ARKANSAS STATE HIGHWAY AND TRANSPORTATION DEPARTMENT
AHTD

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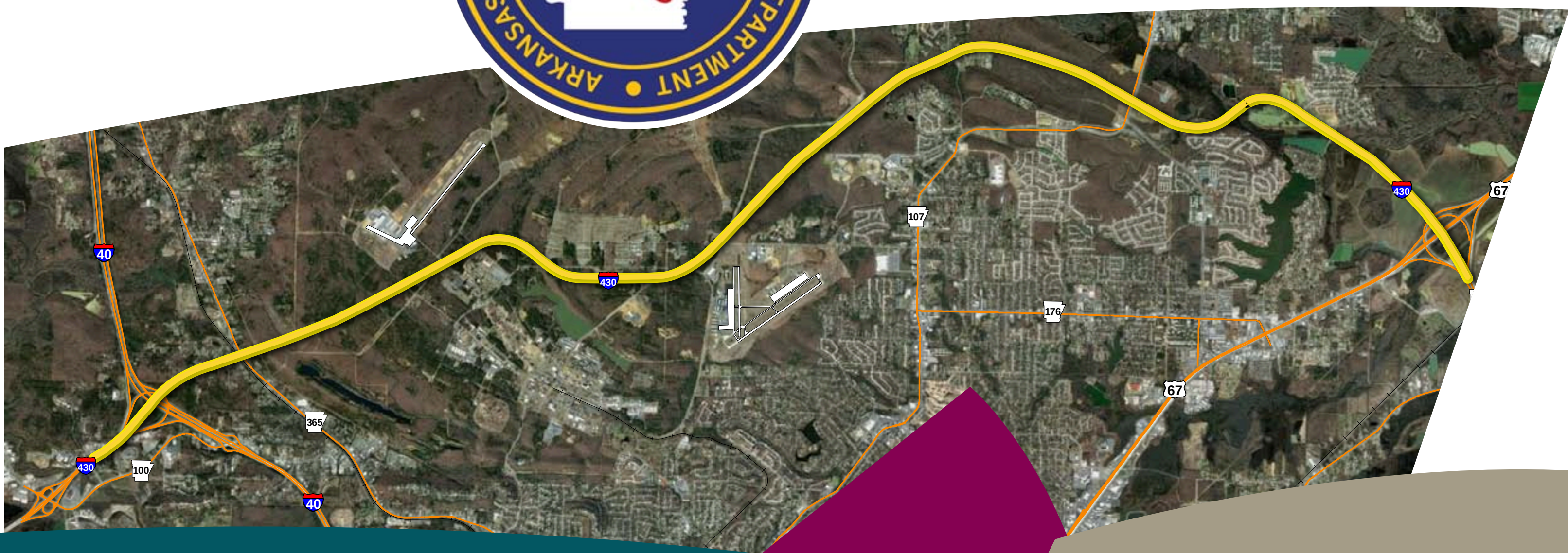

North Belt Freeway Toll Feasibility Study

Final Findings

May 2014

ATKINS

10074|JLS|14

North Belt Freeway Toll Feasibility Study
Final Report

Developed by:

ATKINS

In Consultation with:

ICA Engineering

Baez Consulting, LLC

KSD Consulting, Inc.

and

PFM

May 2014

Arkansas State Highway and Transportation Department
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Prepared by Atkins North America, Inc.
In cooperation with Metroplan, the
Arkansas State Highway and Transportation Department and the Federal Highway Administration.

Contents

Page

Figures

Page

Tables

Page

Acronyms and Abbreviations

AAA	American Automobile Association
AADT	annual average daily traffic
ACHM	asphaltic concrete hot mix
AETC	all electronic tolling collection
AHTD	Arkansas State Highway and Transportation Department
CARTS	Central Arkansas Regional Transportation Study
CBER	Center for Business and Economic Research
Commission	State Highway Commission
CSC	Customer Service Center
DTM	digital terrain model
FEIS	Final Environmental Impact Statement
FHWA	Federal Highway Administration
GEC	General Engineering Consultant
I-40	Interstate 40
IBTTA	International Bridge, Tunnel, Turnpike Association
IEA	Institute for Economic Advancement
LPR	License Plate Recognition
MLG	main lane gantry
mph	miles per hour
mvm	million vehicle-miles
OPEX	operations and maintenance expenses
PCC	Portland cement concrete
PS&E	Plans, Specifications, and Estimates
R&R	Renewal and Replacement
RMA	Regional Mobility Authority
ROD	Record of Decision
ROW	right-of-way
SUE	Subsurface Utility Engineering
T&R	traffic and revenue
TDM	travel demand model
UE	User Equilibrium
UPRR	Union Pacific Railroad
USC	United States Code
VDF	volume delay function
VOT	value of time
VPC	Video Processing Center
vpd	vehicles per day
YOE	Year of expenditure

I. INTRODUCTION

The Arkansas State Highway and Transportation Department (AHTD), similar to other transportation agencies across the nation, is facing tremendous challenges in providing needed transportation improvements with limited local, state, and federal funds. In light of declining revenues and increasing demands for transportation infrastructure, the AHTD partnered with Metroplan to evaluate the feasibility of tolling the North Belt Freeway as a means to accelerate development of this strategic project. The feasibility analysis included an assessment of toll revenues, project costs, and financial strategies based on net revenue. The purpose of this report is to describe the methodologies used to develop traffic and revenue (T&R) forecasts, estimate capital and ongoing project costs, and analyze the financial capacity of the project. Results of each of these feasibility analysis inputs, a high level feasibility analysis and a gap analysis to potentially reduce funding gaps are also presented. The report concludes with a high level overview of the safety impacts of the proposed project.

II. PROPOSED PROJECT

The North Belt Freeway is proposed as a new alignment four-lane divided, controlled-access facility between Interstate 40 (I-40) and Highway 67 in central Arkansas. The corridor spans approximately 13 miles completing the connection between I-430 in the west and Highway 440 in the east (Figure 1).

III. EXISTING CONDITIONS

Most of the major highways in the central Arkansas metropolitan area have two or three lanes in each direction with speed limits ranging from 60 to 65 miles per hour (mph). Highway 107 and Highway 176, which are in close proximity to the proposed project (Figure 2) are primarily two lanes in each direction with speed limits ranging from 35 to 55 mph. The area surrounding Highway 107 from Kellogg Acres Road to downtown Little Rock is highly developed with many traffic signals and school zones. Speed limits in this area are reduced to 35 mph. Highway 176 is also highly developed in the section between downtown Little Rock and West Maryland Avenue. From West Maryland Avenue to the community of Gibson in North Little Rock, Highway 176 is one lane in each direction and traverses through relatively undeveloped land. Most of the major employment centers in the central Arkansas metropolitan region are located along the I-630 corridor in downtown Little Rock.

Afternoon congestion levels in the vicinity of the proposed project were observed during a site visit conducted June 27, 2013. During the afternoon peak period (4:30 to 5:15 PM), severe congestion was observed in the eastbound direction of I-30 between I-630 and I-40, and the eastbound direction of I-40 from I-30 to Highway 67 (Figure 3). During this period, the average speed from the I-30/I-630 interchange to Highway 67/McCain Boulevard ranged from 33 to 42 mph. The congestion on I-30 northbound occurs as traffic merges from I-630 and the loop ramps connecting Cumberland Street. On I-40 eastbound, congestion occurs due to high volume traffic from I-30 eastbound merging with I-40

Figure 1: General Corridor Alignment

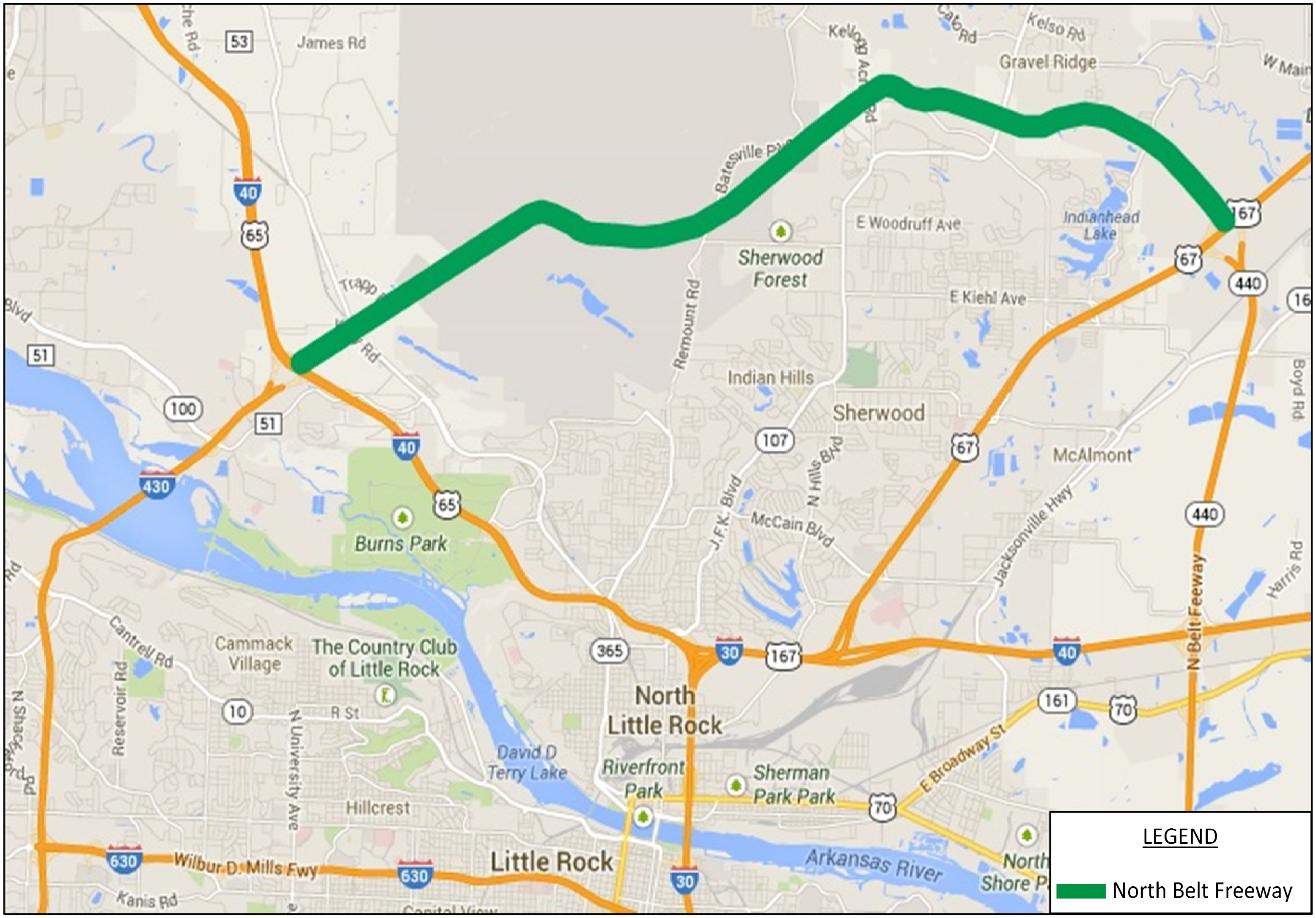


Figure 2: Major Existing Arterials in Proximity to Proposed North Belt Freeway Project

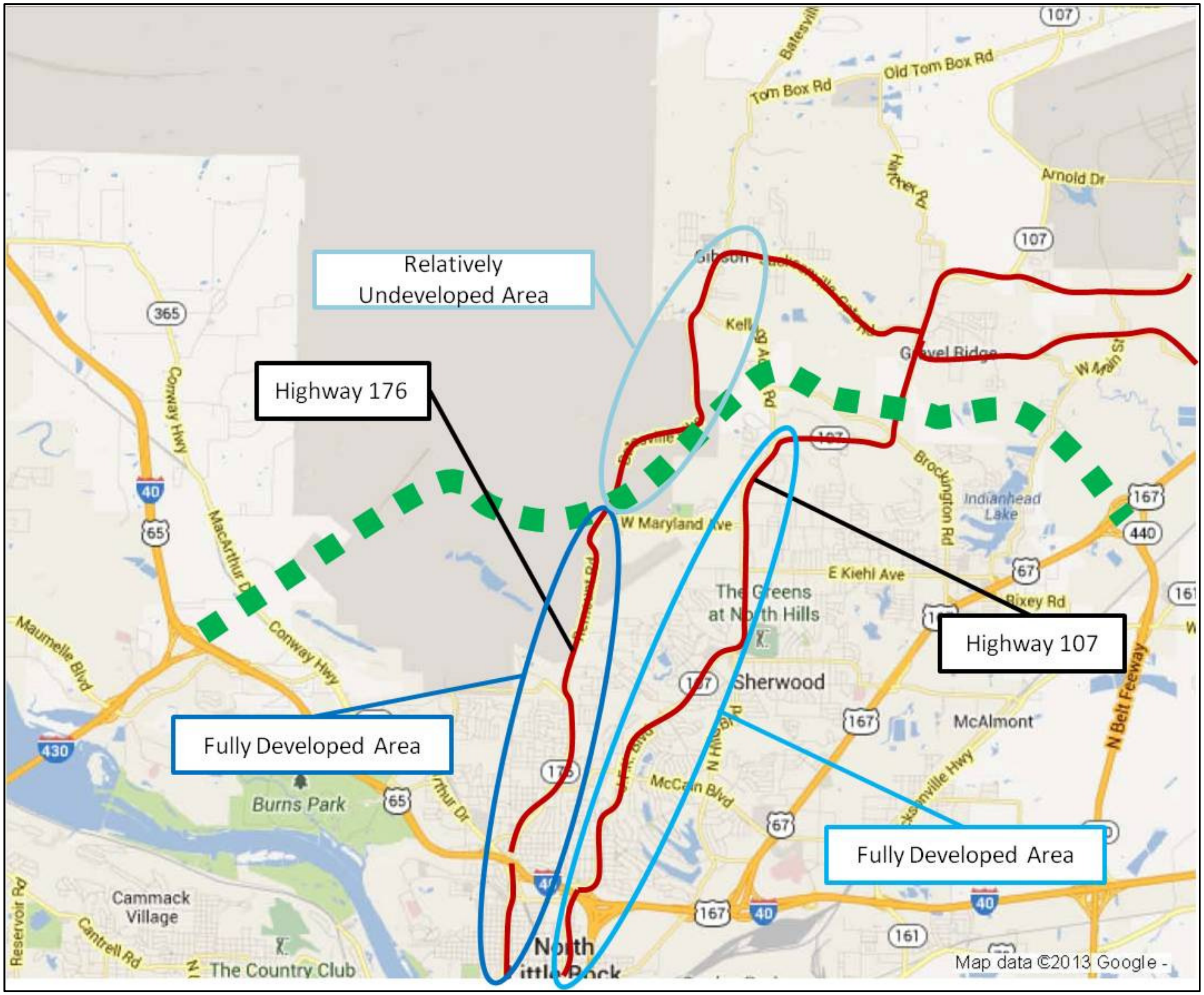
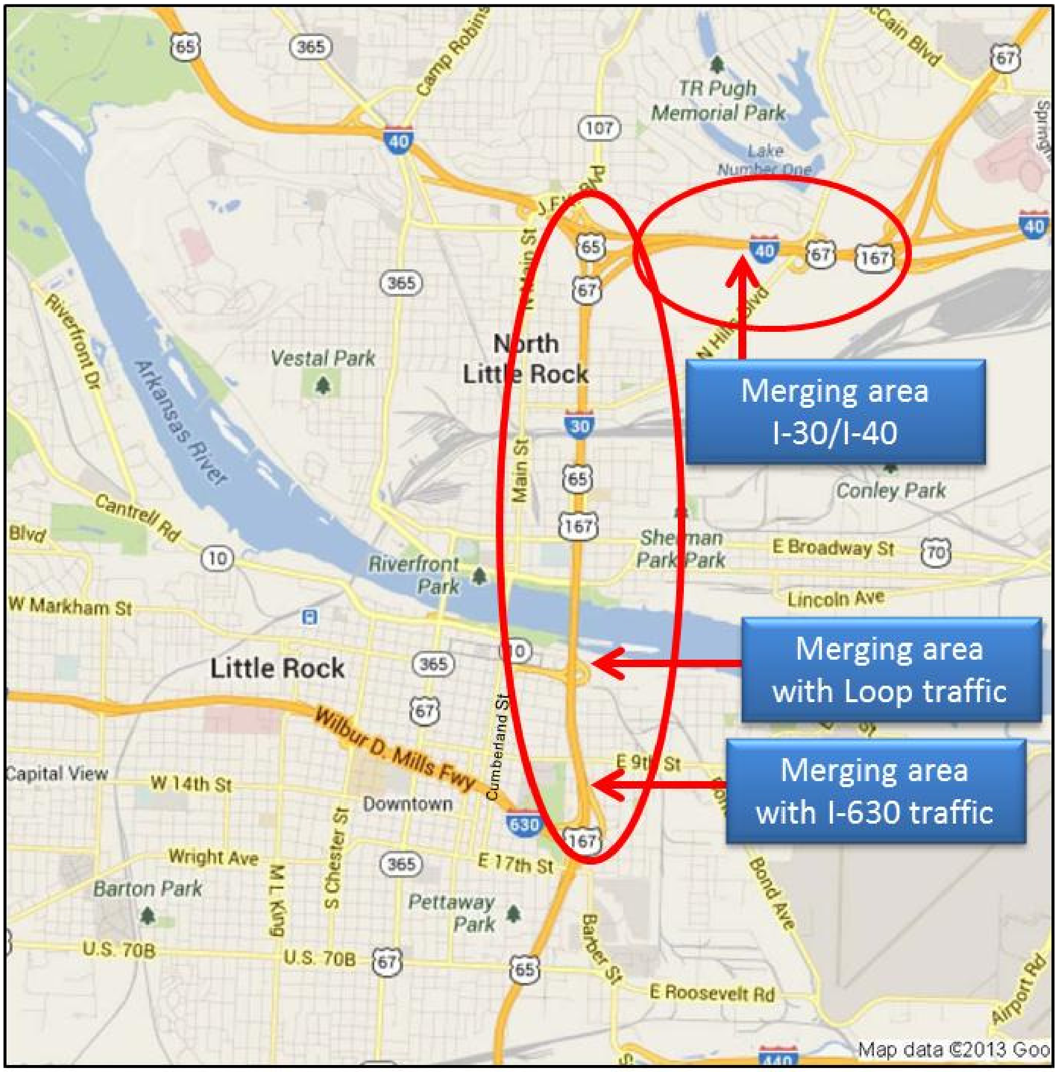


Figure 3: Merging Area of Severe Congestion
Afternoon Peak Period



eastbound traffic. This merging area is very turbulent because traffic traveling from I-30 eastbound to Highway 67 northbound must weave to the interior lane (adjacent to inside shoulder) to access Highway 67 (Figure 4). On the other hand, traffic traveling on I-40 eastbound and continuing eastbound must weave over to the exterior lanes (adjacent to outside shoulder).

The peak period congestion observed during the afternoon was verified using Google maps daily traffic conditions (Figure 5). Highway and arterial segments shown in red represent slow traffic conditions. The map depicts slow traffic conditions on I-30, I-40, Highway 107, and Highway 176. Figure 6 shows the speed conditions during the morning peak period, as reported by Google maps. Congestion conditions occurred on the same facilities but for the reverse movements (southbound/westbound).

Figure 4: Area of Severe Congestion
I-30 and I-40 Merging Area

Figure 5: Afternoon Traffic Conditions
(Google Map; September 20, 2013, 4:45 pm)

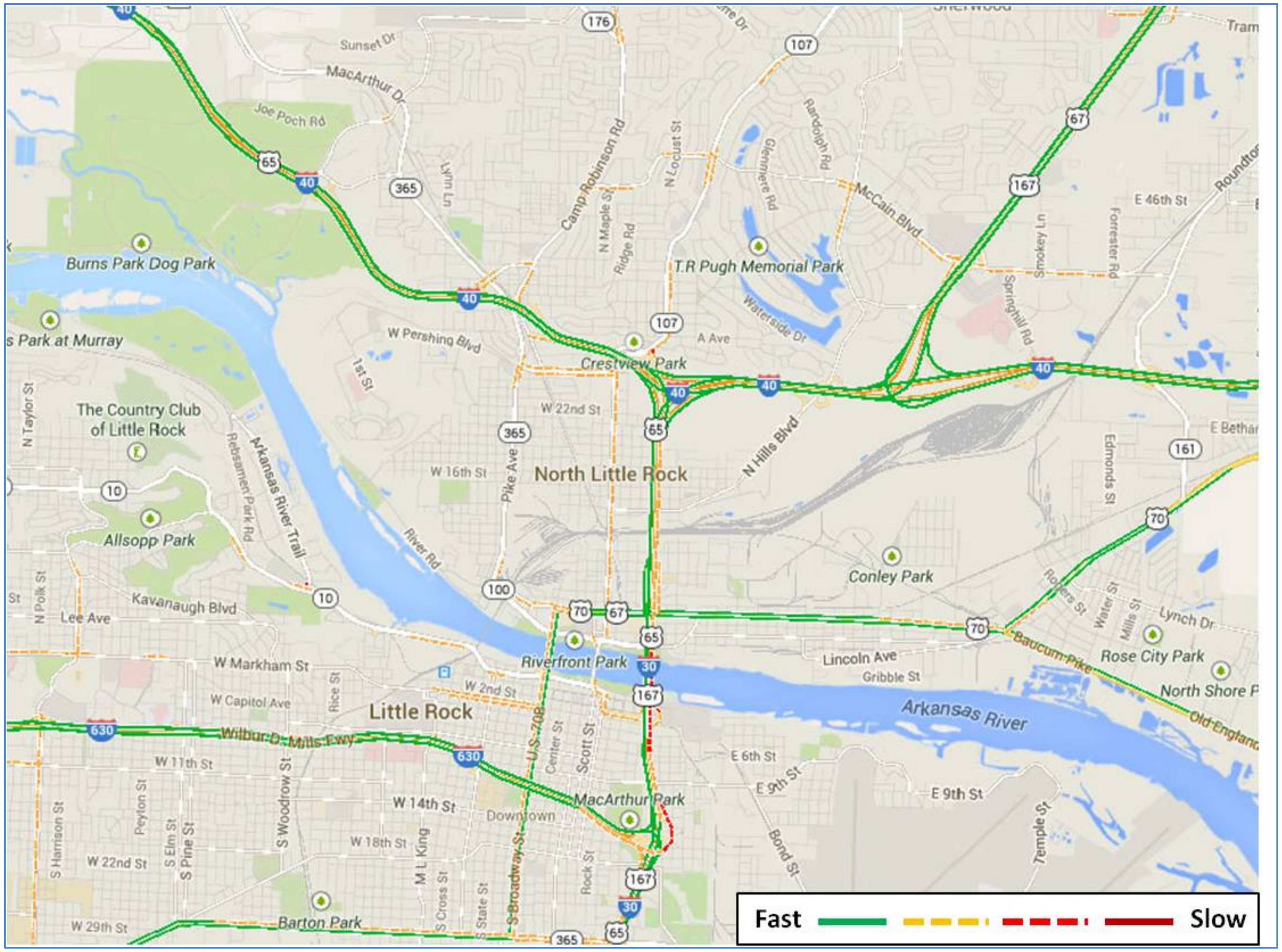
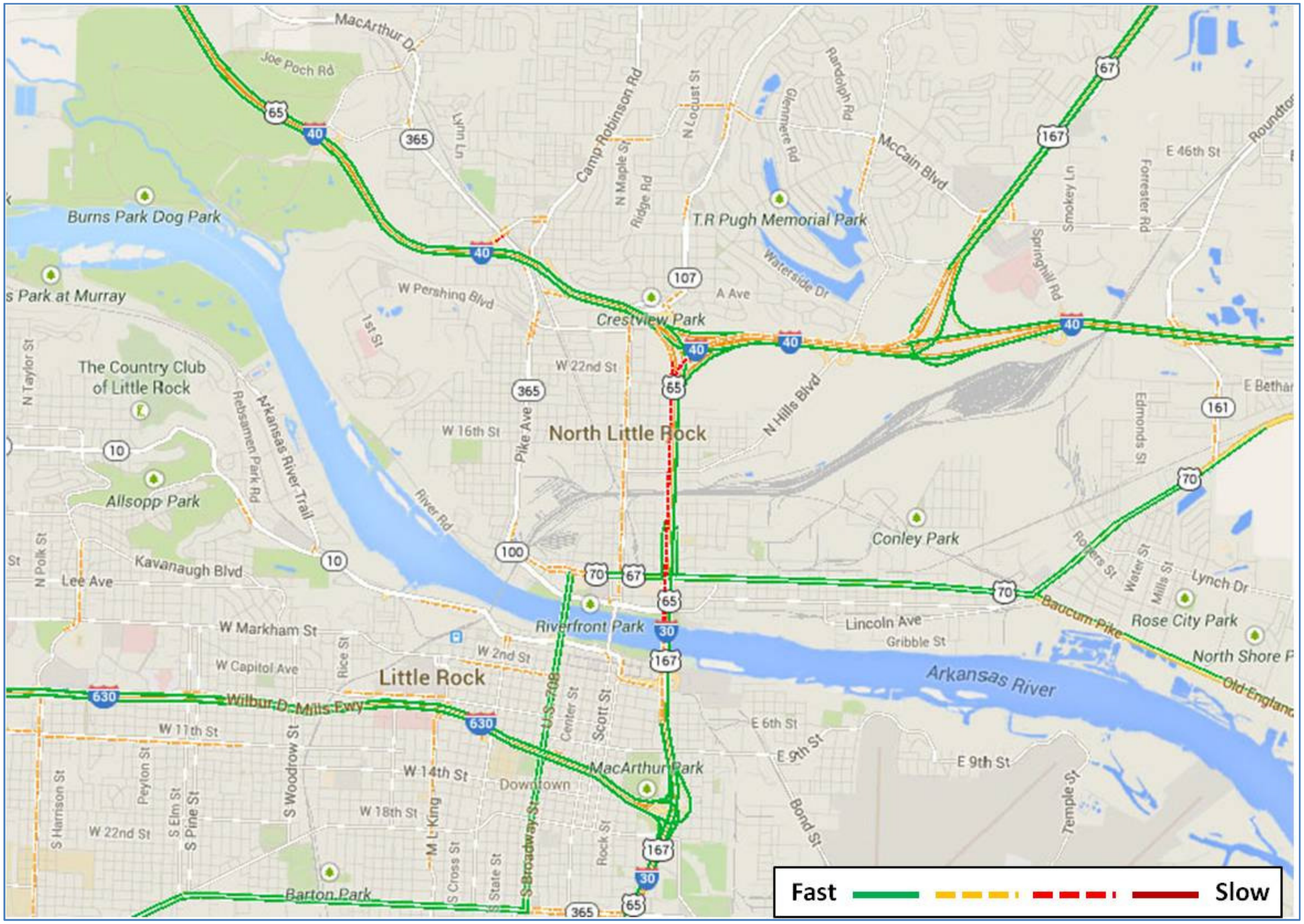


Figure 6: Morning Traffic Conditions
(Google Map; September 26, 2013, 7:51 AM)



IV. LEGISLATIVE FRAMEWORK

A strong legal framework is necessary for clearly defining the powers of a toll road's sponsor to undertake and maintain the project. It is an essential element that project stakeholders, elected officials, rating agencies and investors will consider when examining the viability of the project. Key provisions include the ability to independently set and raise tolls to meet the project's obligations; pledge toll revenues as security to repay debt issued to finance the project; enforce the collection of tolls through the imposition of fines, fees, and other penalties on those who avoid payment; and design, construct, operate, and maintain the project with the sponsor's own forces or through contracts with the private sector. The legal framework also needs to define the ongoing governance and management structure for the project sponsor to ensure that a clear line of responsibility exists to establish policy and manage the toll road's day-to-day operations. Federal and State tolling statutes provide a strong framework for the development of the North Belt Freeway project as a toll road as summarized below and presented in more detail in the legislative analysis memorandum provided in Appendix A.

A. FEDERAL TOLLING STATUTES (TITLE 23 USC SECTION 129)

Title 23 of the United States Code (USC), Section 129 defines Federal requirements for toll road projects. Section 129 provides the AHTD with the ability to develop the North Belt Freeway as a toll road since Federal participation is allowed for the initial construction of a new toll highway, bridge, or tunnel. The Federal requirements also include provisions that allow for public private partnerships and the use of toll revenues to pay debt service. A more-detailed discussion of the Federal tolling requirements is included in the Legislative Analysis memorandum in Appendix A.

B. STATE TOLLING LEGISLATION

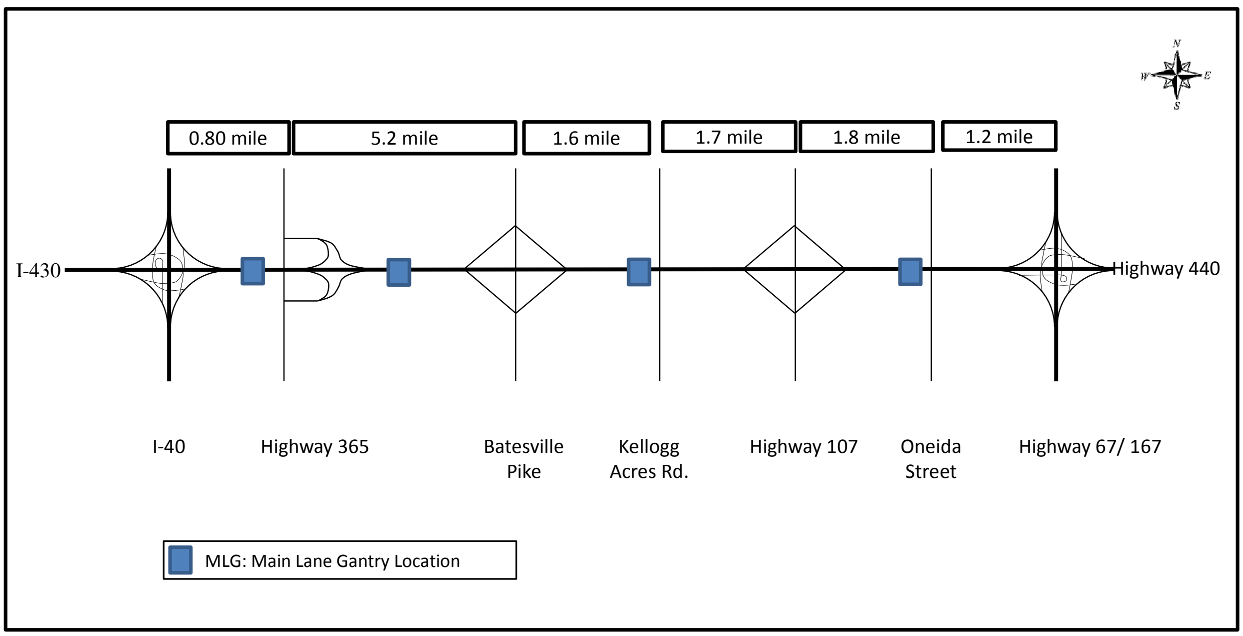
Title 27 of the Arkansas Code establishes the State's legal framework for designing, constructing, financing, and operating toll road projects. Toll facilities may be undertaken by a Regional Mobility Authority (RMA) or the State Highway Commission (the Commission). As is the case under federal legislation, state legislation also provides the option to undertake the project as a publicly or privately developed facility, including the use of a design, build, operate finance, and maintain structure. State statute provides clear authority for the issuance and payment of revenue bonds secured by tolls and the ability to receive non-toll funding sources. Rate setting and authority to issue project debt rests with the Commission or RMA, as applicable. However, the RMA structure requires voter approval for the initial toll rates and debt issuance—which introduces a significant element of project risk that would need to be resolved prior to the marketing and issuance of the bonds.

V. TOLLING CONCEPT

A key step in evaluating toll feasibility is developing a tolling concept that is equitable, optimizes toll revenues, and minimizes tolling related costs. Ideally, a closed toll system that does not allow any non-tolled movement on the facility is preferred. However, depending upon the roadway configuration, the additional costs associated with this type of system must be considered relative to the potential increase in revenue. Each time a toll transaction occurs, net revenue is reduced due to the costs incurred to process the transaction and collect the toll revenue.

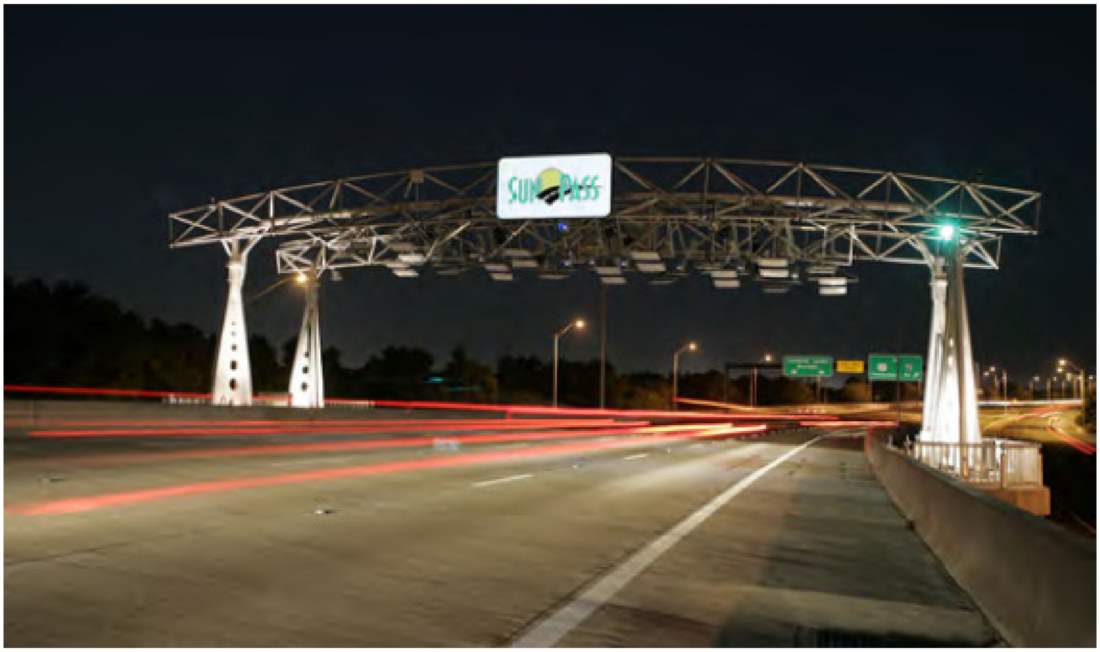
A tolling concept was developed for the North Belt Freeway based on a review of project schematics and intersecting roadways. As depicted on Figure 7, the proposed tolling concept includes four-mainline gantries that are located between ingress and egress points. This positioning ensures that motorists using any portion of the project would pass through at least one toll gantry. For example, motorists entering the facility from either Highway 67 or Highway 440 east of the project terminus would not be able to exit without travelling through the toll gantry in the proximity of Highway 107. The toll charged at each gantry will be set based on the distance between the adjacent interchanges. This approach results in a closed toll system.

Figure 7: North Belt Freeway Tolling Concept



Due to cost and operational efficiencies, an all electronic tolling collection (AETC) system that utilizes both transponder and camera-based technology was assumed for the North Belt Freeway. Arkansas Act 1491 of 2013, “Automatic License Plate Reader System Act," makes use of automatic license plate reader systems illegal by individuals, private industry, and agencies and political subdivisions of the State of Arkansas including AHTD. It was assumed that this legislation will be modified prior to the projected opening date. An example of an AETC tolling gantry from Florida's Turnpike Enterprise is provided on Figure 8. No cash collection will occur on the North Belt Freeway.

Figure 8: Florida's Turnpike Enterprise AETC Tolling Gantry



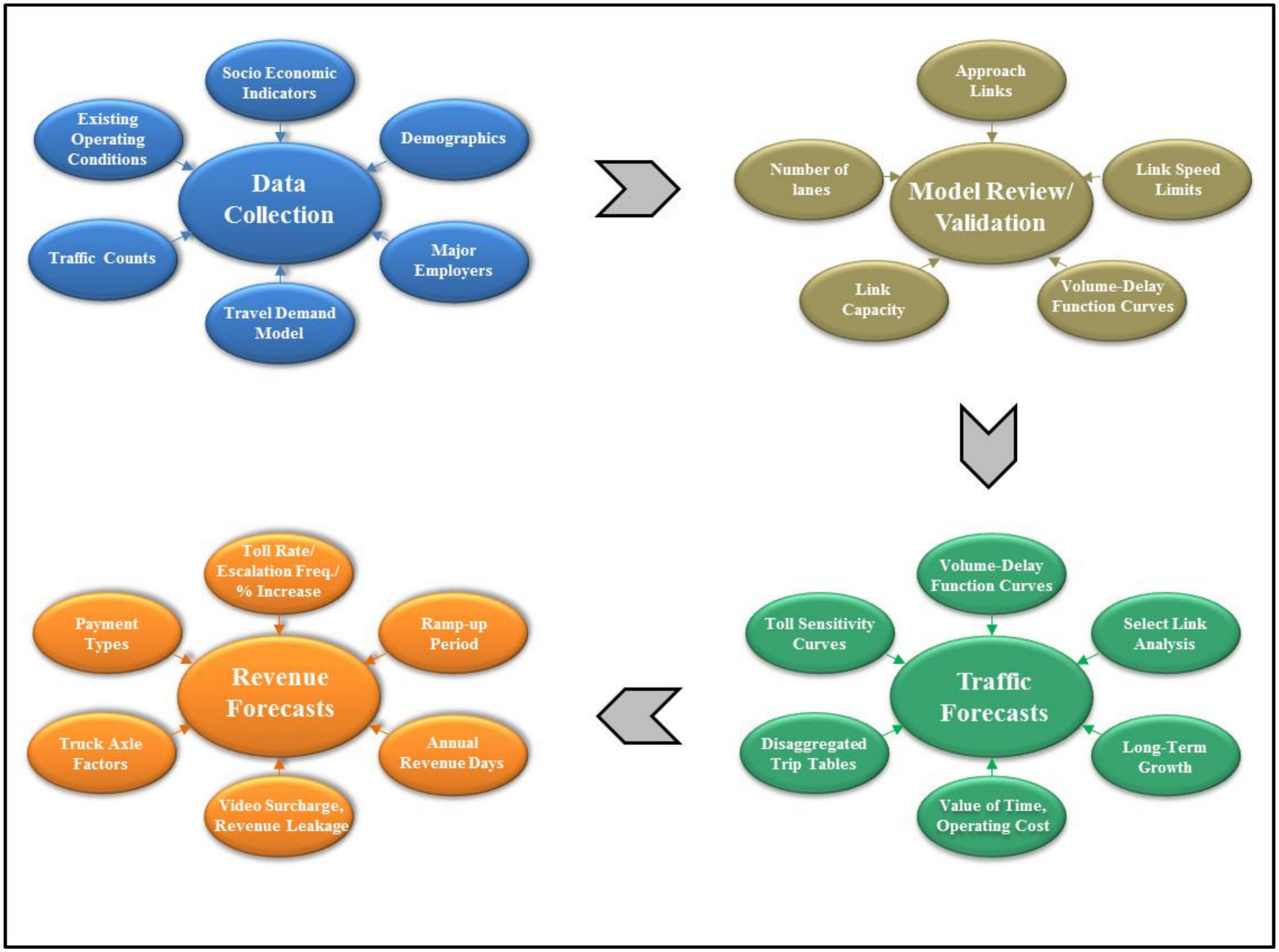
VI. TRAFFIC AND REVENUE FORECASTING METHODOLOGY

The T&R forecasts are based on a sketch level analysis to quantify the toll revenue potential of the project. A sketch level analysis is an introductory type of analysis used to determine the toll feasibility of a highway project. The sketch level analysis requires minimum data collection and a limited amount of travel demand modeling.

The traffic and revenue forecasting process was divided into the following four major steps (Figure 9):

1. Data collection
2. Travel demand model review and validation
3. Traffic forecast
4. Toll revenue forecast

Figure 9: Traffic and Revenue Forecasting Process

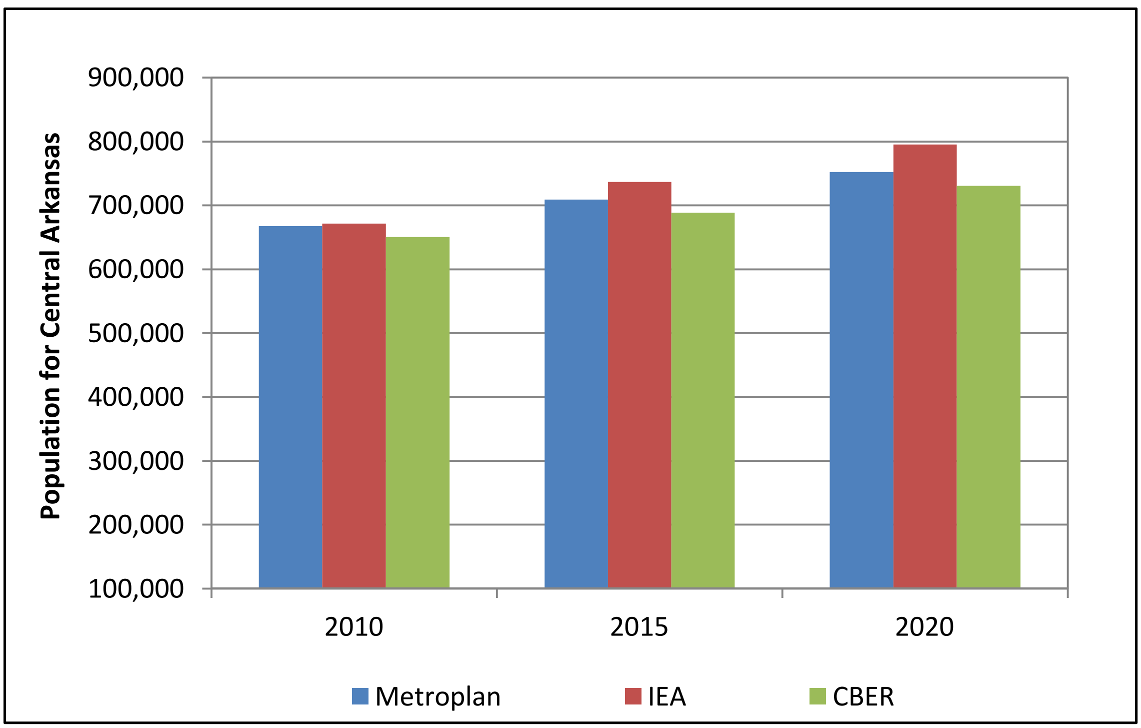


Step 1: Data Collection

The first step in the forecasting process is to collect, summarize and evaluate the historical and existing conditions of the study area to develop a thorough understanding of the corridor. Additionally, these data are used to conduct a limited validation of the travel demand model which was utilized to develop the traffic and toll revenue forecasts. A summary of the data collected for this study is presented below. A detailed discussion of all the data collected and analyzed for the traffic and revenue forecast is provided in the interim traffic and toll revenue assessment report provided in Appendix A.

- Demographics: Includes historical and forecast growth trends in population and employment for the central Arkansas metropolitan planning area. Historical and current traffic data were utilized to ascertain the impact of demographic growth on traffic levels along the corridor. The information was used to evaluate the historical relationship between demographics and traffic growth and helps to establish an anticipated long-term traffic growth pattern for the North Belt Freeway. Figure 10 presents the population forecast from three different sources: Metroplan, the Institute for Economic Advancement (IEA) from the University of Arkansas, and the Center for Business and Economic Research (CBER) from the University of Arkansas at Little Rock.

Figure 10: Central Arkansas Population Forecast (2010–2020)



- Socioeconomic Indicators: Income and wage data were obtained from the U.S. Census and the American Community Survey. This information was utilized to determine the value of time (VOT). VOT is important in estimating travel demand for a toll facility as it serves as the basis for estimating patrons' willingness to pay to use the tolled facility. Unemployment rate data were also obtained from the Bureau of Labor Statistics. Tables 1 and 2 present the median household income and mean hourly wage data, respectively.

Table 1. Median Household Income

Year	U.S	Arkansas	Faulkner	Lonoke	Pulaski	Saline
1970	$8,486	$5,356	$5,736	$5,064	$7,285	$7,205
1980	$16,841	$12,214	$13,500	$13,493	$15,652	$17,536
1990	$30,056	$21,147	$23,663	$23,831	$26,883	$28,262
1995	$34,076	$25,814	$34,160	$34,694	$32,524	$38,089
2000	$41,990	$29,697	$39,355	$40,728	$38,328	$43,528
2001	$42,228	$33,339	$38,345	$40,275	$37,998	$42,469
2002	$42,409	$32,387	$38,817	$40,964	$38,068	$43,002
2003	$43,318	$32,002	$40,395	$42,953	$39,325	$44,342
2004	$44,334	$34,984	$41,297	$44,551	$40,499	$46,508
2005	$46,236	$36,658	$42,738	$45,012	$40,629	$48,487
2006	$48,201	$37,057	$42,757	$48,798	$43,338	$48,287
2007	$50,233	$40,795	$45,370	$47,810	$44,909	$50,849
2008	$50,303	$39,856	$43,553	$49,241	$45,215	$50,133
2009	$50,221	$37,888	$48,390	$50,910	$42,107	$52,630
2010	$50,046	$38,413	$46,199	$50,021	$44,733	$53,430
2011	$50,502	$38,758	$49,886	$48,161	$43,461	$53,557
1970-2011	4.4%	4.9%	5.4%	5.6%	4.5%	5.0%
2000-2011	1.7%	2.5%	2.2%	1.5%	1.1%	1.9%

Source: Historical Median Household Income by Decennial Census, U.S. Census Bureau
2011: American Community Survey, One-year Estimates, U.S. Census Bureau.

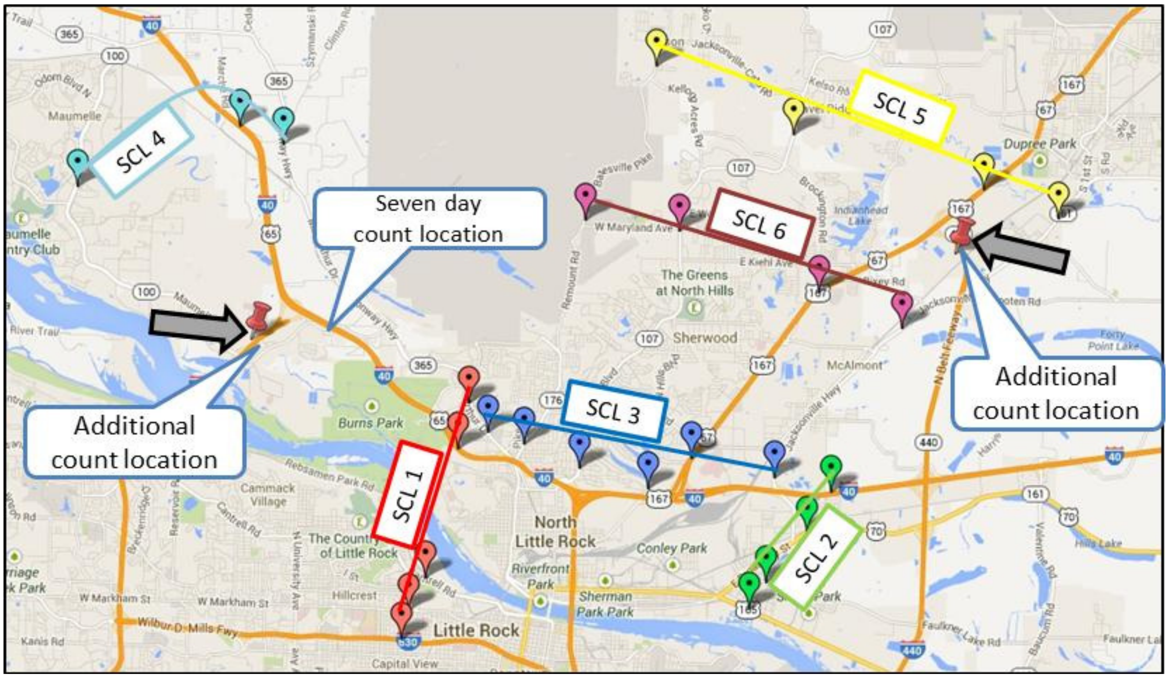
Table 2. Mean Hourly Wage

Year	Mean Hourly Wage
2002	$15.28
2012	$19.25
2002-2012	2.3%

Source: Bureau of Labor Statistics,
Occupational Employment Statistics,
Little Rock-North Little Rock-Conway, All Occupations

- Traffic Counts: Historical traffic counts were collected from the AHTD and summarized for the analysis. Traffic counts were used to review the travel demand model and define long-term traffic growth. Figure 11 identifies the traffic count locations. Table 3 presents the average daily traffic at the locations depicted on Figure 11.

Figure 11: Traffic Count Locations



- Existing Operation Conditions: A field visit was conducted on June 27, 2013, to document the highway characteristics, land-use, and traffic conditions in the vicinity of the proposed project. Data obtained from this visit were used to evaluate operating conditions of highway and arterial facilities located in the vicinity of the study area.

- Travel Demand Model Databases: Travel demand model databases created by Metroplan and AHTD were utilized in the modeling forecast process. The TransCad FAF^3 model (Freight Analysis Framework, Version 3.0) was obtained from the Federal Highway Administration (FHWA). The truck forecast incorporated in FAF^3 was compared to the truck forecast from the Central Arkansas Regional Transportation Study (CARTS) travel demand model (TDM) to determine if general adjustments to the CARTS forecasts were warranted.

Step 2. Travel Demand Model Review and Validation

A base 2012 model-year framework was developed utilizing travel demand model databases from Metroplan and AHTD. Highway network attributes were reviewed for the base year model prior to running traffic assignments. Traffic forecasts for the base year were compared against traffic counts to ensure that the travel demand model replicated existing conditions. The travel demand validation was limited in scope because this study is a sketch level evaluation and it was assumed that Metroplan had validated the model at the regional level.

Table 3. Traffic Count Screenlines
(Average Daily Traffic Counts)

Facility	1990	2012	Growth: 1990-2012
Screenline 1: West of I-30 (red)			
I-630	85,680	109,000	1.1%
Markham Dr.	12,590	13,000	0.1%
Highway 10	18,550	23,000	1.0%
I-40	42,000	77,000	2.8%
Highway 365	9,340	9,100	-0.1%
Total	**168,160**	**231,100**	**1.5%**
Screenline 2: East of I-30/Highway 67 (green)			
Highway 165	3,750	5,300	1.6%
Lynch Dr.	6,440	5,900	-0.4%
Highway 70	5,040	6,400	1.1%
I-40	19,530	28,000	1.7%
Total	**34,760**	**45,600**	**1.2%**
Screenline 3: North of I-40 (blue)			
MacArthur Dr.	10,880	10,000	-0.4%
Highway 176	21,110	27,000	1.1%
Highway 107	28,300	32,000	0.6%
Hills Blvd.	13,910	17,000	0.9%
Highway 167	70,000	79,000	0.6%
Highway 161	10,570	9,900	-0.3%
Total	**154,770**	**174,900**	**0.6%**
Screenline 4: North of I-430 (aqua)			
Highway 100	9,820	22,000	3.7%
I-40	41,030	66,000	2.2%
MacArthur Dr.	4,500	5,700	1.1%
Total	**55,350**	**93,700**	**2.4%**
Screenline 5: North of Highway 440/Highway 167 (yellow)			
Batesville Pike	5,130	6,300	0.9%
Highway 107	11,010	17,000	2.0%
Highway 67	47,740	72,000	1.9%
1st St.	8,150	9,300	0.6%
Total	**72,030**	**104,600**	**1.7%**
Screenline 6: South of Highway 440/Highway 167 (maroon)			
Batesville Pike	2,890	3,200	0.5%
Highway 107	12,980	21,000	2.2%
Highway 67	46,210	71,000	2.0%
Highway 161	6,340	5,800	-0.4%
Total	**68,420**	**101,000**	**1.8%**

Source: AADT Estimates, Arkansas Highway Transportation Department

Step 3. Traffic Forecast

After validating the model for the base year, the facility's opening year (assumed to be 2020) and forecast year (2030), modeling databases were developed. A select link analysis identifying the traffic volumes for specific origin and destination links was performed for the 2030 model year along the corridor. The purpose of this analysis was to identify the major destination points and to determine the trip market for short and long distance trips using the North Belt Freeway corridor. Drivers with long-trips tend to utilize toll facilities more often because toll facilities offer higher travel time savings. Traffic operation reliability is also better on toll facilities because toll road operators typically clear accidents or incidents faster than traditional highways.

The full-capability of the CARTS TDM was utilized to forecast travel demand for the North Belt Freeway and traffic diversion to competing facilities. As this is a new facility, diversion was measured in terms of the amount of traffic diverted to competing routes for a build without toll versus build with toll scenario. CARTS TDM is a TransCad base travel demand model offering several algorithms for traffic assignment. Metroplan uses the multi-modal User Equilibrium (UE) traffic assignment algorithm for CARTS TDM. The UE assignment algorithm is the most popular assignment algorithm used by metropolitan planning organizations in the USA. The UE assignment algorithm includes the generalized cost equation as the base to find the minimum path between origin and destinations. The generalized cost equation is defined as:

Total Travel Cost = VOT * Travel Time + Operating Cost + Toll Cost

VOT = Value of time. For this study, the VOT is estimated from income or hourly-wage information. The VOT in the existing CARTS TDM was compared to wage information collected from independent sources as discussed in the data collection section.

Travel time = Time between origin and destination.

Operating Cost = Operating cost refers to the costs accrued by wear and tear of the vehicles and other associated costs. Operating cost data are publicly available from American Automobile Association (AAA) annual estimates by vehicle categories. Operating cost in the existing CARTS TDM were compared to the AAA data and adjusted as warranted.

Toll = The total toll fee for a given route. Tolling points and toll fees were coded in the North Belt Freeway network.

The multi-modal UE assignment algorithm was used to develop the traffic forecast. Trip tables were disaggregated by county (origins), or city (origins), or trip distance to account for the variation of VOT across a metropolitan area and trip distance. This process has been tested in the Dallas area and has compared very well with other toll modeling alternatives, such as the use of logit diversion equations. Application of a logit diversion equation requires the implementation of a Stated Preference Survey, which is outside the scope of this sketch level evaluation. The modeling process for each forecast year (2020 and 2030) is summarized below.

1. Reviewed and modified (if necessary) highway attributes and volume delay function (VDF) equations
2. Developed select link locations to identify major trip origins and destinations
3. Disaggregated trip tables by origin
4. Estimated VOT for each origin and mode
5. Ran multi-modal UE assignments for toll-free and toll alternatives
6. Developed toll sensitivity curves changing the toll from $0 to $0.50 per mile to determine the maximum toll rate that could be charged in the corridor that maximizes toll revenue. The toll plan was developed such that it is equitable across distances for all users
7. Estimated traffic diversion to competing routes when the North Belt Freeway is tolled

The traffic forecast beyond 2030 was estimated using a nominal traffic growth trend influenced by historical traffic growth in the central Arkansas region, capacity of the North Belt Freeway, and congestion on competing routes.

Step 4. Toll Revenue Forecast

Toll revenue for each year was estimated using the traffic forecast described in the previous section. Toll revenue was estimated by multiplying the number of transactions at each gantry location by their respective toll fee. The general formula to estimate annual toll revenue is the following.

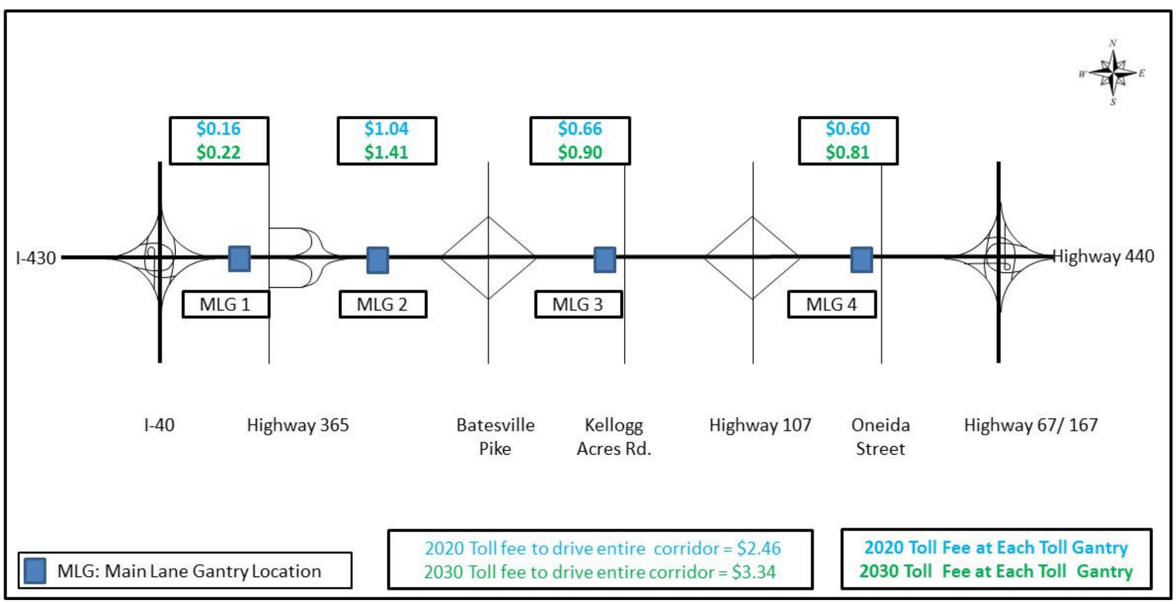
Annual Revenue = number of transactions for each gantry * toll fee at each gantry * revenue days (factor to convert the weekday number of transactions to annual transactions) * (1-revenue leakage)

A summary of the major assumptions of the traffic and revenue forecast, which can be considered an aggressive revenue scenario, is provided below.

