

Comparing MTP Scenarios using Corridor Performance Measures

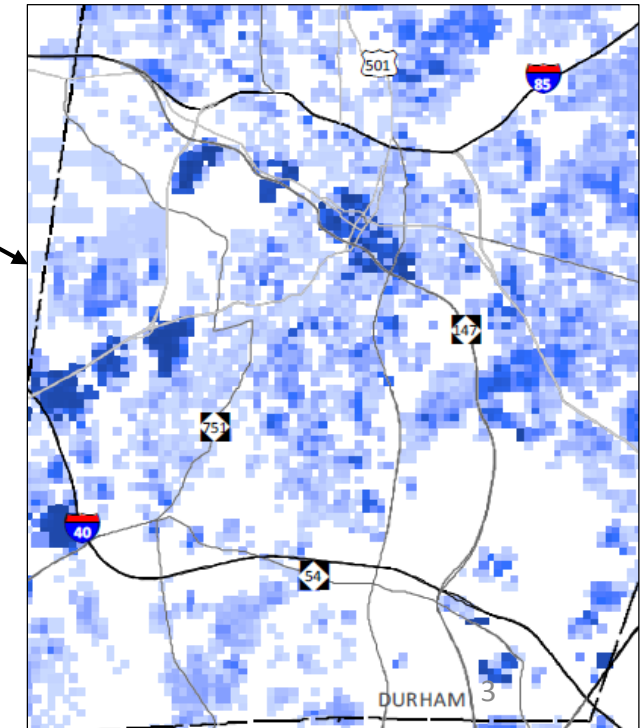
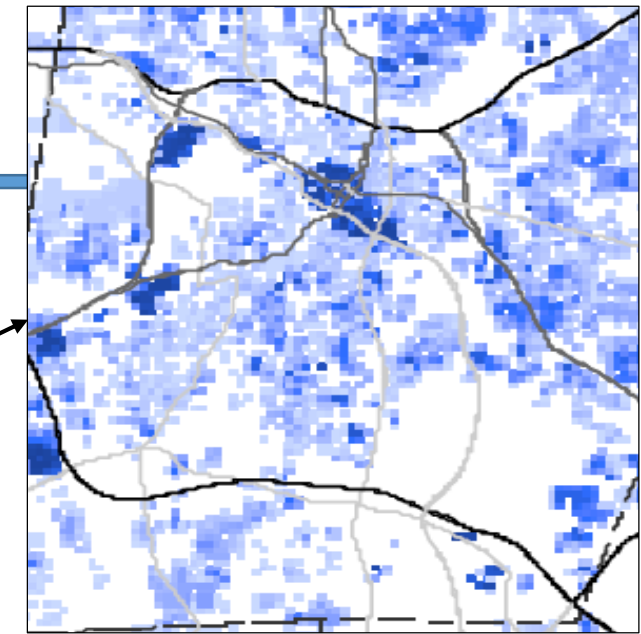
Scenarios to Compare

The DCHC MPO compared four different network scenarios with 2 different land use allocation scenarios (Community Plan/Aim High) for their 2045 MTP

- 2013 Baseline
- 2045 E+C
- Moderate 1: MTP/CP
- Moderate 3: MTP, Hwy+, No Fixed Guideway/Commuter Rail
- Aspirational1: MTP, Transit+/AIM High
- Aspirational2: MTP/AIM High

MTP Scenarios

Scenario	Highway Network	Transit Network	SE Data
Alternatives			
Moderate1- 2040 MTP	2040 MTP	2040 MTP (LRT, CRT, BRT)	Community Plan
Moderate3- Highway Enhanced/No Fixed Guideway	2040 MTP+	No Fixed Guideway (no LRT, CRT, BRT)	Community Plan
Aspirational1- Transit Enhanced	2040 MTP	Fixed Guideway+ <ul style="list-style-type: none"> • LRT to Carrboro • 15min peak bus headway • 30min off-peak bus headway 	AIM High
Aspirational2- 2040 MTP	2040 MTP	2040 MTP (LRT, CRT, BRT)	AIM High
Baseline and E+C			
2013 – Baseline	2013	2013	2013
2015 -- Baseline	2015	2015	2015 – interpolate SE Data
2045 E+C	E+C	E+C	Community Plan



