APPENDIX

J VISSIM MODEL CALIBRATION AND RESULTS

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1 VISSIM MODEL CALIBRATION AND ASSUMPTIONS

A model of the Interstate I-65/I-264 Interchange was developed using VISSIM 10.00-16. As the Kentucky Transportation Cabinet (KYTC) is in the process of implementing a Microsimulation Standards and Guidelines manual, this report is provided to document the depth of calibration and replicability of model networks that KYTC wants to produce. It should be noted that a detailed explanation of the development of base year traffic volumes, origin-destination (O-D) matrices, growth rates and future year traffic volumes can be found in **Appendix C-Traffic Forecast** of the main I-65/I-264 Interchange Report. Modeling efforts included several layers of calibration to accurately portray existing measures of effectiveness (MOEs), and more finely detail characteristics of the interchange as they exist today. Multiple MOEs were processed to calibrate the model to accurately reflect real-life existing conditions of the network, such as volume throughput, speed, and Level of Service (LOS) comparisons. The modeling team understands that not all interchanges operate the same: roadway characteristics, lane utilization, grade, driver aggression, etc. are some examples of how a microsimulation model can more precisely illustrate the conditions in an area. WSP USA Inc. (WSP) evaluated the interchange using the defaults in VISSIM to get an understanding of what needed calibrating and what would need to be assumed to allow the model to best reflect existing conditions.

The modeling team is defining assumptions differently than standardizations. Both are necessary in calibrating, but, for this memo, an assumption can be viewed as a metric that is too broad or vast to precisely define within the scope of this project, while a standardizing effort is based around hard data or known factors. For example, an assumption was made with regards to desired speed distributions. Speed distributions are used for Desired Speed Decisions, locations where the speed limit changes, and wherever Reduced Speed Areas are used, such as on a ramp. The speed vehicles choose to travel are set by bounds that were chosen by the modeling team to portray the range of speeds vehicles travel in real life. An example of standardization is vehicle routing. WSP created a network of O-D zones for each entry and exit point coded in the network. O-D pairs were created based on Streetlight Data. Vehicles enter the network and are given a destination pair based on the relative number of vehicles arriving at each destination. The model runs numerous times with vehicles testing the various paths between each origin and destination. With each run, the paths are stored, and vehicles then change their routes based on the travel time of each path. The model is run until an equilibrium is reached, at which point vehicle paths are set. This process creates realistic traffic patterns that imitate what might be found in the system network.

1.1 ASSUMPTIONS

DISTRIBUTIONS

VISSIM uses a series of distributions to account for the variance that occurs in the real-world. These distributions assist in tuning the model to what is true in the network. A network speed comparison between 2019 HERE data collected within the network and model speeds along concurrent segments are shown in section 1.3. HERE collects data from over 100,000 sources to provide an accurate digital representation of world traffic operations.

Speed curves – VISSIM uses Desired Speed Decisions and Reduced Speed Areas to determine vehicle speeds throughout the model. Speed decisions assign the speed of a vehicle once it passes through that point. Vehicles will keep that desired speed, or regain that speed, during free flow. There is a qualifier for this feature; vehicle types can be defined in the decision, which allows different vehicle types to follow different speed decisions or for vehicles without designations to ignore the speed decision altogether. Reduced Speed Areas are coded to determine the speed of vehicles over a specified length, such as a curve with a lower design speed. Once Speed Decisions and Reduced Speed Areas are coded, speed curves determine the range of speed vehicles can travel and the percentage of vehicles that are assigned to the speed under the curve. VISSIM's default settings typically set a range of ± 5 miles per hour (mph) from the identified speed. This standard is not frequently seen in real-life networks. The speed distribution for "45 mph" is shown in **Figure 1**. 90% of traffic is programed at or below 45 mph. **Figure 2** shows the modified ramp speeds that more closely represent study area traffic at some of the slower moving ramps. This specific speed decision was created to address a problematic ramp curve, I-264 westbound to I-65 southbound. The speed

distribution was created based on field observed speeds by the modeling team. The lower bound is set to 15 mph and the upper bound is set to 20 mph. The distribution puts 77% of vehicles under 18 mph (between 15-18 mph), and a linear distribution again between 18 and 20 mph. The distribution change allows for some more aggressive drivers to travel at the upper threshold, while most take a more cautious approach to the ramp as is seen in the existing network.

Figure 1: Default 45 mph Speed Distribution

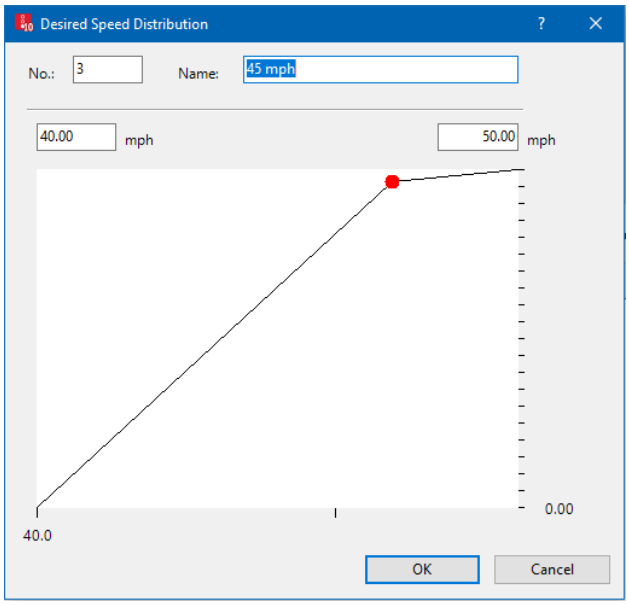
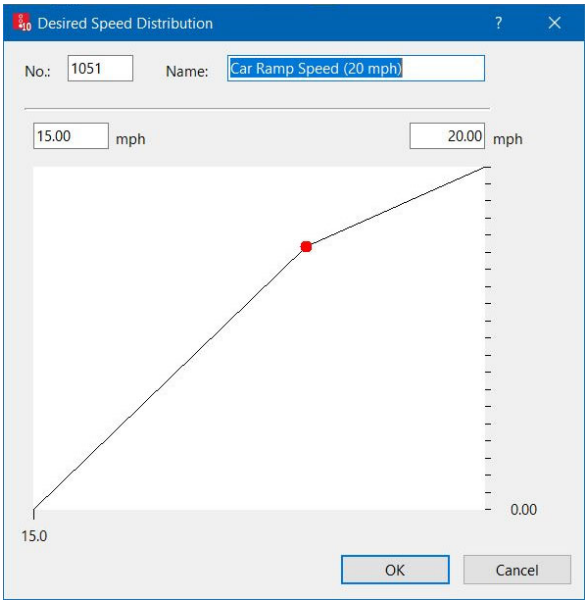


Figure 2: Modified Speed Distribution for Study Area Ramps



VEHICLE TYPE

The Streetlight data collected for this project showed that car, bus, and truck patterns were different enough to develop three separate O-D matrices. Moreover, O-D matrices were coded in 30-minute bins between 3:00-5:30 PM; therefore, 15 total matrices were composed. The vehicle type breakdown of vehicles in the network is dependent on location and time. The North American Fleet vehicles were imported into this model to imitate actual vehicles in the network.

ROUTING AND THROUGHPUT

In modeling scenarios with dynamic traffic assignment, vehicle routing and segment volumes manifest new results until an equilibrium between travel times and O-D pairs is reached. Vehicles choose new paths to reach their destination based on numerous previous model runs. Once an equilibrium is reached, vehicle routes are set and do not change. Because the model gets vehicles from their origin to their destination in the most efficient manner, throughput may not equal the expected values within the network based on traffic counts. Volume processed at the entry and exit points of the model are closer to the expected values because the origin and destination values are set all the time. **Table 1** shows the volume throughput for the outer segments of the model network. The entry volume at the eastern portion of the network (westbound entry) shows 16% lower processed volume than the expected balanced volume. This result is indicative of significant levels of congestion at this point in the westbound direction. A comparison difference between balanced and expected volume within 10-20% is typically considered acceptable in a base model after calibration. Only a single location experiences this difference before volumes reach the desired 10% threshold. Understanding the base model is representative of a normal, typical peak hour within the existing network, not a replication of it, volumes within 20% at all key locations of a highly congested network are considered acceptable for modeling purposes. A full breakdown of the model throughput results is found in Section 1.3.

Table 1: Base Model Volume Throughput Results

Segment	VISSIM OUTPUT				
	Data Collection Group	Total Balanced Volume	% Difference	Total Processed Volume	GEH
F1 I-264 EB @ Crittenden	1	5206	-2%	5295	1.2
F6 I-264 EB after Poplar Level	32	7329	0%	7293	0.4
F7 I-264 WB before Poplar Level	37	5391	16%	4521	12.4
F13 I 264 WB after Crittenden Dr	75	4815	9%	4378	6.4
F14 I 65 NB before Grade Lane	80	5683	0%	5689	0.1
F18 I-65 NB after I-264 Merge	101	3827	3%	3723	1.7
F19 I-65 SB before Phillips Lane Exit	106	5384	0%	5375	0.1
F23 I-65 SB after Grade Lane Merge	133	7415	4%	7155	3.0

VISSIM Processed within ±10% Balanced Expected Volume	VISSIM Processed within ±20% Balanced Expected Volume	VISSIM Processed outside ±20% Balanced Expected Volume

CONNECTOR PARAMETERS

Connector Parameters are an important part of the decision-making process for vehicles in the system. Two primary attributes for model calibration within connector options are Emergency Stop Distance and Lane Change Distance.

EMERGENCY STOP DISTANCE

The Emergency Stop Distance is the distance vehicles are programmed to stop before the connector if it cannot reach the lane before the connector. The Emergency Stop distance can help vehicles in tight areas organize when the roadway begins to be over capacity. Setting connector Emergency Stop Distances at a slightly higher distance can give vehicles more room to accelerate into the connector and allow speed to build back up. Where the modeling team found the Emergency Stop Distance to be an issue, the default 16.4 feet was increased to 50 feet. The emergency stop distance increase mitigated much of the congestion in the westbound direction with multiple crossing conflicts frequently not allowing vehicles to complete their decision as they approach the end of a decision point.

LANE CHANGE DISTANCE

Lane Change Distance is the distance vehicles begin to look ahead to change into the lane(s) of the connector they are programmed to travel through. Setting this value higher allows vehicles to start processing the change with more time. If the value is too low, vehicles may not have enough time to make the lane change before reaching the Emergency Stop Distance, leading vehicles to stop in the road. The default Lane Change Distance is set at 656.2 feet before the connector. Within the I-65/264 model, the modeling team set Lane Change Distance back to the nearest signage from the decision point. This creates a scenario where vehicles begin to make lane change decisions as typical drivers would when reading road signage. The reason for this increase is to more accurately portray real lane change patterns (lane drop locations, weaving, diverging) based on existing operations. Standard values for Lane Change Distances are currently being researched by KYTC in the VISSIM/Microsimulation Parameters Guideline Manual. **Table 2** on the following page shows the connectors in VISSIM with custom Lane Change Distances.

Table 2: Base Model Connector Lane Change Distances

Number	Name of Connection	Lane Change Distance (ft)
10006	I-264 EB to I-264 EB at Diverge to Crittenden	2,000
10007	I-264 EB to Ramp at Diverge to Crittenden	2,000
10040	I-264 EB to CD Road at Diverge to CD	6,600
10041	WB CD Road to Crittenden	2,000
10042	WB CD Road to I-264 WB	1,200
10059	I-264 EB CD Road to Terminal Drive	1,200
10081	I-264 EB CD Road to I-65 SB	2,500
10082	I-264 EB CD Road to I-264 EB CD Road	2,500
10087	I-65 SB to I-264 WB Ramp	10,560
10099	I-65 SB to I-264 EB Ramp	3,960
10110	I-65 NB to Freedom Way	7,920
10117	I-65 NB CD Road to I-65 NB	1,300
10129	I-264 WB to I-264 WB at Diverge to CD Road	1,800
10130	I-264 WB to CD Road at Diverge to CD Road	1,800
10131	I-264 WB Exit Ramp to I-65 SB Loop Ramp	1,500
10136	I-65 NB CD Road to I-65 NB CD Road at Ramp to (KY 61) Preston Hwy	1,600
10137	I-65 NB CD Road to I-264 EB	1,500
10141	I-65 SB Ramp to Grade Lane	3,960
10151	I-65 NB Ramp to Preston Hwy	9,240
10154	I-65 NB to I-65 NB at Diverge to CD Road	1,500
10155	I-65 NB to CD Road	10,560
10159	I-264 WB to I-264 WB at Diverge to I-65 Exit Ramp	1,840
10160	I-264 WB to I-65 at Diverge to I-65 Exit Ramp	1,850
10169	I-264 EB to I-264 EB at Diverge to Poplar Level	3,000
10170	I-264 EB to Poplar Level at Diverge to Poplar Level	2,500
10182	Poplar Level NB LT to I-264 WB Ramp	1,000
10185	Poplar Level SB LT to I-264 EB Ramp	1,000
10202	I-264 WB to Poplar Level at Diverge to Poplar Level	5,280
10236	I-65 Merge on Ramp Approaching I-264 EB	800
10237	Poplar Level Ramp Merge on Ramp to I-264 EB	800
10265	I-264 WB Merge with CD Road and I-264 WB	1,500

DRIVING BEHAVIOR

Driving behaviors are sets of defined values that are programmed into the roadway. An example of a VISSIM default driving behavior is the “Urban” selection. The default Urban (motorized) behavior is different from the

Freeway behavior in that the attributes of each are intended to emulate typical decision-making processes of drivers in those situations. The two behavior sets consist of two different car following models, Urban uses Wiedemann 74 while Freeway uses Wiedemann 99. These models utilize different parameter settings to attain the desired car following behaviors in the specified roadway. These options are pre-tuned parameters. Some of these parameters include look ahead distance, look back distance and lane change parameters to make vehicles interact with each other more cohesively and aggressively. Urban and Freeway Driving Behaviors were the only chosen behaviors within this model for calibration purposes, as it was determined that additional types were not necessary. The individual default settings within both behaviors remained unchanged.

LINK BEHAVIOR

Link behavior is the chosen Driving Behavior of each link. This behavior is important as vehicles tend to change their aggressiveness based on the decisions, geometry, and roadway characteristics ahead. When a vehicle travels onto a new link, it takes on the behaviors of the defined link. As noted, the only chosen driving behaviors in this model were Urban and Freeway. All interstate and ramp segments were defined as Freeway, while all arterials were defined as Urban.

1.2 STANDARDIZATIONS

VEHICLE INPUTS

Though the Vehicle Input control was not used in this model, vehicles are coded into the model through matrices, discussed below. Vehicle types (lights, busses, and trucks) are determined using multiple matrices which specifically call each type individually. These breakdowns were based on StreetLight data from each entry point over 30-minute periods; therefore, vehicle type breakdowns are representative of what is seen in the existing network. Further discussion on this topic is found in the Traffic Forecast document.

