

Jefferson Area Eastern Planning Initiative



THOMAS JEFFERSON PLANNING DISTRICT COMMISSION

Technical Report

FEBRUARY 21, 2002

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*Special Thanks to **FHWA** staff Ivan Rucker of the Virginia Division, Felicia Young and Elizabeth Fischer of the TCSP program. In addition, Scott Carson formerly of the FHWA Virginia Division and Dave Roberts formerly of the Thomas Jefferson PDC were instrumental in shaping the vision and funding for this project.*

This report was funded by the Federal Highway Administration (FHWA) Transportation and Community and Systems Preservation (TCSP) grant program. Additional support was provided by the Thomas Jefferson PDC and the Charlottesville-Albemarle Metropolitan Planning Organization. The contents of this report are the responsibility of the Thomas Jefferson PDC and do not necessarily reflect the opinions of the Federal Highway Administration.

Louisa & Fluvanna Housing Foundations
nia Gateway
eene Future
Jim Elmore, Piedmont Council of the Arts
arm Bureau Greene Co.
e Homebuilders
of Women Voters
A Tourism Council (retired)
s Jefferson Partnership for Economic Dev
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Estate Foundation
son Area Disability Services Board (Fluvanna
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e members with outstanding dedication.

EASTERN PLANNING INITIATIVE TECHNICAL REPORT

Eastern Planning Initiative (EPI) is a integrated land use and transportation plan for an area that includes the City of Charlottesville, the eastern two-thirds of Albemarle County, the western two-thirds of Loudoun County, the western two-thirds of Greene County, and all of Louisa and Stafford Counties (Figure 1). The Thomas Jefferson Planning District Commission (TJPD) and the Charlottesville Metropolitan Planning Organization (MPO) conducted the study with support through a Transportation and Community and System Preservation (TCSP) grant from the Federal Highway Administration (FHWA).

Residents of the Jefferson Planning District are not satisfied with current development patterns and the need for changes that are appropriate for those areas. In particular, it has been difficult for the region to address congestion on the routes into and out of Charlottesville. Some of the proposed solutions include the proposed extension of the US 29 Bypass from near Barracks Road to just south of the city limits on US 29 north of the Rivanna River, changes to building parallel frontage roads, and a widespread support. Increasing traffic volumes to the east of Charlottesville have led the region to consider solutions in that area, including a controversial bypass.

With proposed roadway improvements and alternatives by the MPO to other types of transportation modes, most notably light rail transit. Given the region's size and land use densities might make light rail transit, there was an interest to explore whether it could be feasible if future development was more transit-oriented. To make the determination, the

region sought an integrated land use and transportation planning study. Furthermore, recognizing the lack of integrated land use and transportation planning tools suitable for small urban and rural communities, the region proposed developing the needed tool and using it in the planning effort.

The EPI had two phases, the first being the development of the integrated land use and transportation planning tool and the second the development of a land use and transportation plan. The second phase was divided into three major tasks:

- Developing an inventory of existing land uses and transportation conditions in the study area,
- Working with the public to envision new community designs and regional land use patterns, and
- Evaluating the alternatives against a trend-line scenario and each other to determine the preferred course of action.

The TJPD created an Advisory Committee to provide policy direction for the EPI. The Committee met nine times during the course of the study, with four meetings being workshops open to the public.

This report is one of five documents prepared for the EPI. It details the technical analysis conducted for the study and is written for those wanting to know more about the analysis and assumptions made.

The *EPI Brochure* is a fold out summary of the EPI findings and is designed for widespread distribution. The *EPI Summary Report* is a policy-oriented document written for decision makers and others wanting to know more about the EPI. It provides an overview of the study processes, presents details of the preferred land use and transportation vision and lists the policy actions needed to implement the vision.

A handbook is available for other regions wanting to use the EPI's tools and processes, and the integrated land use and transportation planning model (CorPlan) that was developed

The study is available with a user's manual for users and planners wishing to apply the model to other regions. All of these documents are available from the FHWA and DC.

The summary of the how the Community-Planning (CorPlan) model was developed, the development of the regional land use modeling section discusses the development of the model and the transportation improvements and use scenarios. The final section presents alternatives. This report does not provide EPI's implementation strategies. That information is in the *Brochure and Summary Report*.

When I was developing the CorPlan modeling software to develop regional land use scenarios and a four-step travel demand model. Once the software was developed, existing data was used. The calibrated model was then used to generate a Scenario from which alternative future scenarios were created.

The model was developed in an Excel spreadsheet, with ArcView geographic information system software for scenario building. The model uses community elements, referred to as community elements, as the building blocks for developing land use scenarios.

The model and socioeconomic characteristics were assumed for each element (equal to a quarter mile diameter) are entered into the model. The model then assigns an element to subareas, Traffic Analysis Zones (TAZs), and the model multiplies the characteristics by the total developable land in the subarea. The model totals the subarea information to

provide information for larger areas. Details of how the model works are available in the *CorPlan User's Manual*.

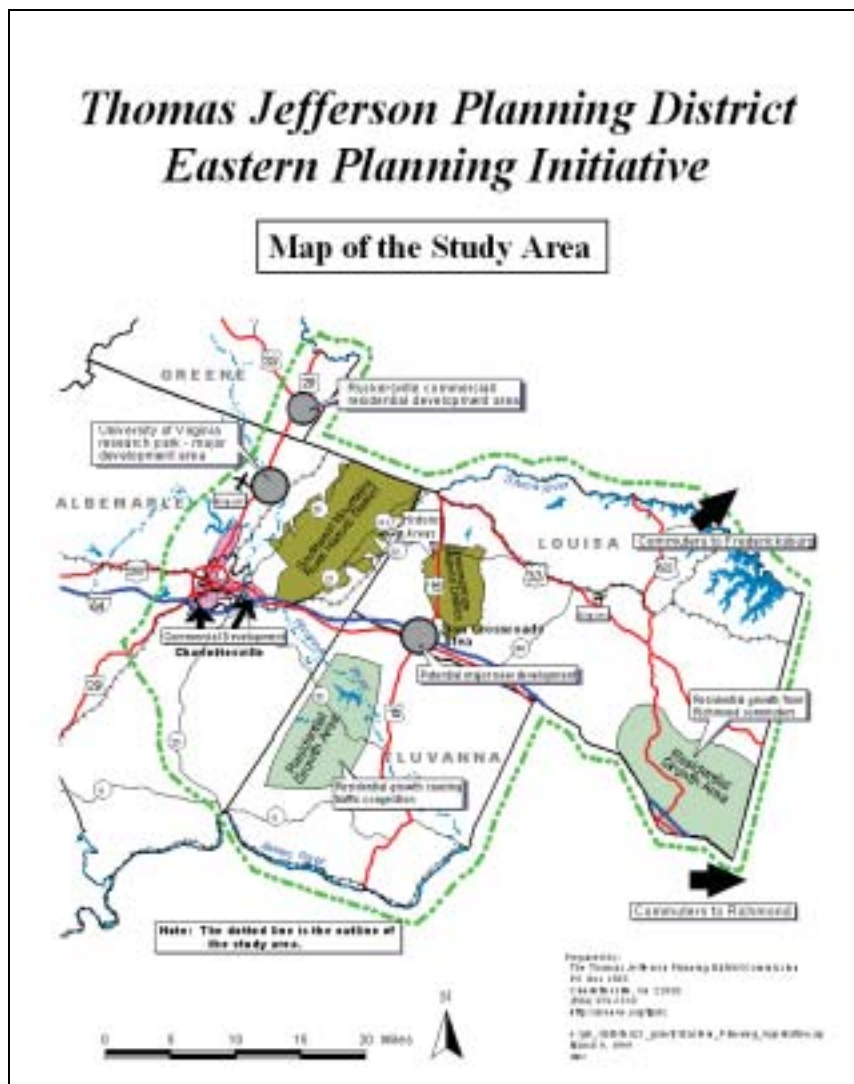


Figure 1 - EPI Study Area

lements

structure was developed, the project team identified community elements in the EPI study area and the location of the elements was discussed with the Advisory Committee. Plans were developed for each element from aerial photography and inventories were then created from the plans. Figure 2 illustrates the plan graphic for the urban mixed-use subarea while Table 2 summarizes and compares the location of the inventories. The complete set of inventories are provided in Appendix A.

in the process of calibrating the CorPlan model by comparing economic and land use estimates with actual data were available for Charlottesville, Virginia. Employment data were available for the study area which includes Charlottesville and much of the surrounding area. Only population data were available for

Suburban	Rural
Residential	Small town
Mixed-use	Village
Commercial	Residential
Office	Mixed-use
Public / institutional	Agriculture/forest
Industrial	

1 - Community Elements

MPO study area.

areas used within the MPO area, while the remaining areas were grouped to create subareas outside the MPO. Information from Charlottesville was used for calibration. Population and employment data for the year 1996 were available by TAZ

from the MPO and 1990 population counts were available from the Census Bureau via the TJPDC.

Land not suitable for development was netted out from each subarea using GIS. The factors used to identify "undevelopable" places in the EPI area are shown in Figure 3.

The first step of calibration was assigning community elements to subareas based on the field study conducted by the project team and a community location map drawn by the Advisory Committee. The second step was modifying the inventory inputs and subarea assignments to reduce differences between model estimates and actual conditions.



