

# Omaha-Council Bluffs Metro Beltway Feasibility Study

MTMUG  
March 19, 2009  
Courtney Sokol and Greg Youell

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## Purpose of this Study

- ❖ To determine the need for and feasibility of an outer loop freeway

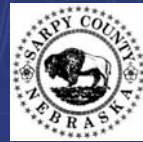
AND

- ❖ Determine if land use patterns or other transportation network options alter the answer

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## Study Sponsors



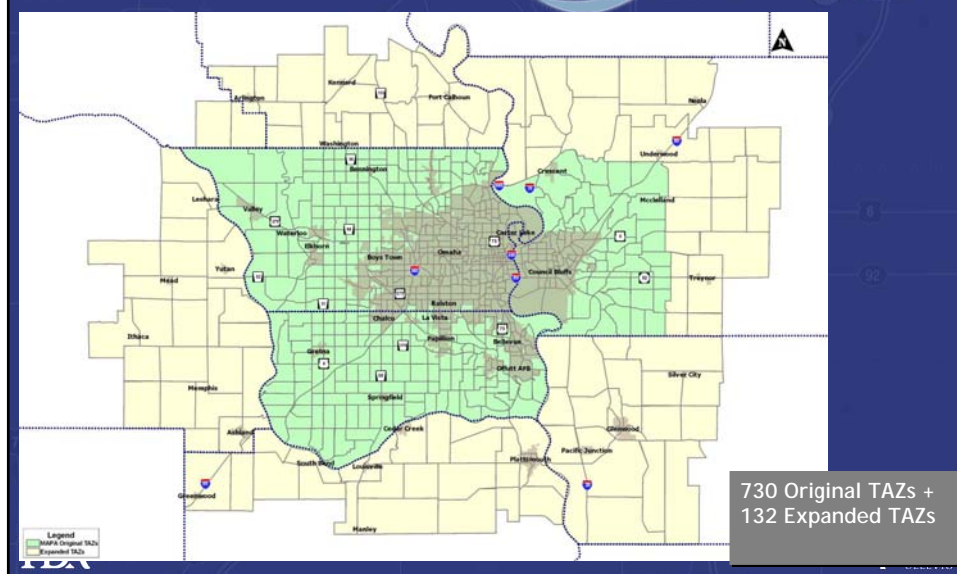
## What is a Beltway & What Would it Do?

- ❖ A major, limited access roadway around a metropolitan area
- ❖ Maintain a quality transportation system

