



MEMORANDUM

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To: Ben Ehreth
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Date: February 5, 2009

Subject: Draft 2035 Baseline Traffic Forecasts and Operations

BACKGROUND

The purpose of this memorandum is to document the 2035 traffic forecasts developed for the 2009-2035 Long Range Transportation Plan Update. The forecasts were prepared by URS based on output from the MPO's computer travel demand model, which is developed and maintained by ATAC at North Dakota State University.

The 2035 forecasts are presented as a "baseline" 2035 condition as they represent forecasted daily traffic volumes for the existing-plus-committed roadway network scenario. The 2035 existing-plus-committed (E+C) roadway network scenario assumes that there are no roadway capacity increasing, roadway extension, access adding improvements to the Bismarck-Mandan-Lincoln area beyond those included in the current four-year (2009-2012). Transportation Improvement Program (TIP). The 2035 baseline traffic forecasts assume that the 2035 land development concept is in place. Based on those forecasted 2035 traffic levels and the existing-plus-committed roadway network, the memorandum then provides planning-level estimates of future 2035 traffic operations on the roadway network. These baseline 2035 traffic operations estimates provide guidance to the study team in assessing where there may be traffic flow deficiencies in 2035, and alternatives will be developed to address these forecasted deficiencies.

The remainder of this memo will provide a brief background on the forecasting process and provide a general summary of the preliminary traffic growth trends identified.

TRAFFIC FORECASTING APPROACH

The Bismarck-Mandan MPO area travel model is currently being maintain for the MPO by ATAC as a computer application that can evaluate/simulate the interaction between developed areas identified in the area land use plans, specifically the locations and amounts of housing and employment, and its roadway system. The travel model can be applied to:

- Estimate traffic volumes associated with a specific level and type of land development, whether existing or future development scenarios. These model applications help us to gain an understanding of the potential traffic impacts associated with that land

development scenario.

- Estimate the effects of improvements to the roadway network. Thus, through changing the input roadway characteristics, the travel model will allow the study team to test the transportation system changes / alternative improvements identified through the course of this study.
- Quantify the traffic impacts of not making a specific network improvement. As the model has the capabilities to assess how congestion on various routes results in people diverting through neighborhoods to avoid congested arterial routes and how congestion results in longer travel times between origins and destinations, it is a good tool to provide information regarding the “what if we do not do this” scenario.

Three general steps have been completed thus far in development of the 2035 traffic forecasts:

- *Model Validation:* The MPO worked with ATAC to update and validate an existing conditions (2007) model, which attempted to replicate existing housing and employment conditions and the existing roadway system. The base year model inputs of 2007 employment, housing and roadway network conditions were applied to estimate 2007 traffic flow patterns within the 2007 model. The 2007 model-estimated traffic volumes were then compared to observed existing traffic counts. Through this validation process, ATAC and the MPO deemed that the model did a reasonably good job of simulating existing traffic conditions in the metro area. The model validation was documented in a July 2008 memorandum from ATAC.
- *2035 Development Concept:* The MPO staff produced the 2035 land development concept based on input from local planning staff, data available from local jurisdictions and from other studies recently completed in the metropolitan area. The development concept includes the number of and type of new jobs (whether retail, service or other sector jobs) and households by traffic analysis zone (TAZ).
- *2035 Baseline Model Development:* The 2035 Baseline travel model uses the 2035 Development Concept as its input for future jobs and housing scenario, and assumes that the current 2009 – 2012 TIP are the only roadway network improvements made by 2035.

2035 DEVELOPMENT ASSUMPTIONS

As noted above, the 2035 traffic forecasts presented in this memorandum use the 2035 land development concept as an input. As previously reviewed by the TAC and Policy Board and documented in Table 1, the development concept for the region assumes that housing and employment levels increase by 42 and 41 percent respectively between 2007 and 2035.

Table 1. Bismarck-Mandan Regional Housing and Employment Summary, 2007 and 2035

	2007	2035	Change	2007 to 2035 Change
Households	37,300	52,900	15,600	42%
Employment				
Retail	10,900	15,400	4,500	41%
Service	23,500	33,200	9,700	41%
Other	17,700	24,700	7,000	40%
Total	52,100	73,300	21,200	41%

Source: Bismarck-Mandan Travel Demand Model

Figure 1 illustrates the level of housing growth by TAZ, and Figure 2 the level of employment growth by TAZ.