Figure 2 - Urban Mixed-use Community Element Plan Graphic

	Status Quo	Urban Mixed-Use	Urban Residential	Urban Residential College	Urban College Campus	Urban P ublic Institutional	Urban Parks/Conservation	Suburban Mixed-Use	Suburban Res. High Density	Suburban Res. Mod. Density	Suburban Res. Low Density	Suburban P ublic Institution	Suburban Industrial	Suburban Commercial	Suburban Office	Rural Mixed-Use	Rural Res. Mod. Density	Rural Res. Low Density	Rural Agricultural/F-orestal	Rural Small Town	Rural Village	Enhanced Mixed Use	Enhanced Residential	
SQ	UMX	URS	URC	UCC	UPI	UPK	SMX	SRH	SRM	SRL	SPI	SIN	SCM	SOF	RMX	RRM	RRL	RAF	RST	RVL	EMX	ERS	ECM	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
1	0%	10%	41%	41%	5%	6%	6%	19%	60%	60%	17%	10%	17%	0%	0%	10%	32%	36%	16%	32%	6%	8%	63%	0%
2	0%	10%	14%	24%	35%	5%	0%	17%	10%	0%	0%	0%	6%	4%	0%	0%	0%	0%	0%	0%	19%	7%	2%	
3	0%	15%	4%	1%	0%	2%	0%	10%	0%	0%	0%	24%	7%	61%	4%	0%	0%	0%	7%	0%	12%	2%	3%	
4	0%	10%	5%	1%	7%	0%	1%	18%	2%	2%	3%	0%	12%	60%	3%	15%	0%	0%	9%	0%	12%	1%	52%	
5	0%	7%	2%	1%	0%	0%	0%	5%	1%	5%	7%	0%	0%	1%	2%	1%	1%	1%	7%	0%	9%	3%	0%	
6	0%	10%	5%	4%	32%	69%	4%	4%	5%	2%	3%	40%	0%	5%	3%	2%	0%	0%	7%	0%	9%	2%	2%	
7	0%	5%	2%	0%	0%	0%	0%	4%	2%	0%	0%	0%	33%	2%	3%	44%	5%	0%	0%	5%	1%	0%	1%	
8	0%	5%	1%	1%	5%	4%	1%	0%	0%	0%	22%	0%	2%	4%	0%	0%	0%	0%	2%	0%	15%	2%	22%	
9	0%	25%	23%	21%	15%	14%	16%	19%	19%	21%	17%	19%	13%	18%	19%	19%	12%	12%	5%	17%	17%	11%	13%	15%
10	0%	1%	1%	3%	0%	1%	22%	1%	0%	1%	4%	7%	0%	0%	2%	0%	0%	0%	4%	6%	4%	3%	3%	
11	0%	1%	1%	3%	1%	0%	51%	3%	2%	3%	4%	3%	2%	1%	0%	4%	0%	0%	3%	3%	4%	3%	0%	
12	0%	0%	0%	0%	0%	0%	0%	0%	6%	45%	0%	6%	45%	0%	0%	51%	51%	75%	7%	65%	0%	0%	0%	
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	
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	70	130	155	310	45	9	85	100	40	11	10	20	25	15	10	5	3	1	20	4	80	100	10	
	183	299	388	655	103	23	199	224	100	29	25	48	60	30	25	12	6	2	46	9	164	243	24	
	524	96	10	972	2,508	11	107	13	14	13	14	553	580	520	108	8	3	1	86	4	320	64	540	
	104	25	4	36	-	2	29	4	2	3	-	28	375	5	40	0	1	0	13	1	80	8	480	
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	2.61	2.30	2.50	2.11	2.28	2.50	2.34	2.24	2.50	2.60	2.50	2.40	2.40	2.00	2.50	2.40	2.40	2.40	2.30	2.20	2.05	2.43	2.40	
	1.42	1.40	0.59	2.49	1.69	0.88	0.83	0.50	0.76	0.70	0.12	1.19	1.32	0.97	0.90	0.61	1.00	1.02	0.63	0.50	1.00	1.00	1.00	
	5.00	5.00	5.00	6.67	6.50	5.00	2.50	3.20	2.10	2.00	3.30	3.80	-	-	3.30	0.50	0.22	0.20	2.00	2.00	4.00	3.80	-	
	18.00	15.00	12.00	27.00	23.00	-	13.00	13.00	-	-	-	14.00	11.00	-	-	-	-	-	-	-	12.00	12.00	15.00	
	0.58	0.28	0.19	0.72	1.49	0.21	0.24	0.20	0.15	0.10	0.22	0.49	0.44	0.55	0.13	0.15	0.15	0.10	0.27	0.25	0.57	0.55	0.67	
	2.23	4.14	4.93	9.87	1.43	0.29	2.71	3.18	1.27	0.35	0.32	0.64	0.80	0.48	0.32	0.16	0.08	0.03	0.64	0.13	2.55	3.18	0.32	
	5.81	9.52	12.33	20.85	3.27	0.72	6.33	7.13	3.18	0.91	0.80	1.53	1.91	0.95	0.80	0.38	0.19	0.08	1.46	0.28	5.22	7.72	0.76	
	16.68	3.05	0.31	30.94	79.82	0.34	3.40	0.41	0.43	0.40	0.46	17.60	18.46	16.55	3.44	0.24	0.08	0.04	2.72	0.13	10.18	2.04	17.19	
	3.31	0.80	0.11	1.15	0.00	0.05	0.92	0.11	0.08	0.09	0.00	0.89	11.94	0.16	1.27	0.01	0.02	0.00	0.40	0.02	2.55	0.25	15.28	
	4,906	1,729	967	9,853	20,317	159	1,522	852	441	203	195	3,622	6,557	3,984	941	78	43	19	851	58	3,428	1,307	6,727	
	0.28	0.28	0.27	0.36	0.28	0.28	0.10	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.00	0.00	0.25	0.25	0.23	0.21	0.25	
	445	876	876	1,897	289	67	580	743	320	88	80	160	164	99	80	40	20	8	160	32	540	764	66	
	2.44	2.93	2.26	2.90	2.82	2.96	2.92	3.32	3.20	3.08	3.20	3.33	2.74	3.29	3.20	3.33	3.33	3.33	3.48	3.64	3.29	3.15	2.74	
	4,461	854	91	7,956	20,028	93	942	109	121	115	115	3,462	6,393	3,885	861	38	23	11	691	26	2,888	542	6,661	
	8.51	8.92	9.38	8.19	7.99	8.75	8.82	8.40	8.88	9.11	8.00	6.26	11.02	7.47	7.97	4.95	9.00	8.28	8.08	6.38	9.03	8.48	12.34	

Table 2 - Community Element Statistics

Does not include Floor Area Ratio calculations for residential uses. The subtotals shown above are averages for the... In planning for specific mixed-use communities, discrete use FAR calculations should be combined, with the presence of each associated use, to obtain an accurate measure of the overall intensity of development.

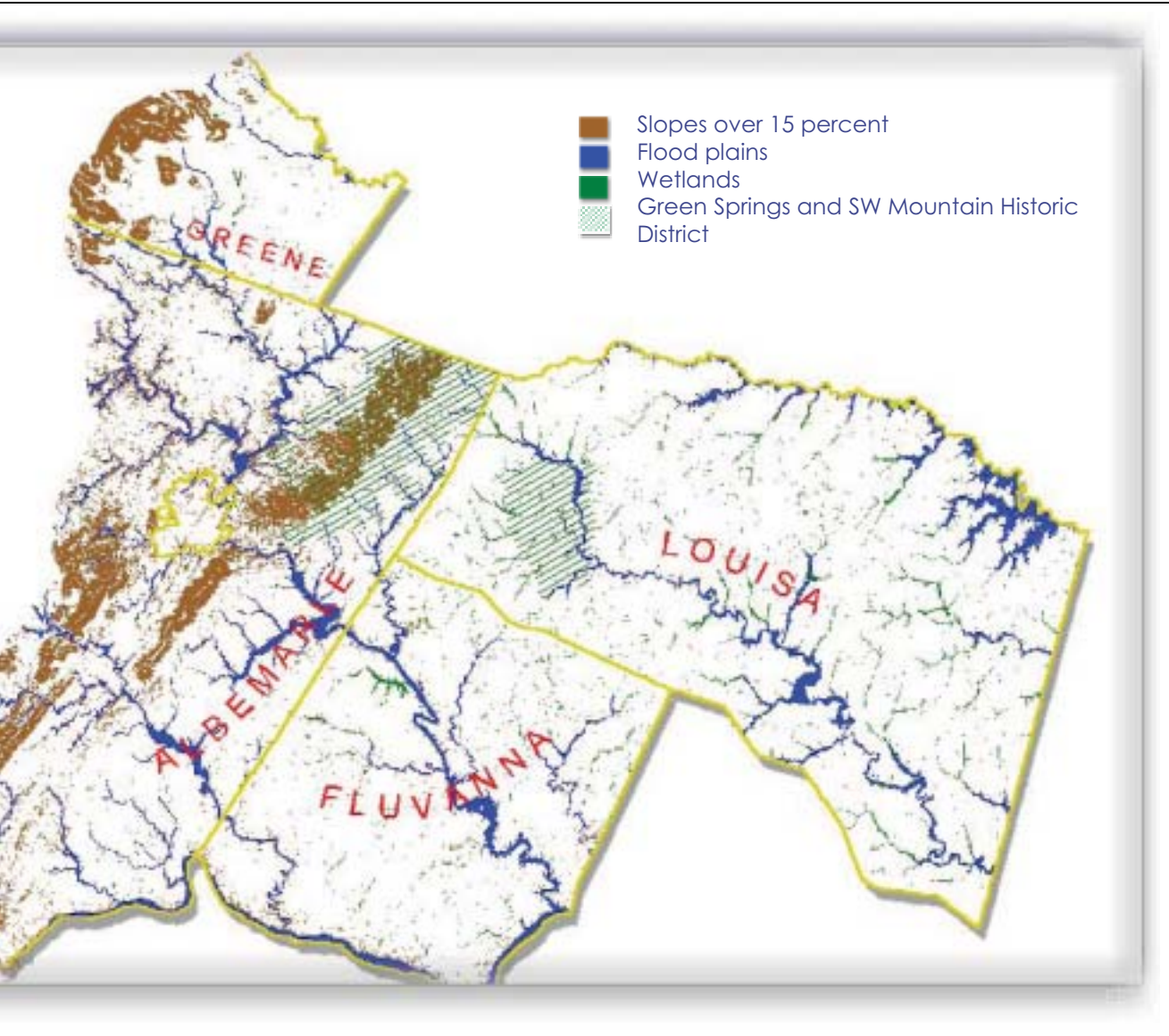


Figure 3 - Undevelopable Land

Summary of the calibration results. Figure 4 shows the assignment of elements to subareas. Population estimates were within ten percent of actual population. Its estimates of land use were within five percent of Charlottesville's actual land use. The results reasonably replicate actual data where available. It is important to note that the actual data used for the model was rather limited. The calibrated model scenario for the EPI. From this scenario, all elements were developed.