Performance Measures

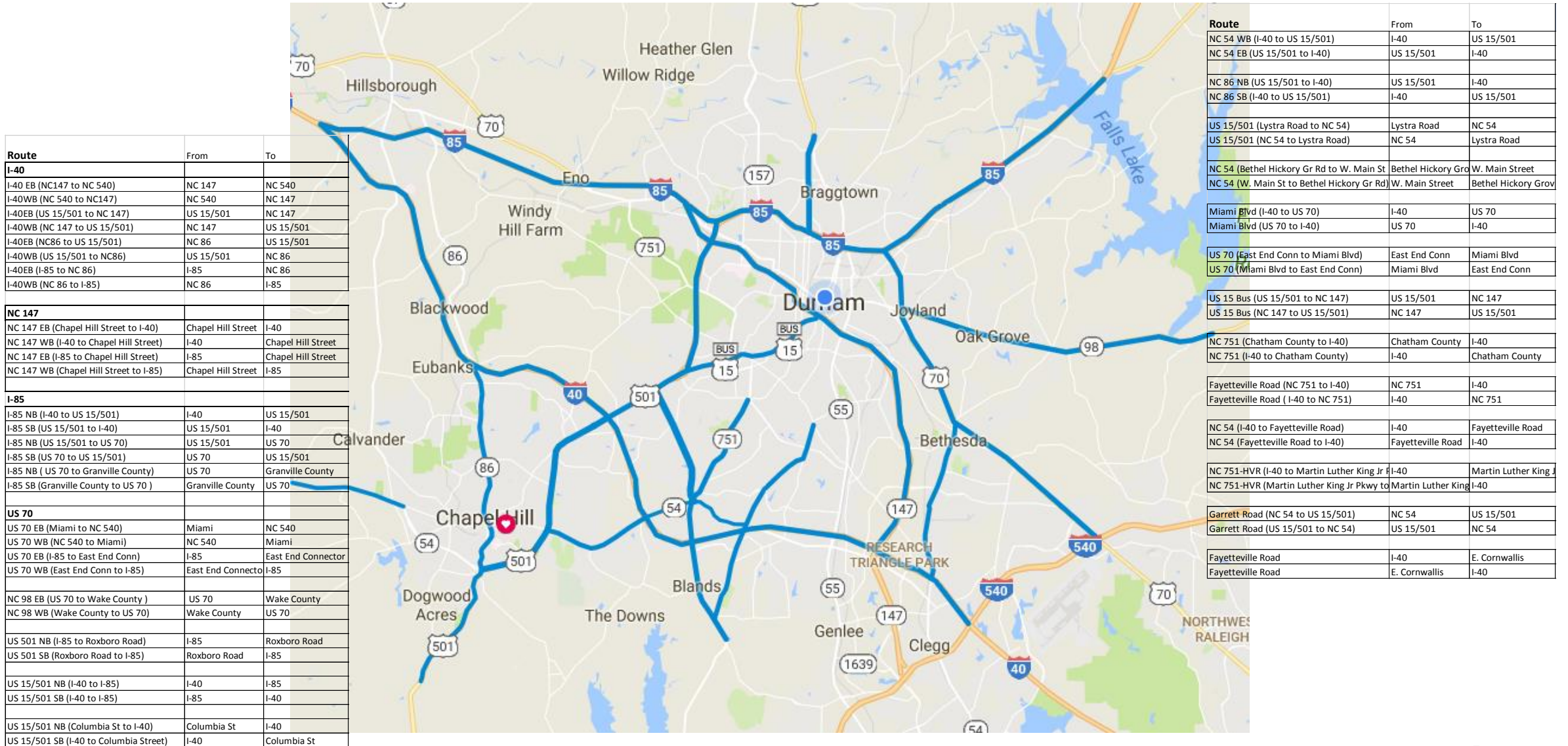
Corridors

Measures were calculated for selected travel corridors of the MPO for each Scenario. In addition to the travel time and speed, the travel time index and hourly cost of congestion indicate levels of congestion and are useful for measuring a corridor's performance:

The Travel Time Index indicates the level of congestion by dividing the peak period travel time by the free-flow travel time. For example, a TTI of 1.2 means that a 10-minute free-flow trip will take 12 minutes in the afternoon peak.

The Hourly Cost of Congestion shows the value of the additional time it takes for all the motorists, both car and truck, while traveling in that corridor under congested conditions.