→ *History of the beltway concept in Omaha*

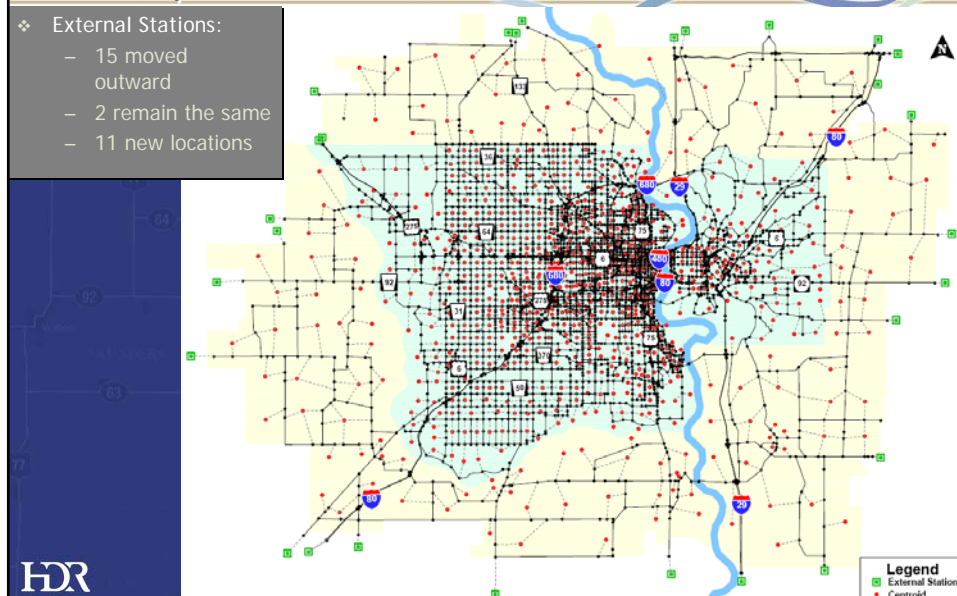


## Travel Demand Model Enhancements: Expanded 2004 Base Year Model

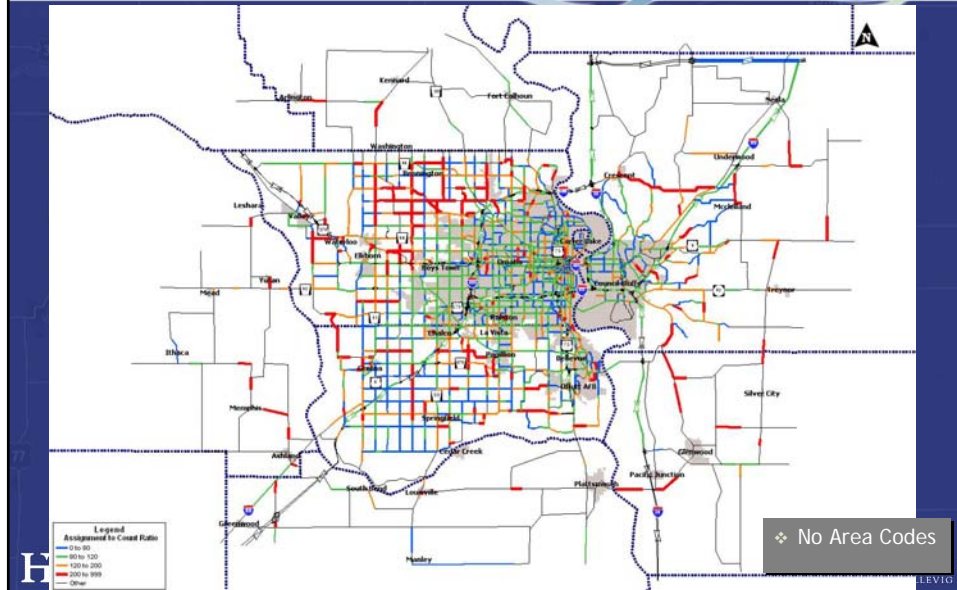


## Travel Demand Model Enhancements: Expanded 2004 Base Year Model

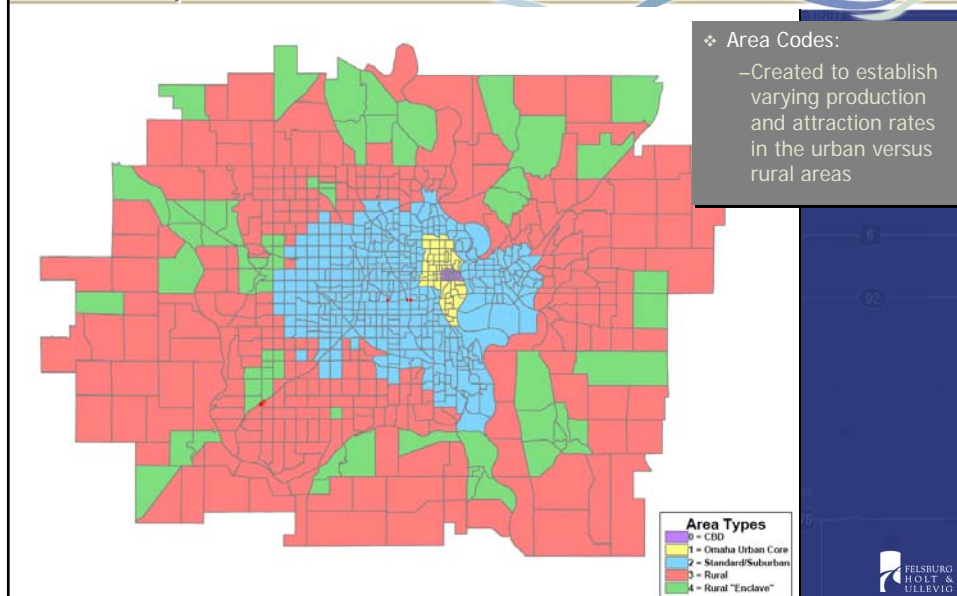
- ❖ External Stations:
  - 15 moved outward
  - 2 remain the same
  - 11 new locations



## Travel Demand Model Enhancements: Expanded 2004 Base Year Model

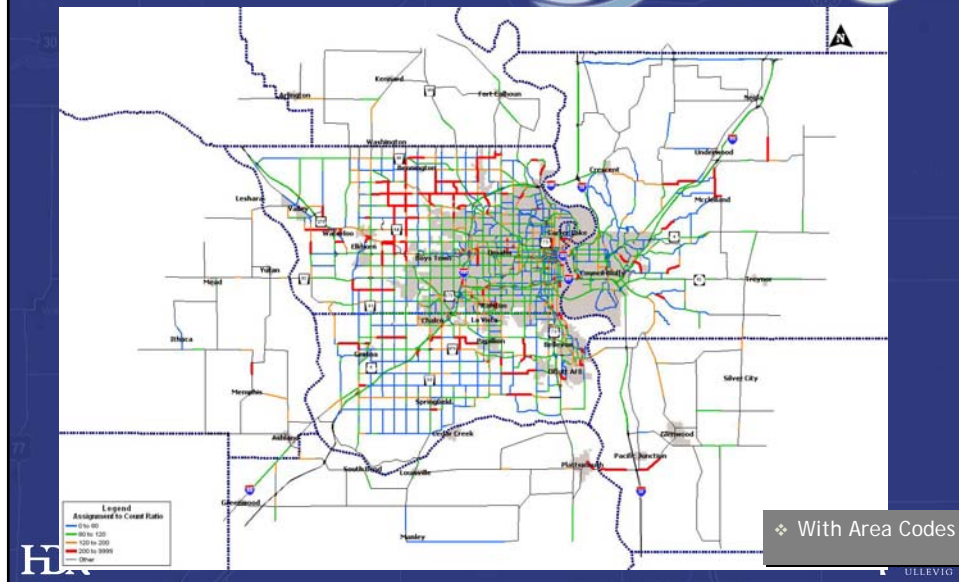


## Travel Demand Model Enhancements: Expanded 2004 Base Year Model





## Travel Demand Model Enhancements: Expanded 2004 Base Year Model



## Travel Demand Model Enhancements: Expanded 2004 Base Year Model

### Production Rates

Income in 1000s	New Code 0, 1, 2	New Code 3	New Code 4	MAPA Old	HDR Expanded	NCHRP 365
5 (Minimum)	1	1	1	1.01	-	4
20 (Low)	6.5	4.5	3.5	6.63	-	6
50 (Mid)	11.5	7	5.5	12.89	7.89	8.9
70 (High)	14	10	8	15.4	10.4	11.5
100+ (Max)	15	11	10	16.82	11.82	13

Rural TAZs (3) and Rural Enclave TAZs (4) have lower production rates

### Attraction Rates

Trip Purpose	0 (CBD)			1 (Urban Core)			2 (Non-Rural, Non-CBD/Core)			3 (Rural)			4 (Rural Enclaves)		
	Retail	Non-Retail	HHs	Retail	Non-Retail	HHs	Retail	Non-Retail	HHs	Retail	Non-Retail	HHs	Retail	Non-Retail	HHs
HBW	1.6	1.6		1.6	1.6		1.6	1.6		1.5	1.5		1.4	1.4	
HBNW	4	1	1.5	8	1	1.5	12	1.25	1.5	11	0.9	1.25	10	0.8	1
NHB	1.5	1	0.6	2.5	1	0.6	3.5	1	0.6	3.25	0.8	0.6	3	0.6	0.5

Attraction rates by Area Code helped reduce previous imbalance between P's and A's.