1. Electronic toll collection (Tag and Video)
2. Opening year: January 1, 2020
3. Number of lanes: Two lanes in each direction
4. Forecast period: 50 years
5. Operating free speed: 65 mph
6. Gantry locations as indicated on Figure 7
7. Toll rate (nominal dollars):
    a. Opening toll rate: $0.20 per mile rate (maximum toll rate for 2020 based on sensitivity analyses)
    b. Escalation frequency: Annually
    c. Escalation percentage for revenue forecasts: 3.1 percent per year (based on the southern region CPI annual growth from 1980–2012, which includes Arkansas)
    d. The tolls at each plaza for 2020 and 2030 are illustrated on Figure 12.

8. Truck share: 10 percent (based on CARTS TDM)
9. Truck axle factor = 3.3 (based on traffic counts provided by AHTD)
10. Tag/video shares: 70/30 percent in 2020 reaching 90/10 percent in 2030. It was assumed that AHTD will conduct an aggressive marketing campaign to register drivers as Tag users.
11. Video surcharge = 50 percent higher than Tag rate to account for the higher collection cost
12. Toll leakage:
    a. Toll Tag Leakage = 1 percent
    b. Video Leakage = 10 percent (Assumes adequate enabling legislation to prosecute toll violations)
13. Annualization Factor: 337 (based on traffic counts provided by AHTD)
14. Ramp-up period:
    a. 50 percent in 2020
    b. 60 percent in 2021
    c. 70 percent in 2022
    d. 80 percent in 2023
    e. 90 percent in 2024
    f. 100 percent in 2025
15. Long-term transaction growth: 2.0 percent per year

Figure 12: Main Lane Gantry Toll Fee in 2020 and 2030



As previously noted, annual transactions and toll revenue were developed for the opening year (2020) and the forecast year (2030). Traffic for the intermediate years was interpolated. Toll traffic volumes beyond 2030 were extrapolated based on projected long-term demographic growth and nominal growth assumptions.

VII. TRAFFIC AND REVENUE FORECAST

The North Belt Freeway's travel demand for 2020 and 2030 was estimated for the toll-free and tolled base case scenarios. Figures 13 and 14 present the average daily traffic at each main lane gantry for both scenarios.

In the year 2020, the toll-free traffic forecast is 19,100 vehicles per day (vpd) at main lane gantry (MLG) 4 and 33,800 vpd at MLG 1 (Figure 13). For the tolled base case scenario, the traffic decreases to 8,300 vpd at MLG 4 and to 24,900 vpd at MLG 1. The percentage of diversion (traffic loss due to tolling) at MLGs 1-4 is 26.3%, 28.5%, 39.8%, and 56.5% , respectively. These percentages are consistent with the diversion observed on recently open tolled facilities in Texas following termination of the initial toll-free period. The 2020 weighted average weekday tolled traffic along the North Belt Freeway corridor is approximately 18,450 vpd.

In the year 2030, the toll-free traffic increased to 24,100 vpd at MLG 4 and 42,400 at MLG 1 (Figure 14). Tolled traffic for MLG 4 and MLG 1 reached 12,300 and 30,600 vpd, respectively. The 2030 weighted average weekday tolled traffic is approximately 23,680 vpd, increasing by 28.3 percent between 2020 and 2030. The diversion percentages are lower in 2030 as a consequence of increased traffic congestion on alternative routes.

Toll revenue was estimated for a 50-year period for the base scenario (aggressive toll revenue condition). Table 4 presents the annual transactions and toll revenue for a 50-year period. Toll revenue and transactions are disaggregated by electronic and video collection (ETC and Video). Annual toll revenue will increase from $10.3 million in 2020 to $33.7 million in 2030 and $240.1 million in 2069. From 2025 (after the ramp-up period) to 2069, toll revenue is expected to increase at an annual rate of 5.1 percent. During the fifty-year period, the North Belt Freeway is expected to generate $4.47 billion in nominal currency for the base case scenario.

The number of annual transactions will increase from 12.4 million in 2020 to 31.9 million in 2030 and to 69.1 million in 2069. The video transactions account for 30 percent of total transactions in the opening year (2020) and decrease to 10 percent in 2030, and thereafter. From 2025 to 2069, the annual number of transactions will increase at an annual rate of 2.0 percent. Figure 15 provides a graphic illustration of the annual toll revenue trend.

Figure 13: 2020 Average Daily Traffic Volumes
(Toll-Free and Tolled Base Case Scenarios)

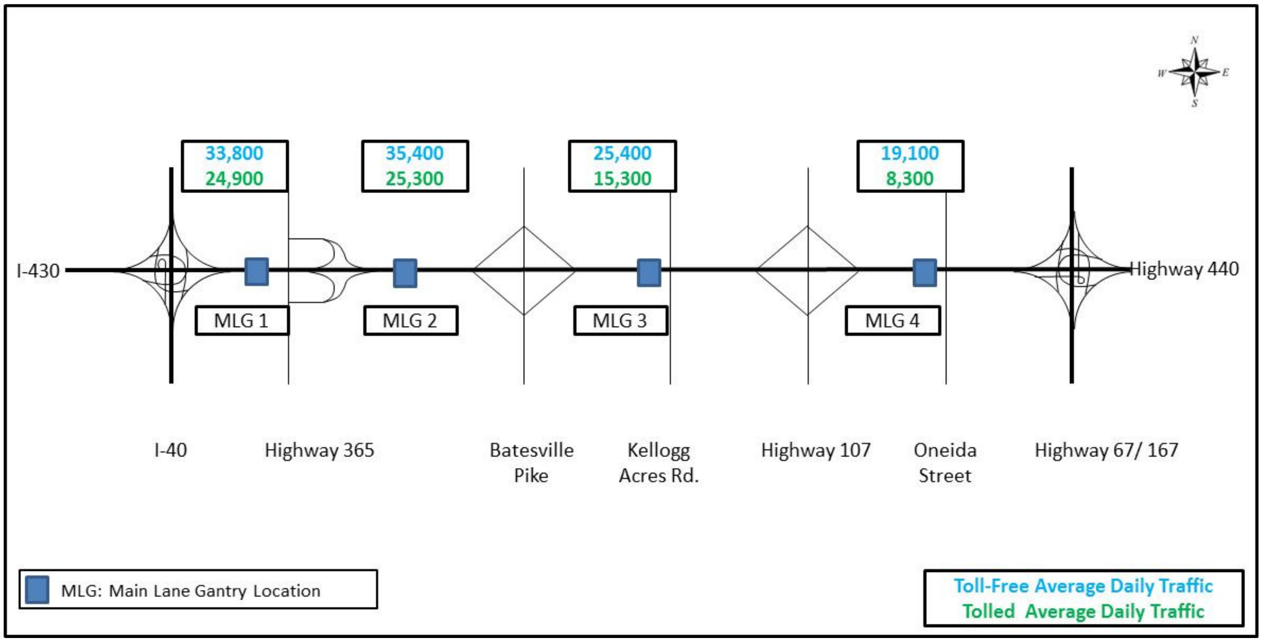


Figure 14: 2030 Average Daily Traffic Volumes
(Toll-Free and Tolled Base Case Scenarios)

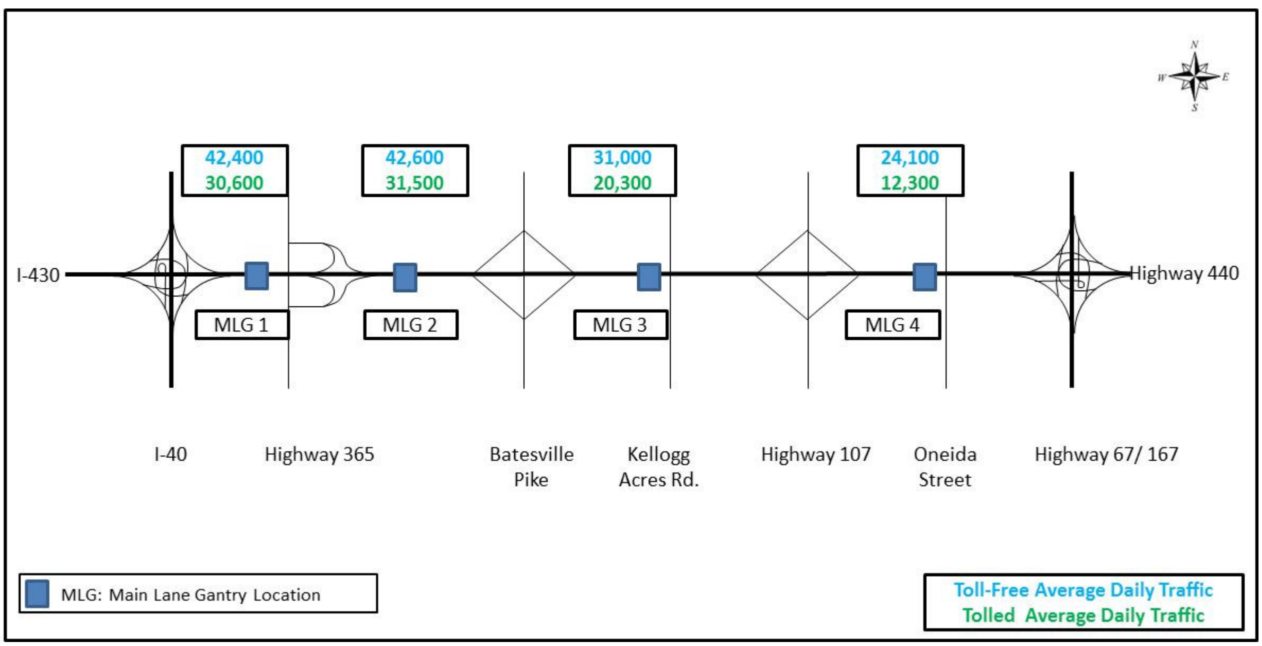
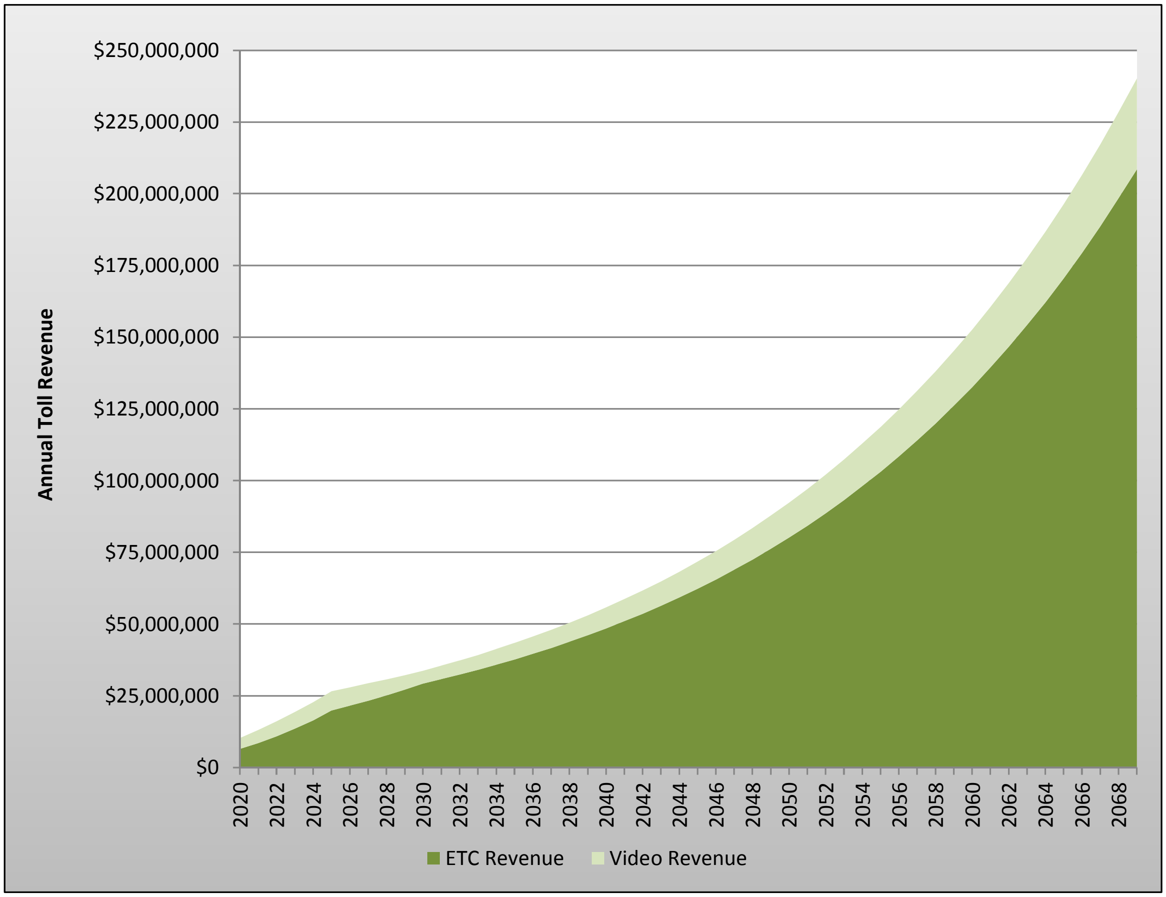


Table 4. Toll Revenue and Transactions Forecast for Base Case Scenario

Year	Annual Transactions			Annual Revenues		
	ETC	Video	Total	ETC	Video	Total
2020	8,704,700	3,730,600	12,435,300	$6,517,000	$3,809,000	$10,326,000
2021	11,048,400	4,296,600	15,345,000	$8,532,000	$4,524,000	$13,056,000
2022	13,612,700	4,782,800	18,395,500	$10,843,000	$5,194,000	$16,037,000
2023	16,406,000	5,180,900	21,586,900	$13,478,000	$5,804,000	$19,282,000
2024	19,436,900	5,482,200	24,919,100	$16,469,000	$6,335,000	$22,804,000
2025	22,713,800	5,678,500	28,392,300	$19,850,000	$6,767,000	$26,617,000
2026	23,859,200	5,237,400	29,096,600	$21,505,000	$6,437,000	$27,942,000
2027	25,032,800	4,768,100	29,800,900	$23,269,000	$6,044,000	$29,313,000
2028	26,234,500	4,270,700	30,505,200	$25,150,000	$5,583,000	$30,733,000
2029	27,464,500	3,745,100	31,209,600	$27,154,000	$5,049,000	$32,203,000
2030	28,722,500	3,191,400	31,913,900	$29,286,000	$4,438,000	$33,724,000
2031	29,297,000	3,255,200	32,552,200	$30,798,000	$4,666,000	$35,464,000
2032	29,882,900	3,320,300	33,203,200	$32,388,000	$4,907,000	$37,295,000
2033	30,480,600	3,386,700	33,867,300	$34,060,000	$5,160,000	$39,220,000
2034	31,090,200	3,454,400	34,544,600	$35,818,000	$5,427,000	$41,245,000
2035	31,711,900	3,523,600	35,235,500	$37,667,000	$5,707,000	$43,374,000
2036	32,346,200	3,594,000	35,940,200	$39,611,000	$6,002,000	$45,613,000
2037	32,993,100	3,665,900	36,659,000	$41,656,000	$6,311,000	$47,967,000
2038	33,653,000	3,739,200	37,392,200	$43,807,000	$6,637,000	$50,444,000
2039	34,326,100	3,814,000	38,140,100	$46,067,000	$6,980,000	$53,047,000
2040	35,012,600	3,890,300	38,902,900	$48,445,000	$7,341,000	$55,786,000
2041	35,712,800	3,968,100	39,680,900	$50,946,000	$7,719,000	$58,665,000
2042	36,427,100	4,047,400	40,474,500	$53,576,000	$8,118,000	$61,694,000
2043	37,155,600	4,128,400	41,284,000	$56,342,000	$8,536,000	$64,878,000
2044	37,898,700	4,211,000	42,109,700	$59,250,000	$8,977,000	$68,227,000
2045	38,656,700	4,295,200	42,951,900	$62,308,000	$9,441,000	$71,749,000
2046	39,429,800	4,381,100	43,810,900	$65,525,000	$9,928,000	$75,453,000
2047	40,218,400	4,468,800	44,687,200	$68,907,000	$10,441,000	$79,348,000
2048	41,022,800	4,558,100	45,580,900	$72,465,000	$10,979,000	$83,444,000
2049	41,843,300	4,649,200	46,492,500	$76,205,000	$11,546,000	$87,751,000
2050	42,680,200	4,742,200	47,422,400	$80,139,000	$12,142,000	$92,281,000
2051	43,533,700	4,837,100	48,370,800	$84,275,000	$12,769,000	$97,044,000
2052	44,404,400	4,933,800	49,338,200	$88,626,000	$13,428,000	$102,054,000
2053	45,292,500	5,032,500	50,325,000	$93,200,000	$14,122,000	$107,322,000
2054	46,198,400	5,133,100	51,331,500	$98,012,000	$14,850,000	$112,862,000
2055	47,122,300	5,235,800	52,358,100	$103,071,000	$15,617,000	$118,688,000
2056	48,064,800	5,340,500	53,405,300	$108,391,000	$16,423,000	$124,814,000
2057	49,026,100	5,447,300	54,473,400	$113,987,000	$17,270,000	$131,257,000
2058	50,006,600	5,556,300	55,562,900	$119,871,000	$18,162,000	$138,033,000
2059	51,006,700	5,667,400	56,674,100	$126,058,000	$19,100,000	$145,158,000
2060	52,026,900	5,780,700	57,807,600	$132,565,000	$20,086,000	$152,651,000
2061	53,067,400	5,896,400	58,963,800	$139,409,000	$21,122,000	$160,531,000
2062	54,128,700	6,014,300	60,143,000	$146,605,000	$22,212,000	$168,817,000
2063	55,211,300	6,134,600	61,345,900	$154,173,000	$23,359,000	$177,532,000
2064	56,315,500	6,257,300	62,572,800	$162,131,000	$24,565,000	$186,696,000
2065	57,441,900	6,382,400	63,824,300	$170,500,000	$25,833,000	$196,333,000
2066	58,590,700	6,510,100	65,100,800	$179,301,000	$27,167,000	$206,468,000
2067	59,762,500	6,640,300	66,402,800	$188,557,000	$28,569,000	$217,126,000
2068	60,957,700	6,773,100	67,730,800	$198,290,000	$30,044,000	$228,334,000
2069	62,176,900	6,908,500	69,085,400	$208,526,000	$31,595,000	$240,121,000
Total	**1,929,410,000**	**239,938,900**	**2,169,348,900**	**$3,853,581,000**	**$613,242,000**	**$4,466,823,000**

Figure 15: Trend in Annual Toll Revenue (2020–2069)



A select link analysis for 2030 was conducted to identify the origin and destination of trips using the North Belt Freeway. Figures 16 through 19 illustrate the select link results for two locations (shown by a green arrow) at the easternmost and westernmost segments of North Belt Freeway for both toll-free and tolled scenarios.

Based on the analysis conducted, 6,900 vpd, or 33 percent, of the toll-free traffic originating at the westernmost segment traverses the entire North Belt Freeway facility (Figure 16). The ramps located at Batesville Pike are the major destination for both toll-free and tolled scenarios (see Figures 16 and 17). For the tolled scenario only 21 percent of the traffic (3,300 vpd) traverse the entire North Belt Freeway (see Figure 17). All traffic traversing the entire length of the North Belt Freeway continues northbound on Highway 167.

For the westbound/southbound movement, 60 percent of the traffic traverses the entire corridor. This represents 7,500 vpd under the toll free scenario and 4,000 vpd under the tolled scenario (see Figures 18 and 19). Highway 107 ramps are the most heavily utilized ramps for traffic passing through the easternmost section of the corridor (see green arrow on Figures 18 and 19). Seventy-three and twenty-seven percent of the traffic passing through the easternmost section is coming from Highway 167 and

Figure 16: Toll-Free 2030 Select Link at Westernmost Segment (northbound/eastbound)

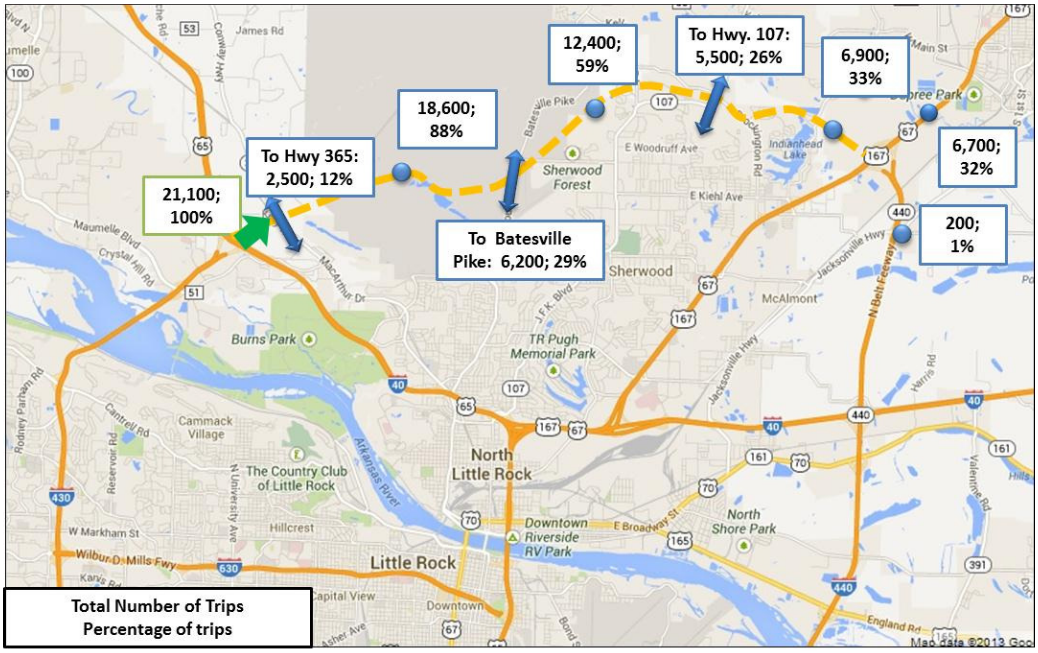


Figure 17: Tolled 2030 Select Link at Westernmost Segment (northbound/eastbound)

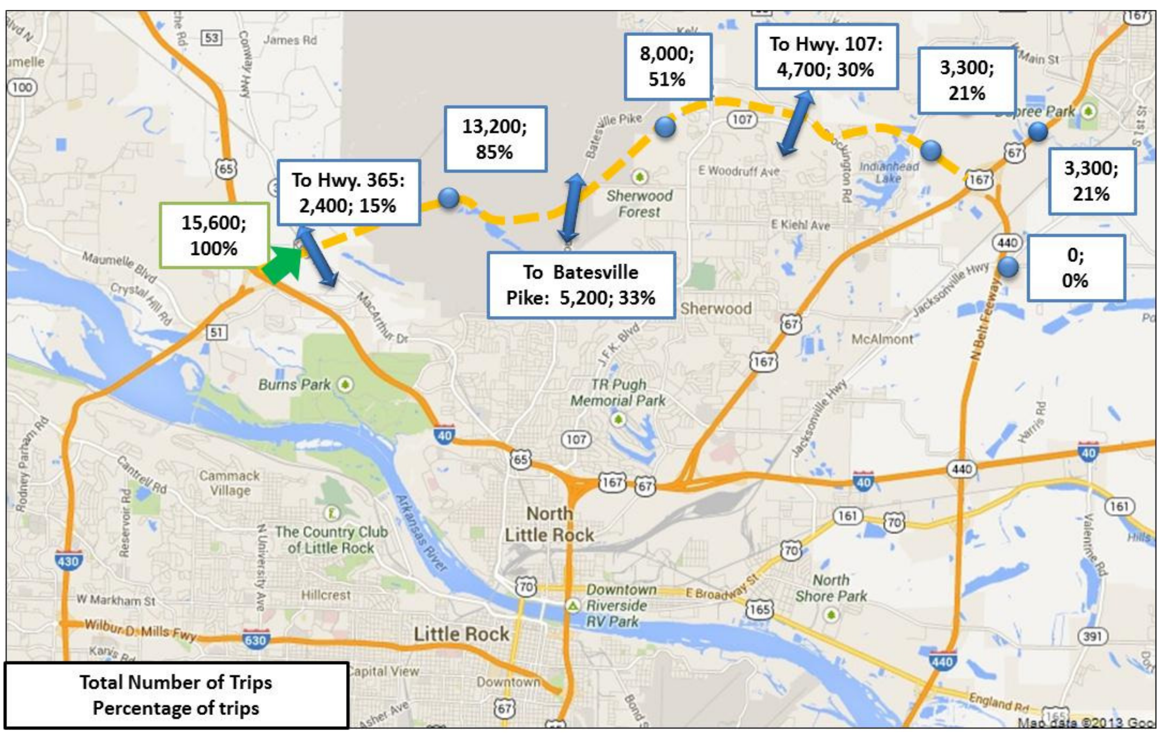


Figure 18: Toll-Free 2030 Select Link at Easternmost Segment (westbound/southbound)

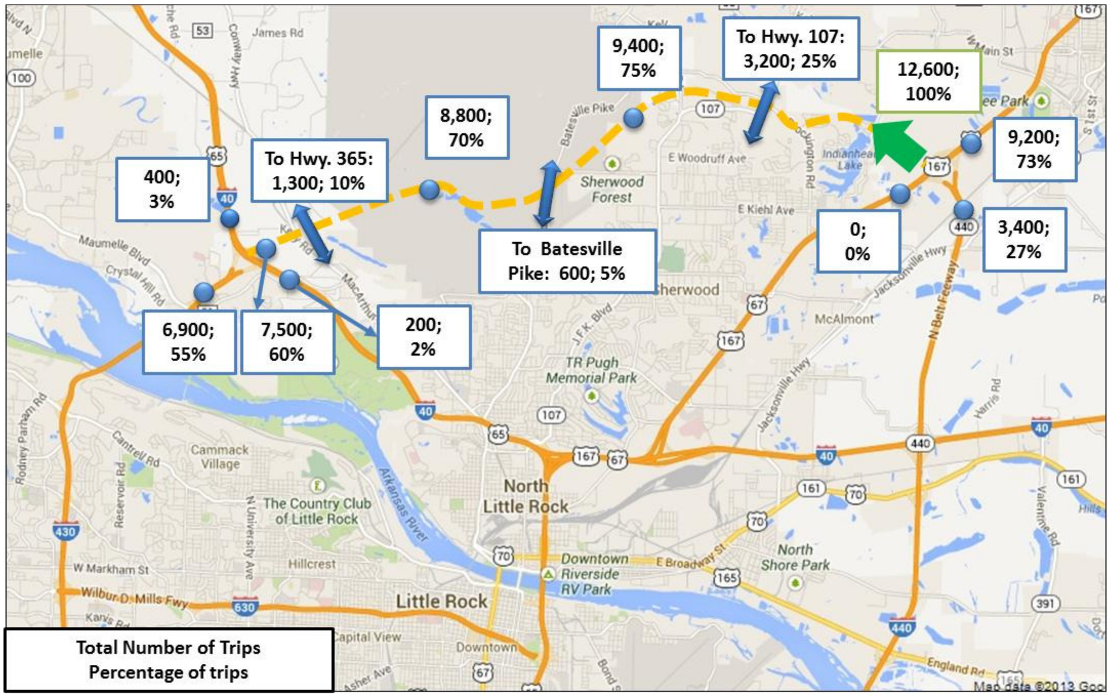
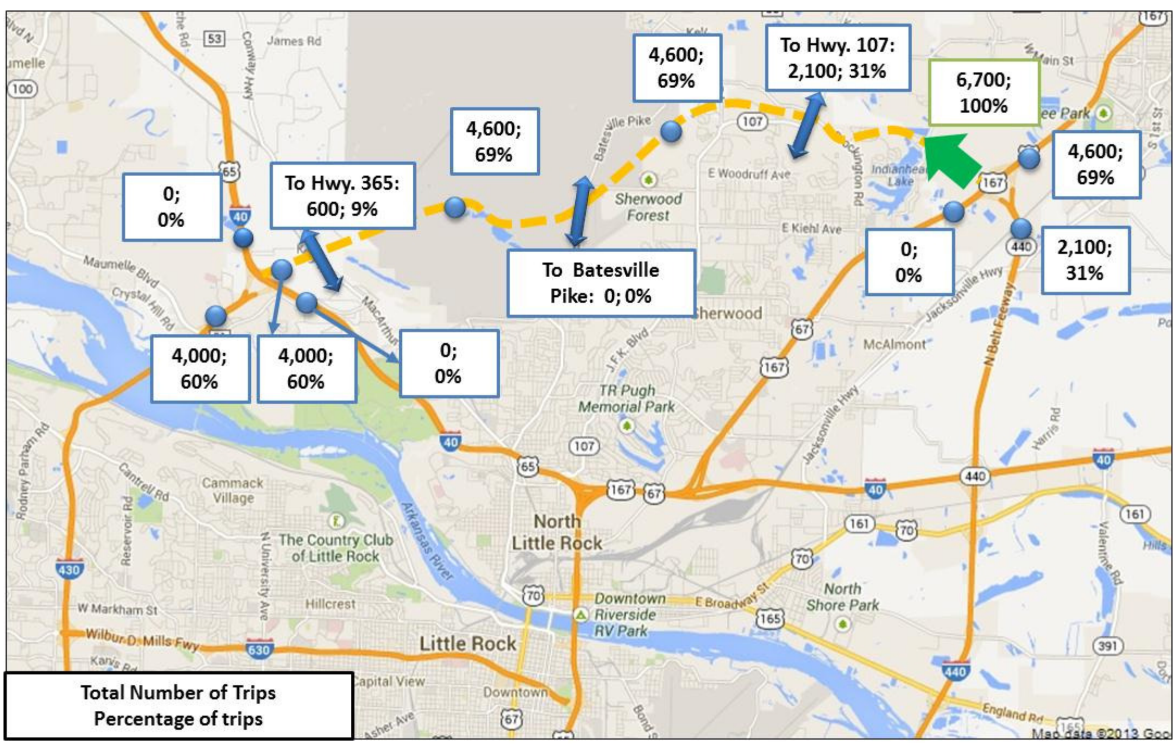


Figure 19: Tolled 2030 Select Link at Easternmost Segment (westbound/southbound)



Highway 440, respectively, for the toll-free scenario. Under the tolled scenario the percentage of traffic coming from Highway 167 and Highway 440 changes to 69 percent and 31 percent (see Figure 19). For the southbound/westbound movement, the Batesville destination is the least desirable under both the toll-free and toll scenarios.

A travel time savings comparison was conducted to evaluate the travel advantage offered by the North Belt Freeway in 2030. Four origin and destination scenarios were selected for analysis from six potential locations to compare the travel time using the North Belt Freeway with the travel time using other toll-free routes. These locations are presented on Figure 20 and described below.

- Location A: At Highway 67, north of North Belt Freeway and Highway 67 interchange
- Location B: At I-40, west of I-430 and North Belt Freeway
- Location C: At the intersection of I-630 and John Barrow Road
- Location D: At I-40, east of Highway 440 and I-440
- Location E: At the intersection of Highway 107 and Jacksonville Cutoff Road
- Location F: At the intersection of I-630 and Main Street

Figure 20: Origin and Destination Locations for Travel Time Saving Comparisons

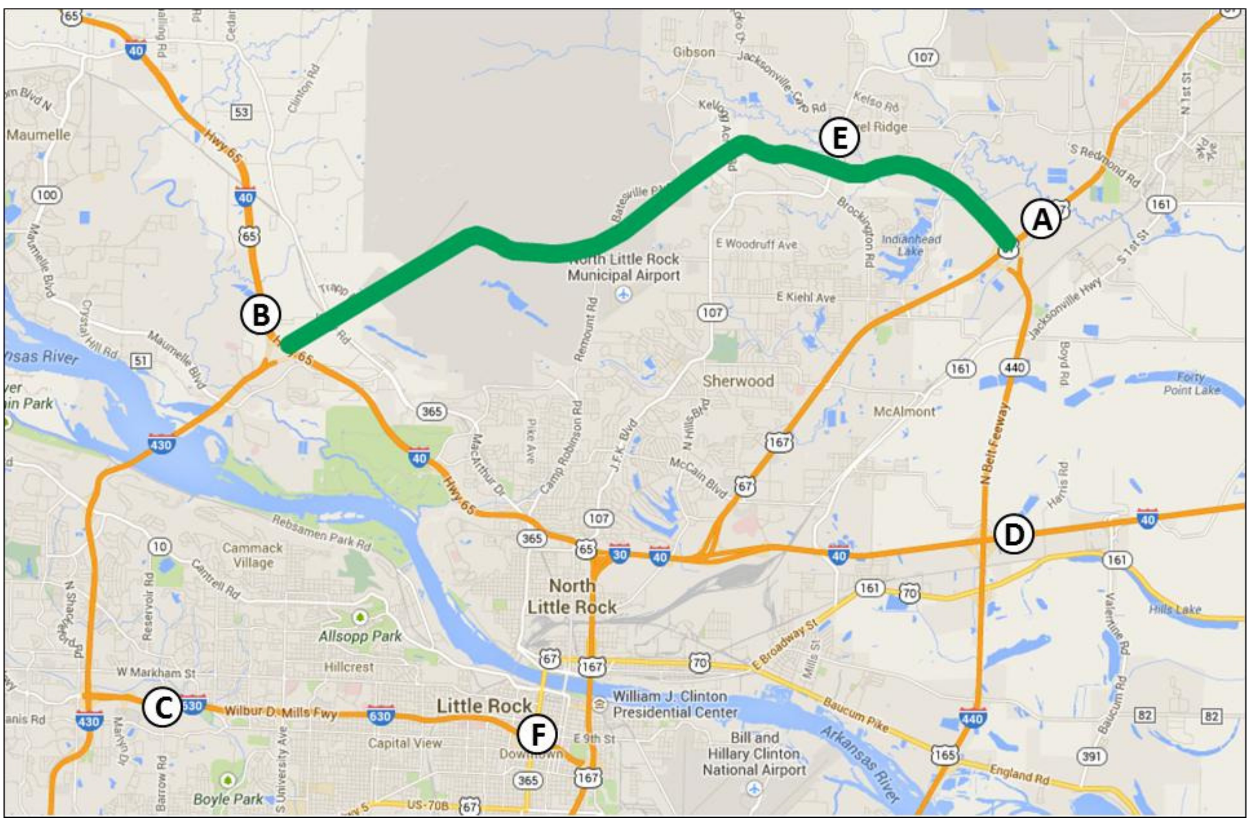


Table 5 shows the travel time estimates offered by each route between each origin and destination combination. Travel time savings ranged from –1.3 minutes to 12.6 minutes. There is no travel time savings offered by the North Belt Freeway between Location B and Location D because the distance using the North Belt Freeway is much longer and the reduced congestion on the tolled route does not compensate for the added distance.

Table 5. Travel Time Savings Comparative Analysis

From	To	Toll-Free Route	Travel Time (mins.)	North Belt Freeway Route	Travel Time (mins.)	Travel Time Savings (min.)	Travel Time Savings (percent)
A	B	Highway 67/I-40	27.8	Highway 67/ North Belt Freeway/I-40	18.9	8.9	47%
A	C	Highway 67/I-40/ I-30/I-630	34.8	Highway 67/North Belt Freeway/I-430/I-630	29.3	5.5	19%
B	D	I-40	21.2	I-40/North Belt Freeway/ Highway 440/I-40	22.5	-1.3	-6%
E	F	Highway 107/I-30/I-630	47.6	Highway 107/North Belt Freeway/I-430/I-630	34.9	12.6	36%

VIII. PROJECT COST IN 2013 DOLLARS

The total project cost estimates presented in this report include the following:

- Environmental Documentation
- Preliminary Engineering
- General Engineering Consultant (GEC) Management and Oversight
- Final Engineering
- Right-of-Way (ROW) Acquisition
- Utility Relocation
- Construction
- Construction Engineering & Inspection (CE&I)

A description of the methodology used to develop each of these cost elements is provided in the following subsections.

A. ENVIRONMENTAL DOCUMENTATION

The Environmental Documentation cost element includes costs incurred to prepare the Final Environmental Impact Statement (FEIS) and obtain issuance of a Record of Decision (ROD). A ROD for the North Belt Freeway was issued on September 23, 2008. Therefore, costs for this activity have already been incurred and are not included in the total project costs remaining to implement the project. However, a reevaluation may be required to address tolling. The estimated cost for the reevaluation is $90,000 in 2013 dollars.

B. PRELIMINARY ENGINEERING

The preliminary design phase includes the development of preliminary engineering design and ROW plans. The preliminary engineering cost is based on four percent of the total construction cost.

C. GENERAL ENGINEERING CONSULTANT MANAGEMENT AND OVERSIGHT

Costs include General Engineering Consultant (GEC) costs to provide general project management, project scheduling, management and oversight of design consultants, design document reviews, and coordination and documentation. Although AHTD typically conducts oversight activities for federally funded transportation projects, should the project move forward as a toll project, an independent GEC will be required to support bond sales to be repaid through toll revenues. The GEC management and oversight cost is based on one percent of the total construction cost.

D. FINAL ENGINEERING

The final engineering costs include costs for preparing construction plans and developing the Plans, Specifications, and Estimates (PS&E). The PS&E cost is based on eight percent of the total construction cost. Surveying and geotechnical costs are included in the PS&E costs.

E. RIGHT-OF-WAY ACQUISITION

The ROW acquisition cost includes parcel acquisition costs plus other costs such as legal and administrative services, displacee relocations, expert witnesses, etc. Aerial photography was used to assess land use and estimate the extent of the ROW needed to accommodate construction of the project based on the proposed alignment. The ROW width was based on an average width for the project. The average cost per acre was obtained from current or recent real estate transactions and is estimated at $15,000 per acre. Additional costs were included to incorporate those associated with existing structures located on the properties. These costs were developed based on the following averages:

- Residential structures – $175,000 per structure
- Commercial structures – $550,000 per structure
- Other – $25,000 per structure

Costs associated with the acquisition process, including legal and administrative services, displacee relocations, expert witnesses, condemnation, etc. were estimated at 11 percent of the property costs.

F. UTILITY RELOCATION

The utility relocation costs include Subsurface Utility Engineering (SUE), utility design, and construction of relocations. One large overhead power line that crosses the proposed alignment has been identified to the east of Highway 107; however, the preliminary vertical alignment prepared for the overall cost estimate allows for the proposed roadway to go under the overhead power line. Therefore, relocation of this power line is not needed. No other major utilities were identified based on a review of the available topography information. Therefore, no costs are included in the estimate for utility relocation.

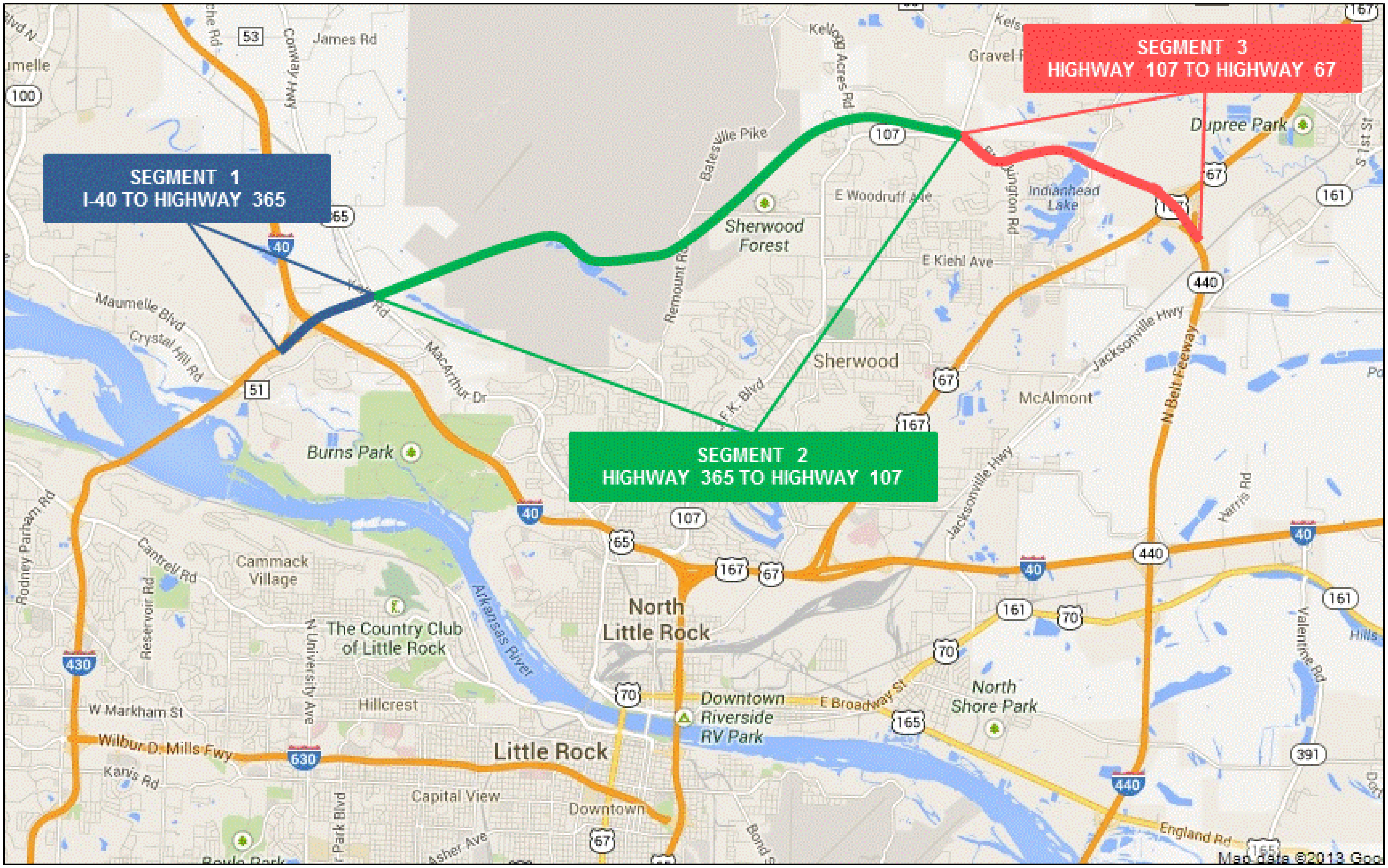
G. CONSTRUCTION

1. Roadway

Based on the status of the project, limited design data for the project are currently available. Therefore, several assumptions regarding the overall design of the project were made to develop the cost estimate presented in this report. A summary of the key assumptions implemented to develop the roadway cost estimate based on the information provided and discussions with AHTD staff is provided below. A summary of all the project cost assumptions is included in the Cost Estimating Methodology memorandum included in Appendix B.

- Per AHTD and Metroplan's request, the project cost estimate was prepared for the following segments (Figure 21).
  - I-40/I-430 to Highway 365 (Segment #1)
  - Highway 365 to Highway 107 (Segment #2)
  - Highway 107 to Highway 67 (Segment #3)
- Pricing is based on Arkansas-weighted average unit prices dated January–December 2012, unless otherwise noted.
- The roadway construction cost estimate was developed based on two preliminary typical sections. Based on discussions with AHTD and Metroplan staff, the first mainlane proposed section was assumed to be a four-lane depressed median within a controlled access facility with 12-foot lanes and 10-foot outside and 6-foot inside shoulders. The median width for this typical section is 50 feet. The second mainlane proposed typical section was assumed to be a four-lane controlled-access facility with a median barrier with 12-foot lanes and 10-foot outside and 10-foot inside shoulders. The median width for the concrete barrier wall median is 22 feet. Typical Sections were also developed for a one lane interchange ramp, a two-lane side road and a four-lane side road. Typical sections are included in the Cost Estimating Methodology memorandum presented in Appendix B.
- The roadway construction cost estimate assumed a concrete barrier through the Camp Robinson sections of the project and a cable barrier system along the sections that do not have a concrete median. The cable barrier was assumed for Segments 1 and 2, which have the depressed median typical section. The cable barrier will not be needed for Segment 3, which has the concrete barrier wall in the median.

Figure 21: Project Cost Segments



- Preliminary survey data provided by the AHTD was utilized to prepare a digital terrain model (DTM), which was used to prepare a preliminary vertical alignment for the horizontal alignment provided in the FEIS. This preliminary vertical alignment along with the preliminary proposed typical sections were used to estimate earthwork for the project. Earthwork costs are based on the following:
    a. The estimate for earthwork on the mainlanes is based on excavation and embankment.
    b. The estimate for earthwork on the ramps assumes 5 feet in embankment height with additional costs based on calculations developed by ICA Engineering.
    c. The estimate for earthwork on the side roads assumes 2 feet in embankment height with additional costs based on calculations developed by ICA Engineering.
- DTM, available Federal Emergency Management Agency mapping, and engineering judgment were used to evaluate the area between Highway 107 and Highway 67 for hydraulic openings to estimate the type of structure that might be needed such as a bridge or a box culvert.
- Grade separation costs were developed for the Union Pacific Railroad (UPRR), Nebraska Avenue, Missouri Avenue, H Street, New York Avenue, 6th Street, Kellogg Acres Road, and Oneida Street. Costs for roadway and bridges were prepared by developing a side road typical section and estimating bridge costs based on a prepared cost per square foot of bridge deck. Per discussions with AHTD and Metroplan, the cost estimate assumes that the mainlanes will go over the UPRR, Kellogg Acres, and Oneida. The estimate assumes that side roads will go over the mainlanes for the remainder of the crossings.
- An additional miscellaneous cost equal to 20 percent of the base construction cost was added to account for incidental items such as signing, guardrail, concrete ditch paving, traffic signals, etc. that cannot be quantified at this time based on the level of information currently available. The proposed percentage is similar to costs used on other planning projects in central Arkansas such as the Highway 67 Planning Study.
- Consistent with AHTD Standard Specifications, mobilization was estimated at 5 percent of the base construction cost. An additional 20 percent of the base construction cost was included to account for engineering and contingencies during construction, including design/review time and material costs for change orders that may occur during construction. These items are identified as separate line items from the base construction cost and are included in the total construction cost.

2. Toll Systems

The toll facility and systems equipment costs were developed using costs for similar facilities. For this sketch level study, it was assumed that toll collection would be all electronic. There are mainline toll gantries proposed at four locations in each direction. The toll gantries will be located between each interchange. No gantries or tolling points are proposed for any interchange ramps. Transactions recorded at the mainline gantries will be transmitted via fiber optic cable along the corridor to a single host toll system and to a payment processing Customer Service Center (CSC)/Video Processing Center (VPC). The CSC/VPC is proposed to be housed within an existing facility, and no construction of a building is required.

The toll system cost estimate developed for this analysis includes and is based on the following:

a. Capital cost of the roadside tolling point including the cost of the gantry structure associated tolling equipment, and a "technical shelter." The gantries would span all four lanes and provide toll equipment for each lane and the shoulders. The technical shelter would house the tolling point electronics for the toll system, network communications, security/access control, and supporting utilities. This is also where the fiber and power would connect to the toll system. For purposes of this analysis, the capital costs of each tolling point in 2013 dollars were estimated as follows:

   – Four-lane gantry and toll equipment is $2,610,000 each

   – Total cost of four gantries and toll equipment is $10,440,000

b. The fiber optic cable that would run along the length of the corridor was estimated at $65,000 per mile. It was assumed that the fiber will connect to an existing system at either end. The total cost estimate for fiber the 12.3-mile length of the corridor equaled $799,500.

c. The Host System will be a single small toll transaction host site estimated to cost $1,400,000. This cost includes the hardware, software, systems development costs, and infrastructure.

d. The CSC/VPC is assumed to be housed within an existing AHTD facility. It is assumed that the CSC/VPC will be sized to operate the proposed North Belt Freeway project as a standalone project. The cost assumed for the hardware, software, and systems development of the CSC/VPC was $1,390,000. A cost of $110,000 was assumed for the build out of the existing facility for a total cost of $1,500,000.

H. CONSTRUCTION ENGINEERING AND INSPECTION

The Construction Engineering and Inspection cost element includes costs of maintaining staff to manage the construction engineering and inspection tasks, review contractor's plans, inspection of contractor's operations, conduct construction inspections and materials testing, and tracking project progress through review of progress/status reports. The Construction Engineering and Inspection cost was estimated at ten percent of the total construction cost.

I. TOTAL 2013 PROJECT COST

Table 6 presents the total project cost in 2013 dollars for each of the three segments and the entire North Belt Freeway based on the methodology described in the previous sections. As presented in Table 6, the total construction cost for the entire North Belt Freeway totaled approximately $459 million. The bridge structures represent approximately 40 percent of this total. Including the other project cost elements, the total project cost increases to approximately $575 million.

Table 6. North Belt Freeway Total Project Cost (2013 $)

Cost Element	Segment 1 (I-40 to Highway 365)	Segment 2 (Highway 365 to Highway 107)	Segment 3 (Highway 107 to Highway 67)	TOTAL
Construction				
Grading Base & Surfacing[1]	$11,713,000	$66,698,000	$22,638,000	$101,049,000
Bridges	$53,089,000	$13,222,000	$119,369,000	$185,680,000
Drainage Structures	$530,000	$4,890,000	$835,000	$6,255,000
Traffic Signal Installation	$250,000	$250,000	$250,000	$750,000
Maintenance of Traffic	$250,000	$120,000	$260,000	$630,000
SUBTOTAL	***$65,832,000***	***$85,180,000***	***$143,352,000***	***$294,364,000***
Miscellaneous (20%)[2]	$13,167,000	$17,036,000	$28,671,000	$58,874,000
SUBTOTAL	***$78,999,000***	***$102,216,000***	***$172,023,000***	***$353,238,000***
Mobilization (5%)	$3,950,000	$5,111,000	$8,602,000	$17,663,000
SUBTOTAL	***$82,949,000***	***$107,327,000***	***$180,625,000***	***$370,901,000***
Contingency (20%)	$16,590,000	$21,466,000	$36,125,000	$74,181,000
SUBTOTAL	***$99,539,000***	***$128,793,000***	***$216,750,000***	***$445,082,000***
Toll System	$3,535,000	$7,070,000	$3,535,000	$14,140,000
TOTAL CONSTRUCTION COST[2]	**$103,074,000**	**$135,863,000**	**$220,285,000**	***$459,222,000***
Other Project Costs				
Environmental Clearance[3]	$30,000	$30,000	$30,000	$90,000
Preliminary Engineering (4%)	$4,123,000	$5,435,000	$8,812,000	$18,370,000
GEC Management & Oversight (1%)	$1,031,000	$1,359,000	$2,203,000	$4,593,000
Final Engineering (8%)	$8,246,000	$10,870,000	$17,623,000	$36,739,000
Construction Engineering & Inspection (10%)	$10,308,000	$13,587,000	$22,029,000	$45,924,000
Right of Way Acquisition[4]	$2,948,000	$4,574,000	$2,331,000	$9,853,000
Utilities[5]	$0	$0	$0	$0
TOTAL OTHER PROJECT COSTS	***$26,686,000***	***$35,855,000***	***$53,028,000***	***$115,569,000***
TOTAL PROJECT COST (2013$)	**$129,760,000**	**$171,718,000**	**$273,313,000**	**$574,791,000**

BASIS OF CONSTRUCTION COST ESTIMATE:

COST ROUNDED TO THE NEAREST $1,000.

PRICING BASED ON ARKANSAS WEIGHTED AVERAGE UNIT PRICES DATED JANUARY–DECEMBER 2012 UNLESS OTHERWISE NOTED.

EARTHWORK FOR MAINLANES BASED ON PRELIM. LINE AND GRADE DEVELOPED BY ICA ENG. ($5.73/CY EXCAVATION AND $6.74/CY EMBANKMENT).

EARTHWORK FOR RAMPS ASSUMED TO BE 5 FEET IN EMBANKMENT HEIGHT WITH THE ADDITIONAL COSTS FOUND BY ICA CALCULATIONS ($89.15/FT).

EARTHWORK FOR SIDE ROADS ASSUMED TO BE 2 FEET IN EMBANKMENT HEIGHT WITH THE ADDITIONAL COSTS FOUND BY ICA CALCULATIONS ($23.96/FT & $35.95/FT).

DRAINAGE COST BASED ON AVERAGE DRAINAGE AND AHTD UNIT PRICES ($78.39/FT).

TRAFFIC SIGNAL INSTALLATION BASED A COST OF $125,000/EACH.

MAINTENANCE OF TRAFFIC BASED ON ENGINEERING JUDGMENT.

NOTES:

1. Includes the following cost: $11.24/ft for cable median barrier and $219.62/ft for concrete median barrier.

2. Includes incidental items such as signing, guardrail, concrete ditch paving, traffic signals, etc. that cannot be quantified at this time based on the level of information currently available.

3. Cost for environmental clearance activities already conducted to obtain a Record of Decision are considered a sunk cost and are not included in the estimate. However, $90,000 is included to allow for potential re-evaluation of the FEIS to address tolling.

4. Right-of-way acquisition includes 11% of the property costs for cost of acquisition (legal, appraisal, relocation, etc.) Land value based on $15,000/acre, Residential value based on $175,000/house, Commercial value based on $550,000, and Other value based on $25,000/each.

5. There is one identified large overhead power line to the east of Highway 107 that crosses the proposed alignment; however, the preliminary vertical alignment that has been prepared allows for the proposed roadway to go under the overhead power line and not require relocation.

No other major utilities have been identified based on the available topography information. Therefore, no costs were included for utilities in the estimate.

IX. PROJECT COST IN YEAR OF EXPENDITURE DOLLARS

The project was assumed to open in 2020. To meet this opening date, construction was anticipated to begin in January 2018. Therefore, the construction cost estimate was adjusted for inflation. Year of expenditure (YOE) costs were calculated by applying an estimated annual inflation rate to base year cost estimates. The base year for the project cost is 2013. The base year cost for each cost element has been escalated to the first year of the activity based on an annual inflation rate of 2.5 percent per year. Table 7 provides a high level schedule for project implementation based on the assumed opening date of 2020. ROW acquisition is assumed to occur in 2017 upon completion of the preliminary engineering and the 2013 ROW cost is inflated to the midpoint of the activity. Table 8 provides the YOE costs taking into account the anticipated impact of inflation and assumed project schedule. As noted in Table 8, the total year of expenditure cost is approximately $648 million.

Table 7. North Belt Freeway Assumed Implementation Schedule

North Belt Freeway							
Cost Element	Begin	End	2015	2016	2017	2018	2019
Environmental Clearance[1]	January-16	December-16		■			
Preliminary Engineering	January-16	December-16		■			
GEC Management & Oversight	January-16	December-19		■	■	■	■
Final Engineering	January-17	December-17			■		
Right of Way Acquisition	January-17	December-17			■		
Construction	January-18	December-19				■	■
Construction Engineering & Inspection	January-18	December-19				■	■

1. Re-evaluation for tolling only.

Table 8. North Belt Freeway Year of Expenditure Cost Estimate

Element	Year of Cost Estimate	Inflation Year	Costs (2013$)	Annual Inflation Rate	Inflated Year of Expenditure Cost Estimate
Environmental Clearance[1]	2013	2016	$90,000	2.50%	$97,000
Preliminary Engineering	2013	2016	$18,370,000	2.50%	$19,783,000
GEC Management & Oversight	2013	2016	$4,593,000	2.50%	$4,947,000
Final Engineering	2013	2017	$36,739,000	2.50%	$40,553,000
ROW Acquisition	2013	2017	$9,853,000	2.50%	$11,011,000
Construction	2013	2018	$459,222,000	2.50%	$519,568,000
Construction Engineering & Inspection	2013	2018	$45,924,000	2.50%	$51,959,000
Total			**$574,791,000**		**$647,918,000**

1. Re-evaluation for tolling only.

X. TOLL SYSTEM OPERATIONS AND MAINTENANCE COST

A. TOLL OPERATIONS

Operations encompass a variety of activities but generally include the processing and collection of tolls. Based on the estimated number of transactions, small number of tag accounts, and high percentage of initial transactions being video based, it is assumed that 10 customer service representatives and 20 image reviewers will be required to perform these functions. At the conceptual level, the cost for collecting and processing tolls is typically included in an average cost per tolled transaction. For purposes of this analysis, the cost per transaction was developed based on a review of transaction costs for several tolling entities in the U.S. and was estimated in 2013 dollars at $0.15 per transponder transaction and $0.40 per video transaction. In the initial year of opening, assumed to be 2020, it is estimated that 70 percent of the transactions are by transponder and 30 percent will be video based. By 2030, it is estimated that 90 percent of the transactions are by transponder and 10 percent by video. This 90/10 percent split is assumed for the remaining duration of the forecast period.