Corridors Evaluated



Route	From	To
I-40		
I-40 EB (NC147 to NC 540)	NC 147	NC 540
I-40WB (NC 540 to NC147)	NC 540	NC 147
I-40EB (US 15/501 to NC 147)	US 15/501	NC 147
I-40WB (NC 147 to US 15/501)	NC 147	US 15/501
I-40EB (NC86 to US 15/501)	NC 86	US 15/501
I-40WB (US 15/501 to NC86)	US 15/501	NC 86
I-40EB (I-85 to NC 86)	I-85	NC 86
I-40WB (NC 86 to I-85)	NC 86	I-85
NC 147		
NC 147 EB (Chapel Hill Street to I-40)	Chapel Hill Street	I-40
NC 147 WB (I-40 to Chapel Hill Street)	I-40	Chapel Hill Street
NC 147 EB (I-85 to Chapel Hill Street)	I-85	Chapel Hill Street
NC 147 WB (Chapel Hill Street to I-85)	Chapel Hill Street	I-85
I-85		
I-85 NB (I-40 to US 15/501)	I-40	US 15/501
I-85 SB (US 15/501 to I-40)	US 15/501	I-40
I-85 NB (US 15/501 to US 70)	US 15/501	US 70
I-85 SB (US 70 to US 15/501)	US 70	US 15/501
I-85 NB (US 70 to Granville County)	US 70	Granville County
I-85 SB (Granville County to US 70)	Granville County	US 70
US 70		
US 70 EB (Miami to NC 540)	Miami	NC 540
US 70 WB (NC 540 to Miami)	NC 540	Miami
US 70 EB (I-85 to East End Conn)	I-85	East End Connector
US 70 WB (East End Conn to I-85)	East End Connector	I-85
NC 98 EB (US 70 to Wake County)	US 70	Wake County
NC 98 WB (Wake County to US 70)	Wake County	US 70
US 501 NB (I-85 to Roxboro Road)	I-85	Roxboro Road
US 501 SB (Roxboro Road to I-85)	Roxboro Road	I-85
US 15/501 NB (I-40 to I-85)	I-40	I-85
US 15/501 SB (I-40 to I-85)	I-85	I-40
US 15/501 NB (Columbia St to I-40)	Columbia St	I-40
US 15/501 SB (I-40 to Columbia Street)	I-40	Columbia St

Route	From	To
NC 54 WB (I-40 to US 15/501)	I-40	US 15/501
NC 54 EB (US 15/501 to I-40)	US 15/501	I-40
NC 86 NB (US 15/501 to I-40)	US 15/501	I-40
NC 86 SB (I-40 to US 15/501)	I-40	US 15/501
US 15/501 (Lystra Road to NC 54)	Lystra Road	NC 54
US 15/501 (NC 54 to Lystra Road)	NC 54	Lystra Road
NC 54 (Bethel Hickory Gr Rd to W. Main St)	Bethel Hickory Gro	W. Main Street
NC 54 (W. Main St to Bethel Hickory Gr Rd)	W. Main Street	Bethel Hickory Gro
Miami Blvd (I-40 to US 70)	I-40	US 70
Miami Blvd (US 70 to I-40)	US 70	I-40
US 70 (East End Conn to Miami Blvd)	East End Conn	Miami Blvd
US 70 (Miami Blvd to East End Conn)	Miami Blvd	East End Conn
US 15 Bus (US 15/501 to NC 147)	US 15/501	NC 147
US 15 Bus (NC 147 to US 15/501)	NC 147	US 15/501
NC 751 (Chatham County to I-40)	Chatham County	I-40
NC 751 (I-40 to Chatham County)	I-40	Chatham County
Fayetteville Road (NC 751 to I-40)	NC 751	I-40
Fayetteville Road (I-40 to NC 751)	I-40	NC 751
NC 54 (I-40 to Fayetteville Road)	I-40	Fayetteville Road
NC 54 (Fayetteville Road to I-40)	Fayetteville Road	I-40
NC 751-HVR (I-40 to Martin Luther King Jr Pkwy)	I-40	Martin Luther King Jr Pkwy
NC 751-HVR (Martin Luther King Jr Pkwy to I-40)	Martin Luther King Jr Pkwy	I-40
Garrett Road (NC 54 to US 15/501)	NC 54	US 15/501
Garrett Road (US 15/501 to NC 54)	US 15/501	NC 54
Fayetteville Road	I-40	E. Cornwallis
Fayetteville Road	E. Cornwallis	I-40