Elements

A workshop held in the spring of 2000 had an objective to review and critique the existing elements. Participants were divided into groups, each reviewing one of the elements. The group reported out at the end of the workshop.

Element	Existing	%	Base	%
Central	97,846	15%	97,785	15%
Suburban	937	0%	931	0%
Urban	479	0%	540	0%
Open Space	35,581	5%	35,537	5%
Light Industrial	4,986	1%	5,022	1%
Medium Density Residential	1,397	0%	1,317	0%
High Density Residential	2,962	0%	2,911	0%
Office	267	0%	316	0%
Commercial	2,768	0%	2,785	0%
Penetration	743	0%	825	0%
Regional	12,981	2%	12,969	2%
Total	160,948	25%	160,939	25%
Central	144,092	22%	144,092	22%
Suburban	349,056	53%	349,066	53%
Total	654,096	100%	654,097	100%
Central	132,273	17%	132,273	17%
Total	786,369		786,370	
		% Exist		
Central	87,141		80,150	-8%
Suburban	17,756		17,397	-2%
Urban	57,953		54,028	-7%
Open Space	139,233		129,357	-7%
Light Industrial	18,125		14,758	-19%

CorPlan Calibration Results



Figure 4 – EPI Calibrated Base Scenario

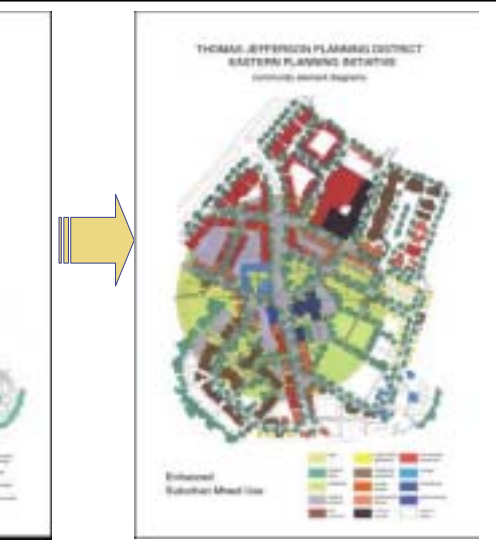
The workshop with very similar suggestions for improving community design, primarily the suburban elements. The suggestions were:

- Provide a focal point and distinguishable boundaries
- Increase the number and variety of activities
- Make better use of open spaces
- Build at a more human scale
- Make more pedestrian friendly

With these suggestions, the project team prepared an enhanced set of community elements. Figure 5 illustrates how the suburban mixed-use element was modified.

Inventories for the enhanced elements were added to the CorPlan model (the key statistics for the enhanced elements

2). Housing densities in the enhanced are higher than the current suburban below the urban elements, while non- are even higher, nearly equal to urban



Example of Enhanced Element

SCENARIOS

ette of community elements, regional built in CorPlan. The process began with n’s population growth by the year 2050. the public’s identification of possible t map game.” Step three translated the use scenarios using the CorPlan model. identifying appropriate transportation of the land use scenarios.

Future Growth

The MPO uses 20-year population forecasts from the Virginia Employment Commission (VEC) for its plan updates. The EPI used the same VEC source to identify a forecast of 330,000 total population in the year 2050 (Table 4). The VEC’s forecasting methodology is available from the TJPDC.

Locality	2000	2020	2050
Charlottesville	40,002	39,495	39,495
Albemarle	81,996	111,008	154,526
Fluvanna	19,704	32,296	51,184
Greene	14,701	23,305	36,211
Louisa	25,407	34,599	48,387
Total:	181,810	240,703	329,803

Table 4 - VEC Population Forecasts

The VEC’s county-level forecasts were somewhat problematic because portions of Albemarle and Greene County are not in the study area. In the year 2000, about 87 percent of the total population of the city and four counties lived in the EPI area. If this proportion continues to the year 2050, the VEC forecast could be 13 percent lower for the study area, or around 280,000. Given the uncertainty of such a long-range forecast and the desire of the project team to reasonably over-estimate potential impacts, the 330,000 forecast was used. Several on the Advisory Committee were not comfortable with the 330,000 forecast, so the project team and Committee agreed to develop a second forecast that assumed half the anticipated growth, or a total population of 220,000. Scenarios were developed using both forecasts.

Current employment in the MPO study area is about 60 percent of population. Recent trends indicate the ratio is increasing, so the project team assumed total employment would be around 67 percent of total population, resulting in an

220,000 for the high forecast and 110,000 for the low forecast.

Community type	Value
Urban (red)	6
Enhanced suburban (yellow)	4
Suburban (yellow)	3
Small town (blue)	2
Rural (green)	1

Table 5 - Dot Values

Each dot represented roughly a square mile area. Red dots represented urban community element types, yellow dots represented enhanced suburban elements, yellow dots with an “E” represented enhanced suburban elements, blue dots represented small town / village elements and green dots represented rural residential elements.

The community element inventories were used to create a dot map (Table 5). Participants were asked to place dots on the map to achieve a target population value represented the high population and employment forecast of 220,000.

Participants were divided into six groups nicknamed after TV shows. Each group was charged with placing dots so as to achieve the following objectives, which reflected the goals that were raised during community discussions of land use patterns.

Preservation of farms and forests (the “Green

- Maximize the protection of the environment (“Grizzly Adams”)
- Maximize ridership on a light rail system (“Petticoat Junction”)
- Maximize land development profits (“The Price is Right”)
- Equitably allocate development to the city and four counties in the study area (“Let’s Make a Deal”)
- Anticipate the influence of technology such as the internet (“Lost in Space”)

The final dot maps created by the groups were similar (Appendix C). All groups anticipated growth along the US 29 corridor north of Charlottesville and the US 250 corridor east of Charlottesville. Nearly all groups anticipated growth in Zion Crossroads and Ruckersville. Most groups anticipated some growth in existing towns and villages. All groups primarily used urban, enhanced suburban or town/village dots; very few rural residential and no suburban dots were used.

Creating Land Use Scenarios

The dot maps were entered into a GIS as an underlying layer to help assign community elements to subareas. The GIS element assignments were then imported into CorPlan. Refinements were made to ensure the regional population and employment totals matched the year 2050 targets.

Three distinct land use patterns emerged from the dot maps – the Town Centers, Urban CoreL and Core M scenarios. A fourth scenario was developed to reflect the extrapolation of past development trends, which is referred to as the Dispersed scenario. Figure 6 presents the land use patterns of the four scenarios assuming the high population forecast. Maps of the scenarios assuming the lower population forecast and other information for the scenarios are included in Appendix D.