VEHICLE MODEL BREAKDOWN BY TYPE

Three vehicle types are used in the VISSIM model network: Car, Truck (HGV) and Bus. VISSM includes a default package of vehicles to simulate real-life vehicles in the network. The modeling team used the default North American Fleet package. The breakdowns of each vehicle type/model are shown in **Tables 3** through **5**. The share shown is a relative percent compared to 1. The sum of the share between models does not need to equal 1.

Table 3: Vehicle Model Breakdown for Cars in North American Fleet

Share	Model
0.129	1: Car - Honda Accord
0.06	2: Car - Nissan Altima
0.064	3: Car - Nissan Quest
0.055	4: Car - Plymouth Voyager
0.135	5: Car - Toyota Avensis
0.106	6: SUV - Ford Explorer
0.05	7: SUV - GMC Yukon
0.058	8: SUV - Jeep Grand Cherokee
0.151	11: LtTruck - Chevrolet Silverado
0.151	12: LtTruck - Ford F150

Table 5: Vehicle Model Breakdown for Busses in North American Fleet

Share	Model
0.1	31: Bus - EU Standard

Table 4: Vehicle Model Breakdown for Trucks in North American Fleet

Share	Model
0.105	21: HGV - US AASHTO WB-40
0.48	22: HGV - US AASHTO WB-50
0.045	23: HGV - US AASHTO WB-65
0.045	24: HGV - US AASHTO WB-67
0.05	25: HGV - Flatbed
0.275	26: HGV - EU 04

PARKING LOTS

Parking Lots were coded as Zone Connectors. The Zones are coded into the O-D list as Origin Zones and Destination Zones. Matrices are formed in VISSIM based on these O-D Pairs. Vehicle volumes are entered into each matrix for determined time periods. Time periods were 30-minute intervals for this model. This is the process used for matching entry/exit volumes in the network.

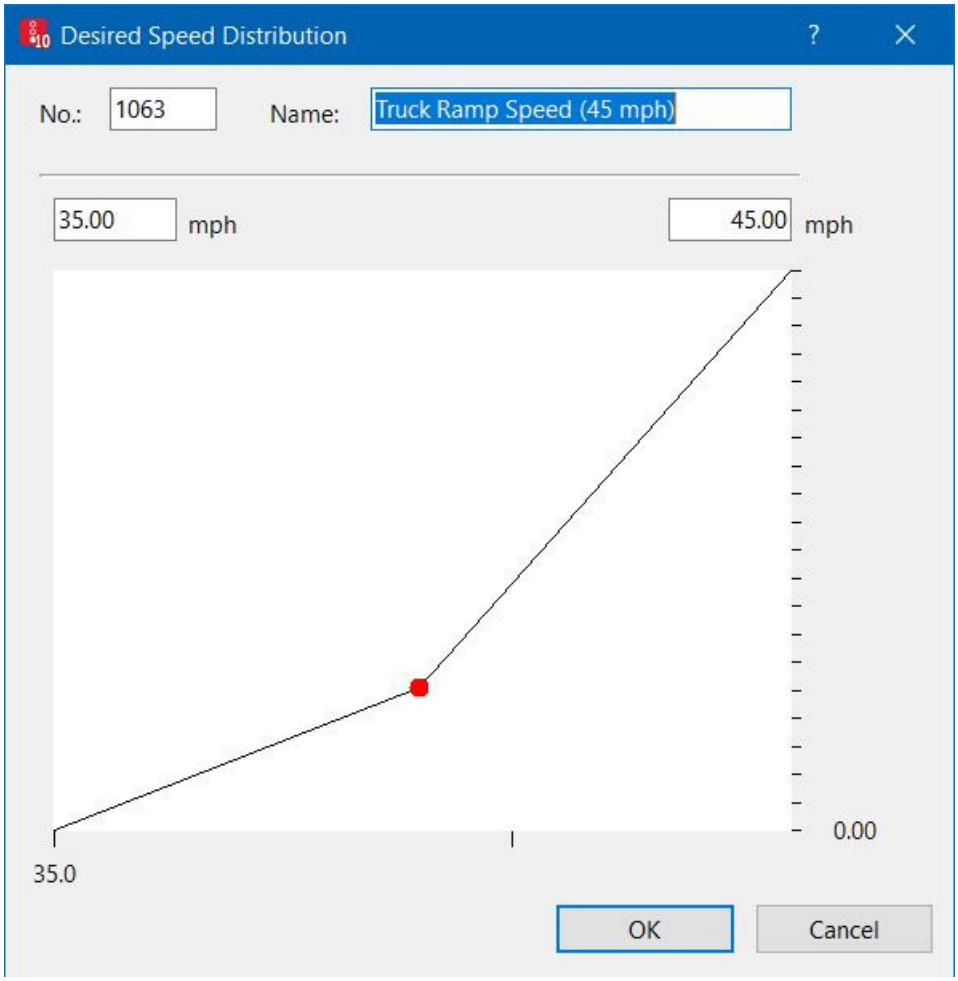
MATRICES

WSP used an O-D matrix based on Streetlight Data, to determine the breakdown of vehicles' start and endpoints. As a vehicle enters the model, it is assigned an endpoint, and, after numerous runs, an equilibrium is eventually reached which determines the route(s) and usage. Vehicles enter the model relative to the total number of vehicles coming from that origin and are assigned destinations in the same relative manner of number of vehicles at each destination.

SPEED DECISIONS/REDUCED SPEED AREAS

As Speed Curves are assumed to determine minimum and maximum speeds, as well as the distribution between the two, Speed Decisions and Reduced Speed Areas are coded based on speed limit and reduced speed warning signs. **Figure 2** illustrates the percent of trucks travelling the desired speed based on the curve and thresholds.

Figure 3: Truck Ramp Speed Example



CONFLICT AREAS

Conflict areas are used to determine the way vehicles interact with each other when they are approaching a point of conflict. Conflict areas are typically used to aid intersection operations when vehicles can conflict with one another. In this model, they are also coded into a few diverge locations. This is an added precaution that allows vehicles proceeding through the mainline to continue first while the diverge movement stops.

VEHICLE ROUTE CLOSURES

Closures are coded to disallow potential vehicle routes that vehicles may take based on the algorithms that VISSIM runs to get a vehicle from point A to point B in the most efficient way. The purpose of doing this is to prevent vehicles from executing routes that would not be considered valid routes. **Figure 3** shows a Vehicle Route Closure in the I-65/264 model created to prevent vehicles from exiting I-264 westbound on the ramp approaching the Louisville Muhammad Ali International Airport and Crittenden Drive and using the on-ramp back to I-264 westbound.

Figure 4: System-Long Vehicle Routes

1.3 BASE MODEL RESULTS

Detailed tables in the following sections illustrate the results from the base model. The base model network is a representation of the existing, base year 2020, PM (4:00-5:00) peak hour. MOE results collected included volume throughput, speed, density, and LOS for the traffic analysis.

1.3.1 VOLUME THROUGHPUT

Volume throughput is collected to ensure that the entered vehicular input matches the field observed throughput. This measure allows for an easy check to make sure that model operations function as desired. When volume throughput is significantly different than the expected (field) volume, errors that may exist consist of the following:

- Vehicle Input, Route Decisions, or O-D matrices may be inaccurate;
- geometry may be incorrectly coded, causing unusual traffic patterns or congestion; or,
- the model may not be able to process the volume due to over-saturation.

Typically, locations that fall within 10% (cells in green) of the balanced volume are considered acceptable, while between 10-20% (cells in yellow) shows locations that need to be verified or if VISSIM could not process the required volume, and anything outside of 20% (cells in red) should be inspected. The GEH statistic (from Geoffrey E. Havers) is an empirical formula allowing multiple sets of varying traffic volumes to be compared. The acceptable range for GEH is typically between 0.0-5.0. GEH values ranging between 5.0-10.0 may show reason to investigate further; however, GEH greater than 10.0 likely show an issue with the data or the model.

The volume comparison table is shown in **Table 6**. In the table, processed volume is within reasonable requirements for much of the network. The locations with volumes outside of a 10% difference correspond to locations with GEH values greater than 5.0. These occur where significant congestion occurs both in the model and in actual conditions, mostly in the westbound direction beginning at the I-264 westbound exit ramps to I-65. The I-264 westbound segment leading to the I-65 ramps is a weave segment, causing disruptions in vehicle travel. Another major issue occurring at this location is the geometric configuration of the loop ramp connecting to I-65 southbound. The diverge section of I-264 westbound to Phillips Lane experiences the greatest difference in volume processed, which is a result of the congestion preceding it causing vehicles to be stuck in traffic and unable to reach their destination during the simulation period. The model is representative of existing field conditions.

Calibration of the network is intended to lead to a model that is representative of typical traffic operations, not necessarily the exact replication of a dataset. The model volume throughput shows differences in excess of 10% (and even 30% in one location where volumes are lower) in the westbound direction along I-264, due to congestion that occurs in both the model network and in the field. This congestion that is representative of real-world conditions prevents vehicles from being able to complete their routes during the hour-long simulation which accounts for the difference in model throughput and balanced network volumes. Results of the model is representative of the overall study area network.

Table 6: Base Model Volume Throughput Comparison

Segment	VISSIM OUTPUT				
	Data Collection Group	Total Balanced Volume	% Difference	Total Processed Volume	GEH
F1 I-264 EB @ Crittenden	1	5206	-2%	5295	1.2
D1 I-264 EB Ramp to Crittenden	5	416	-2%	423	0.3
F2 I-264 EB	7	4790	-2%	4885	1.4
D2 I-264 EB to Phillips Lane	10	1710	0%	1718	0.2
F3 I-264 EB	11	3080	-2%	3152	1.3
M1 I-264 EB from Airport	14	794	6%	750	1.6
F4 I-264 EB	15	3874	-1%	3896	0.4
I-264 EB from I-65 NB	18	3189	-1%	3226	0.7
W1 I-264 EB between I-65 and Poplar Level Rd	20	7063	-1%	7131	0.8
I-264 EB Exit to Poplar Level	25	934	-1%	947	0.4
F5 I-264 EB between Poplar Level Ramps	27	6129	-1%	6205	1.0
M2 Poplar Level On Ramp to I-264 EB	31	1137	4%	1090	1.4
F6 I-264 EB after Poplar Level	32	7329	0%	7293	0.4
F7 I-264 WB before Poplar Level	37	5391	16%	4521	12.4
D3 I-264 WB Exit to Poplar Level	41	771	16%	644	4.8
F8 I-264 WB between Poplar Level Ramps	42	4620	17%	3847	11.9
Poplar Level On Ramp to I-264 WB	46	1207	5%	1148	1.7
W2 I-264 WB between Poplar Level and I-65	48	5827	16%	4898	12.7
I-264 WB Ramp to I-65	53	2290	17%	1893	8.7
F9 I-264 WB between I-65 and Phillips Lane	55	3537	16%	2981	9.7
D4 I-264 WB Ramp to Phillips Lane	59	666	32%	455	8.9
F10 I-264 WB between Phillips Lane and I-65 SB Merge	61	2871	12%	2525	6.7
M3 I-65 SB Merge with I-264 WB	64	186	2%	183	0.2
F11 I-264 WB between I-65 SB and Phillips Lane Merge	65	3057	11%	2713	6.4
M4 Phillips Lane On Ramp to I-264 WB	68	1546	7%	1439	2.8
F12 I-264 WB between Phillips Lane and Crittenden Dr	70	4603	10%	4161	6.7
M5 Crittenden Dr On Ramp to I-264 WB	74	212	1%	210	0.1
F13 I 264 WB after Crittenden Dr	75	4815	9%	4378	6.4
F14 I 65 NB before Grade Lane	80	5683	0%	5689	0.1
D5 I 65 NB Exit to Grade Lane	85	358	0%	359	0.1
F15 I-65 NB at Grade Lane	86	5325	0%	5321	0.1
D6 I-65 NB to I-264 EB	91	2592	0%	2591	0.0
F16 I-65 NB to I-264 WB	92	2733	0%	2737	0.1
D7 I-65 NB Exit to I-264 WB	95	69	-4%	72	0.4
F17 I-65 NB after I-264 Exit	96	2664	0%	2664	0.0
M6 I-264 to I-65 NB	99	1163	8%	1065	2.9
F18 I-65 NB after I-264 Merge	101	3827	3%	3723	1.7
F19 I-65 SB before Phillips Lane Exit	106	5384	0%	5375	0.1
D8 Phillips Lane Exit from I-65 SB	110	374	0%	373	0.1
F20 I-65 SB after Phillips Lane Exit	111	5010	0%	5011	0.0
D9 I-65 SB to I-264 EB	115	1099	-1%	1111	0.4
F21 I-65 SB before I-264 Merge	116	3911	0%	3895	0.3
W3 I-65 SB between I-264 EB ramp and Grade Lane Exit	121	7258	3%	7030	2.7
F22 I-65 SB between Grade Lane Ramps	127	6820	3%	6584	2.9
M7 Grade Lane merge to I-65 SB	132	595	3%	577	0.7
F23 I-65 SB after Grade Lane Merge	133	7415	4%	7155	3.0

VISSIM Processed within ±10% Balanced Expected Volume	VISSIM Processed within ±20% Balanced Expected Volume	VISSIM Processed outside ±20% Balanced Expected Volume

1.3.2 SPEED

As part of the data collection, HERE Speed data was provided by KYTC for the study area. HERE data is based on GPS usage and data usage. HERE determines average speed over given segments defined by mile points. WSP aligned HERE segments with VISSIM links to evaluate a speed comparison between the model and existing network speeds. Speed was used as a qualitative comparison of the base network conditions.

The speed comparison results are shown in **Table 7**. Speed is impacted by model conditions as well as network settings. Speed is typically used as a check for the model conditions to gain an understanding of where congestion is occurring and if the model operations are running as the existing network is. The results are also depicted in **Figures 4** and **5**. The modeling team evaluated speed comparisons using ranges of 5 mph intervals. VISSIM measured speeds within ±5 mph are green, ±10 mph are yellow, and outside of ±10 mph are red. Many of the areas that experience the greatest difference in speed are in heavily congested areas or areas where multiple "decisions" are being made in short distances. VISSIM often incurs issues when the network is oversaturated. For example, segments 12-15 are all outside of 10 mph of the expected speeds. I-264 westbound experiences both factors of multiple decisions being made in a short distance as well as heavy congestion, resulting in an oversaturated condition. For the model to have realistic levels of queueing, the speeds must be lower than the field measured speeds. After the weave to I-65, when congestion dissipates both in the model and in actual conditions, VISSIM and HERE speeds align much more closely. There are several areas throughout the model where model speeds are lower than field measured speeds, however the model queuing represents field conditions accurately.