# Travel Demand Model Enhancements: Expanded 2004 Base Year Model Results

## Final Expanded 2004 Model Stats Total Area (MAPA Original + Expanded Beltway Area)

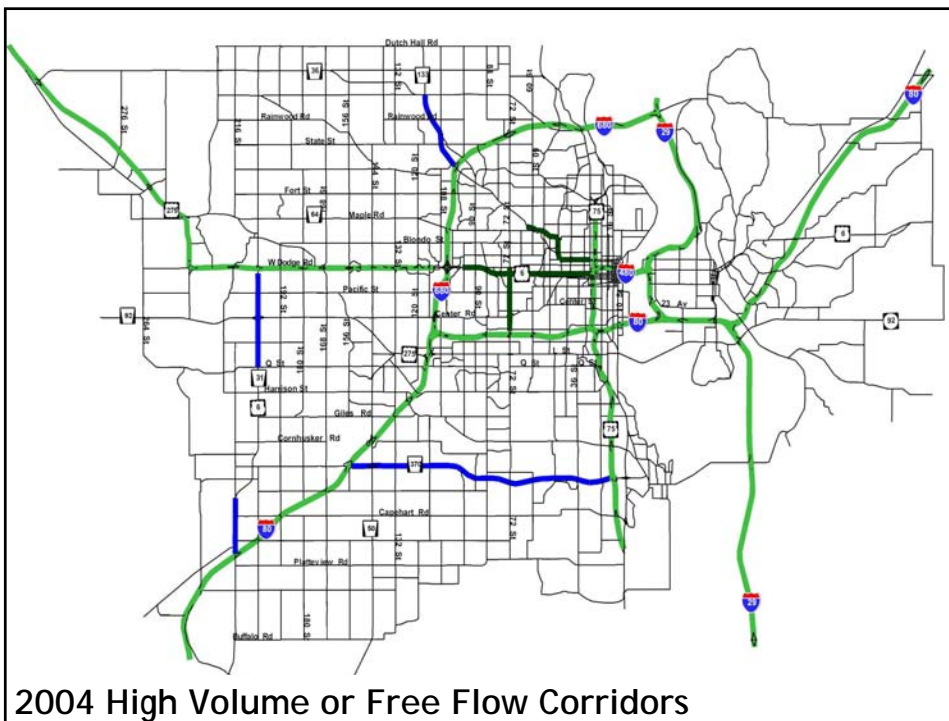
Selection	Observations	RMSE			R Squared	
		RMSE	GOAL	%Flow/ Count	R Sq.	GOAL
All Roads Counts	4027	29.77	29.71	-1.85	0.927	0.929
Freeways	178	13.42	13.87	-1.22	0.970	0.967
Arterials	2632	26.46	27.2	-1.96	0.915	0.908
Collectors Locals	1195	73.21	73.55	-1.84	0.596	0.604

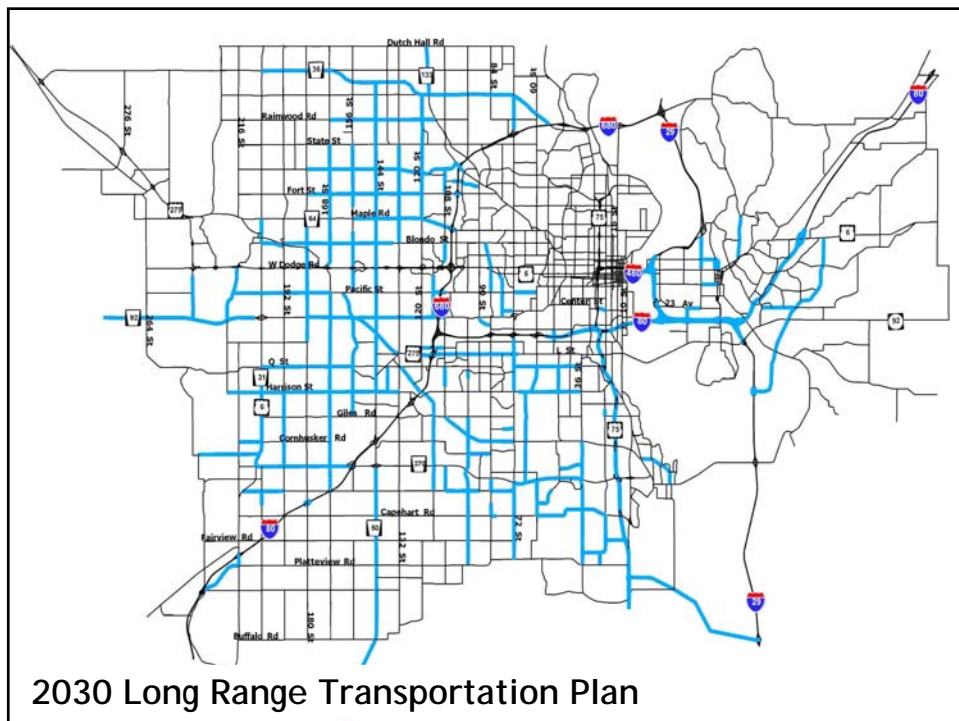
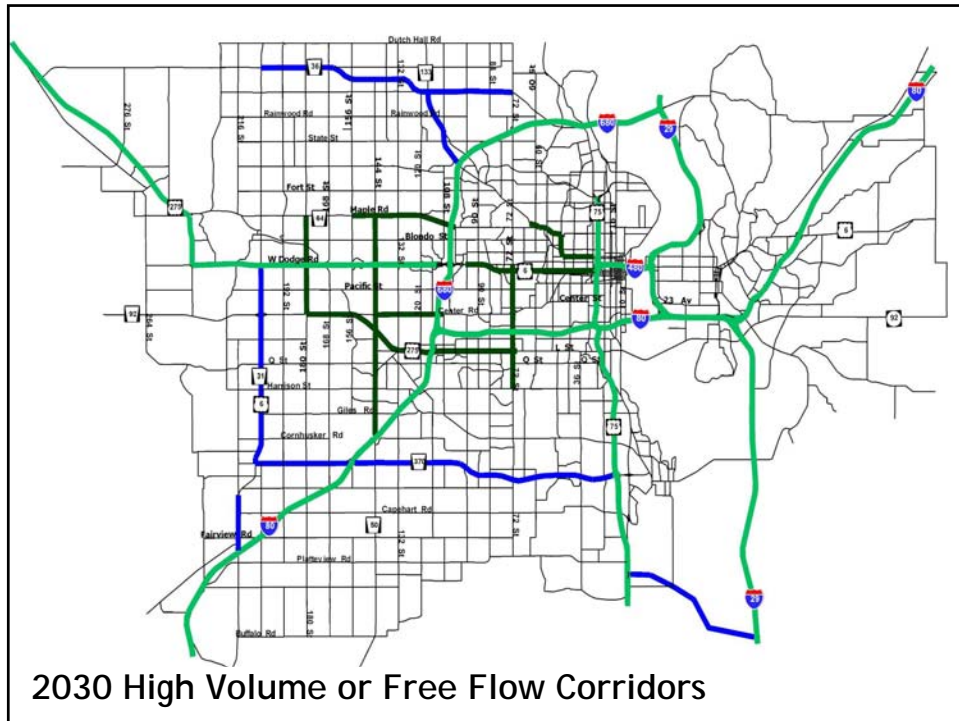
## Final Expanded 2004 Model Stats MAPA Original Area Only