Annual operations cost was determined by multiplying the per transaction cost for each transaction type by the number of each type of transaction. The transaction costs have been inflated each year by 2.5 percent.

B. TOLL SYSTEM MAINTENANCE

In addition to the per transaction processing costs, there are costs to maintain the toll systems to ensure that they are operating correctly. For purposes of this analysis, it was assumed that the monthly cost to maintain the toll equipment is approximately $4,000 per gantry each direction. As previously noted, the proposed toll concept includes four gantries, each spanning a total of four lanes (two in each direction). Based on the estimated per gantry cost and proposed toll configuration, toll system maintenance was estimated at $32,000 per month in 2013 dollars. This equates to $384,000 per year. Maintenance of the toll system network was estimated at an additional $150,000 per year. Total toll system maintenance was estimated at $534,000 per year in 2013 dollars. The 2013 estimated cost was escalated by 2.5 percent per year throughout the 50-year forecast period.

C. ENFORCEMENT

Several options are available for reducing the number of facility users evading payment of tolls, including:

1. Police enforcement
2. Audible alarms
3. Camera based solutions

The first two options have additional equipment requirements not directly related to toll collection or operations. As such they tend to be more expensive than camera-based solutions, which utilize equipment already installed for video tolling to capture front and rear license plate images. Additionally, the non-camera-based solutions are more intrusive and can result in traffic disruptions or impede traffic flow. Based on these limitations and assuming all electronic tolling, the first two options are not recommended for the North Belt Freeway.

The camera-based option coupled with back office business rules for notifying violators and processing payments is the most commonly used process for enforcing payment on facilities that utilize AETC. This involves the processing of license plate numbers, database searches of motor vehicle department records to identify the vehicle owner, and issuance of mailing notices seeking payment of the tolls and administrative costs.

The existence of legislative authority to access registration data and allow for suspension of vehicle registration due to unpaid tolls is a prerequisite to the effective use of camera-based technology as a violation enforcement mechanism. The cost of the cameras is included in the capital cost of the tolling equipment. Additionally, License Plate Recognition (LPR) technology can be automated for the majority of the video transactions, further reducing costs. However, there are additional staffing costs to perform the back office functions needed to bill and collect payment. These costs are included in the $0.40 cost per video transaction (in 2013 dollars and inflated to year of expenditure).

D. LIFECYCLE TOLL SYSTEM AND OPERATIONS COSTS

The estimated toll system and operations costs for the North Belt Freeway over a 50-year period based on the methodology described are presented in Section XIII.

XI. ROADWAY MAINTENANCE COST

During the initial years of operation, the system should require relatively minor maintenance. The annual routine roadway maintenance cost was based on the cost of similar facilities. These costs included routine maintenance of the roadside, such as litter and vegetation management (mowing) and of the signing and pavement marking and striping. Toll roads are typically maintained at a higher level than non-toll roads. This provides an added incentive for toll paying customers to drive on the roadway. Based on annual maintenance costs for similar toll roads in Florida and Texas, per mile routine maintenance costs range from approximately $90,000 to $120,000 per centerline mile. For purposes of this analysis, the annual maintenance cost per centerline mile was estimated at $100,000 in 2013 dollars. This estimate was based on a length of 12.3 miles. The annual maintenance estimate was inflated at 2.5 percent annually. The 50-year roadway maintenance costs based on the methodology described are presented in Section XIII.

XII. RENEWAL AND REPLACEMENT (R&R) COSTS

A. ROADWAY

Typically a pavement structure is designed for a 20-year life expectancy. Over a 50-year period the initial construction will deteriorate and ultimately fail even with routine maintenance. Based on historical data, a maintenance and rehabilitation schedule was developed for the pavement structure. As previously noted, maintenance in the first few years will be less than in later years. For this study, the first non-annual treatment was projected to occur in year 15. The 15-year treatment will include rehabilitation of joints, concrete patching, grinding to restore smoothness, and recompaction of shoulders. The second major treatment will occur in year 25 and consist of concrete patching, rehabilitation of joints, guardrail replacement, and adding a 6-inch asphaltic concrete hot mix (ACHM) overlay to the Portland cement concrete (PCC) pavement. In year 35, a full depth reconstruction will be needed. Finally in year 50, the treatment conducted in year 15 will be repeated.

B. TOLL SYSTEMS

As components break down and become obsolete, the toll collection system will need to be rehabilitated and/or upgraded to accommodate technology improvements. Based on experience with tolling entities across the U.S., the toll systems renewal and replacement estimates assumed that the toll systems will need to be replaced on average every 7 years. For this sketch level analysis, the 2013 toll system capital cost minus the cost of the fiber ($13,340,000) was escalated by 2.5 percent annually to the year of the expense.

C. LIFECYCLE RENEWAL AND REPLACEMENT COSTS

The R&R costs for both the roadway and the toll systems over a 50-year period based on the methodology previously described are presented in Section XIII.

XIII. TOTAL OPERATIONS AND MAINTENANCE (O&M) AND LIFECYCLE COSTS

As noted in the previous sections, there are various costs incurred to operate and maintain a toll facility. Table 9 presents the total O&M and lifecycle R&R costs over a 50-year period for each of these elements for the base case toll traffic and revenue scenario. The total cost for operations, maintenance, and renewal and replacement is approximately $1.5B over the 50-year period is shown in Table 9. The majority of the costs (69 percent) over the 50-year period are for toll collections and operations. At 15 percent, toll systems R&R represents the second highest cost over the 50-year period. The remaining 16 percent is almost evenly split between roadway maintenance (9 percent) and roadway R&R (7 percent).

Table 9. North Belt Freeway Operations and Maintenance and Lifecycle R&R Costs (2020–2069)

Toll Revenue Maximization ($0.20/mile)					
Year	Toll Collections and Operations (including Toll Systems Maintenance)	Roadway Maintenance	Roadway R&R	Toll Systems R&R	Total O&M and R&R
2020	$3,960,636	$1,462,083	$0	$0	$5,422,719
2021	$4,763,833	$1,498,636	$0	$0	$6,262,469
2022	$5,606,177	$1,536,101	$0	$0	$7,142,279
2023	$6,486,470	$1,574,504	$0	$0	$8,060,974
2024	$7,403,337	$1,613,867	$0	$0	$9,017,204
2025	$8,355,081	$1,654,213	$0	$0	$10,009,295
2026	$8,557,576	$1,695,569	$0	$18,389,337	$28,642,482
2027	$8,755,012	$1,737,958	$0	$0	$10,492,970
2028	$8,946,797	$1,781,407	$0	$0	$10,728,203
2029	$9,132,233	$1,825,942	$0	$0	$10,958,175
2030	$9,310,683	$1,871,590	$0	$0	$11,182,274
2031	$9,717,656	$1,918,380	$0	$0	$11,636,037
2032	$10,142,724	$1,966,340	$0	$0	$12,109,064
2033	$10,586,724	$2,015,498	$4,081,250	$21,859,143	$38,542,615
2034	$11,050,523	$2,065,886	$0	$0	$13,116,409
2035	$11,534,942	$2,117,533	$0	$0	$13,652,474
2036	$12,040,874	$2,170,471	$0	$0	$14,211,345
2037	$12,569,424	$2,224,733	$0	$0	$14,794,157
2038	$13,121,530	$2,280,351	$0	$0	$15,401,882
2039	$13,698,288	$2,337,360	$0	$0	$16,035,648
2040	$14,300,767	$2,395,794	$0	$25,983,652	$42,680,213
2041	$14,930,109	$2,455,689	$0	$0	$17,385,798
2042	$15,587,618	$2,517,081	$0	$0	$18,104,699
2043	$16,274,398	$2,580,008	$25,917,762	$0	$44,772,168
2044	$16,991,944	$2,644,508	$0	$0	$19,636,453
2045	$17,741,533	$2,710,621	$0	$0	$20,452,154
2046	$18,524,666	$2,778,387	$0	$0	$21,303,053
2047	$19,342,757	$2,847,846	$0	$30,886,397	$53,077,000
2048	$20,197,542	$2,919,042	$0	$0	$23,116,585
2049	$21,090,604	$2,992,018	$0	$0	$24,082,623
2050	$22,023,487	$3,066,819	$0	$0	$25,090,306
2051	$22,998,318	$3,143,489	$0	$0	$26,141,807
2052	$24,016,730	$3,222,077	$0	$0	$27,238,807
2053	$25,080,846	$3,302,629	$64,734,530	$0	$93,118,004
2054	$26,192,706	$3,385,194	$0	$36,714,220	$66,292,121
2055	$27,354,245	$3,469,824	$0	$0	$30,824,069
2056	$28,567,987	$3,556,570	$0	$0	$32,124,557
2057	$29,836,167	$3,645,484	$0	$0	$33,481,651
2058	$31,161,323	$3,736,621	$0	$0	$34,897,944
2059	$32,545,860	$3,830,037	$0	$0	$36,375,897
2060	$33,992,708	$3,925,787	$0	$0	$37,918,495
2061	$35,504,397	$4,023,932	$0	$43,641,671	$83,170,000
2062	$37,083,972	$4,124,530	$0	$0	$41,208,502
2063	$38,734,617	$4,227,644	$0	$0	$42,962,261
2064	$40,459,414	$4,333,335	$0	$0	$44,792,748
2065	$42,261,678	$4,441,668	$0	$0	$46,703,347
2066	$44,145,166	$4,552,710	$0	$0	$48,697,876
2067	$46,113,241	$4,666,528	$0	$0	$50,779,769
2068	$48,169,823	$4,783,191	$9,685,158	$51,876,232	$114,514,404
2069	$50,318,908	$4,902,771	$0	$0	$55,221,679
TOTAL	**$1,047,284,056**	**$142,530,256**	**$104,418,700**	**$229,350,654**	**$1,523,583,665**

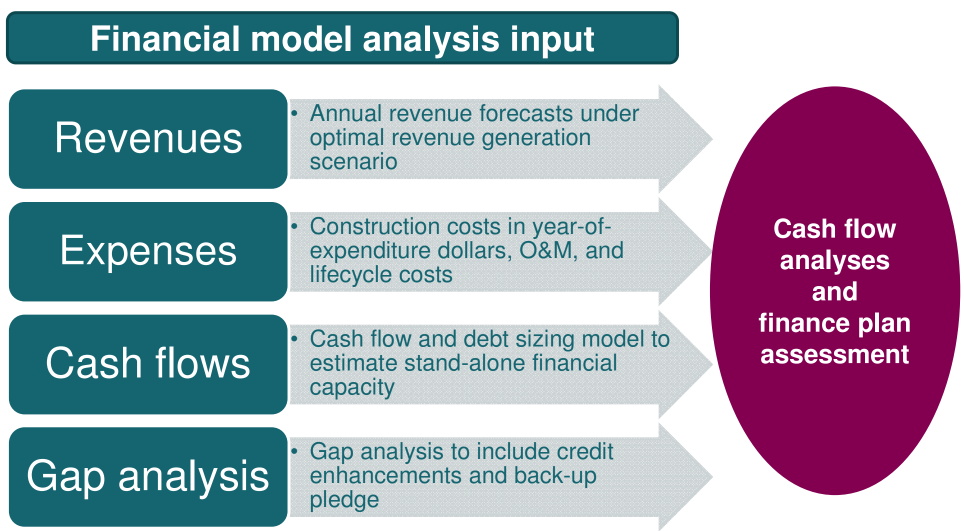
XIV. FINANCIAL ANALYSIS

The objective of the financial feasibility analysis was to assess the capacity of toll revenues generated by the North Belt Freeway to support initial construction costs and on-going operations, maintenance, and R&R costs over a 40-year period. It is important to note that toll revenues for start-up, stand-alone toll projects like the North Belt Freeway are not typically sufficient to meet all initial construction and on-going costs over the life of the project. Consequently, they are dependent upon some level of external support in addition to toll revenues. Such support can be in the form of a non-cash credit enhancement such as a commitment by a public entity to cover operating costs and/or debt service costs to the extent toll revenues are insufficient. In addition, direct funding contributions from a public entity are options used in many cases.

A. APPROACH

The financial analysis integrates the results of the traffic and revenue forecasting, capital costing, operations and maintenance and R&R lifecycle costing efforts into a comprehensive cash flow model. Figure 22 summarizes the approach.

Figure 22: Financial Analysis Approach



Three scenarios were tested to assess the funding capacity of the project's toll revenues. The Base Case considered the capacity of annual net toll revenues, after the payment of annual operations and maintenance expenses (Net Pledge). Next, two non-cash, credit enhancement structures (referred to as Gap Analysis 1 and 2) were considered. Gap Analysis 1 assumed operations and maintenance expenses would be covered by an external public entity funding source to the extent toll revenues are insufficient. This allows debt service to be paid prior to operating and maintenance expenses (Gross Pledge) and consequently increases the capacity to finance payment of debt service on the bonds. Gap Analysis 2 also assumes use of the Gross Pledge and includes a commitment by a public entity to fund debt service payments to the extent toll revenues are not sufficient (Gross Pledge plus Public Entity Back-up). This scenario provides additional financing capacity because the commitment by an external source to pay debt service is expected to improve the project's credit quality, lower its debt service expense and reduce the annual debt service coverage ratio requirement. Table 10 summarizes the three scenarios that were tested.

Table 10. Financing Scenarios

Approach	Revenue	Debt Payment Priority	Public Entity Payment Obligation?
Net pledge (Base case)	Toll revenues less OPEX*	After OPEX*	No
Gross pledge (Gap analysis 1)	Toll Revenues	Before OPEX	Yes, if toll revenues are less than OPEX
Gross pledge plus potential Public Entity backup (Gap analysis 2)	Toll revenues	Before OPEX	Yes, if toll revenues are less than OPEX and Debt Service

*OPEX- reoccurring operations and maintenance expenses

B. FINANCIAL MODEL

A comprehensive financial planning model was developed to assess the financial capacity of the North Belt Freeway's toll revenues to fund its initial construction needs and on-going operations, maintenance, and R&R costs. Debt secured by toll revenues is issued to finance the project's initial construction costs. Debt is assumed to be based on a tax exempt structure and similar to other start-up stand-alone toll roads. It would include a mix of debt products including current interest bonds, capital appreciation bonds and convertible capital appreciation bonds. This approach allows annual debt service payments to be structured based on the projected growth in toll revenues, using an escalating back-loaded profile and a 40-year term. Given any expected financing for the project would be several years away, interest rate assumptions included additional basis points to account for future rate variability. Base rates reflect the 10-year average of the AAA, tax exempt index, and include an additional 50 basis points to address the potential for future interest rate variability. It was assumed that the Base Case and Gap Analysis 1 structures, if feasible, would receive the lowest investment grade rating BBB-. As a result, reflecting the credit quality of the debt, current interest bonds would have additional spread of 186 basis points, while convertible capital appreciation bonds and capital appreciation bonds would have additional spreads of up to 281 and 315 basis points, respectively. Gap Analysis 2, which assumed the commitment of a public entity to pay debt service if needed, would result in an 'A' rating on the bonds. As a result, the spread for current interest bonds, convertible capital appreciation bonds and capital appreciation bonds for this scenario would be lower at up to 110, 185 and 230 basis points, respectively. Given the above interest rate and debt structuring assumptions, the true interest cost for the Base Case and Gap Analysis 1 structures, consistent with their rating was assumed to be 7.2 percent, while the Gap Analysis 2 structure was assumed to have a true interest cost of 6.3 percent.

Since toll revenues for start-up stand-alone toll road projects are subject to variability given their reliance on forecasts of future economic, demographic and travel conditions, the capital markets and rating agencies require pledged toll revenues to exceed debt service by a significant multiple, known as a debt service coverage ratio. For the Base Case and Gap Analysis 1 structures, a financially feasible project would have an average annual debt service coverage ratio of 2.5 times annual debt payments (2.5x). A gross pledge plus public entity back-up (Gap Analysis 2) offers more protection to bondholders and requires a lower debt service coverage ratio, averaging about 2.0x.

C. RESULTS

As a first step to assessing the financial viability of the North Belt Freeway, a high level present value analysis was conducted to define the capacity of toll revenues to meet project needs. A discount rate equal to the 7.2 percent true interest cost for the Base Case was assumed. The present value analysis shows a funding gap of $375.2 million between toll revenues and project costs, indicating the project requires significant external funding support (Table 11).

Table 11. High Level Present Value Feasibility Analysis

Revenue/Cost Item	Present Value Revenues/Costs
Toll Revenues	$358,261,000
Construction Cost	$574,791,000
Operating and Maintenance Cost	$117,408,000
Rehabilitation and Replacement Cost	$41,242,000
Net	($375,180,000)

Following this initial assessment, a more detailed year-by-year cash flow analysis was undertaken to evaluate the magnitude of the funding gap based on capital market requirements and the three alternative financing structures. Similar to other start-up stand-alone toll road projects, the North Belt Freeway's initial capital costs would primarily be debt financed. Table 12 presents a summary of the results for each scenario, while Appendix A includes the Interim Financial Feasibility Report which provides the detailed cash flows for the analysis scenarios.

Based on capital markets and rating agency debt service coverage ratio and reserve requirements, the funding gap for each of the scenarios is higher than under the high level present value analysis. While the gap analysis scenarios do reduce the funding gap to some degree, it remains at least $453 million. Given the significant gap between resources and needs, an alternative delivery approach/public private partnership would be infeasible. As a result, the project's funding would be heavily reliant on external funding sources. However, a portion of the external funding could be re-paid over the project's lifecycle from the amount of revenues providing excess coverage on annual debt service. This "stranded capital" could be used after the payment of debt service on the bonds to secure a deeply subordinated loan between the project and another public entity to finance a portion of the remaining funding gap.

Table 12. Summary of Financial Analysis Options

Approach	Revenue Available	O&M Coverage/ Backup	Public Entity Debt Payment Obligation (Y/N)	Available Total Sources ($M)	Bond Rating/ Required Coverage Ratio	Remaining Funding Gap ($M)
Net pledge (Base case; optimum revenue)	Toll revenues less O&M	Toll revenues only	No	117.4	BBB-/2.5x	(561.7)
Gross pledge (Gap Analysis 1)	Toll revenues	Public Entity provides backup	No	170.7	BBB-/2.5x	(517.5)
Gross pledge plus Public Entity credit enhancement (Gap Analysis 2)	Toll revenues	Public Entity provides backup	Yes	252.9	A/2.0x	(453.1)

XV. SAFETY IMPACTS

A high level assessment of the safety impacts of the proposed North Belt Freeway on existing highways and arterials was conducted for three different scenarios: No-Build, Build (toll-free) and Build (tolled). This assessment included a quantitative analysis based on changes in traffic volumes and 2012 crash rates and a qualitative analysis based on published studies addressing safety on roads across the U.S., including toll roads.

A. QUANTITATIVE ASSESSMENT

Eight screenlines spread across the central Arkansas metropolitan area were delineated to comprehensively assess the traffic diversion and level of service impact as a result of the construction of the North Belt Freeway. Figure 23 presents the screenline locations, and Table 13 identifies the routes included in each screenline.

Detailed results of the diversion analysis for each screenline and route are included in the Impacts Analysis memorandum provided in Appendix C. A summary of the results is included in this section.

Figure 23: Screenline Locations

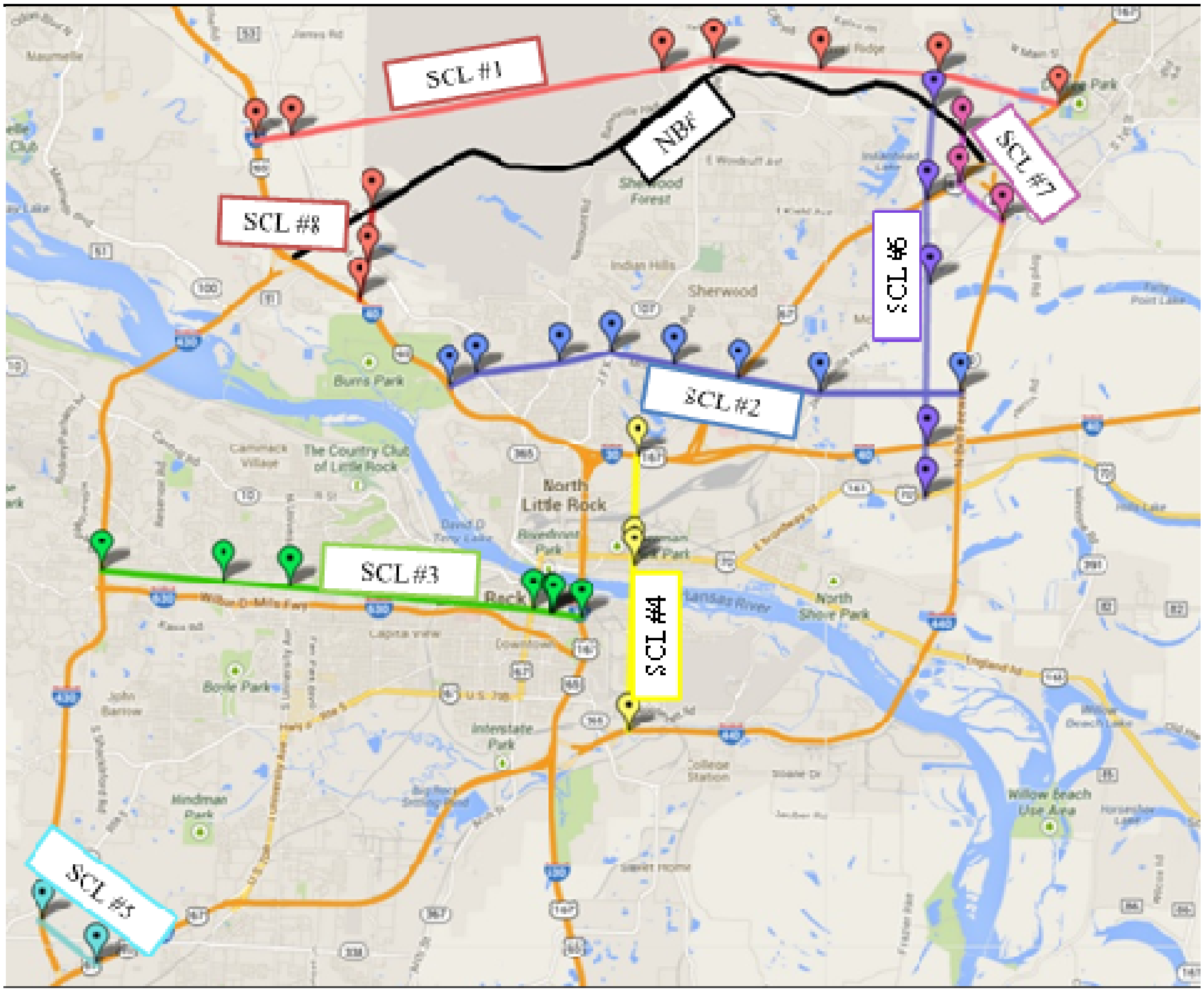


Table 13. Routes included in Each Screenline

Screenline 1: North of NBF	Screenline 2: South of NBF	Screenline 3: North of I-630	Screenline 4: East of I-30
I-40	I-40	I-30	I-440
Highway 365	MacArthur Dr.	I-30 Frtg.	E. Washington Ave.
Batesville Pike	Camp Robinson Rd.	Scott St.	E. Broadway St.
Kellogg Acres Rd.	Highway 107	Main St.	I-40
Highway 107	North Hills	Louisiana St.	
Oneida St.	Highway 67	Broadway St.	
Highway 67	Highway 67 Frtg.	S. University Ave.	
	Highway 161	S. Mississippi St.	
	Highway 440	I-430	
Screenline 5: SW Little Rock	**Screenline 6: Eastern Side**	**Screenline 7: Southeast of NBF**	**Screenline 8: Southwest of NBF**
I-430	NBF	NBF	NBF
I-30	Highway 67	Highway 67	Highway 365
	Highway 161	Highway 440	I-40
	I-40		
	Highway 70		

Construction of the North Belt Freeway will divert traffic from most of the major highways and arterials in the area, including:

- I-40 (screenlines 1, 2, 4, 6, and 8),
- I-30 (screenline 3),
- Highway 67 (screenlines 2, 6, and 7),
- MacArthur Drive and JFK Boulevard (screenline 2),
- Highway 161 (screenline 6), and
- Highway 365 (screenline 8).

Traffic volumes increase for a few select arterials that serve as feeder routes to the North Belt Freeway. For example, traffic volumes on Highway 365 (screenline 1) are forecast to increase from 9,000 vpd for the No-Build condition to 9,700 vpd for the toll-free condition and 9,800 for the tolled condition as traffic is rebalanced across screenline 1 when the toll is charged.

Construction of the North Belt Freeway improves the traffic conditions for many routes. For example, in screenline 2, traffic on I-40 for the No-Build scenario is 95,100 vpd. This volume decreases to 80,200 and 82,900 vpd for the toll-free and tolled alternatives, respectively.

Tolling reduces traffic volumes on the North Belt Freeway by 48.9 percent on the east side of the corridor (screenlines 6 and 7) and by 26.1 percent on the west side of the corridor (screenline 8). This diversion percentage is consistent with diversions observed following termination of the initial toll-free period on recently opened projects located in metropolitan areas in Texas. The observed percentage of traffic diverted (amount of traffic lost after tolling) from toll facilities in Texas ranges from 20 percent (Sam Rayburn Tollroad in Dallas) to 60 percent (Loop 49 in Tyler).

Construction of the North Belt Freeway will improve the volume to capacity (V/C) ratio for the majority of the highways and arterials (No-Build versus Toll-Free, and No-Build versus Tolled). The diversion in response to tolling the North Belt Freeway minimally decreases the V/C ratio for the facilities receiving the diverted traffic (e.g., in screenline 2 the V/C ratio for Highway 67 increases from 0.66 for toll-free to 0.69 for tolled). In the case of Highway 107 (screenline 1), the V/C ratio increases under the toll-free and tolled scenarios because Highway 107 serves as a feeder to the North Belt Freeway. Highways receiving the highest V/C ratio improvements from the construction of the North Belt Freeway include I-40 (screenline 2, 4, and 8) and Highway 67 (screenline 2 and 6).

The North Belt Freeway, a proposed four-lane divided freeway, has 2030 tolled traffic forecasts along the alignment ranging from 31,500 vpd at the western end to 12,300 vpd at the eastern end. The 2012 Arkansas statewide crash rate for urban four-lane divided freeways with an average annual average daily traffic (AADT) of 34,328 vpd is 0.73 crashes per million vehicle-miles (mvm) (Table 14). The statewide crash rate for rural four-lane freeways with an average AADT of 23,097 vpd is 0.38 crashes per mvm. The crash rate on the North Belt Freeway can be expected to fall within this range.

I-40 within the study area is a six-lane freeway with a proposed 2030 no-build traffic forecast from 95,100 vpd (on the section of I-40 located south of the proposed North Belt Freeway-screenline #2) to as high as 150,400 vpd (between I-30 and Highway 67-screenline #4). The Arkansas 2012 statewide crash rate for urban six-lane divided freeways is 0.95 per mvm. This is based upon a statewide average AADT of 73,414 vpd. Typically, the higher the AADT, the higher the anticipated number of crashes.

For the tolled scenario, construction of the North Belt Freeway will divert approximately 12,000 vpd from I-40 between I-430 and Highway 67 (screenlines #2 and #4) with the majority of these vehicles using the North Belt Freeway. This will decrease the overall number of crashes with vehicles diverting from a facility with a higher crash rate to a facility with a lower crash rate.

Construction of the North Belt Freeway will also divert traffic from Highway 67 (six-lane freeway), MacArthur Drive/Highway 365 (two- and three-lane undivided highway), Highway 107 (four-lane divided highway), and Highway 161 (two-lane undivided highway). The average statewide crash rate for the classification of each of these facilities is higher than the average statewide crash rate for the four-lane divided freeway, the classification for the North Belt Freeway.

Table 14. AHTD 2012 Crash Data

Description	Miles	Average AADT[1]	Annual VMT, in millions[2]	Number of Crashes: All Severity Types	Number of Crashes: Fatal (K)	Number of Crashes: Serious Injury (A)	Number of Crashes: Fatal + Ser. Inj. (KA)	Crash Rate: All Severity Types (per MVM)	Crash Rate: Fatal (K) (per 100 MVM)	Crash Rate: Serious Injury (A) (per 100 MVM)	Crash Rate: Fatal + Ser. Inj. (KA) (per 100 MVM)
Four-Lane Divided Highways, Full-Control of Access (Freeways)[3]											
Rural	562.07	23,097	4,738.49	1,810	25	145	170	0.38	0.53	3.06	3.59
Urban	242.47	34,328	3,038.16	2,216	23	121	144	0.73	0.76	3.98	4.74
Total	**804.54**	**26,482**	**7,776.65**	**4,026**	**48**	**266**	**314**	**0.52**	**0.62**	**3.42**	**4.04**
Six-Lane or More Divided Highways, Full-Control of Access (Freeways)[3]											
Rural	0.76	9,400	2.61	0	0	0	0	0	0	0	0
Urban	79.96	73,414	2,142.64	2,033	12	97	109	0.95	0.56	4.53	5.09
Total	**80.72**	**72,811**	**2,145.25**	**2,033**	**12**	**97**	**109**	**0.95**	**0.56**	**4.52**	**5.08**
Four-Lane Divided Highways, Partial-Control of Access											
Rural	198.56	8,013	580.78	222	5	22	27	0.38	0.86	3.62	4.65
Urban	70.59	16,204	417.52	925	4	25	29	2.22	0.96	5.99	6.95
Total	**269.15**	**10,161**	**998.30**	**1,147**	**9**	**47**	**56**	**1.15**	**0.90**	**4.71**	**5.61**
Four-Lane Divided Highways, No-Control of Access											
Rural	4.30	8,125	12.75	8	0	0	0	0.63	0	0	0
Urban	9.04	24,807	81.85	374	0	2	2	4.57	0	2.44	2.44
Total	**13.34**	**19,430**	**94.60**	**382**	**0.00**	**2**	**2**	**4.04**	**0.00**	**2.11**	**2.11**
Four-Lane Undivided Highways, No-Control of Access											
Rural	392.66	8,700	1,246.93	877	27	83	110	0.70	2.17	6.66	8.82
Urban	471.56	16,274	2,801.12	12,497	34	236	270	4.46	1.21	8.43	9.64
Total	**864.22**	**12,833**	**4,048.05**	**13,374**	**61**	**319**	**380**	**3.30**	**1.51**	**7.88**	**9.39**
Two-Lane Undivided Highways, No-Control of Access											
Rural	13,106.76	1,589	7,602.22	7,742	224	996	1,190	1.02	2.95	12.71	15.65
Urban	837.13	5,412	1,653.70	4,591	31	158	189	2.78	1.88	9.55	11.43
Total	**13,943.89**	**1,819**	**9,255.92**	**12,333**	**255**	**1,154**	**1,379**	**1.33**	**2.75**	**12.47**	**14.90**
Three-Lane Undivided Highways, No-Control of Access, Rural (Passing Lanes)											
Rural	351.79	4,577	587.75	383	13	46	59	0.65	2.21	7.83	10.04

[1] Average AADT (Annual Average Daily Traffic), measured in vehicles per day (vpd), a weighted average.

[2] VMT (Vehicle Miles Traveled), when expressed in millions, is referred to as MVM (Million Vehicle Miles).

[3] Does not include ramps or frontage roads.

AHTD:TPP:TSS:TE 05.07.2014

B. QUALITATIVE ASSESSMENT

If constructed, some motorists currently using local arterials would likely opt to use the proposed North Belt Freeway to reach their destination. Research has shown that interstate highways and toll roads are safer than other principal arterial highways. For example:

> *"Drivers on interstate highways face a lower risk of accidents than drivers on other principal arterial highways. Driving on interstate highways is safer for a number of reasons. Interstate highways typically are wider, have more lanes, and are straighter than arterial highways. But, most importantly, interstate highways have controlled access through on-ramps, while access onto many other principal arterial highways is typically uncontrolled. Vehicles entering these other highways from side roads provide a traffic hazard as they accelerate to driving speed."* [1]

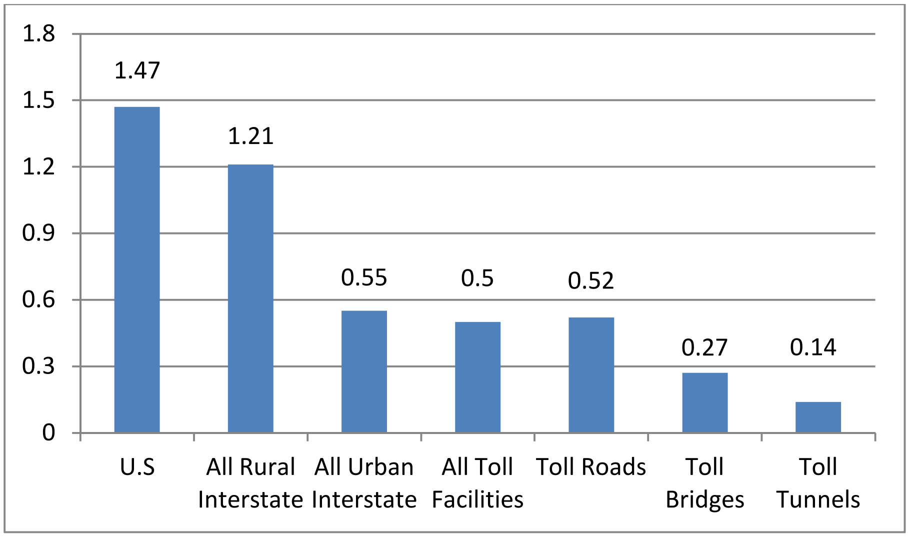
A shift in traffic to the proposed freeway facility or toll road is therefore likely to improve driving safety on the local arterials. The project would provide an alternate travel option, resulting in the physical separation of slower speed local traffic from higher speed through traffic.

The amount of diversion from the major arterials to the new facility is lower under the tolling scenario than under the non-tolled scenario, as stated earlier. However, research studies indicate that toll roads are actually safer than non-tolled interstates. This is most likely due to lower traffic levels leading to an improved level of service.

As previously discussed, construction of the North Belt Freeway will divert traffic from I-40, an Urban Interstate, onto the new facility. This diversion was forecast to be as high as 15,200 vpd in 2030 (east of I-430-screenline #8) for the Base (tolled) Scenario. The previous analysis has stated that both urban and rural four-lane freeways have crash rates that are lower than six-lane urban freeways. While the crash rate on I-40 may not decrease, there is a substantial diversion of traffic onto a facility with a lower crash rate, thereby lowering the total number of crashes in the system. Additionally, Figure 24 presents the results of a study conducted by the International Bridge, Tunnel, Turnpike Association (IBTTA) to assess the safety of toll road facilities. As illustrated on Figure 24, fatality rates for toll roads are slightly below those of all urban interstates.

[1] *Eric C. Thompson and Amitabh Chandra,* Economic Impact of Interstate Highways in Kentucky, accessed from the following website: http://cber.uky.edu/Downloads/highways.htm.

Figure 24: A Comparison of Fatality Rates Toll Entities vs. All Roads Fatalities per 100 Million Vehicle Miles Traveled, 2005[2]



XVI. CONCLUSION

In terms of safety impacts, the changes in 2030 forecasted traffic volumes under the no build, build toll-free, and build and toll scenarios indicate that construction of the North Belt Freeway could divert traffic from most of the major highways and arterials to the North Belt Freeway. The level of diversion to the North Belt Freeway from other routes decreases under the tolled scenario relative to the toll-free scenario; however, the traffic volumes on the majority of the local highways and arterials under the tolled scenario are still predicted to be below the traffic volumes under the No-Build scenario. This shift in traffic to the proposed toll road, or toll free interstate facility is therefore likely to improve driving safety on the local arterials by reducing traffic volumes.

The toll feasibility study performed for the North Belt Freeway demonstrates that the significant costs for this unique facility, when combined with its relatively short length, under today's financial market expectations for standalone start up toll projects, cannot be paid for by toll revenues alone. Projected toll revenues would cover anticipated operations and maintenance costs, while meeting the debt service coverage ratios and reserve fund requirements for the portion of project costs that are debt funded. However, a significant funding gap remains between total project needs and available resources. Therefore, options to implement the project as part of the metro area's transportation network would require the infusion of upfront financial resources. The amount of toll revenues providing debt service coverage required by rating agencies and the capital markets can be viewed as a form of stranded capital that could serve to "pay back" over time a portion of the initial funding agency(s) investment to close the up-front funding gap.

[2] *Toll* vs. *Nontoll: Toll Facilities Are Safer*, Jeff Campbell, Tollways, Winter 2008.

APPENDIX A

Federal and State Legislative Issues Technical Memorandum

North Belt Freeway Feasibility Study

Federal and State Legislative Issues Technical Memorandum

Developed by:

PFM®

KSD Consulting, Inc.

In Consultation with:

ATKINS

(FINAL)

November 2013

Table of Contents

1. Introduction

The feasibility of a toll road is dependent upon both the economic fundamentals and the legal framework supporting the project. The Atkins Team has provided separate technical memoranda describing the financial considerations for a start-up toll road project and the financial feasibility analysis that will be undertaken for the North Belt project. This technical memorandum reviews the Federal and State tolling legislation that provide the legal underpinnings of the project.

A strong legal framework is necessary for clearly defining the powers of a toll road's sponsor to undertake and maintain the project. It is an essential element that project stakeholders, elected officials, rating agencies and investors will consider when examining the viability of the project. Key provisions include the ability to independently set and raise tolls to meet the project's obligations; pledge toll revenues as security to repay debt issued to finance the project; enforce the collection of tolls through the imposition of fines, fees and other penalties on those who avoid payment; and design, construct, operate and maintain the project with the sponsor's own forces or through contracts with the private sector. The legal framework also needs to define the ongoing governance and management structure for the project sponsor to ensure that a clear line of responsibility exists to establish policy and manage the toll road's day-to-day operations.

Section 2 of this technical memorandum describes Federal provisions governing toll roads. Such provisions are important given the North Belt Freeway will be designated as a Federal interstate facility Section 3 describes State tolling legislation, while Section 4 provides the conclusion.

2. Federal Tolling Statutes (Title 23 USC Section 129)

Title 23 of the United States Code, Section 129 defines Federal requirements for toll road projects. Section 129 provides AHTD with the ability to develop the North Belt as a toll road since Federal participation is allowed for the initial construction of a new toll highway, bridge or tunnel. Other allowable projects include construction of one or more toll lanes that provide additional capacity on a non-interstate facility; construction or one or more tolled lanes providing additional capacity or reconstruction of an interstate facility so long as there is not a reduction in the number of non-tolled general purpose lanes; reconstruction and/or replacement of an existing non-tolled bridge, tunnel or non-interstate road and conversion to a toll facility; reconstruction and/or replacement of an existing tolled highway, bridge or tunnel; and conversion of a high occupancy vehicle ("HOV") lane to a toll facility. Prior to undertaking a project, a State is required to enact legislation that permits tolling.

A tolled facility may be publicly owned or privately owned if the public sponsor with jurisdiction over the facility has entered into one or more contracts with the private sector to design, construct, operate, maintain and finance the facility. Such public private partnerships are allowed so long as the public sponsor retains responsibility for complying with all of the provisions of Title 23.

Toll revenues generated by the facility are permitted to be used to pay debt service associated with projects financing, including the funding of reasonable reserves; and the toll facility's operations and maintenance, reconstruction, resurfacing, restoration and rehabilitation costs. Under a public private partnership, toll revenues may be used to provide a reasonable return on investment to a private entity financing the project and its investors, as determined by the State. In addition, toll revenues can be used for any other purpose allowed under Title 23 so long as the public sponsor annually certifies that the toll facility is being adequately maintained.

Section 129 requires the public sponsor to conduct an annual audit to ensure the toll facility is adequately maintained and that toll revenues are only applied for permitted uses. In addition, the public sponsor is to provide the audits to USDOT upon reasonable notice from the Department.

The State acting on its' or a public sponsor's behalf can seek Federal funding for the project's construction costs under applicable Title 23 funding programs. A State may also loan an amount equal to all or a portion of the Federal share (maximum of 80%) to finance a toll project's construction costs. It is important to note that this is a distinctly different financing structure from that of a TIFIA loan. The public or private entity receiving the State loan needs to ensure the project is carried out in compliance with Title 23 and other applicable Federal laws. The State loan may be subordinated to other financing for the project. The State loan will have a maximum term of 30 years and repayment is required to begin no later than five years after the project has been opened. The State determines the interest rate on the loan to be at or below market rates. State loan repayments may be used for any purpose eligible under Title 23 or to provide credit enhancement or an interest rate subsidy for other projects.

3. State Tolling Legislation

Title 27 of the Arkansas Code establishes the State's legal framework for designing, constructing, financing and operating toll road projects. Toll facilities may be undertaken by a Regional Mobility Authority ("RMA"), the State Highway Commission (the "Commission") or one or more counties for bridge projects. The following summarizes the key provisions for each of these toll facility governance frameworks.

Regional Mobility Authority (A.C.A. § 27-76-101, 201-203, 301-304)

Arkansas state statute authorizes one or more counties to create an RMA by adoption of an ordinance and by an agreement among members of the RMA that defines the terms and conditions under which it operates. An RMA's purpose is to plan, construct, operate and fund transportation projects, including toll facilities, and improvements to the existing highway system within its jurisdiction. A board of directors consisting of no fewer than five members is responsible for the RMA's governance

Powers (A.C.A. § 27-76-401)

Board members consist of the County Judge and Mayors, or their appointed representatives of the member jurisdictions. Key powers of the Authority include:

- Make and adopt all necessary bylaws for its organization and operation
- Elect officers and employ personnel for its operations
- Build, operate, maintain, expand, fund or own a transportation project or system
- Apply/receive grants
- Enter into contracts with a public or private entity to study, design, construct, operate or repair a toll facility. Plans for RMA projects must be consistent with metropolitan and state transportation plans and programs
- Enter into development agreements with a public or private entity for the design, construction and financing of a toll facility. However, the RMA is prohibited from guaranteeing the obligations of the public entity or private entity developing the project.
- Acquire property
- Enter into agreements with the State Highway Commission, AHTD or other RMA's.
- Impose and collect tolls for a toll facility project owned or operated by the RMA. However, voter approval is required for the initial imposition of tolls and the toll rate. Initial voter approval is not typical for a start-up toll road project. To mitigate this risk from a project's financing, it will be important for an RMA to secure such approval in advance of the marketing and sale of the bonds.
- Impose and collect user fees for other transportation projects including transit, ferries, rail, parking and intermodal facilities
- Develop and utilize financing options and issue revenue bonds. However, voter approval is also required for the maximum principal amount of the proposed debt. Likewise such approval is necessary prior to the marketing and sale of the bonds.

Toll Setting and Payment (A.C.A. § 27-76-601, 701, 703, 705, 708, 710, 713)

RMA's are only allowed to impose tolls as part of the construction of a new highway project (new highway capacity); existing highways cannot be tolled. An RMA toll facility cannot be leased or sold to a private entity. However, it can sell or lease a toll facility to another public entity.

In addition to revenues generated from a toll road project, an RMA may receive revenues from city or county imposed sales tax, motor vehicle tax, user fees imposed for other non-toll transportation projects, and state funding. The imposition of tolls and the application of county and/or city taxes are subject to voter authorization.

An RMA is authorized to set toll rates so that toll revenues and any other sources received are sufficient to cover the project's construction costs; operations, maintenance and repair costs; debt service; and any reserves. The toll rate and structure imposed is required to be competitively neutral and nondiscriminatory towards the users of the toll facility.

The enabling statute also includes provisions that require payment of tolls from all users of the RMA's toll facility. Exceptions are granted to emergency vehicles. The RMA may offer reduced toll rates such as discounts for electronic tolls or free passage for any particular class of vehicle it determines. Toll violations are considered to be an administrative offense. The RMA has the authority to collect an unpaid toll from a violator and impose an administrative fee of up to $100. The collection notice is required to be sent within 30 days of the date of the violation and is repaid within 30 days after the notice was mailed.

Failure to pay a toll is subject to prosecution. If the violator pleads guilty, or no contest or is found guilty, the violator is guilty of a Class B misdemeanor under State law which is punishable with a sentence not to exceed 90 days and a fine of up to $1,000.

Debt Provisions (A.C.A. § 27-76-602-611)

An RMA may issue bonds secured by revenues of a toll facility to finance its development and construction. Revenue bonds are authorized by a resolution of the RMA's board. The resolution defines the pledge of revenues to bondholders; the toll rates charged to generate sufficient revenues to pay debt service when due; and the form, denomination, interest rate and covenants for the bonds. The maximum term for RMA bonds is 40 years, which is standard for start-up toll road projects. Key covenants include the pledge of security for debt service payments, establishment and maintenance of reserves, collection of toll revenues and their application in the flow of funds to meet the project's obligations, use of bond proceeds and state of good repair of the project. The RMA statute also provides the authority to establish a trust indenture that defines in detail the contractual obligations of the RMA to pledge the project's revenues and make its covenants to bondholders.

Bond proceeds are allowed to be used for construction, improvement and extensions of a project; interest payments during construction; cost of issuance and necessary reserves. Debt service on the bonds is solely paid by pledged revenues and is not an obligation of the State or an RMA member county or city.

If after paying operations, maintenance, debt service, repair expenses and maintaining reserves the RMA determines it has surplus funds, it may reduce toll rates or spend the surplus on other transportation projects within its jurisdiction. It is important to note that the reduction of toll rates or the use of surplus revenues for other projects will be subject to the RMA's compliance with its covenants to bond holders in the trust agreement including its adherence to minimum toll rates and state of good repair of the project. In addition, an RMA would need to consider whether a reduction in toll rates or use of surplus funds, even if in compliance with the trust indenture, would be viewed negatively by rating agencies and investors as an action that dilutes bond holder protections and the toll facility's financial flexibility.

State Toll Roads *(A.C.A. § 27-90-201-215)*

The Commission is authorized, by Arkansas statute, to develop toll roads, known as turnpike projects, on the State Highway System. Turnpike projects are constructed in accordance with the rules governing State highways. The statue also allows the Commission to undertake projects utilizing a design-build framework including the bundling of design, construction, operation, finance and maintenance functions.

The Commission has the authority to independently fix and revise tolls on turnpike projects; apply for and receive grants from the Federal government, State or other entity; issue revenue bonds to finance projects; employ staff and consultants; enter into joint project development agreements with the Federal government, State or other agreements.

Turnpike project toll revenues can be used as security for revenue bonds, pay operations, maintenance and repair expenses, fund reserves, pay debt service on other turnpike projects and for any other lawful purpose.

Revenue bonds issued to finance turnpike projects are authorized through a Commission resolution and subject to the terms and covenants established in a trust indenture. The provisions governing turnpike revenue bonds are comparable to those for RMA revenue bonds.

Toll Bridge Franchises (A.C.A. § 27-86-201-211)

Counties are authorized to grant an exclusive franchise/enter into a contract with a private entity for the development of a toll bridge running over or alongside a body of water. A franchise for a toll bridge crossing a navigable waterway is subject to Federal approval. In addition, a public notice and hearing is required once an application for a franchise has been filed with a County.

Counties have the authority to set toll rates. Tolls are to be based on a reasonable return for the amount invested and on-going expenses. The County can adjust toll rates if it determines that revenue yield is less than or greater than a reasonable rate of return. Affected citizens may appeal a County's actions related to a toll bridge franchise. Such an appeal would be tried in circuit court.

The State Highway Commission is authorized to purchase a privately owned toll bridge based upon rules and regulations promulgated by the Commission. If the Commission is unable to purchase a privately owned bridge, it has the authority to construct a parallel facility. While this provision protects the State's interests, it puts the private sector at a considerable disadvantage where it may feel its ability to receive a fair value is constrained by the State's power to construct a parallel facility. The presence of this provision could discourage the development of private toll bridges.

The Commission is also authorized to set toll rates for any privately owned toll bridge that is part of the State Highway System. In establishing toll rates, the Commission will consider the interests of the owners of the toll bridge, the public and bondholders. Bonds are only secured by the toll revenues of the bridge and are not a debt of the State.

4. Conclusions

Federal and State tolling statutes provide a strong framework for the development of the North Belt Freeway project as a toll road. AHTD and Metroplan appear to have the option of pursuing the project through either the RMA or Commission turnpike framework. Both provide the option to undertake the project as publicly or private developed facility, including the use of a design, build, operate finance and maintain structure. State statute provides clear authority for the issuance and payment of revenues bonds secured by tolls and the ability to receive non-toll funding sources. Rate setting and authority to issue project debt rests with the Commission or RMA, as applicable. However, the RMA structure requires voter approval for the initial toll rates and debt issuance—which introduces a significant element of project risk that would need to be resolved prior to the marketing and issuance of the bonds.

APPENDIX B

Proposed Cost Estimating Methodology and Assumptions

North Belt Freeway Feasibility Study

Proposed Cost Estimating Methodology & Assumptions

Developed by:

ICA Engineering

In Consultation with:

ATKINS

FINAL

March 2014

The Atkins team is currently conducting a toll feasibility study for the North Belt Freeway. One of the key inputs to the feasibility analysis is the capital cost estimate to construct the proposed facility. The North Belt Freeway is proposed as a four-lane, limited-access facility between I-40 and Highway 67 in Central Arkansas. The corridor spans approximately 13 miles completing the connection between I-430 in the west and Highway in the east.

The purpose of this memorandum is to outline and request concurrence on the proposed methodology that will be implemented to develop the capital cost estimates for both the roadway and the tolling infrastructure. This methodology, which was established primarily based on the available design files provided by AHTD and the preferred alternative route described in the Final Environmental Impact Statement (FEIS), is summarized below.

1. Cost estimates will be based upon the following preliminary typical sections as depicted in Attachment 1:

    a. First mainlane proposed typical section - a four-lane depressed median controlled access facility with 12 foot lanes and 10 foot outside and 6 foot inside shoulders.
    b. Second mainlane proposed typical section - a four-lane controlled access facility with a median barrier with 12 foot lanes and 10 foot outside and 10 foot inside shoulders.
    c. One-lane interchange ramp.
    d. Two-lane side road and a four-lane side road.

2. The cost estimate will assume a concrete barrier through the Camp Robinson sections of the project and a cable barrier system along the sections that do not have a concrete median.

3. A Preliminary 19-inch thick Pavement Design consisting of 12 inches of portland cement concrete pavement, 1 inch of ACHM surface course (used as a bond breaker), and 6 inches of cement stabilized crushed stone base course will be used to estimate the mainlanes and ramps pavement costs. This section is consistent with pavement designs used along Highway 67 in Pulaski County. The proposed 19-inch depth should be reviewed for appropriateness when final traffic projections are available. Any proposed modifications based on forecasted traffic volumes will be transmitted to AHTD for approval.

4. A Preliminary 12-inch thick Pavement Design consisting of 5 inches of ACHM Base Course, 3 inches of ACHM Binder Course, and 4 inches of ACHM Surface Course will be used to estimate the side road pavement costs. The proposed 12-inch depth should be reviewed for appropriateness when final traffic projections are available. Any proposed modifications based on forecasted traffic volumes will be transmitted to AHTD for approval.

5. Preliminary survey data provided by the Department will be used to prepare a digital terrain model (DTM). The DTM will be used to prepare a preliminary vertical alignment for the provided horizontal alignment shown in the FEIS. This preliminary vertical alignment along with the preliminary proposed typical section will be used to estimate earthwork for the project. Additionally, DTM, available FEMA mapping, and engineering judgment to evaluate the area

between Highway 107 and Highway 67 for hydraulic openings to estimate the type of structure that might be need such as a bridge or a box culvert.

6. The capital cost estimate for the tolling infrastructure and equipment will be developed by Atkins assuming that AHTD or another entity will operate a Customer Service Center (CSC) for the proposed facility with sufficient capacity to include the North Belt Freeway transactions. The Customer Service Center would handle all transponder-based and video transactions and would process violations. It will be assumed that the CSC will be housed in an existing entity's office space and no new building construction is needed. However, the cost of the equipment housed in the CSC will be included. Additionally the infrastructure costs to install equipment/fiber to transmit data from the tolling site to the CSC will be included as the CSC capital cost.

   The cost of operations will be based on a per transaction cost that will account for assumed personnel and equipment costs for the CSC and maintenance of the tolling systems. Overhead costs associated with the CSC building (i.e., electricity, water) will not be included as they are assumed to be absorbed as part of the existing entities overall operating costs.

   The estimate will assume all electronic toll collection, whereby transactions are recorded at the roadside tolling points and transmitted via fiber optic cable along the corridor to a host toll system and to the Customer Service Center for processing. This approach is consistent with the Moving Ahead for Progress in the 21st Century Act (MAP-21) provisions which require that all Federal-aid highway toll facilities implement technologies or business practices that provide for the interoperability of electronic toll collection by October 1, 2016. To minimize costs, at this stage of the concept development, the toll system is proposed to include one host toll site for the project.

   Based on the description provided above, the toll system estimate developed for this analysis will include the capital cost of the roadside tolling point including the cost of the gantry structure, associated tolling equipment, and a "technical shelter." The technical shelter would house tolling point electronics for the tolling system, network communications, security/access control, and supporting utilities. This is also where the long haul fiber and power would connect to the toll system. For purposes of this analysis, fiber optic cable will run along the length of the corridor.

7. The project cost estimate will be prepared for the following segments

   - I-40 / I-430 to Highway 365 (Segment #1)
   - Highway 365 to Highway 107 (Segment #2)
   - Highway 107 to Highway 67 (Segment #3)

8. Interchange costs will be developed for proposed interchanges at I-40, Highway 365, relocated Batesville Pike, Highway 107, and Highway 67/I-440. Interchange capital costs will be included in one of the segments identified above if the interchange is located at the termini of a segment such as the Highway 107 and Highway 365 interchanges.

9. Grade separation costs will be developed for UPRR, Nebraska Ave, Missouri Ave, H Street, New York Ave, 6th Street, Kellogg Acres Rd, and Oneida St. Costs for roadway and bridges will be prepared by developing a side road typical section and estimating bridge costs based on a prepared costs per square foot of bridge deck. The cost estimate will be based on the assumption that the main lanes will go over the UPRR, Kellogg Acres, and Oneida. For the remainder of the project, it will be assumed that the side roads will go over the main lanes for the remainder of the crossings.

10. Maintenance of Traffic will be based on engineering judgment at interchange and crossing road locations.

11. Once the base construction cost has been developed an additional miscellaneous cost equal to 20% of the base construction cost will be added to account for incidental items such as signing, guardrail, concrete ditch paving, traffic signals, etc. that cannot be quantified at this time based on the level of information currently available. The proposed percentage is similar to costs used on other planning projects in central Arkansas such as the Highway 67 Planning Study.

12. Consistent with AHTD Standard Specifications, mobilization will be estimated at 5% of the base construction cost. An additional 20% of the base construction cost will be included to account for engineering and contingencies during construction, including design/review time and material costs for change orders that may occur during construction. These items will be identified as separate line items from the base construction cost but will be included in the total construction cost.

13. There is one identified large overhead power line to the east of Highway 107 that crosses the proposed alignment; however, the preliminary vertical alignment that has been prepared allows for the proposed roadway to go under the overhead power line and not require relocation. There have not been any other major utilities identified based on the provided topographic information. Therefore, no costs will be included for utilities in the estimate.

14. Aerial photography will be used to estimate land use and develop a cost per acre for right of way costs. The right of way width will be based on an average width for the project. The average cost per acre, based on current or recent real estate transactions is estimated at $15,000 per acre. Additional costs will be included to incorporate the cost associated with existing structures located on the properties. These costs will be developed based on the following averages:

    - Residential structures - $175,000 per structure
    - Commercial structures - $550,000 per structure
    - Other - $25,000 per structure

    Costs associated with the acquisition process, including legal and administrative services, displacee re-locations, expert witnesses, condemnation, etc. will be estimated at 11% of the property costs.

15. The following presents the methodology for determining the total project cost:

- Environmental Clearance - $90,000*
- Preliminary Engineering – 4% of total construction cost
- GEC Management & Oversight – 1% of total construction cost**
- Final Engineering – 8% of total construction cost
- Construction Engineering and Inspection – 10% of total construction cost

*Although a ROD for the North Belt Freeway was issued on September 23, 2008, a re-evaluation may be required to address tolling.
** Although AHTD typically conducts oversight activities, should the project move forward as a toll project, an independent GEC will be needed.

