activities input by hour of day, model outputs are converted to hourly values for the emissions processing. The DRCOG model time periods are shown in Table 1.

Table 1: DRCOG Model Time Periods

Period	Time Range	Duration (Hours)
OP1	11:00 PM - 6:00 AM	7
AM1	6:00 AM - 7:00 AM	1
AM2	7:00 AM - 8:00 AM	1
AM3	8:00 AM - 9:00 AM	1
OP2	9:00 AM - 11:00 AM	2
OP3	11:00 AM - 3:00 PM	4
PM1	3:00 PM - 5:00 PM	2
PM2	5:00 PM - 6:00 PM	1
PM3	6:00 PM - 7:00 PM	1
OP4	7:00 PM - 11:00 PM	4

Hourly traffic volumes are calculated by dividing each modeled period volume equally among the hours within that period. The hourly volume for each link is calculated as:

$$Hourly\ Volume = \frac{Period\ Volume}{Number\ of\ Hours\ in\ Period}$$

The modeled link speed for each time period is assigned to all hours in the represented period. This process preserves the modeled daily traffic volumes and vehicle miles traveled (VMT) while producing the required hourly inputs for the MOVES. Table 2 shows the process of converting from the DRCOG modeled 10 time periods into the 24-hour required by the MOVES.

Table 2: Conversion of DRCOG Model Time Periods for MOVES Calculations

Period	Hour	Start Hour	End Hour	Period Name	Divide Period Volume By
11:00 PM - 6:00 AM	1	12:00 AM	1:00 AM	OP1	7
11:00 PM - 6:00 AM	2	1:00 AM	2:00 AM	OP1	7
11:00 PM - 6:00 AM	3	2:00 AM	3:00 AM	OP1	7
11:00 PM - 6:00 AM	4	3:00 AM	4:00 AM	OP1	7
11:00 PM - 6:00 AM	5	4:00 AM	5:00 AM	OP1	7
11:00 PM - 6:00 AM	6	5:00 AM	6:00 AM	OP1	7
6:00 AM - 7:00 AM	7	6:00 AM	7:00 AM	AM1	1
7:00 AM - 8:00 AM	8	7:00 AM	8:00 AM	AM2	1
8:00 AM - 9:00 AM	9	8:00 AM	9:00 AM	AM3	1
9:00 AM - 11:00 AM	10	9:00 AM	10:00 AM	OP2	2
9:00 AM - 11:00 AM	11	10:00 AM	11:00 AM	OP2	2
11:00 AM - 3:00 PM	12	11:00 AM	12:00 PM	OP3	4
11:00 AM - 3:00 PM	13	12:00 PM	1:00 PM	OP3	4
11:00 AM - 3:00 PM	14	1:00 PM	2:00 PM	OP3	4
11:00 AM - 3:00 PM	15	2:00 PM	3:00 PM	OP3	4
3:00 PM - 5:00 PM	16	3:00 PM	4:00 PM	PM1	2
3:00 PM - 5:00 PM	17	4:00 PM	5:00 PM	PM1	2
5:00 PM - 6:00 PM	18	5:00 PM	6:00 PM	PM2	1
6:00 PM - 7:00 PM	19	6:00 PM	7:00 PM	PM3	1
7:00 PM - 11:00 PM	20	7:00 PM	8:00 PM	OP4	4
7:00 PM - 11:00 PM	21	8:00 PM	9:00 PM	OP4	4
7:00 PM - 11:00 PM	22	9:00 PM	10:00 PM	OP4	4
7:00 PM - 11:00 PM	23	10:00 PM	11:00 PM	OP4	4
11:00 PM - 6:00 AM	24	11:00 PM	12:00 AM	OP1	7