TransCAD - Shortest Path Skim (setup)

- Add the PM peak hour VMT and PM peak hour congested travel time to TransCAD network file, highway.net (length and FFtime are already in highway.net)

Step 1. Join the PM peak hour assignment result file,
PMP2.bin to Highway_line.dbd (under \input\highway\)

Step 2. Calculate PM peak hour VMT and travel time fields in the highway line file

Step 2. Add the PM peak hour VMT and travel time fields in the highway.net using *update network*,
 $AB_PMPkHr_VMT=length*AB_PkFlow$ $BA_PMPkHr_VMT=length*BA_PkFlow$
 $AB_PMPk_TT=length*60/AB_Pktime$ $BA_PMPk_TT=length*60/BA_Pktime$

- Use TransCAD Geo file, e.g. Highway_line.dbd with the network file to calculate the measures using *Shortest Path* tool

Field
ID1
AB_Flow_PCE
BA_Flow_PCE
Tot_Flow_PCE
AB_Time
BA_Time
Max_Time
AB_VOC
BA_VOC
Max_VOC
AB_V_Dist_T
BA_V_Dist_T
Tot_V_Dist_T
AB_VHT
BA_VHT
Tot_VHT
AB_Speed
BA_Speed
AB_VDF
BA_VDF
Max_VDF
AB_Flow_SOV2
BA_Flow_SOV2
AB_Flow_HOV2
BA_Flow_HOV2
AB_Flow_SUT2
BA_Flow_SUT2
AB_Flow_MUT2
BA_Flow_MUT2
AB_Flow
BA_Flow
Tot_Flow

TransCAD - Shortest Path Skim (setup - cont.)

The screenshot displays the TransCAD interface with two dialog boxes open over a map window titled "Map1 - Highway_Line".

Network Settings Dialog:

- File: C:\...model\2045Mod\Output\Highway.net
- Based on: C:\...od\INPUT\HIGHWAY\Highway_Line.DBD
- Description: C:\TRM model\2045Mod\OUTPUT\Highway.net
- General tab selected.
- Centroids: Centroids are in network (2956 nodes)
- Link Type (None): In use, Not in use
- Penalties: None, Turn, Transfer

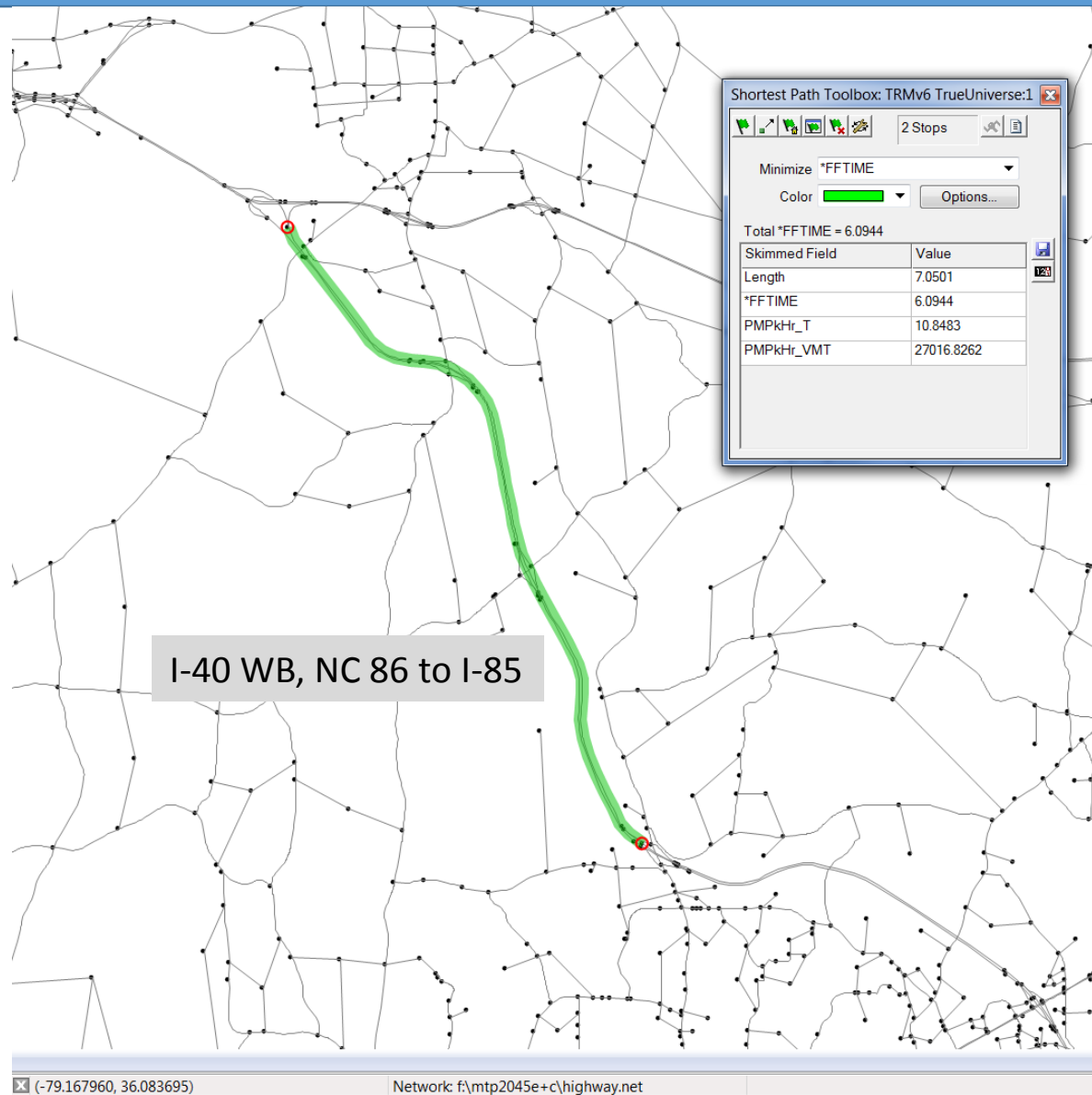
Update Network Dialog:

- Enable/Disable Links: Action: No Change
- Lookup Table: Table: None
- Layer Type Field: None
- Link Costs table:

Update	Network Field	From Line Layer Field	Defaults
<input type="checkbox"/>	MDTime	[ABMDTime / BAMDTime]	
<input type="checkbox"/>	NTTime	[ABNTTime / BANTTime]	
<input type="checkbox"/>	PMPkHr_Vol		
<input type="checkbox"/>	PMPkHr_Time		
<input type="checkbox"/>	PMPkHr_VMT	[AB_PMPkHr_VMT / BA_PM	
<input checked="" type="checkbox"/>	AM_PkHr_T		

Node Costs table is empty.

TransCAD - Shortest Path Skim



Performance Calculations by Scenario

2045 E+C -- PM Peak Hour

Corridor	From	To	Period	Direction	Length	FF TT (min)	Peak Avg Volume (Tot_Flow*L ength/Leng th)	Tot_Flow*L ength (all links)	Peak TT (min)	Peak Speed	FF Speed (spd Limit)	TTI	Total Veh Delay PP (min)	Total Veh Delay PP (hrs)	VOT/hour	VOT/hour/ mile
I-40					★	★		★	★							
I-40 EB (NC147 to NC 540)	NC 147	NC 540	PM Peak	Eastbound	3.43	3.12	8,257	28,317	6.38	32	66	2.0	26,876	448	\$ 10,181	\$ 2,968
I-40WB (NC 540 to NC147)	NC 540	NC 147	PM Peak	Westbound	3.26	2.97	7,744	25,220	4.53	43	66	1.5	12,090	201	\$ 4,580	\$ 1,406
I-40EB (US 15/501 to NC 147)	US 15/501	NC 147	PM Peak	Eastbound	9.52	8.61	6,522	62,110	20.89	27	66	2.4	80,140	1,336	\$ 30,357	\$ 3,188
I-40WB (NC 147 to US 15/501)	NC 147	US 15/501	PM Peak	Westbound	9.70	8.77	6,002	58,202	16.20	36	66	1.8	44,586	743	\$ 16,889	\$ 1,742
I-40EB (NC86 to US 15/501)	NC 86	US 15/501	PM Peak	Eastbound	4.23	3.85	3,637	15,374	6.38	40	66	1.7	9,187	153	\$ 3,480	\$ 823
I-40WB (US 15/501 to NC86)	US 15/501	NC 86	PM Peak	Westbound	4.42	4.03	4,377	19,365	12.14	22	66	3.0	35,480	591	\$ 13,440	\$ 3,038
I-40EB (I-85 to NC 86)	I-85	NC 86	PM Peak	Eastbound	7.25	6.56	2,996	21,717	8.10	54	66	1.2	4,619	77	\$ 1,750	\$ 241
I-40WB (NC 86 to I-85)	NC 86	I-85	PM Peak	Westbound	7.05	6.09	3,832	27,017	10.85	39	69	1.8	18,218	304	\$ 6,901	\$ 979