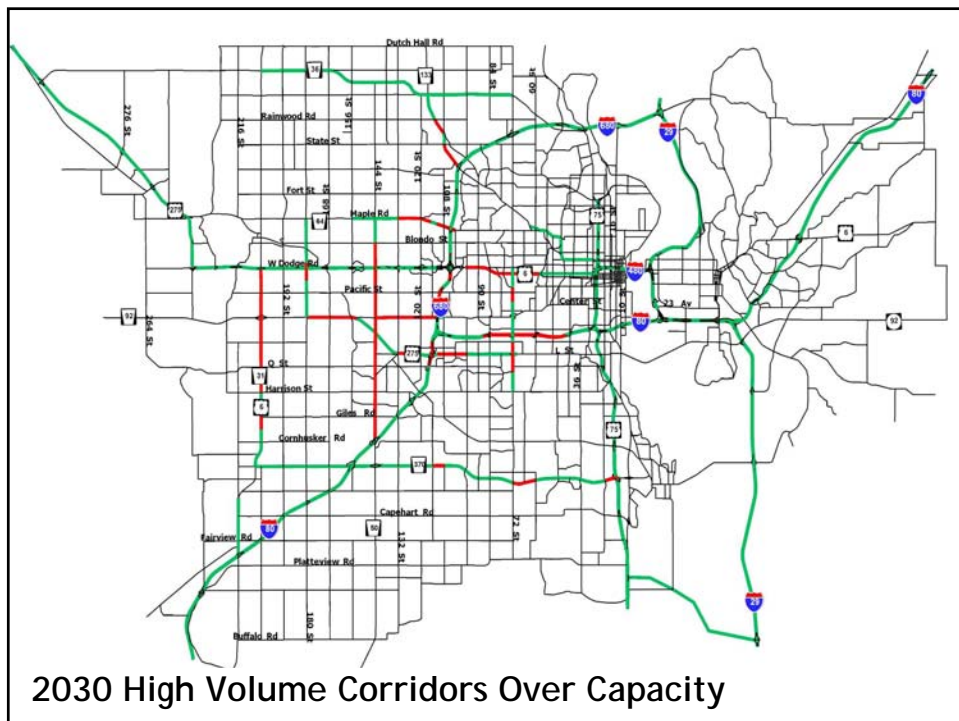
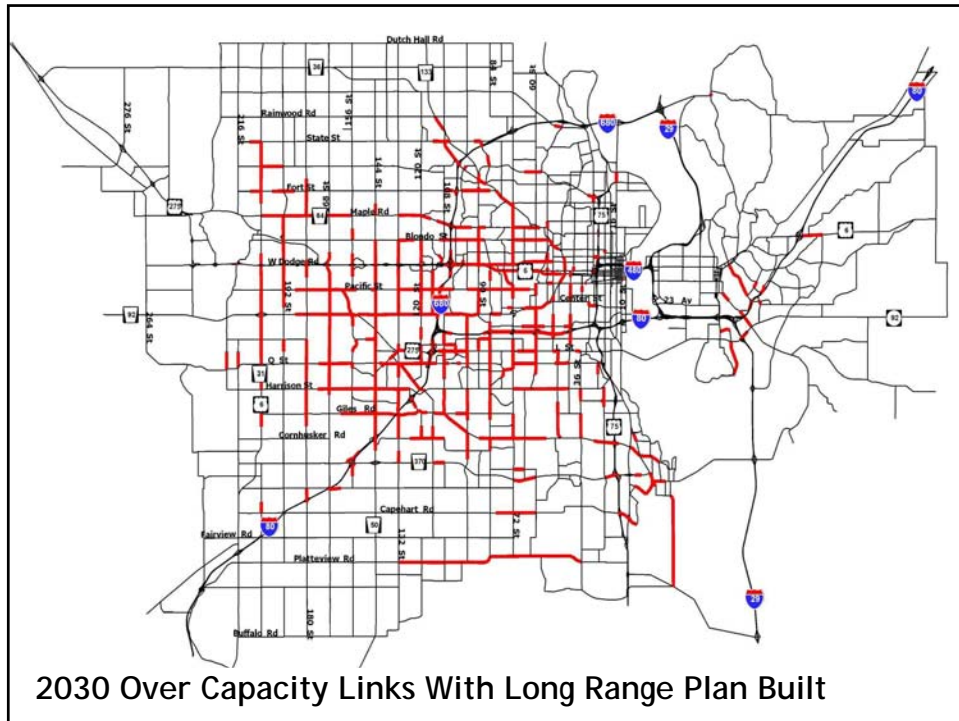
Selection	Observations	RMSE			R Squared	
		RMSE	GOAL	%Flow/ Count	R Sq.	GOAL
All Roads Counts	3951	29.68	29.71	-1.9	0.926	0.929
Freeways	158	13.02	13.87	-1.13	0.966	0.967
Arterials	2576	26.28	27.2	-2.03	0.914	0.908
Collectors Locals	1195	73.21	73.55	-1.84	0.596	0.604

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## What does this change from today?