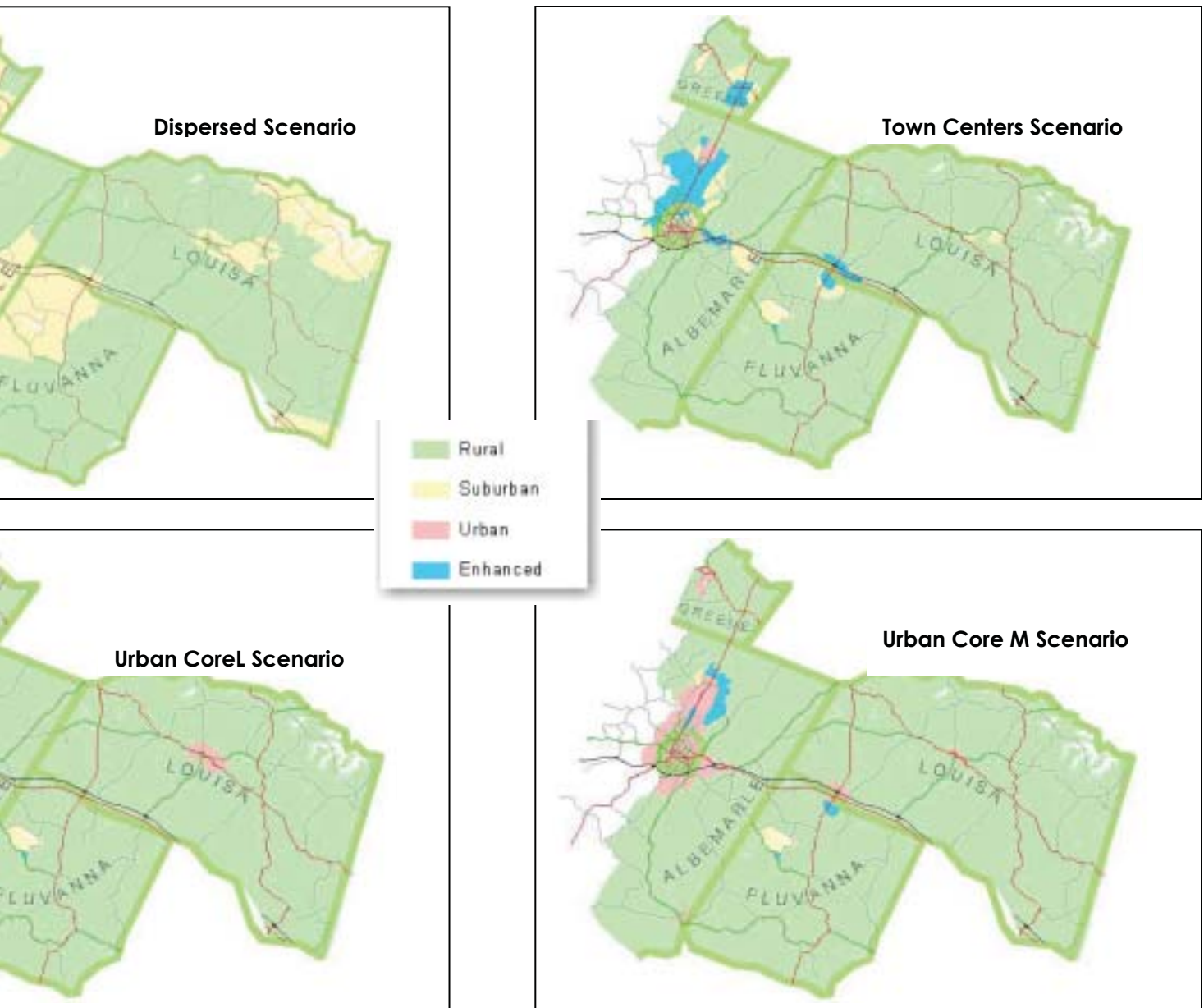


Figure 6 - Land Use Scenarios

Scenario

Advisory Committee, the project team also in CorPlan that reflects the adopted in the study area (Figure 7). The analysis identifies land use changes that localities have planned for more land, potential land, than is warranted given the over the next 20 years (the planning plans). When aggregated, the plans in residential acreage to accommodate This amount of land exceeds the 2050 employees.

Analysis identified several inconsistencies in land use plans, most notably along the southeastern boundary of Fluvanna County where the plan for low-density residential development conflicts with the plan for farms and forests.

Modeling

Information needed for developing land use scenarios and which transportation improvements could be implemented. A travel demand model was then used to evaluate transportation improvements. The first travel demand step is typically trip generation. For the EPI, the model was used to generate trips used in the model for trip distribution. The next modeling step had to be developed anew for the EPI. Assigning trips to the highway and transit network from this last step was used to evaluate transportation scenarios.

In converting the MPO's MINUTP model to TP+, the project team opted to use TP+ instead. TRANPLAN and MINUTP are both developed by the same company (as is TP+) and are very similar in methodology. Transit and highway networks for the model were edited in the VIPER software package, which is a version of MPO's highway network



Figure 7 - Comprehensive Plan Scenario

straightforward (the transit networks had to be created). The rest of the MPO's MINUTP model was easily translated into TRANPLAN. This section describes the transportation modeling steps used for the EPI.

Some Limitations of the Model

The traditional four-step model used to develop transportation recommendations from the CorPlan land use scenarios has some limitations that are important to note:

The model does not account for congestion-relieving benefits from strategies such as intersection improvements, transit-oriented development, and other TSM or TDM strategies. It may therefore underestimate the proposed transportation network's effectiveness at relieving congestion.

The proposed transportation improvements developed by the project team were for sketch planning purposes only, and were not rigorously reviewed for their locations, design, or community and environmental impacts. This type of review

for the MPO to agreement is use vision.

Development

Highway network MPO study area, of Charlottesville Louisa County. This extended to the EPI es using a GIS guide. Minor also made to the k to align it more roadway layer. characteristics, area types and s, were used for work. Figure 8 al network and the extended

made to the rnal (EE) and trips to account

ns are located at the edge of the MPO e extended EPI area, and

s are forecast to the year 2020, not the orizon.

ew external stations were estimated using olation" of external volumes in the MPO's the total year 2020 external volume at

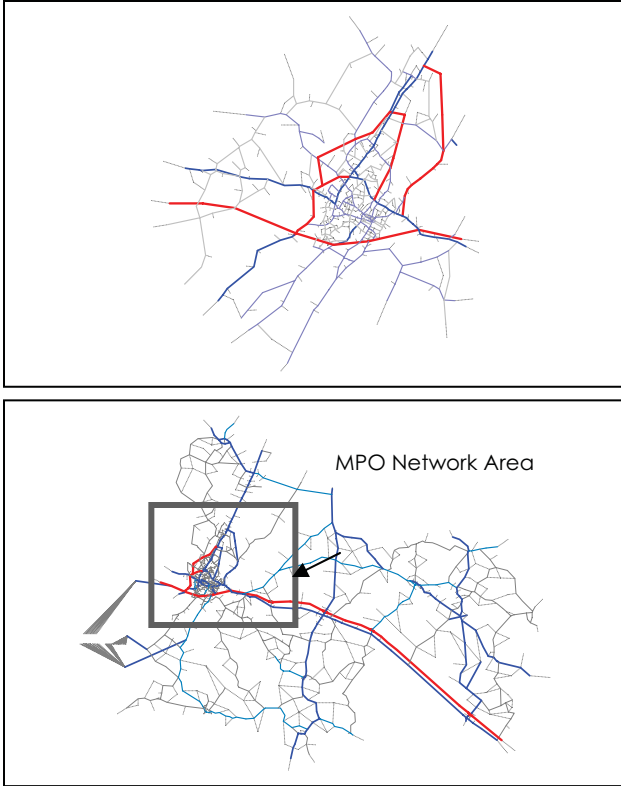


Figure 9 - Extended Highway Network

the I-64 east station near Charlottesville was lowered and the percentage of EE trips increased when moving the station to the eastern edge of Louisa County. These changes reflect the new station's greater distance from Charlottesville. The geographic extrapolations were checked against factored traffic counts from VDOT where possible.

The new external station volumes were then temporally extrapolated from the year 2020 to the year 2050. Growth rates that ranged up to 50 percent were used. The 50 percent increase is equal to the forecast population growth rate for the study area. Individual stations were adjusted based on their locations in the study area and the proportion of EE trips to total external trips. Generally, increases were not as high for stations located in areas where not much internal growth is expected, or for stations where the proportion of EE trips is high because the growth in traffic beyond the EPI area is not expected to be as high as the growth within. For example, the 20 percent growth rate for I-64 east assumes a low growth rate in the adjacent area and most traffic continues to be EE trips.

The final step was balancing EE trips using the year 2020 EE table as a guide and manually adjusting trip allocations between stations using a spreadsheet. The 2050 external trip forecasts are shown in Table 6.

2050 Volume	Growth Factor	2050 Volume	2050 IE Pct.	2050 IE Volume	2050 EE Volume
13,000	51%	13,000	70%	9,100	3,900
23,000	21%	23,000	60%	13,800	9,200
7,000	40%	7,000	90%	6,300	700
6,000	50%	6,000	65%	3,900	2,100
3,000	50%	3,000	95%	2,850	150
26,000	18%	26,000	80%	20,800	5,200
4,000	54%	4,000	90%	3,600	400
6,000	40%	6,000	80%	4,800	1,200
3,000	50%	3,000	95%	2,850	150
6,000	50%	6,000	95%	5,700	300
4,000	33%	4,000	60%	2,400	1,600
25,000	42%	25,000	62%	15,380	9,620
1,000	0%	1,000	96%	960	40
3,000	50%	3,000	95%	2,850	150
4,000	33%	4,000	68%	2,720	1,280
3,000	50%	3,000	89%	2,670	330
4,000	0%	4,000	95%	3,830	170

Year 2050 External Trips

either socioeconomic or trip end inputs demand model. For the EPI, CorPlan estimate trip ends. Trip productions and are calculated by multiplying community element population and employment estimates in were initially set to match rates used in NUTP-based trip generation model, then for the influence of community design on walking and cycling trips. Transit trips were not included at this stage, but were estimated as a Modal Choice)

influence of community design on walking was used to factor the trip rates for each

community type. The research indicates that up to 30 percent of trips may be shifted to walking/cycling if complementary land uses are in close proximity and there is an interconnected set of paths for walkers and cyclists to use (Figure 10).

These findings led to the element-specific factors that subtract walking and cycling trips from total person trips (listed at the bottom of Table 2 on page 4). The net productions and attractions were then used as inputs to the trip distribution model. Trip generation outputs are provided in Appendix B.

The CorPlan estimated trip ends were formatted according the Florida Standard Urban Transportation Modeling Structure (FSUTMS) available in TRANPLAN. FSUTMS uses the following trip purposes:

- Home-based work (HBW),
- Home-based shopping (HBS),
- Home-based social/recreational (HBSR),
- Home-based other (HBO),
- Non-home based (NHB),
- Truck and taxi (TT),
- Internal-external (IE) and
- External-external (EE)

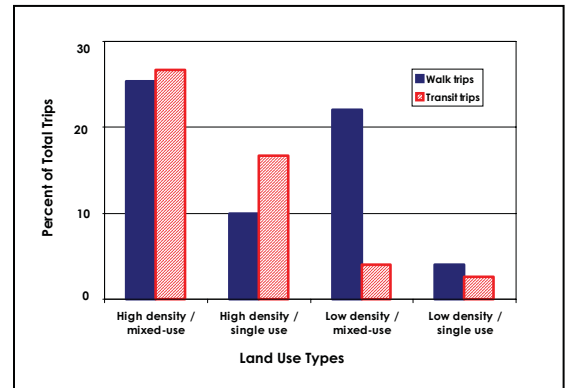


Figure 10 - Community Design and Travel

The MPO's trip purposes align with those used in FSUTMS except for the home-based non-work (HBNW) purpose, which is an aggregation of the HBS, HBSR and HBO purpose in FSUTMS. HBNW trips from CorPlan were allocated to these purposes

typical HBS, HBSR and HBO percentages

of productions and attractions were scenarios:

to be build out of the vacant land within developing areas

assumes the Dispersed land development low population forecast (220,000)

Scenario 7 – assumes the Town Centers scenario population forecast

Scenario 8 – assumes the Dispersed scenario and the low population forecast (330,000)

Scenario 9 – assumes the Town Centers scenario population forecast

Scenario 10 – assumes the Urban CoreL scenario and low population forecast

Scenario 11 – assumes the Urban CoreM scenario population forecast.