Aspirational 2

Corridor	From	To	Period	Direction	Length	FF TT (min)	Peak Avg Volume (Tot_Flow*L ength/Leng th)	Tot_Flow*L ength (all links)	Peak TT (min)	Peak Speed	FF Speed (spd Limit)	TTI	Total Veh Delay PP (min)	Total Veh Delay PP (hrs)	VOT/hour	VOT/hour/ mile
I-40																
I-40 EB (NC147 to NC 540)	NC 147	NC 540	PM Peak	Eastbound	3.43	3.12	7,757	26,579	5.09	40	66	1.6	15,248	254	\$ 5,776	\$ 1,686
I-40WB (NC 540 to NC147)	NC 540	NC 147	PM Peak	Westbound	3.27	2.98	7,591	24,831	4.16	47	66	1.4	8,945	149	\$ 3,388	\$ 1,036
I-40EB (US 15/501 to NC 147)	US 15/501	NC 147	PM Peak	Eastbound	9.22	8.32	5,867	54,069	14.31	39	66	1.7	35,116	585	\$ 13,302	\$ 1,443
I-40WB (NC 147 to US 15/501)	NC 147	US 15/501	PM Peak	Westbound	9.32	8.42	5,915	55,122	14.08	40	66	1.7	33,453	558	\$ 12,672	\$ 1,360
I-40EB (NC86 to US 15/501)	NC 86	US 15/501	PM Peak	Eastbound	4.15	3.79	4,481	18,575	4.63	54	66	1.2	3,778	63	\$ 1,431	\$ 345
I-40WB (US 15/501 to NC86)	US 15/501	NC 86	PM Peak	Westbound	4.17	3.81	5,425	22,626	5.36	47	66	1.4	8,429	140	\$ 3,193	\$ 766
I-40EB (I-85 to NC 86)	I-85	NC 86	PM Peak	Eastbound	6.76	5.82	4,356	29,460	6.64	61	70	1.1	3,585	60	\$ 1,358	\$ 201
I-40WB (NC 86 to I-85)	NC 86	I-85	PM Peak	Westbound	6.71	5.79	4,821	32,363	6.95	58	70	1.2	5,596	93	\$ 2,120	\$ 316

pm Peak Hour Travel Time

Route	Travel Time (min.)					
	2015 Base Year	2045 E+C	Mod-MTP	Mod - Hwy+	Asp - Transit	Asp - MTP
I-40						
I-40 EB (NC147 to NC 540)	4.0	6.4	5.6	5.4	5.0	5.1
I-40WB (NC 540 to NC147)	3.6	4.5	4.0	4.0	4.2	4.2
I-40EB (US 15/501 to NC 147)	10.6	20.9	16.9	18.6	14.2	14.3
I-40WB (NC 147 to US 15/501)	10.8	16.2	14.6	15.0	14.0	14.1
I-40EB (NC86 to US 15/501)	4.9	6.4	4.5	4.3	4.6	4.6
I-40WB (US 15/501 to NC86)	4.9	12.1	6.0	5.3	5.4	5.4
I-40EB (I-85 to NC 86)	7.1	8.1	7.0	6.7	6.6	6.6
I-40WB (NC 86 to I-85)	6.8	10.8	7.5	7.6	7.0	6.9