By 2030, even with 2030 LRTP built:

- ❖ Delay will increase by more than 160%
- ❖ Miles of congested roads will increase 190%
- ❖ Delay on the freeways will increase 340%
- ❖ Congested freeway miles will increase 260%



## What Other Metro Areas have Done

- ❖ Review of 58 metro areas between 500,000 and 1.5 million population
  - 22% No Beltway
  - 74% Partial Beltway
  - 4% Full Beltway
- ❖ Of 26 cities between 1.0 & 1.5 million population all had partial or full beltway systems in place



## What Other Metro Areas have Done

Table 8-3 Comparison of Freeway Travel Statistics - Peer Cities

Urbanized Area (Population, thousands)	Freeway Miles		Freeway Lane Miles		Freeway DVMT		% of Miles that are Freeways		% of DVMT <sup>1</sup> Served by Freeways	
	Miles	Rank	Miles	Rank	DVMT	Rank	%	Rank	%	Rank
Oklahoma City, OK (856)	143	2	748	1	9,243	1	3.2	4	34.1	4
Springfield, MA (587)	95	5	460	4	5,489	4	2.9	6	37.8	3
Tulsa, OK (575)	152	1	743	2	6,958	2	4.6	1	33.3	6
Albuquerque, NM (573)	64	7	329	8	4,664	7	2.5	7	32.1	7
<b>Omaha, NE (571)</b>	<b>56</b>	<b>9</b>	<b>291</b>	<b>9</b>	<b>3,591</b>	<b>8</b>	<b>2.2</b>	<b>9</b>	<b>27.2</b>	<b>9</b>
Knoxville, TN (483)	63	8	341	7	5,136	6	2.1	10	31.3	8
Youngstown, OH (444)	84	6	354	6	2,476	10	3.2	4	25.7	10
Des Moines, IA (394)	50	10	259	10	3,375	9	2.3	8	33.9	5
Harrisburg, PA (390)	97	3	421	5	5,487	5	4.6	1	47.0	2
Little Rock, AR (376)	97	3	497	3	6,071	3	3.6	3	51.6	1

<sup>1</sup> DVMT = Daily Vehicle Miles Traveled  
Source: FHWA Highway Statistics 2005



## Transportation Network Alternatives

- A. Future Base (LRTP only)
- B. Outer Beltway
- C. Inner Beltway
- D. Radials
- E. Super Arterials
- F. Transit





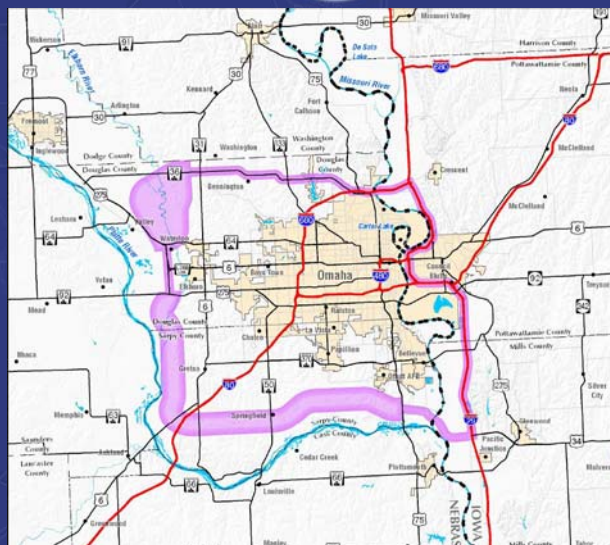
## Outer Beltway Performance

### ❖ Outer Beltway Compared to Base LRTP

- VMT +3.5%
- Average Speed +1.4%
- VHT -0.9%
- Total Delay -8.1%
- Lane-Miles of Links over Capacity -9.8%