16. The cost estimate will include both a 2013 estimate and a year of expenditure estimate based on the following inflation methodology and the draft implementation schedule presented in Table 1:

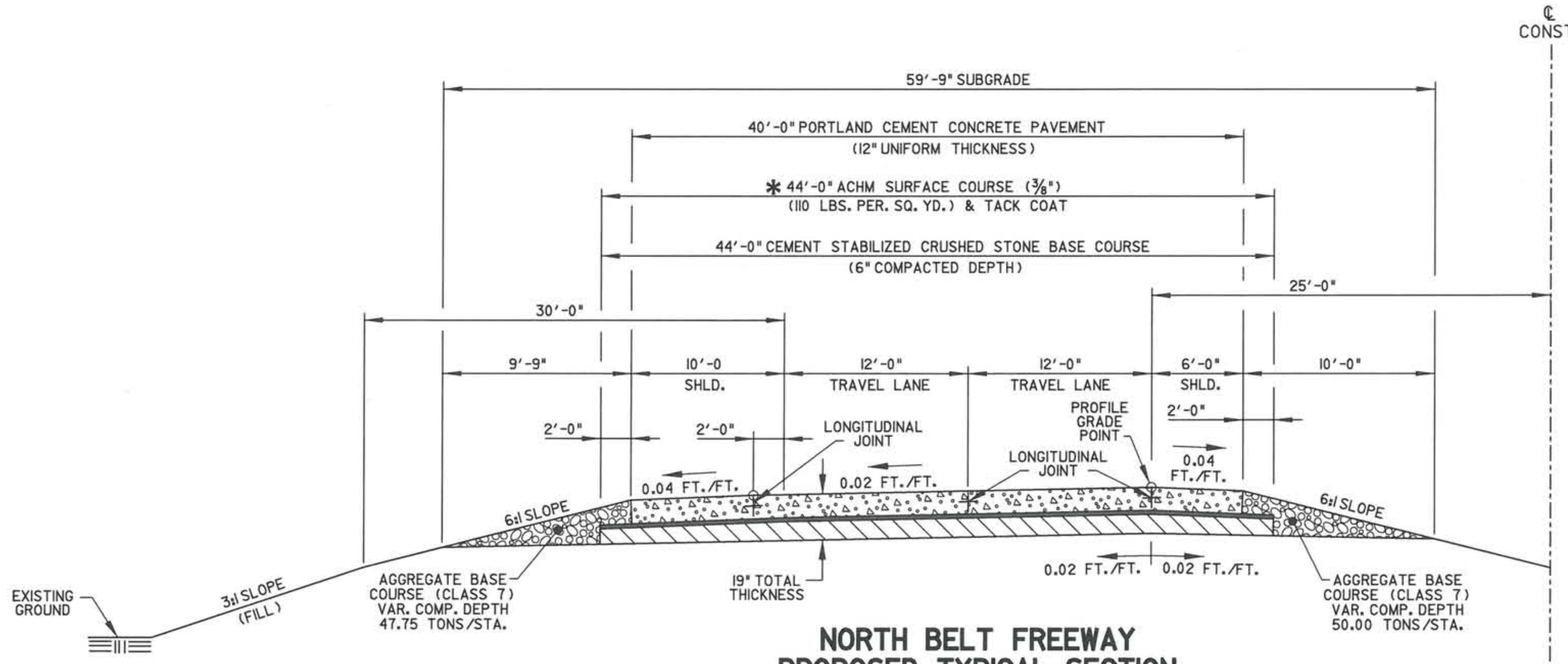
With the exception of ROW, the base year cost for each cost element will be escalated to the first year of the activity based on an annual inflation rate of 2.5 percent per year. ROW acquisition is assumed to occur in 2017 upon completion of the preliminary engineering and the 2013 ROW cost will be inflated to July 2017 or the midpoint of the activity.

Table 1. Assumed North Belt Freeway Implementation Schedule

North Belt Freeway							
Cost Element	Begin	End	2015	2016	2017	2018	2019
Environmental Clearance[1]	January-16	December-16					
Preliminary Engineering	January-16	December-16					
GEC Management & Oversight	January-16	December-19					
Final Engineering	January-17	December-17					
Right of Way Acquisition	January-17	December-17					
Construction	January-18	December-19					
Construction Engineering & Inspection	January-18	December-19					
1. Re-evaluation for tolling only.							

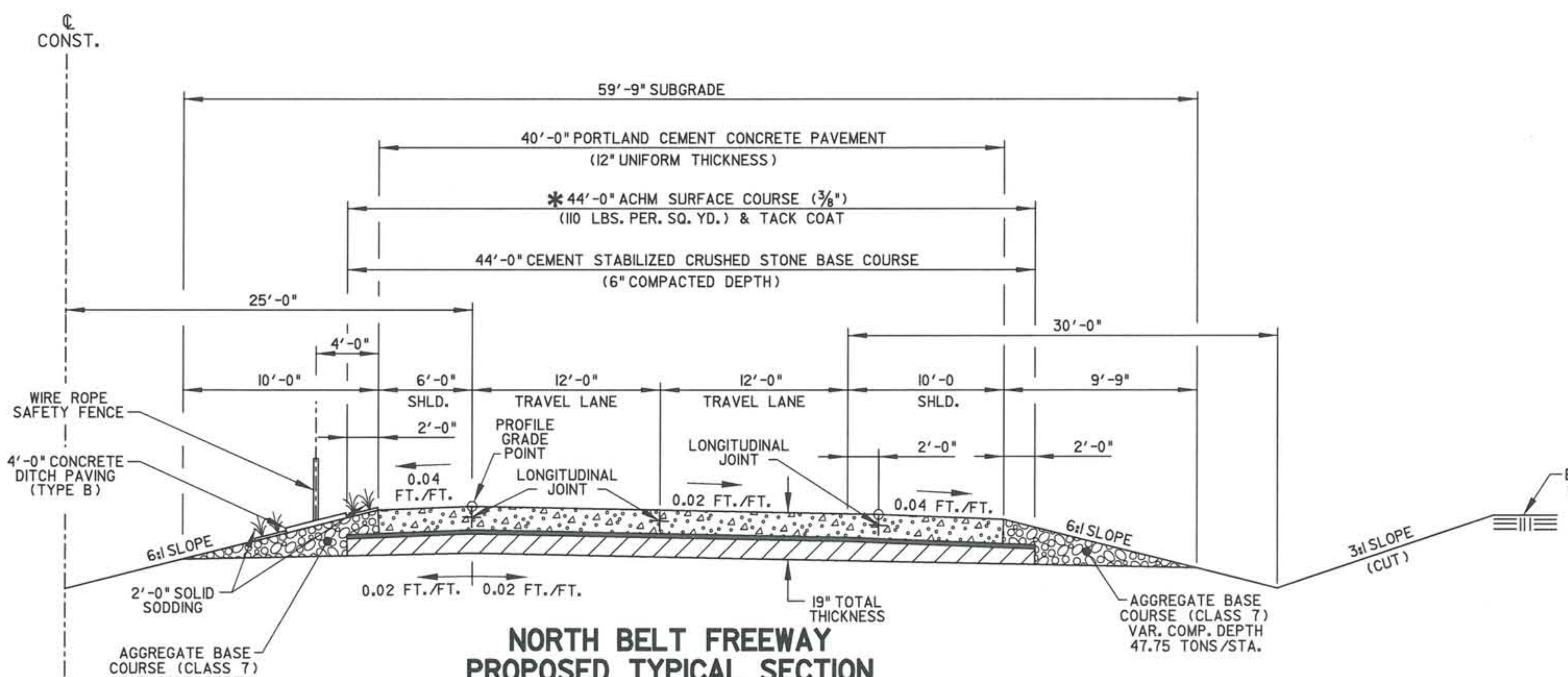
1. Re-evaluation for tolling only.

Attachment A
North Belt Freeway Proposed Typical Sections



NORTH BELT FREEWAY
PROPOSED TYPICAL SECTION
LEFT MAIN LANES
A-A

* DENSITY REQUIREMENTS WAIVED



NORTH BELT FREEWAY
PROPOSED TYPICAL SECTION
RIGHT MAIN LANES
A-A

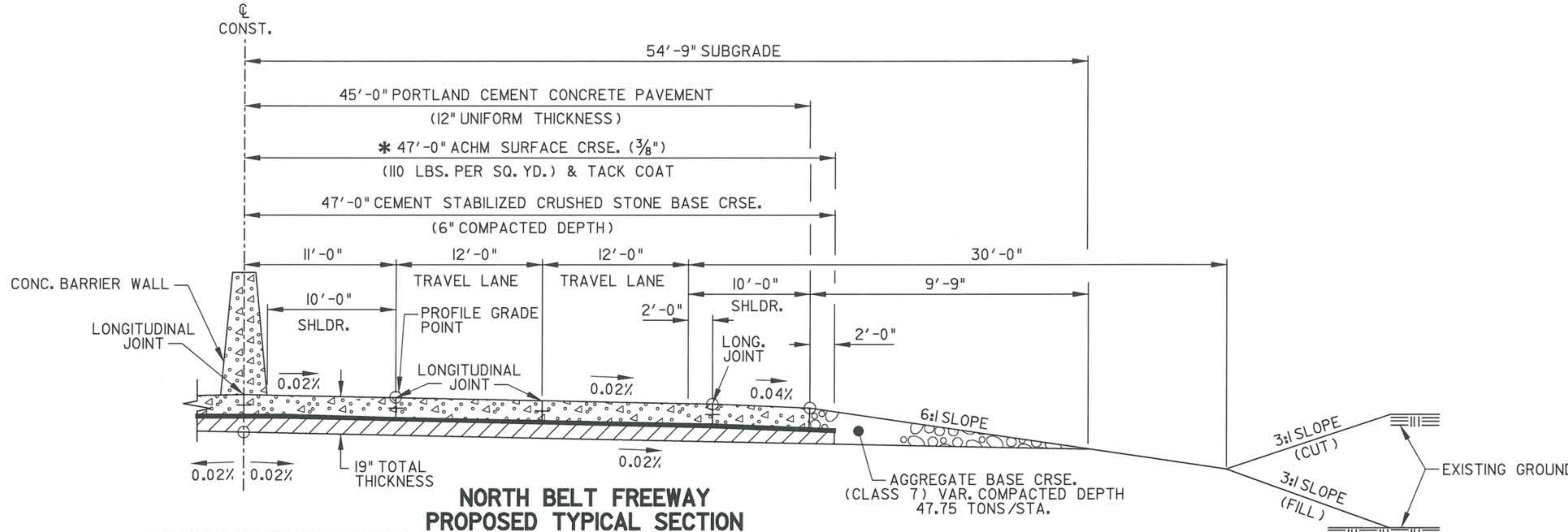
* DENSITY REQUIREMENTS WAIVED

PRELIMINARY - NOT FOR CONSTRUCTION

ICA Engineering
320 Executive Court, Suite 100
Little Rock, AR 72205
501.907.7153
www.icaeng.com

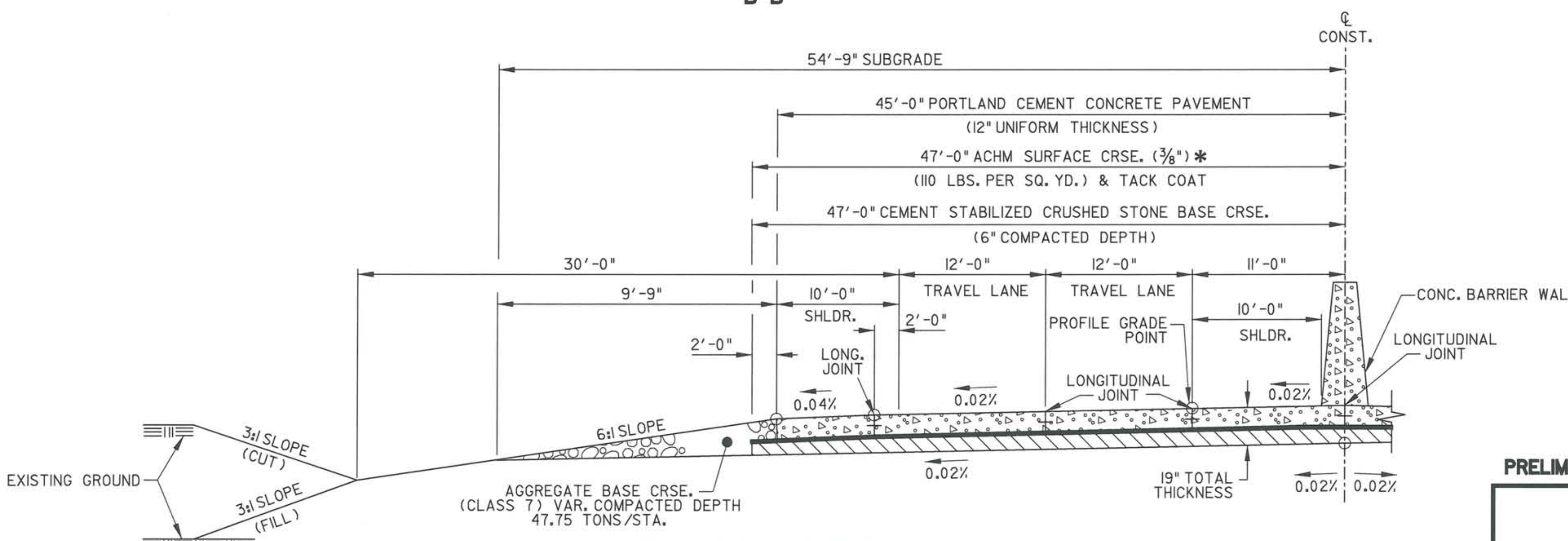
NORTH BELT FREEWAY FEASIBILITY STUDY
TYPICAL SECTIONS

COUNTY: PULASKI	DISTRICT: 6	JOB: 061386



* DENSITY REQUIREMENTS WAIVED

NORTH BELT FREEWAY
PROPOSED TYPICAL SECTION
LEFT MAIN LANES
B-B



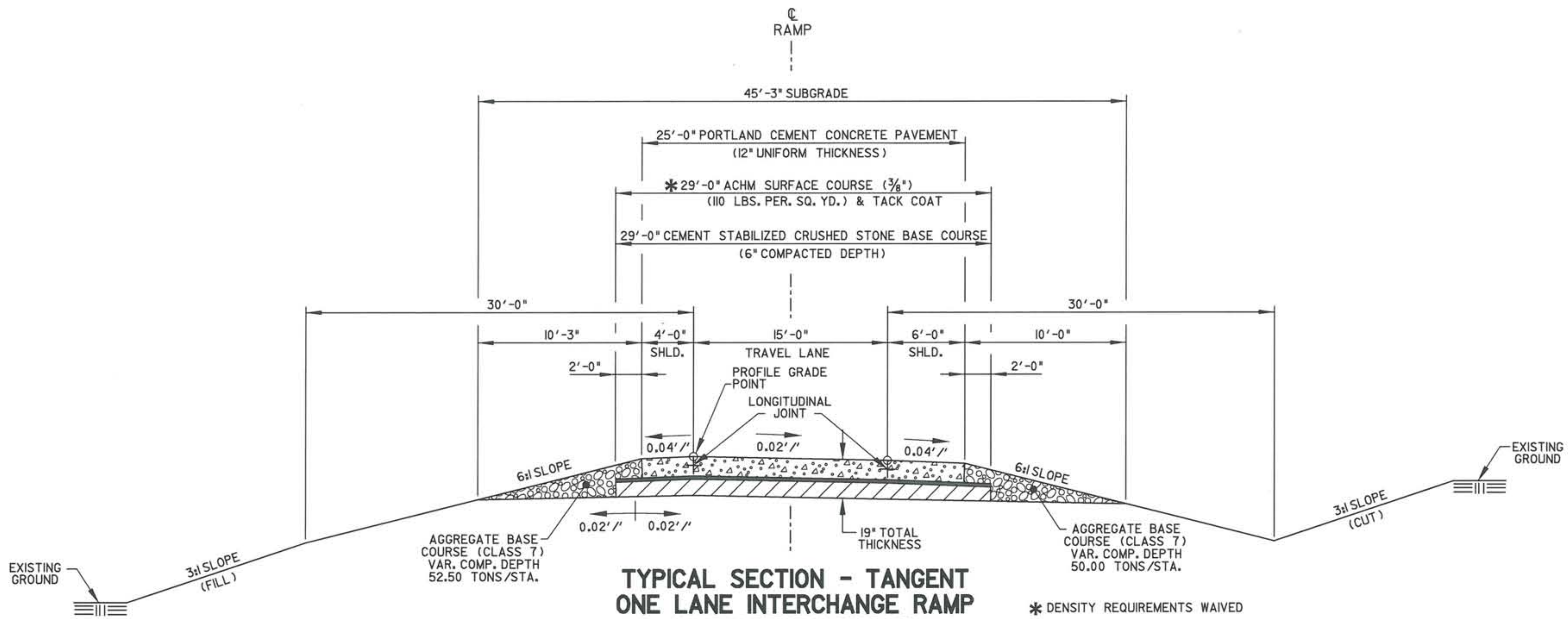
NORTH BELT FREEWAY
PROPOSED TYPICAL SECTION
RIGHT MAIN LANES
B-B

PRELIMINARY - NOT FOR CONSTRUCTION

ICA Engineering
320 Executive Court, Suite 100
Little Rock, AR 72205
501.907.7153
www.icaeng.com

NORTH BELT FREEWAY FEASIBILITY STUDY
TYPICAL SECTIONS

COUNTY: PULASKI	DISTRICT: 6	JOB: 061386



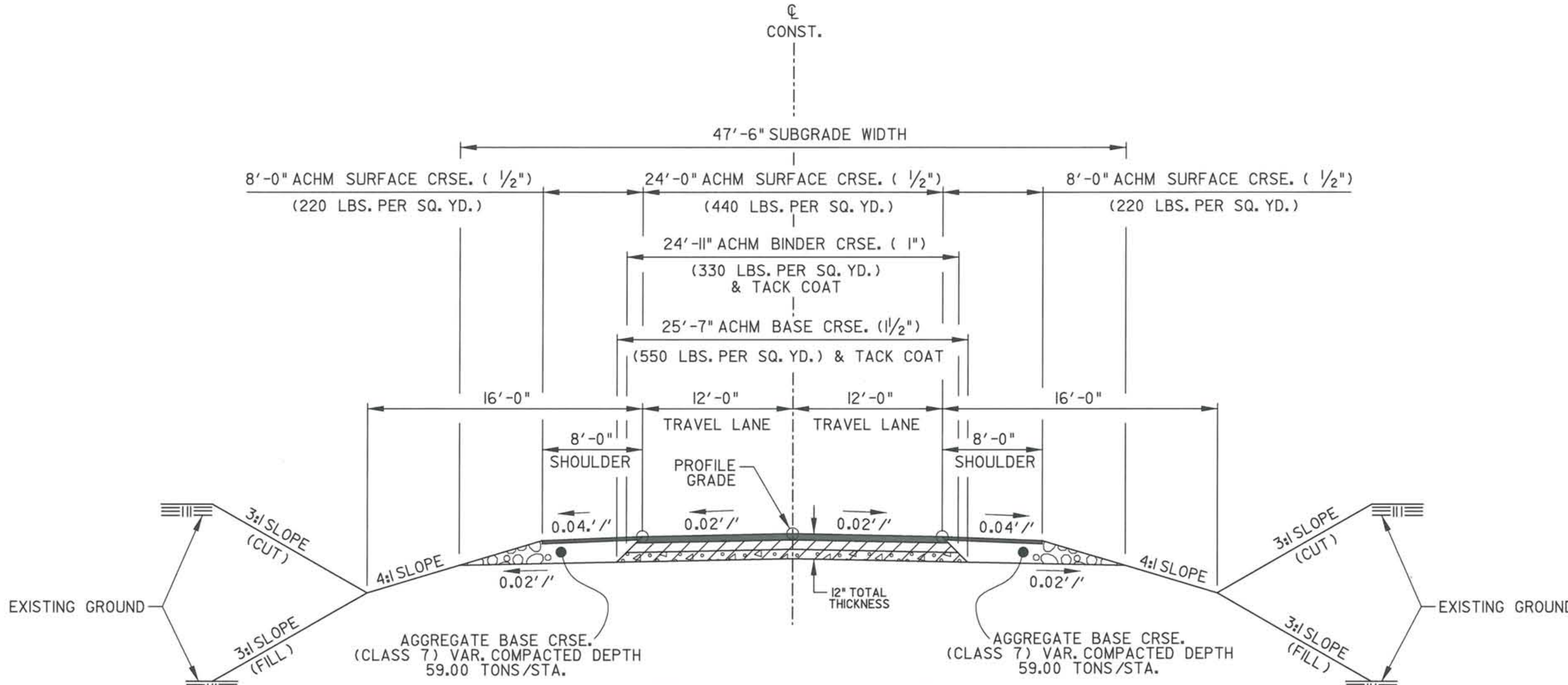
TYPICAL SECTION - TANGENT
ONE LANE INTERCHANGE RAMP
(SHOWN IN DIRECTION OF TRAFFIC)

PRELIMINARY - SUBJECT TO REVISION

ICA Engineering
320 Executive Court, Suite 100
Little Rock, AR 72205
501.907.7153
www.icaeng.com

NORTH BELT FREEWAY FEASIBILITY STUDY
TYPICAL SECTIONS

COUNTY: PULASKI	DISTRICT: 6	JOB: 061386



TYPICAL SECTION - TANGENT
2-LANE CROSSING ROAD

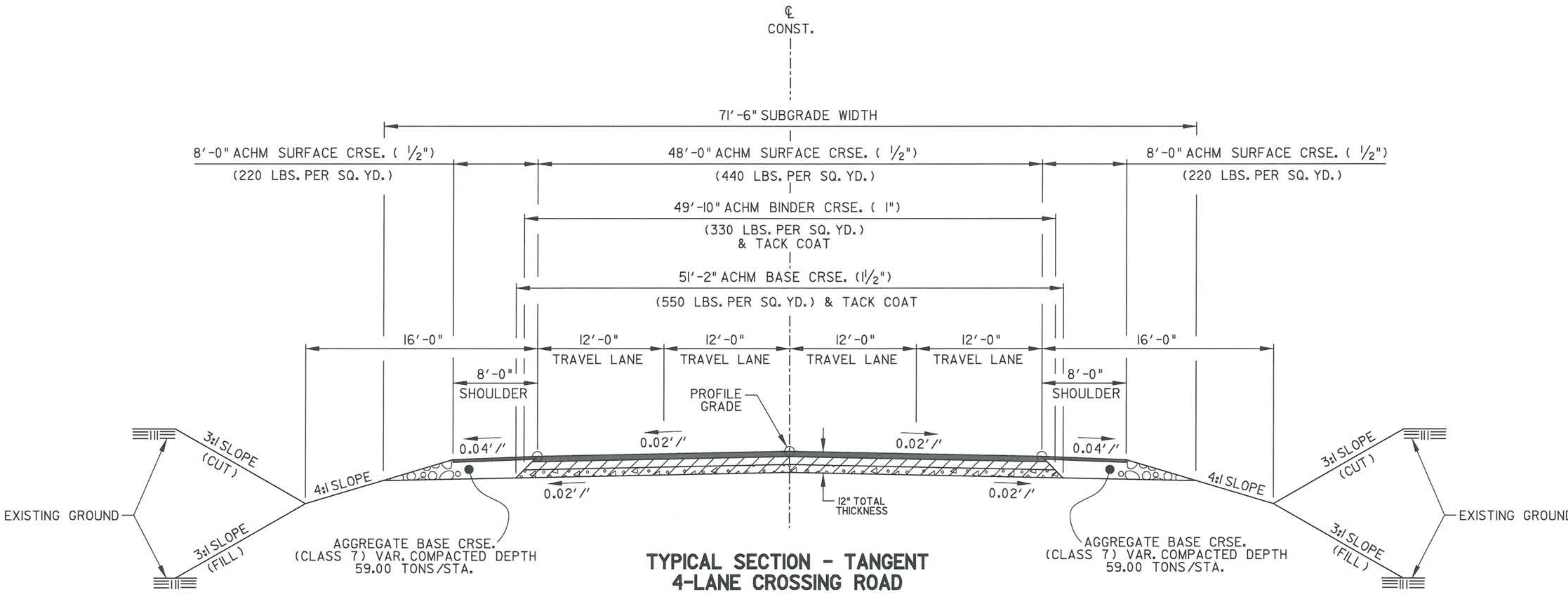
HWY. 365
NEBRASKA AVE.
MISSOURI AVE.
H ST.
NEW YORK. AVE.
6TH ST.
BATESVILLE PIKE
KELLOGG ACRES RD.
ONEIDA ST.

PRELIMINARY - SUBJECT TO REVISION

ICA Engineering
320 Executive Court, Suite 100
Little Rock, AR 72205
501.907.7153
www.icaeng.com

NORTH BELT FREEWAY FEASIBILITY STUDY
TYPICAL SECTIONS

COUNTY: PULASKI	DISTRICT: 6	JOB: 061386



TYPICAL SECTION - TANGENT
4-LANE CROSSING ROAD

HWY. 107

PRELIMINARY - SUBJECT TO REVISION

ICA Engineering
320 Executive Court, Suite 100
Little Rock, AR 72205
501.907.7153
www.icaeng.com

NORTH BELT FREEWAY FEASIBILITY STUDY
TYPICAL SECTIONS

COUNTY: PULASKI	DISTRICT: 6	JOB: 061386

APPENDIX C

Impact Analysis Memorandum

North Belt Freeway Feasibility Study Impact Analysis Memorandum

Developed by:

ATKINS

FINAL

In Consultation with:

Baez Consulting, LLC

June 2014

I. INTRODUCTION

The Arkansas Highway Transportation Department (AHTD) and METROPLAN commissioned a study to evaluate the financial feasibility of constructing the North Belt Freeway as a tolled facility. The North Belt Freeway is proposed as a four-lane, limited-access facility between Interstate 40 (I-40) and Highway 67. The corridor spans approximately 13 miles completing the connection between I-430 in the west and Highway 440 in the east (see Figure 1). The feasibility study scope also includes a high level assessment of the safety impacts of the proposed project. This impact analysis memorandum documents the safety impact assessment component of the study. In summary, it describes the methodology implemented to quantify the volume of traffic diverted to competing facilities, presents the diversion analysis results, and provides a qualitative assessment of the potential safety impacts of the proposed project relative to the existing roadways.

II. EXISTING CONDITIONS ON MAJOR ARTERIALS AND SURFACE STREETS

Most of the major highways in the Little Rock metropolitan area have two or three lanes in each direction with speed limits ranging from 60 to 65 miles per hour (mph). Highway 107 and Highway 176 which are in close proximity to the proposed project (see Figure 2) are primarily two lanes in each direction with speed limits ranging from 35 mph to 55 mph. The area surrounding Highway 107 from Kellogg Acres Road to downtown Little Rock is highly developed with many traffic signals and school zones. Speed limits in this area are reduced to 35 mph. Highway 176 is also highly developed in the section between downtown North Little Rock and West Maryland Avenue. From West Maryland Avenue to the community of Gibson, Highway 176 is one lane in each direction and traverses through relatively undeveloped land. Most of the major employment centers in the Central Arkansas metropolitan region are located along the I-630 corridor in downtown Little Rock.

Afternoon congestion levels in the vicinity of the proposed project were observed during a site visit conducted on June 27, 2013. During the afternoon peak period (4:30 to 5:15 pm) severe congestion was observed in the eastbound direction of I-30 between I-630 and I-40; and the eastbound direction of I-40 from I-30 to Highway 67 (see Figure 3). During this period, the average speed from the I-30/I-630 interchange to Highway 67/McCain Boulevard ranged from 33 mph to 42 mph. The congestion on I-30 eastbound occurs as traffic merges from I-630 and the loops connecting Cumberland Street. On I-40 eastbound, congestion occurs due to high volume traffic from I-30 eastbound merging with I-40 eastbound traffic. This merging area is very turbulent because traffic traveling from I-30 eastbound to Highway 67 northbound must weave to the interior lane (adjacent to inside shoulder) to access Highway 67 (see Figure 4); on the other hand, traffic traveling on I-40 eastbound and continuing eastbound must cross over to the exterior lanes (adjacent to outside shoulder). The peak period congestion observed during the afternoon occurs in the reverse (southbound/westbound) direction during the morning peak period.

Figure 1. Proposed North Belt Freeway Project Location Map

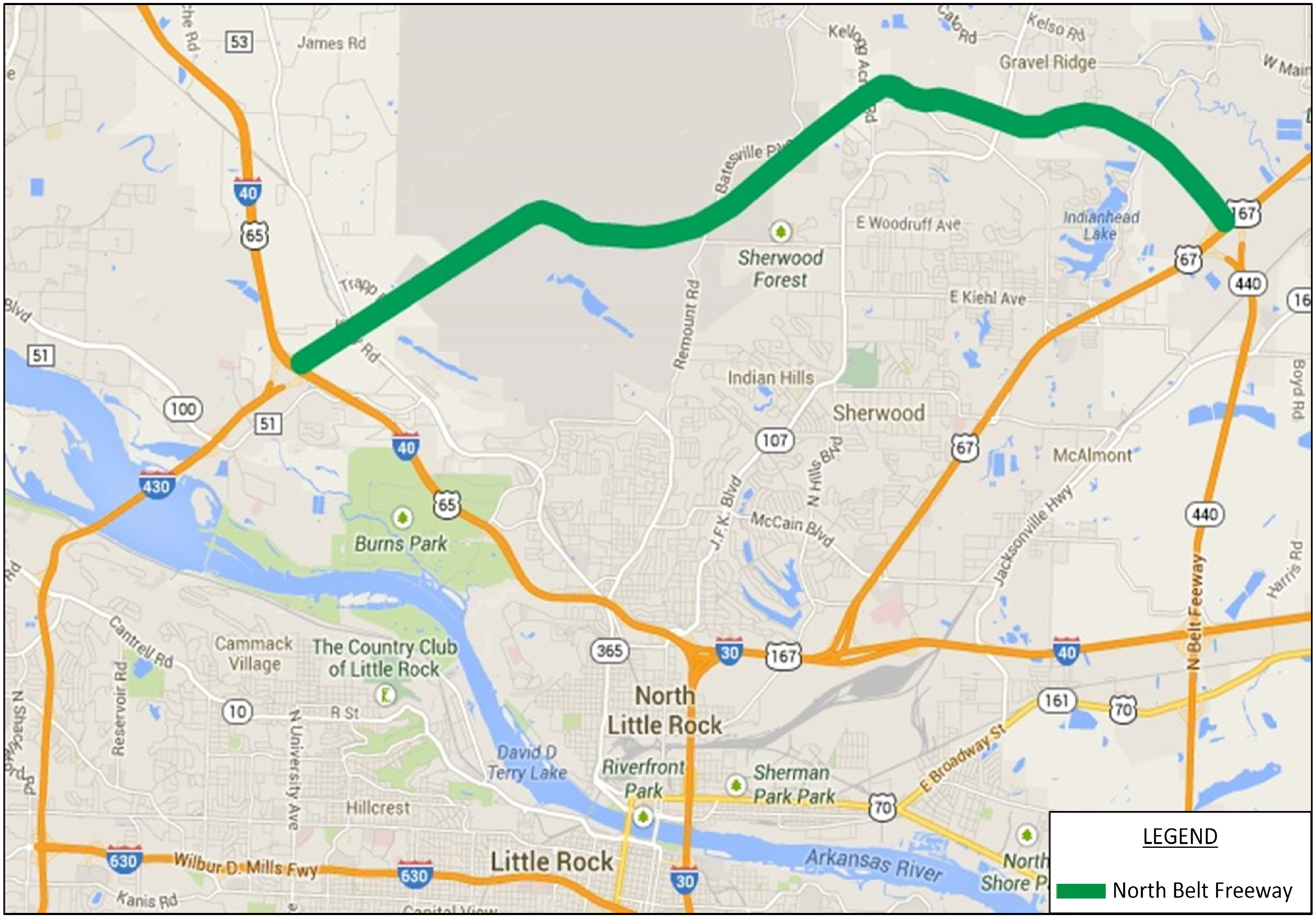


Figure 2. Major Existing Arterials in Proximity to Proposed North Belt Freeway Project

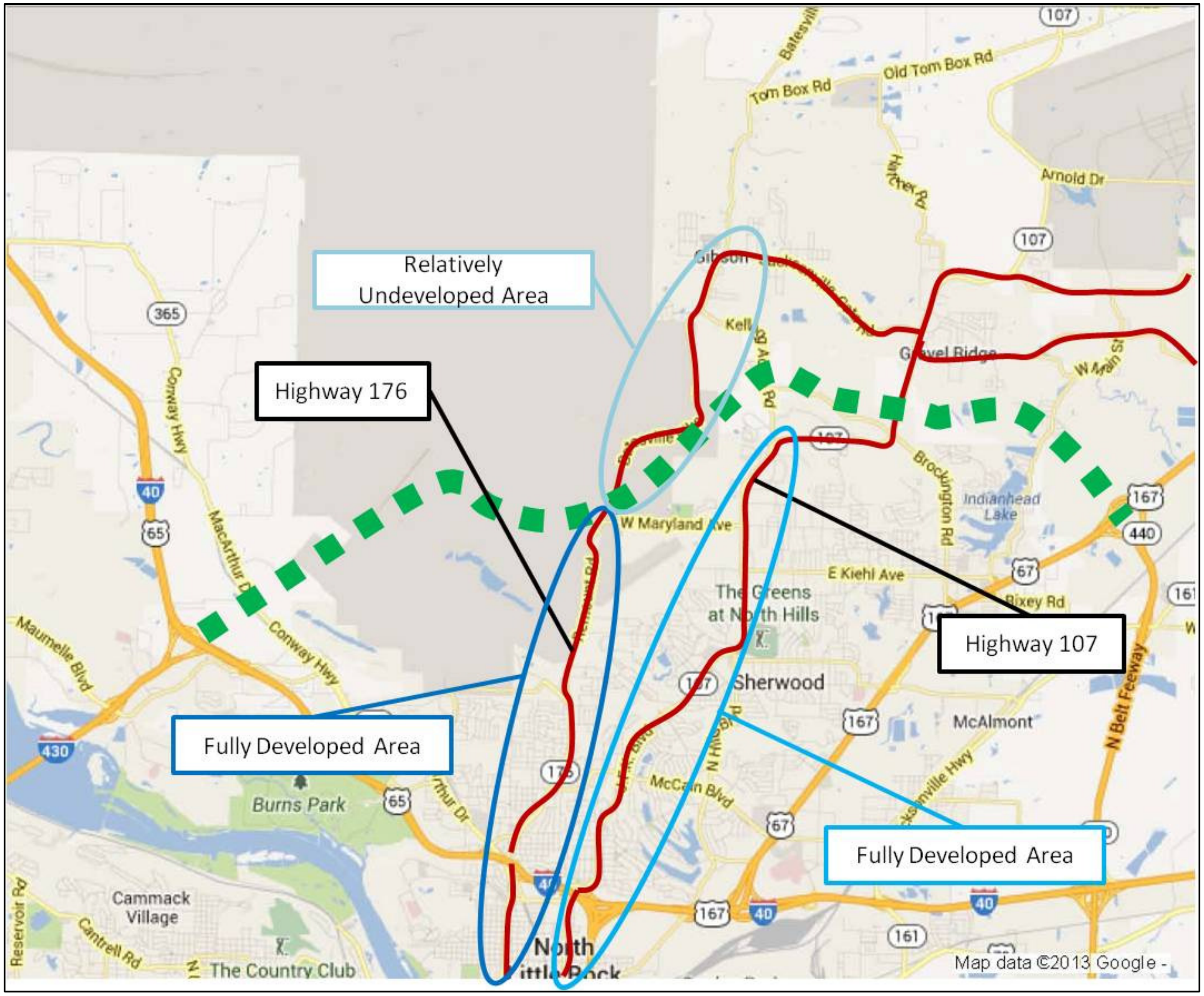


Figure 3. Merging Area of Severe Congestion Afternoon Peak Period

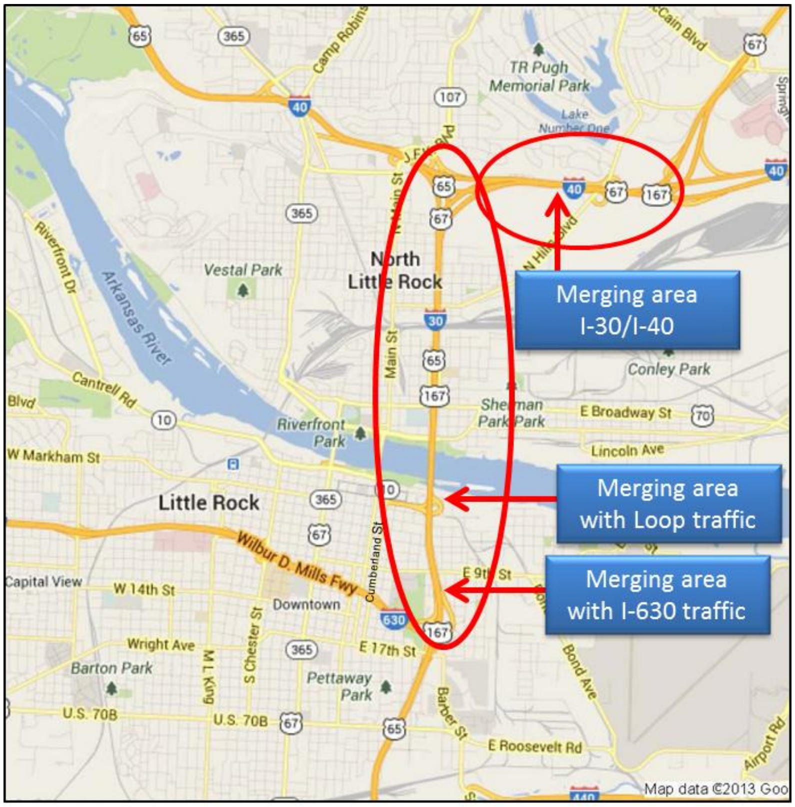
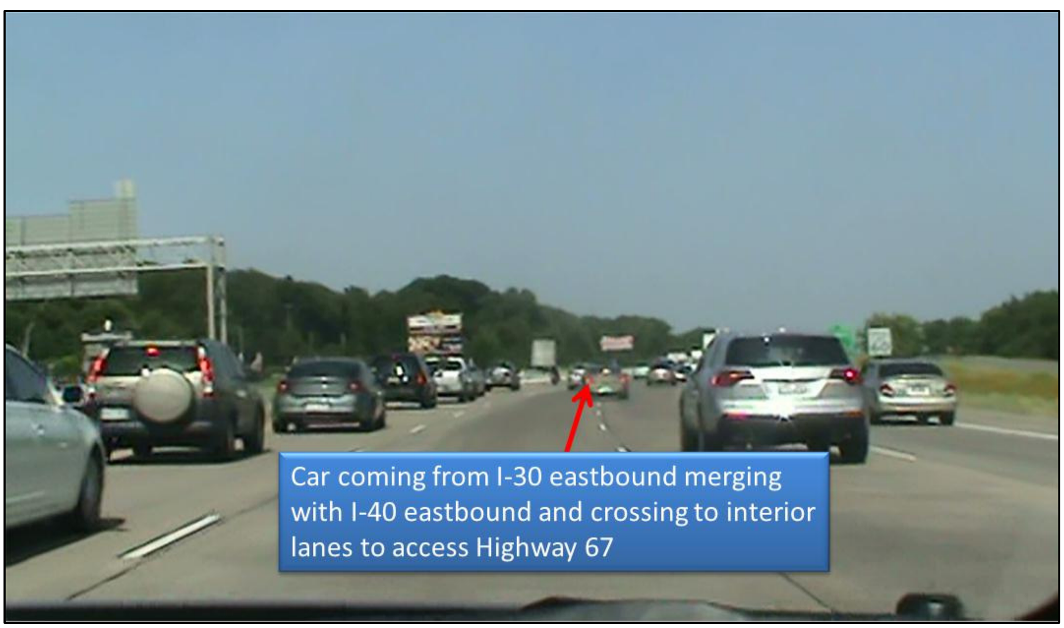
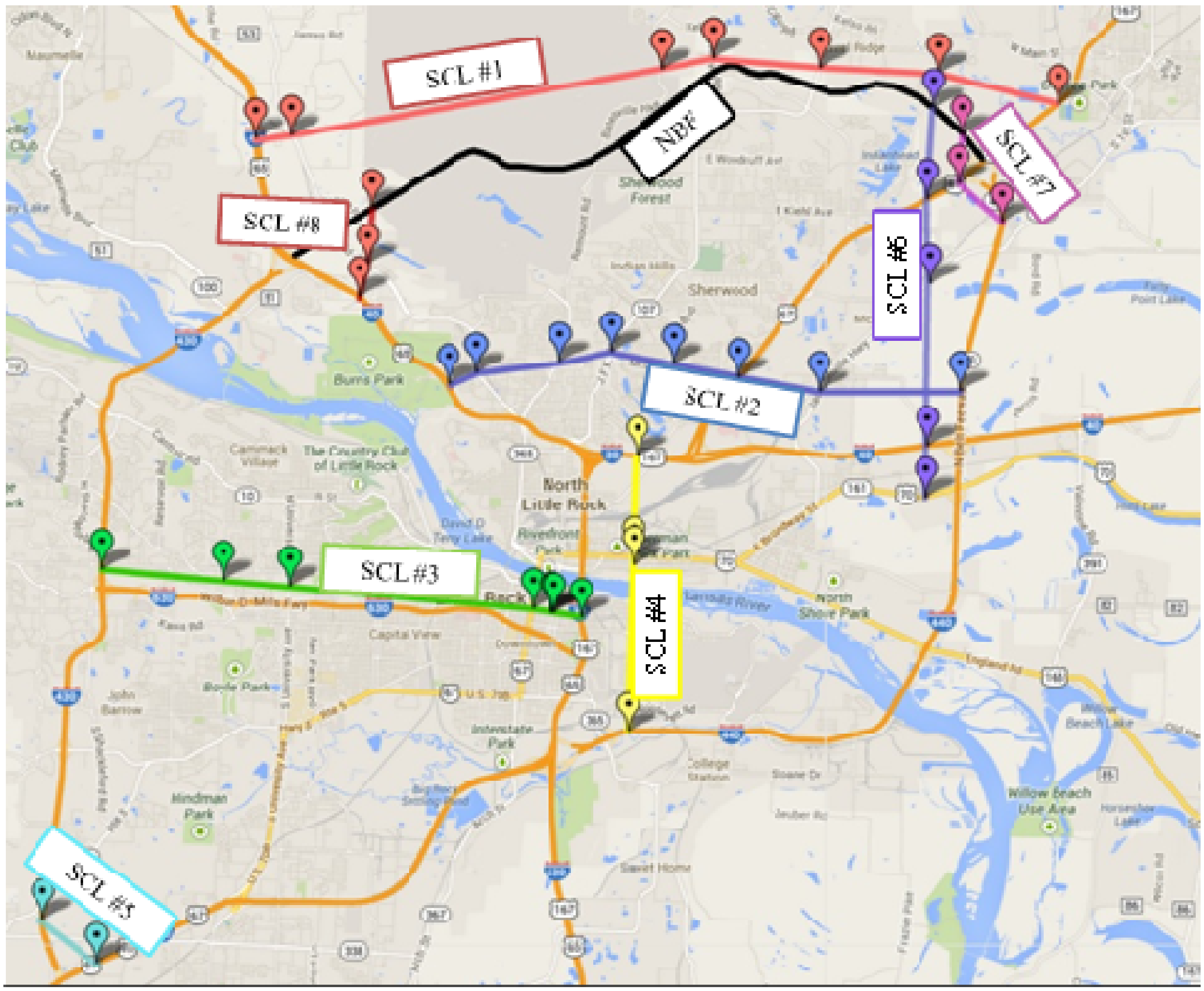


Figure 4. Area of Severe Congestion
I-30 and I-40 Merging Area



Eight screenlines spread across the Little Rock metropolitan area were delineated to comprehensively assess the traffic diversion and level of service impact as a result of the construction of the North Belt Freeway. Figure 5 presents the screenline locations and Table 1 identifies the routes included in each screenline.

Figure 5. Screenline Locations



III. DIVERSION ANALYSIS

This section includes a discussion of the diversion analysis methodology and forecasted travel volumes for the major arterials and surface streets identified in Section II. The diversion analysis identified projected 2030 traffic volumes under three different scenarios:

1. No-Build Scenario
2. Build Scenario – No Tolls
3. Build Scenario – With Tolls (Base Case)

Table 1. Routes included in Each Screenline

Screenline 1: North of NBF	Screenline 2: South of NBF	Screenline 3: North of I-630	Screenline 4: East of I-30
I-40	I-40	I-30	I-440
Highway 365	MacArthur Dr.	I-30 Frtg.	E. Washington Ave.
Batesville Pike	Camp Robinson Rd.	Scott St.	E. Broadway St.
Kellogg Acres Rd.	Highway 107	Main St.	I-40
Highway 107	North Hills	Louisiana St.	
Oneida St.	Highway 67	Broadway St.	
Highway 67	Highway 67 Frtg.	S. University Ave.	
	Highway 161	S. Mississippi St.	
	Highway 440	I-430	
Screenline 5: SW Little Rock	**Screenline 6: Eastern Side**	**Screenline 7: Southeast of NBF**	**Screenline 8: Southwest of NBF**
I-430	NBF	NBF	NBF
I-30	Highway 67	Highway 67	Highway 365
	Highway 161	Highway 440	I-40
	I-40		
	Highway 70		

A. Diversion Analysis Methodology

The full-capability of the CARTS Travel Demand Model (TDM) was utilized to forecast travel demand for the North Belt Freeway and traffic diversion to competing facilities. Diversion was measured in terms of the amount of traffic diverted to competing routes for a build without toll versus build with toll scenario. CARTS TDM is a TransCad based travel demand model offering several algorithms for traffic assignment. METROPLAN uses the multi-modal User Equilibrium (UE) traffic assignment algorithm for CARTS TDM. The UE assignment algorithm is the most popular assignment algorithm used by metropolitan planning organizations in the USA. The traffic forecast and diversion for 2030 (forecast year) was performed using the generalized cost equation within the multi-modal user equilibrium assignment algorithm. A detailed description of the general cost equation is included in the “Traffic and Toll Revenue Forecasting Methodology and Assumptions Technical Memorandum” dated August 2013.

B. Impacts of Diversion on Projected 2030 Arterial Surface Street Traffic Volumes

Detailed results of the diversion analysis for each screenline and route are included in Appendix A, Table 1. A summary of the results is provided below.

Construction of the North Belt Freeway will divert traffic from most of the major highways and arterials in the area, including:

- I-40 (screenlines 1, 2, 4, 6, and 8),
- I-30 (screenline 3),
- Highway 67 (screenlines 2, 6, and 7);
- MacArthur Drive and JFK Boulevard (screenline 2),
- Highway 161 (screenline 6), and
- Highway 365 (screenline 8).

Traffic volumes increase for a few select arterials that serve as feeder routes to the North Belt Freeway. For example traffic volumes on Highway 365 (screenline 1) are forecast to increase from 9,000 vehicles per day (vpd) for the No Build condition to 9,700 vpd for the toll-free condition and 9,800 for the tolled condition.

Construction of the North Belt Freeway improves the traffic conditions for many routes. For example, in screenline 2, traffic on I-40 for the No Build scenario is 95,100 vpd. This volume decreases to 80,200 vpd and 82,900 vpd for the toll-free and tolled alternatives, respectively.

Tolling reduces traffic volumes on the North Belt Freeway by 48.9 percent on the east side of the corridor (screenlines 6 and 7) and by 26.1 percent on the west side of the corridor (screenline 8). This diversion percentage is consistent with the diversion observed on existing tolled projects located in metropolitan areas in Texas. The observed percentage of traffic diverted (amount of traffic lost after tolling) from toll facilities in Texas ranges from 20 percent (Sam Rayburn Tollroad in Dallas) to 60 percent (Loop 49 in Tyler).

Appendix A, Table 2 shows the daily volume-capacity (VC) ratio results for each highway and arterial included in the screenlines. The VC ratio serves as a general guideline to evaluate the level of service (LOS) impact as a result of traffic diversion in response to implementing a toll on the North Belt Freeway. A VC ratio higher than 1.0 indicates the facility is significantly congested. The capacity for each facility was obtained from the CARTS TDM. It is important to clarify that a detailed LOS analysis for the peak period condition was not included in this study.

Based on the data presented in Appendix A, Table 2, construction of the North Belt Freeway will improve the V/C ratio for the majority of the highways and arterials (No Build versus Toll-Free, and No Build versus Tolled). The diversion (amount of traffic lost after tolling) in response to tolling the North Belt Freeway minimally decreases the V/C ratio for the facilities receiving the diverted traffic (e.g in screenline 2 the V/C ratio for Highway 67 increases from 0.66 for toll-free to 0.69 for tolled). In the case of Highway 107 (screenline 1), the V/C ratio increases under the toll-free and tolled scenarios because Highway 107 serves as a feeder to the North Belt Freeway. Highways receiving the highest V/C ratio improvements from the construction of the North Belt Freeway include I-40 (screenline 2, 4 and 8) and Highway 67 (screenline 2 and 6).

C. Select Link Analysis

A select link analysis for 2030 was conducted to identify the origin and destination of trips using the North Belt Freeway. Figures 6 through 9 illustrate the select link results for two locations (shown by a green arrow) at the easternmost and westernmost segments of North Belt Freeway for both toll-free and tolled scenarios.

6,900 vpd, or 33 percent of the toll-free traffic originating at the westernmost segment traverses the entire North Belt Freeway facility (see Figure 6). The ramps located at Batesville Pike are the major destination for both toll-free and tolled scenarios (see Figures 6 and 7). For the tolled scenario only 21 percent of the traffic (3,300 vpd) traverse the entire North Belt Freeway (see Figure 7). Twenty one percent of the tolled traffic continues northbound in Highway 167.

For the westbound/southbound movement, 60 percent of the traffic traverses the entire corridor. This represents 7,500 vpd under the toll free scenario and 4,000 vpd under the tolled scenario (see Figures 8 and 9). Highway 107 ramps are the most heavily utilized ramps for traffic passing through the easternmost section of the corridor (see green arrow in Figures 8 and 9). Seventy-three and twenty-seven percent of the traffic passing through the easternmost section is coming from Highway 167 and Highway 440, respectively, for the toll-free scenario. Under the tolled scenario the percentage of traffic coming from Highway 167 and Highway 440 changes to 69 percent and 31 percent (see Figure 9). For the southbound/westbound movement, the Batesville destination is the least desirable under both the toll-free and toll scenarios.

D. Traffic Volumes, Facility Types and Crash Rates

Table 2 presents 2012 Arkansas statewide crash data which were obtained from AHTD. The data presented in Table 2 shows the Crash Rates for different classifications of roadways including freeways (full control of access), divided highways (partial control of access), and undivided highways (no control of access). Please note that these crash rates do not represent the total number of crashes, but are an indication of the number of crashes based on a million vehicle miles (mvm) travelled.

The North Belt Freeway, a proposed four-lane divided freeway, has 2030 tolled traffic forecasts along the alignment ranging from 31,500 vpd at the western end to 12,300 vpd at the eastern end. The statewide crash rate for urban four-lane divided freeways with an average AADT of 34,328 vpd shown in Table 2 is 0.73 crashes per mvm. The statewide crash rate for rural four-lane freeways with an average AADT of 23,097 vpd is 0.38 crashes per mvm. The crash rate on the North Belt Freeway can be expected to fall within this range.

I-40 within the study area is a six-lane freeway with a proposed 2030 no-build traffic forecast from 95,100 vpd (on the section of I-40 located south of the proposed North Belt Freeway-screenline #2) to as high as 150,400 vpd (between I-30 and Highway 67-screenline #4). Table 2 shows the statewide crash rate for urban six-lane divided freeways to be 0.95 per mvm. This is based upon a statewide average AADT of 73,414 vpd. Typically, the higher the AADT, the higher the anticipated number of crashes.

For the tolled scenario, construction of the North Belt Freeway will divert approximately 12,000 vpd from I-40 between I-430 and Highway 67 (screenlines #2 and #4) with the majority of these vehicles using the North Belt Freeway. This will decrease the overall number of crashes with vehicles diverting from a facility with a higher crash rate to a facility with a lower crash rate.