pm Peak Hour & FF Speed

DCHC MPO - Alternatives Analysis														
Route	Peak Speed by Corridor						Free Flow Speed by Corridor							
	2015 Base Year	2045 E+C	Mod-MTP	Mod - Hwy+	Asp - Transit	Asp - MTP	2013 Baseline	2015 Base Year	2045 E+C	Mod-MTP	Mod - Hwy+	Asp - Transit	Asp - MTP	
I-40														
I-40 EB (NC147 to NC 540)	50.8	32.3	37.0	37.7	41.2	40.4	65.7	65.8	65.9	65.8	65.8	65.8	65.8	65.8
I-40WB (NC 540 to NC147)	56.1	43.1	49.5	49.2	46.5	47.2	66.0	66.0	65.8	65.8	65.8	65.8	65.8	65.8
I-40EB (US 15/501 to NC 147)	52.2	27.3	32.7	29.6	38.7	38.6	67.4	67.4	66.4	66.4	66.5	66.5	66.5	66.4
I-40WB (NC 147 to US 15/501)	52.0	35.9	38.3	37.2	40.0	39.7	67.3	67.4	66.3	66.3	66.4	66.4	66.4	66.4
I-40EB (NC86 to US 15/501)	50.4	39.8	54.9	57.6	53.7	53.7	65.9	65.8	65.8	65.8	65.8	65.8	65.7	65.7
I-40WB (US 15/501 to NC86)	50.7	21.9	41.7	47.4	46.5	46.7	66.3	65.8	65.8	65.8	65.8	65.8	65.7	65.7
I-40EB (I-85 to NC 86)	56.9	53.7	62.1	60.6	61.0	61.1	66.4	66.3	66.3	69.5	66.0	69.7	69.7	69.7
I-40WB (NC 86 to I-85)	59.1	39.0	53.4	52.8	57.5	58.0	69.7	69.7	69.4	69.4	69.4	69.6	69.6	69.6

* Peak Speed = Length/(PKTT*60)

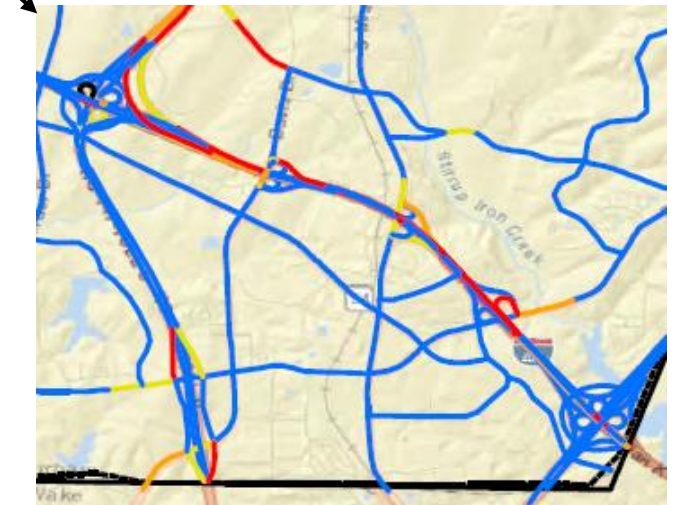
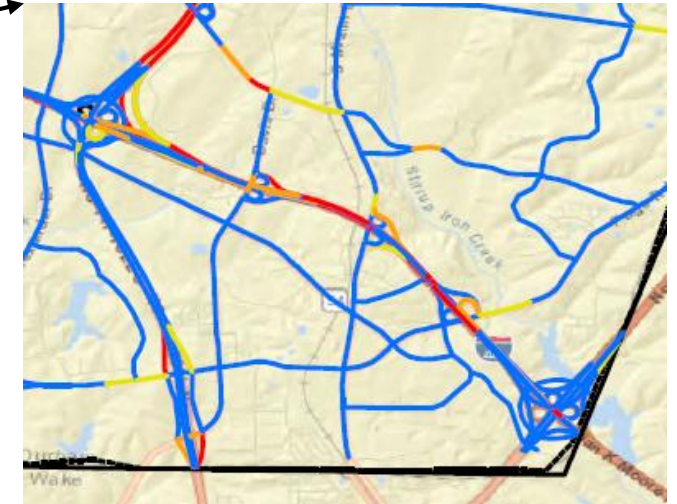
* Free Flow Speed = Length/(FFTT*60)