Table 7: Base Model Speed Comparison Results

Segment Number	Link	Type	VISSIM Avg Speed	HERE Avg Speed
1	F1 I-264 EB @ Crittenden	Freeway	37.8	45.8
2	D1 I-264 EB Ramp to Crittenden	Diverge	33.6	46.4
3	F2 I-264 EB	Freeway	49.4	47.2
4	D2 I-264 EB to Phillips Lane	Diverge	49.0	48.5
5	F3 I-264 EB	Freeway	58.5	58.0
6	M1 I-264 EB from Airport	Merge	43.0	56.2
7	F4 I-264 EB	Freeway	54.8	53.9
8	W1 I-264 EB between I-65 and Poplar Level Rd	Weave	40.6	50.8
9	F5 I-264 EB between Poplar Level Ramps	Freeway	56.7	53.3
10	M2 Poplar Level On Ramp to I-264 EB	Merge	57.9	52.4
11	F6 I-264 EB after Poplar Level	Freeway	58.9	56.8
12	F7 I-264 WB before Poplar Level	Freeway	18.5	32.8
13	D3 I-264 WB Exit to Poplar Level	Diverge	18.0	33.9
14	F8 I-264 WB between Poplar Level Ramps	Freeway	11.9	31.4
15	W2 I-264 WB between Poplar Level and I-65	Weave	10.4	36.6
16	F9 I-264 WB between I-65 and Phillips Lane	Freeway	52.4	50.9
17	D4 I-264 WB Ramp to Phillips Lane	Diverge	56.3	55.2
18	F10 I-264 WB between Phillips Lane and I-65 SB Merge	Freeway	58.7	59.1
19	M3 I-65 SB Merge with I-264 WB	Merge	52.6	60.3
20	F11 I-264 WB between I-65 SB and Phillips Lane Merge	Freeway	58.5	61.0
21	M4 Phillips Lane On Ramp to I-264 WB	Merge	53.3	60.1
22	F12 I-264 WB between Phillips Lane and Crittenden Dr	Freeway	58.6	59.9
23	M5 Crittenden Dr On Ramp to I-264 WB	Merge	58.8	60.5
24	F13 I 264 WB after Crittenden Dr	Freeway	59.2	60.6
25	F14 I 65 NB before Grade Lane	Freeway	58.3	58.2
26	D5 I 65 NB Exit to Grade Lane	Diverge	54.8	56.7
27	F15 I-65 NB at Grade Lane	Freeway	43.6	56.0

Segment Number	Link	Type	VISSIM Avg Speed	HERE Avg Speed
28	D6 I-65 NB to I-264 EB	Diverge	58.2	54.8
29	F16 I-65 NB to I-264 WB	Freeway	58.2	60.4
30	D7 I-65 NB Exit to I-264 WB	Diverge	58.6	61.1
31	F17 I-65 NB after I-264 Exit	Freeway	58.6	60.0
32	M6 I-264 to I-65 NB	Merge	56.8	57.2
33	F18 I-65 NB after I-264 Merge	Freeway	58.6	56.4
34	F19 I-65 SB before Phillips Lane Exit	Freeway	58.5	52.6
35	D8 Phillips Lane Exit from I-65 SB	Diverge	57.6	53.4
36	F20 I-65 SB after Phillips Lane Exit	Freeway	55.1	52.9
37	D9 I-65 SB to I-264 EB	Diverge	42.7	53.4
38	F21 I-65 SB before I-264 Merge	Freeway	57.6	58.0
39	W3 I-264 to I-65 SB	Weave	54.9	57.6
40	F22 I-65 SB between Grade Lane Ramps	Freeway	57.7	59.6
41	M7 Grade Lane merge to I-65 SB	Merge	58.2	60.3
42	F23 I-65 SB after Grade Lane Merge	Freeway	58.8	60.3
43	W4 I-264 EB CD Road b/w 3rd and Crittenden	Weave	51.0	36.1
44	CD1 I-264 EB CD Road	Collector-Distributor	43.1	38.3
45	D10 I-264 EB CD Ramp to I-65 SB	Diverge	25.8	38.3
46	CD2 I-264 EB CD Road	Collector-Distributor	51.1	51.1
47	D11 I-264 EB CD Ramp to I-65 NB	Diverge	37.3	51.1
48	M8 Crittenden to I-264 WB CD	Merge	53.8	58.2
49	CD3 CD to I-264 WB	Collector-Distributor	54.5	58.2
50	W5 I-264 WB b/w Crittenden and 3rd	Weave	47.7	58.7
51	CD4 I-65 NB b/w Preston Ramps	Collector-Distributor	51.1	44.9
52	W6 b/w Preston Hwy and I-264 EB Ramp	Weave	27.5	44.5
53	CD5 I-65 NB b/w I-264 EB-WB Ramps	Collector-Distributor	49.8	52.6
54	D12 I-65 NB b/w I-264 EB-WB Ramps	Diverge	49.8	52.6

VISSIM Spd ± 5mph HERE Spd	VISSIM Spd ± 10mph HERE Spd	VISSIM Spd outside 10mph HERE Spd

Figure 5: Average Link Speed - VISSIM

Figure 6: Average Segment Speed - HERE Data

1.3.3 DENSITY AND LOS

In VISSIM, density is recorded by lane on each connector. Density and LOS are used to address existing capacity issues and identify bottleneck locations as well as compare future No-Build and Build conditions. **Table 8** shows the different thresholds in the study area network.

Table 8: LOS Thresholds for Freeway Segments

Freeway	Freeway Weave	CD Weave	Merge/Diverge
Density	Density	Density	Density
A≤11	A≤10	A≤12	A≤10
11<B≤18	10<B≤20	12<B≤24	10<B≤20
18<C≤26	20<C≤28	24<C≤32	20<C≤28
26<D≤35	28<D≤35	32<D≤36	28<D≤35
35<E≤45	E>35	E>36	E>35
F>45			

Table 9 shows the average density and LOS results from the final base model. The cell color of the average LOS column in each segment matches the legend in **Figure 6.** The results below will be used as a basis for comparison for future No-Build and Build models. The results are mapped as well in **Figure 6**. Study area segments are typically experiencing similar density and LOS results as in HCS, shown in the **Interchange Report**. Variation in the result sets is due the difference in how each software functions to obtain its measurements. HCS independently evaluates segments based on demand and geometry of the segment while VISSIM simulates traffic operations concurrently as a network.

These segments will be used to determine areas of focus for the development of potential improvement strategies. LOS results at E and F typically correspond with the same areas in the network experiencing large speed discrepancies. These areas are experiencing the most congestion in VISSIM because of weaving conditions, high traffic volumes and multiple route decisions over a short distance; the density and LOS results confirm this.

Figure 7 is a map comparing the VISSIM measured speed over the collected HERE speed to show a direct difference between the two networks.

Table 9: Base Model Density and LOS Results

Segment Number	Link	Type	Avg Density	Avg LOS
1	F1 I-264 EB @ Crittenden	Freeway	40.1	E
2	D1 I-264 EB Ramp to Crittenden	Diverge	48.2	E
3	F2 I-264 EB	Freeway	33.4	D
4	D2 I-264 EB to Phillips Lane	Diverge	28.7	D
5	F3 I-264 EB	Freeway	18.0	C
6	M1 I-264 EB from Airport	Merge	24.6	C
7	F4 I-264 EB	Freeway	23.6	C
8	W1 I-264 EB between I-65 and Poplar Level Rd	Weave	37.6	E
9	F5 I-264 EB between Poplar Level Ramps	Freeway	27.2	D
10	M2 Poplar Level On Ramp to I-264 EB	Merge	24.6	C
11	F6 I-264 EB after Poplar Level	Freeway	10.8	A
12	F7 I-264 WB before Poplar Level	Freeway	108.7	F
13	D3 I-264 WB Exit to Poplar Level	Diverge	112.2	E
14	F8 I-264 WB between Poplar Level Ramps	Freeway	122.5	F
15	W2 I-264 WB between Poplar Level and I-65	Weave	107.8	E
16	F9 I-264 WB between I-65 and Phillips Lane	Freeway	14.1	B
17	D4 I-264 WB Ramp to Phillips Lane	Diverge	13.0	B
18	F10 I-264 WB between Phillips Lane and I-65 SB Merge	Freeway	14.2	B
19	M3 I-65 SB Merge with I-264 WB	Merge	13.6	B
20	F11 I-264 WB between I-65 SB and Phillips Lane Merge	Freeway	15.5	B
21	M4 Phillips Lane On Ramp to I-264 WB	Merge	15.9	B
22	F12 I-264 WB between Phillips Lane and Crittenden Dr	Freeway	17.6	B
23	M5 Crittenden Dr On Ramp to I-264 WB	Merge	14.8	B
24	F13 I 264 WB after Crittenden Dr	Freeway	11.6	B
25	F14 I 65 NB before Grade Lane	Freeway	19.7	C
26	D5 I 65 NB Exit to Grade Lane	Diverge	21.5	C
27	F15 I-65 NB at Grade Lane	Freeway	32.6	D
28	D6 I-65 NB to I-264 EB	Diverge	13.7	B
29	F16 I-65 NB to I-264 WB	Freeway	15.7	B
30	D7 I-65 NB Exit to I-264 WB	Diverge	15.5	B
31	F17 I-65 NB after I-264 Exit	Freeway	15.0	B
32	M6 I-264 to I-65 NB	Merge	12.6	B
33	F18 I-65 NB after I-264 Merge	Freeway	15.8	B
34	F19 I-65 SB before Phillips Lane Exit	Freeway	23.0	C
35	D8 Phillips Lane Exit from I-65 SB	Diverge	23.2	C
36	F20 I-65 SB after Phillips Lane Exit	Freeway	23.0	C
37	D9 I-65 SB to I-264 EB	Diverge	32.0	D
38	F21 I-65 SB before I-264 Merge	Freeway	22.4	C
39	W3 I-264 to I-65 SB	Weave	25.3	C
40	F22 I-65 SB between Grade Lane Ramps	Freeway	22.7	C
41	M7 Grade Lane merge to I-65 SB	Merge	20.4	C
42	F23 I-65 SB after Grade Lane Merge	Freeway	13.0	B
43	W4 I-264 EB CD Road b/w 3rd and Crittenden	Weave	19.8	B
44	CD1 I-264 EB CD Road	Collector-Distributor	23.7	C
45	D10 I-264 EB CD Ramp to I-65 SB	Diverge	38.0	E
46	CD2 I-264 EB CD Road	Collector-Distributor	10.6	A
47	D11 I-264 EB CD Ramp to I-65 NB	Diverge	14.1	B
48	M8 Crittenden to I-264 WB CD	Merge	9.9	A
49	CD3 CD to I-264 WB	Collector-Distributor	8.7	A
50	W5 I-264 WB b/w Crittenden and 3rd	Weave	9.6	A
51	CD4 I-65 NB b/w Preston Ramps	Collector-Distributor	16.5	B
52	W6 b/w Preston Hwy and I-264 EB Ramp	Weave	38.5	E
53	CD5 I-65 NB b/w I-264 EB-WB Ramps	Collector-Distributor	10.8	A
54	D12 I-65 NB b/w I-264 EB-WB Ramps	Diverge	10.5	B