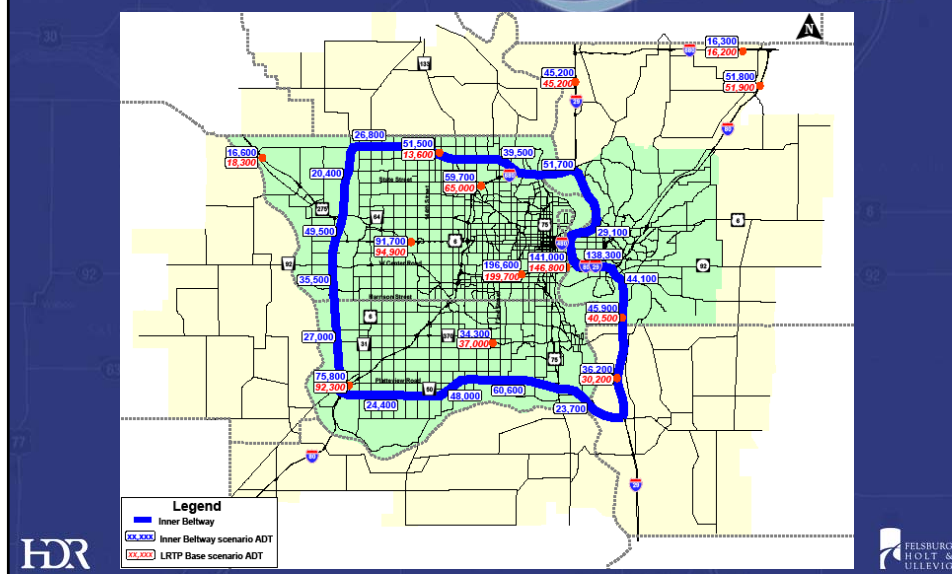


## Inner Beltway





## Inner Beltway Travel Demand



## Inner Beltway Performance

### ❖ Inner Beltway Compared to Base LRTD

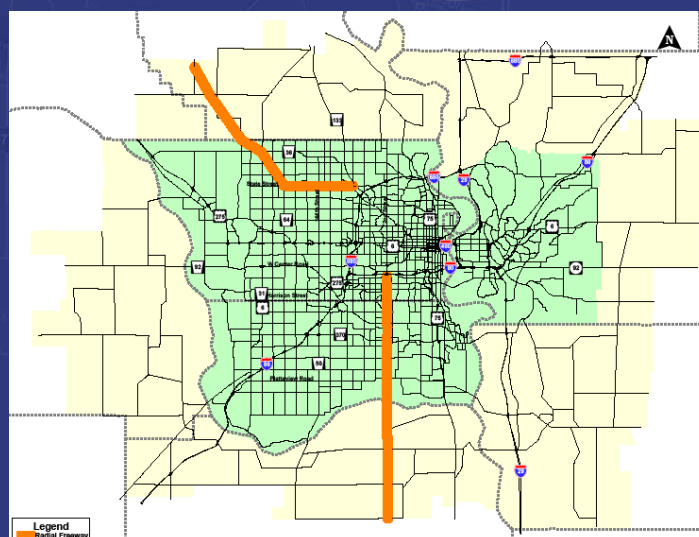
- VMT +3.8%
- Average Speed +1.4%
- VHT -0.9%
- Total Delay -7.2%
- Lane-Miles of Links over Capacity -13.7%

## Other Options

- ❖ **Radial Freeways**
  - South / northwest
- ❖ **Super Arterials**
  - Illustrative projects and additional arterials
- ❖ **Transit**
  - Light rail system



## Radial Freeways



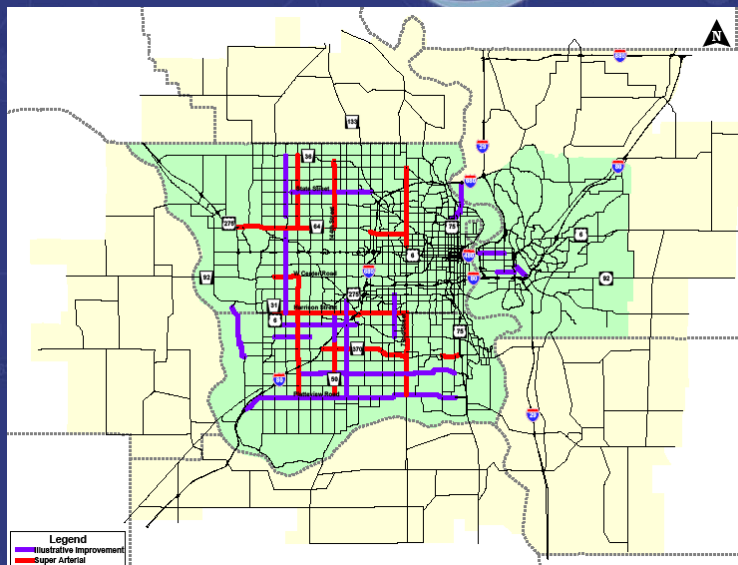
## Radials Performance

### ❖ Radials Compared to LRTP Base

- Total Delay -1.2%
- Lane-Miles of Links over Capacity -3.5%
- VMT +1.0%
- Average Speed +0.8%
- VHT -0.4%



## Super Arterials



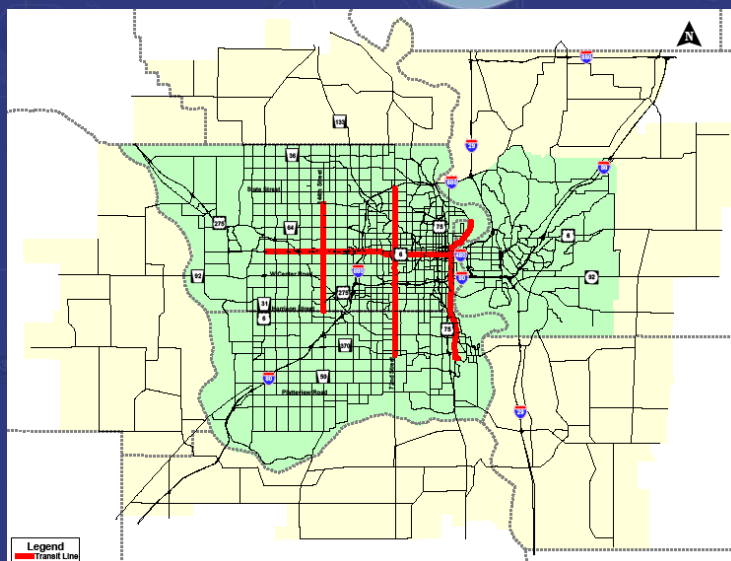
## Super Arterials Performance

### ❖ Super Arterials Compared to L RTP Base

- Total Delay -10.0%
- Lane-Miles of Links over Capacity -22.5%
- VMT +1.6%
- Average Speed +2.1%
- VHT -1.4%

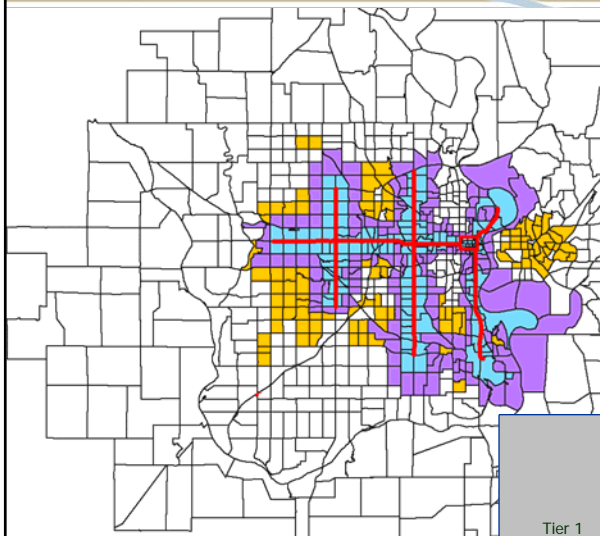


## Transit System





## Transit "Model"



- ❖ Goal = 5% Mode Share to Light Rail
  - 3 Tiers
  - Reduced the HBW Trip Matrix to take trips off the network before assignment