Travel Time Index

Afternoon Peak Period

DCHC MPO - Alternatives Analysis Travel Time Index by Corridor

Route	2015 Base Year	2045 E+C	Mod-MTP	Mod-Hwy	Asp-Transit	Asp-MTP
I-40						
I-40 EB (NC147 to NC 540)	1.3	2.0	1.8	1.7	1.6	1.6
I-40WB (NC 540 to NC147)	1.2	1.5	1.3	1.3	1.4	1.4
I-40EB (US 15/501 to NC 147)	1.3	2.4	2.0	2.2	1.7	1.7
I-40WB (NC 147 to US 15/501)	1.3	1.8	1.7	1.8	1.7	1.7
I-40EB (NC86 to US 15/501)	1.3	1.7	1.2	1.1	1.2	1.2
I-40WB (US 15/501 to NC86)	1.3	3.0	1.6	1.4	1.4	1.4
I-40EB (I-85 to NC 86)	1.2	1.2	1.1	1.1	1.1	1.1
I-40WB (NC 86 to I-85)	1.2	1.8	1.3	1.3	1.2	1.2



Value of Time/Hour

Route	VOT/hour					
	2015 Base Year	2045 E+C	Mod-MTP	Mod - Hwy+	Asp - Transit	Asp - MTP
I-40						
I-40 EB (NC147 to NC 540)	\$ 2,391	\$ 10,181	\$ 7,394	\$ 6,989	\$ 5,422	\$ 5,776
I-40WB (NC 540 to NC147)	\$ 1,288	\$ 4,580	\$ 2,718	\$ 2,794	\$ 3,613	\$ 3,388
I-40EB (US 15/501 to NC 147)	\$ 4,880	\$ 30,357	\$ 19,607	\$ 24,969	\$ 13,258	\$ 13,302
I-40WB (NC 147 to US 15/501)	\$ 4,915	\$ 16,889	\$ 13,978	\$ 15,307	\$ 12,430	\$ 12,672
I-40EB (NC86 to US 15/501)	\$ 1,569	\$ 3,480	\$ 1,226	\$ 811	\$ 1,441	\$ 1,431
I-40WB (US 15/501 to NC86)	\$ 1,538	\$ 13,440	\$ 4,786	\$ 3,109	\$ 3,227	\$ 3,193
I-40EB (I-85 to NC 86)	\$ 1,182	\$ 1,750	\$ 1,128	\$ 716	\$ 1,370	\$ 1,358
I-40WB (NC 86 to I-85)	\$ 1,288	\$ 6,901	\$ 3,374	\$ 3,577	\$ 2,248	\$ 2,120

VOT/Hr = Total Veh Delay Pk Period (hrs)[(CarMix*CarHrlyVOT)+(CVMix*CVHrlyVOT)]

Value of Time/Hour/Mile

Afternoon Peak Period

DCHC MPO - Alternatives Analysis Hourly Cost of Congestion* by Corridor

Route	2015 Base Year	2045 E+C	Mod-MTP	Mod-Hwy	Asp-Transit	Asp-MTP
I-40						
I-40 EB (NC147 to NC 540)	\$ 702	\$ 2,968	\$ 2,158	\$ 2,040	\$ 1,583	\$ 1,686
I-40WB (NC 540 to NC147)	\$ 385	\$ 1,406	\$ 831	\$ 854	\$ 1,105	\$ 1,036
I-40EB (US 15/501 to NC 147)	\$ 530	\$ 3,188	\$ 2,124	\$ 2,720	\$ 1,444	\$ 1,443
I-40WB (NC 147 to US 15/501)	\$ 527	\$ 1,742	\$ 1,500	\$ 1,642	\$ 1,334	\$ 1,360
I-40EB (NC86 to US 15/501)	\$ 379	\$ 823	\$ 296	\$ 196	\$ 348	\$ 345
I-40WB (US 15/501 to NC86)	\$ 369	\$ 3,038	\$ 1,147	\$ 745	\$ 774	\$ 766
I-40EB (I-85 to NC 86)	\$ 175	\$ 241	\$ 155	\$ 106	\$ 203	\$ 201
I-40WB (NC 86 to I-85)	\$ 192	\$ 979	\$ 503	\$ 533	\$ 335	\$ 316

VOT/Hr/mi = {Total Veh Delay Pk Period (hrs)[(CarMix*CarHrlyVOT)+(CVMix*CVHrlyVOT)]}/length

Conclusions

- Corridor Performance Measures are an effective way to compare the impact of different MTP and LU scenarios on specific corridors.
- Using TransCADs shortest path tool and a loaded network provides the data for the measures.
- For the future: Write a script to facilitate the extraction and calculation of the measures for each corridor.

Questions?