NETWORK UPDATES BETWEEN CURRENT AND 2035 FOR E+C NETWORK

The existing plus committed (E+C) network represents the current roadway system plus the projects listed in the current TIP that would add capacity to the roadway network, extend collector and arterial routes from their present terminus, add new access to or across the interstate system, add new bridges, etc. TIP projects that provided significant improvements to network capacity or connectivity that were added to the current model network are:

- Upgrade Century Avenue Hamilton Street through Centennial Road as a four-lane divided or five-lane roadway.
- Upgrade Centennial Road from Trenton Avenue to Jericho Avenue as a five-lane arterial.
- Upgrade Divide Avenue from Volk Street through Bismarck Expressway.
- Finish expansion of Memorial Highway bridge as four-lane.
- Extend Division Street from 8th Avenue NE to Mandan Avenue.
- Addition of turn lanes to US 83 north of 57th Avenue.

REGIONAL 2035 TRAFFIC RESULTS

Total trip levels for 2035 were estimated by applying the travel model, based on the 2035 household and employment levels projected in the development concept. Table 2 documents the existing and forecasted regional daily levels of travel for the study area. Travel is presented in three different ways:

- Total daily trip generation, the number of trips made in the metropolitan area. Trip generation is projected to increase by approximately 42 percent between 2007 and 2035, a rate similar to the level of housing and employment growth.

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- Daily vehicle miles of travel (VMT), a calculation of the total system mileage traveled (product of the number of trips multiplied by their length). VMT is projected to increase by approximately 60 percent between 2007 and 2035.
- Daily vehicle hours of travel (VHT), a calculation of the total time spent traveling on the system (product of the number of trips multiplied by their total travel time). VHT is projected to increase by approximately 77 percent between 2007 and 2035.

Table 2. Bismarck-Mandan Regional Travel Demand Summary, 2007 and 2035

	2007	2035	Change	2007 to 2035 Change
Trip Generation	732,000	1,038,000	306,000	42%
VMT	1,460,000	2,330,000	870,000	60%
VHT	39,100	69,100	30,000	77%

Source: URS Corp, Bismarck-Mandan Travel Demand Model

As shown in Table 2, VMT is projected to grow more than trip generation, indicating that average trip lengths (in miles) are forecasted to increase over the planning horizon. The location of the new jobs and houses added over the planning horizon (illustrated in Figures 1 and 2) are predominantly located on the periphery of existing developed areas, thus longer average trip lengths are an expected outcome of the proposed development concept. Table 2 also shows that in the E+C condition, vehicle hours of travel (+ 77%) increase more than vehicle miles of travel (+60%). This would indicate that average system travel time for the same trip that is made today will be greater by 2035 if no improvements are made to the highway network beyond those included in the current 2009 – 2012 TIP. This increase in travel time relative to the increase in number of trips and increase in VMT indicated that congestion will grow if no other investment is made in the roadway network other than what is in the current TIP.

The draft daily traffic forecasts associated with the 2035 E+C roadway network are presented in Figure 3. The forecasts are not reported directly from travel model output; URS has applied a process to refine the 2035 travel model output on a segment-by-segment basis. This post-processing of travel model output is applied according to the level of deviation seen between the 2007 model-predicted traffic volumes and field-observed traffic volumes.

2035 EXISTING-PLUS-COMMITTED TRAFFIC OPERATIONS

Regional 2035 baseline traffic operations were estimated for all functionally-classified regional roadways, based on the 2035 traffic forecasts presented in Figure 3 and the estimated roadway capacities in the E+C scenario. As with the *Existing Conditions Report*, roadway segments are considered “deficient” when traffic flow is estimated to operate at LOS D or worse. Figure 4 illustrates those segments which are forecasted to operate at LOS “C” (approaching deficient) or

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LOS "D" or worse (deficient) in the 2035 E+C condition.

The capacities used in this evaluation are presented in terms of daily traffic volumes, but have been developed to reflect the approximate daily traffic levels at which a roadway will experience peak period congestion. Thus, most of the roadway capacity deficiencies shown in Figure 4 would experience relatively short periods of travel delays (often an hour or slightly more) over the course of the day in the 2035 E+C condition.

SUMMARY

The information presented in this memorandum is a key input to the LRTP update, as it provides the list of future traffic congestion locations. Thus, in addition to those issues identified by the public and identified traffic safety issues, this analysis provides the locations where the study team will investigate roadway improvement alternatives for inclusion in the recommended Transportation Plan.