### HBW

#### Reductions comparison

	Tier 1	Tier 2	Tier 3
Tier 1	50%	40%	20%
Tier 2	40%	40%	10%
Tier 3	20%	10%	10%

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## Transit Performance

- ❖ Transit Compared to LRTP Base
  - Total Delay -18.6%
  - Lane-Miles of Links over Capacity -26.3%
  - VMT -4.4%
  - Average Speed +1.8%
  - VHT -8.6%
- ❖ Assumptions
  - 5% ridership (0.5% today)
  - Any land use variations?

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## Summary of Transportation Alternatives

	Delay reduction (%)	Congestion Reduction (%)	Approx. Cost (mil)*
2030 LRTP	-	-	\$3,200
Outer Beltway	8.1	9.8	1,400
Inner Beltway	7.2	13.7	750
Radials	1.2	3.5	660
Super Arterials	10.0	22.5	1,400
Transit	18.6	26.3	2,500

\*Alternative approximate costs are in addition to the 2030 LRTP Base costs



## Alternative Land Uses

### ❖ Base Scenario

- Current forecast based upon Comprehensive Plans

### ❖ Targeted Density

- Densification at nodes

### ❖ Transit Oriented Development

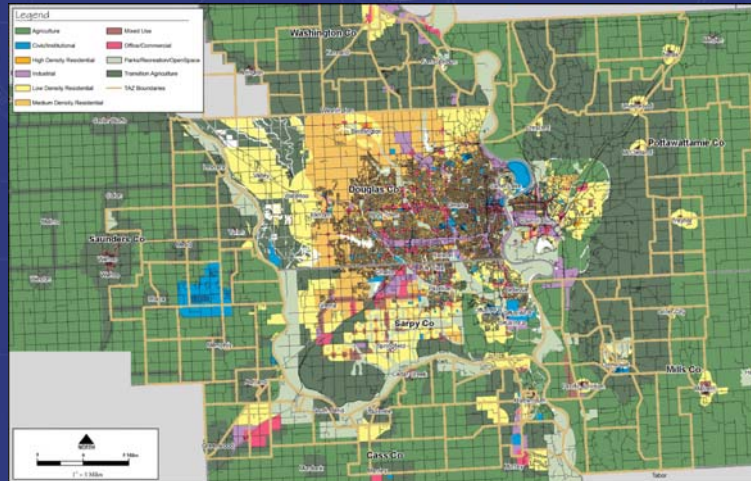
- Densification along transit lines

### ❖ Sprawl

- Low density through the region



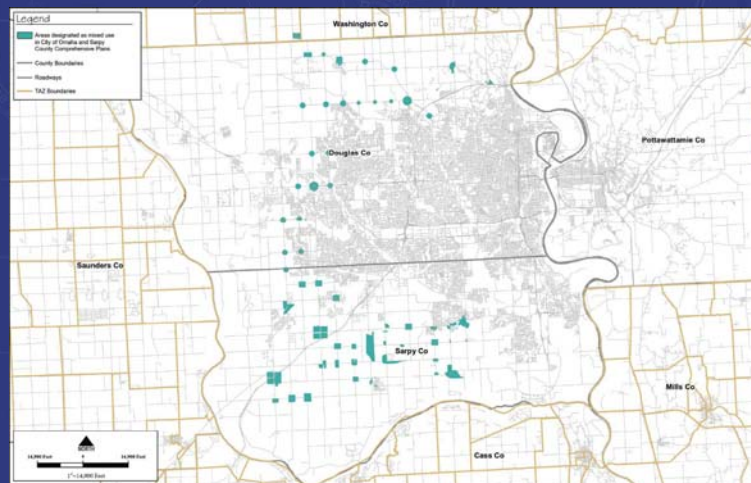
## Future Base



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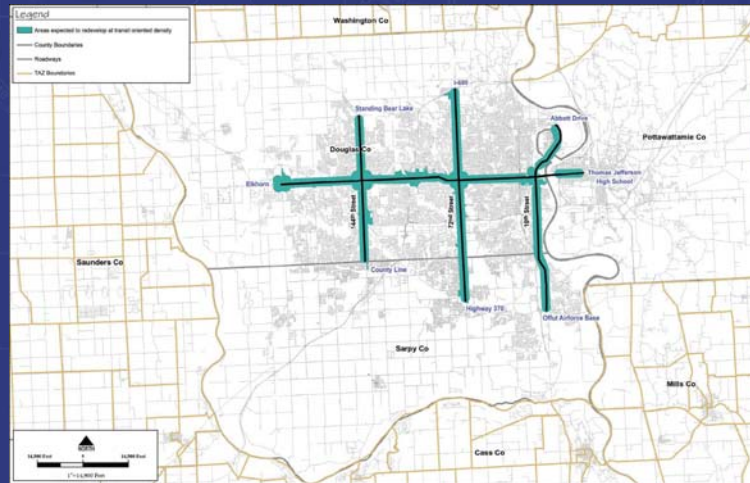
## Targeted Density