Figure 7: VISSIM Base Model LOS Results

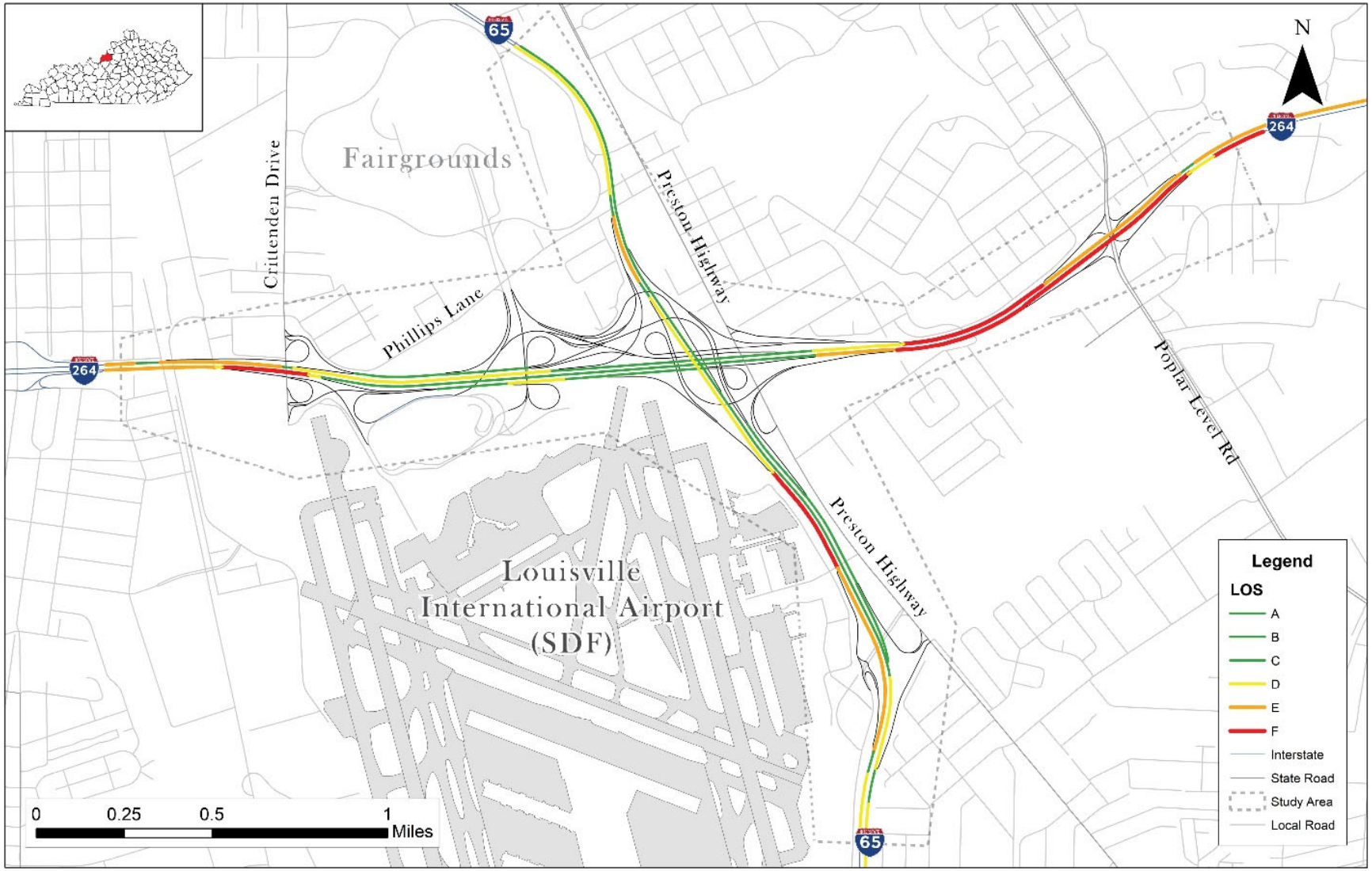
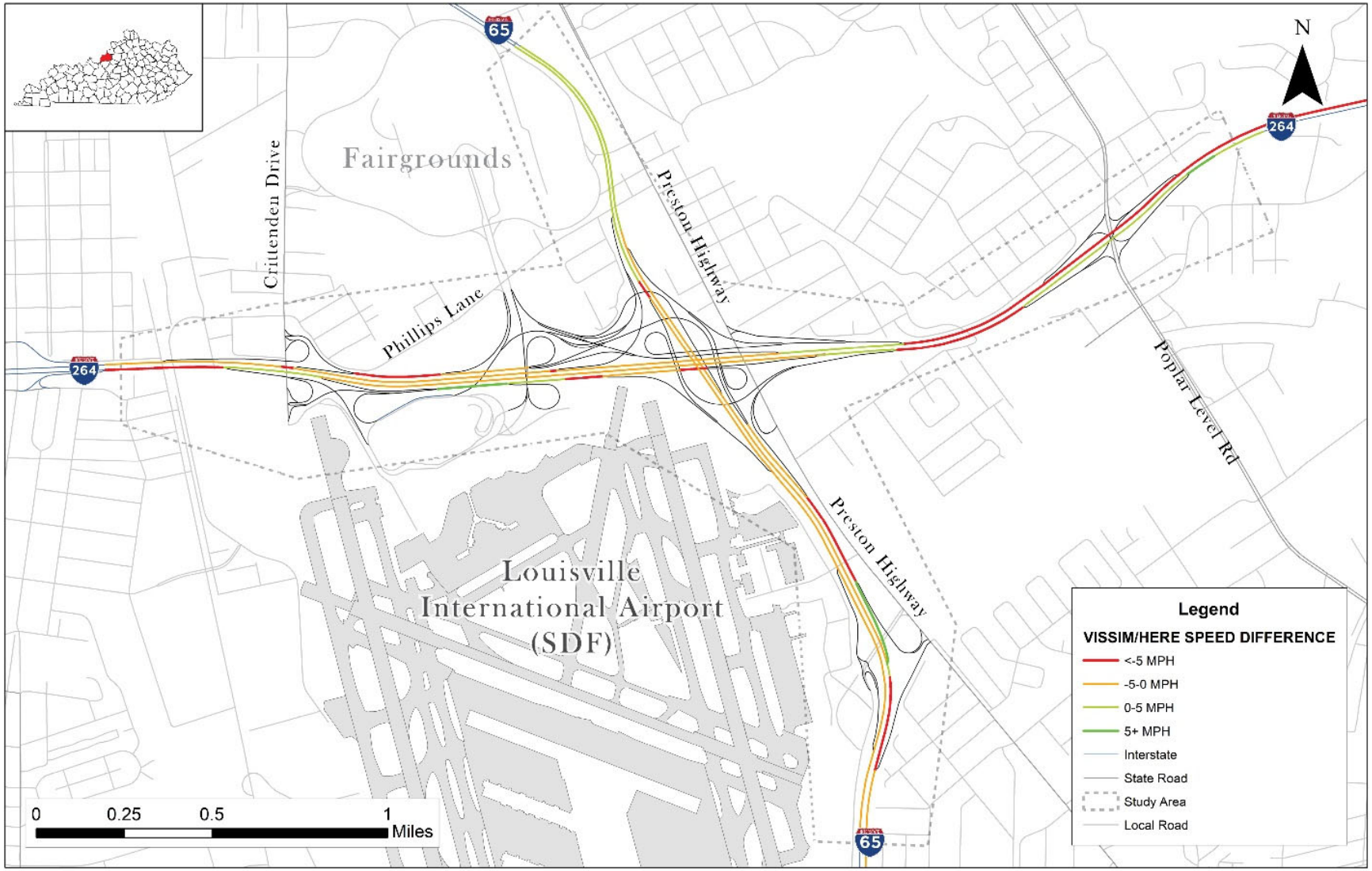


Figure 8: VISSIM/HERE Speed Results Differential



2 NO-BUILD MODEL

After calibration of the model, WSP used forecasted volumes to model a No-Build scenario to the year 2045. The purpose of the No-Build model is to demonstrate the impact of future-year volume on the network if the existing road system remains the same to the forecast year. These results become the new "base" conditions to compare the build scenarios against.

Detailed tables in the following sections illustrate the results from the No-Build scenario. MOE results collected included volume throughput, speed, density, and LOS for the traffic analysis.

2.1 VOLUME THROUGHPUT

The No-Build model throughput was forecasted to compare the new "balanced" volume to the "processed" volume.

The volume comparison table is shown in **Table 10**. In the table, processed volume is within reasonable requirements for much of the network. Congestion occurs mostly in the westbound direction beginning at the I-264 westbound exit ramps to I-65. The I-264 westbound segment leading to the I-65 ramps is a weave segment, causing disruptions in vehicle travel. Another major issue occurring at this location is the geometric configuration of the loop ramp connecting to I-65 southbound. The diverge section of I-264 westbound to Phillips Lane experiences the greatest difference in volume. The volume throughput is deficient in the same areas as the base conditions model, as expected with grown volumes and the same traffic patterns.

Table 10: No-Build Volume Results

Segment	VISSIM OUTPUT				
	Data Collection Group	Total Balanced Volume	% Difference	Total Processed Volume	GEH
F1 I-264 EB @ Crittenden	1	5479	0%	5504	0.3
D1 I-264 EB Ramp to Crittenden	5	438	0%	437	0.0
F2 I-264 EB	7	5041	-1%	5071	0.4
D2 I-264 EB to Phillips Lane	10	1800	1%	1776	0.6
F3 I-264 EB	11	3242	-2%	3294	0.9
M1 I-264 EB from Airport	14	838	5%	795	1.5
F4 I-264 EB	15	4077	0%	4090	0.2
I-264 EB from I-65 NB	18	3356	5%	3191	2.9
W1 I-264 EB between I-65 and Poplar Level Rd	20	7434	2%	7285	1.7
I-264 EB Exit to Poplar Level	25	983	0%	980	0.1
F5 I-264 EB between Poplar Level Ramps	27	6451	2%	6326	1.6
M2 Poplar Level On Ramp to I-264 EB	31	1197	5%	1142	1.6
F6 I-264 EB after Poplar Level	32	7647	2%	7473	2.0
F7 I-264 WB before Poplar Level	37	5674	29%	4052	23.3
D3 I-264 WB Exit to Poplar Level	41	811	30%	567	9.3
F8 I-264 WB between Poplar Level Ramps	42	4863	28%	3505	21.0
Poplar Level On Ramp to I-264 WB	46	1270	6%	1194	2.2
W2 I-264 WB between Poplar Level and I-65	48	6133	24%	4666	20.0
I-264 WB Ramp to I-65	53	2410	25%	1814	13.0
F9 I-264 WB between I-65 and Phillips Lane	55	3723	23%	2855	15.1
D4 I-264 WB Ramp to Phillips Lane	59	701	39%	425	11.6
F10 I-264 WB between Phillips Lane and I-65 SB Merge	61	3022	20%	2409	11.8
M3 I-65 SB Merge with I-264 WB	64	196	2%	193	0.2
F11 I-264 WB between I-65 SB and Phillips Lane Merge	65	3217	19%	2598	11.5
M4 Phillips Lane On Ramp to I-264 WB	68	1627	14%	1398	5.9
F12 I-264 WB between Phillips Lane and Crittenden Dr	70	4845	17%	4009	12.6
M5 Crittenden Dr On Ramp to I-264 WB	74	223	2%	218	0.3
F13 I 264 WB after Crittenden Dr	75	5068	16%	4235	12.2
F14 I 65 NB before Grade Lane	80	5981	11%	5297	9.1
D5 I 65 NB Exit to Grade Lane	85	377	13%	328	2.6
F15 I-65 NB at Grade Lane	86	5605	12%	4946	9.1
D6 I-65 NB to I-264 EB	91	2728	14%	2344	7.6
F16 I-65 NB to I-264 WB	92	2876	10%	2599	5.3
D7 I-65 NB Exit to I-264 WB	95	73	14%	63	1.2
F17 I-65 NB after I-264 Exit	96	2804	9%	2538	5.1
M6 I-264 to I-65 NB	99	1224	11%	1084	4.1
F18 I-65 NB after I-264 Merge	101	4028	10%	3626	6.5
F19 I-65 SB before Phillips Lane Exit	106	5667	0%	5661	0.1
D8 Phillips Lane Exit from I-65 SB	110	394	1%	390	0.2
F20 I-65 SB after Phillips Lane Exit	111	5273	0%	5272	0.0
D9 I-65 SB to I-264 EB	115	1157	-1%	1169	0.4
F21 I-65 SB before I-264 Merge	116	4116	1%	4091	0.4
W3 I-65 SB between I-264 EB ramp and Grade Lane Exit	121	7639	6%	7218	4.9
F22 I-65 SB between Grade Lane Ramps	127	7178	6%	6753	5.1
M7 Grade Lane merge to I-65 SB	132	626	7%	585	1.7
F23 I-65 SB after Grade Lane Merge	133	7804	6%	7334	5.4

VISSIM Processed within ±10% Balanced Expected Volume	VISSIM Processed within ±20% Balanced Expected Volume	VISSIM Processed outside ±20% Balanced Expected Volume

2.2 SPEED

The speed comparison results are shown in **Table 11**. Variance has increased in the 2045 No-Build model. Lower speed and higher variance in speed is indicative of worsening conditions. Speeds in the westbound direction fall under 10 mph on segments with an existing HERE speed greater than 30 mph. Those westbound segments are experiencing excessive congestion and queuing.

Table 11: No-Build Model Speed Comparison Results

Segment Number	Link	Type	VISSIM Avg Speed	HERE Avg Speed	Segment Number	Link	Type	VISSIM Avg Speed	HERE Avg Speed
1	F1 I-264 EB @ Crittenden	Freeway	32.2	45.8	28	D6 I-65 NB to I-264 EB	Diverge	47.4	54.8
2	D1 I-264 EB Ramp to Crittenden	Diverge	30.6	46.4	29	F16 I-65 NB to I-264 WB	Freeway	57.7	60.4
3	F2 I-264 EB	Freeway	48.2	47.2	30	D7 I-65 NB Exit to I-264 WB	Diverge	58.6	61.1
4	D2 I-264 EB to Phillips Lane	Diverge	47.7	48.5	31	F17 I-65 NB after I-264 Exit	Freeway	58.6	60.0
5	F3 I-264 EB	Freeway	58.5	58.0	32	M6 I-264 to I-65 NB	Merge	56.4	57.2
6	M1 I-264 EB from Airport	Merge	42.0	56.2	33	F18 I-65 NB after I-264 Merge	Freeway	58.5	56.4
7	F4 I-264 EB	Freeway	53.7	53.9	34	F19 I-65 SB before Phillips Lane Exit	Freeway	58.4	52.6
8	W1 I-264 EB between I-65 and Poplar Level Rd	Weave	39.0	50.8	35	D8 Phillips Lane Exit from I-65 SB	Diverge	57.2	53.4
9	F5 I-264 EB between Poplar Level Ramps	Freeway	56.7	53.3	36	F20 I-65 SB after Phillips Lane Exit	Freeway	52.1	52.9
10	M2 Poplar Level On Ramp to I-264 EB	Merge	57.9	52.4	37	D9 I-65 SB to I-264 EB	Diverge	37.3	53.4
11	F6 I-264 EB after Poplar Level	Freeway	58.9	56.8	38	F21 I-65 SB before I-264 Merge	Freeway	57.2	58.0
12	F7 I-264 WB before Poplar Level	Freeway	7.4	32.8	39	W3 I-264 to I-65 SB	Weave	55.5	57.6
13	D3 I-264 WB Exit to Poplar Level	Diverge	7.4	33.9	40	F22 I-65 SB between Grade Lane Ramps	Freeway	57.7	59.6
14	F8 I-264 WB between Poplar Level Ramps	Freeway	6.0	31.4	41	M7 Grade Lane merge to I-65 SB	Merge	58.3	60.3
15	W2 I-264 WB between Poplar Level and I-65	Weave	8.5	36.6	42	F23 I-65 SB after Grade Lane Merge	Freeway	58.8	60.3
16	F9 I-264 WB between I-65 and Phillips Lane	Freeway	52.1	50.9	43	W4 I-264 EB CD Road b/w 3rd and Crittenden	Weave	43.1	36.1
17	D4 I-264 WB Ramp to Phillips Lane	Diverge	57.0	55.2	44	CD1 I-264 EB CD Road	Collector-Distributor	34.4	38.3
18	F10 I-264 WB between Phillips Lane and I-65 SB Merge	Freeway	58.8	59.1	45	D10 I-264 EB CD Ramp to I-65 SB	Diverge	19.7	38.3
19	M3 I-65 SB Merge with I-264 WB	Merge	53.6	60.3	46	CD2 I-264 EB CD Road	Collector-Distributor	45.7	51.1
20	F11 I-264 WB between I-65 SB and Phillips Lane Merge	Freeway	58.6	61.0	47	D11 I-264 EB CD Ramp to I-65 NB	Diverge	32.6	51.1
21	M4 Phillips Lane On Ramp to I-264 WB	Merge	51.8	60.1	48	M8 Crittenden to I-264 WB CD	Merge	53.8	58.2
22	F12 I-264 WB between Phillips Lane and Crittenden Dr	Freeway	58.6	59.9	49	CD3 CD to I-264 WB	Collector-Distributor	54.4	58.2
23	M5 Crittenden Dr On Ramp to I-264 WB	Merge	58.8	60.5	50	W5 I-264 WB b/w Crittenden and 3rd	Weave	47.8	58.7
24	F13 I 264 WB after Crittenden Dr	Freeway	59.2	60.6	51	CD4 I-65 NB b/w Preston Ramps	Collector-Distributor	5.4	44.9
25	F14 I 65 NB before Grade Lane	Freeway	18.6	58.2	52	W6 b/w Preston Hwy and I-264 EB Ramp	Weave	6.2	44.5
26	D5 I 65 NB Exit to Grade Lane	Diverge	18.6	56.7	53	CD5 I-65 NB b/w I-264 EB-WB Ramps	Collector-Distributor	47.4	52.6
27	F15 I-65 NB at Grade Lane	Freeway	16.8	56.0	54	D12 I-65 NB b/w I-264 EB-WB Ramps	Diverge	43.0	52.6

VISSIM Spd ± 5mph HERE Spd	VISSIM Spd ± 10mph HERE Spd	VISSIM Spd outside 10mph HERE Spd

2.3 DENSITY AND LOS

Table 12 shows the average density and LOS results from the No-Build model. Segments with LOS E and F are considered failing. More failure occurs throughout the network. In addition to the already failing segments, red segment numbers are indicative of segments experiencing LOS grades worse than in the Base model **and** under LOS C.