Please review information provided in this memorandum. If there are any questions or comments, please contact Jason Carbee at (402) 952-2506.



Legend

Household Growth

- 50 or Less
- 51 to 200
- 201 to 500
- 501 to 1,000
- More than 1,000

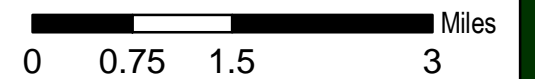
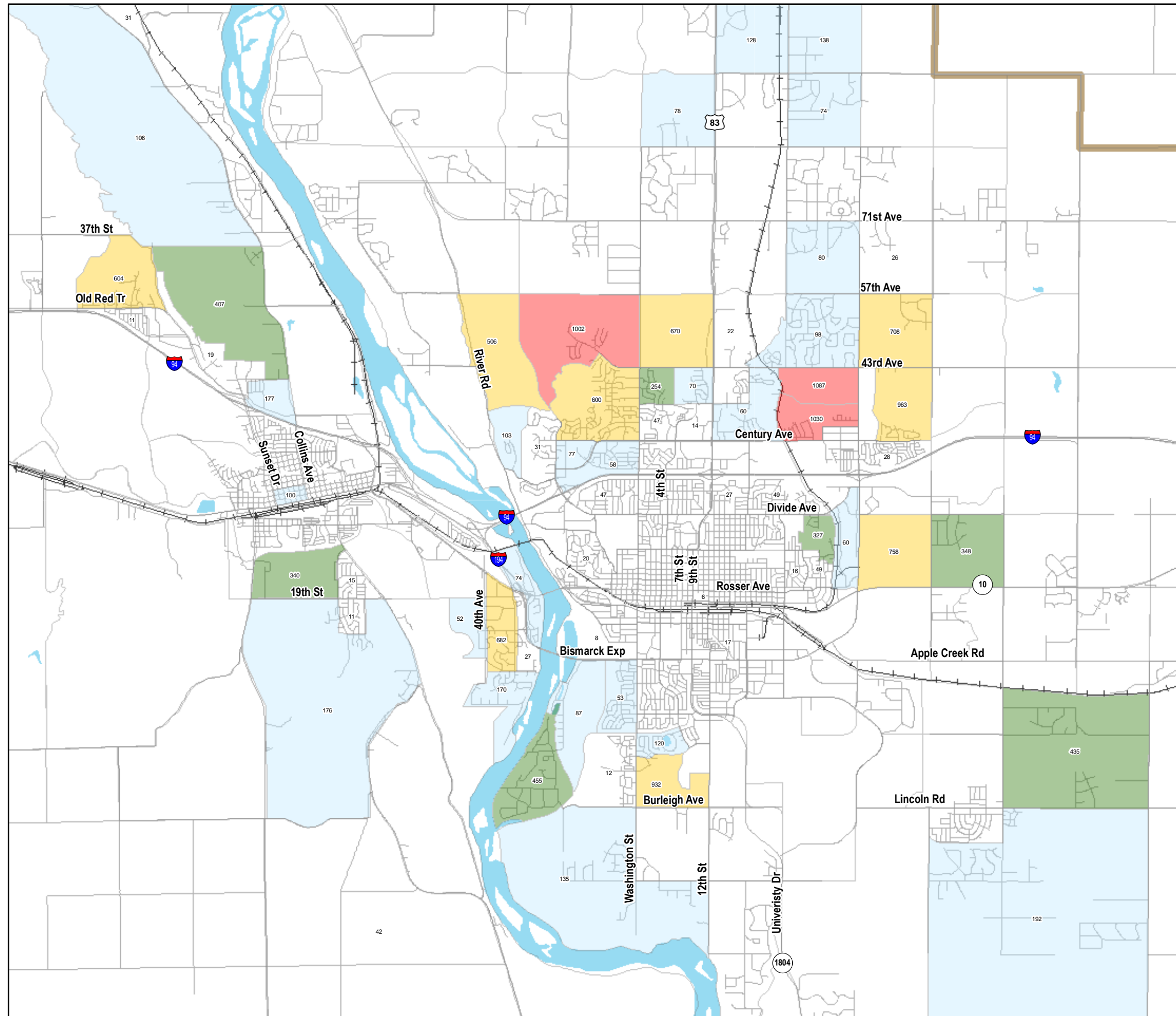
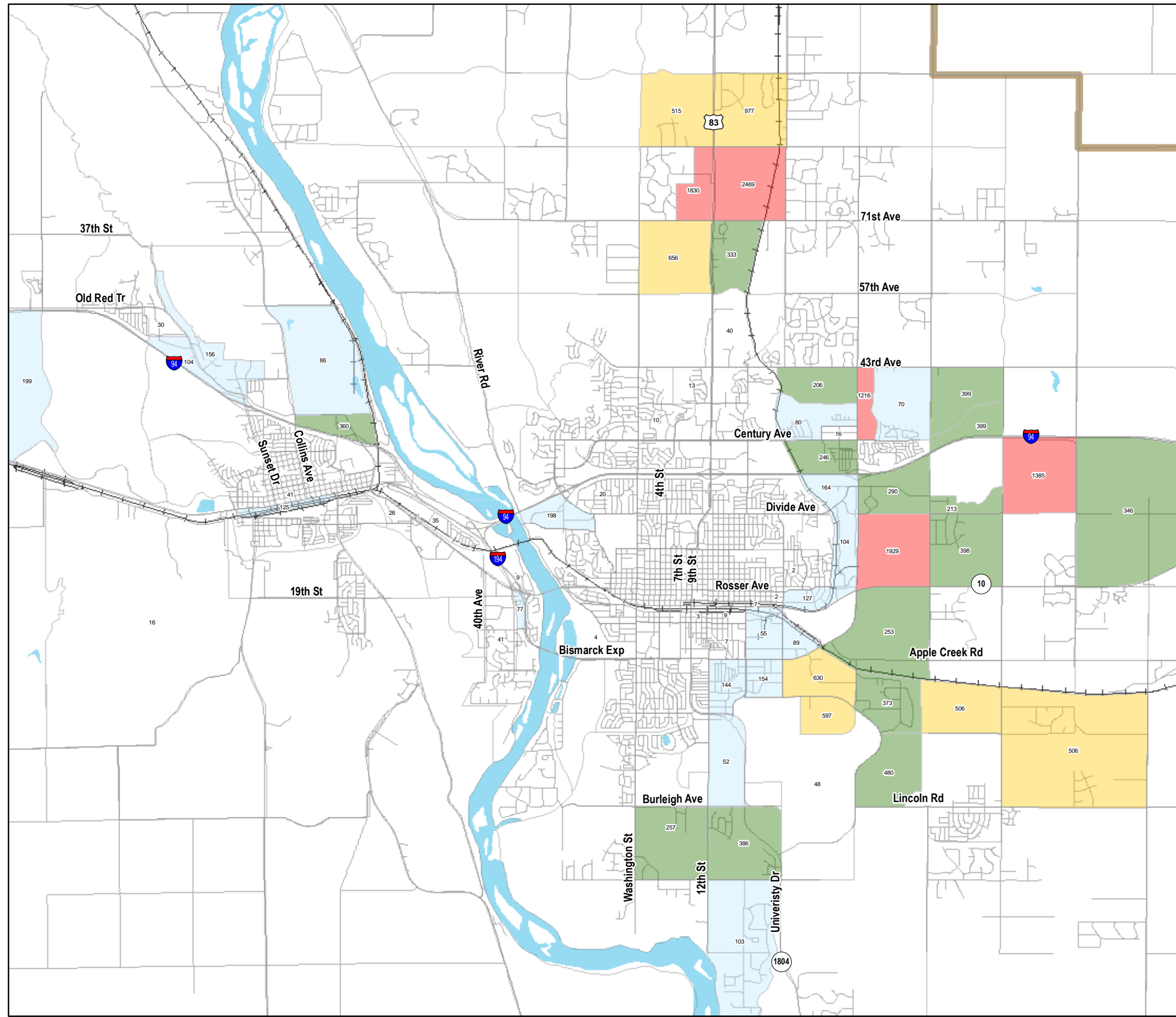