Figure 6
Toll-Free Year 2030 Select Link at Westernmost Segment (northbound/eastbound)

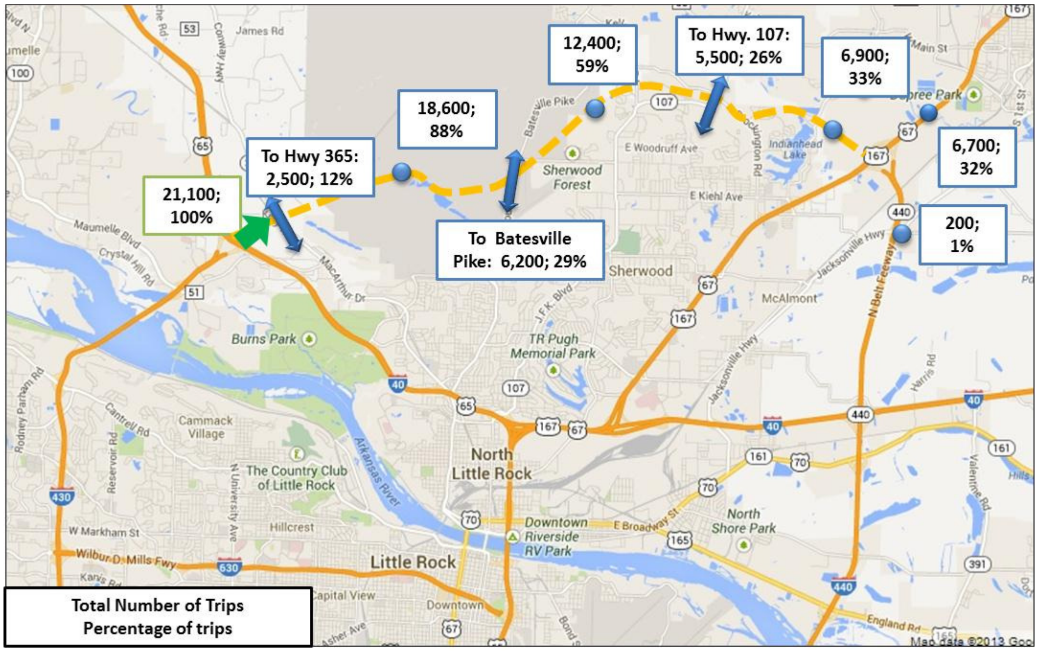


Figure 7
Tolled Year 2030 Select Link at Westernmost Segment (northbound/eastbound)

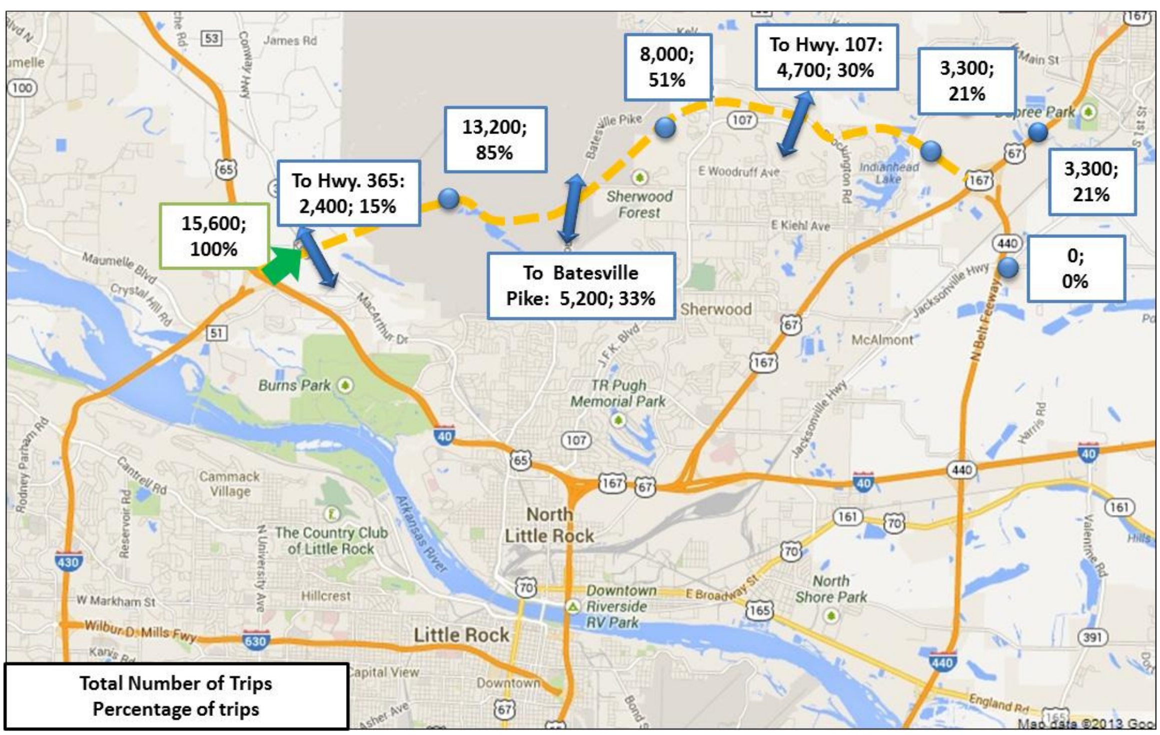


Figure 8
Toll-Free Year 2030 Select Link at Easternmost Segment (westbound/southbound)

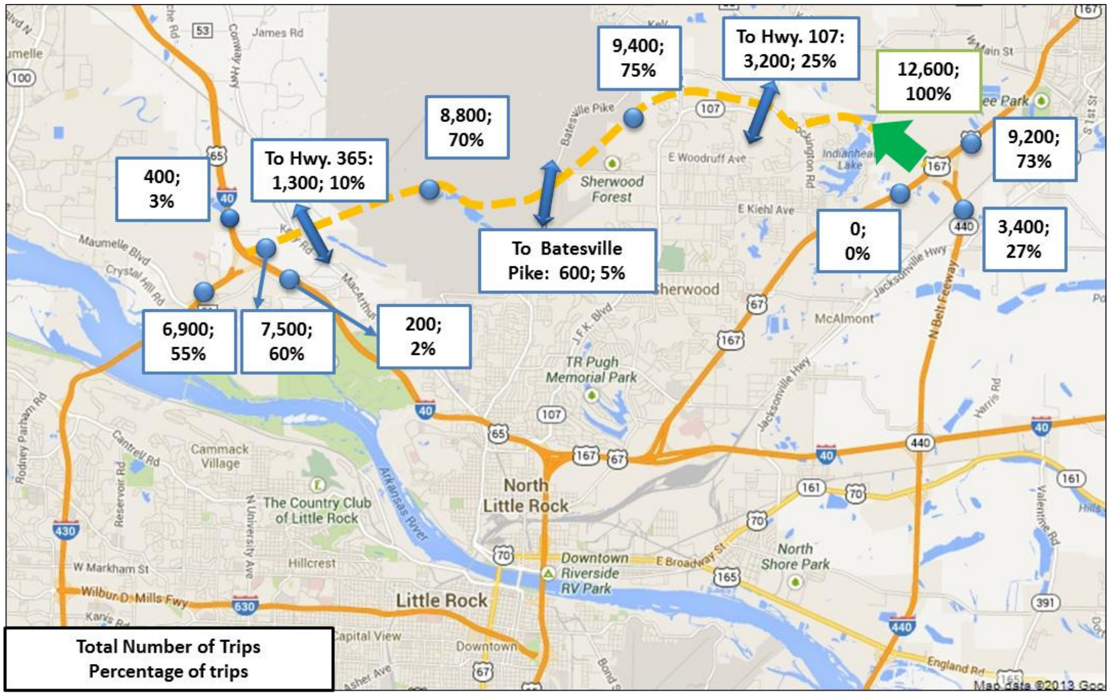


Figure 9
Tolled Year 2030 Select Link at Easternmost Segment (westbound/southbound)

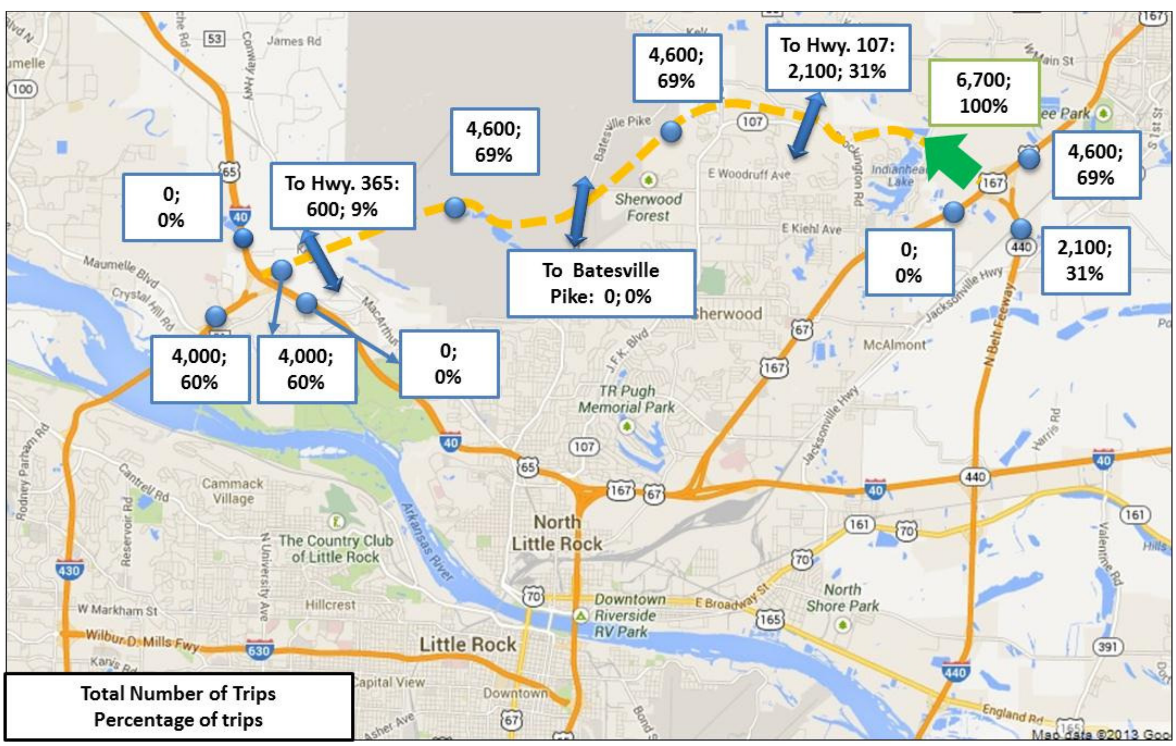


Table 2. Arkansas 2012 Statewide Crash Data for Select Highway Types

Description	Miles	Average AADT[1]	Annual VMT, in millions[2]	Number of Crashes: All Severity Types	Number of Crashes: Fatal (K)	Number of Crashes: Serious Injury (A)	Number of Crashes: Fatal + Ser. Inj. (KA)	Crash Rate: All Severity Types (per MVM)	Crash Rate: Fatal (K) (per 100 MVM)	Crash Rate: Serious Injury (A) (per 100 MVM)	Crash Rate: Fatal + Ser. Inj. (KA) (per 100 MVM)
Four-Lane Divided Highways, Full-Control of Access (Freeways)[3]											
Rural	562.07	23,097	4,738.49	1,810	25	145	170	0.38	0.53	3.06	3.59
Urban	242.47	34,328	3,038.16	2,216	23	121	144	0.73	0.76	3.98	4.74
Total	**804.54**	**26,482**	**7,776.65**	**4,026**	**48**	**266**	**314**	**0.52**	**0.62**	**3.42**	**4.04**
Six-Lane or More Divided Highways, Full-Control of Access (Freeways)[3]											
Rural	0.76	9,400	2.61	0	0	0	0	0	0	0	0
Urban	79.96	73,414	2,142.64	2,033	12	97	109	0.95	0.56	4.53	5.09
Total	**80.72**	**72,811**	**2,145.25**	**2,033**	**12**	**97**	**109**	**0.95**	**0.56**	**4.52**	**5.08**
Four-Lane Divided Highways, Partial-Control of Access											
Rural	198.56	8,013	580.78	222	5	22	27	0.38	0.86	3.62	4.65
Urban	70.59	16,204	417.52	925	4	25	29	2.22	0.96	5.99	6.95
Total	**269.15**	**10,161**	**998.30**	**1,147**	**9**	**47**	**56**	**1.15**	**0.90**	**4.71**	**5.61**
Four-Lane Divided Highways, No-Control of Access											
Rural	4.30	8,125	12.75	8	0	0	0	0.63	0	0	0
Urban	9.04	24,807	81.85	374	0	2	2	4.57	0	2.44	2.44
Total	**13.34**	**19,430**	**94.60**	**382**	**0.00**	**2**	**2**	**4.04**	**0.00**	**2.11**	**2.11**
Four-Lane Undivided Highways, No-Control of Access											
Rural	392.66	8,700	1,246.93	877	27	83	110	0.70	2.17	6.66	8.82
Urban	471.56	16,274	2,801.12	12,497	34	236	270	4.46	1.21	8.43	9.64
Total	**864.22**	**12,833**	**4,048.05**	**13,374**	**61**	**319**	**380**	**3.30**	**1.51**	**7.88**	**9.39**
Two-Lane Undivided Highways, No-Control of Access											
Rural	13,106.76	1,589	7,602.22	7,742	224	996	1,190	1.02	2.95	12.71	15.65
Urban	837.13	5,412	1,653.70	4,591	31	158	189	2.78	1.88	9.55	11.43
Total	**13,943.89**	**1,819**	**9,255.92**	**12,333**	**255**	**1,154**	**1,379**	**1.33**	**2.75**	**12.47**	**14.90**
Three-Lane Undivided Highways, No-Control of Access, Rural (Passing Lanes)											
Rural	351.79	4,577	587.75	383	13	46	59	0.65	2.21	7.83	10.04

[1]Average AADT (Annual Average Daily Traffic), measured in vehicles per day (vpd), a weighted average.

[2]VMT (Vehicle Miles Traveled), when expressed in millions, is referred to as MVM (Million Vehicle Miles).

[3]Does not include ramps or frontage roads.

AHTD:TPP:TSS:TE 05.07.2014

Construction of the North Belt Freeway will also divert traffic from Highway 67 (six-lane freeway), MacArthur Drive/ Highway 365 (two- and three-lane undivided highway), Highway 107 (four-lane divided highway) and Highway 161 (two-lane undivided highway). The average statewide crash rate for the classification of each of these facilities is higher than the average statewide crash rate for the four-lane divided freeway, the classification for the North Belt Freeway.

IV. QUALITATIVE ASSESSMENT OF SAFETY IMPACTS

As noted in Section III, if constructed, some motorists currently using local arterials would likely opt to use the proposed North Belt Freeway to reach their destination. Research has shown that interstate highways and toll roads are safer than other principal arterial highways. For example:

> "*Drivers on interstate highways face a lower risk of accidents than drivers on other principal arterial highways. Driving on interstate highways is safer for a number of reasons. Interstate highways typically are wider, have more lanes, and are straighter than arterial highways. But, most importantly, interstate highways have controlled access through on-ramps, while access onto many other principal arterial highways is typically uncontrolled. Vehicles entering these other highways from side roads provide a traffic hazard as they accelerate to driving speed.*" [1]

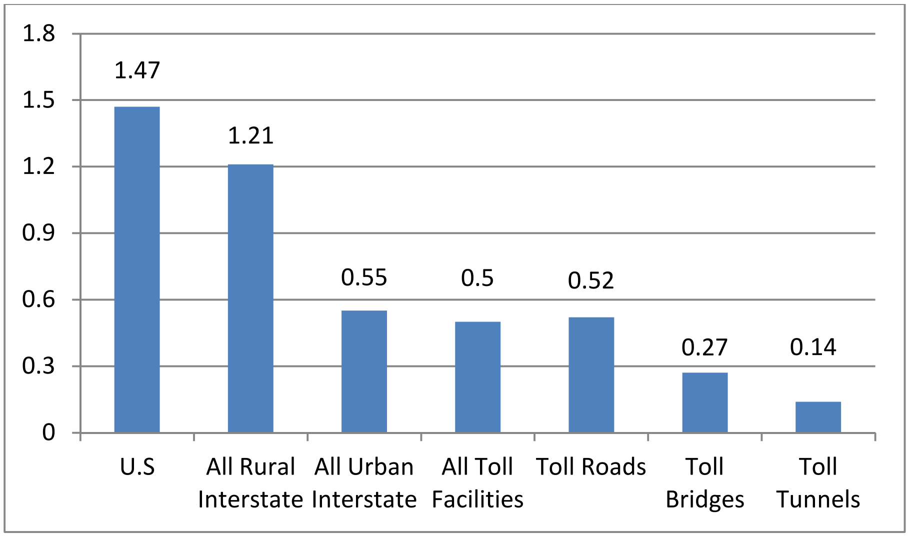
A shift in traffic to the proposed freeway facility or toll road is therefore likely to improve driving safety on the local arterials. The project would provide an alternate travel option, resulting in the physical separation of slower speed local traffic from higher speed through traffic.

The amount of diversion from the major arterials to the new facility is lower under the tolling scenario than under the non-tolled scenario, as stated earlier. However, research studies indicate that toll roads are actually safer than non-tolled interstates. This is most likely due to lower traffic levels leading to an improved level of service.

The diversion data presented in Appendix A shows that construction of the North Belt Freeway will divert traffic from I-40, an Urban Interstate, onto the new facility. This diversion is forecast to be as high as 15,200 vehicles per day in 2030 (east of I-430-screenline #8) for the Base (tolled) Scenario. The previous analysis has stated that both urban and rural four-lane freeways have crash rates that are lower than six-lane urban freeways. While the crash rate on I-40 may not decrease, there is a substantial diversion of traffic onto a facility with a lower crash rate, thereby lowering the total number of crashes in the system. Additionally, Figure 10 presents the results of a study conducted by the International Bridge, Tunnel, Turnpike Association (IBTTA) to assess the safety of toll road facilities. As illustrated in Figure 10, fatality rates for toll roads are slightly below those of all urban interstates.

[1] *Eric C. Thompson and Amitabh Chandra,* Economic Impact of Interstate Highways in Kentucky, accessed from the following website: http://cber.uky.edu/Downloads/highways.htm.

Figure 10. A Comparison of Fatality Rates Toll Entities vs. All Roads Fatalities per 100 Million Vehicle Miles Traveled, 2005[2]



V. CONCLUSION

The AHTD and METROPLAN commissioned a study to evaluate the financial feasibility of constructing the North Belt Freeway as a tolled facility. As part of this study, a high level assessment of the safety impacts of the proposed North Belt Freeway on existing highways and arterials was conducted for three different scenarios: 1) No-Build, 2) Build (toll-free) and 3) Build (tolled). The following summarize the conclusions of the assessment conducted:

- In general, based on the changes in 2030 forecasted traffic volumes across the three scenarios, construction of the North Belt Freeway will divert traffic from most of the major highways and arterials in the area to the North Belt Freeway.
- While the amount of diversion to the North Belt Freeway decreases under the tolled scenario relative to the toll-free scenario, the traffic volumes on the majority of the local highways and arterials under the tolled scenario are predicted to be below the traffic volumes under the No-Build scenario. This shift in traffic to the proposed interstate facility or toll road is therefore likely to improve driving safety on the local arterials.
- Based on a review of the forecasted traffic volumes and available crash data, both build scenarios will divert a substantial amount of traffic from I-40, a six-lane urban freeway or Interstate, to the North Belt Freeway. Research has shown that both rural and urban four-lane freeways have a lower crash rates than urban six-lane freeways or Interstates. With more miles being driven on toll roads and fewer miles on urban Interstates, it is expected that the total number of crashes will be reduced with the construction of the North Belt Freeway.

[2] *Toll vs. Nontoll: Toll Facilities Are Safer,* Jeff Campbell, Tollways, Winter 2008.

APPENDIX A

2030 Traffic Diversion Results for Each Screenline and Route

Table 1
2030 Traffic for Each Screenline

Facility	No Build	Toll- Free	Base Scenario (Tolled)
Screenline1: North of NBF			
I-40	109,500	108,900	108,400
Highway 365	9,000	9,700	9,800
Batesville Pike	7,900	8,700	9,000
Kellogg Acres Rd.	6,500	6,500	6,300
Highway 107	28,400	32,600	33,200
Oneida St.	6,800	6,500	6,600
Highway 67	117,500	119,400	116,400
Total	285,600	292,300	289,700
Screenline 2: South of NBF			
I-40	95,100	80,200	82,900
MacArthur Dr.	12,500	11,800	11,900
Camp Robinson Rd.	15,800	14,900	15,800
Highway 107	36,700	31,200	32,400
North Hills	16,400	16,600	16,700
Highway 67	86,200	71,300	75,200
Highway Frtg.	24,400	24,800	24,900
Highway 161	8,900	8,300	8,500
Highway 440	47,800	42,700	43,400
Total	343,800	301,800	311,700
Screenline 3: North of I-630			
I-30	113,100	109,300	110,600
I-30 Frtg.	18,200	18,300	18,300
Scott St.	6,400	6,200	6,300
Main St.	7,700	7,600	7,700
Louisiana St.	5,000	5,000	5,000
Broadway St.	27,700	27,900	27,800
S. University Ave.	33,300	33,200	33,400
S. Mississippi St.	12,700	12,600	12,600
I-430	93,600	100,000	97,500
Total	317,700	320,100	319,200

Facility	No Build	Toll-Free	Base Scenario (Tolled)
Screenline 4: East of I-30			
I-440	59,600	56,900	57,600
E. Washington Ave.	10,100	9,000	9,100
E. Broadway St.	24,100	23,100	23,400
I-40	150,400	134,600	138,700
Total	244,200	223,600	228,800
Screenline 5: Southwest Little Rock			
I-430	92,500	91,600	91,800
I-30	109,600	108,200	108,600
Total	202,100	199,800	200,400
Screenline 6: Eastern Side			
NBF	0	24,100	12,300
Highway 67	86,800	76,900	80,300
Highway 161	13,400	11,800	12,100
I-40	48,300	45,000	45,700
Highway 70	10,300	9,400	9,500
Total	158,800	167,200	159,900
Screenline 7: Southeast of NBF			
NBF	0	24,100	12,300
Highway 67	86,800	76,900	80,300
Highway 440	39,400	36,200	35,600
Total	126,200	137,200	128,200
Screenline 8: Southwest of NBF			
NBF	0	42,600	31,500
Highway 365	13,000	9,400	9,400
I-40	105,300	86,800	90,100
Total	118,300	138,800	131,000

Table 2
2030 Daily Volume to Capacity Ratio

Facility	No Build	Toll-Free	Base Scenario (Tolled)
Screenline1: North of NBF			
I-40	1.20	1.19	1.18
Highway 365	0.64	0.68	0.69
Batesville Pike	0.89	0.98	1.01
Kellogg Acres Rd.	0.57	0.57	0.55
Highway 107	1.00	1.15	1.17
Oneida St.	0.77	0.74	0.75
Highway 67	1.28	1.31	1.27
Screenline 2: South of NBF			
I-40	0.88	0.74	0.77
MacArthur Dr.	0.79	0.74	0.75
Camp Robinson Rd.	0.99	0.94	1.00
Highway 107	1.15	0.98	1.02
North Hills	0.61	0.62	0.62
Highway 67	0.80	0.66	0.69
Highway 67 Frtg.	1.06	1.08	1.08
Highway 161	0.63	0.59	0.60
Highway 440	0.52	0.47	0.47
Screenline 3: North of I-630			
I-30	0.89	0.87	0.88
I-30 Frtg.	0.60	0.60	0.60
Scott St.	0.43	0.41	0.42
Main St.	0.68	0.67	0.67
Louisiana St.	0.34	0.34	0.34
Broadway St.	0.85	0.86	0.86
S. University Ave.	0.69	0.68	0.69
S. Mississippi St.	0.47	0.47	0.47
I-430	0.65	0.69	0.68

Facility	No Build	Toll-Free	Base Scenario (Tolled)
Screenline 4: East of I-30			
I-440	0.65	0.62	0.63
E. Washington Ave.	0.75	0.67	0.68
E. Broadway St.	0.76	0.72	0.74
I-40	1.04	0.93	0.96
Screenline 5: Southwest Little Rock			
I-430	1.28	1.27	1.27
I-30	1.10	1.08	1.09
Screenline 6: Eastern Side			
NBF	0.00	0.40	0.20
Highway 67	0.95	0.84	0.88
Highway 161	0.94	0.83	0.86
I-40	0.79	0.74	0.75
Highway 70	0.72	0.66	0.67
Screenline 7: Southeast of NBF			
NBF	0.00	0.40	0.20
Highway 67	0.95	0.84	0.88
Highway 440	0.43	0.40	0.39
Screenline 8: Southwest of NBF			
NBF	0.00	0.70	0.52
Highway 365	0.91	0.66	0.66
I-40	1.15	0.95	0.98

APPENDIX D

Traffic and Toll Revenue Forecasting Methodology & Assumptions Technical Memorandum

North Belt Freeway Feasibility Study

Traffic and Toll Revenue Forecasting Methodology & Assumptions Technical Memorandum

Developed by:

Baez Consulting, LLC

In Consultation with:

ATKINS

FINAL

August 2013

Introduction

The following memorandum describes the proposed methodology to forecast traffic and toll revenue for the North Belt Freeway located in Central Arkansas.

As required by the scope of work, the traffic and revenue forecast will be performed at the sketch level to quantify the toll revenue potential of the project. A sketch level analysis is an introductory type of analysis to determine the toll feasibility of a highway project. The sketch level analysis requires minimum data collection and a limited amount of travel demand modeling.

The traffic and revenue forecasting process will be divided into the following four major steps (see Figure 1):

1. Data collection
2. Travel demand model review and validation
3. Traffic forecast
4. Toll revenue forecast

These steps will be implemented to develop a fifty-year traffic and toll revenue forecast.

Project Background

The North Belt Freeway is proposed as a four-lane, limited-access facility between I-40 and US 67 in Central Arkansas,. The corridor spans approximately 13 miles completing the connection between I-430 in the west and State Highway 440 (SH-440) in the east (see Figure 2).

Data Collection

The first step in the forecasting process will be to collect, summarize and evaluate the historical and existing conditions of the study area to develop a thorough understanding of the corridor. Additionally, this data will be used to conduct a limited validation of the travel demand model which will be utilized to develop the traffic and toll revenue forecasts. A summary of the data that will be collected is presented below.

a) Demographics: This includes historical and forecast growth trends in population and employment for the Little Rock metropolitan planning area. The information will be used to evaluate the historical relationship between demographics and traffic growth and will help establish the long-term traffic growth pattern for the North Belt Freeway. In addition to the demographic information included in METRO 2030.2 (Long Range Transportation Plan for Central Arkansas), demographics will be collected from other sources including the U.S Census, Institute for Economic Advancement (University of Arkansas at Little Rock), and the Center for Business and Economic Research (University of Arkansas).

Figure 1
Travel Demand Process

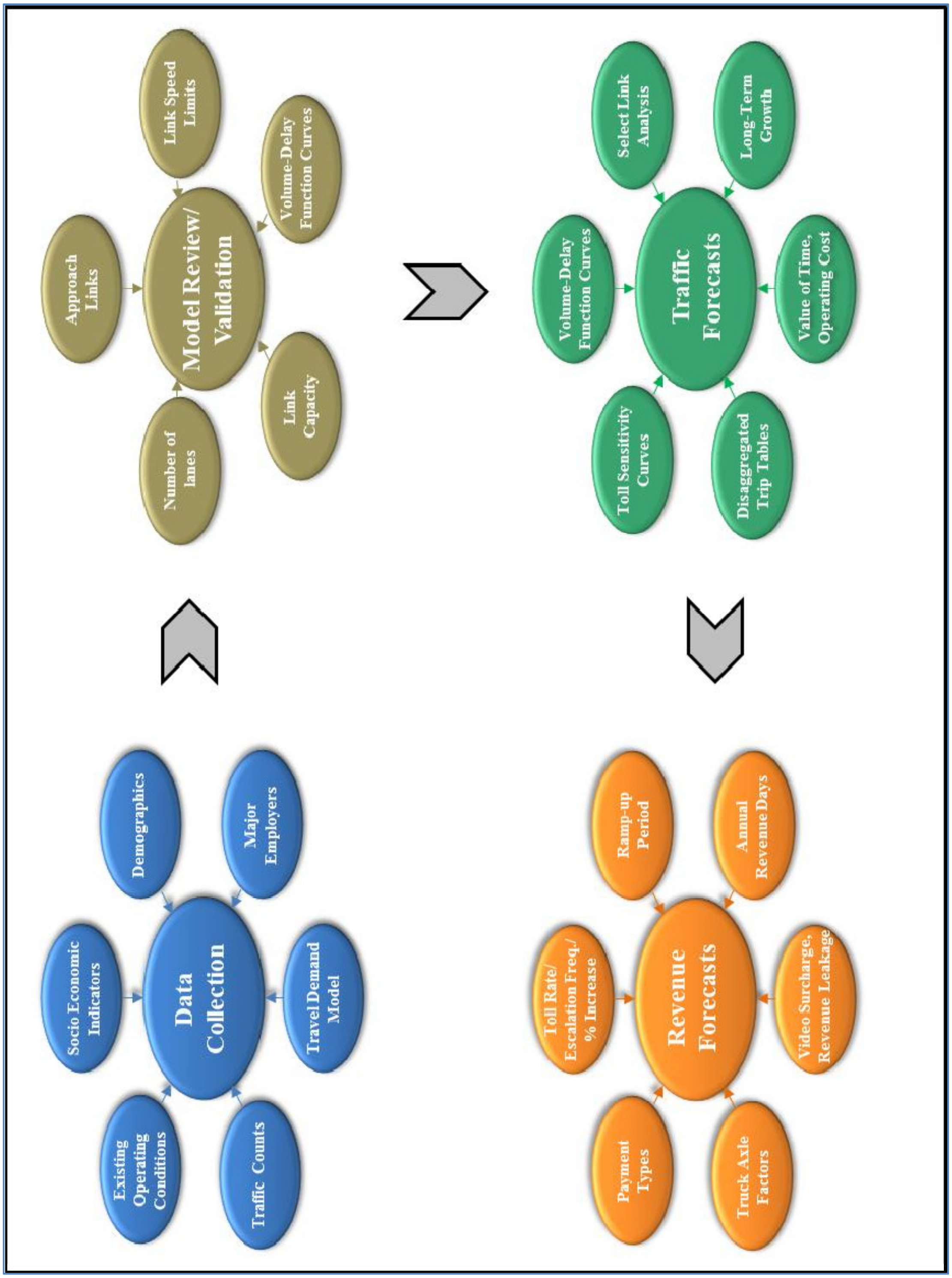
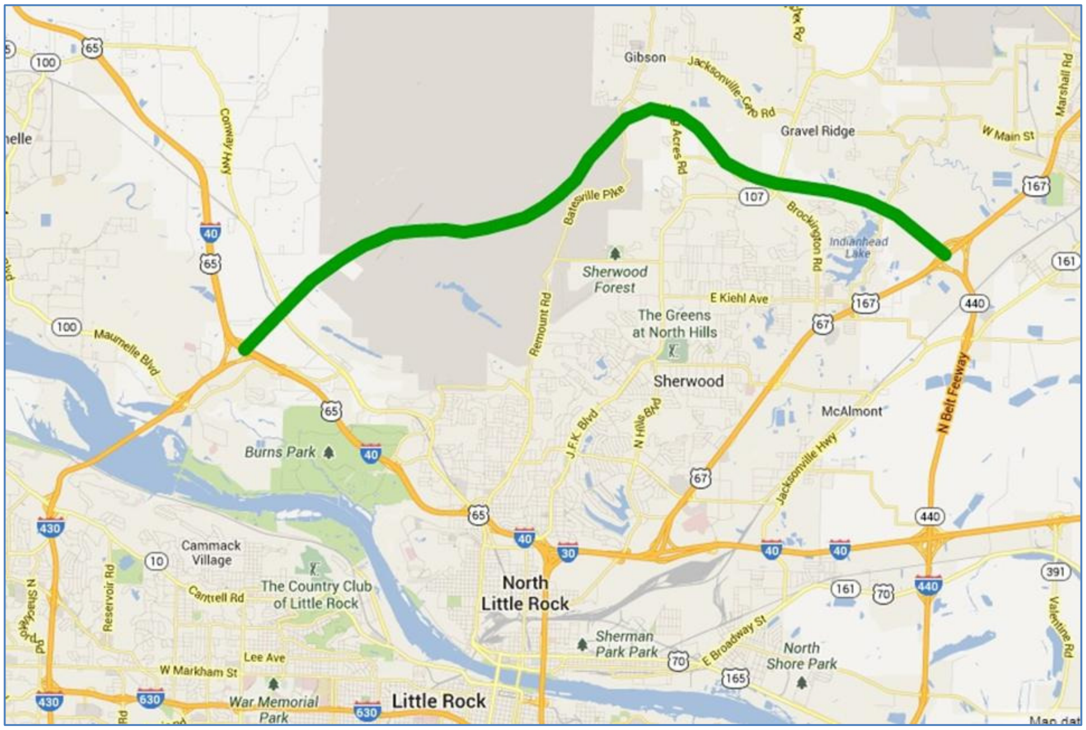


Figure 2
General Corridor Alignment



b) Socio-economic Indicators: Income and wage data will be obtained from the U.S Census and the American Community Survey. This information will be utilized to determine the value of time (VOT). VOT is important in estimating travel demand for a toll facility as it is the basis for estimating patrons' willingness to pay to use the tolled facility. Unemployment rate data will also be obtained from the Bureau of Labor Statistics.

c) Traffic Counts: Historical traffic counts will be collected from the Arkansas Highway Transportation Department (AHTD) and summarized for the analysis. Traffic counts will be used to review the travel demand model and define long-term traffic growth. The extent of the traffic count analysis will depend on the detail and amount of traffic counts provided by AHTD.

d) Existing Operation Conditions: Speed surveys will be conducted during the peak periods on I-40, SH-440, US 67 and major arterials using the Google maps traffic condition tools. Data obtained from the surveys will be used to evaluate the time savings that could potentially be achieved by using the proposed North Belt Freeway and hence the attractiveness of the tolled facility to patrons. A corridor visit will also be conducted to evaluate operating conditions of highway and arterial facilities located in the vicinity of the study area.

e) Major Employment Locations: Major employers located in the Little Rock metropolitan area will be visited in order to understand the potential trip market distribution for the

f) Travel Demand Model Databases: Travel demand model databases created by METROPLAN and AHTD will be collected for use in the modeling forecast process. The TransCad FAF^3 model (Freight Analysis Framework, Version 3.0) will also be obtained from the Federal Highway Administration (FHWA). The truck forecast incorporated in FAF^3 will be compared to the truck forecast from the CARTS travel demand model (TDM) to determine if general adjustments to the CARTS forecasts are warranted.

Review and Validate Travel Demand Model

After receiving the travel demand model databases from METROPLAN and AHTD, a base 2012 model-year framework will be developed. The following highway network attributes will be reviewed for the base-year model:

- Approach links
- Number of lanes
- Speed limits
- Capacity

Traffic assignments will be run and traffic forecasts for the base-year will be compared against traffic counts to ensure that the travel demand replicates existing conditions. The travel demand validation will be limited in scope because this study is a sketch level evaluation and it is assumed that METROPLAN has validated the model at the regional level.

Speed input and volume-delay function (VDF) curves play a critical role in estimating travel demand for toll facilities. In general when modeling toll roads, travel demand models tend to over-forecast traffic on arterials and frontage roads and under-forecast the demand for toll facilities. Modifying the speeds and VDF curves ensures that the traffic assignment algorithm assigns the correct amount of traffic on the toll facility. VDF curves and coded speed incorporated in the CARTS TDM will be reviewed and modified as necessary.

Forecast Traffic

After validating the model for the base-year, opening year (assumed to be 2020) and forecast year (2030) modeling databases will be developed. If not yet incorporated in the highway network, the North Belt Freeway corridor will be coded for both years. A select link analysis identifying the traffic volumes for specific origin and destination links will be performed for modeling year 2030 along the corridor. The purpose of this analysis is to identify the major destination points and determine the trip market for short and long trips using the North Belt Freeway corridor. Drivers with long-trips tend to utilize toll facilities more often because toll facilities offer higher travel time savings. Traffic operation reliability is also better on toll facilities because toll road operators typically clear accidents or incidents faster than traditional highways.

The full-capability of the CARTS TDM will be utilized to forecast travel demand for the North Belt Freeway and traffic diversion to competing facilities. As this is a new facility, diversion will be measured in terms of the amount of traffic diverted to competing routes for a build without toll versus build with toll scenario. CARTS TDM is a TransCad base travel demand model offering several algorithms for traffic assignment. METROPLAN uses the multi-modal User Equilibrium (UE) traffic assignment algorithm for CARTS TDM. The UE assignment algorithm is the most popular assignment algorithm used by metropolitan planning organizations in the USA. The UE assignment algorithm includes the generalized cost equation as the base to find the minimum path between origin and destinations. The generalized cost equation is defined as:

Total Travel Cost = VOT * Travel Time + Operating Cost + Toll Cost

VOT = Value of time. For this study, the VOT will be estimated from income or hourly-wage information. The VOT in the existing CARTS TDM will be compared to wage information collected from independent sources as discussed in the data collection section. VOT is usually applied globally for all the zones and in some cases for all modes.

Travel time = Time between origin and destination.

Operating Cost = Operating cost refers to the costs accrued by wear and tear of the vehicles and other associated costs. Operating cost data are publicly available from AAA annual estimates by vehicle categories. Operating cost in the existing CARTS TDM will be compared to the AAA data and adjusted as warranted based on the results.

Toll = The total toll fee for a given route. Tolling points and toll fees will be coded in the North Belt Freeway network.

For this study, the multi-modal UE assignment algorithm will be used to develop the traffic forecast. Trip tables will be disaggregated by county (origins), or city (origins) or trip distance to account for the variation of value-of-time across a metropolitan area and trip distance. The final decision on how to split trip tables will be made after receipt and evaluation of the CARTS TDM. This process has been tested in the Dallas area and has compared very well with other toll modeling alternatives, such as the use of logit diversion equations. The application of a logit diversion equation requires the implementation of a Stated Preference Survey, which is outside the scope of this sketch level evaluation. The modeling process for each forecast year (2020 and 2030) is summarized below.

1. Review and modify (if necessary) highway attributes and VDF equations
2. Develop a select link to identify major trip origins and destinations
3. Disaggregate trip tables by origin
4. Estimate value-of-time for each origin and mode
5. Run multi-modal user equilibrium assignments for toll-free and toll alternatives
6. Develop toll sensitivity curves changing the toll from $0 to $1 per mile to determine the maximum toll rate that could be charged in the corridor. The toll plan will be developed such that it is equitable across distances for all users
7. Estimate traffic diversion to competing routes when the North Belt Freeway is tolled

The traffic forecast beyond 2030 will be estimated using a nominal traffic growth trend influenced by historical traffic growth in the Central Arkansas region, capacity of the North Belt Freeway, and congestion on competing routes.

Toll Revenue Forecast

Toll revenue for each year will be estimated using the traffic forecast described in the previous section. Toll revenue is estimated by multiplying the number of transactions at each gantry location by their respective toll fee. The general formula to estimate annual toll revenue is the following:

Annual Revenue = number of transactions for each gantry * toll fee at each gantry * revenue days (factor to convert the weekday number of transactions to annual transactions) * revenue leakage

There are several assumptions that need to be considered in the estimation of annual toll revenue as described below.

a) Opening toll rate: The per mile toll rate charged when the project opens. A recommended toll rate based on the toll sensitivity curves will be developed and presented to AHTD and METROPLAN staff for approval prior to estimating toll revenue.

b) Escalation Frequency: The frequency of toll rate increases. The escalation frequency will be influenced by the outcome of the sensitivity curves. Toll agencies around the country have adopted different policies. Some of them increase rates every year, others every two years, and a few increase the rate only when necessary to cover maintenance and operation costs. A recommended escalation frequency will be presented to AHTD and METROPLAN staff for approval prior to estimating toll revenue.

c) Percentage Toll Increase: The percentage toll rate increase that will be applied when the toll rate is increased. Usually the increment is related to the CPI of the region. A recommended percentage increase based on an analysis of the regional CPI will be presented to AHTD and METROPLAN staff for approval prior to estimating toll revenue. The percentage increase must be at a level that does not result in a toll rate that exceeds the maximum toll rate estimated by the toll sensitivity curves.

d) Payment type: Due to the costs associated with cash collection, the analysis will assume that the North Belt Freeway will deploy an electronic toll collection (ETC) system consisting of Tag and Video collection payments. The distribution of these payment types impacts the overall feasibility analysis as the cost of processing the tolled transaction is higher for video transactions than tag transactions when the patron has an established account. When a toll facility is being introduced to an area, the percentage of tag transactions is typically lower. However, over time as patrons recognize the benefits of using the facility and the convenience of tag payments, the percentage of toll tag users increases. A recommended payment distribution percentage based on percentages experienced by other new toll facilities in the country will be presented to AHTD and METROPLAN staff for approval prior to estimating toll revenue.

e) Truck axle factor: Trucks with more than two axles are typically tolled at higher rates than autos. The truck axle factor reflects the average number of truck axles for the corridor. The factor to be used for the North Belt Freeway analysis will be calculated based on the traffic count data provided by AHTD. A recommend per mile truck toll rate based on these calculations will be presented to AHTD and METROPLAN staff for approval prior to estimating toll revenue.

f) Video Surcharge: Video toll payments cost more to process than Tag transactions. Toll agencies charge an additional fee ranging from 30 percent to 50 percent of the base toll for each video transaction to cover this additional cost. Due to the conceptual nature of a sketch analysis, this charge is not typically included in the feasibility evaluation.

g) Toll Leakage: The amount of lost revenue from drivers avoiding toll payment. The toll leakage is higher for video transactions. Toll leakage typically ranges from 5 percent to 15 percent depending on the level of regional enforcement. A recommended toll leakage percentage experienced by other new toll facilities in the country will be presented to AHTD and METROPLAN staff for approval prior to estimating toll revenue.

h) Annualization Factor: The annualization factor converts the average weekday toll transactions to annual transactions. In urban areas, the number ranges from 300 to 340. The annualization factor will be determined based on the traffic counts provided by AHTD.

i) Ramp-up period and factors: The time period between the toll road opening and the time the drivers become acquainted with and recognize the benefits of the toll facility. The ramp-up period ranges from three to six years depending on the presence of toll roads in the area. The ramp-up factors reduce the traffic forecast estimates generated by the travel demand model. For this analysis a six year ramp-up period will be assumed for the North Belt Freeway. The factors for the North Belt Freeway will be as follows:

   - 50 percent in 2020
   - 60 percent in 2021
   - 70 percent in 2022
   - 80 percent in 2023
   - 90 percent in 2024
   - 100 percent in 2025

As previously noted, annual transactions and toll revenue will be developed for the opening year (2020) and the forecast year (2030). Traffic for the intermediate years will be interpolated. Toll traffic volumes beyond 2030 will be extrapolated based on projected long-term demographic growth and nominal growth assumptions. A reasonableness check will be performed by comparing the estimated toll revenue generated by the North Belt Freeway to toll revenue on other similar toll road facilities in the US.

APPENDIX E

Interim Tolling Concept Report

North Belt Freeway Feasibility Study
Interim Tolling Concept Report

Developed by:

ATKINS

FINAL

In Consultation with:

ICA Engineering

and

Baez Consulting, LLC

March 2014

Contents

Figures

Page

Tables

Page

I. INTRODUCTION

The Arkansas State Highway and Transportation Department (AHTD), similar to other transportation agencies across the nation, is facing tremendous challenges in providing needed transportation improvements with limited local, state, and federal funds. In light of declining revenues and increasing demands for transportation infrastructure, the AHTD is partnering with Metroplan to evaluate the feasibility of tolling the North Belt Freeway as a means to accelerate development of this strategic project. The feasibility analysis includes an assessment of project costs, toll revenues, and financial strategies based on net revenue. The purpose of this interim tolling concept report is to present the proposed tolling concept for the project, discuss the cost estimating methodology and present the projected capital, routine, lifecycle, and operations costs assuming the North Belt Freeway is implemented as a tolled facility. The costs presented in this interim tolling concept report will be included in the financial feasibility analysis and summarized in the final feasibility report.

II. PROPOSED PROJECT

The North Belt Freeway is proposed as a new alignment four-lane divided, controlled-access facility between Interstate 40 (I-40) and Highway 67 in central Arkansas. The corridor spans approximately 13 miles completing the connection between I-430 in the west and Highway 440 in the east (see Figure 1).

III. EXISTING CONDITIONS

Most of the major highways in the Central Arkansas metropolitan area have two or three lanes in each direction with speed limits ranging from 60 to 65 miles per hour (mph). Highway 107 and Highway 176, which are in close proximity to the proposed project (see Figure 2) are primarily two lanes in each direction with speed limits ranging from 35 to 55 mph. The area surrounding Highway 107 from Kellogg Acres Road to downtown Little Rock is highly developed with many traffic signals and school zones. Speed limits in this area are reduced to 35 mph. Highway 176 is also highly developed in the section between downtown Little Rock and West Maryland Avenue. From West Maryland Avenue to the community of Gibson in North Little Rock, Highway 176 is one lane in each direction and traverses through relatively undeveloped land. Most of the major employment centers in the Central Arkansas metropolitan region are located along the I-630 corridor in downtown Little Rock.

Afternoon congestion levels in the vicinity of the proposed project were observed during a site visit conducted June 27, 2013.

Figure 1. General Corridor Alignment

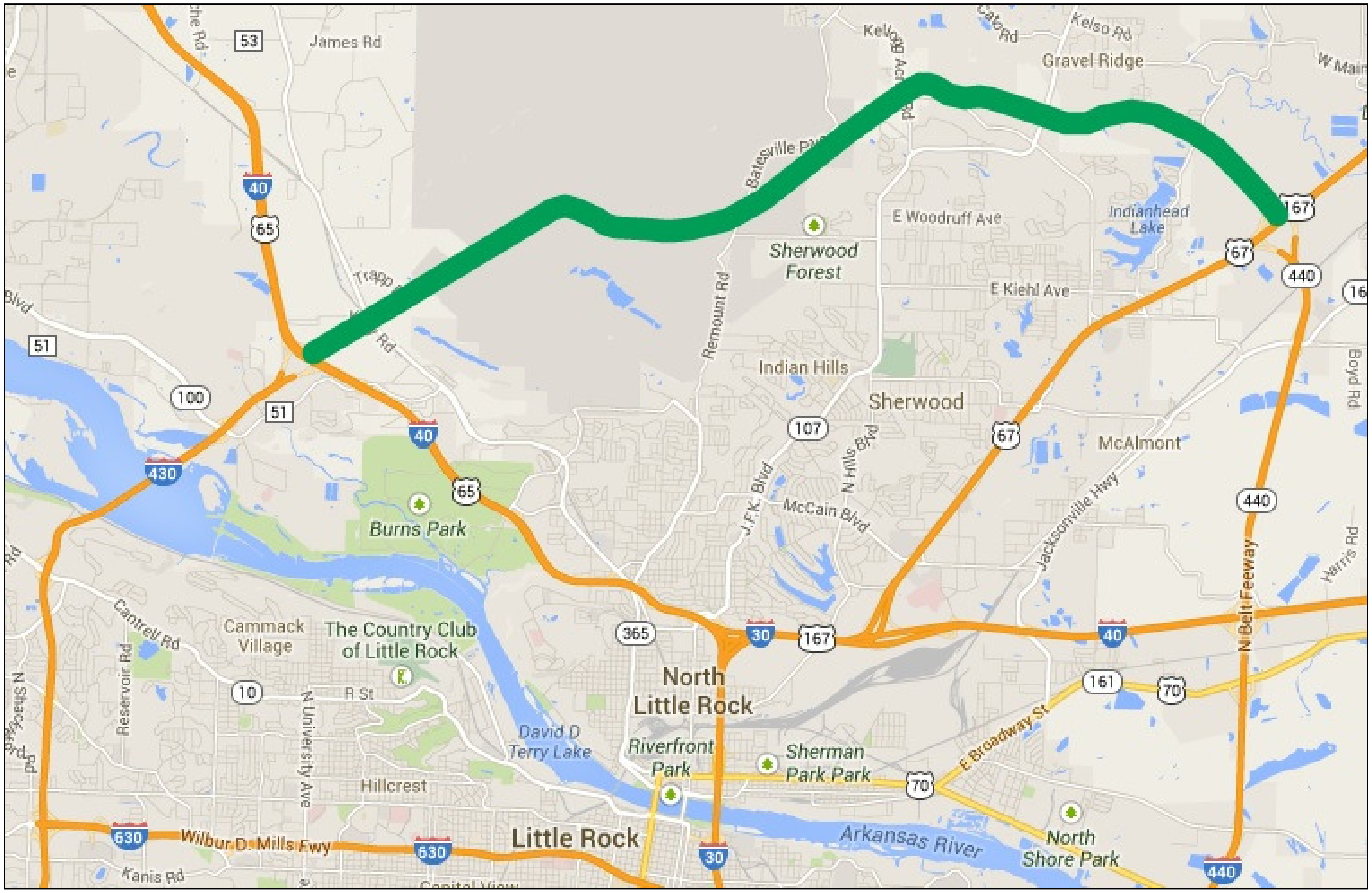
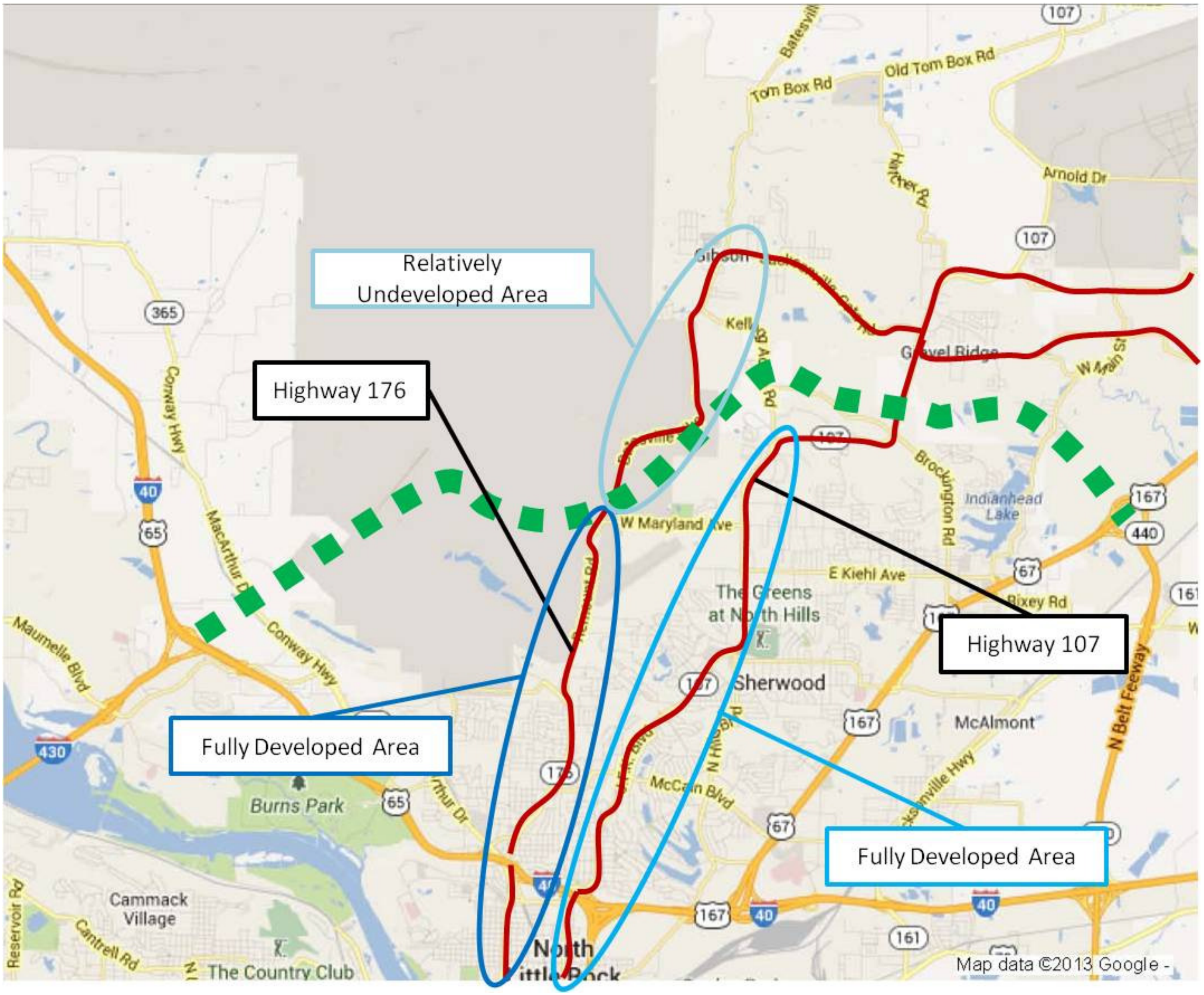


Figure 2. Major Existing Arterials in Proximity to Proposed North Belt Freeway Project



During the afternoon peak period (4:30 to 5:15 PM), severe congestion was observed in the eastbound direction of I-30 between I-630 and I-40, and the eastbound direction of I-40 from I-30 to Highway 67 (see Figure 3). During this period, the average speed from the I-30/I-630 interchange to Highway 67/ McCain Boulevard ranged from 33 to 42 mph. The congestion on I-30 northbound occurs as traffic merges from I-630 and the loops connecting Cumberland Street. On I-40 eastbound, congestion occurs due to high volume traffic from I-30 eastbound merging with I-40 eastbound traffic. This merging area is very turbulent because traffic traveling from I-30 eastbound to Highway 67 northbound must weave to the interior lane (adjacent to inside shoulder) to access Highway 67 (see Figure 4); on the other hand, traffic traveling on I-40 eastbound and continuing eastbound must cross over to the exterior lanes (adjacent to outside shoulder).

The peak period congestion observed during the afternoon was verified using Google maps daily traffic conditions (see Figure 5). Highway and arterial segments shown in red represent slow traffic conditions. The map depicts slow traffic conditions on I-30, I-40, Highway 107 and Highway 176. Figure 6 shows the speed conditions during the morning peak period, as reported by Google maps. Congestion conditions occurred on the same facilities but for the reverse movements (southbound/westbound).

Figure 3. Merging Area of Severe Congestion
Afternoon Peak Period

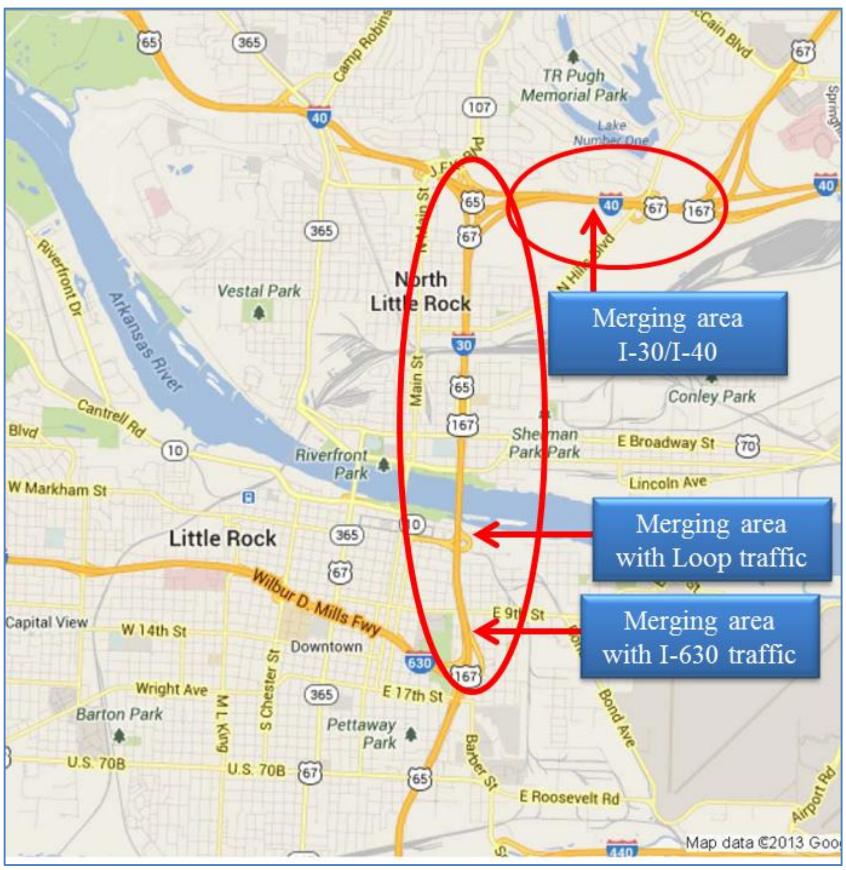


Figure 4. Area of Severe Congestion
I-30 and I-40 Merging Area

Figure 5. Afternoon Traffic Conditions
(Google Map; September 20, 2013; 4:45 p.m.)

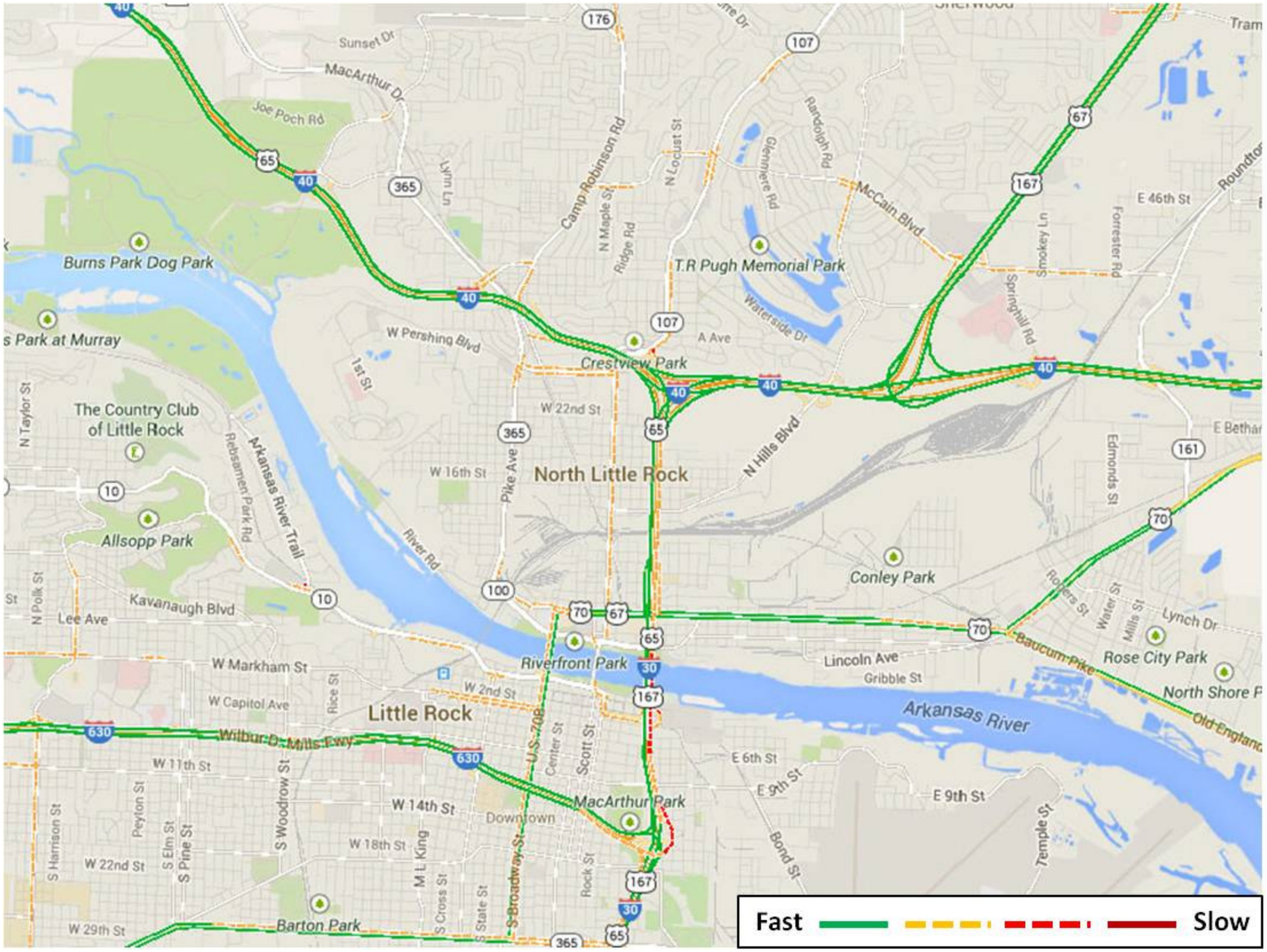
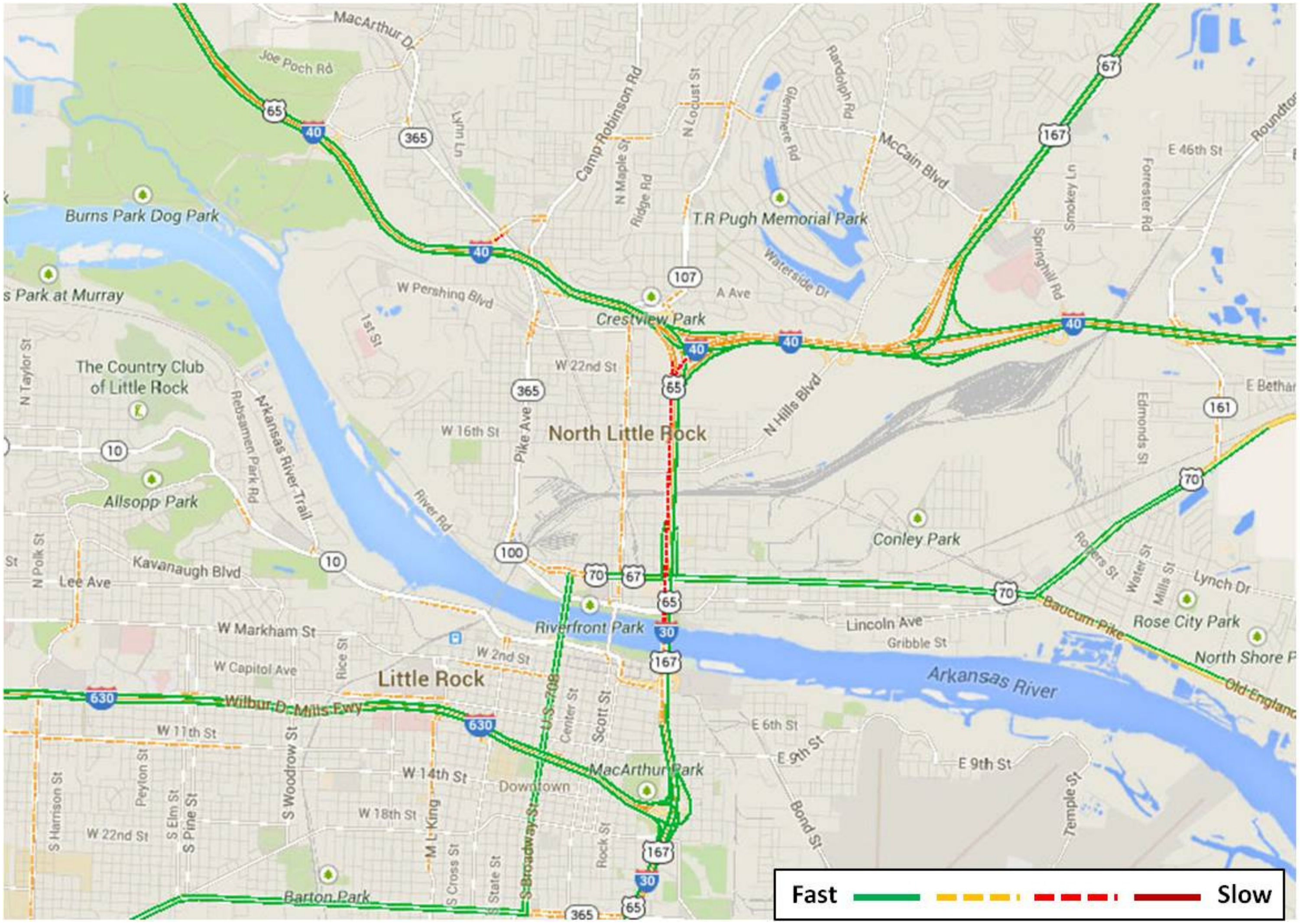


Figure 6. Morning Traffic Conditions
(Google Map; September 26, 2013; 7:51 a.m.)