Table 12: No-Build Model Density and LOS Results

Segment Number	Link	Type	Avg Density	Avg LOS
1	F1 I-264 EB @ Crittenden	Freeway	51.7	F
2	D1 I-264 EB Ramp to Crittenden	Diverge	57.2	E
3	F2 I-264 EB	Freeway	35.7	E
4	D2 I-264 EB to Phillips Lane	Diverge	30.6	D
5	F3 I-264 EB	Freeway	18.8	C
6	M1 I-264 EB from Airport	Merge	27.7	C
7	F4 I-264 EB	Freeway	25.3	C
8	W1 I-264 EB between I-65 and Poplar Level Rd	Weave	40.4	E
9	F5 I-264 EB between Poplar Level Ramps	Freeway	27.7	D
10	M2 Poplar Level On Ramp to I-264 EB	Merge	25.2	C
11	F6 I-264 EB after Poplar Level	Freeway	11.0	B
12	F7 I-264 WB before Poplar Level	Freeway	137.4	F
13	D3 I-264 WB Exit to Poplar Level	Diverge	138.8	E
14	F8 I-264 WB between Poplar Level Ramps	Freeway	147.3	F
15	W2 I-264 WB between Poplar Level and I-65	Weave	119.1	E
16	F9 I-264 WB between I-65 and Phillips Lane	Freeway	13.6	B
17	D4 I-264 WB Ramp to Phillips Lane	Diverge	12.3	B
18	F10 I-264 WB between Phillips Lane and I-65 SB Merge	Freeway	13.5	B
19	M3 I-65 SB Merge with I-264 WB	Merge	12.9	B
20	F11 I-264 WB between I-65 SB and Phillips Lane Merge	Freeway	14.8	B
21	M4 Phillips Lane On Ramp to I-264 WB	Merge	15.8	B
22	F12 I-264 WB between Phillips Lane and Crittenden Dr	Freeway	17.0	B
23	M5 Crittenden Dr On Ramp to I-264 WB	Merge	14.3	B
24	F13 I 264 WB after Crittenden Dr	Freeway	11.2	B
25	F14 I 65 NB before Grade Lane	Freeway	75.7	F
26	D5 I 65 NB Exit to Grade Lane	Diverge	76.5	E
27	F15 I-65 NB at Grade Lane	Freeway	81.4	F
28	D6 I-65 NB to I-264 EB	Diverge	20.6	C
29	F16 I-65 NB to I-264 WB	Freeway	15.0	B
30	D7 I-65 NB Exit to I-264 WB	Diverge	14.7	B
31	F17 I-65 NB after I-264 Exit	Freeway	14.4	B
32	M6 I-264 to I-65 NB	Merge	12.3	B
33	F18 I-65 NB after I-264 Merge	Freeway	15.4	B
34	F19 I-65 SB before Phillips Lane Exit	Freeway	24.3	C
35	D8 Phillips Lane Exit from I-65 SB	Diverge	24.6	C
36	F20 I-65 SB after Phillips Lane Exit	Freeway	26.0	D
37	D9 I-65 SB to I-264 EB	Diverge	39.1	E
38	F21 I-65 SB before I-264 Merge	Freeway	23.7	C
39	W3 I-264 to I-65 SB	Weave	25.6	C
40	F22 I-65 SB between Grade Lane Ramps	Freeway	23.2	C
41	M7 Grade Lane merge to I-65 SB	Merge	20.9	C
42	F23 I-65 SB after Grade Lane Merge	Freeway	13.3	B
43	W4 I-264 EB CD Road b/w 3rd and Crittenden	Weave	31.0	D
44	CD1 I-264 EB CD Road	Collector-Distributor	41.5	E
45	D10 I-264 EB CD Ramp to I-65 SB	Diverge	58.1	F
46	CD2 I-264 EB CD Road	Collector-Distributor	13.1	B
47	D11 I-264 EB CD Ramp to I-65 NB	Diverge	18.0	B
48	M8 Crittenden to I-264 WB CD	Merge	9.6	A
49	CD3 CD to I-264 WB	Collector-Distributor	8.5	A
50	W5 I-264 WB b/w Crittenden and 3rd	Weave	9.4	A
51	CD4 I-65 NB b/w Preston Ramps	Collector-Distributor	144.1	F
52	W6 b/w Preston Hwy and I-264 EB Ramp	Weave	129.2	E
53	CD5 I-65 NB b/w I-264 EB-WB Ramps	Collector-Distributor	11.1	B
54	D12 I-65 NB b/w I-264 EB-WB Ramps	Diverge	11.7	B

3 POTENTIAL IMPROVEMENT STRATEGY A MODEL RESULTS

Potential Improvement Strategy A, focused on improving flow on I-264 eastbound, has three sub-scenarios and one common build section shared between them. As part of the "A" improvement strategies, the existing location of the I-264 eastbound collector-distributor (CD) merge onto the I-264 eastbound mainline and realigns Exit 12 to fly over the CD roadway before merging from the right to lower the number of vehicles weaving. Finally, the on-ramp back to the mainline I-264 eastbound is relocated and proposed to merge before crossing I-65 southbound.

Potential Improvement Strategy A-1 closes the ramp from KY 61 (Preston Highway). The ramp from I-65 northbound to I-264 eastbound is widened to two lanes. Lastly, the I-65 southbound traffic merges directly onto I-264 eastbound, west of the current merge location, changing the merging pattern.

Potential Improvement Strategy A-2 moves the on-ramp from KY 61 (Preston Highway) to I-264 eastbound to the north, making it part of a partial tight diamond interchange.

Potential Improvement Strategy A-3 does not close the KY 61 (Preston Highway) ramp access or widen the I-65 northbound ramp to two lanes but moves the I-65 southbound ramp to merge with I-264 eastbound to the west of the current merge location. The report further illustrates these improvement strategies.

Results for the specific improvement objective of each (A-1, 2, and 3) model is shown in the following sections.

3.1 VOLUME THROUGHPUT

The volume throughput tables were updated to accommodate the volume change differences due to the build geometries. **Table 13** illustrates the volume results compared to the expected throughput. Volume throughput increases along the I-65 northbound segments approaching the exit to I-264 in all three "A" improvement strategy models.

Table 13: Potential Improvement Strategy A Volume Throughput Comparison

Segment	Data Collection Group	Total Balanced Volume	No-Build % Difference	A-1 % Difference	A-2 % Difference	A-3 % Difference
F1 I-264 EB @ Crittenden	1	5479	0%	1%	1%	0%
D1 I-264 EB Ramp to Crittenden	5	438	0%	0%	1%	1%
F2 I-264 EB	7	5041	-1%	1%	1%	0%
D2 I-264 EB to Phillips Lane	10	1800	1%	3%	2%	2%
F3 I-264 EB	11	3242	-2%	0%	0%	0%
M1 I-264 EB from Airport	14	838	5%	6%	8%	6%
I-65 SB to I-264 EB Proposed Merge	134a	1157	--	0%	0%	-2%
F4 I-264 EB	15	4077	0%	1%	1%	0%
I-264 EB from I-65 NB	18	3356	5%	2%	5%	8%
W1 I-264 EB between I-65 and Poplar Level Rd	20	7434	2%	1%	3%	2%
I-264 EB Exit to Poplar Level	25	983	0%	1%	2%	0%
F5 I-264 EB between Poplar Level Ramps	27	6451	2%	1%	3%	2%
M2 Poplar Level On Ramp to I-264 EB	31	1197	5%	5%	6%	7%
F6 I-264 EB after Poplar Level	32	7647	2%	2%	3%	3%
F7 I-264 WB before Poplar Level	37	5674	29%	23%	24%	29%
D3 I-264 WB Exit to Poplar Level	41	811	30%	25%	26%	30%
F8 I-264 WB between Poplar Level Ramps	42	4863	28%	23%	25%	29%
Poplar Level On Ramp to I-264 WB	46	1270	6%	6%	7%	7%
W2 I-264 WB between Poplar Level and I-65	48	6133	24%	20%	21%	24%
I-264 WB Ramp to I-65	53	2410	25%	21%	22%	25%
F9 I-264 WB between I-65 and Phillips Lane	55	3723	23%	19%	21%	46%
D4 I-264 WB Ramp to Phillips Lane	59	701	39%	37%	37%	40%
F10 I-264 WB between Phillips Lane and I-65 SB Merge	61	3022	20%	16%	17%	20%
M3 I-65 SB Merge with I-264 WB	64	196	2%	3%	3%	2%
F11 I-264 WB between I-65 SB and Phillips Lane Merge	65	3217	19%	15%	16%	19%
M4 Phillips Lane On Ramp to I-264 WB	68	1627	14%	7%	8%	14%
F12 I-264 WB between Phillips Lane and Crittenden Dr	70	4845	17%	12%	13%	17%
M5 Crittenden Dr On Ramp to I-264 WB	74	223	2%	2%	2%	3%
F13 I 264 WB after Crittenden Dr	75	5068	16%	12%	13%	17%
F14 I 65 NB before Grade Lane	80	5981	11%	0%	0%	8%
D5 I 65 NB Exit to Grade Lane	85	377	13%	0%	0%	9%
F15 I-65 NB at Grade Lane	86	5605	12%	0%	0%	8%
D6 I-65 NB to I-264 EB	91	2728	14%	2%	2%	12%
F16 I-65 NB to I-264 WB	92	2876	10%	-2%	-2%	5%
D7 I-65 NB Exit to I-264 WB	95	73	14%	1%	1%	11%
F17 I-65 NB after I-264 Exit	96	2804	9%	-2%	-2%	5%
M6 I-264 to I-65 NB	99	1224	11%	14%	16%	16%
F18 I-65 NB after I-264 Merge	101	4028	10%	3%	4%	8%
F19 I-65 SB before Phillips Lane Exit	106	5667	0%	1%	0%	0%
D8 Phillips Lane Exit from I-65 SB	110	394	1%	3%	1%	1%
F20 I-65 SB after Phillips Lane Exit	111	5273	0%	1%	0%	0%
D9 I-65 SB to I-264 EB	115	1157	-1%	1%	0%	-1%
F21 I-65 SB before I-264 Merge	116	4116	1%	1%	1%	1%
W3 I-65 SB between I-264 EB ramp and Grade Lane Exit	121	7639	6%	5%	6%	6%
F22 I-65 SB between Grade Lane Ramps	127	7178	6%	5%	6%	6%
M7 Grade Lane merge to I-65 SB	132	626	7%	6%	6%	6%
F23 I-65 SB after Grade Lane Merge	133	7804	6%	6%	6%	6%

VISSIM Processed within ±10% Balanced Expected Volume	VISSIM Processed within ±20% Balanced Expected Volume	VISSIM Processed outside ±20% Balanced Expected Volume

3.2 SPEED

The Potential Improvement Strategy A speeds are compared to the 2045 No-Build speed results in **Table 14**. Cells that are green denote speeds that are either higher than the No-Build or within 5 mph. Cells in yellow denote a 5 to 10 mph reduction in speed from the No-Build, and cells in red indicate a greater than 10 mph reduction in speed from the No-Build. There is a significant increase in speeds along the I-65 northbound segments approach the exit to I-264, as well as the CD road and weaving section prior to the I-264 exit. This speed difference is indicative of less congestion experienced from the multiple merges into the weave.