Figure 1. 2008 to 2035 Household Growth





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Employment Growth

- 50 or Less
- 51 to 200
- 201 to 500
- 501 to 1,000
- More than 1,000

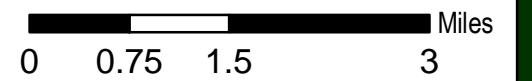


Figure 2. 2008 to 2035 Employment Growth



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8,200 2035 Daily Traffic Forecast

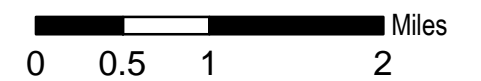
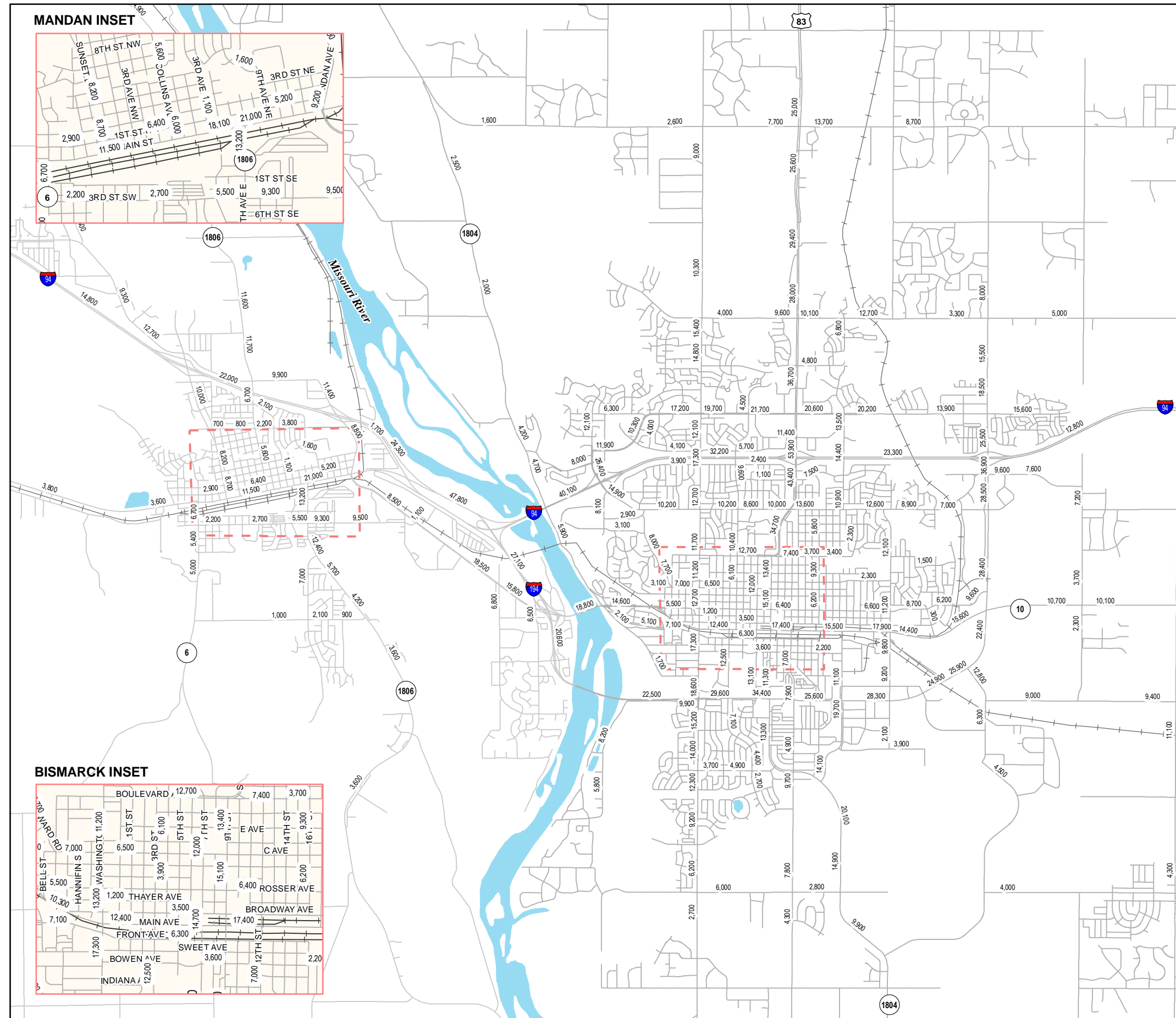


Figure 3. Forecasted 2035 E+C Scenario Daily Traffic Volumes





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2035 Level of Service

- LOSC
- LOSD
- LOSE
- LOSF

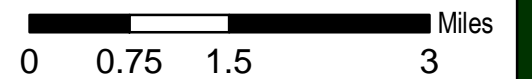


Figure 4. Forecasted 2035 E+C Roadway Levels of Service