FRANPLAN was used to distribute the trip productions estimated by the CorPlan model. Friction factors were slightly modified to the network area. The MPO's HBNW friction factors were applied to the HBS, HBSR and the HBO trip productions. The MPO's original and the final friction factors are shown in Appendix B.

The modeling chain does not include a transit mode choice model. Both had to be developed for the Urban CoreL and Urban CoreM scenarios (and modified for the Dispersed scenario). INET

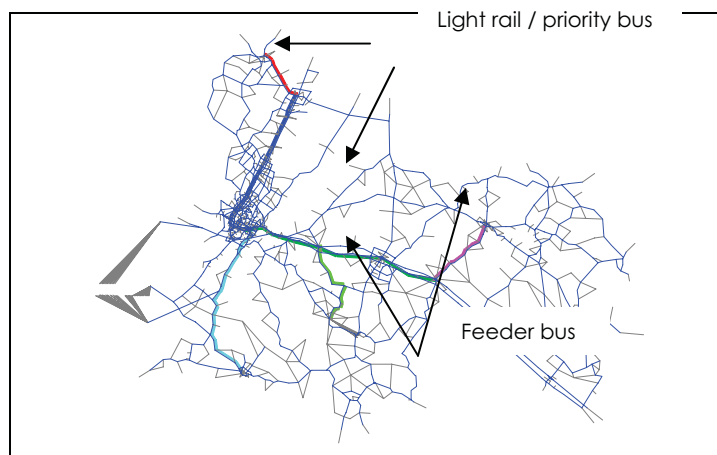


Figure 11 – Town Centers/Core Transit Network

Formatted transit route cards were prepared using the VIPER software. In addition, transit only links were added to the highway network for assumed priority transit improvements (light rail and priority buses). The operating characteristics of the various transit modes and walk and auto access links were also coded.

Two distinct priority transit service options were coded along the US 29 north and US 250 / I-64 east corridors; light rail transit and priority bus transit (Figure 11). Each improvement assumes that transit vehicles will run on dedicated alignments (thus not competing with traffic). Both assume the same station locations, feeder bus service and headways. The major differences between the two were the operating characteristics, with light rail having less dwell time at stations, higher top end speeds and higher capacities. The transit network characteristics are shown in Appendix B.

Modal Choice

The FSUTMS multi-path, multi-period, nested logit mode choice model was used to allocate person trips to highway versus transit travel modes. The model compares the travel-time and

of a trip made via transit versus an early evaluate the trip characteristics, an tion is made and highway trips from added to the highway network to estimate s. A second mode split determination is congested times.

nts and coefficients in FSUTMS were used nts. It should be noted that FSUTMS uses cient to factor mode choice estimates r transit improvement made (i.e., light rail he modal choice parameters are shown

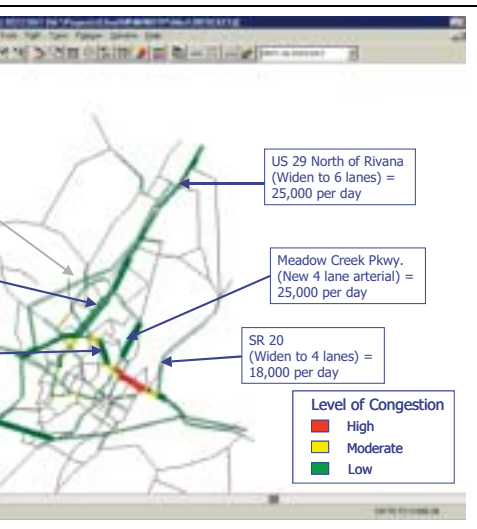
ation

avel demand modeling process assigned e modal choice model to the highway rips to the transit network. The transit a morning assignment of home-based day assignment of all other internal trips. y the assignments provide statistics, such

as daily vehicle miles of travel and hours of delay, with which to compare alternatives. The reports are listed in Appendix B.

TRANPLAN Checking

CorPlan's base scenario estimates a total population of around 122,000 in those subareas where the MPO and EPI study areas overlap. The MPO's 2015 forecast is around 123,000 in the same overlapping subareas, suggesting that results of the two forecasts should be reasonably close. Figures 12 and 13 present the volumes and congestion levels for the MPO's 2015 and the EPI's base scenario, respectively. On all of major segments checked, the EPI volumes were within 6,000 of the MPO volumes except the proposed Meadowcreek Parkway and US 29. The latter difference is likely due the proximity to an external station that was moved in the EPI. It was noted during a review meeting that the EPI volumes on the US 250 Bypass are low in comparison with existing volumes. Apparently this is a problem in the existing MPO model as well, which forecasts only slightly higher volumes.



MPO 2015 Volumes and Congestion

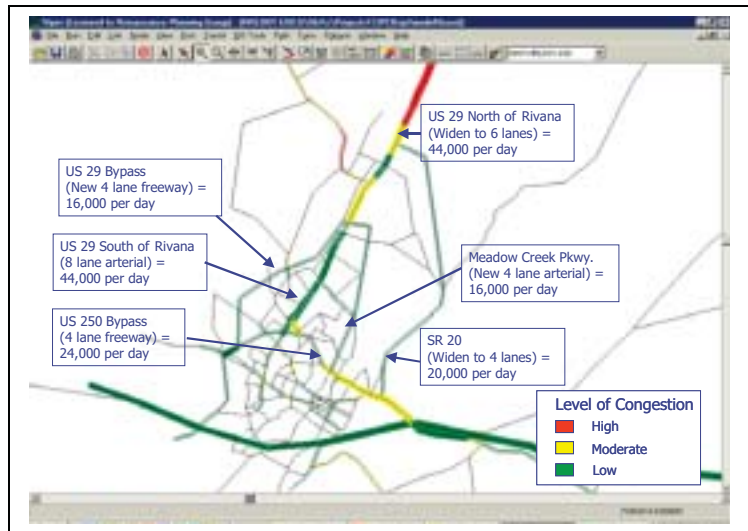


Figure 13 – EPI Base Volumes and Congestion



Scenario Transportation Improvements

IMPROVEMENTS

present an overview of the highway and road network planned for the Dispersed and Town Centers / Urban scenarios. These networks were developed based on the use patterns of each scenario.

The Dispersed scenario assumes existing roads in rural areas where development is anticipated. The network includes the planned US 29 Bypass from the north to just south of the Rivanna River, and another bypass from US 29 north to the southeast, connecting with I-64 in the Pantops area just east of the river. Transit improvements are not assumed in the Dispersed scenario because the suburban development pattern is conducive to transit.

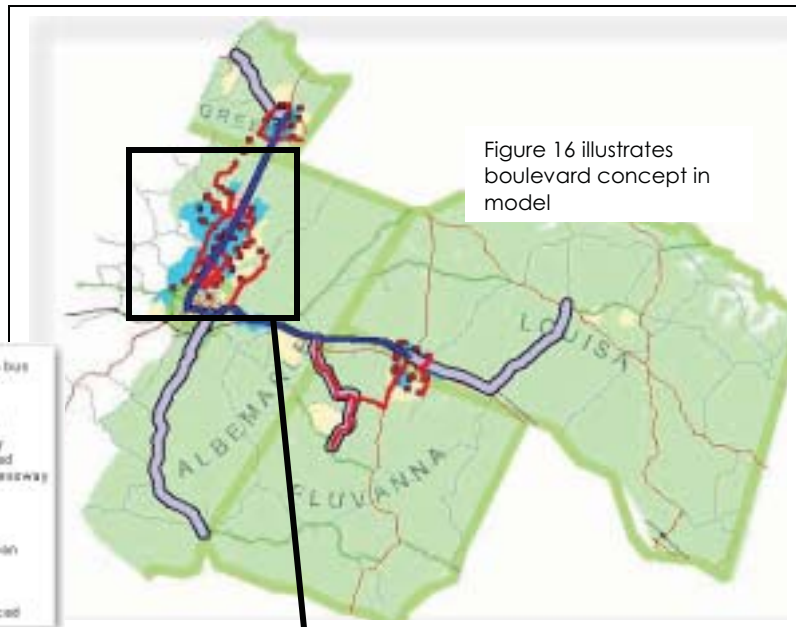


Figure 16 Town Centers Scenario Transportation Improvements

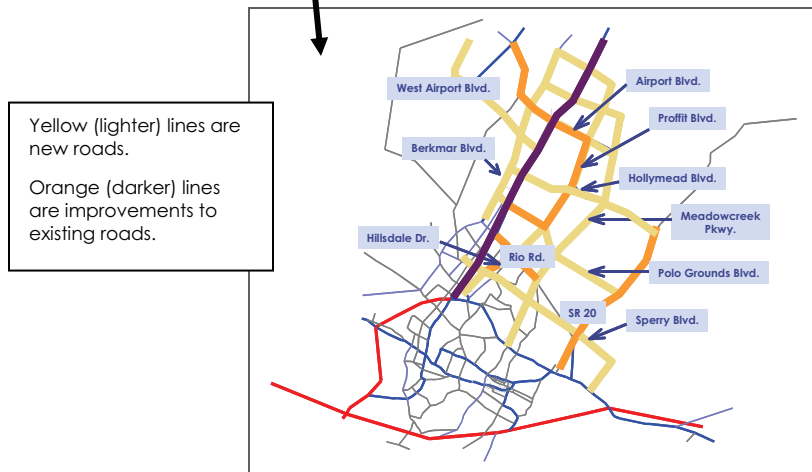


Figure 14 -Possible Boulevards Coded into Network



CoreL Transportation Improvements

Scenarios

appropriate for the Town Centers and both of the scenarios are similar (Figures 15, 16 and 17). None of the scenarios include bypasses and all include priority feeder service.