Table 14: Potential Improvement Strategy A Speed Results

Segment Number	Link	Type	VISSIM Avg No-Build Speed	HERE Avg Speed	VISSIM Avg A-1 Speed	VISSIM Avg A-2 Speed	VISSIM Avg A-3 Speed
1	F1 I-264 EB @ Crittenden	Freeway	32.2	45.8	30.0	31.2	31.3
2	D1 I-264 EB Ramp to Crittenden	Diverge	30.6	46.4	29.4	30.2	30.3
3	F2 I-264 EB	Freeway	48.2	47.2	41.9	42.0	43.9
4	D2 I-264 EB to Phillips Lane	Diverge	47.7	48.5	47.0	46.8	50.3
5	F3 I-264 EB	Freeway	58.5	58.0	58.1	58.1	57.4
6	M1 I-264 EB from Airport	Merge	42.0	56.2	54.1	53.9	41.9
7	F4 I-264 EB	Freeway	53.7	53.9	49.9	56.5	51.6
8.1	MERGE WITH PROPOSED RAMP	Merge	--	--	34.2	40.0	44.0
8	W1 I-264 EB between I-65 and Poplar Level Rd	Weave	39.0	50.8	30.9	21.4	45.8
9	F5 I-264 EB between Poplar Level Ramps	Freeway	56.7	53.3	54.9	47.2	54.0
10	M2 Poplar Level On Ramp to I-264 EB	Merge	57.9	52.4	56.5	50.1	56.5
11	F6 I-264 EB after Poplar Level	Freeway	58.9	56.8	57.6	52.7	57.2
12	F7 I-264 WB before Poplar Level	Freeway	7.4	32.8	8.3	8.2	15.6
13	D3 I-264 WB Exit to Poplar Level	Diverge	7.4	33.9	8.2	8.0	7.2
14	F8 I-264 WB between Poplar Level Ramps	Freeway	6.0	31.4	6.6	6.5	5.7
15	W2 I-264 WB between Poplar Level and I-65	Weave	8.5	36.6	9.0	8.8	7.9
16	F9 I-264 WB between I-65 and Phillips Lane	Freeway	52.1	50.9	51.7	52.1	30.7
17	D4 I-264 WB Ramp to Phillips Lane	Diverge	57.0	55.2	55.2	56.8	55.8
18	F10 I-264 WB between Phillips Lane and I-65 SB Merge	Freeway	58.8	59.1	58.6	58.7	58.4
19	M3 I-65 SB Merge with I-264 WB	Merge	53.6	60.3	52.3	52.9	53.5
20	F11 I-264 WB between I-65 SB and Phillips Lane Merge	Freeway	58.6	61.0	58.4	58.5	58.6
21	M4 Phillips Lane On Ramp to I-264 WB	Merge	51.8	60.1	53.5	53.6	52.5
22	F12 I-264 WB between Phillips Lane and Crittenden Dr	Freeway	58.6	59.9	58.4	58.5	58.5
23	M5 Crittenden Dr On Ramp to I-264 WB	Merge	58.8	60.5	58.8	58.7	58.8
24	F13 I 264 WB after Crittenden Dr	Freeway	59.2	60.6	59.2	59.2	59.1
25	F14 I 65 NB before Grade Lane	Freeway	18.6	58.2	57.5	58.1	31.3
26	D5 I 65 NB Exit to Grade Lane	Diverge	18.6	56.7	51.8	52.5	25.8
27	F15 I-65 NB at Grade Lane	Freeway	16.8	56.0	52.1	49.9	29.6
28	D6 I-65 NB to I-264 EB	Diverge	47.4	54.8	39.7	44.5	40.7
29	F16 I-65 NB to I-264 WB	Freeway	57.7	60.4	57.9	42.8	57.3
30	D7 I-65 NB Exit to I-264 WB	Diverge	58.6	61.1	58.5	58.3	58.6
31	F17 I-65 NB after I-264 Exit	Freeway	58.6	60.0	58.4	58.3	58.6
32	M6 I-264 to I-65 NB	Merge	56.4	57.2	55.9	58.6	56.0
33	F18 I-65 NB after I-264 Merge	Freeway	58.5	56.4	58.4	55.7	58.5
34	F19 I-65 SB before Phillips Lane Exit	Freeway	58.4	52.6	57.2	58.2	58.3
35	D8 Phillips Lane Exit from I-65 SB	Diverge	57.2	53.4	52.4	44.7	57.2
36	F20 I-65 SB after Phillips Lane Exit	Freeway	52.1	52.9	46.0	54.7	52.9
37	D9 I-65 SB to I-264 EB	Diverge	37.3	53.4	33.8	49.6	42.5
38	F21 I-65 SB before I-264 Merge	Freeway	57.2	58.0	57.2	48.9	51.8
38.1	Merge I-65 SB w I-264 WB Proposed	Merge	--	--	--	--	--
38.2	Freeway segment between Merges Proposed	Freeway	--	--	--	--	--
39	W3 I-264 to I-65 SB	Weave	55.5	57.6	54.8	55.9	50.3
40	F22 I-65 SB between Grade Lane Ramps	Freeway	57.7	59.6	57.7	57.1	57.9
41	M7 Grade Lane merge to I-65 SB	Merge	58.3	60.3	58.2	58.1	58.4
42	F23 I-65 SB after Grade Lane Merge	Freeway	58.8	60.3	58.8	58.1	49.7
43	W4 I-264 EB CD Road b/w 3rd and Crittenden	Weave	43.1	36.1	34.1	58.8	35.4
44	CD1 I-264 EB CD Road	Collector-Distributor	34.4	38.3	20.5	16.3	18.0
45	D10 I-264 EB CD Ramp to I-65 SB	Diverge	19.7	38.3	14.0	21.3	39.2
46	CD2 I-264 EB CD Road	Collector-Distributor	45.7	51.1	48.1	22.9	46.8
47	D11 I-264 EB CD Ramp to I-65 NB	Diverge	32.6	51.1	53.3	12.4	54.4
48	M8 Crittenden to I-264 WB CD	Merge	53.8	58.2	16.4	14.9	54.4
49	CD3 CD to I-264 WB	Collector-Distributor	54.4	58.2	21.6	35.2	37.7
50	W5 I-264 WB b/w Crittenden and 3rd	Weave	47.8	58.7	50.7	27.0	16.7
51	CD4 I-65 NB b/w Preston Ramps	Collector-Distributor	5.4	44.9	51.5	49.0	8.6
52	W6 b/w Preston Hwy and I-264 EB Ramp	Weave	6.2	44.5	47.8	49.7	20.9
53	CD5 I-65 NB b/w I-264 EB-WB Ramps	Collector-Distributor	47.4	52.6	50.8	44.0	44.6
54	D12 I-65 NB b/w I-264 EB-WB Ramps	Diverge	43.0	52.6	49.0	41.9	54.1

VISSIM Processed within ±10% Balanced Expected Volume	VISSIM Processed within ±20% Balanced Expected Volume	VISSIM Processed outside ±20% Balanced Expected Volume

3.3 DENSITY AND LOS

Table 15 shows the average density and LOS results from the A build models. Segments with LOS E and F are considered failing. Segments 25-27, I-65 northbound mainline through Grade Lane, each experience more than a single grade-level improvement in the model. This result is indicative that the identified problem for the improvement strategy, the connection between I-65 and I-264 eastbound, is being improved in the models.

Table 15: Potential Improvement Strategy A Density and LOS Results

Segment Number	Link	Type	No-Build Avg Density	Avg LOS	A-1 Avg Density	A-1 Avg LOS	A-2 Avg Density	A-2 Avg LOS	A-3 Avg Density	A-3 Avg LOS
1	F1 I-264 EB @ Crittenden	Freeway	51.7	F	55.3	F	53.1	F	53.0	F
2	D1 I-264 EB Ramp to Crittenden	Diverge	57.2	E	59.8	E	57.7	E	57.7	E
3	F2 I-264 EB	Freeway	35.7	E	40.2	E	41.1	E	39.0	E
4	D2 I-264 EB to Phillips Lane	Diverge	30.6	D	4.5	A	4.5	A	6.7	A
5	F3 I-264 EB	Freeway	18.8	C	19.2	C	19.3	C	19.3	C
6	M1 I-264 EB from Airport	Merge	27.7	C	35.0	D	25.4	C	34.4	D
7	F4 I-264 EB	Freeway	25.3	C	33.6	D	25.6	C	31.4	D
8.1	MERGE WITH PROPOSED RAMP	Merge	--	--	47.3	E	39.4	E	34.9	D
8	W1 I-264 EB between I-65 and Poplar Level Rd	Weave	40.4	E	50.5	E	68.7	E	33.6	D
9	F5 I-264 EB between Poplar Level Ramps	Freeway	27.7	D	33.4	D	36.4	E	29.4	D
10	M2 Poplar Level On Ramp to I-264 EB	Merge	25.2	C	28.1	D	29.9	D	25.9	C
11	F6 I-264 EB after Poplar Level	Freeway	11.0	B	23.9	C	19.9	C	18.0	B
12	F7 I-264 WB before Poplar Level	Freeway	137.4	F	99.4	F	112.7	F	115.6	F
13	D3 I-264 WB Exit to Poplar Level	Diverge	138.8	E	130.2	E	134.3	E	139.6	E
14	F8 I-264 WB between Poplar Level Ramps	Freeway	147.3	F	144.1	F	144.8	F	148.8	F
15	W2 I-264 WB between Poplar Level and I-65	Weave	119.1	E	121.5	E	122.2	E	124.8	E
16	F9 I-264 WB between I-65 and Phillips Lane	Freeway	13.6	B	58.1	F	57.9	F	58.7	F
17	D4 I-264 WB Ramp to Phillips Lane	Diverge	12.3	B	13.6	B	13.1	B	12.6	B
18	F10 I-264 WB between Phillips Lane and I-65 SB Merge	Freeway	13.5	B	14.7	B	14.3	B	13.8	B
19	M3 I-65 SB Merge with I-264 WB	Merge	12.9	B	13.4	B	13.1	B	12.5	B
20	F11 I-264 WB between I-65 SB and Phillips Lane Merge	Freeway	14.8	B	15.8	B	15.5	B	14.9	B
21	M4 Phillips Lane On Ramp to I-264 WB	Merge	15.8	B	15.9	B	13.5	B	15.2	B
22	F12 I-264 WB between Phillips Lane and Crittenden Dr	Freeway	17.0	B	18.0	C	17.8	B	16.9	B
23	M5 Crittenden Dr On Ramp to I-264 WB	Merge	14.3	B	15.1	B	14.9	B	14.2	B
24	F13 I 264 WB after Crittenden Dr	Freeway	11.2	B	12.7	B	13.1	B	12.6	B
25	F14 I 65 NB before Grade Lane	Freeway	75.7	F	21.3	C	20.9	C	54.1	F
26	D5 I 65 NB Exit to Grade Lane	Diverge	76.5	E	24.9	C	24.5	C	60.7	E
27	F15 I-65 NB at Grade Lane	Freeway	81.4	F	22.8	C	24.6	C	56.4	F
28	D6 I-65 NB to I-264 EB	Diverge	20.6	C	30.0	D	31.5	D	33.8	D
29	F16 I-65 NB to I-264 WB	Freeway	15.0	B	26.1	D	26.0	C	15.8	B
30	D7 I-65 NB Exit to I-264 WB	Diverge	14.7	B	17.1	B	17.0	B	15.8	B
31	F17 I-65 NB after I-264 Exit	Freeway	14.4	B	15.5	B	16.3	B	15.3	B
32	M6 I-264 to I-65 NB	Merge	12.3	B	16.6	B	15.3	B	12.6	B
33	F18 I-65 NB after I-264 Merge	Freeway	15.4	B	12.4	B	12.3	B	15.6	B
34	F19 I-65 SB before Phillips Lane Exit	Freeway	24.3	C	24.5	C	21.0	C	23.6	C
35	D8 Phillips Lane Exit from I-65 SB	Diverge	24.6	C	23.3	C	22.9	C	25.4	C
36	F20 I-65 SB after Phillips Lane Exit	Freeway	26.0	D	34.8	D	33.5	D	24.8	C
37	D9 I-65 SB to I-264 EB	Diverge	39.1	E	21.5	C	21.3	C	35.4	E
38	F21 I-65 SB before I-264 Merge	Freeway	23.7	C	34.2	D	33.4	D	24.9	C
39	W3 I-264 to I-65 SB	Weave	25.6	C	25.3	C	25.2	C	23.0	C
40	F22 I-65 SB between Grade Lane Ramps	Freeway	23.2	C	22.9	C	23.3	C	21.7	C
41	M7 Grade Lane merge to I-65 SB	Merge	20.9	C	21.5	C	24.3	C	20.6	C
42	F23 I-65 SB after Grade Lane Merge	Freeway	13.3	B	23.6	C	23.4	C	29.8	D
43	W4 I-264 EB CD Road b/w 3rd and Crittenden	Weave	31.0	D	27.2	C	16.0	B	42.0	E
44	CD1 I-264 EB CD Road	Collector-Distributor	41.5	E	34.6	D	42.1	E	72.0	F
45	D10 I-264 EB CD Ramp to I-65 SB	Diverge	58.1	F	62.3	F	85.8	F	25.1	C
46	CD2 I-264 EB CD Road	Collector-Distributor	13.1	B	37.0	E	55.1	F	30.0	D
47	D11 I-264 EB CD Ramp to I-65 NB	Diverge	18.0	B	87.3	E	107.8	E	7.5	A
48	M8 Crittenden to I-264 WB CD	Merge	9.6	A	78.1	F	83.9	F	8.6	A
49	CD3 CD to I-264 WB	Collector-Distributor	8.5	A	9.0	A	9.3	A	19.3	C
50	W5 I-264 WB b/w Crittenden and 3rd	Weave	9.4	A	38.3	E	14.0	B	54.5	E
51	CD4 I-65 NB b/w Preston Ramps	Collector-Distributor	144.1	F	13.0	B	13.1	B	116.1	F
52	W6 b/w Preston Hwy and I-264 EB Ramp	Weave	129.2	E	21.3	B	20.2	B	84.3	E
53	CD5 I-65 NB b/w I-264 EB-WB Ramps	Collector-Distributor	11.1	B	17.9	B	22.6	C	11.1	B
54	D12 I-65 NB b/w I-264 EB-WB Ramps	Diverge	11.7	B	10.7	B	14.5	B	9.3	A

4 POTENTIAL IMPROVEMENT STRATEGY B MODEL RESULTS

Potential Improvement Strategy B addresses slow vehicle traffic occurring regularly on I-264 westbound due to the tight radius of the I-264 westbound ramp to I-65 southbound. It improves the radius of the loop ramp from I-264 westbound to I-65 southbound and moves the traffic using this ramp from Exit 12 to Exit 11. The loop ramp would become an add lane of traffic to I-65 southbound just north of the bridge over I-264. By improving the radius of the loop ramp and separating this exit from the KY 61 (Preston Highway) and I-65 northbound exit, both sight distances and the weave between Poplar Level Road and I-65 would be improved, reducing driver confusion and resulting in better traffic flow. Additionally, the I-65 southbound to I-264 eastbound ramp can use the existing bridge from the I-264 westbound to I-65 southbound loop ramp to improve its radius and sight distance. Results for the improvement objective are shown in the following sections.

4.1 VOLUME THROUGHPUT

Table 16 illustrates the volume results compared to the expected throughput. Compared to the No-Build results for the following section, significant improvements are made to the westbound progression. The portion of the network experiencing the greatest failure now processes the expected demand within 5%. The wider curve radius allows for greater speeds to be realized, while the newly designed exit location allows for greater mobility through the westbound weave. Congestion and queuing are alleviated greatly as conflicts are reduced.

Table 16: Potential Improvement Strategy B Volume Throughput Comparison

Segment	Data Collection Group	Total Balanced Volume	No-Build % Difference	B % Difference
F1 I-264 EB @ Crittenden	1	5479	0%	0%
D1 I-264 EB Ramp to Crittenden	5	438	0%	1%
F2 I-264 EB	7	5041	-1%	0%
D2 I-264 EB to Phillips Lane	10	1800	1%	2%
F3 I-264 EB	11	3242	-2%	-1%
M1 I-264 EB from Airport	14	838	5%	6%
F4 I-264 EB	15	4077	0%	0%
I-264 EB from I-65 NB	18	3356	5%	8%
W1 I-264 EB between I-65 and Poplar Level Rd	20	7434	2%	4%
I-264 EB Exit to Poplar Level	25	983	0%	1%
F5 I-264 EB between Poplar Level Ramps	27	6451	2%	4%
M2 Poplar Level On Ramp to I-264 EB	31	1197	5%	4%
F6 I-264 EB after Poplar Level	32	7647	2%	4%
F7 I-264 WB before Poplar Level	37	5674	29%	0%
D3 I-264 WB Exit to Poplar Level	41	811	30%	0%
F8 I-264 WB between Poplar Level Ramps	42	4863	28%	0%
Poplar Level On Ramp to I-264 WB	46	1270	6%	0%
W2 I-264 WB between Poplar Level and I-65	48	6133	24%	0%
I-264 WB Ramp to I-65	53	2410	25%	0%
F9 I-264 WB between I-65 and Phillips Lane	55	3723	23%	0%
D4 I-264 WB Ramp to Phillips Lane	59	701	39%	5%
F10 I-264 WB between Phillips Lane and I-65 SB Merge	61	3022	20%	-3%
M3 I-65 SB Merge with I-264 WB	64	196	2%	2%
F11 I-264 WB between I-65 SB and Phillips Lane Merge	65	3217	19%	-3%
M4 Phillips Lane On Ramp to I-264 WB	68	1627	14%	15%
F12 I-264 WB between Phillips Lane and Crittenden Dr	70	4845	17%	3%
M5 Crittenden Dr On Ramp to I-264 WB	74	223	2%	3%
F13 I 264 WB after Crittenden Dr	75	5068	16%	3%
F14 I 65 NB before Grade Lane	80	5981	11%	24%
D5 I 65 NB Exit to Grade Lane	85	377	13%	27%
F15 I-65 NB at Grade Lane	86	5605	12%	23%
D6 I-65 NB to I-264 EB	91	2728	14%	-14%
F16 I-65 NB to I-264 WB	92	2876	10%	57%
D7 I-65 NB Exit to I-264 WB	95	73	14%	22%
F17 I-65 NB after I-264 Exit	96	2804	9%	58%
M6 I-264 to I-65 NB	99	1224	11%	-78%
F18 I-65 NB after I-264 Merge	101	4028	10%	16%
F19 I-65 SB before Phillips Lane Exit	106	5667	0%	0%
D8 Phillips Lane Exit from I-65 SB	110	394	1%	1%
F20 I-65 SB after Phillips Lane Exit	111	5273	0%	0%
D9 I-65 SB to I-264 EB	115	1157	-1%	-1%
F21 I-65 SB before I-264 Merge	116	4116	1%	1%
W3 I-65 SB between I-264 EB ramp and Grade Lane Exit	121	7639	6%	0%
F22 I-65 SB between Grade Lane Ramps	127	7178	6%	1%
M7 Grade Lane merge to I-65 SB	132	626	7%	6%
F23 I-65 SB after Grade Lane Merge	133	7804	6%	1%

VISSIM Processed within ±10% Balanced Expected Volume	VISSIM Processed within ±20% Balanced Expected Volume	VISSIM Processed outside ±20% Balanced Expected Volume

4.2 SPEED

The Potential Improvement Strategy B speeds are compared to the 2045 No-Build speed results in **Table 17**. The speed results manifest the realized reduction in congestion with much higher speeds through the I-264 westbound weave approaching I-65.