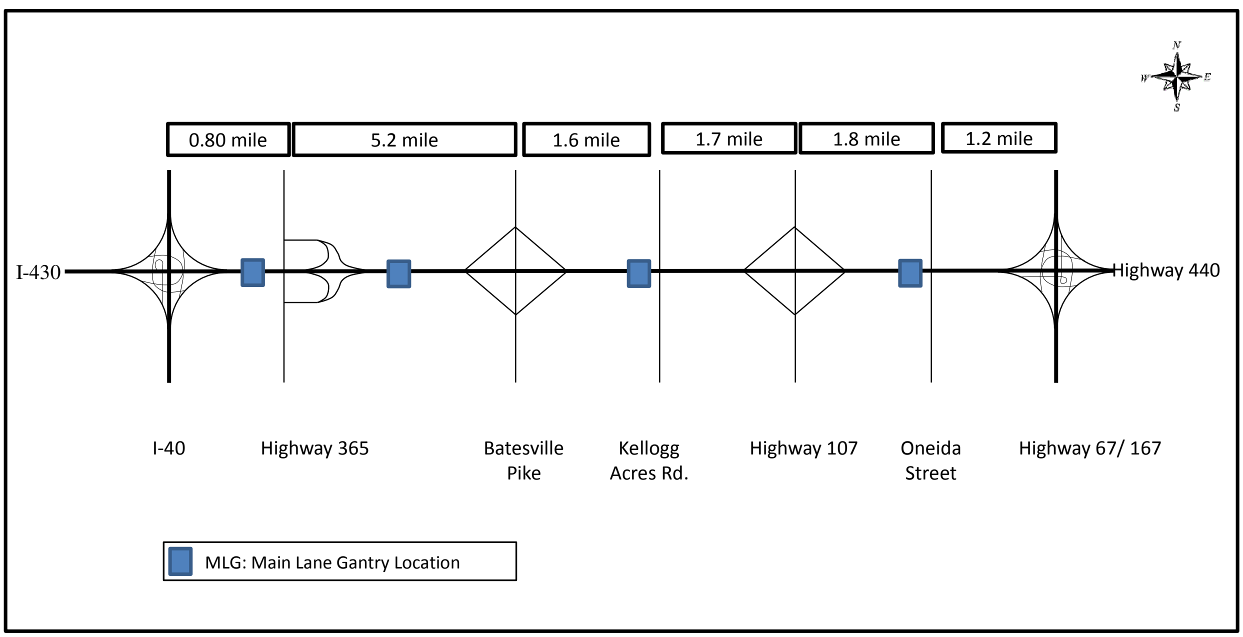


IV. TOLLING CONCEPT

A key step in evaluating toll feasibility is developing a tolling concept that is equitable, maximizes toll revenues, and minimizes tolling related costs. Ideally, a closed toll system that does not allow any non-tolled movement on the facility is preferred. However, depending upon the roadway configuration, the additional costs associated with this type of system must be considered relative to the potential increase in revenue. Each time a toll transaction occurs, net revenue is reduced due to the costs incurred to process the transaction and collect the toll revenue.

A tolling concept was developed for the North Belt Freeway based on a review of project schematics and intersecting roadways. As depicted on Figure 7, the proposed tolling concept includes four-mainline gantries that are located between ingress and egress points. This positioning ensures that motorists using any portion of the project would pass through at least one toll gantry. For example, motorists entering the facility from either Highway 67 or Highway 440 east of the project terminus would not be able to exit without travelling through the toll gantry in the proximity of Highway 107. The toll charged at each gantry will be set based on the distance between the adjacent interchanges. This approach results in a closed toll system.

Figure 7. North Belt Freeway Tolling Concept



Due to cost and operational efficiencies, an all electronic tolling collection (AETC) system that utilizes both transponder and camera-based technology is assumed for the North Belt Freeway. Act 1491 of 2013, "Automatic License Plate Reader System Act," makes use of automatic license plate reader systems illegal by individuals, private industry, and agencies and political subdivisions of the State of

Arkansas including AHTD. It is assumed that this legislation will be modified prior to the projected opening date.

An example of an AETC tolling gantry from Florida's Turnpike Enterprise is provided on Figure 8. Additional designs for larger mainline gantries have also been developed that provide more substantial structural options with enhanced maintenance features. An example of a toll gantry designed to facilitate maintenance by allowing access from above is provided in Figure 9. No cash will be collected on the North Belt Freeway.

Figure 8. Florida's Turnpike Enterprise AETC Tolling Gantry

V. PROJECT COST IN 2013 DOLLARS

The total project cost estimates presented in this memorandum include the following:

- Environmental Documentation
- Preliminary Engineering
- GEC Management and Oversight
- Final Engineering
- Right-of-Way (ROW) Acquisition
- Utility Relocation
- Construction
- Construction Engineering & Inspection

A description of the methodology used to develop each of these cost elements is provided in the following subsections.

Figure 9. Florida's Turnpike Enterprise AETC Tolling Gantry with Improved Access for Maintenance

A. ENVIRONMENTAL DOCUMENTATION

The Environmental Documentation cost element includes costs incurred to prepare the Final Environmental Impact Statement (FEIS) and obtain issuance of a Record of Decision (ROD). A ROD for the North Belt Freeway was issued on September 23, 2008. Therefore, costs for this activity have already been incurred and are not included in the total project costs remaining to implement the project. However, a reevaluation may be required to address tolling. The estimated cost for the reevaluation is $90,000 in 2013 dollars.

B. PRELIMINARY ENGINEERING

The preliminary design phase includes the development of preliminary engineering design and ROW plans. The preliminary engineering cost is based on four percent of the total construction cost.

C. GENERAL ENGINEERING CONSULTANT MANAGEMENT AND OVERSIGHT

Costs include General Engineering Consultant (GEC) costs to provide general project management, project scheduling, management and oversight of design consultants, design document reviews, and coordination and documentation. Although AHTD typically conducts oversight activities for federally funded transportation projects, should the project move forward as a toll project, an independent GEC will be required to support bond sales based on toll revenues. The GEC management and oversight cost is based on one percent of the total construction cost.

D. FINAL ENGINEERING

The final engineering costs include costs for preparing construction plans and developing the Plans, Specifications, and Estimates (PS&E). The PS&E cost is based on eight percent of the total construction cost. Surveying and geotechnical costs are included in the PS&E costs.

E. RIGHT-OF-WAY ACQUISITION

The ROW acquisition cost includes parcel acquisition costs plus other costs such as legal and administrative services, displacee relocations, expert witnesses, etc. Aerial photography was used to assess land use and estimate the extent of the ROW needed to accommodate construction of the project based on the proposed alignment. The ROW width was based on an average width for the project. The average cost per acre was obtained from current or recent real estate transactions and is estimated at $15,000 per acre. Additional costs were included to incorporate the cost associated with existing structures located on the properties. These costs were developed based on the following averages:

- Residential structures – $175,000 per structure
- Commercial structures – $550,000 per structure
- Other – $25,000 per structure

Costs associated with the acquisition process, including legal and administrative services, displacee relocations, expert witnesses, condemnation, etc. were estimated at 11 percent of the property costs.

F. UTILITY RELOCATION

The utility relocation costs include Subsurface Utility Engineering (SUE), utility design, and construction of relocations. One large overhead power line that crosses the proposed alignment has been identified to the east of Highway 107; however, the preliminary vertical alignment prepared for the overall cost estimate allows for the proposed roadway to go under the overhead power line. Therefore, relocation of this power line is not needed. No other major utilities were identified based on a review of the available topography information. Therefore, no costs are included in the estimate for utility relocation.

G. CONSTRUCTION

1. Roadway

Based on the status of the project, limited design data are currently available. Therefore, several assumptions regarding the overall design of the project were made to develop the cost estimate presented in this report. A summary of the key assumptions implemented to develop the roadway cost estimate based on the information provided and discussions with AHTD staff is provided below. A summary of all the project cost assumptions is included in Appendix A. Unit costs are provided in the detailed data supporting the base construction cost estimate and are presented in Appendix B.

- Per AHTD and Metroplan's request, the project cost estimate was prepared for the following segments
  - I-40/I-430 to Highway 365 (Segment #1)
  - Highway 365 to Highway 107 (Segment #2)
  - Highway 107 to Highway 67 (Segment #3)
- Pricing is based on Arkansas-weighted average unit prices dated January–December 2012 unless otherwise noted.
- The roadway construction cost estimate was developed based on two preliminary typical sections. Based on discussions with AHTD and Metroplan staff, the first mainlane proposed section was assumed to be a four-lane depressed median within a controlled access facility with 12-foot lanes and 10-foot outside and 6-foot inside shoulders. The median width for this typical section is 50 feet. The second mainlane proposed typical section was assumed to be a four-lane controlled-access facility with a median barrier with 12-foot lanes and 10-foot outside and 10-foot inside shoulders. The median width for the concrete barrier wall median is 22 feet. Typical Sections were also developed for a one lane interchange ramp, a two-lane side road and a four-lane side road. Typical sections are included in Appendix A.
- The roadway construction cost estimate assumed a concrete barrier through the Camp Robinson sections of the project and a cable barrier system along the sections that do not have a concrete median. The cable barrier was assumed for Segments 1 and 2, which have the depressed median typical section. The cable barrier will not be needed for Segment 3, which has the concrete barrier wall in the median.
- Preliminary survey data provided by the AHTD was utilized to prepare a digital terrain model (DTM), which was used to prepare a preliminary vertical alignment for the provided horizontal alignment shown in the FEIS. This preliminary vertical alignment along with the preliminary proposed typical sections were used to estimate earthwork for the project. Earthwork costs are based on the following:
  a. The estimate for earthwork on the mainlanes is based on excavation and embankment.
  b. The estimate for earthwork on the ramps assumes 5 feet in embankment height with additional costs based on calculations developed by ICA engineering.
  c. The estimate for earthwork on the side roads assumes 2 feet in embankment height with additional costs based on calculations developed by ICA Engineering.
- DTM, available Federal Emergency Management Agency mapping, and engineering judgment were used to evaluate the area between Highway 107 and Highway 67 for hydraulic openings to estimate the type of structure that might be needed such as a bridge or a box culvert.
- Grade separation costs were developed for the Union Pacific Railroad (UPRR), Nebraska Avenue, Missouri Avenue, H Street, New York Avenue, 6th Street, Kellogg Acres Road, and Oneida Street.

Costs for roadway and bridges were prepared by developing a side road typical section and estimating bridge costs based on a prepared cost per square foot of bridge deck. Per discussions with AHTD and Metroplan, the cost estimate assumes that the mainlanes will go over the UPRR, Kellogg Acres, and Oneida. The estimate assumes that side roads will go over the mainlanes for the remainder of the crossings.

- An additional miscellaneous cost equal to 20 percent of the base construction cost was added to account for incidental items such as signing, guardrail, concrete ditch paving, traffic signals, etc. that cannot be quantified at this time based on the level of information currently available. The proposed percentage is similar to costs used on other planning projects in central Arkansas such as the Highway 67 Planning Study.
- Consistent with AHTD Standard Specifications, mobilization was estimated at 5 percent of the base construction cost. An additional 20 percent of the base construction cost was included to account for engineering and contingencies during construction, including design/review time and material costs for change orders that may occur during construction. These items are identified as separate line items from the base construction cost and are included in the total construction cost.

2. Toll Systems

The toll facility and equipment costs were developed using costs for similar facilities. For this Level 1 study, it was assumed that toll collection would be all electronic. There are four mainline toll gantries proposed. These will span the entire proposed four-lane section. The toll gantries will be located between each interchange. No gantries or tolling points are proposed for any interchange ramps. Transactions recorded at the mainline gantries will be transmitted via fiber optic cable along the corridor to a single host toll system and payment processing Customer Service Center (CSC)/Video Processing Center (VPC). The CSC/VPC is proposed to be housed within an existing facility, and no construction of a building is required.

The toll system cost estimate developed for this analysis includes and is based on the following:

a. Capital cost of the roadside tolling point including the cost of the gantry structure associated tolling equipment, and a "technical shelter." The gantry would span all four lanes and provide toll equipment for each lane and the shoulders. The technical shelter would house the tolling point electronics for the toll system, network communications, security/access control, and supporting utilities. This is also where the fiber and power would connect to the toll system. For purposes of this analysis, the capital costs of each tolling point in 2013 dollars were estimated as follows:
   - Four-lane gantry and toll equipment – $2,610,000 each
   - The cost of four gantries and toll equipment is $10,440,000

b. The fiber optic cable that runs along the length of the corridor is estimated at $65,000 per mile. It is assumed that the fiber will connect to an existing system at either end. The total cost for fiber the 12.3-mile length of the corridor is $799,500.

c. The Host System will be a single small toll transaction host site estimated at $1,400,000. This cost includes the hardware, software, systems development costs, and infrastructure.
d. The CSC/VPC is assumed to be housed within an existing AHTD facility. It is assumed that the CSC/VPC will be sized to operate the proposed North Belt project as a standalone project. The cost of the hardware, software, and systems development for the CSC/VPC is estimated at $1,390,000. A cost of $110,000 is assumed for the build out of the existing facility for a total cost of $1,500,000.

H. CONSTRUCTION ENGINEERING AND INSPECTION

The Construction Engineering and Inspection cost element includes costs of maintaining staff to manage the construction engineering and inspection tasks, review contractor's plans, inspection of contractor's operations, conduct construction inspections and materials testing, and tracking project progress through review of progress/status reports. The Construction Engineering and Inspection cost is estimated at 10 percent of the total construction cost.

I. TOTAL 2013 PROJECT COST

Table 1 presents the total project cost in 2013 dollars for each of the three segments and the entire North Belt Freeway based on the methodology described in the previous sections. As presented in Table 1, the total construction cost for the entire North Belt Freeway is approximately $459 million. The bridge structures represent approximately 40 percent of this total. Including the other project cost elements the total project cost increases to approximately $575 million. Detailed information supporting the cost data presented in Table 1 is provided in Appendix A.

VI. PROJECT COST IN YEAR OF EXPENDITURE DOLLARS

The project is assumed to open in 2020. To meet this opening date, construction is anticipated to begin in January 2018. Therefore, the construction cost estimate must be adjusted for inflation. Year of expenditure (YOE) costs are calculated by applying an estimated annual inflation rate to base year cost estimates. The base year for the project cost is 2013.The base year cost for each cost element has been escalated to the first year of the activity based on an annual inflation rate of 2.5 percent per year. Table 2, provides a high level schedule for project implementation based on the assumed opening date of 2020. ROW acquisition is assumed to occur in 2017 upon completion of the preliminary engineering and the 2013 ROW cost is inflated to the midpoint of the activity. Table 3 provides the YOE costs taking into account the anticipated impact of inflation and assumed project schedule. As noted in table 3, the total year of expenditure cost is approximately $648 million.

Table 1. North Belt Freeway Total Project Cost (2013 $)

Cost Element	Segment I (I-40 to Highway 365)	Segment II (Highway 365 to Highway 107)	Segment III (Highway 107 to Highway 67)	TOTAL
Construction				
Grading Base & Surfacing[1]	$11,713,000	$66,698,000	$22,638,000	$101,049,000
Bridges	$53,089,000	$13,222,000	$119,369,000	$185,680,000
Drainage Structures	$530,000	$4,890,000	$835,000	$6,255,000
Traffic Signal Installation	$250,000	$250,000	$250,000	$750,000
Maintenance of Traffic	$250,000	$120,000	$260,000	$630,000
SUBTOTAL	***$65,832,000***	***$85,180,000***	***$143,352,000***	***$294,364,000***
Miscellaneous (20%)[2]	$13,167,000	$17,036,000	$28,671,000	$58,874,000
SUBTOTAL	***$78,999,000***	***$102,216,000***	***$172,023,000***	***$353,238,000***
Mobilization (5%)	$3,950,000	$5,111,000	$8,602,000	$17,663,000
SUBTOTAL	***$82,949,000***	***$107,327,000***	***$180,625,000***	***$370,901,000***
Contingency (20%)	$16,590,000	$21,466,000	$36,125,000	$74,181,000
SUBTOTAL	***$99,539,000***	***$128,793,000***	***$216,750,000***	***$445,082,000***
Toll System	$3,535,000	$7,070,000	$3,535,000	$14,140,000
TOTAL CONSTRUCTION COST[2]	**$103,074,000**	**$135,863,000**	**$220,285,000**	***$459,222,000***
Other Project Costs				
Environmental Clearance[3]	$30,000	$30,000	$30,000	$90,000
Preliminary Engineering (4%)	$4,123,000	$5,435,000	$8,812,000	$18,370,000
GEC Management & Oversight (1%)	$1,031,000	$1,359,000	$2,203,000	$4,593,000
Final Engineering (8%)	$8,246,000	$10,870,000	$17,623,000	$36,739,000
Construction Engineering & Inspection (10%)	$10,308,000	$13,587,000	$22,029,000	$45,924,000
Right of Way Acquisition[4]	$2,948,000	$4,574,000	$2,331,000	$9,853,000
Utilities[5]	$0	$0	$0	$0
TOTAL OTHER PROJECT COSTS	***$26,686,000***	***$35,855,000***	***$53,028,000***	***$115,569,000***
TOTAL PROJECT COST (2013$)	**$129,760,000**	**$171,718,000**	**$273,313,000**	**$574,791,000**

BASIS OF CONSTRUCTION COST ESTIMATE:

COST ROUNDED TO THE NEAREST $1,000.

PRICING BASED ON ARKANSAS WEIGHTED AVERAGE UNIT PRICES DATED JANUARY–DECEMBER 2012 UNLESS OTHERWISE NOTED.

EARTHWORK FOR MAINLANES BASED ON PRELIM. LINE AND GRADE DEVELOPED BY ICA ENG. ($5.73/CY EXCAVATION AND $6.74/CY EMBANKMENT).

EARTHWORK FOR RAMPS ASSUMED TO BE 5 FEET IN EMBANKMENT HEIGHT WITH THE ADDITIONAL COSTS FOUND BY ICA CALCULATIONS ($89.15/FT).

EARTHWORK FOR SIDE ROADS ASSUMED TO BE 2 FEET IN EMBANKMENT HEIGHT WITH THE ADDITIONAL COSTS FOUND BY ICA CALCULATIONS ($23.96/FT & $35.95/FT).

DRAINAGE COST BASED ON AVERAGE DRAINAGE AND AHTD UNIT PRICES ($78.39/FT).

TRAFFIC SIGNAL INSTALLATION BASED A COST OF $125,000/EACH.

MAINTENACE OF TRAFFIC BASED ON ENGINEERING JUDGEMENT.

NOTES:

1. Includes the following cost: $11.24/ft for wire rope safety fence and $219.62/ft for concrete median barrier.

2. Includes incidental items such as signing, guardrail, concrete ditch paving, traffic signals, etc. that cannot be quantified at this time based on the level of information currently available.

3. Cost for environmental clearance activities already conducted to obtain a Record of Decision are considered a sunk cost and are not included in the estimate. However, $90,000 is included to allow for potential re-evaluation of the FEIS to address tolling.

4. Right-of-way acquisition includes 11% of the property costs for cost of acquisition (legal, appraisal, relocation, etc.) Land value based on $15,000/acre, Residental value based on $175,000/house, Commercial value based on $550,000, and Other value based on $25,000/each.

5. There is one identified large overhead power line to the east of Highway 107 that crosses the proposed alignment; however, the preliminary vertical alignment that has been prepared allows for the proposed roadway to go under the overhead power line and not require relocation.

No other major utilities have been identified based on the available topography information. Therefore, no costs were included for utilities in the estimate.

Table 2. North Belt Freeway Assumed Implementation Schedule

North Belt Freeway							
Cost Element	Begin	End	2015	2016	2017	2018	2019
Environmental Clearance[1]	January-16	December-16					
Preliminary Engineering	January-16	December-16					
GEC Management & Oversight	January-16	December-19					
Final Engineering	January-17	December-17					
Right of Way Acquisition	January-17	December-17					
Construction	January-18	December-19					
Construction Engineering & Inspection	January-18	December-19					

1. Re-evaluation for tolling only.

Table 3. North Belt Freeway Year of Expenditure Cost Estimate

Element	Year of Cost Estimate	Inflation Year	Costs (2013$)	Annual Inflation Rate	Inflated Year of Expenditure Cost Estimate
Environmental Clearance[1]	2013	2016	$90,000	2.50%	$97,000
Preliminary Engineering	2013	2016	$18,370,000	2.50%	$19,783,000
GEC Management & Oversight	2013	2016	$4,593,000	2.50%	$4,947,000
Final Engineering	2013	2017	$36,739,000	2.50%	$40,553,000
ROW Acquisition	2013	2017	$9,853,000	2.50%	$11,011,000
Construction	2013	2018	$459,222,000	2.50%	$519,568,000
Construction Engineering & Inspection	2013	2018	$45,924,000	2.50%	$51,959,000
Total			**$574,791,000**		**$647,918,000**

1. Re-evaluation for tolling only.

VII. TOLL SYSTEM OPERATIONS AND MAINTENANCE COST

A. TOLL OPERATIONS

Operations encompass a variety of activities but generally include the processing and collection of tolls. Based on the estimated number of transactions, small number of accounts, and high percentage of initial transactions being video based, it is assumed that 10 customer service representatives and 20 image reviewers will be required to perform these functions. At the conceptual level the cost for collecting and processing tolls is typically included in an average cost per tolled transaction. For purposes of this analysis, the cost per transaction was developed based on a review of transaction costs for several tolling entities in the U.S. and was estimated in 2013 dollars at $0.15 per transponder transaction and $0.40 per video transaction. In the initial year of opening, assumed to be 2020, it is estimated that 70 percent of the transactions are by transponder and 30 percent will be video based. By

2030, it is estimated that 90 percent of the transactions are by transponder and 10 percent by video. This 90/10 percent split is assumed for the remaining duration of the forecast period.

The annual operations cost has been determined by multiplying the per transaction cost for each transaction type by the number of each type of transaction. The transaction costs have been inflated each year by 2.5 percent.

B. TOLL SYSTEM MAINTENANCE

In addition to the per transaction processing costs, there are costs to maintain the toll systems to ensure that they are operating correctly. For purposes of this analysis, it is assumed that the monthly cost to maintain the toll equipment is approximately $4,000 per gantry each direction. As previously noted, the proposed toll concept includes four gantries, each spanning a total of four lanes (two in each direction). Based on the estimated per gantry lane cost and proposed toll configuration, toll system maintenance is estimated at $32,000 per month in 2013 dollars. This equates to $384,000 per year. Maintenance of the toll system network is estimated at an additional $150,000 per year. Total toll system maintenance is estimated at $534,000 per year in 2013 dollars. The 2013 estimated cost is escalated by 2.5 percent per year throughout the 50-year forecast period.

C. ENFORCEMENT

Several options are available for reducing the number of facility users evading payment of tolls, including:

1. Police enforcement
2. Audible alarms
3. Camera based solutions

The first two options have additional equipment requirements not directly related to toll collection or operations. As such they tend to be more expensive than camera-based solutions, which utilize equipment already installed for video tolling to capture front and rear license plate images. Additionally, the noncamera-based solutions are more intrusive and can result in traffic disruptions or impede traffic flow. Based on these limitations and assuming all electronic tolling, the first two options are not recommended for the North Belt Freeway.

The camera-based option coupled with back office business rules for notifying violators and processing payments is the most commonly used process for enforcing payment on facilities that utilize AETC. This process involves the processing of license plate numbers, database searches of motor vehicle department records to identify the vehicle owner, and issuance of mailing notices seeking payment of the tolls and administrative costs.

The existence of legislative authority to access registration data and allow for suspension of vehicle registration due to unpaid tolls is a prerequisite to the effective use of camera-based technology as a violation enforcement mechanism. The cost of the cameras is included in the capital cost of the tolling equipment. Additionally, License Plate Recognition (LPR) technology can be automated for the majority of the video transactions, further reducing costs. However, there are additional staffing costs to perform the back office functions needed to bill and collect payment. These costs are included in the $0.40 cost per video transaction (in 2013 dollars and inflated to year of expenditure).

D. LIFECYCLE TOLL SYSTEM AND OPERATIONS COSTS

The estimated toll system and operations costs for the North Belt Freeway over a 50-year period based on the methodology described are presented in Section X.

VIII. ROADWAY MAINTENANCE COST

During the initial years of operation, the system should require relatively minor capital improvements. The annual routine roadway maintenance cost is based on the cost of similar facilities. These costs include routine maintenance of the roadside, such as litter and vegetation management (mowing) and of the signing and pavement marking and striping. Toll roads are typically maintained at a higher level than nontoll roads. This provides an added incentive for toll paying customers to drive on the roadway. Based on annual maintenance costs for similar toll roads in Florida and Texas, per mile routine maintenance costs range from approximately $90,000 to $120,000 per centerline mile. For purposes of this analysis, the annual maintenance cost per centerline mile was estimated at $100,000 in 2013 dollars. This estimate was based on a length of 12.3 miles. The annual maintenance estimate was inflated at 2.5 percent annually. The 50-year roadway maintenance costs based on the methodology described above are presented in Section X.

IX. RENEWAL AND REPLACEMENT COSTS

A. ROADWAY

Typically a pavement structure is designed for a 20-year life expectancy. Over a 50-year period the initial construction will deteriorate and ultimately fail even with routine maintenance. Based on historical data, a maintenance and rehabilitation schedule has been developed for the pavement structure. As previously noted, in the first few years maintenance will be less than in later years. For this study, the first nonannual treatment is projected to occur in year 15. The 15-year treatment will include rehabilitation of joints, concrete patching, grinding to restore smoothness, and recompaction of shoulders. The second major treatment will occur in year 25 and consist of concrete patching, rehabilitation of joints, guardrail replacement, and adding a 6-inch asphaltic concrete hot mix (ACHM) overlay to the Portland cement concrete (PCC) pavement. In year 35, a full depth reconstruction will be needed. Finally in year 50, the treatment conducted in year 15 will be repeated.

B. TOLL SYSTEMS

As components break down and become obsolete, the toll collection system will need to be rehabilitated and/or upgraded to accommodate technology improvements. Based on experience with tolling entities across the U.S., the toll systems renewal and replacement estimates assume that the toll systems will need to be replaced on average every 7 years. For this sketch level analysis, the 2013 toll system capital cost minus the cost of the fiber ($13,340,000) was escalated by 2.5 percent annually to the year of the expense.

C. LIFECYCLE RENEWAL AND REPLACEMENT COSTS

The renewal and replacement costs for both the roadway and the toll systems over a 50-year period based on the methodology previously described are presented in Section X.

X. TOTAL LIFECYCLE COSTS

As noted in the previous sections, there are various costs incurred to operate and maintain a toll facility. Table 4 presents the total 50-year lifecycle costs for each of these elements for the base case toll traffic and revenue scenario. As noted in Table 4, the total cost for operations, maintenance, and renewal and replacement is approximately $1.5B over the 50-year period. The majority of the lifecycle costs (69 percent) are for toll collections and operations. At 15 percent, toll systems renewal and replacement represents the second highest cost over the 50-year life cycle. The remaining 16 percent is almost evenly split between roadway maintenance (9 percent) and roadway renewal and replacement (7 percent).

Table 4. North Belt Freeway Lifecycle Operations and Maintenance Costs (2020–2069)

Toll Revenue Maximization ($0.20/mile)					
Year	Toll Collections and Operations (including Toll Systems Maintenance)	Roadway Maintenance	Roadway R&R	Toll Systems R&R	Total O&M and R&R
2020	$3,960,636	$1,462,083	$0	$0	$5,422,719
2021	$4,763,833	$1,498,636	$0	$0	$6,262,469
2022	$5,606,177	$1,536,101	$0	$0	$7,142,279
2023	$6,486,470	$1,574,504	$0	$0	$8,060,974
2024	$7,403,337	$1,613,867	$0	$0	$9,017,204
2025	$8,355,081	$1,654,213	$0	$0	$10,009,295
2026	$8,557,576	$1,695,569	$0	$18,389,337	$28,642,482
2027	$8,755,012	$1,737,958	$0	$0	$10,492,970
2028	$8,946,797	$1,781,407	$0	$0	$10,728,203
2029	$9,132,233	$1,825,942	$0	$0	$10,958,175
2030	$9,310,683	$1,871,590	$0	$0	$11,182,274
2031	$9,717,656	$1,918,380	$0	$0	$11,636,037
2032	$10,142,724	$1,966,340	$0	$0	$12,109,064
2033	$10,586,724	$2,015,498	$4,081,250	$21,859,143	$38,542,615
2034	$11,050,523	$2,065,886	$0	$0	$13,116,409
2035	$11,534,942	$2,117,533	$0	$0	$13,652,474
2036	$12,040,874	$2,170,471	$0	$0	$14,211,345
2037	$12,569,424	$2,224,733	$0	$0	$14,794,157
2038	$13,121,530	$2,280,351	$0	$0	$15,401,882
2039	$13,698,288	$2,337,360	$0	$0	$16,035,648
2040	$14,300,767	$2,395,794	$0	$25,983,652	$42,680,213
2041	$14,930,109	$2,455,689	$0	$0	$17,385,798
2042	$15,587,618	$2,517,081	$0	$0	$18,104,699
2043	$16,274,398	$2,580,008	$25,917,762	$0	$44,772,168
2044	$16,991,944	$2,644,508	$0	$0	$19,636,453
2045	$17,741,533	$2,710,621	$0	$0	$20,452,154
2046	$18,524,666	$2,778,387	$0	$0	$21,303,053
2047	$19,342,757	$2,847,846	$0	$30,886,397	$53,077,000
2048	$20,197,542	$2,919,042	$0	$0	$23,116,585
2049	$21,090,604	$2,992,018	$0	$0	$24,082,623
2050	$22,023,487	$3,066,819	$0	$0	$25,090,306
2051	$22,998,318	$3,143,489	$0	$0	$26,141,807
2052	$24,016,730	$3,222,077	$0	$0	$27,238,807
2053	$25,080,846	$3,302,629	$64,734,530	$0	$93,118,004
2054	$26,192,706	$3,385,194	$0	$36,714,220	$66,292,121
2055	$27,354,245	$3,469,824	$0	$0	$30,824,069
2056	$28,567,987	$3,556,570	$0	$0	$32,124,557
2057	$29,836,167	$3,645,484	$0	$0	$33,481,651
2058	$31,161,323	$3,736,621	$0	$0	$34,897,944
2059	$32,545,860	$3,830,037	$0	$0	$36,375,897
2060	$33,992,708	$3,925,787	$0	$0	$37,918,495
2061	$35,504,397	$4,023,932	$0	$43,641,671	$83,170,000
2062	$37,083,972	$4,124,530	$0	$0	$41,208,502
2063	$38,734,617	$4,227,644	$0	$0	$42,962,261
2064	$40,459,414	$4,333,335	$0	$0	$44,792,748
2065	$42,261,678	$4,441,668	$0	$0	$46,703,347
2066	$44,145,166	$4,552,710	$0	$0	$48,697,876
2067	$46,113,241	$4,666,528	$0	$0	$50,779,769
2068	$48,169,823	$4,783,191	$9,685,158	$51,876,232	$114,514,404
2069	$50,318,908	$4,902,771	$0	$0	$55,221,679
TOTAL	**$1,047,284,056**	**$142,530,256**	**$104,418,700**	**$229,350,654**	**$1,523,583,665**

APPENDIX A

COST ESTIMATING METHODOLOGY MEMO

North Belt Freeway Feasibility Study

Proposed Cost Estimating Methodology & Assumptions

Developed by:

ICA Engineering

In Consultation with:

ATKINS

FINAL

March 2014

The Atkins team is currently conducting a toll feasibility study for the North Belt Freeway. One of the key inputs to the feasibility analysis is the capital cost estimate to construct the proposed facility. The North Belt Freeway is proposed as a four-lane, limited-access facility between I-40 and Highway 67 in Central Arkansas. The corridor spans approximately 13 miles completing the connection between I-430 in the west and Highway in the east.

The purpose of this memorandum is to outline and request concurrence on the proposed methodology that will be implemented to develop the capital cost estimates for both the roadway and the tolling infrastructure. This methodology, which was established primarily based on the available design files provided by AHTD and the preferred alternative route described in the Final Environmental Impact Statement (FEIS), is summarized below.

1. Cost estimates will be based upon the following preliminary typical sections as depicted in Attachment 1:

    a. First mainlane proposed typical section - a four-lane depressed median controlled access facility with 12 foot lanes and 10 foot outside and 6 foot inside shoulders.
    b. Second mainlane proposed typical section - a four-lane controlled access facility with a median barrier with 12 foot lanes and 10 foot outside and 10 foot inside shoulders.
    c. One-lane interchange ramp.
    d. Two-lane side road and a four-lane side road.

2. The cost estimate will assume a concrete barrier through the Camp Robinson sections of the project and a cable barrier system along the sections that do not have a concrete median.

3. A Preliminary 19-inch thick Pavement Design consisting of 12 inches of portland cement concrete pavement, 1 inch of ACHM surface course (used as a bond breaker), and 6 inches of cement stabilized crushed stone base course will be used to estimate the mainlanes and ramps pavement costs. This section is consistent with pavement designs used along Highway 67 in Pulaski County. The proposed 19-inch depth should be reviewed for appropriateness when final traffic projections are available. Any proposed modifications based on forecasted traffic volumes will be transmitted to AHTD for approval.

4. A Preliminary 12-inch thick Pavement Design consisting of 5 inches of ACHM Base Course, 3 inches of ACHM Binder Course, and 4 inches of ACHM Surface Course will be used to estimate the side road pavement costs. The proposed 12-inch depth should be reviewed for appropriateness when final traffic projections are available. Any proposed modifications based on forecasted traffic volumes will be transmitted to AHTD for approval.

5. Preliminary survey data provided by the Department will be used to prepare a digital terrain model (DTM). The DTM will be used to prepare a preliminary vertical alignment for the provided horizontal alignment shown in the FEIS. This preliminary vertical alignment along with the preliminary proposed typical section will be used to estimate earthwork for the project. Additionally, DTM, available FEMA mapping, and engineering judgment to evaluate the area

between Highway 107 and Highway 67 for hydraulic openings to estimate the type of structure that might be need such as a bridge or a box culvert.

6. The capital cost estimate for the tolling infrastructure and equipment will be developed by Atkins assuming that AHTD or another entity will operate a Customer Service Center (CSC) for the proposed facility with sufficient capacity to include the North Belt Freeway transactions. The Customer Service Center would handle all transponder-based and video transactions and would process violations. It will be assumed that the CSC will be housed in an existing entity's office space and no new building construction is needed. However, the cost of the equipment housed in the CSC will be included. Additionally the infrastructure costs to install equipment/fiber to transmit data from the tolling site to the CSC will be included as the CSC capital cost.

   The cost of operations will be based on a per transaction cost that will account for assumed personnel and equipment costs for the CSC and maintenance of the tolling systems. Overhead costs associated with the CSC building (i.e., electricity, water) will not be included as they are assumed to be absorbed as part of the existing entities overall operating costs.

   The estimate will assume all electronic toll collection, whereby transactions are recorded at the roadside tolling points and transmitted via fiber optic cable along the corridor to a host toll system and to the Customer Service Center for processing. This approach is consistent with the Moving Ahead for Progress in the 21st Century Act (MAP-21) provisions which require that all Federal-aid highway toll facilities implement technologies or business practices that provide for the interoperability of electronic toll collection by October 1, 2016. To minimize costs, at this stage of the concept development, the toll system is proposed to include one host toll site for the project.

   Based on the description provided above, the toll system estimate developed for this analysis will include the capital cost of the roadside tolling point including the cost of the gantry structure, associated tolling equipment, and a "technical shelter." The technical shelter would house tolling point electronics for the tolling system, network communications, security/access control, and supporting utilities. This is also where the long haul fiber and power would connect to the toll system. For purposes of this analysis, fiber optic cable will run along the length of the corridor.

7. The project cost estimate will be prepared for the following segments

   - I-40 / I-430 to Highway 365 (Segment #1)
   - Highway 365 to Highway 107 (Segment #2)
   - Highway 107 to Highway 67 (Segment #3)

8. Interchange costs will be developed for proposed interchanges at I-40, Highway 365, relocated Batesville Pike, Highway 107, and Highway 67/I-440. Interchange capital costs will be included in one of the segments identified above if the interchange is located at the termini of a segment such as the Highway 107 and Highway 365 interchanges.

9. Grade separation costs will be developed for UPRR, Nebraska Ave, Missouri Ave, H Street, New York Ave, 6th Street, Kellogg Acres Rd, and Oneida St. Costs for roadway and bridges will be prepared by developing a side road typical section and estimating bridge costs based on a prepared costs per square foot of bridge deck. The cost estimate will be based on the assumption that the main lanes will go over the UPRR, Kellogg Acres, and Oneida. For the remainder of the project, it will be assumed that the side roads will go over the main lanes for the remainder of the crossings.

10. Maintenance of Traffic will be based on engineering judgment at interchange and crossing road locations.

11. Once the base construction cost has been developed an additional miscellaneous cost equal to 20% of the base construction cost will be added to account for incidental items such as signing, guardrail, concrete ditch paving, traffic signals, etc. that cannot be quantified at this time based on the level of information currently available. The proposed percentage is similar to costs used on other planning projects in central Arkansas such as the Highway 67 Planning Study.

12. Consistent with AHTD Standard Specifications, mobilization will be estimated at 5% of the base construction cost. An additional 20% of the base construction cost will be included to account for engineering and contingencies during construction, including design/review time and material costs for change orders that may occur during construction. These items will be identified as separate line items from the base construction cost but will be included in the total construction cost.

13. There is one identified large overhead power line to the east of Highway 107 that crosses the proposed alignment; however, the preliminary vertical alignment that has been prepared allows for the proposed roadway to go under the overhead power line and not require relocation. There have not been any other major utilities identified based on the provided topographic information. Therefore, no costs will be included for utilities in the estimate.

14. Aerial photography will be used to estimate land use and develop a cost per acre for right of way costs. The right of way width will be based on an average width for the project. The average cost per acre, based on current or recent real estate transactions is estimated at $15,000 per acre. Additional costs will be included to incorporate the cost associated with existing structures located on the properties. These costs will be developed based on the following averages:

    - Residential structures - $175,000 per structure
    - Commercial structures - $550,000 per structure
    - Other - $25,000 per structure

    Costs associated with the acquisition process, including legal and administrative services, displacee re-locations, expert witnesses, condemnation, etc. will be estimated at 11% of the property costs.

15. The following presents the methodology for determining the total project cost:

- Environmental Clearance - $90,000*
- Preliminary Engineering – 4% of total construction cost
- GEC Management & Oversight – 1% of total construction cost**
- Final Engineering – 8% of total construction cost
- Construction Engineering and Inspection – 10% of total construction cost

*Although a ROD for the North Belt Freeway was issued on September 23, 2008, a re-evaluation may be required to address tolling.
** Although AHTD typically conducts oversight activities, should the project move forward as a toll project, an independent GEC will be needed.

16. The cost estimate will include both a 2013 estimate and a year of expenditure estimate based on the following inflation methodology and the draft implementation schedule presented in Table 1:

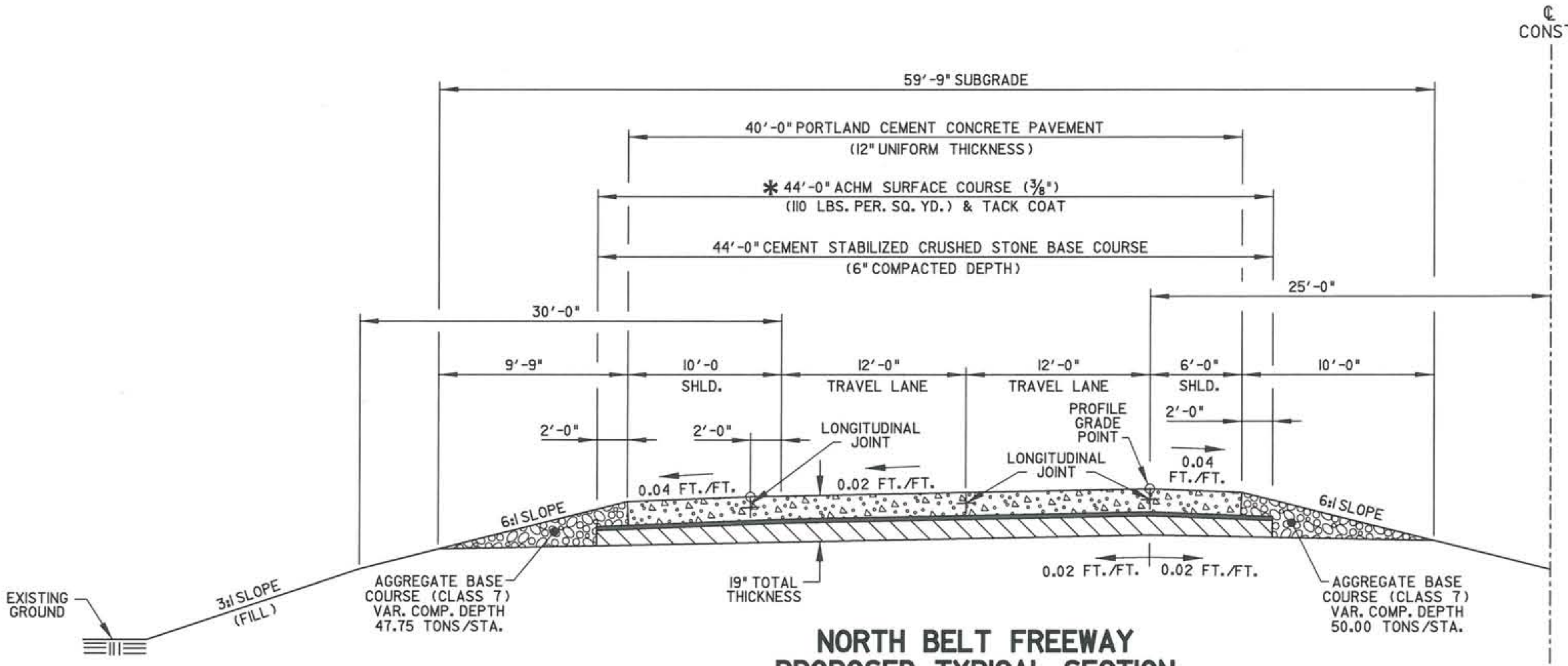
With the exception of ROW, the base year cost for each cost element will be escalated to the first year of the activity based on an annual inflation rate of 2.5 percent per year. ROW acquisition is assumed to occur in 2017 upon completion of the preliminary engineering and the 2013 ROW cost will be inflated to July 2017 or the midpoint of the activity.

Table 1. Assumed North Belt Freeway Implementation Schedule

North Belt Freeway							
Cost Element	Begin	End	2015	2016	2017	2018	2019
Environmental Clearance[1]	January-16	December-16					
Preliminary Engineering	January-16	December-16					
GEC Management & Oversight	January-16	December-19					
Final Engineering	January-17	December-17					
Right of Way Acquisition	January-17	December-17					
Construction	January-18	December-19					
Construction Engineering & Inspection	January-18	December-19					
1. Re-evaluation for tolling only.							

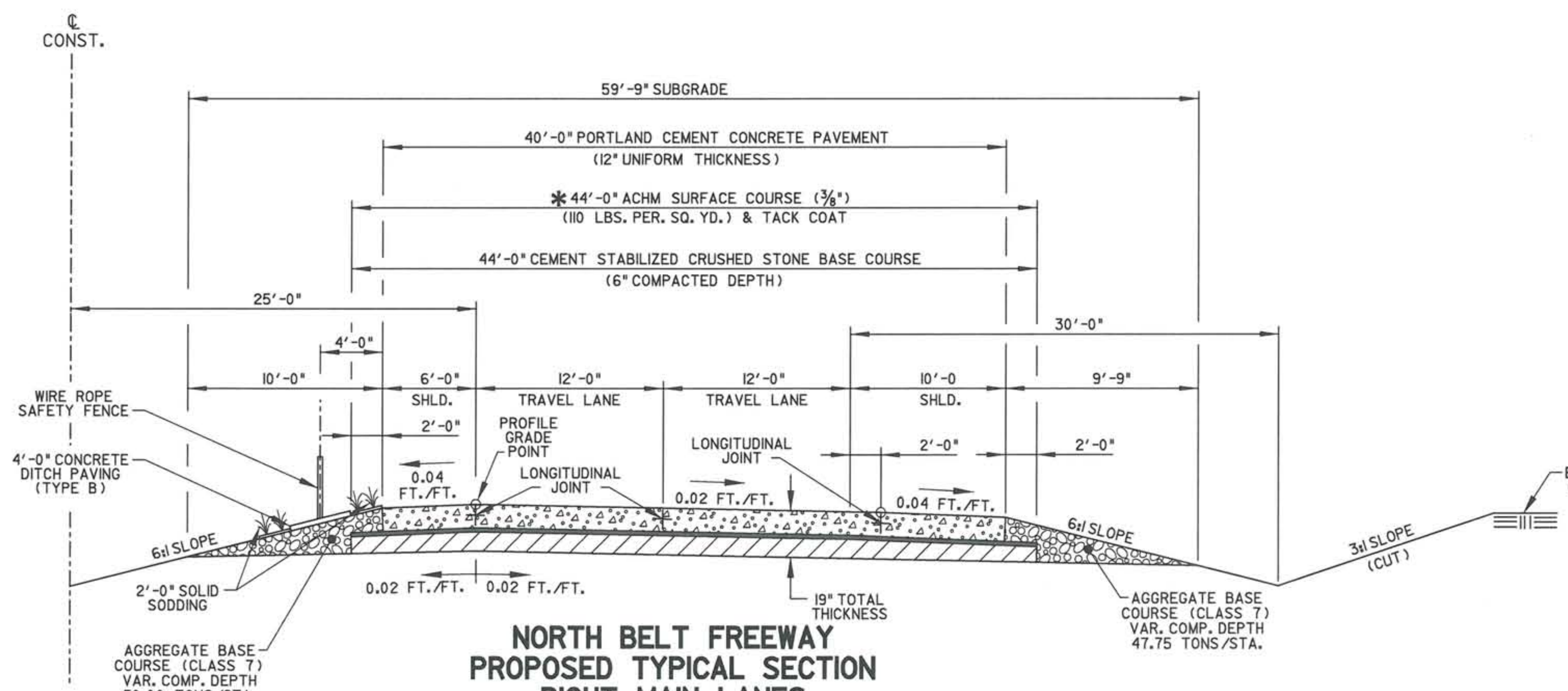
1. Re-evaluation for tolling only.