Model

Due to the limitations of this comparison that should be noted, some modifications were made to the model based on available research, the model's ability to estimate the influences of factors such as pedestrian-friendly streets, on travel time and transit ridership. Policy strategies were developed to control the availability and price of transit services to further stimulate transit ridership. In the model, walk trips were combined in the model; the daily nature of the streets and boulevards,

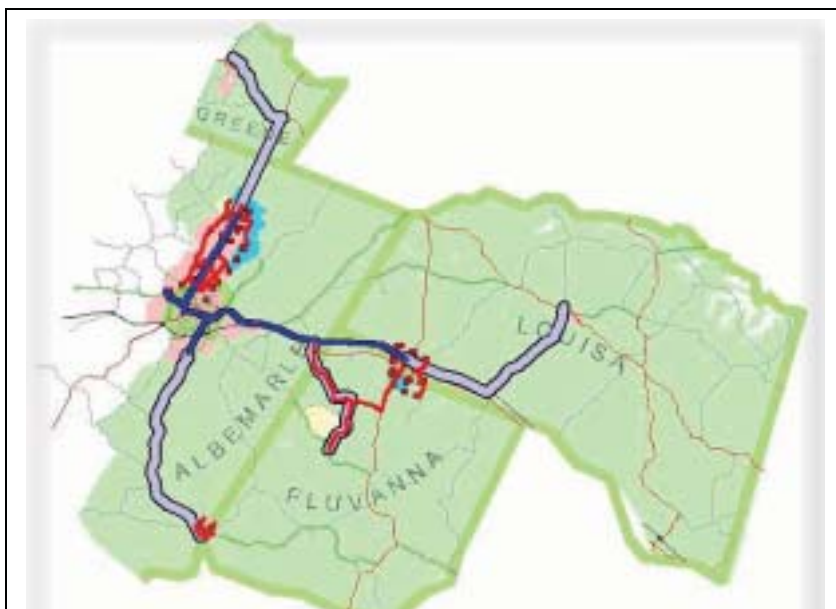


Figure 18 – Urban CoreM Transportation Improvements

and the closeness of the communities, it would be useful to test how many medium distance trips, perhaps between one and five miles, could be reasonably allocated to bicycles.

Miles	Cost per Mile (millions)	Total Cost (millions)
12.1	\$ 25.0	\$ 301.6
29.7	\$ 4.0	\$ 118.9
176.1	\$ 3.5	\$ 616.3
217.9		\$ 1,036.8
NA	NA	NA
56.8	\$ 4.0	\$ 227.1
67.4	\$ 3.5	\$ 236.0
124.2		\$ 463.2
NA	NA	NA
38.5	\$ 4.0	\$ 154.0
46.7	\$ 3.5	\$ 163.5
85.2		\$ 317.5
NA	NA	NA
37.5	\$ 4.0	\$ 150.0
47.9	\$ 3.5	\$ 167.7
85.4		\$ 317.7

GIS summaries of networks based on the cost for the US 29 extension. The per mile cost applied to the cost of the proposed freeway from US

Boulevards would connect urban communities along the US 29 corridor from the University area north to the airport and the Pantops area along US 250 east of the city in all three scenarios. In the Town Centers scenario, boulevards are proposed for the Ruckersville area at the junction of US 29 and US 33 in Greene County and the Zion Crossroads area at the junction of US 250 and US 15 in Louisa and Fluvanna Counties. In the Urban Urban CoreL scenario, the boulevard system is assumed for the Town of Louisa instead of Zion Crossroads. In the Urban CoreM scenario, boulevards are proposed for Zion Crossroads area and in and around Stanardsville.

Several network modifications were proposed based on assignment results. In the Town Centers Scenario, two boulevards that cross the Rivanna River were added to alleviate congestion on Meadowcreek Parkway. These were not in the Urban Urban CoreL and Urban CoreM scenarios and the results presented in the next section indicate the congestion levels on the Parkway. In addition, the three roads that connect I-64 with the Town of Louisa were widened in the Urban Urban CoreL scenario because of the congestion caused by the amount of development assumed in the town.

Figure 16 illustrates possible boulevard locations in Albemarle 7 along the US 29 north and the US 250 east corridors. The specific locations of the boulevards shown in the figure are not necessarily recommended by the EPI, but they are presented to show how the improvements were coded in order to evaluate the viability of the concept.

Transit Improvements

Because of the concentration of walkable, transit-oriented communities along the US 29 corridor north and the US 250 corridor east of Charlottesville, light rail and priority bus improvements were tested for the Town Centers High and Town Centers Low scenarios to determine the feasibility of both of these priority systems in the short and long term. Light rail improvements were tested for the Urban CoreL and Urban

Roadway Improvement Costs

nts
system of neighborhood streets, main
an-friendly boulevards is proposed for
nd enhanced suburban development.

	US 29 North	US 250 East	Total
	17.5	15.5	33.0
ns)	\$ 20.0	\$ 15.0	
	\$ 350.0	\$ 232.5	\$ 582.5
	17.5	15.5	33.0
ns)	\$ 35.0	\$ 30.0	\$ 30.0
	\$ 612.5	\$ 465.0	\$ 1,077.5

3 in Ruckersville, through UVA, then east to downtown
 downtown Charlottesville to US 15 in Zion Crossroads
 Transit Administration statistics
 for US 250 corridor because of lower right of way costs

Table 8 - Priority Transit Costs

et a sense of potential ridership assuming
 options.

nit alternatives assume the expansion of
 e bus service into the developed areas
 e to each of the stations. Figure 11 on
 e light rail / priority bus and the feeder
 network. Figures 15, 17 and 18 illustrate
 express bus service tested.

improvements assumed for each of the
 ed in Table 7. Generalized costs for the
 sted for the Town Centers and Core
 ed in Table 8. The tables stratify roadway
 ents by type and multiply the total length
 nit costs for each type. Unit costs were
 A, FTA, and VDOT reports. MPO staff

provided the cost of the currently proposed US 29 Bypass extension, from which a unit cost was developed and applied to the total freeway length in the Dispersed scenario.

TRANSPORTATION DEMAND

Traffic model runs were made for the High (330,000) and Low (220,000) population forecasts. This section presents the results for the High forecast; information on the Low growth model runs is provided in Appendix B.

To identify the net effects of development patterns versus transit improvements, two model runs were made for each scenario. The first did not include any transit improvements. This identified the influence of development patterns on roadway travel. The second included transit improvements, which identified the interplay between development patterns and transit.

Roadway- Only Results

Key regional transportation system statistics for each of the scenarios are shown in Table 9. Figures 18 and 19 present year 2050 traffic volumes on selected major roadways and

	Dispersed	Town Ctr	CoreL	CoreM
Total person trips (000s)	1,900	1,900	1,900	1,900
Vehicle trips (000s)	1,300	1,100	1,000	1,100
Walk trips (000s)	73	274	322	341
Percent walk trips	4%	14%	17%	17%
Vehicle miles traveled (000s)	15,700	12,300	10,900	11,200
Vehicle hours traveled (000s)	730	450	370	380
Average speed (mph)	22	28	29	29
Pct. VMT congested	44%	27%	20%	21%

All statistics are reported for an average weekday in 2050
 Data from TRANPLAN assignment report

Table 9 – Year 2050 System-wide Results

the study area and Charlottesville area,

I-64 will be needed in the area for any type of plan for the future.

at, even without transit, the Town Centers generate fewer vehicle miles traveled (VMT), and hours of delay than scenario (Table 9). Traffic volumes and are also lower under the Town Centers and scenarios 18 and 19).

to walk trips, due to pedestrian-oriented accounts partly for the lower rates. Other factors play, however, because the increase in total VMT and VHT exceeds the decrease in walk trips. The proximity of jobs and an efficient community street system in the Town Centers and Core scenarios may be other factors that reduce VMT and VHT.

Roadway Segments

In the Core scenario, 2050 traffic volumes reach 100,000 per day on I-64 between US 29 north between Charlottesville and Crossroads and 40,000 per day on I-64 south of Crossroads east of Charlottesville (Figure 17). Traffic volumes on the same locations in the other scenarios are noticeably lower – 20,000 per day on US 29, 70,000 per day on US 250 (Figure 17). In the Core scenario, traffic volumes are similar among all of the scenarios (Figure 18).