Table 17: Potential Improvement Strategy B Speed Comparison Results

Segment Number	Link	Type	VISSIM Avg No-Build Speed	HERE Avg Speed	VISSIM Avg B Speed
1	F1 I-264 EB @ Crittenden	Freeway	32.2	45.8	31.7
2	D1 I-264 EB Ramp to Crittenden	Diverge	30.6	46.4	30.4
3	F2 I-264 EB	Freeway	48.2	47.2	46.9
4	D2 I-264 EB to Phillips Lane	Diverge	47.7	48.5	46.6
5	F3 I-264 EB	Freeway	58.5	58.0	58.5
6	M1 I-264 EB from Airport	Merge	42.0	56.2	41.1
7	F4 I-264 EB	Freeway	53.7	53.9	52.1
8	W1 I-264 EB between I-65 and Poplar Level Rd	Weave	39.0	50.8	38.7
9	F5 I-264 EB between Poplar Level Ramps	Freeway	56.7	53.3	56.8
10	M2 Poplar Level On Ramp to I-264 EB	Merge	57.9	52.4	57.9
11	F6 I-264 EB after Poplar Level	Freeway	58.9	56.8	58.9
12	F7 I-264 WB before Poplar Level	Freeway	7.4	32.8	58.4
13	D3 I-264 WB Exit to Poplar Level	Diverge	7.4	33.9	57.4
14	F8 I-264 WB between Poplar Level Ramps	Freeway	6.0	31.4	58.2
15	W2 I-264 WB between Poplar Level and I-65	Weave	8.5	36.6	47.2
16	F9 I-264 WB between I-65 and Phillips Lane	Freeway	52.1	50.9	49.2
17	D4 I-264 WB Ramp to Phillips Lane	Diverge	57.0	55.2	32.3
18	F10 I-264 WB between Phillips Lane and I-65 SB Merge	Freeway	58.8	59.1	57.8
19	M3 I-65 SB Merge with I-264 WB	Merge	53.6	60.3	52.1
20	F11 I-264 WB between I-65 SB and Phillips Lane Merge	Freeway	58.6	61.0	58.4
21	M4 Phillips Lane On Ramp to I-264 WB	Merge	51.8	60.1	52.7
22	F12 I-264 WB between Phillips Lane and Crittenden Dr	Freeway	58.6	59.9	58.4
23	M5 Crittenden Dr On Ramp to I-264 WB	Merge	58.8	60.5	58.7
24	F13 I 264 WB after Crittenden Dr	Freeway	59.2	60.6	59.1
25	F14 I 65 NB before Grade Lane	Freeway	18.6	58.2	9.0
26	D5 I 65 NB Exit to Grade Lane	Diverge	18.6	56.7	12.3
27	F15 I-65 NB at Grade Lane	Freeway	16.8	56.0	40.9
28	D6 I-65 NB to I-264 EB	Diverge	47.4	54.8	39.0
29	F16 I-65 NB to I-264 WB	Freeway	57.7	60.4	58.2
30	D7 I-65 NB Exit to I-264 WB	Diverge	58.6	61.1	59.0
31	F17 I-65 NB after I-264 Exit	Freeway	58.6	60.0	59.0
32	M6 I-264 to I-65 NB	Merge	56.4	57.2	53.1
33	F18 I-65 NB after I-264 Merge	Freeway	58.5	56.4	58.0
34	F19 I-65 SB before Phillips Lane Exit	Freeway	58.4	52.6	58.3
35	D8 Phillips Lane Exit from I-65 SB	Diverge	57.2	53.4	57.0
36	F20 I-65 SB after Phillips Lane Exit	Freeway	52.1	52.9	50.3
37	D9 I-65 SB to I-264 EB	Diverge	37.3	53.4	35.9
38	F21 I-65 SB before I-264 Merge	Freeway	57.2	58.0	56.5
38.1	Merge I-65 SB w I-264 WB Proposed	Merge	--	--	50.5
38.2	Freeway segment between Merges Proposed	Freeway	--	--	49.2
39	W3 I-264 to I-65 SB	Weave	55.5	57.6	48.3
40	F22 I-65 SB between Grade Lane Ramps	Freeway	57.7	59.6	45.1
41	M7 Grade Lane merge to I-65 SB	Merge	58.3	60.3	51.8
42	F23 I-65 SB after Grade Lane Merge	Freeway	58.8	60.3	51.5
43	W4 I-264 EB CD Road b/w 3rd and Crittenden	Weave	43.1	36.1	30.9
44	CD1 I-264 EB CD Road	Collector-Distributor	34.4	38.3	19.4
45	D10 I-264 EB CD Ramp to I-65 SB	Diverge	19.7	38.3	15.2
46	CD2 I-264 EB CD Road	Collector-Distributor	45.7	51.1	43.3
47	D11 I-264 EB CD Ramp to I-65 NB	Diverge	32.6	51.1	30.4
48	M8 Crittenden to I-264 WB CD	Merge	53.8	58.2	53.8
49	CD3 CD to I-264 WB	Collector-Distributor	54.4	58.2	54.5
50	W5 I-264 WB b/w Crittenden and 3rd	Weave	47.8	58.7	48.7
51	CD4 I-65 NB b/w Preston Ramps	Collector-Distributor	5.4	44.9	22.6
52	W6 b/w Preston Hwy and I-264 EB Ramp	Weave	6.2	44.5	13.3
53	CD5 I-65 NB b/w I-264 EB-WB Ramps	Collector-Distributor	47.4	52.6	34.4
54	D12 I-65 NB b/w I-264 EB-WB Ramps	Diverge	43.0	52.6	26.7

VISSIM Spd ± 5mph HERE Spd	VISSIM Spd ± 10mph HERE Spd	VISSIM Spd outside 10mph HERE Spd

4.3 DENSITY AND LOS

Table 18 shows the average density and LOS results from Potential Improvement Strategy B. Segments 12-15, leading into and through the I-264 westbound weave, all improve from a failing grade to LOS C. Most of the westbound segments are within LOS C or better under these conditions. Segments 16 and 17, I-264 westbound directly following the weave, experience LOS D and E, respectively. This is due to the redistribution in traffic from one exit to the next; however, the respective densities experienced are 27 and 40, significantly lower than the projected densities leading into the weave in the 2045 No-Build which are greater than 100.

Table 18: Potential Improvement Strategy B Density and LOS Results

Segment Number	Link	Type	No-Build Avg Density	Avg LOS	B Avg Density	B Avg LOS
1	F1 I-264 EB @ Crittenden	Freeway	51.7	F	52.5	F
2	D1 I-264 EB Ramp to Crittenden	Diverge	57.2	E	57.4	E
3	F2 I-264 EB	Freeway	35.7	E	36.8	E
4	D2 I-264 EB to Phillips Lane	Diverge	30.6	D	31.4	D
5	F3 I-264 EB	Freeway	18.8	C	18.8	C
6	M1 I-264 EB from Airport	Merge	27.7	C	28.8	D
7	F4 I-264 EB	Freeway	25.3	C	26.2	D
8	W1 I-264 EB between I-65 and Poplar Level Rd	Weave	40.4	E	40.5	E
9	F5 I-264 EB between Poplar Level Ramps	Freeway	27.7	D	27.1	D
10	M2 Poplar Level On Ramp to I-264 EB	Merge	25.2	C	24.8	C
11	F6 I-264 EB after Poplar Level	Freeway	11.0	B	10.9	A
12	F7 I-264 WB before Poplar Level	Freeway	137.4	F	24.3	C
13	D3 I-264 WB Exit to Poplar Level	Diverge	138.8	E	24.6	C
14	F8 I-264 WB between Poplar Level Ramps	Freeway	147.3	F	20.8	C
15	W2 I-264 WB between Poplar Level and I-65	Weave	119.1	E	26.8	C
16	F9 I-264 WB between I-65 and Phillips Lane	Freeway	13.6	B	27.3	D
17	D4 I-264 WB Ramp to Phillips Lane	Diverge	12.3	B	40.3	E
18	F10 I-264 WB between Phillips Lane and I-65 SB Merge	Freeway	13.5	B	17.9	B
19	M3 I-65 SB Merge with I-264 WB	Merge	12.9	B	16.7	B
20	F11 I-264 WB between I-65 SB and Phillips Lane Merge	Freeway	14.8	B	18.9	C
21	M4 Phillips Lane On Ramp to I-264 WB	Merge	15.8	B	18.1	B
22	F12 I-264 WB between Phillips Lane and Crittenden Dr	Freeway	17.0	B	20.0	C
23	M5 Crittenden Dr On Ramp to I-264 WB	Merge	14.3	B	16.6	B
24	F13 I 264 WB after Crittenden Dr	Freeway	11.2	B	13.1	B
25	F14 I 65 NB before Grade Lane	Freeway	75.7	F	116.1	F
26	D5 I 65 NB Exit to Grade Lane	Diverge	76.5	E	93.5	E
27	F15 I-65 NB at Grade Lane	Freeway	81.4	F	25.4	C
28	D6 I-65 NB to I-264 EB	Diverge	20.6	C	29.3	D
29	F16 I-65 NB to I-264 WB	Freeway	15.0	B	7.1	A
30	D7 I-65 NB Exit to I-264 WB	Diverge	14.7	B	7.0	A
31	F17 I-65 NB after I-264 Exit	Freeway	14.4	B	6.7	A
32	M6 I-264 to I-65 NB	Merge	12.3	B	12.4	B
33	F18 I-65 NB after I-264 Merge	Freeway	15.4	B	14.5	B
34	F19 I-65 SB before Phillips Lane Exit	Freeway	24.3	C	24.3	C
35	D8 Phillips Lane Exit from I-65 SB	Diverge	24.6	C	24.7	C
36	F20 I-65 SB after Phillips Lane Exit	Freeway	26.0	D	27.6	D
37	D9 I-65 SB to I-264 EB	Diverge	39.1	E	41.8	E
38	F21 I-65 SB before I-264 Merge	Freeway	23.7	C	24.2	C
38.1	Merge I-65 SB w I-264 WB Proposed	Merge I-65 SB w I-264 WB Proposed	Merge	--	28.5	D
38.2	Freeway segment between Merges Proposed	Freeway segment	Freeway	--	28.9	D
39	W3 I-264 to I-65 SB	Weave	25.6	C	31.3	D
40	F22 I-65 SB between Grade Lane Ramps	Freeway	23.2	C	26.0	D
41	M7 Grade Lane merge to I-65 SB	Merge	20.9	C	27.7	C
42	F23 I-65 SB after Grade Lane Merge	Freeway	13.3	B	16.0	B
43	W4 I-264 EB CD Road b/w 3rd and Crittenden	Weave	31.0	D	42.3	E
44	CD1 I-264 EB CD Road	Collector-Distributor	41.5	E	63.1	F
45	D10 I-264 EB CD Ramp to I-65 SB	Diverge	58.1	F	78.4	F
46	CD2 I-264 EB CD Road	Collector-Distributor	13.1	B	13.4	B
47	D11 I-264 EB CD Ramp to I-65 NB	Diverge	18.0	B	19.0	B
48	M8 Crittenden to I-264 WB CD	Merge	9.6	A	9.6	A
49	CD3 CD to I-264 WB	Collector-Distributor	8.5	A	8.5	A
50	W5 I-264 WB b/w Crittenden and 3rd	Weave	9.4	A	9.2	A
51	CD4 I-65 NB b/w Preston Ramps	Collector-Distributor	144.1	F	49.0	F
52	W6 b/w Preston Hwy and I-264 EB Ramp	Weave	129.2	E	79.1	E
53	CD5 I-65 NB b/w I-264 EB-WB Ramps	Collector-Distributor	11.1	B	25.3	C
54	D12 I-65 NB b/w I-264 EB-WB Ramps	Diverge	11.7	B	39.2	E

A-C	D	E	F

5 POTENTIAL IMPROVEMENT STRATEGY C MODEL RESULTS

Potential Improvement Strategy C reconfigures the I-65 southbound exits to I-264 westbound and eastbound by separating the westbound exit from Exit 131B and joining with the eastbound exit just north of its existing location. This results in two exits: Exit 131-B to the Fairgrounds/Expo Center and Exit 131A to I-264 westbound and I-264 eastbound. The improvement allows more time and distance to improve driver decision making for the ramp movements. Results for the improvement objective are shown in the following sections.

5.1 VOLUME THROUGHPUT

Table 19 illustrates the volume results compared to the expected throughput. Compared to the No-Build results for the section of I-65 southbound that will be impacted, there are no significant changes in volume throughput (although it is not an issue in the No-Build scenario either).