Attachment A
North Belt Freeway Proposed Typical Sections



NORTH BELT FREEWAY
PROPOSED TYPICAL SECTION
LEFT MAIN LANES
A-A

* DENSITY REQUIREMENTS WAIVED



NORTH BELT FREEWAY
PROPOSED TYPICAL SECTION
RIGHT MAIN LANES
A-A

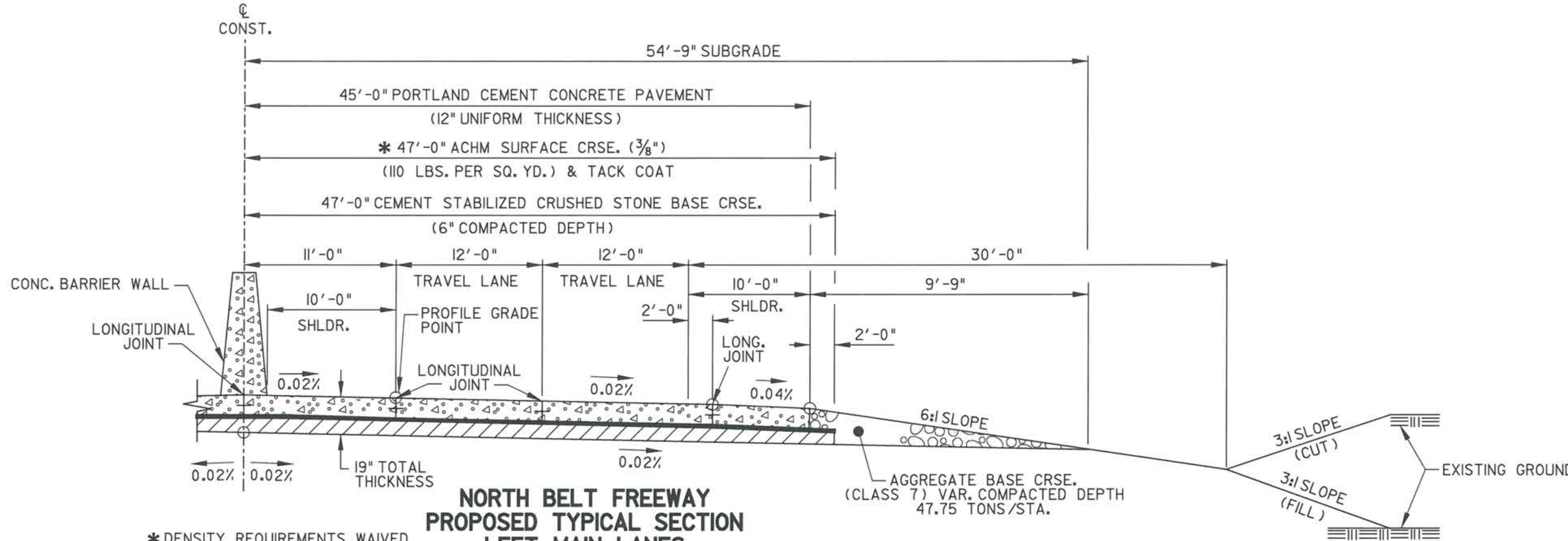
* DENSITY REQUIREMENTS WAIVED

PRELIMINARY - NOT FOR CONSTRUCTION

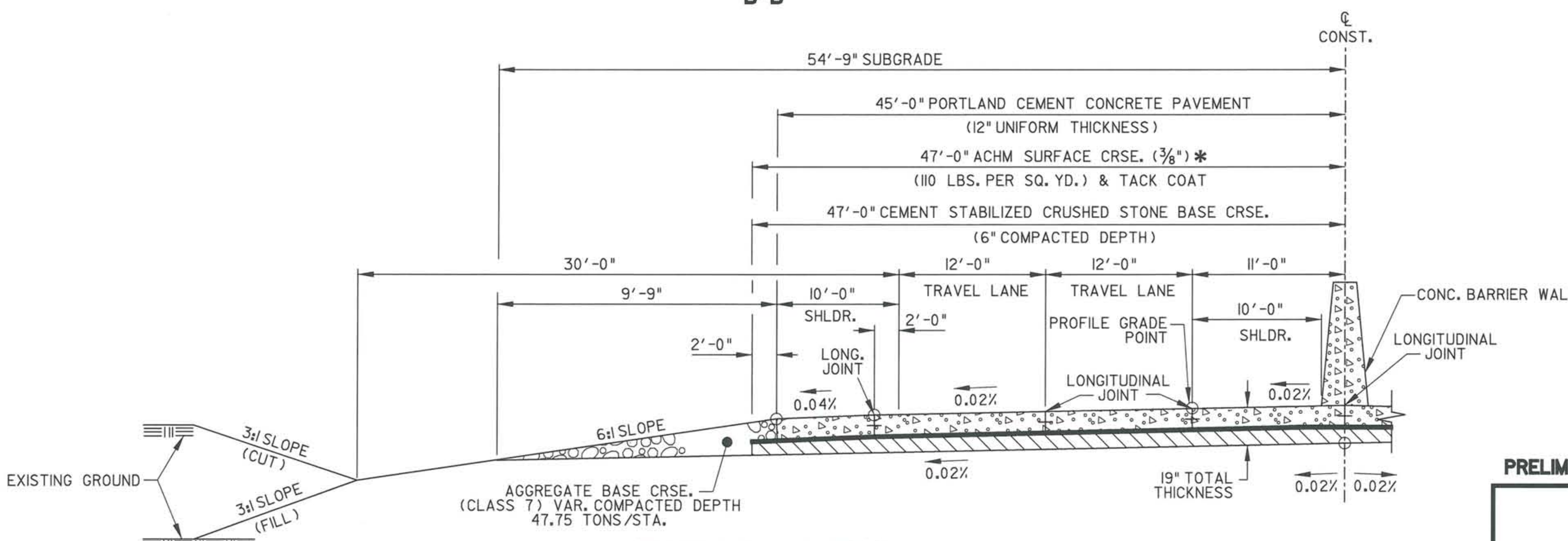
ICA Engineering
320 Executive Court, Suite 100
Little Rock, AR 72205
501.907.7153
www.icaeng.com

NORTH BELT FREEWAY FEASIBILITY STUDY
TYPICAL SECTIONS

COUNTY: PULASKI	DISTRICT: 6	JOB: 061386



NORTH BELT FREEWAY
PROPOSED TYPICAL SECTION
LEFT MAIN LANES
B-B



NORTH BELT FREEWAY
PROPOSED TYPICAL SECTION
RIGHT MAIN LANES
B-B

PRELIMINARY - NOT FOR CONSTRUCTION

ICA Engineering
320 Executive Court, Suite 100
Little Rock, AR 72205
501.907.7153
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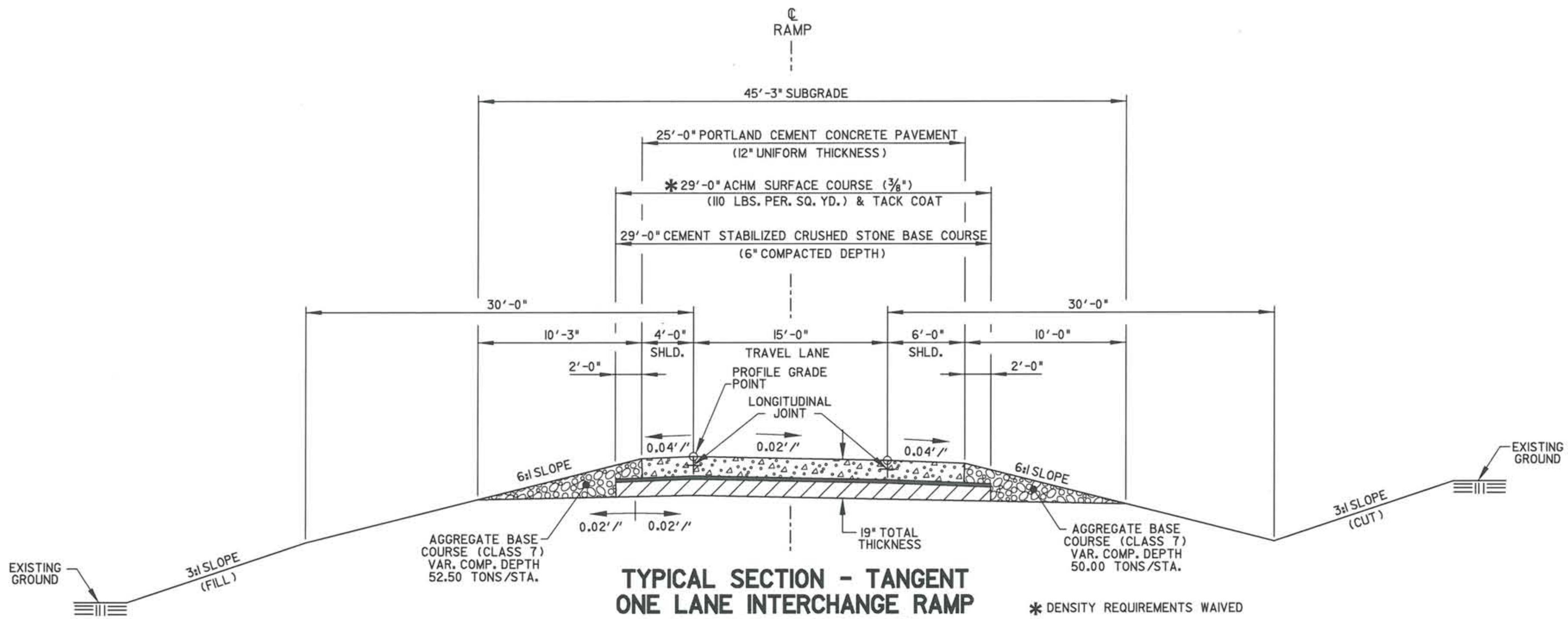
NORTH BELT FREEWAY FEASIBILITY STUDY
TYPICAL SECTIONS

COUNTY: PULASKI	DISTRICT:6	JOB: 061386



TYPICAL SECTION - TANGENT ONE LANE INTERCHANGE RAMP

(SHOWN IN DIRECTION OF TRAFFIC)

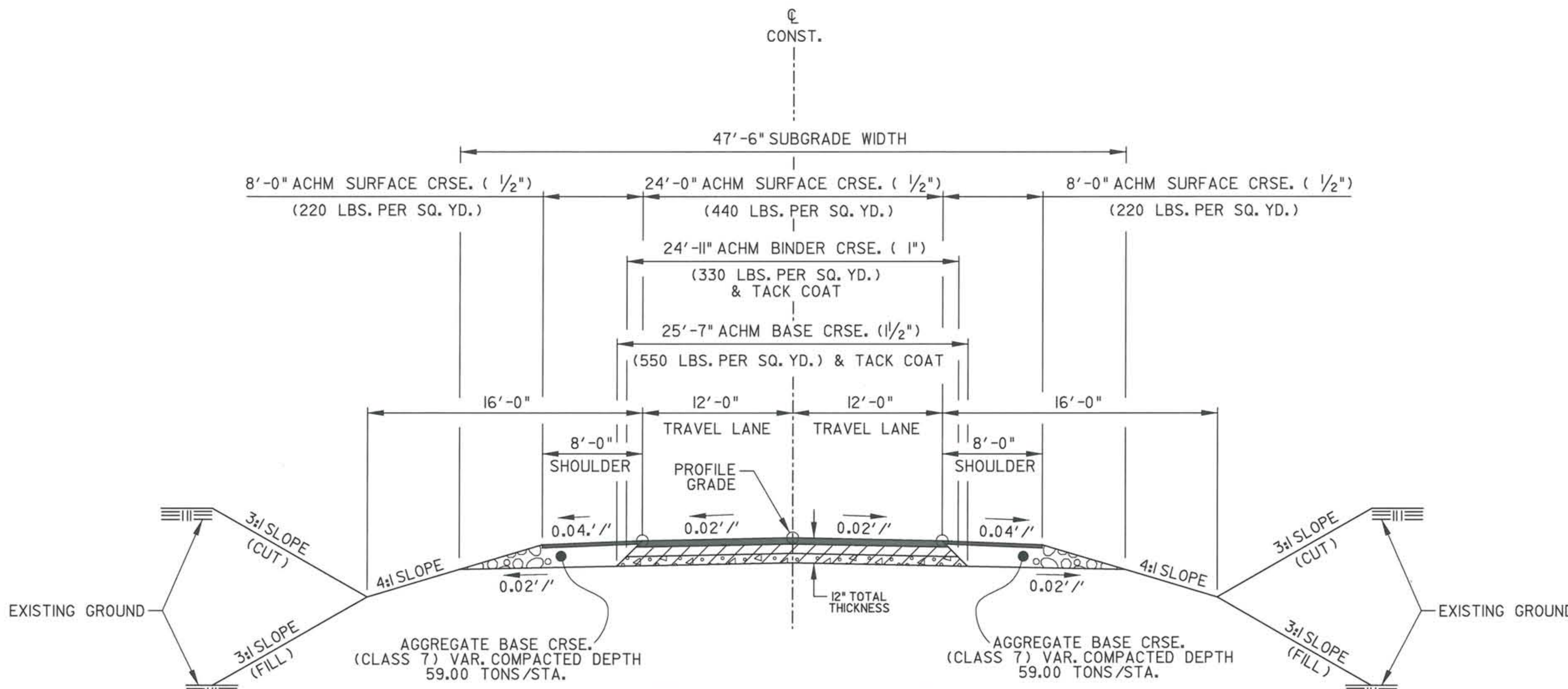
* DENSITY REQUIREMENTS WAIVED

PRELIMINARY - SUBJECT TO REVISION

ICA Engineering
320 Executive Court, Suite 100
Little Rock, AR 72205
501.907.7153
www.icaeng.com

NORTH BELT FREEWAY FEASIBILITY STUDY
TYPICAL SECTIONS

COUNTY: PULASKI	DISTRICT: 6	JOB: 061386



TYPICAL SECTION - TANGENT
2-LANE CROSSING ROAD

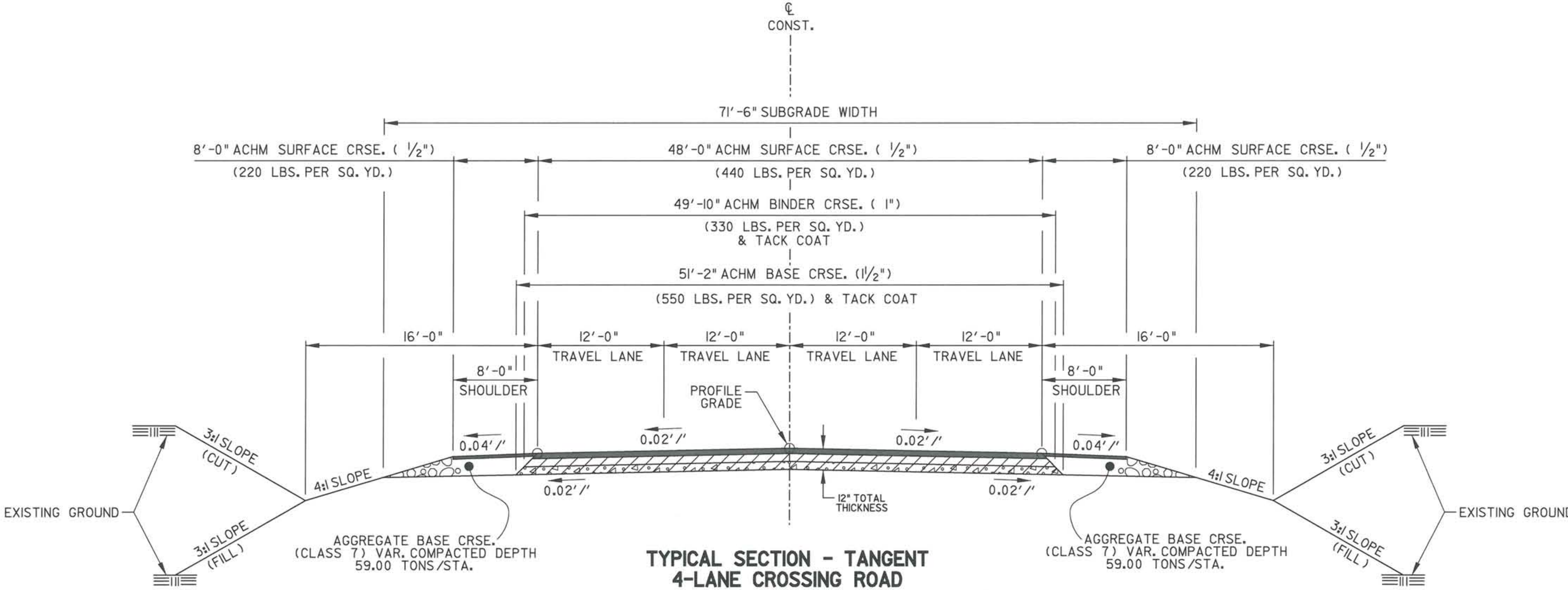
HWY. 365
NEBRASKA AVE.
MISSOURI AVE.
H ST.
NEW YORK. AVE.
6TH ST.
BATESVILLE PIKE
KELLOGG ACRES RD.
ONEIDA ST.

PRELIMINARY - SUBJECT TO REVISION

ICA Engineering
320 Executive Court, Suite 100
Little Rock, AR 72205
501.907.7153
www.icaeng.com

NORTH BELT FREEWAY FEASIBILITY STUDY
TYPICAL SECTIONS

COUNTY: PULASKI	DISTRICT: 6	JOB: 061386



TYPICAL SECTION - TANGENT
4-LANE CROSSING ROAD
HWY. 107

PRELIMINARY - SUBJECT TO REVISION

ICA Engineering
320 Executive Court, Suite 100
Little Rock, AR 72205
501.907.7153
www.icaeng.com

NORTH BELT FREEWAY FEASIBILITY STUDY
TYPICAL SECTIONS

COUNTY: PULASKI	DISTRICT: 6	JOB: 061386

APPENDIX B

COST ESTIMATE SUPPORT DATA

PRELIMINARY CONSTRUCTION COST ESTIMATE FOR
NORTH BELT FREEWAY FEASIBILITY STUDY

1/29/2014

SEGMENT 1: I-40 TO HWY 365

LOCATION	LENGTH OF ROADWAY (LIN. FT.)	COST OF BASE & SURFACING (PER FT.)	DECK AREA OF BRIDGE (SQ. FT.)	COST OF BRIDGE (PER SQ. FT.)	TOP OF BOX CULVERT (SQ. FT.)	COST OF BOX CULVERT (PER SQ. FT.)	GRADING, BASE AND SURFACING ▲	BRIDGES ▲	DRAINAGE STRUCTURES ▲	TRAFFIC SIGNAL INSTALLATION ▲	MAINTENANCE OF TRAFFIC ▲
MAIN LANES W/WIRE ROPE SAFETY FENCE (SECTION A-A)	6757	$486.40	241733	$125	0	$69	$7,859,000	$30,217,000	$530,000		
I-40 INTERCHANGE RAMPS (ONE LANE RAMPS)											
WESTBOUND EXIT RAMP NORTH TO I-40 WEST	2211	$158.17					$547,000				
EASTBOUND ENTRANCE RAMP FROM I-40 EAST	2453	$158.17	14788	$125			$607,000	$1,849,000			
WESTBOUND EXIT RAMP TO I-40 EAST	1957	$158.17	9154	$125			$485,000	$1,145,000			
EASTBOUND ENTRANCE RAMP FROM I-40 WEST	1468	$158.17					$364,000				
HWY 365 INTERCHANGE RAMPS (ONE LANE RAMPS)										$250,000	
WESTBOUND EXIT RAMP TO HWY 365	2883	$158.17	30279	$125			$714,000	$3,785,000			
EASTBOUND ENTRANCE RAMP FROM HWY 365	2818	$158.17	18308	$125			$697,000	$2,289,000			
WESTBOUND ENTRANCE RAMP FROM HWY 365	1103	$158.17	47179	$125			$273,000	$5,898,000			
EASTBOUND EXIT RAMP TO HWY 365	672	$158.17	40138	$125			$167,000	$5,018,000			
WESTBOUND ENTRANCE RAMP MERGE LANE (Additional width)			11100	$125				$1,388,000			
EASTBOUND EXIT RAMP MERGE LANE (Additional width)			12000	$125				$1,500,000			
TOTALS :							**$11,713,000**	**$53,089,000**	**$530,000**	**$250,000**	**$250,000**

▲ COST ROUNDED TO THE NEAREST $1000

BASIS OF ESTIMATE:

PRICING BASED ON ARKANSAS WEIGHTED AVERAGE UNIT PRICES DATED JANUARY - DECEMBER 2012 UNLESS OTHERWISE NOTED.

EARTHWORK FOR MAINLANES BASED ON PRELIM. LINE AND GRADE DEVELOPED BY ICA ENG. ($5.73/CY EXCAVATION AND $6.74/CY EMBANKMENT)

EARTHWORK FOR RAMPS ASSUMED TO BE 5 FEET IN EMBANKMENT HEIGHT WITH THE ADDITIONAL COSTS FOUND BY ICA CALCULATIONS ($89.15/FT)

DRAINAGE COST BASED ON AVERAGE DRAINAGE AND AHTD UNIT PRICES ($78.39/FT)

TRAFFIC SIGNAL INSTALLATION BASED ON TWO SIGNALS AT HWY. 365 INTERCHANGE ($125,000/EACH)

MAINTENACE OF TRAFFIC BASED ON ENGINEERING JUDGEMENT.

SUBTOTAL =	$65,832,000
MISCELLANEOUS (20%) =	$13,167,000
SUBTOTAL =	$78,999,000
MOBILIZATION (5%) =	$3,950,000
SUBTOTAL (CONSTRUCTION COST) =	$82,949,000
ENGINEERING & CONTINGENCIES(20%) =	$16,590,000
TOLL SYSTEM =	$3,535,000
▲ **GRAND TOTAL =**	**$103,074,000**

PRELIMINARY CONSTRUCTION COST ESTIMATE FOR
NORTH BELT FREEWAY FEASIBILITY STUDY

1/29/2014

SEGMENT 2: HWY 365 TO HWY 107											
LOCATION	LENGTH OF ROADWAY (LIN. FT.)	COST OF BASE & SURFACING (PER FT.)	DECK AREA OF BRIDGE (SQ. FT.)	COST OF BRIDGE (PER SQ. FT.)	TOP OF BOX CULVERT (SQ. FT.)	COST OF BOX CULVERT (PER SQ. FT.)	GRADING, BASE AND SURFACING ▲	BRIDGES ▲	DRAINAGE STRUCTURES ▲	TRAFFIC SIGNAL INSTALLATION ▲	MAINTENANCE OF TRAFFIC ▲
MAIN LANES W/WIRE ROPE SAFETY FENCE (SECTION A-A)	42353	$486.40	45325	$125	20975	$69	$58,684,000	$5,666,000	$4,769,000		
CAMP ROBINSON											
10' CHAIN LINK FENCE ▲ ($48.56/FT)	55900						$2,715,000				
NEBRASKA AVE. GRADE SEPARATION (2 LANES)	1975	$171.72	15108	$125			$387,000	$1,889,000			
MISSOURI AVE. GRADE SEPARATION (2 LANES)	2175	$171.72	15108	$125			$426,000	$1,889,000			
H. AVE. GRADE SEPARATION (2 LANES)	1550	$171.72	15108	$125			$304,000	$1,889,000			
NEW YORK (2 LANES)	500	$171.72					$98,000				
6TH ST. GRADE SEPARATION (2 LANES)	1845	$171.72	15108	$125			$362,000	$1,889,000			
BATESVILLE PIKE INTERCHANGE (ONE LANE RAMPS)										$250,000	
WESTBOUND EXIT RAMP WEST TO BATESVILLE PIKE EXTENSION	1778	$158.17					$440,000				
EASTBOUND ENTRANCE RAMP FROM BATESVILLE PIKE EXTENSION	3257	$158.17			350	$69	$806,000		$25,000		
WESTBOUND ENTRANCE RAMP FROM BATESVILLE PIKE EXTENSION	3224	$158.17			300	$69	$798,000		$21,000		
EASTBOUND EXIT RAMP TO BATESVILLE PIKE EXTENSION	1692	$158.17					$419,000				
BATESVILLE PIKE EXTENSION (2 LANES)	5930	$171.72			1080	$69	$1,161,000		$75,000		
KELLOGG ACRES											
KELLOGG ACRES RD. UNDER MAIN LANES (2 LANES)	500	$171.72					$98,000				
TOTALS :							**$66,698,000**	**$13,222,000**	**$4,890,000**	**$250,000**	**$120,000**

▲ COST ROUNDED TO THE NEAREST $1000

BASIS OF ESTIMATE:

PRICING BASED ON ARKANSAS WEIGHTED AVERAGE UNIT PRICES DATED JANUARY - DECEMBER 2012 UNLESS OTHERWISE NOTED.

EARTHWORK FOR MAINLANES BASED ON PRELIM. LINE AND GRADE DEVELOPED BY ICA ENG. ($5.73/CY EXCAVATION AND $6.74/CY EMBANKMENT)

EARTHWORK FOR RAMPS ASSUMED TO BE 5 FEET IN EMBANKMENT HEIGHT WITH THE ADDITIONAL COSTS FOUND BY ICA CALCULATIONS ($89.15/FT)

EARTHWORK FOR SIDE ROADS ASSUMED TO BE 2 FEET IN EMBANKMENT HEIGHT WITH THE ADDITIONAL COSTS FOUND BY ICA CALCULATIONS ($23.96/FT)

DRAINAGE COST BASED ON AVERAGE DRAINAGE AND AHTD UNIT PRICES ($78.39/FT)

TRAFFIC SIGNAL INSTALLATION BASED ON TWO SIGNALS AT BATESVILLE PIKE INTERCHANGE ($125,000/EACH)

MAINTENACE OF TRAFFIC BASED ON ENGINEERING JUDGEMENT.

SUBTOTAL =	$85,180,000
MISCELLANEOUS (20%) =	$17,036,000
SUBTOTAL =	$102,216,000
MOBILIZATION (5%) =	$5,111,000
SUBTOTAL (CONSTRUCTION COST) =	$107,327,000
ENGINEERING & CONTINGENCIES(20%) =	$21,466,000
TOLL SYSTEM =	$7,070,000
▲ **GRAND TOTAL =**	**$135,863,000**

PRELIMINARY CONSTRUCTION COST ESTIMATE FOR
NORTH BELT FREEWAY FEASIBILITY STUDY

1/29/2014

SEGEMENT 3: HWY 107 TO HWY 67

LOCATION	LENGTH OF ROADWAY (LIN. FT.)	COST OF BASE & SURFACING (PER FT.)	DECK AREA OF BRIDGE (SQ. FT.)	COST OF BRIDGE (PER SQ. FT.)	TOP OF BOX CULVERT (SQ. FT.)	COST OF BOX CULVERT (PER SQ. FT.)	GRADING, BASE AND SURFACING ▲	BRIDGES ▲	DRAINAGE STRUCTURES ▲	TRAFFIC SIGNAL INSTALLATION ▲	MAINTENANCE OF TRAFFIC ▲
MAIN LANES W/MEDIAN BARRIER (SECTION B-B)	9799	$720.57	802132	$125	0	$69	$18,364,000	$100,267,000	$769,000		
HWY 107 INTERCHANGE (ONE LANE RAMPS)										$250,000	
WESTBOUND ENTRANCE RAMP FROM HWY 107	2181	$158.17					$540,000				
EASTBOUND EXIT RAMP TO HWY 107	2393	$158.17					$592,000				
WESTBOUND EXIT RAMP NORTH TO HWY 107	1852	$158.17					$459,000				
EASTBOUND ENTRANCE RAMP FROM HWY 107	2146	$158.17					$531,000				
HWY 107 (4 LANES)	500	$305.49					$171,000				
ONEIDA DR.											
ONEIDA DR. UNDER MAIN LANES (2 LANES)	500	$171.72					$98,000				
HWY. 67 INTERCHANGE (ONE LANE RAMPS)											
WESTBOUND ENTRANCE RAMP FROM NORTHBOUND HWY. 67	275	$158.17	42250	$125			$69,000	$5,282,000			
EASTBOUND EXIT RAMP TO NORTHBOUND HWY. 67	200	$158.17	50700	$125			$50,000	$6,338,000			
WESTBOUND ENTRANCE RAMP FROM SOUTHBOUND HWY. 67	2242	$158.17	26758	$125			$555,000	$3,345,000			
EASTBOUND EXIT RAMP TO SOUTHBOUND HWY. 67	2272	$158.17	33096	$125			$562,000	$4,137,000			
HWY. 67 SIDE ROAD											
NORTHBOUND HWY. 67 CD RD. (2 LANES)	3302	$171.72			950	$69	$647,000		$66,000		
TOTALS :							**$22,638,000**	**$119,369,000**	**$835,000**	**$250,000**	**$260,000**

▲ COST ROUNDED TO THE NEAREST $1000

BASIS OF ESTIMATE:

- PRICING BASED ON ARKANSAS WEIGHTED AVERAGE UNIT PRICES DATED JANUARY - DECEMBER 2012 UNLESS OTHERWISE NOTED.
- EARTHWORK FOR MAINLANES BASED ON PRELIM. LINE AND GRADE DEVELOPED BY ICA ENG. ($5.73/CY EXCAVATION AND $6.74/CY EMBANKMENT)
- EARTHWORK FOR RAMPS ASSUMED TO BE 5 FEET IN EMBANKMENT HEIGHT WITH THE ADDITIONAL COSTS FOUND BY ICA CALCULATIONS ($89.15/FT)
- EARTHWORK FOR SIDE ROADS ASSUMED TO BE 2 FEET IN EMBANKMENT HEIGHT WITH THE ADDITIONAL COSTS FOUND BY ICA CALCULATIONS ($23.96/FT & $35.95/FT)
- DRAINAGE COST BASED ON AVERAGE DRAINAGE AND AHTD UNIT PRICES ($78.39/FT)
- TRAFFIC SIGNAL INSTALLATION BASED ON TWO SIGNALS AT HWY. 107 INTERCHANGE ($125,000/EACH)
- MAINTENACE OF TRAFFIC BASED ON ENGINEERING JUDGEMENT.

SUBTOTAL =	$143,352,000
MISCELLANEOUS (20%) =	$28,671,000
SUBTOTAL =	$172,023,000
MOBILIZATION (5%) =	$8,602,000
SUBTOTAL (CONSTRUCTION COST) =	$180,625,000
ENGINEERING & CONTINGENCIES(20%) =	$36,125,000
TOLL SYSTEM =	$3,535,000
▲ **GRAND TOTAL =**	**$220,285,000**

NORTH BELT FREEWAY FEASIBILITY STUDY
MAIN LANES (EB & WB LANES) SECTION A-A

ITEM	WIDTH (FEET)	DEPTH (INCHES)	QUANTITY (PER STA.)	UNIT	PRICE (2013)	COST (PER STA.)	COST (PER FOOT)
ACHM SURFACE COURSE (3/8") (PG 64-22)	88.00	1.00	53.78	TON	$91.94	$4,944.53	$49.45
PROCESS CEMENT STABILIZED CRUSHED STONE BASE COURSE	88.00	6.00	977.78	SQ. YD.	$3.90	$3,813.34	$38.13
AGGREGATE IN CEMENT STABILIZED CRUSHED STONE BASE COURSE	88.00	6.00	321.69	TON	$11.03	$3,548.24	$35.48
CEMENT IN CEMENT STABILIZED CRUSHED STONE BASE COURSE	88.00	6.00	20.53	TON	$115.00	$2,360.95	$23.61
PORTLAND CEMENT CONCRETE PAVEMENT (12” U.T.)	80.00	12.00	888.89	SQ. YD.	$32.58	$28,960.04	$289.60
AGGREGATE BASE COURSE (CLASS 7)	VARIABLE	VARIABLE	195.50	TON	$18.66	$3,648.03	$36.48
TACK COAT	88.00	✱	29.33	GAL.	$2.12	$62.18	$0.62
WIRE ROPE SAFETY FENCE	-	-	100.00	LIN. FT.	$11.24	$1,124.00	$11.24
SOLID SODDING	4.00	-	44.44	SQ. YD.	$4.02	$178.65	$1.79
					SUBTOTAL:	$48,639.96	$486.40
					TOTAL:	**$48,639.96**	**$486.40**

BASIS OF ESTIMATE: ✱0.03 GAL/SQ. YD.

CEMENT STABILIZED CRUSHED STONE BASE - AGGREGATE= 94.0%, CEMENT= 6.0%

ACHM SURFACE COURSE (3/8") - MINERAL AGGREGATE= 95.0%, ASPHALT BINDER (PG 64-22)= 5.0%

- MINERAL AGGREGATE ($80.67/TON*95%) = $76.64/TON
- ASPHALT BINDER ($305.92/TON*5%) = $15.30/TON
- ACHM SURFACE COURSE ($76.64/TON + $15.30/TON) = $91.94/TON

1/29/2014

NORTH BELT FREEWAY FEASIBILITY STUDY
MAIN LANES (EB & WB LANES) SECTION B-B

ITEM	WIDTH (FEET)	DEPTH (INCHES)	QUANTITY (PER STA.)	UNIT	PRICE (2013)	COST (PER STA.)	COST (PER FOOT)
ACHM SURFACE COURSE (3/8") (PG 64-22)	94.00	1.00	57.44	TON	$91.94	$5,281.03	$52.81
PROCESS CEMENT STABILIZED CRUSHED STONE BASE COURSE	94.00	6.00	1044.44	SQ. YD.	$3.90	$4,073.32	$40.73
AGGREGATE IN CEMENT STABILIZED CRUSHED STONE BASE COURSE	94.00	6.00	343.62	TON	$11.03	$3,790.13	$37.90
CEMENT IN CEMENT STABILIZED CRUSHED STONE BASE COURSE	94.00	6.00	21.93	TON	$115.00	$2,521.95	$25.22
PORTLAND CEMENT CONCRETE PAVEMENT (12" U.T.)	90.00	12.00	1000.00	SQ. YD.	$32.58	$32,580.00	$325.80
AGGREGATE BASE COURSE (CLASS 7)	VARIABLE	VARIABLE	95.50	TON	$18.66	$1,782.03	$17.82
TACK COAT	94.00	*	31.33	GAL.	$2.12	$66.42	$0.66
CONCRETE BARRIER WALL	-	-	100.00	LIN. FT.	$219.62	$21,962.00	$219.62
					SUBTOTAL:	$72,056.88	$720.57
					TOTAL:	**$72,056.88**	**$720.57**

BASIS OF ESTIMATE: *0.03 GAL/SQ. YD.

CEMENT STABILIZED CRUSHED STONE BASE - AGGREGATE= 94.0%, CEMENT= 6.0%

ACHM SURFACE COURSE (3/8") - MINERAL AGGREGATE= 95.0%, ASPHALT BINDER (PG 64-22)= 5.0%

- MINERAL AGGREGATE ($80.67/TON*95%) = $76.64/TON
- ASPHALT BINDER ($305.92/TON*5%) = $15.30/TON
- ACHM SURFACE COURSE ($76.64/TON + $15.30/TON) = $91.94/TON

1/29/2014

NORTH BELT FREEWAY FEASIBILITY STUDY
INTERCHANGE RAMP (ONE-LANE)

ITEM	WIDTH (FEET)	DEPTH (INCHES)	QUANTITY (PER STA.)	UNIT	PRICE (2013)	COST (PER STA.)	COST (PER FOOT)
ACHM SURFACE COURSE (3/8") (PG 64-22)	29.00	1.00	17.72	TON	$91.94	$1,629.18	$16.29
PROCESS CEMENT STABILIZED CRUSHED STONE BASE COURSE	29.00	6.00	322.22	SQ. YD.	$3.90	$1,256.66	$12.57
AGGREGATE IN CEMENT STABILIZED CRUSHED STONE BASE COURSE	29.00	6.00	106.01	TON	$11.03	$1,169.29	$11.69
CEMENT IN CEMENT STABILIZED CRUSHED STONE BASE COURSE	29.00	6.00	6.77	TON	$115.00	$778.55	$7.79
PORTLAND CEMENT CONCRETE PAVEMENT (12" U.T.)	25.00	12.00	277.78	SQ. YD.	$32.58	$9,050.07	$90.50
AGGREGATE BASE COURSE (CLASS 7)	VARIABLE	VARIABLE	102.50	TON	$18.66	$1,912.65	$19.13
TACK COAT	29.00	✱	9.67	GAL.	$2.12	$20.50	$0.21
					SUBTOTAL:	$15,816.90	$158.17
					TOTAL:	**$15,816.90**	**$158.17**

BASIS OF ESTIMATE: ✱0.03 GAL/SQ. YD.

CEMENT STABILIZED CRUSHED STONE BASE - AGGREGATE= 94.0%, CEMENT= 6.0%

ACHM SURFACE COURSE (3/8") - MINERAL AGGREGATE= 95.0%, ASPHALT BINDER (PG 64-22)= 5.0%

- MINERAL AGGREGATE ($80.67/TON*95%) = $76.64/TC
- ASPHALT BINDER ($305.92/TON*5%) = $15.30/TC
- ACHM SURFACE COURSE ($76.64/TON + $15.30/TON) = $91.94/TC

1/29/2014

NORTH BELT FREEWAY FEASIBILITY STUDY:
INTERCHANGE RAMP (TWO-LANE)

ITEM	WIDTH (FEET)	DEPTH (INCHES)	QUANTITY (PER STA.)	UNIT	PRICE (2013)	COST (PER STA.)	COST (PER FOOT)
ACHM SURFACE COURSE (3/8") (PG 64-22)	38.00	1.00	23.22	TON	$91.94	$2,134.85	$21.35
PROCESS CEMENT STABILIZED CRUSHED STONE BASE COURSE	38.00	6.00	422.22	SQ. YD.	$3.90	$1,646.66	$16.47
AGGREGATE IN CEMENT STABILIZED CRUSHED STONE BASE COURSE	38.00	6.00	138.91	TON	$11.03	$1,532.18	$15.32
CEMENT IN CEMENT STABILIZED CRUSHED STONE BASE COURSE	38.00	6.00	8.87	TON	$115.00	$1,020.05	$10.20
PORTLAND CEMENT CONCRETE PAVEMENT (12" U.T.)	34.00	12.00	377.78	SQ. YD.	$32.58	$12,308.07	$123.08
AGGREGATE BASE COURSE (CLASS 7)	VARIABLE	VARIABLE	102.50	TON	$18.66	$1,912.65	$19.13
TACK COAT	38.00	✱	12.67	GAL.	$2.12	$26.86	$0.27
					SUBTOTAL:	$20,581.31	$205.81
					TOTAL:	**$20,581.31**	**$205.81**

BASIS OF ESTIMATE: ✱0.03 GAL/SQ. YD.

CEMENT STABILIZED CRUSHED STONE BASE - AGGREGATE= 94.0%, CEMENT= 6.0%

ACHM SURFACE COURSE (3/8") - MINERAL AGGREGATE= 95.0%, ASPHALT BINDER (PG 64-22)= 5.0%

- MINERAL AGGREGATE ($80.67/TON*95%) = $76.64/TC
- ASPHALT BINDER ($305.92/TON*5%) = $15.30/TC
- ACHM SURFACE COURSE ($76.64/TON + $15.30/TON) = $91.94/TC

1/29/2014

NORTH BELT FREEWAY FEASIBILITY STUDY
SIDE ROAD (TWO-LANE)

ITEM	WIDTH (FEET)	DEPTH (INCHES)	QUANTITY (PER STA.)	UNIT	PRICE (2013)	COST (PER STA.)	COST (PER FOOT)
ACHM BASE COURSE (1.5") (PG 64-22) - LANES	25.58	5.00	78.17	TON	$69.07	$5,399.20	$53.99
ACHM BINDER COURSE (1") (PG 64-22) - LANES	24.92	3.00	45.68	SQ. YD.	$68.55	$3,131.36	$31.31
ACHM SURFACE COURSE (1/2") (PG 70-22) - LANES	24.00	4.00	58.67	TON	$81.41	$4,776.32	$47.76
ACHM SURFACE COURSE (1/2") (PG 70-22) - SHOULDER	16.00	2.00	19.56	TON	$81.41	$1,592.38	$15.92
AGGREGATE BASE COURSE (CLASS 7)	VARIABLE	VARIABLE	118.00	TON	$18.66	$2,201.88	$22.02
TACK COAT	100.08	✱	33.36	GAL.	$2.12	$70.72	$0.71
					SUBTOTAL:	$17,171.87	$171.72
					TOTAL:	**$17,171.87**	**$171.72**

BASIS OF ESTIMATE: ✱0.03 GAL/SQ. YD.

ACHM SURFACE COURSE (1/2") - MINERAL AGGREGATE= 95.0%, ASPHALT BINDER (PG 70-22)= 5.0%

- MINERAL AGGREGATE ($63.21/TON*95%) = $60.05/TON
- ASPHALT BINDER ($427.19/TON*5%) = $21.36/TON
- ACHM SURFACE COURSE ($60.05/TON + $21.36/TON) = $81.41/TON

ACHM BINDER COURSE (1") - MINERAL AGGREGATE= 95.6%, ASPHALT BINDER (PG 64-22)= 4.4%

- MINERAL AGGREGATE ($54.78/TON*95.6%) = $52.37/TON
- ASPHALT BINDER ($367.12/TON*4.4%) = $16.18/TON
- ACHM BINDER COURSE ($52.37/TON + $16.18/TON) = $68.55/TON

ACHM BASE COURSE (1.5") - MINERAL AGGREGATE= 96.7%, ASPHALT BINDER (PG 64-22)= 3.8%

- MINERAL AGGREGATE ($54.33/TON*96.7%) = $52.54/TON
- ASPHALT BINDER ($435.07/TON*3.8%) = $16.53/TON
- ACHM BASE COURSE ($52.54/TON + $16.53/TON) = $69.07/TON

1/29/2014

NORTH BELT FREEWAY FEASIBILITY STUDY:
SIDE ROAD (FOUR-LANE)

ITEM	WIDTH (FEET)	DEPTH (INCHES)	QUANTITY (PER STA.)	UNIT	PRICE (2013)	COST (PER STA.)	COST (PER FOOT)
ACHM BASE COURSE (1.5") (PG 64-22) - LANES	51.17	5.00	156.34	TON	$69.07	$10,798.40	$107.98
ACHM BINDER COURSE (1") (PG 64-22) - LANES	49.83	3.00	91.36	SQ. YD.	$68.55	$6,262.73	$62.63
ACHM SURFACE COURSE (1/2") (PG 70-22) - LANES	48.00	4.00	117.33	TON	$81.41	$9,551.84	$95.52
ACHM SURFACE COURSE (1/2") (PG 70-22) - SHOULDER	16.00	2.00	19.56	TON	$81.41	$1,592.38	$15.92
AGGREGATE BASE COURSE (CLASS 7)	VARIABLE	VARIABLE	118.00	TON	$18.66	$2,201.88	$22.02
TACK COAT	200.17	✱	66.72	GAL.	$2.12	$141.45	$1.41
					SUBTOTAL:	$30,548.67	$305.49
					TOTAL:	**$30,548.67**	**$305.49**

BASIS OF ESTIMATE: ✱0.03 GAL/SQ. YD.

ACHM SURFACE COURSE (1/2") - MINERAL AGGREGATE= 95.0%, ASPHALT BINDER (PG 70-22)= 5.0%
- MINERAL AGGREGATE ($63.21/TON*95%) = $60.05/TON
- ASPHALT BINDER ($427.19/TON*5%) = $21.36/TON
- ACHM SURFACE COURSE ($60.05/TON + $21.36/TON) = $81.41/TON

ACHM BINDER COURSE (1") - MINERAL AGGREGATE= 95.6%, ASPHALT BINDER (PG 64-22)= 4.4%
- MINERAL AGGREGATE ($54.78/TON*95.6%) = $52.37/TON
- ASPHALT BINDER ($367.12/TON*4.4%) = $16.18/TON
- ACHM BINDER COURSE ($52.37/TON + $16.18/TON) = $68.55/TON

ACHM BASE COURSE (1.5") - MINERAL AGGREGATE= 96.7%, ASPHALT BINDER (PG 64-22)= 3.8%
- MINERAL AGGREGATE ($54.33/TON*96.7%) = $52.54/TON
- ASPHALT BINDER ($435.07/TON*3.8%) = $16.53/TON
- ACHM BASE COURSE ($52.54/TON + $16.53/TON) = $69.07/TON

1/29/2014

PRELIMINARY CONSTRUCTION COST ESTIMATE FOR
NORTH BELT FREEWAY FEASIBILITY STUDY

1/29/2014

SEGMENT 1: I-40 TO HWY 365

LOCATION	LENGTH OF BRIDGE (FT.)	WIDTH OF BRIDGE (FT.)	DECK AREA OF BRIDGE (SQ. FT.)	COST OF BRIDGE (PER SQ. FT.)	BRIDGES ▲
MAIN LANES W/WIRE ROPE SAFETY FENCE (SECTION A-A)					
STA. 131+50.03 (RT.)	1150	43.17	49642		
STA. 131+50.03 (LT.)	1200	43.17	51800		
STA. 170+44.56 (RT.)	1625	43.17	70146		
STA. 170+44.56 (LT.)	1625	43.17	70146		
TOTAL			**241733**	$125	**$30,217,000**
I-40 INTERCHANGE RAMPS (ONE LANE RAMPS)					
EASTBOUND ENTRANCE RAMP FROM I-40 EAST (FIRST)	175	28.17	4929		
EASTBOUND ENTRANCE RAMP FROM I-40 EAST (SECOND)	350	28.17	9858		
RAMP TOTAL			**14788**	$125	**$1,849,000**
WESTBOUND EXIT RAMP TO I-40 EAST	325	28.17	**9154**	$125	**$1,145,000**
HWY 365 INTERCHANGE RAMPS (ONE LANE RAMPS)					
WESTBOUND EXIT RAMP TO HWY 365	1075	28.17	**30279**	$125	**$3,785,000**
EASTBOUND ENTRANCE RAMP FROM HWY 365	650	28.17	**18308**	$125	**$2,289,000**
WESTBOUND ENTRANCE RAMP FROM HWY 365	1675	28.17	**47179**	$125	**$5,898,000**
EASTBOUND EXIT RAMP TO HWY 365	1425	28.17	**40138**	$125	**$5,018,000**
WESTBOUND ENTRANCE RAMP MERGE LANE (Additional width)	925	12.00	**11100**	$125	**$1,388,000**
EASTBOUND EXIT RAMP MERGE LANE (Additional width)	1000	12.00	**12000**	$125	**$1,500,000**

GRAND TOTAL = $53,089,000

PRELIMINARY CONSTRUCTION COST ESTIMATE FOR
NORTH BELT FREEWAY FEASIBILITY STUDY

1/29/2014

SEGMENT 2: HWY 365 TO HWY 107

LOCATION	LENGTH OF BRIDGE (FT.)	WIDTH OF BRIDGE (FT.)	DECK AREA OF BRIDGE (SQ. FT.)	COST OF BRIDGE (PER SQ. FT.)	**BRIDGES ▲**
MAIN LANES W/WIRE ROPE SAFETY FENCE (SECTION A-A)					
STA. 326+40.48 (RT.) (OVER 16TH STREET)	175	43.17	7554		
STA. 326+98.58 (LT.) (OVER 16TH STREET)	175	43.17	7554		
STA. 454+70.69 (RT.) (OVER BATESVILLE PIKE EXTENSION)	175	43.17	7554		
STA. 455+11.31 (LT.) (OVER BATESVILLE PIKE EXTENSION)	175	43.17	7554		
STA. 534+40.18 (RT.) (OVER KELLOGG ACRES ROAD)	175	43.17	7554		
STA. 534+40.18 (LT.) (OVER KELLOGG ACRES ROAD)	175	43.17	7554		
TOTAL			**45325**	$125	**$5,666,000**
CAMP ROBINSON					
NEBRASKA AVE. GRADE SEPARATION (2 LANES)	350	43.17	**15108**	$125	**$1,889,000**
MISSOURI AVE. GRADE SEPARATION (2 LANES)	350	43.17	**15108**	$125	**$1,889,000**
H. AVE. GRADE SEPARATION (2 LANES)	350	43.17	**15108**	$125	**$1,889,000**
6TH ST. GRADE SEPARATION (2 LANES)	350	43.17	**15108**	$125	**$1,889,000**

GRAND TOTAL = $13,222,000

PRELIMINARY CONSTRUCTION COST ESTIMATE FOR
NORTH BELT FREEWAY FEASIBILITY STUDY

1/29/2014

SEGMENT 3: HWY 107 TO HWY 67

LOCATION	LENGTH OF BRIDGE (FT.)	WIDTH OF BRIDGE (FT.)	DECK AREA OF BRIDGE (SQ. FT.)	COST OF BRIDGE (PER SQ. FT.)	BRIDGES ▲
MAIN LANES W/MEDIAN BARRIER (SECTION B-B)					
STA. 623+36.24 (RT.) (OVER HWY 107)	350	42.67	14933		
STA. 623+42.39 (LT.) (OVER HWY 107)	350	42.67	14933		
STA. 641+84.33 (RT.)	300	42.67	12800		
STA. 641+65.05 (LT.)	300	42.67	12800		
STA. 658+82.70 (RT.)	1700	42.67	72533		
STA. 658+21.28 (LT.)	1700	42.67	72533		
STA. 694+60.55 (RT.) (OVER ONEIDA DRIVE)	2500	42.67	106667		
STA. 694+82.92 (LT.) (OVER ONEIDA DRIVE)	2500	42.67	106667		
STA. 724+46.59 (RT.)	450	42.67	19200		
STA. 726+10.28 (LT.)	450	42.67	19200		
STA. 733+64.05 (RT.)	250	42.67	10667		
STA. 733+24.92 (RT.)	250	42.67	10667		
STA. 757+53.24 (RT.)	125	42.67	5333		
STA. 757+64.41 (LT.)	125	42.67	5333		
STA. 764+99.78 (RT.) (OVER HWY 67)	3725	42.67	158933		
STA. 764+99.78 (LT.) (OVER HWY 67)	3725	42.67	158933		
TOTAL			**802132**	$125	**$100,267,000**
HWY 67 INTERCHANGE (ONE LANE RAMPS)					
WESTBOUND ENTRANCE RAMP FROM NORTHBOUND HWY 67	1500	28.17	**42250**	$125	**$5,282,000**
EASTBOUND EXIT RAMP TO NORTHBOUND HWY 67	1800	28.17	**50700**	$125	**$6,338,000**
WESTBOUND ENTRANCE RAMP FROM SOUTHBOUND HWY 67	950	28.17	**26758**	$125	**$3,345,000**
EASTBOUND EXIT RAMP TO SOUTHBOUND HWY 67	1175	28.17	**33096**	$125	**$4,137,000**

GRAND TOTAL = $119,369,000

PRELIMINARY CONSTRUCTION COST ESTIMATE FOR NORTH BELT FREEWAY FEASIBILITY STUDY

ADDITIONAL DRAINAGE:

24" R.C.P. (CLASS 3) = $46.52 PER LIN. FT.
R.M. D.I. = $2885.74 EACH
24" F.E.S. = $1243.76 EACH
ASSUMED EVERY 300' ON ROADWAY

46.52 (85') + 2885.74 (1) + 1243.76 (1) = $8083.70

$8083.70 / 300 FT. = $26.95 PER LIN. FT.

36" R.CP. (CLASS 4) = $95.93 PER LIN. FT.
36" F.E.S = $1826.64 EACH
ASSUMED EVERY 500' ON ROADWAY

95.93 (230') + 1826.64 (2) = $25717.20

$25,717.20 / 500 FT. = $51.44 PER LIN. FT.

FINAL ESTIMATE PRICE => 26.95 + 51.44 = $78.39 PER LIN.FT.

***NOTE: ALL CALCULATIONS BASED ON ASSUMED AVERAGES FORCOMMON ROADWAY CONDITIONS. ACTUAL SIZE, CLASSIFICATION, AND NUMBER OF STRUCTURES MAY VARY.**

NORTH BELT FREEWAY FEASIBILITY STUDY

ROW STRUCTURES

STATION	DESCRIPTION
150+00	Framed House RT of CL
151+30	Garage/Shop RT of CL
151+30	Barn LT of CL
152+30	Barn/Shed RT of CL
150+50	Shed RT of CL
156+80	Shed LT of CL
158+40	Brick Home
158+60	2 Story Brick RT of CL
173+30	Framed Ruin Home LT of CL
173+65	Framed Ruin Home LT of CL
173+70	Framed House RT of CL
174+90	Shed RT of CL
174+90	Framed House RT of CL
175+70	Framed House LT of CL
176+50	Framed House LT of CL
180+30	Auto Vending of Ark (Metal) RT of CL
181+00	Framed House LT of CL
181+10	Framed Storage
181+30	Metal (Com) Building
181+75	Shed LT of CL
182+50	Metal Shed LT of CL
516+80	Framed House RT of CL
554+00	Brick House LT of CL
556+00	Frame House LT of CL
557+30	Shed LT of CL
635+15	Metal Shed/Mobile Home
651+50	Garage/Shed LT of CL
652+30	Garage/Shop Lt of CL
653+50	Framed House LT of CL
702+00	Brick 2 Story RT of CL
704+00	Brick 2 Story RT of CL

PRELIMINARY CONSTRUCTION COST ESTIMATE FOR NORTH BELT FREEWAY FEASIBILITY STUDY

1/29/2014

ROW STRUCTURES COST					
STATION	**RESIDENTIAL**	**COMMERCIAL**	**OTHER**	**COST**	**SEGMENT COST**
AVG. COST	$ 175,000.00	$ 550,000.00	$ 25,000.00		
150+00	1			$ 175,000.00	
151+30			1	$ 25,000.00	
151+30			1	$ 25,000.00	
152+30			1	$ 25,000.00	
150+50			1	$ 25,000.00	
156+80			1	$ 25,000.00	
158+40	1			$ 175,000.00	
158+60	1			$ 175,000.00	
173+30	1			$ 175,000.00	
173+65	1			$ 175,000.00	
173+70	1			$ 175,000.00	
174+90			1	$ 25,000.00	
174+90	1			$ 175,000.00	
175+70	1			$ 175,000.00	
176+50	1			$ 175,000.00	
					$ 1,725,000.00
180+30		1		$ 550,000.00	
181+00	1			$ 175,000.00	
181+10	1			$ 175,000.00	
181+30		1		$ 550,000.00	
181+75			1	$ 25,000.00	
182+50			1	$ 25,000.00	
516+80	1			$ 175,000.00	
554+00	1			$ 175,000.00	
556+00	1			$ 175,000.00	
557+30			1	$ 25,000.00	
					$ 2,050,000.00
635+15			1	$ 25,000.00	
651+50			1	$ 25,000.00	
652+30			1	$ 25,000.00	
653+50	1			$ 175,000.00	
702+00	1			$ 175,000.00	
704+00	1			$ 175,000.00	
					$ 600,000.00
Totals	17	2	12		$ 4,375,000.00

PRELIMINARY CONSTRUCTION COST ESTIMATE FOR
NORTH BELT FREEWAY FEASIBILTY STUDY

1/29/2014

ROW LAND COSTS							
SEGMENT	**STATION**	**AVG WIDTH**	**SQ. FT.**	**ACRES**	**COST / ACRE**	**COST**	**SEGMENT COST**
I-40 TO HWY 365	100+00 TO 180+00	340	2,720,000	62	$ 15,000.00	$ 930,000.00	$ 930,000.00
HWY 365 - HWY 107	180+00 TO 205+00	250	625,000	14	$ 15,000.00	$ 210,000.00	
HWY 365 - HWY 107	205+00 TO 405+00	250	5,000,000	115	DOD LAND	$ -	$ 2,070,000.00
HWY 365 - HWY 107	405+00 TO 621+50	250	5,412,500	124	$ 15,000.00	$ 1,860,000.00	
HWY 107 TO HWY 67	621+50 TO 802+29	240	4,338,960	100	$ 15,000.00	$ 1,500,000.00	$ 1,500,000.00
				TOTAL		$ 4,500,000.00	

ITEM LIST

ITEM	UNIT	2013 UNIT PRICE
INITIAL CONSTRUCTION		
ACHM Surface Course (3/8") (PG 64-22)	Ton	$ 91.94
Tack Coat	Gallon	$ 2.12
Aggregate Base Course (CL. 7)	Ton	$ 18.66
PCC Pavement (12" U.T.)	Sq. Yd.	$ 32.58
Processing Cement Stabilized Crushed Stone Base Crse.	Sq. Yd.	$ 3.90
Aggregate in Cem. Stab. Crushed Stone Base Crse.	Ton	$ 11.03
Cement in Cem. Stab. Crushed Stone Base Crse.	Ton	$ 115.00
MAINTENANCE & REHABILITATION		
Tack Coat	Gallon	$ 2.12
Grinding PCCP	Sq. Yd.	$ 2.15
Joint Rehab. (TYPE B)	Lin. Ft.	$ 2.83
PCCP Patching (12" U.T.)	Sq. Yd.	$ 100.00
R & D Concrete Pavement for Patching	Sq. Yd.	$ 35.09
Cold Milling Asphalt Pavement (< 4")	Sq. Yd.	$ 1.62
Guardrail (Type A)	Lin. Ft.	$ 21.75
Guardrail Terminal (Type 2)	Each	$ 2,476.94
Thrie Beam Guard Rail Terminal	Each	$ 1,971.77
Topsoil Furnished and Placed	Cu. Yd.	$ 6.13
ACHM Patching of Existing Asphalt Roadway	Ton	$ 142.30
Clean & Fill Joints	Lin. Ft.	$ 3.72
Scarify & Recompact Shoulders	Sq. Yd.	$ 12.92
ACHM Surface Course Overlay (1/2") (PG 64-22)	Ton	$ 79.67
ACHM Surface Course Overlay (1/2") (PG 76-22)	Ton	$ 73.96
ACHM Binder Course Overlay (1") (PG 64-22)	Ton	$ 70.43
ACHM Binder Course Overlay (1") (PG 76-22)	Ton	$ 59.71
Salvage Value of Asphalt Pavement	Cu. Yd.	$ (2.05)
Salvage Value of Concrete Pavement	Sq. Yd.	$ (0.35)

Volume Controls:

Cement Stablized Crushed Stone Base

LAYER	MATERIAL DESCRIPTION	THICKNESS (INCHES)
1	PCC Pavement (jointed, non-reinforced)	12
2	ACHM SURFACE COURSE (3/8")	1
3	CEMENT STABILIZED CRUSHED STONE BASE COURSE	6
	TOTAL	19

Job Length	70229 feet	=	13.301	miles
Bridge Length	25450 feet	=	4.820	miles
Roadway Length	44779 feet	=	8.481	miles

TOTAL ROADWAY LENGTH = **44779**

COST ESTIMATE FOR ONE STATION (one side)

ITEM	WIDTH (feet)	DEPTH (inches)	QUANTITY	UNIT	PRICE	COST
MAIN LANES						
PCC Pavement	24.00	12.00	266.67	Sq. Yd.	32.58	$8,688.11
ACHM Surface Course (3/8") (PG 64-22)	24.00	1.00	14.67	Ton	91.94	$1,348.76
Process. Cem. Stab. Crushed Stone Base Crse.	24.00	6.00	266.67	Sq. Yd.	3.90	$1,040.01
Aggr. in Cem. Stab. Crushed Stone Base Crse.	24.00	6.00	87.73	Ton	11.03	$967.66
Cem. in Cem. Stab. Crushed Stone Base Crse.	24.00	6.00	5.60	Ton	115.00	$644.00
Tack Coat	24.00	0.03 gal/sq yd	8.00	Gal	2.12	$16.96
Wire Rope Safety Fence			50.00	Lin. Ft.	11.24	$562.00
SHOULDERS						
Inside						
PCC Pavement	6.00	12.00	66.67	Sq. Yd.	32.58	$2,172.11
ACHM Surface Course (3/8") (PG 64-22)	8.00	1.00	4.89	Ton	91.94	$449.59
Process. Cem. Stab. Crushed Stone Base Crse.	8.00	6.00	88.89	Sq. Yd.	3.90	$346.67
Aggr. in Cem. Stab. Crushed Stone Base Crse.	8.00	6.00	29.24	Ton	11.03	$322.52
Cem. in Cem. Stab. Crushed Stone Base Crse.	8.00	6.00	1.87	Ton	115.00	$215.05
Tack Coat	8.00	0.03 gal/sq yd	2.67	Gal	2.12	$5.66
Aggregate Base Course (Class 7)		Varies	50.00	Ton	18.66	$933.00
Solid Sodding	4.00		11.11	Sq. Yd.	4.02	$44.66
Outside						
PCC Pavement	10.00	12.00	111.11	Sq. Yd.	32.58	$3,619.96
ACHM Surface Course (3/8") (PG 64-22)	12.00	1.00	7.33	Ton	91.94	$673.92
Process. Cem. Stab. Crushed Stone Base Crse.	12.00	6.00	133.33	Sq. Yd.	3.90	$519.99
Aggr. in Cem. Stab. Crushed Stone Base Crse.	12.00	6.00	43.87	Ton	11.03	$483.89
Cem. in Cem. Stab. Crushed Stone Base Crse.	12.00	6.00	2.80	Ton	115.00	$322.00
Tack Coat	12.00	0.03 gal/sq yd	4.00	Gal	2.12	$8.48
Aggregate Base Course (Class 7)		Varies	47.75	Ton	18.66	$891.02
Solid Sodding	4.00		11.11	Sq. Yd.	4.02	$44.66
					SUB-TOTAL:	$24,320.68

TOTAL: **$24,320.68**

MAINTENANCE & REHABILITATION STRATEGY
CONCRETE PAVEMENTS

YEAR NO.	TREATMENT
15	JOINT REHAB ALL JOINTS
	CONCRETE PATCH 3% OF PAVEMENT AREA
	GRIND 20% OF PAVEMENT AREA
	SCARIFY & RECOMPACT ASPHALT SHOULDERS (IF APPLICABLE)
25	CONCRETE PATCH 5% OF PAVEMENT AREA
	CLEAN & FILL JOINTS
	6" ACHM OVERLAY (2" SURF. & 4" BINDER - LANES & SHOULDERS)
	INSTALL GUARDRAIL
35	REMOVAL & RECONSTRUCTION
50	JOINT REHAB ALL JOINTS

LIFE CYCLE COST ANALYSIS
MAINTENANCE & REHABILITATION

CONSTANT YEAR 2013 DOLLARS USED **ROADWAY LENGTH (ft.) =** **44,779**

YEAR	YR. NO. FROM CONST.	YR. NO. FROM 2013	INFLATION	ITEM	QUANTITY	UNIT	UNIT COST	COST
2018	**0**	**5**	**2.50%**	**INITIAL CONSTRUCTION**				
				See Cost Summary for Initial Construction Costs				
2033	**15**	**20**	**2.50%**	**MAINTENANCE & REHABILITATION**				
				Joint Rehab. (TYPE B)	501,525	Lin. Ft.	$ 4.64	$ 2,327,076.00
				R & D Concrete Pavement for Patching	7,165	Sq. Yd.	$ 57.50	$ 411,987.50
				PCCP Patching (12" U.T.)	7,165	Sq. Yd.	$ 163.86	$ 1,174,056.90
				Grinding PCCP	47,764	Sq. Yd.	$ 3.52	$ 168,129.28
SUBTOTAL								$ 4,081,249.68
2043	**25**	**30**	**2.50%**	**MAINTENANCE & REHABILITATION**				
				R & D Concrete Pavement for Patching	11,941	Sq. Yd.	$ 73.60	$ 878,857.60
				PCCP Patching (12" U.T.)	11,941	Sq. Yd.	$ 209.76	$ 2,504,744.16
				Clean & Fill Joints	501,525	Lin. Ft.	$ 7.80	$ 3,911,895.00
				ACHM Surface Course Overlay (1/2") (PG 64-22)	16,419	Ton	$ 167.12	$ 2,743,943.28
				ACHM Surface Course Overlay (1/2") (PG 76-22)	26,270	Ton	$ 155.14	$ 4,075,527.80
				ACHM Binder Course Overlay (1") (PG 64-22)	32,838	Ton	$ 147.73	$ 4,851,157.74
				ACHM Binder Course Overlay (1") (PG 76-22)	52,541	Ton	$ 125.25	$ 6,580,760.25
				Tack Coat	50,451	Gallon	$ 4.45	$ 224,506.95
				Guardrail (Type A)	1,100	Lin. Ft.	$ 45.62	$ 50,182.00
				Guardrail Terminal (Type 2)	4	Each	$ 5,195.63	$ 20,782.52
				Thrie Beam Guard Rail Terminal	4	Each	$ 4,135.98	$ 16,543.92
				Topsoil Furnished and Placed	4,577	Cu. Yd.	$ 12.86	$ 58,860.22
SUBTOTAL								$ 25,917,761.44
2053	**35**	**40**	**2.50%**	**REMOVAL & RECONSTRUCTION**				
				Salvage Value - Concrete Pavement	388,085	Sq. Yd.	$ (0.94)	$ (364,799.90)
				Salvage Value - Asphalt Pavement	64,681	Cu. Yd.	$ (5.50)	$ (355,745.50)
				PCC Pavement (12" U.T.)	398,041	Sq. Yd.	$ 87.48	$ 34,820,626.68
				ACHM Surface Course (3/8") (PG 64-22)	24,082	Ton	$ 246.87	$ 5,945,123.34
				Process. Cem. Stab. Crushed Stone Base Crse.	437,840	Sq. Yd.	$ 10.47	$ 4,584,184.80
				Aggr. in Cem. Stab. Crushed Stone Base Crse.	144,045	Ton	$ 29.62	$ 4,266,612.90
				Cem. in Cem. Stab. Crushed Stone Base Crse.	9,198	Ton	$ 308.79	$ 2,840,250.42
				Aggregate Base Course (Cl. 7)	87,543	Ton	$ 50.10	$ 4,385,904.30
				Tack Coat	13,138	Gal.	$ 5.69	$ 74,755.22
				15% E & C				$ 8,537,618.65
SUBTOTAL								$ 64,734,530.91
2068	**50**	**55**	**2.50%**	**MAINTENANCE & REHABILITATION**				
				Joint Rehab. (TYPE B)	501,525	Lin. Ft.	$ 11.01	$ 5,521,790.25
				R & D Concrete Pavement for Patching	7,165	Sq. Yd.	$ 136.46	$ 977,735.90
				PCCP Patching (12" U.T.)	7,165	Sq. Yd.	$ 388.88	$ 2,786,325.20
				Grinding PCCP	47,764	Sq. Yd.	$ 8.36	$ 399,307.04
SUBTOTAL								$ 9,685,158.39

NOTE: LIFECYCLE COSTS FOR BRIDGES ARE NOT INCLUDED BASED ON A 75 YEAR L.F.R.D. DESIGN.