The area among all scenarios is US 250 in the eastern bypass tested in the Core scenario. The eastern bypass tested in the Core scenario provides some relief to this roadway by providing east-west boulevards in the Town Centers scenario suggests another connection to

Volumes in Charlottesville

There was a concern by some on the Advisory Committee about traffic impacts in the City, particularly if the proposed US 29 Bypass extension is not built. The US 29 Bypass extension is assumed in the Dispersed scenario but not the other three. The Town Centers scenario assumes east-west boulevards to support eastern development, while the Core scenarios do not. The total number and length of trips region-wide is higher

	Dispersed	Town Ctrs	CoreL	CoreM
US 29 (Seminole Tr) north of Hydraulic Road*	56,000	70,000	74,000	75,000
US 29 (Emmet Street) between Barracks and Hydraulic Rd	30,000	26,000	26,000	26,000
US 29 Bypass west of US 250 Bypass	24,000	62,000	70,000	70,000
US 250 Bypass east of US 29 to Meadowbrook Hghts*	32,000	34,000	36,000	34,000
Rio Road north of US 250 Bypass*	2,000	8,000	8,000	8,000
Meadow Creek Parkway north of US 250 Bypass*	16,000	30,000	30,000	34,000
US 250 (Ivy Road) west of US 29 (Emmet Street)	56,000	28,000	30,000	30,000
US 250 (Long St) McIntire Rd to Free Bridge	48,000	36,000	40,000	44,000
US 250 at Free Bridge	60,000	50,000	46,000	48,000
US 250 (Richmond Rd) east of Route 20	66,000	84,000	80,000	82,000
US 29 at Fontaine (northeast of US 29 Bypass)	10,000	4,000	7,000	7,000
Fifth -Ridge-McIntire north of I-64	5,000	4,000	7,000	7,000
US 20 (Avon) north of I-64	18,000	12,000	22,000	24,000

Table 10 - Year 2050 Traffic Volumes on Urban Area Streets

IMPORTANT: These figures show only subsections of the total roadway network. See Table 9, System Wide Results, to put these figures into context.

* MC Pkwy assumed to be four lanes. The recently endorsed two-lane road would attract fewer trips in all scenarios. More trips would likely move onto Rio Rd, Rt 29 North, and the Rt 250 bypass.

ario than the others (Table 9).

at travel paths through Charlottesville, McIntire, Park Street, and Emmet Street, are high traffic even when no bypass or east-bypass is present (Table 10). In this case, through trips that neither begins nor ends in Charlottesville and trips that begin and end just outside Charlottesville. The model further estimates that the existing bypass (US 250 and I-64) will not be severely impacted by the segment of US 250 east of McIntire.

ario with the proposed US 29 Bypass in Charlottesville City shows lower traffic estimates for the proposed bypass than the existing US 29 bypass. Volumes on US 29 east of the existing bypass drop to 10% of the existing bypass drop to 10% among the alternatives, suggesting that the proposed bypass rather than Emmet Street. The existing bypass scenario results in more traffic on Emmet Street because of development in Charlottesville City.

Centers scenarios predict more traffic on US 29 Parkway than the Dispersed scenario, in part because the eastern freeway provides fast access to the centers. The eastern freeway provides fast access to the centers expected to develop in that area.

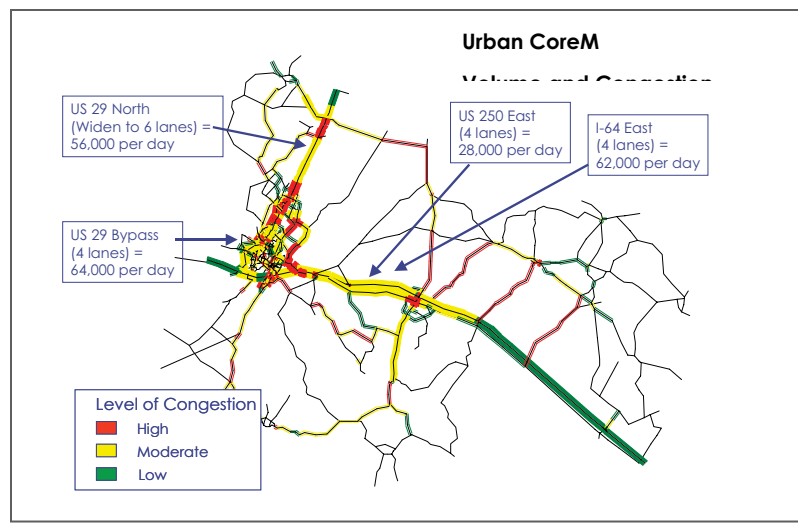
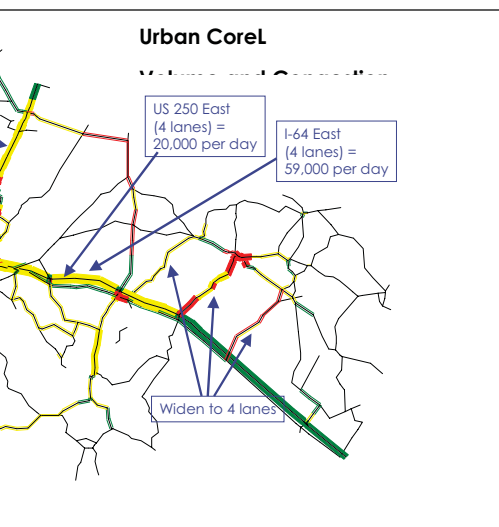
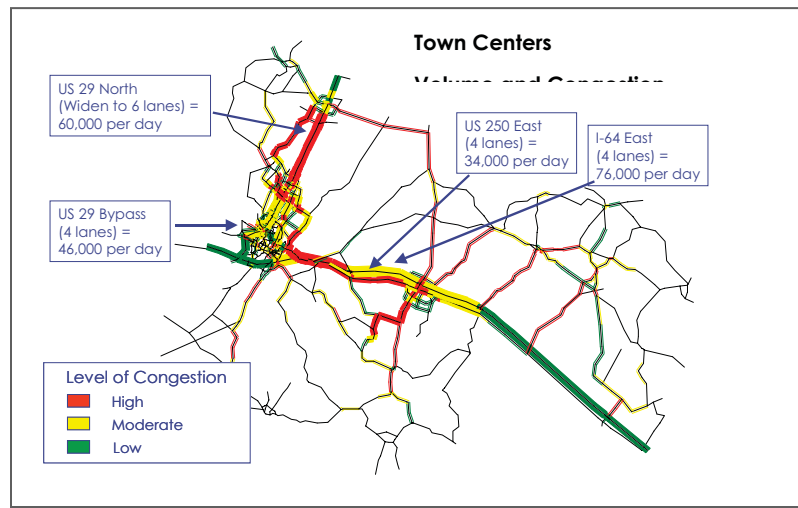
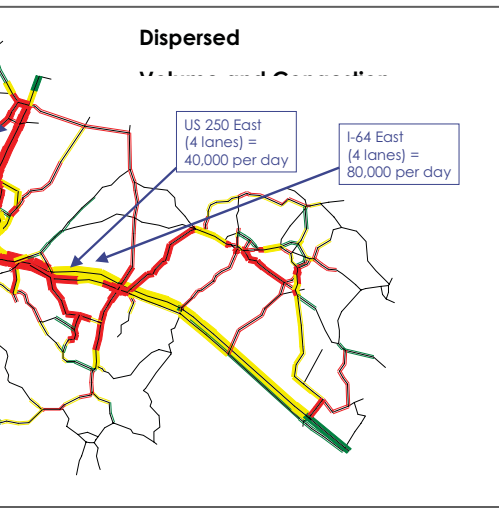


Figure 19 – Alternative Year 2050 Traffic Volumes and Congestion Levels in the Study Area

Model used for this study does not account for congestion relieving benefits offered by such measures as overpasses and grade separated proposed new roads in the scenarios report were developed by the consultant for sketch purposes only and were not reviewed for their their community and environmental impacts.

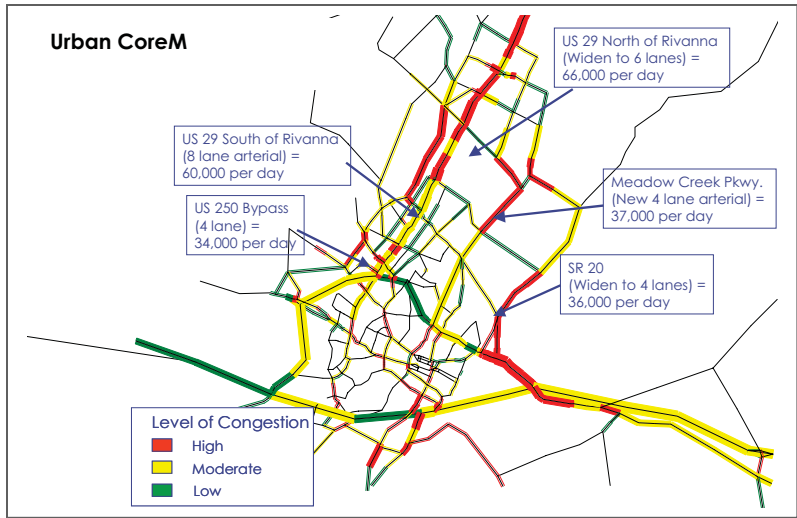
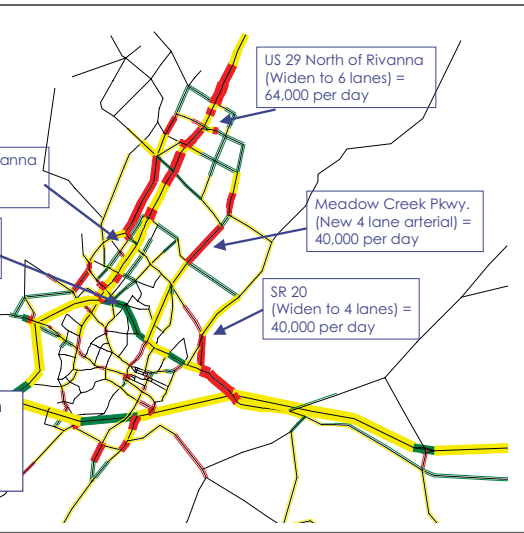
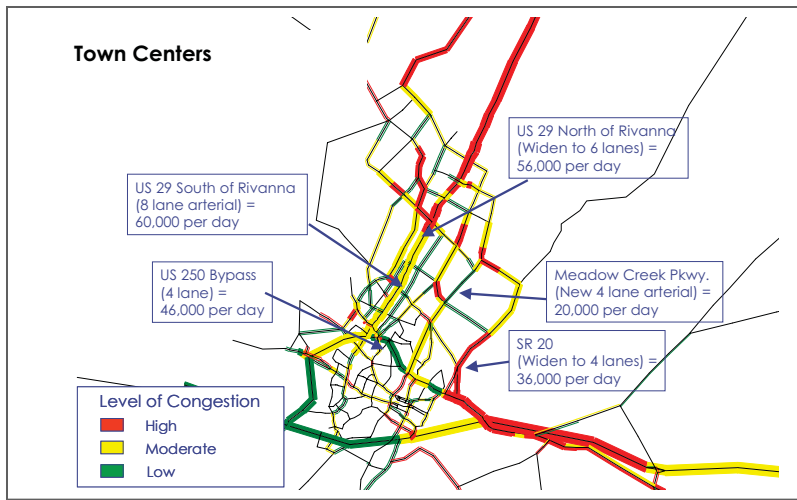
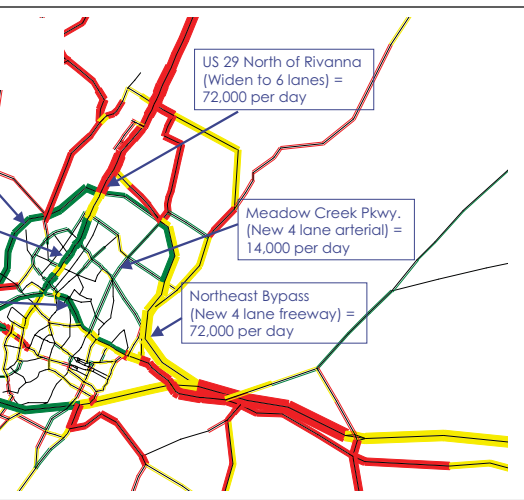