Table 19: Potential Improvement Strategy C Volume Throughput Comparison

Segment	Data Collection Group	Total Balanced Volume	No-Build % Difference	C % Difference
F1 I-264 EB @ Crittenden	1	5479	0%	1%
D1 I-264 EB Ramp to Crittenden	5	438	0%	1%
F2 I-264 EB	7	5041	-1%	1%
D2 I-264 EB to Phillips Lane	10	1800	1%	3%
F3 I-264 EB	11	3242	-2%	0%
M1 I-264 EB from Airport	14	838	5%	5%
F4 I-264 EB	15	4077	0%	1%
I-264 EB from I-65 NB	18	3356	5%	8%
W1 I-264 EB between I-65 and Poplar Level Rd	20	7434	2%	4%
I-264 EB Exit to Poplar Level	25	983	0%	1%
F5 I-264 EB between Poplar Level Ramps	27	6451	2%	5%
M2 Poplar Level On Ramp to I-264 EB	31	1197	5%	7%
F6 I-264 EB after Poplar Level	32	7647	2%	5%
F7 I-264 WB before Poplar Level	37	5674	29%	28%
D3 I-264 WB Exit to Poplar Level	41	811	30%	31%
F8 I-264 WB between Poplar Level Ramps	42	4863	28%	27%
Poplar Level On Ramp to I-264 WB	46	1270	6%	7%
W2 I-264 WB between Poplar Level and I-65	48	6133	24%	23%
I-264 WB Ramp to I-65	53	2410	25%	24%
F9 I-264 WB between I-65 and Phillips Lane	55	3723	23%	22%
D4 I-264 WB Ramp to Phillips Lane	59	701	39%	38%
F10 I-264 WB between Phillips Lane and I-65 SB Merge	61	3022	20%	19%
M3 I-65 SB Merge with I-264 WB	64	196	2%	2%
F11 I-264 WB between I-65 SB and Phillips Lane Merge	65	3217	19%	18%
M4 Phillips Lane On Ramp to I-264 WB	68	1627	14%	15%
F12 I-264 WB between Phillips Lane and Crittenden Dr	70	4845	17%	17%
M5 Crittenden Dr On Ramp to I-264 WB	74	223	2%	2%
F13 I 264 WB after Crittenden Dr	75	5068	16%	16%
F14 I 65 NB before Grade Lane	80	5981	11%	23%
D5 I 65 NB Exit to Grade Lane	85	377	13%	24%
F15 I-65 NB at Grade Lane	86	5605	12%	22%
D6 I-65 NB to I-264 EB	91	2728	14%	-13%
F16 I-65 NB to I-264 WB	92	2876	10%	56%
D7 I-65 NB Exit to I-264 WB	95	73	14%	19%
F17 I-65 NB after I-264 Exit	96	2804	9%	57%
M6 I-264 to I-65 NB	99	1224	11%	-66%
F18 I-65 NB after I-264 Merge	101	4028	10%	20%
F19 I-65 SB before Phillips Lane Exit	106	5667	0%	0%
D8 Phillips Lane Exit from I-65 SB	110	394	1%	1%
F20 I-65 SB after Phillips Lane Exit	111	5273	0%	-4%
I-65 SB Exit to I-264 WB	134b	196	--	1%
D9 I-65 SB to I-264 EB	115	1157	-1%	-1%
F21 I-65 SB before I-264 Merge	116	4116	1%	0%
W3 I-65 SB between I-264 EB ramp and Grade Lane Exit	121	7639	6%	6%
F22 I-65 SB between Grade Lane Ramps	127	7178	6%	6%
M7 Grade Lane merge to I-65 SB	132	626	7%	5%
F23 I-65 SB after Grade Lane Merge	133	7804	6%	6%

VISSIM Processed within ±10% Balanced Expected Volume	VISSIM Processed within ±20% Balanced Expected Volume	VISSIM Processed outside ±20% Balanced Expected Volume

5.2 SPEED

The Potential Improvement Strategy C speeds are compared to the 2045 No-Build speed results in **Table 20**. The speed results show comparable speed to the No-Build results in the areas of I-65 southbound that are impacted by the potential improvement strategy.

Table 20: Potential Improvement Strategy C Speed Comparison Results

Segment Number	Link	Type	VISSIM Avg No-Build Speed	HERE Avg Speed	VISSIM Avg C Speed
1	F1 I-264 EB @ Crittenden	Freeway	32.2	45.8	31.0
2	D1 I-264 EB Ramp to Crittenden	Diverge	30.6	46.4	30.1
3	F2 I-264 EB	Freeway	48.2	47.2	45.5
4	D2 I-264 EB to Phillips Lane	Diverge	47.7	48.5	44.7
5	F3 I-264 EB	Freeway	58.5	58.0	58.4
6	M1 I-264 EB from Airport	Merge	42.0	56.2	41.5
7	F4 I-264 EB	Freeway	53.7	53.9	54.0
8	W1 I-264 EB between I-65 and Poplar Level Rd	Weave	39.0	50.8	40.8
9	F5 I-264 EB between Poplar Level Ramps	Freeway	56.7	53.3	56.8
10	M2 Poplar Level On Ramp to I-264 EB	Merge	57.9	52.4	58.0
11	F6 I-264 EB after Poplar Level	Freeway	58.9	56.8	58.9
12	F7 I-264 WB before Poplar Level	Freeway	7.4	32.8	7.4
13	D3 I-264 WB Exit to Poplar Level	Diverge	7.4	33.9	7.5
14	F8 I-264 WB between Poplar Level Ramps	Freeway	6.0	31.4	6.2
15	W2 I-264 WB between Poplar Level and I-65	Weave	8.5	36.6	8.5
16	F9 I-264 WB between I-65 and Phillips Lane	Freeway	52.1	50.9	52.0
17	D4 I-264 WB Ramp to Phillips Lane	Diverge	57.0	55.2	55.5
18	F10 I-264 WB between Phillips Lane and I-65 SB Merge	Freeway	58.8	59.1	58.7
19	M3 I-65 SB Merge with I-264 WB	Merge	53.6	60.3	53.4
20	F11 I-264 WB between I-65 SB and Phillips Lane Merge	Freeway	58.6	61.0	58.5
21	M4 Phillips Lane On Ramp to I-264 WB	Merge	51.8	60.1	53.2
22	F12 I-264 WB between Phillips Lane and Crittenden Dr	Freeway	58.6	59.9	58.6
23	M5 Crittenden Dr On Ramp to I-264 WB	Merge	58.8	60.5	58.8
24	F13 I 264 WB after Crittenden Dr	Freeway	59.2	60.6	59.2
25	F14 I 65 NB before Grade Lane	Freeway	18.6	58.2	9.3
26	D5 I 65 NB Exit to Grade Lane	Diverge	18.6	56.7	12.4
27	F15 I-65 NB at Grade Lane	Freeway	16.8	56.0	40.1
28	D6 I-65 NB to I-264 EB	Diverge	47.4	54.8	38.1
29	F16 I-65 NB to I-264 WB	Freeway	57.7	60.4	58.2
30	D7 I-65 NB Exit to I-264 WB	Diverge	58.6	61.1	59.0
31	F17 I-65 NB after I-264 Exit	Freeway	58.6	60.0	59.0
32	M6 I-264 to I-65 NB	Merge	56.4	57.2	53.9
33	F18 I-65 NB after I-264 Merge	Freeway	58.5	56.4	58.1
34	F19 I-65 SB before Phillips Lane Exit	Freeway	58.4	52.6	58.3
35	D8 Phillips Lane Exit from I-65 SB	Diverge	57.2	53.4	56.6
36	F20 I-65 SB after Phillips Lane Exit	Freeway	52.1	52.9	47.5
37	D9 I-65 SB to I-264 EB	Diverge	37.3	53.4	51.3
38	F21 I-65 SB before I-264 Merge	Freeway	57.2	58.0	57.5
39	W3 I-264 to I-65 SB	Weave	55.5	57.6	55.2
40	F22 I-65 SB between Grade Lane Ramps	Freeway	57.7	59.6	57.7
41	M7 Grade Lane merge to I-65 SB	Merge	58.3	60.3	58.2
42	F23 I-65 SB after Grade Lane Merge	Freeway	58.8	60.3	58.8
43	W4 I-264 EB CD Road b/w 3rd and Crittenden	Weave	43.1	36.1	31.1
44	CD1 I-264 EB CD Road	Collector-Distributor	34.4	38.3	18.0
45	D10 I-264 EB CD Ramp to I-65 SB	Diverge	19.7	38.3	14.2
46	CD2 I-264 EB CD Road	Collector-Distributor	45.7	51.1	38.9
47	D11 I-264 EB CD Ramp to I-65 NB	Diverge	32.6	51.1	27.5
48	M8 Crittenden to I-264 WB CD	Merge	53.8	58.2	53.8
49	CD3 CD to I-264 WB	Collector-Distributor	54.4	58.2	54.6
50	W5 I-264 WB b/w Crittenden and 3rd	Weave	47.8	58.7	48.5
51	CD4 I-65 NB b/w Preston Ramps	Collector-Distributor	5.4	44.9	34.5
52	W6 b/w Preston Hwy and I-264 EB Ramp	Weave	6.2	44.5	19.9
53	CD5 I-65 NB b/w I-264 EB-WB Ramps	Collector-Distributor	47.4	52.6	39.2
54	D12 I-65 NB b/w I-264 EB-WB Ramps	Diverge	43.0	52.6	22.5

VISSIM Processed within ±10% Balanced Expected Volume	VISSIM Processed within ±20% Balanced Expected Volume	VISSIM Processed outside ±20% Balanced Expected Volume

5.3 DENSITY AND LOS

Table 21 shows the average density and LOS results from Potential Improvement Strategy C. Segments 34-39 are the focal point of Improvement Strategy C. Each of those segments experience an improved or negligible LOS in the model results. The benefits of this strategy, to decrease driver confusion, are not easily recognized in a microsimulation model.

Table 21: Potential Improvement Strategy C Density and LOS Results

Segment Number	Link	Type	No-Build Avg Density	Avg LOS	C Avg Density	C Avg LOS
1	F1 I-264 EB @ Crittenden	Freeway	51.7	F	53.6	F
2	D1 I-264 EB Ramp to Crittenden	Diverge	57.2	E	58.2	E
3	F2 I-264 EB	Freeway	35.7	E	37.7	E
4	D2 I-264 EB to Phillips Lane	Diverge	30.6	D	32.4	D
5	F3 I-264 EB	Freeway	18.8	C	18.6	C
6	M1 I-264 EB from Airport	Merge	27.7	C	28.0	C
7	F4 I-264 EB	Freeway	25.3	C	24.9	C
8	W1 I-264 EB between I-65 and Poplar Level Rd	Weave	40.4	E	37.6	E
9	F5 I-264 EB between Poplar Level Ramps	Freeway	27.7	D	26.9	D
10	M2 Poplar Level On Ramp to I-264 EB	Merge	25.2	C	24.5	C
11	F6 I-264 EB after Poplar Level	Freeway	11.0	B	10.7	A
12	F7 I-264 WB before Poplar Level	Freeway	137.4	F	137.0	F
13	D3 I-264 WB Exit to Poplar Level	Diverge	138.8	E	137.6	E
14	F8 I-264 WB between Poplar Level Ramps	Freeway	147.3	F	146.4	F
15	W2 I-264 WB between Poplar Level and I-65	Weave	119.1	E	118.8	E
16	F9 I-264 WB between I-65 and Phillips Lane	Freeway	13.6	B	13.8	B
17	D4 I-264 WB Ramp to Phillips Lane	Diverge	12.3	B	12.9	B
18	F10 I-264 WB between Phillips Lane and I-65 SB Merge	Freeway	13.5	B	13.8	B
19	M3 I-65 SB Merge with I-264 WB	Merge	12.9	B	13.2	B
20	F11 I-264 WB between I-65 SB and Phillips Lane Merge	Freeway	14.8	B	15.1	B
21	M4 Phillips Lane On Ramp to I-264 WB	Merge	15.8	B	15.3	B
22	F12 I-264 WB between Phillips Lane and Crittenden Dr	Freeway	17.0	B	17.0	B
23	M5 Crittenden Dr On Ramp to I-264 WB	Merge	14.3	B	14.3	B
24	F13 I 264 WB after Crittenden Dr	Freeway	11.2	B	11.3	B
25	F14 I 65 NB before Grade Lane	Freeway	75.7	F	112.5	F
26	D5 I 65 NB Exit to Grade Lane	Diverge	76.5	E	92.5	E
27	F15 I-65 NB at Grade Lane	Freeway	81.4	F	26.1	D
28	D6 I-65 NB to I-264 EB	Diverge	20.6	C	29.5	D
29	F16 I-65 NB to I-264 WB	Freeway	15.0	B	7.3	A
30	D7 I-65 NB Exit to I-264 WB	Diverge	14.7	B	7.1	A
31	F17 I-65 NB after I-264 Exit	Freeway	14.4	B	6.8	A
32	M6 I-264 to I-65 NB	Merge	12.3	B	11.7	B
33	F18 I-65 NB after I-264 Merge	Freeway	15.4	B	13.9	B
34	F19 I-65 SB before Phillips Lane Exit	Freeway	24.3	C	24.3	C
35	D8 Phillips Lane Exit from I-65 SB	Diverge	24.6	C	24.9	C
36	F20 I-65 SB after Phillips Lane Exit	Freeway	26.0	D	28.8	D
37	D9 I-65 SB to I-264 EB	Diverge	39.1	E	25.9	C
38	F21 I-65 SB before I-264 Merge	Freeway	23.7	C	23.7	C
39	W3 I-264 to I-65 SB	Weave	25.6	C	25.8	C
40	F22 I-65 SB between Grade Lane Ramps	Freeway	23.2	C	23.2	C
41	M7 Grade Lane merge to I-65 SB	Merge	20.9	C	20.9	C
42	F23 I-65 SB after Grade Lane Merge	Freeway	13.3	B	13.4	B
43	W4 I-264 EB CD Road b/w 3rd and Crittenden	Weave	31.0	D	43.4	E
44	CD1 I-264 EB CD Road	Collector-Distributor	41.5	E	66.2	F
45	D10 I-264 EB CD Ramp to I-65 SB	Diverge	58.1	F	83.2	F
46	CD2 I-264 EB CD Road	Collector-Distributor	13.1	B	15.2	B
47	D11 I-264 EB CD Ramp to I-65 NB	Diverge	18.0	B	20.6	C
48	M8 Crittenden to I-264 WB CD	Merge	9.6	A	9.5	A
49	CD3 CD to I-264 WB	Collector-Distributor	8.5	A	8.4	A
50	W5 I-264 WB b/w Crittenden and 3rd	Weave	9.4	A	9.0	A
51	CD4 I-65 NB b/w Preston Ramps	Collector-Distributor	144.1	F	48.1	F
52	W6 b/w Preston Hwy and I-264 EB Ramp	Weave	129.2	E	70.5	E
53	CD5 I-65 NB b/w I-264 EB-WB Ramps	Collector-Distributor	11.1	B	22.1	C
54	D12 I-65 NB b/w I-264 EB-WB Ramps	Diverge	11.7	B	36.9	E

A-C	D	E	F