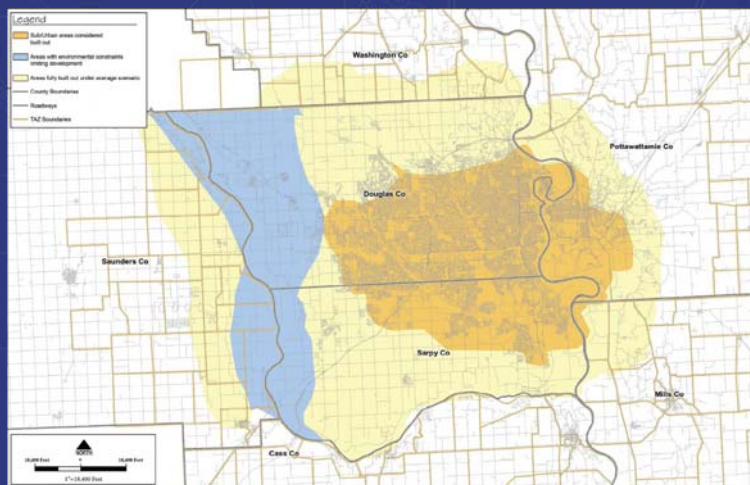
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# Transit Oriented Development



# Sprawl





# Analysis Matrix

	Land Use			
	2035 Base Expanded	Targeted Density	Transit Oriented	Sprawl
2035 LRTP Expanded	A1	A2	A3	A4
Beltway 1 (Outer)	B1	B2	B3	B4
Beltway 2 (Inner)	C1	C2	C3	C4
Radials	D1	D2	D3	D4
LRTP + Illustrative Super Arterials	E1	E2	E3	E4
Transit	F1	F2	F3	F4

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# Analysis Matrix

	Land Use			
	2035 Base Expanded	Targeted Density	Transit Oriented	Sprawl
2035 LRTP Expanded	A1	A2		A4
Beltway 1 (Outer)	B1	B2	B3	B4
Beltway 2 (Inner)	C1	C2		
Radials	D1	D2		
LRTP + Illustrative Super Arterials	E1	E2		E4
Transit	F1		F3	

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## Land Use Alternative Findings Targeted Density

- ❖ Targeted Density land use improved results on all transportation networks

	Land Use			
	2035 Base Expanded	Targeted Density	Transit Oriented	Sprawl
2035 LRTP Expanded	A1	A2		A4
Beltway 1 (Outer)	B1	B2	B3	B4
Beltway 2 (Inner)	C1	C2		
Radials	D1	D2		
LRTP + Illustrative Super Arterials	E1	E2		E4
Transit	F1		F3	

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## Land Use Alternative Findings Transit Oriented Development

- ❖ Transit Oriented land use improves results for both Outer Beltway and Transit networks

	Land Use			
	2035 Base Expanded	Targeted Density	Transit Oriented	Sprawl
2035 LRTP Expanded	A1	A2		A4
Beltway 1 (Outer)	B1	B2	B3	B4
Beltway 2 (Inner)	C1	C2		
Radials	D1	D2		
LRTP + Illustrative Super Arterials	E1	E2		E4
Transit	F1		F3	

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## Land Use Alternative Findings Sprawl

- ❖ Sprawl land use caused significant increases in VMT, VHT and delay on the transportation networks

	Land Use			
	2035 Base Expanded	Targeted Density	Transit Oriented	Sprawl
2035 LRTP Expanded	A1	A2		A4
Beltway 1 (Outer)	B1	B2	B3	B4
Beltway 2 (Inner)	C1	C2		
Radials	D1	D2		
LRTP + Illustrative Super Arterials	E1	E2		E4
Transit	F1		F3	

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## Economic Analysis

- ❖ Question: Do economic benefits outweigh economic costs?

### Benefits

- Reduced congestion
- Improved travel time
- Job creation

### Costs

- Construction costs
- Yearly operating expenses

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# Economic Analysis

Table 6-1 Summary of Results by Alternative

Alternative	Present Value of Total Benefits	Present Value of Total Costs	Net Present Value	Rate of Return	Benefit-Cost Ratio
C2 Inner Beltway - Targeted Density	\$3,002	\$447	\$2,542	11.50%	6.8
C1 Inner Beltway - Base Land Use	\$2,576	\$447	\$2,128	11.10%	5.9
B4 Outer Beltway - Sprawl	\$3,563	\$778	\$2,761	10.70%	4.7
B2 Outer Beltway - Targeted Density	\$2,500	\$778	\$1,694	10.00%	3.2
B1 Outer Beltway - Base Land Use	\$2,253	\$778	\$1,481	9.80%	3.0
B3 Outer Beltway - Transit Oriented	\$2,198	\$778	\$1,411	9.70%	2.9
D2 Radials - Targeted Density	\$932	\$355	\$582	9.50%	2.7
F1 Transit - Base Land Use	\$3,386	\$1,313	\$1,991	9.30%	2.5
F3 Transit - Transit Oriented	\$3,234	\$1,313	\$1,853	9.20%	2.4
E2 Super Arterials - Targeted Density	\$1,935	\$880	\$1,035	9.30%	2.2
D1 Radials - Base Land Use	\$769	\$355	\$413	9.10%	2.2
E1 Super Arterials - Base Land Use	\$1,671	\$880	\$776	9.00%	1.9
E4 Super Arterials - Sprawl	\$436	\$880	-\$309	6.30%	0.6
A4 LRTP Base - Sprawl	-\$1,231	\$0	N/A	N/A	N/A
A2 LRTP Base - Targeted Density	\$236	\$0	N/A	N/A	N/A
A1 LRTP Base - Base Land Use	\$0	\$0	N/A	N/A	N/A

Note: All monetary values in millions of 2008 dollars; if N/A, alternative has no costs.



# Economic Analysis

## ❖ Highest Benefit-Cost Ratio

- C2: Inner Beltway with Targeted Density Land Use
  - B/C = 6.8
  - Present Value of Total Costs = \$447 M
  - Requires 7 years of construction





## Study Conclusions

- ❖ Something is needed beyond the LRTP to address future transportation needs
- ❖ Both beltway systems relieve traffic volumes on key corridors, with reduced delay and congestion throughout the transportation network
- ❖ Inner Beltway alternative with targeted density land use



## Possible Next Steps

- ❖ Focused study on refining a solution
  - Inner Beltway
  - Targeted Density
  - Include Transit system enhancements
- ❖ Consideration to Future Policy Changes
- ❖ Consideration to timing for Corridor Protection