Figure 20 – Alternative Year 2050 Traffic Volumes and Congestion Levels in the MPO Area

Model used for this study does not account for congestion relieving benefits offered by such measures as overpasses and grade separated proposed new roads in the scenarios report were developed by the consultant for sketch purposes only and were not reviewed for their or their community and environmental impacts.

were tested, including a comparison of bus ridership using the Town Centers High, Urban CoreL and Urban Urban CoreL and Urban Urban CoreL. The light rail / priority bus evaluation compares the ridership of either option. The light rail alternative is influenced by the influence of regional development

Bus Feasibility

ridership) estimated by TRANPLAN for the proposed light rail system is around 8,100 per day in the high growth scenario and 5,900 per day in the low growth scenario (Table 11). The ridership is lower – around 4,500 per day in the high growth scenario and around 3,100 per day in the low growth scenario.

Light Rail High	New	Priority Bus		
		Moderate	High	New
600	500	400	500	300
7,500	5,400	3,600	6,200	3,600
8,100	6,000	4,100	7,000	4,000
500	300	200	300	200
4,000	2,800	1,900	3,300	1,900
4,500	3,100	2,100	3,600	2,100
1,100	800	600	800	500
11,500	8,200	5,500	9,500	5,500
12,600	9,100	6,200	10,600	6,100

scenarios only.
ridership in corridor minus system ridership

Table 11- Transit Ridership

Ridership on the priority bus improvement is lower than the light rail alternative (Table 11). There are two likely reasons for this – longer dwell times (time it takes buses to get up to speed after stops) and the coefficient in the modal choice model that reflects the public's present-day preference for rail. These are factors that could be influenced by emerging technologies making mass transit more efficient and marketable.

Cost per Rider

The 8,100 riders per day on the US 29 north segment is low in comparison with other light rail lines of similar length that, according to FTA statistics, can average over 20,000 riders per day. Furthermore, the cost per new rider (total transit system riders minus existing system riders), a key statistic used by the Federal Transit Administration to determine funding, is high in comparison with other systems (higher cost per rider ratios indicate lower cost effectiveness). The annual number of new riders for the US 29 light rail segment is around 1.8 million (6,000 **new** riders per day times an annualization factor of 300 – Table 12). Annual capital and operating cost for light rail, estimated using ratios from a recently completed light rail feasibility study in Birmingham, AL., totals about \$49 million. The resulting cost per new rider for light rail on the US 29 segment is around \$27 (Table 12). The cost per new rider is even higher for the US 250 light rail segment (Table 12).

The lower ridership on the priority bus option is offset by much lower capital and somewhat lower operating costs. Despite the lower costs, the cost per new rider is still higher in comparison with the light rail options in both the US 29 and the US 250 corridors (Table 12).

According to the Federal Transit Administration (FTA), the annual cost per rider on other systems seeking new starts funding in fiscal year 2000 ranged from \$2 to \$48 and averaged around \$10. Because FTA only funds a small number of annual New Start applications, it is doubtful whether a New Starts proposal from the region, with a cost per rider that is at

range, even by the year 2050, would be significant. Therefore, federally funded priority bus lanes do not appear feasible in the short term. It is important for the region to plan transit-oriented development and identify potential transit rights of way to have this option in the future.

Volumes

Light rail ridership in the US 29 and US 250 corridors would be reduced by less than 1,000 riders per day. Lack of traffic reduction is a fairly typical

dynamic of the current relationship between transit and roadway demand. Each new transit rider does not result in one less car on the adjacent roadway because average auto occupancies are greater than one and because some traffic will shift from parallel roads onto the affected roadway to take advantage of its reduced demand.

Priority Transit Feasibility

Given the ridership and cost per rider results for either light rail or priority transit, expanding the existing bus service to the boulevards proposed for the development areas is the most cost-effective transit investment. If over the next fifty years bus ridership exceeds capacity on specific routes, even at frequent headways, the region should consider increased transit capacity using a system like priority buses or light rail transit. Furthermore, transit technology is changing rapidly, lowering the cost to build and operate new fixed guideway systems. This may make it possible for the region to consider funding a system on its own, or for FTA funds to stretch further. Given these possibilities, the region should continually look for opportunities to improve its transit service.

US 29 North	US 250 East	Total
\$ 18.4	\$ 14.0	\$ 32.3
\$ 18.4	\$ 14.0	\$ 32.3
\$ 36.8	\$ 27.9	\$ 64.7
4,000	2,100	6,100
1,200,000	630,000	1,830,000
\$ 30.6	\$ 44.3	\$ 35.3
US 29 North	US 250 East	Total
\$ 30.6	\$ 23.3	\$ 53.9
\$ 18.4	\$ 14.0	\$ 32.3
\$ 49.0	\$ 37.2	\$ 86.2
6,000	3,100	9,100
1,800,000	930,000	2,730,000
\$ 27.2	\$ 40.0	\$ 31.6

Transit is assumed to be 3% of total capital cost
 Light rail transit is assumed to be 3% of total capital cost
 Bus transit is assumed to be 5% of total capital cost
 Ridership is assumed to be 3% of total capital cost
 Ridership. Service is not assumed for Sundays and holidays
 Regional Multimodal Mobility Plan, prepared for the

Transit Ridership by Scenario

Light rail transit was also tested for the Urban CoreL and Urban CoreM scenarios to determine how regional development patterns influence transit ridership (Table 13). Year 2050 forecasts for the Urban CoreL and Urban CoreM scenarios are slightly lower than the Town Centers scenario. This may be due to several factors including lower roadway congestion levels that make transit a less attractive option and shorter trip lengths that are better served by local transit routes than light rail transit.

Annual Cost of New Riders

	Nodal	CoreL	CoreM
	600	300	300
	500	200	300
	1,100	500	600
	900	500	400
	2,000	1,000	1,000
	7,500	5,300	6,000
	4,000	2,300	3,200
	11,500	7,600	9,200
	6,500	4,100	5,400
	18,000	11,700	14,600
	8,100	5,600	6,300
	4,500	2,500	3,500
	12,600	8,100	9,800
	7,400	4,600	5,800
	20,000	12,700	15,600

Measure /Sustainability Accord	Disp- ersed	Nodal	CoreL	CoreM
Pct. Farms and Forests Retain resources/habitat/farms/forests	55	64	65	65
Pct. Developed Retain resources/habitat/farms/forests	45	36	35	35
Pct. Living In Clustered Communities Optimize use/cluster/human scale	13	61	68	68
Pct. Non-auto Trips Transportation Alternatives	4	15	18	18
Annual Gallons Gas Consumed (billions) Conserve Energy	155	121	110	114
Pct. Travel Congested Employment / Education Access	44	27	20	21
Water Quality and Quantity Water Quality and Quantity	Poor	Good	Good	Good

Table 13 - Year 2050 Daily Light Rail Transit Ridership

Table 14- Scenario Comparisons

ATIONS

how each of the scenarios compares measures that are based on the 1998 adopted by the TJPDC. All four high presented in Table 12. Information for the nity measures is from the CorPlan model. ansportation measures is from the travel

suggest that the Town Centers and Core h better at meeting the region's n the Dispersed scenario. The challenge g the steps necessary to achieve some Centers or Core scenario. The *EPI Policy* ailed description of the recommended

SUMMARY

This Technical Report is one of several reports prepared for the Eastern Planning Initiative conducted by the Thomas Jefferson Planning District Commission. This report documents the analytical steps taken and assumptions used to develop and evaluate land use and transportation scenarios for the EPI study area.

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Plan model and a handbook of the EPI
o any interested community or group,

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