APPENDIX F

Interim Traffic and Toll Revenue Assessment Report

North Belt Freeway Feasibility Study

Traffic and Toll Revenue Assessment

Developed by:

Baez Consulting, LLC

In Consultation with:

ATKINS

FINAL

June 2014

CONTENTS

Page

Figures

Page

Tables

Page

List of Acronyms and Abbreviation

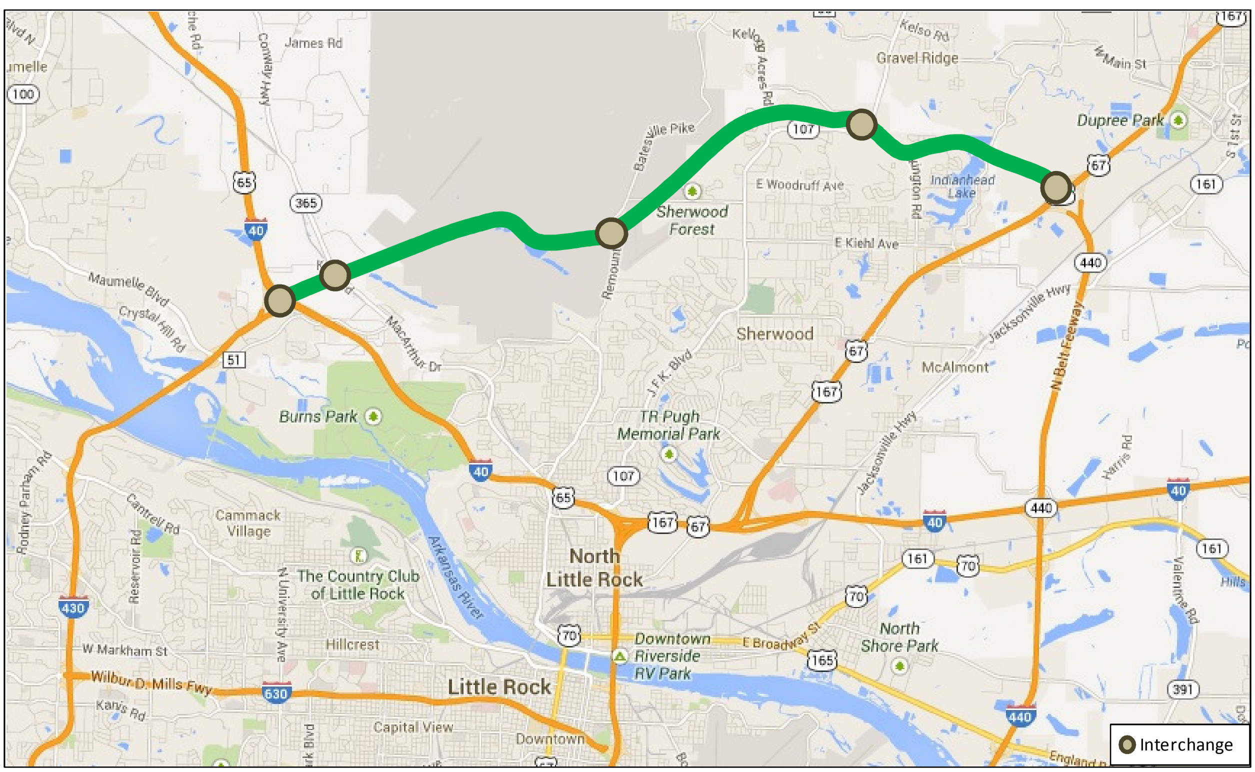
AHTD	Arkansas Highway Transportation Department
CARTS TDM	CARTS travel demand model
CBER	Center for Business and Economic Research
CPI	consumer price index
HOV2P	High-Occupancy Vehicles with two occupants
HOV3P	High-Occupancy Vehicles with three or more occupants
I-40	Interstate Highway 40
IEA	Institute for Economic Advancement
LOS	level of service
MMA	Multimodal-Multiclass Assignment
mph	miles per hour
MPO	Metropolitan Planning Organization
MSA	Metropolitan Statistical Area
NBF	North Belt Freeway
OC	operating costs
SOV	Single-Occupancy Vehicles
TAZ	Traffic Analysis Zone
TRB	Transportation Research Board
UE	User Equilibrium
VC	volume-capacity
VDF	volume delay function
VMT	vehicle-miles-traveled
VOT	value of time
vpd	vehicles per day

This report summarizes the efforts and the results obtained from the sketch level analysis of the proposed North Belt Freeway (NBF) located in central Arkansas. The format of this report follows the methodology approved by the Arkansas Highway Transportation Department (AHTD) in the August 2013, "North Belt Feasibility Study Traffic and Toll Revenue Forecasting Methodology & Assumptions Technical Memorandum." The purpose of this study is to forecast traffic and toll revenue, as well as, to evaluate the feasibility of the North Belt Freeway.

1.0 PROJECT BACKGROUND

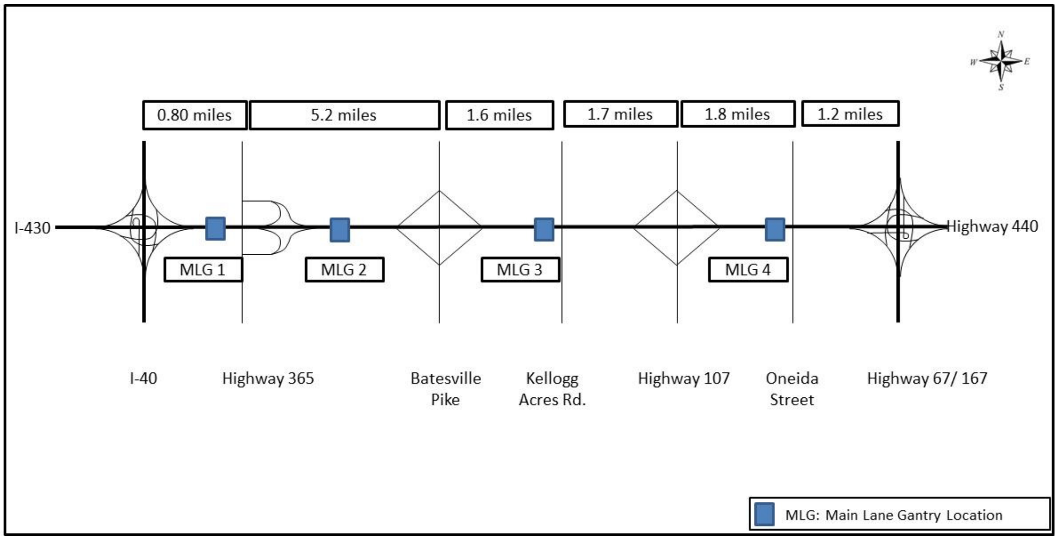
The proposed North Belt Freeway will be a four-lane, limited-access toll facility located between Interstate Highway 40 (I-40) and Highway 67 in central Arkansas. The corridor spans approximately 13 miles completing the connection between I-430 in the west and Highway 440 in the east (see Figure 1). The NBF will complete a loop around Little Rock – North Little Rock. In the long-term, the NBF is expected to relieve traffic congestion on I-40, Highway 67, I-30, and local major arterials.

Figure 1: North Belt Freeway Corridor Alignment



The North Belt Freeway as proposed includes interchanges at I-40/I-430, Highway 365, Batesville Pike, Highway 107, and Highway 440/Highway 67. Figure 2 shows the access points and the proposed locations of the main lane gantries to collect tolls. The location of the gantries ensures a closed system where every trip-movement pays a toll. It is assumed that the NBF will open in 2020. Expansions are not anticipated in the future, and all interchanges and access points will be operational in 2020.

Figure 2: North Belt Freeway Access and Gantry Locations



2.0 DATA COLLECTION

The following sections describe the information collected and evaluated during the study including demographics, socioeconomic indicators, traffic counts, traffic operation conditions of the study area, major employer locations, and other general trip characteristics.

2.1 DEMOGRAPHICS

This subsection documents the historical demographic growth and future demographics and includes a comparison of forecasted and actual demographics.

2.1.1 Historical Demographics

Table 1 presents the historical trends in population from 1900 to 2012 for four counties (Faulkner, Lonoke, Pulaski, and Saline) located in central Arkansas. The combined population of the four counties had an annual growth of 1.6 percent between 1900 and 2012. The population growth between 1950 and 2012, as well as between 2000 and 2012 is very similar to the long-term growth at 1.5 and 1.4 percent, respectively. Pulaski County is the most populous county in central Arkansas and accounts for more than 50 percent of the total population of the region. However, during the last 13 years, both Faulkner and Saline counties added more people than Pulaski County: Faulkner added 32,690 residents, Saline added 28,316 residents, and Pulaski added 27,479 residents.

Similar to the trends in population, Pulaski County is the major source of employment in central Arkansas (see Table 2). Pulaski County added over 128,000 jobs between 1940 and 2011, more than 50 percent of the total jobs added in the region during this period. Between 1940 and 2011, the region's employment grew at an annual rate of 2.1 percent and at a rate of 1.2 percent between 2000 and 2011. Pulaski County experienced an annual growth rate of 0.4 percent between 2000 and 2011, the least amount of growth among the four counties. Faulkner added over 12,500 jobs between 2000 and 2011, compared to over 10,000 added by Saline, and more than 8,400 added by Pulaski County.

Table 1. Historical Population

Year	Faulkner	Lonoke	Pulaski	Saline	Total
Population					
1900	20,780	22,544	63,179	13,122	119,625
1910	23,708	27,983	86,751	16,657	155,099
1920	27,681	33,400	109,464	16,781	187,326
1930	28,381	33,759	137,727	15,660	215,527
1940	25,880	29,802	156,085	19,163	230,930
1950	25,289	27,278	196,685	23,816	273,068
1960	24,303	24,551	242,980	28,956	320,790
1970	31,572	26,249	287,189	36,107	381,117
1980	46,192	34,518	340,613	53,156	474,479
1990	60,006	39,268	349,660	64,183	513,117
2000	86,014	52,828	361,474	83,529	583,845
2010	113,237	68,356	382,748	107,118	671,459
2012	118,704	69,839	388,953	111,845	689,341
1900-2012	1.6%	1.0%	1.6%	1.9%	1.6%
1950-2012	2.5%	1.5%	1.1%	2.5%	1.5%
2000-2012	2.7%	2.4%	0.6%	2.5%	1.4%

Source: Population of the Counties by Decennial Census: U.S. Census Bureau
2012: Intercensal Annual Population Estimates: U.S. Census Bureau

Table 2. Historical Employment

Year	Faulkner	Lonoke	Pulaski	Saline	Total
Employment					
1940	7,317	9,176	52,966	5,127	74,586
1950	3,457	8,920	75,306	7,191	94,874
1960	8,275	7,205	88,221	8,160	111,861
1970	10,815	8,807	108,980	13,286	141,888
1980	18,909	12,947	151,578	22,365	205,799
1990	27,806	17,388	166,541	29,887	241,622
2000	42,479	24,727	172,712	40,045	279,963
2010	53,428	34,558	181,511	52,621	322,118
2011	55,058	31,379	181,128	50,874	318,439
1940-2011	2.9%	1.7%	1.7%	3.3%	2.1%
2000-2011	2.4%	2.2%	0.4%	2.2%	1.2%

Source: Employment of the Counties by Decennial Census: U.S. Census Bureau
2011: American Community Survey, One-year Estimates, U.S. Census Bureau

2.1.2 Future Demographics

There are several public and private institutions forecasting population and employment at the county level. The following sections will examine population and employment estimates recently published by these organizations.

2.1.2.1 METROPLAN

METROPLAN is the designated Metropolitan Planning Organization (MPO) responsible for the transportation planning process in central Arkansas. As part of the planning process, METROPLAN prepares demographic forecasts to support the travel demand model. Table 3 illustrates the population and employment forecasts incorporated into the Long Range Transportation Plan, Metro 2030 adopted in 2005 and revised in 2010 as Metro 2030.2.

Between 2010 and 2030, the combined population for the four-county region is expected to grow at 1.1 percent annually, from over 667,000 residents in 2010 to over 833,800 residents in 2030. Faulkner County is estimated to experience the highest 20-year population growth at 2.1 percent; on the contrary, population in Pulaski County is expected to grow the least, 0.5 percent. Continuing the historical trend in the population increase between 2000 and 2012, the population forecast assumes that more residents will be added to Faulkner and Saline counties than to Pulaski County during the forecast period.

Between 2010 and 2030, employment in central Arkansas is projected to grow annually at 0.8 percent adding over 60,000 new jobs during the same period (see Table 3). Pulaski

County will continue to attract the majority of new jobs (more than 50 percent). Employment in Faulkner County is expected to grow at 1.4 percent, Lonoke County at 1.3 percent, Saline County at 1.2 percent, and Pulaski County at 0.6 percent over the 20-year period.

Table 3. Population and Employment Forecast
METROPLAN (Metro 2030)

Year	Faulkner	Lonoke	Pulaski	Saline	Total
Population					
2010	112,741	66,538	386,259	101,971	667,509
2015	127,064	73,385	396,893	111,555	708,897
2020	142,249	79,863	407,909	121,970	751,991
2025	156,219	85,635	407,909	121,970	771,733
2030	170,509	90,531	428,125	144,660	833,825
2010-2030	2.1%	1.6%	0.5%	1.8%	1.1%
Employment					
2010	48,738	14,647	270,744	26,277	360,406
2015	53,405	16,020	281,015	28,647	379,087
2020	58,371	17,192	291,686	30,517	397,766
2025	61,788	18,106	297,445	31,825	409,164
2030	64,905	19,120	302,903	33,633	420,561
2010-2030	1.4%	1.3%	0.6%	1.2%	0.8%

Source: Metro 2030.2: Long Range Transportation Plan for central Arkansas, Metroplan, March 24, 2010

2.1.2.2 Other Sources

In addition to METROPLAN, demographic forecasts are also developed by public agencies such as the Institute for Economic Advancement (IEA) from the University of Arkansas at Little Rock and by the Center for Business and Economic Research (CBER) from the University of Arkansas.

Based on IEA forecasts, the population in central Arkansas is expected to grow at an annual rate of 1.7 percent between 2010 and 2020, increasing from over 670,000 residents in 2010 to over 795,000 people in 2020 (see Table 4). The IEA population forecast is more aggressive than the population forecast adopted by METROPLAN (see Tables 3 and 4).

Table 4. IEA Population Forecast

Year	Faulkner	Lonoke	Pulaski	Saline	Total
Population					
2010	113,237	68,356	382,748	107,118	671,459
2015	134,470	80,301	396,675	125,135	736,581
2020	154,289	91,344	408,181	141,707	795,521
2010-2020	3.1%	2.9%	0.6%	2.8%	1.7%

Source: Total Population by County Projections 2011-2020,
Institute for Economic Advancement, University of Arkansas at Little Rock, June 18, 2012

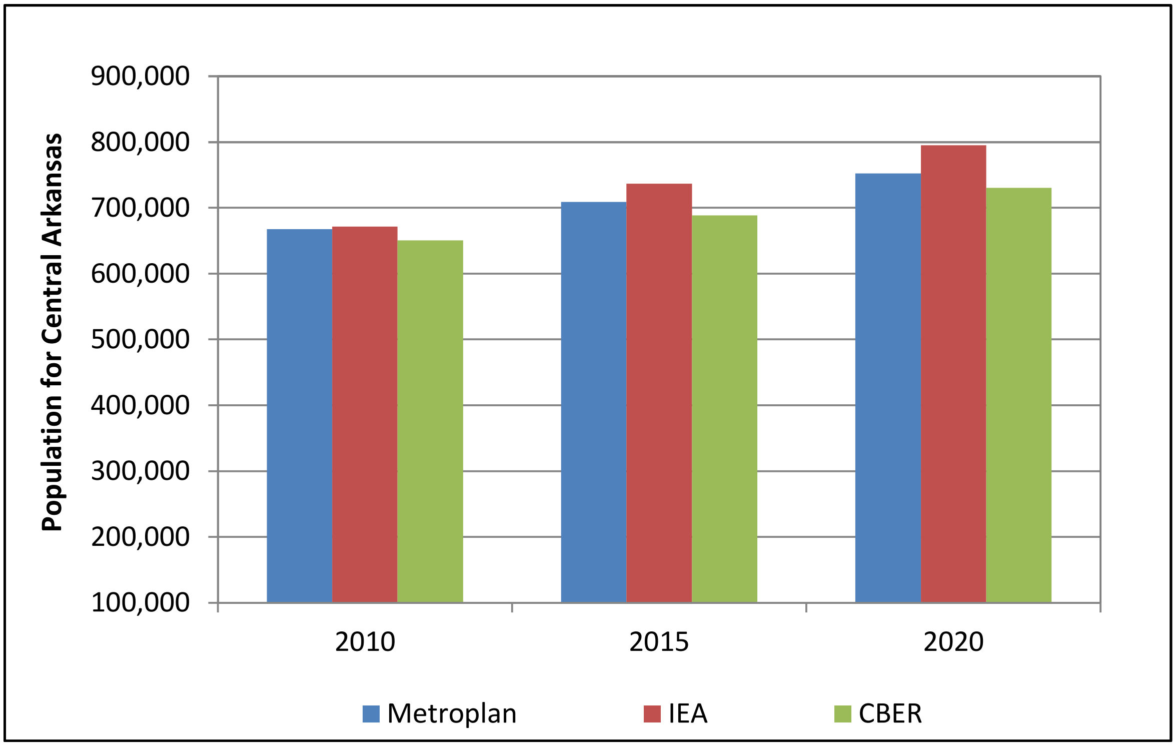
Table 5 presents the population estimates developed by CBER at the University of Arkansas. Based on the CBER forecast, population for central Arkansas will increase at an annual growth rate of 1.2 percent between 2010 and 2025. Pulaski County will add more than 20,000 residents and the other three counties will add at least 25,000 residents to each county during the same period. Figure 3 compares the population forecasts developed by METROPLAN, IEA, and CBER. For each forecast year, the METROPLAN population forecast falls between the population forecast developed by CBER and IEA.

Table 5. CBER Population Forecast

Year	Faulkner	Lonoke	Pulaski	Saline	Total
Population					
2010	109,141	66,390	374,707	100,388	650,626
2015	122,909	74,355	381,437	110,084	688,785
2020	138,413	83,266	388,248	120,704	730,631
2025	155,873	93,256	395,181	132,363	776,673
2010-2025	2.4%	2.3%	0.4%	1.9%	1.2%

Source: Arkansas Population Projections 2003-2025, Center for Business and Economic Research,
University of Arkansas, June 30, 2003

Figure 3: Population Forecast Comparison



2.1.3 Population Comparison; Actual versus Forecasted

A comparison between the forecasted and actual population is important because it provides an "order of magnitude" if a region has been growing faster or slower than expected. Table 6 compares the 2010 census population for the central Arkansas region with the population forecast from Metro 2025 (developed in 1999), Metro 2030 (estimated in 2010 before the census information results were available), and CBER (forecasted in 2003). Table 6 does not include the forecast from IEA since the 2012 IEA population forecast already accounted for the 2010 census results. Typically, forecasts deviate significantly from actual values when forecasts date back several years. For central Arkansas, population forecasts are lower than the actual 2010 census population. Forecasts by the CBER have the highest deviation (see Table 6).

The difference between the actual and forecasted population is very low. Therefore, no modifications to the METROPLAN trip tables were made.

Table 6. Central Arkansas Population: Actual versus Forecasts

Year	Forecasts (2010)	Actual (2010)	Difference	% Difference
Metro 2025	656,542	671,459	-14,917	-2.2%
Metro 2030	667,509	671,459	-3,950	-0.6%
CBER	650,626	671,459	-20,833	-3.1%

Source: Actual-Population of central Arkansas from 2010 Decennial Census: U.S. Census Bureau;
Forecasts-Metro 2025: An Update of the Metropolitan Transportation Plan, Metroplan, October 27, 1999;
Metro 2030.2: Long Range Transportation Plan for Central Arkansas, Metroplan, March 24, 2010;
Arkansas Population Projections 2003-2025, Center for Business and Economic Research,
University of Arkansas, June 30, 2003.

2.2 SOCIOECONOMIC INDICATORS

Travel demand and trip characteristics are directly or indirectly influenced by many socio-economic factors such as household income, hourly wage, consumer price index, and unemployment rate. The next four sections outline the trends for key economic indicators.

Figure 4 and Table 7 show the historical trends in the median household income for the USA, Arkansas and for each county located in central Arkansas. With the exception of Saline County, the 2011 median household income for the counties located in central Arkansas was higher than the median income for the entire state, but lower than the median income of the USA. Since 1970, Lonoke County has experienced the highest annual growth rate (5.6 percent); on the other hand, the Pulaski County median income had the lowest rate of growth (4.5 percent). During the last 12 years (2000–2011), the Faulkner County median income increased annually by 2.2 percent, while the Pulaski County median income increased only by 1.1 percent. Between 2007 and 2011, the median income for counties located in central Arkansas decreased in at least one of the intermediate years (e.g., Pulaski County income decreased from $44,909 in 2007 to $42,107 in 2009). The fluctuation of median household income experienced in central Arkansas between 2007 and 2011 is generally consistent with the income trends at the national level during the economic recession.

Figure 4: Median Household Income

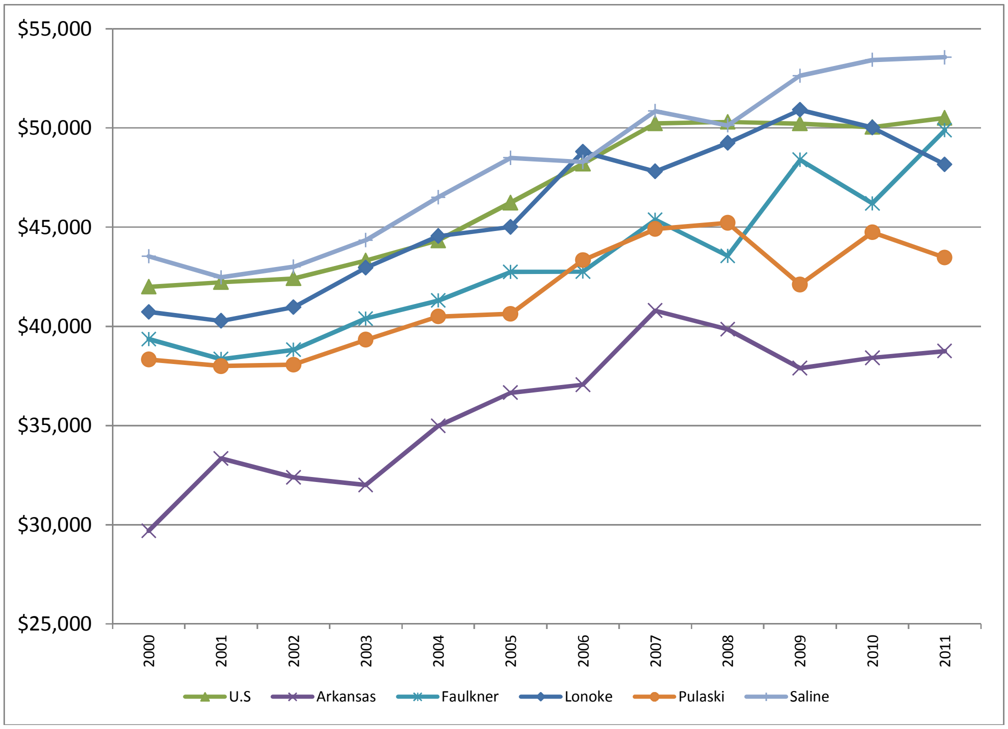


Table 7. Median Household Income

Year	U.S	Arkansas	Faulkner	Lonoke	Pulaski	Saline
1970	$8,486	$5,356	$5,736	$5,064	$7,285	$7,205
1980	$16,841	$12,214	$13,500	$13,493	$15,652	$17,536
1990	$30,056	$21,147	$23,663	$23,831	$26,883	$28,262
1995	$34,076	$25,814	$34,160	$34,694	$32,524	$38,089
2000	$41,990	$29,697	$39,355	$40,728	$38,328	$43,528
2001	$42,228	$33,339	$38,345	$40,275	$37,998	$42,469
2002	$42,409	$32,387	$38,817	$40,964	$38,068	$43,002
2003	$43,318	$32,002	$40,395	$42,953	$39,325	$44,342
2004	$44,334	$34,984	$41,297	$44,551	$40,499	$46,508
2005	$46,236	$36,658	$42,738	$45,012	$40,629	$48,487
2006	$48,201	$37,057	$42,757	$48,798	$43,338	$48,287
2007	$50,233	$40,795	$45,370	$47,810	$44,909	$50,849
2008	$50,303	$39,856	$43,553	$49,241	$45,215	$50,133
2009	$50,221	$37,888	$48,390	$50,910	$42,107	$52,630
2010	$50,046	$38,413	$46,199	$50,021	$44,733	$53,430
2011	$50,502	$38,758	$49,886	$48,161	$43,461	$53,557
1970-2011	4.4%	4.9%	5.4%	5.6%	4.5%	5.0%
2000-2011	1.7%	2.5%	2.2%	1.5%	1.1%	1.9%

Source: Historical Median Household Income by Decennial Census, U.S. Census Bureau
2011: American Community Survey, One-year Estimates, U.S. Census Bureau.

Table 8 depicts the mean hourly wage (all occupations) for the Little Rock/North Little Rock/Conway region for 2002 and 2012. The mean hourly rate has increased at an annual compound rate of 2.3 percent during the same period. Between 2002 and 2012, the mean hourly wage annual growth rate (Table 8) was higher than the median household income annual growth rate between 2002 and 2011 (see Table 7) for all four counties.

Table 8. Mean Hourly Wage

Year	Mean Hourly Wage
2002	$15.28
2012	$19.25
2002-2012	2.3%

Source: Bureau of Labor Statistics,
Occupational Employment Statistics,
Little Rock-North Little Rock-Conway, All Occupations

Table 9 depicts the annual growth rate of the consumer price index (CPI) for the southern region (including Arkansas) and the U.S. for different interval periods. Between 2000 and 2012, the CPI for the southern region increased at an annual rate of 2.5 and 4.3 percent from 1967 to 2012. The CPI annual growth rate during the last 13 years (2000–2012) was slightly higher than the annual growth rate for the mean hourly wage (see Table 8 and Table 9).

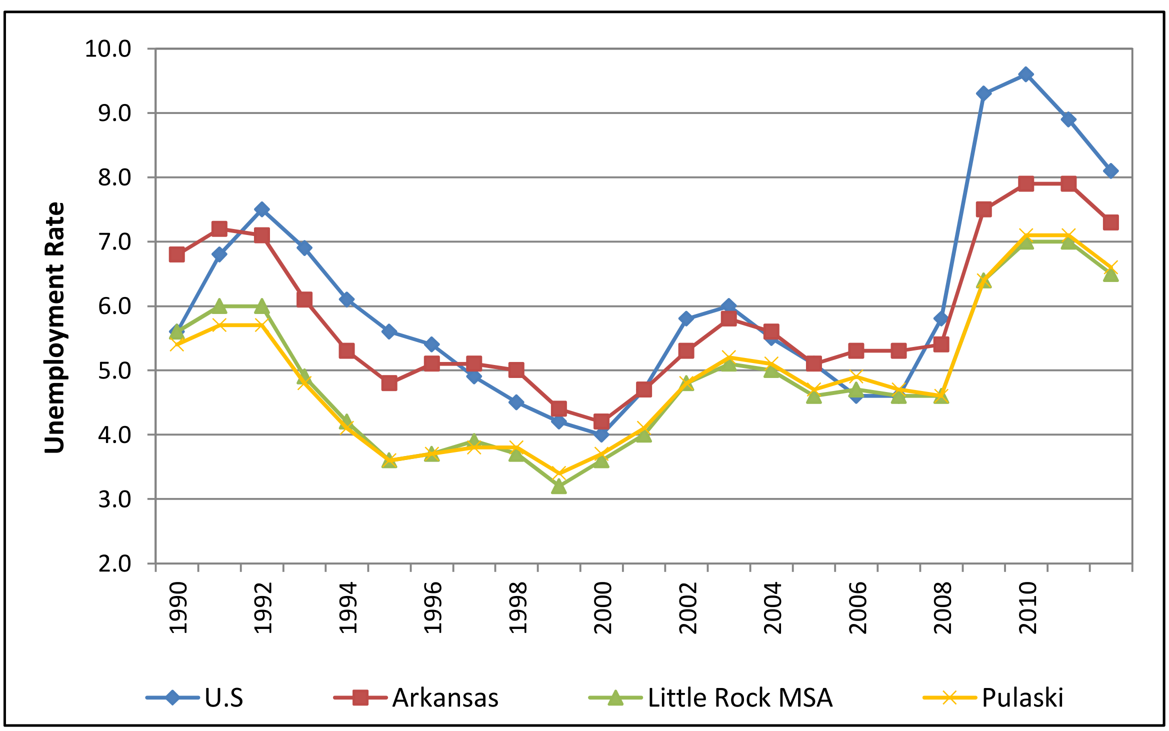
Table 9. Consumer Price Index (CPI)

CPI-Urban		
Period	**South Region**	**US**
1967-2012	4.3%	4.3%
1980-2012	3.1%	3.2%
1990-2012	2.6%	2.6%
2000-2012	2.5%	2.5%

Source: U.S. Bureau of Labor Statistics (BLS). South Region includes Alabama, **Arkansas**, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia.

Figure 5 compares the trend in unemployment rates for the U.S., Arkansas, the Little Rock (Metropolitan Statistical Area [MSA]), and Pulaski County. Historically, the unemployment rate trends for Pulaski County and Little Rock MSA have been very similar. Most of the years, the unemployment rate in central Arkansas (Little Rock MSA) has been lower than the unemployment rate in Arkansas and the U.S.

Figure 5: Unemployment Rate



2.3 TRAFFIC COUNTS

Traffic counts were collected to analyze the trip patterns and validate the central Arkansas Region Transportation Study travel demand model (CARTS TDM). Traffic counts were summarized along several screenlines as illustrated on Figure 6. Table 10 shows the traffic counts for 1990 and 2012 along six screenlines in the NBF study area. Traffic counts were obtained from AHTD's Google Earth based database.

The annual traffic growth rate from 1990 to 2012, along all screenlines, ranges from 0.6 percent (screenline 3, blue) to 2.4 percent (screenline 4, aqua). The traffic growth in screenline 1 (shown in red and located west of I-30), had an annual average growth of 1.5 percent over the last 23 years. I-40 experienced the highest annual growth rate of 2.8 percent. In screenline 2 (shown in green), located east of I-30/US-67, traffic has increased annually at 1.2 percent during the same period.

The facilities with the highest annual traffic increment were Highway 100 (screenline 4, aqua), at 3.7 percent; and I-40 (screenline 1, red), at 2.8 percent. Traffic on screenline 3 (blue) had the lowest annual growth rate of 0.6 percent.

Two additional counts, shown as pins on Figure 6, were summarized in the vicinity of the NBF termini points on I-430 and on Highway 440 (see Figure 6 and Table 11). Traffic on I-430 has increased at an annual growth rate of 3.2 percent from 2004 to 2012, while traffic on Highway 440 has been stagnant during the same period. Traffic on Highway 440 peaked at 27,400 vehicles per day (vpd) in 2007, but decreased to 21,000 vpd by 2012.

A seven-day count located on I-40, east of Crystal Hill Road, was summarized to calculate the annual revenue days. A revenue-day factor of 337 days was estimated at this location.

Figure 6: Traffic Count Locations

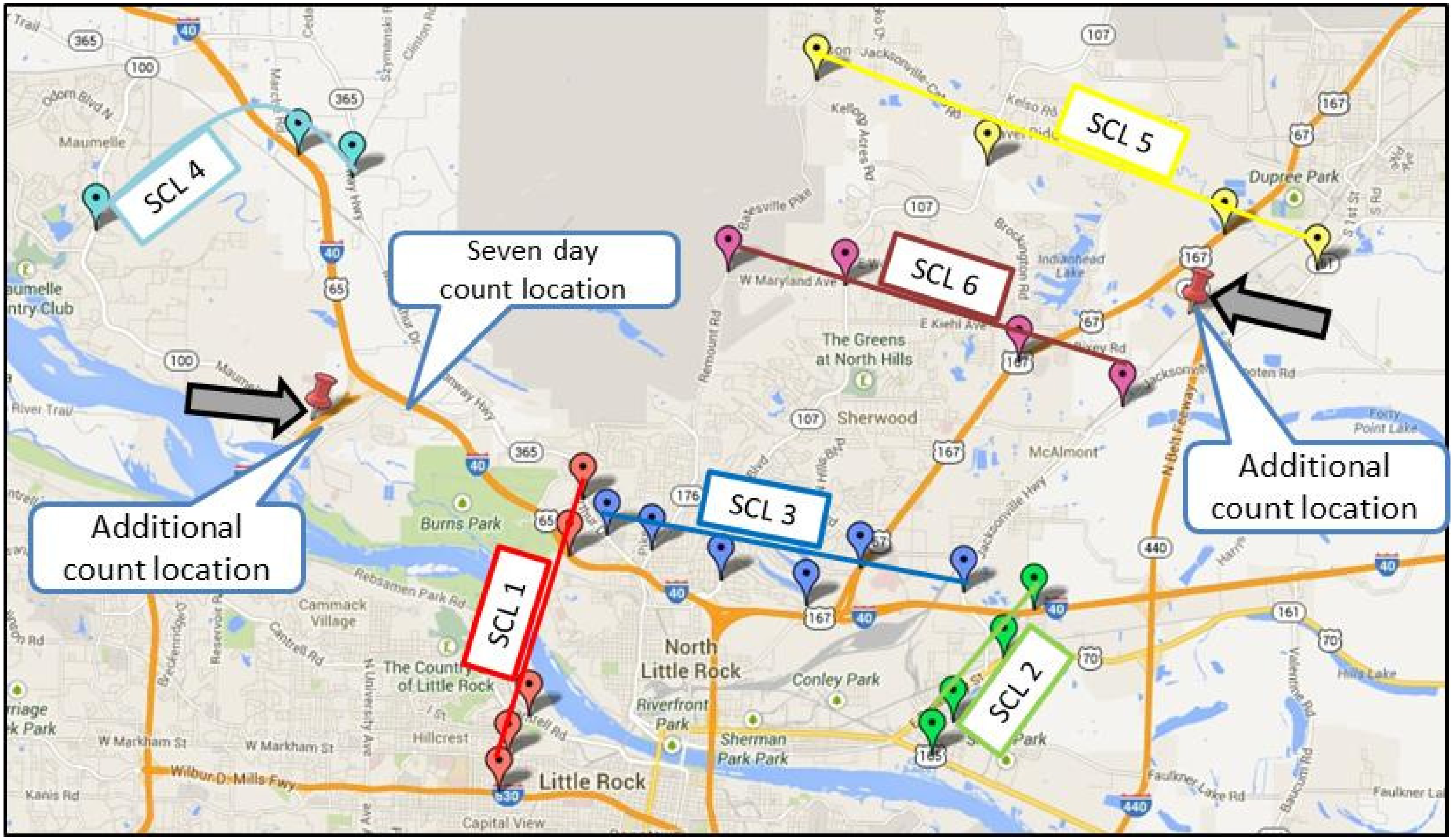


Table 10. Traffic Count Screenlines (Average Daily Traffic Counts)

Facility	1990	2012	Growth: 1990-2012
Screenline 1: West of I-30 (red)			
I-630	85,680	109,000	1.1%
Markham Dr.	12,590	13,000	0.1%
Highway 10	18,550	23,000	1.0%
I-40	42,000	77,000	2.8%
Highway 365	9,340	9,100	-0.1%
Total	**168,160**	**231,100**	**1.5%**
Screenline 2: East of I-30/Highway 67 (green)			
Highway 165	3,750	5,300	1.6%
Lynch Dr.	6,440	5,900	-0.4%
Highway 70	5,040	6,400	1.1%
I-40	19,530	28,000	1.7%
Total	**34,760**	**45,600**	**1.2%**
Screenline 3: North of I-40 (blue)			
MacArthur Dr.	10,880	10,000	-0.4%
Highway 176	21,110	27,000	1.1%
Highway 107	28,300	32,000	0.6%
Hills Blvd.	13,910	17,000	0.9%
Highway 167	70,000	79,000	0.6%
Highway 161	10,570	9,900	-0.3%
Total	**154,770**	**174,900**	**0.6%**
Screenline 4: North of I-430 (aqua)			
Highway 100	9,820	22,000	3.7%
I-40	41,030	66,000	2.2%
MacArthur Dr.	4,500	5,700	1.1%
Total	**55,350**	**93,700**	**2.4%**
Screenline 5: North of Highway 440/Highway 167 (yellow)			
Batesville Pike	5,130	6,300	0.9%
Highway 107	11,010	17,000	2.0%
Highway 67	47,740	72,000	1.9%
1st St.	8,150	9,300	0.6%
Total	**72,030**	**104,600**	**1.7%**
Screenline 6: South of Highway 440/Highway 167 (maroon)			
Batesville Pike	2,890	3,200	0.5%
Highway 107	12,980	21,000	2.2%
Highway 67	46,210	71,000	2.0%
Highway 161	6,340	5,800	-0.4%
Total	**68,420**	**101,000**	**1.8%**

Source: AADT Estimates, Arkansas Highway Transportation Department

Table 11. Average Daily Traffic Counts at I-430 and Highway 440

Year	I-430	Highway 440
2004	53,500	21,300
2005	57,200	18,900
2006	59,900	23,300
2007	69,700	27,400
2008	66,000	22,000
2009	66,000	20,000
2010	71,000	20,000
2011	69,000	17,000
2012	69,000	21,000
Growth: 2004-2012	3.2%	-0.2%

Source: AADT Estimates, Arkansas Highway Transportation Department

2.4 TRAFFIC OPERATION CONDITIONS

Baez Consulting staff visited the North Belt Freeway study area on June 27, 2013. Highway characteristics, land-use, and traffic conditions were documented during the visit.

Most of the major highways in the central Arkansas metropolitan area have two or three lanes in each direction with speed limits ranging from 60 to 65 miles per hour (mph). Highway 107 and Highway 176, which are in close proximity to the proposed project (see Figure 2), are primarily two lanes in each direction with speed limits ranging from 35 to 55 mph. The area surrounding Highway 107 from Kellogg Acres Road to downtown Little Rock is highly developed with many traffic signals and school zones. Speed limits in this area are reduced to 35 mph. Highway 176 is also highly developed in the section between downtown Little Rock and West Maryland Avenue. From West Maryland Avenue to the community of Gibson in North Little Rock, Highway 176 is one lane in each direction and traverses through relatively undeveloped land.

Afternoon congestion levels in the vicinity of the proposed project were observed during a site visit conducted June 27, 2013. During the afternoon peak period (4:30 to 5:15 PM), severe congestion was observed in the eastbound direction of I-30 between I-630 and I-40, and the eastbound direction of I-40 from I-30 to Highway 67 (see Figure 7). During this period, the average speed from the I-30/I-630 interchange to Highway 67/McCain Boulevard ranged from 33 to 42 mph. The congestion on I-30 eastbound occurs as traffic merges from I-630 and the loops connecting Cumberland Street (see Figure 8). On I-40 eastbound, congestion occurs due to high volume traffic from I-30 eastbound merging with I-40 eastbound traffic. This merging area is very turbulent because traffic traveling from I-30 eastbound to Highway 67 northbound must weave to the interior lane (adjacent to inside shoulder) to access Highway 67 (see Figure 9); on the other hand, traffic traveling on I 40 eastbound and continuing eastbound must cross over to the exterior lanes (adjacent to outside shoulder).

The peak period congestion observed during the afternoon was verified using Google maps daily traffic conditions (see Figure 10). Highway and arterial segments shown in red represent slow traffic conditions. The map depicts slow traffic conditions on I-30, I-40, Highway 107 and Camp Robinson Road. Figure 11 presents the speed conditions during the morning peak period, as reported by Google maps. Congestion conditions during the morning peak period occurred on the same facilities but for the reverse movements (southbound/westbound).

Figure 7: Area of Severe Congestion (Afternoon Peak Period)

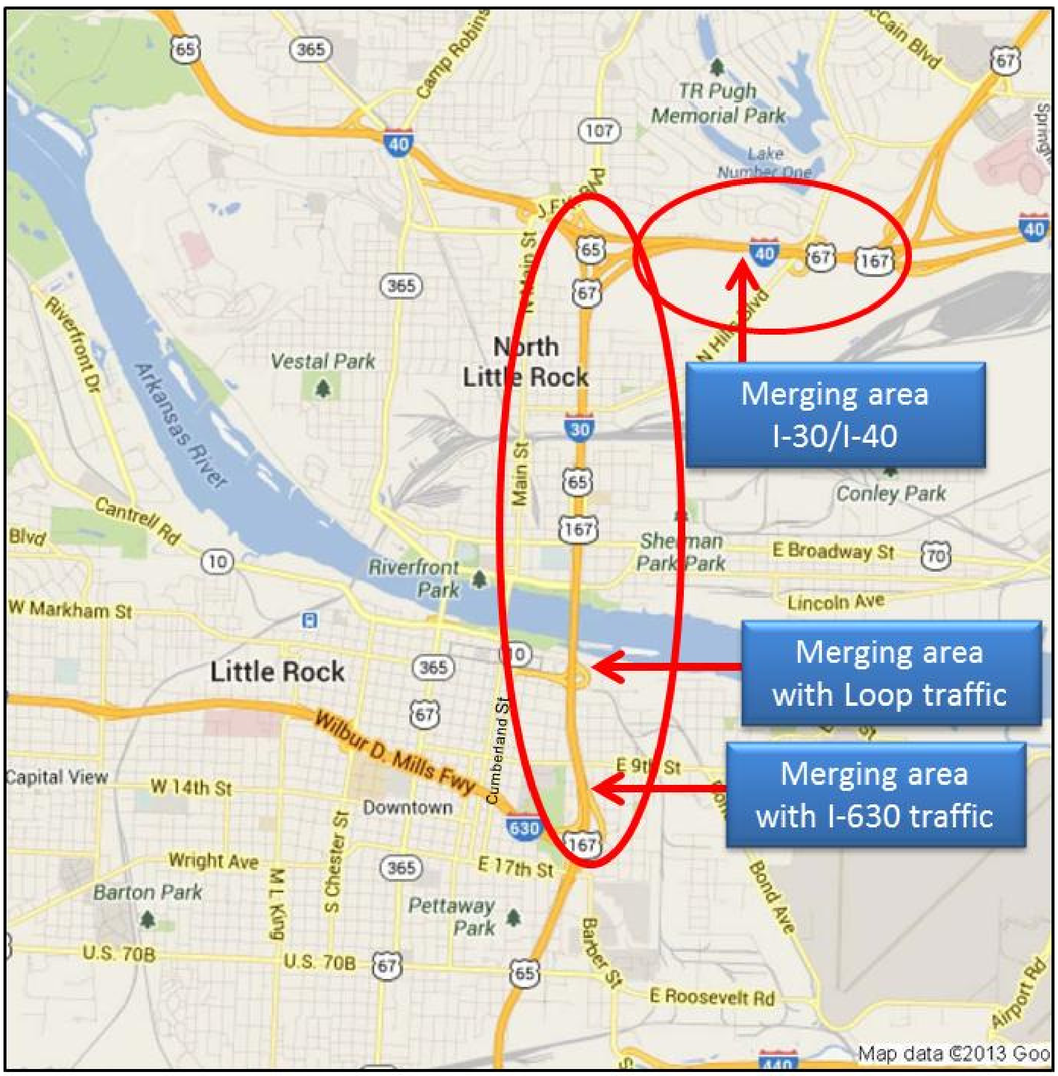


Figure 8: Area of Severe Congestion
(I-30 Eastbound At Loop Entrance)

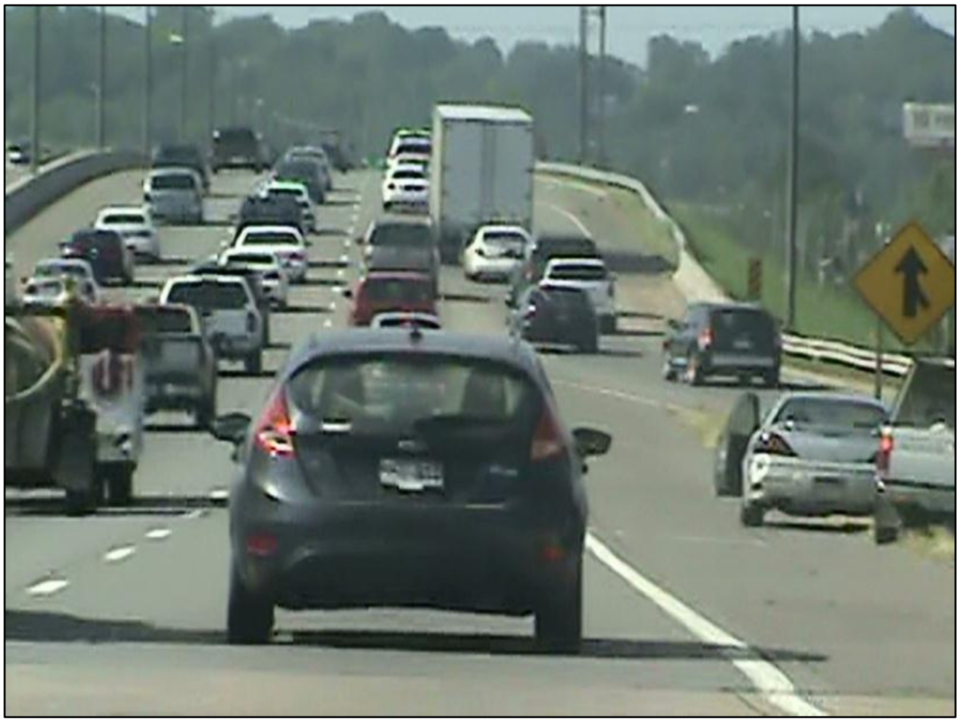


Figure 9: Area of Severe Congestion
(I-30 and I-40 Merging Area)

Figure 10: Traffic Conditions
(Google Map; September 20, 2013; 4:45 p.m.)

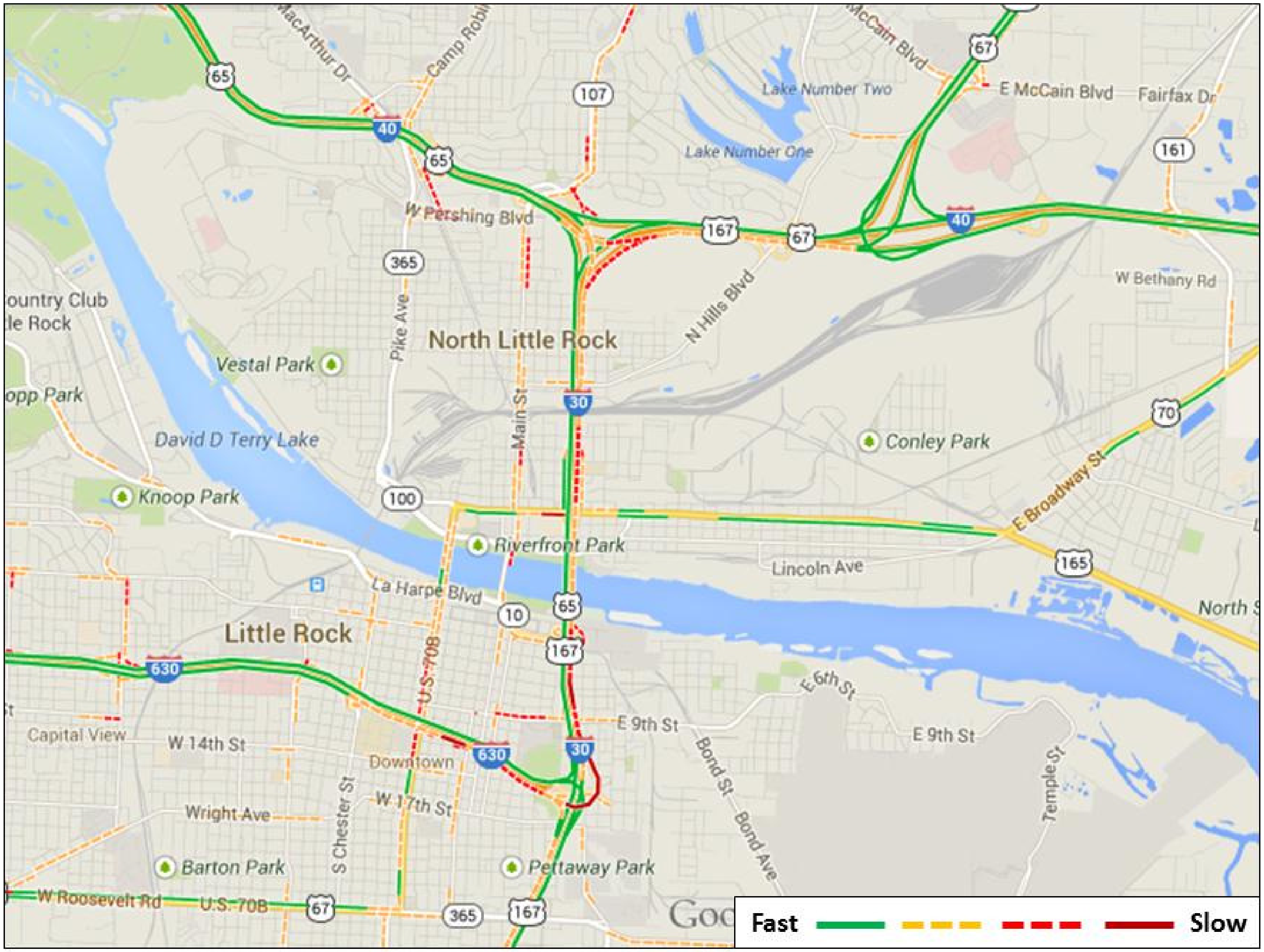
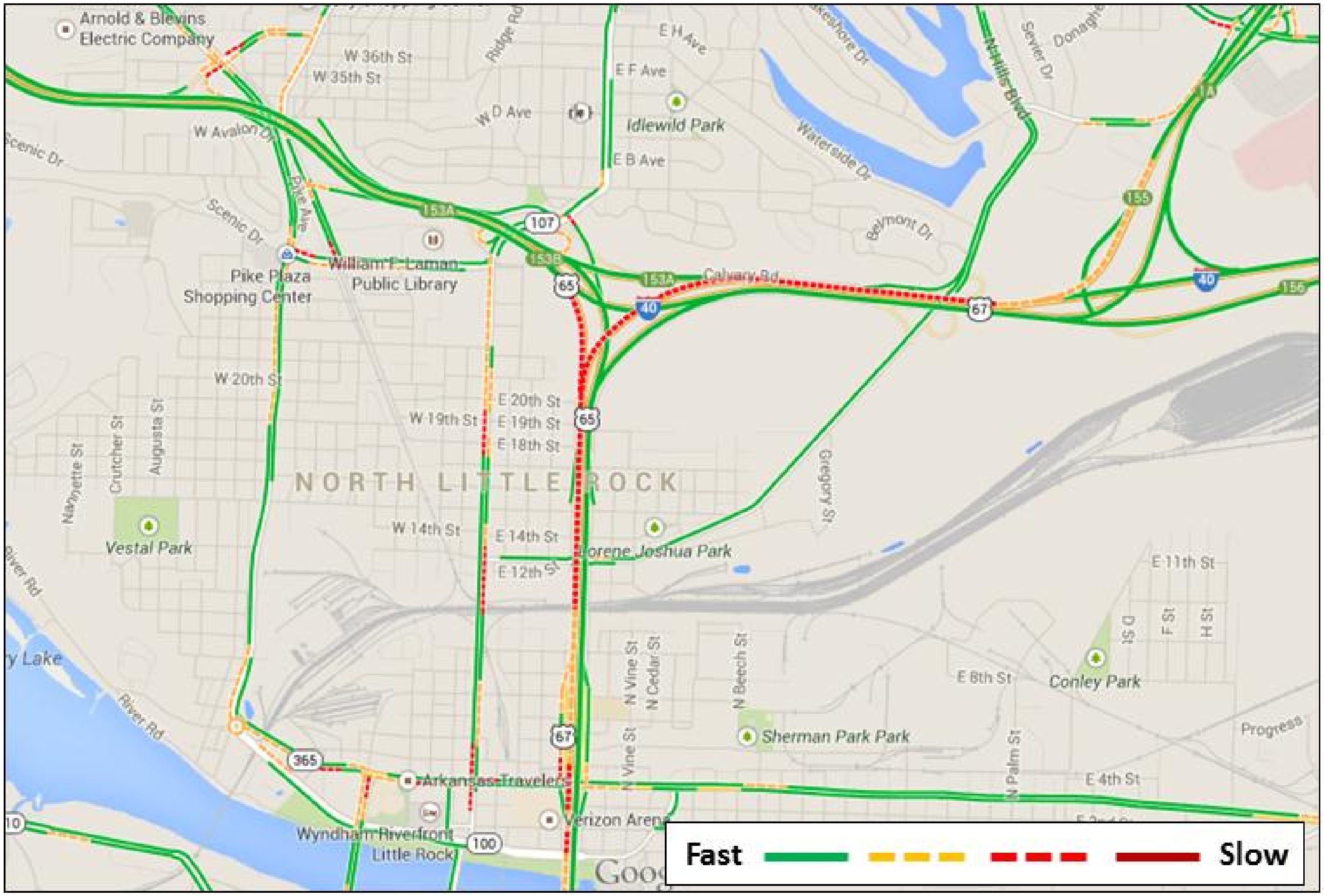


Figure 11: Traffic Conditions
(Google Map; September 26, 2013; 7:51 a.m.)



2.5 MAJOR EMPLOYERS

Most of the major employers in central Arkansas are located in the Little Rock central business district along I-630.

2.6 COMMUTING PATTERNS

Journey-to-work information, gathered by the U.S. Census and American Community Survey (2006–2008), provides a good illustration of where people reside and where they work. Table 12 depicts the historical interaction of commuting among the four counties of central Arkansas. It can be concluded from Table 12 that the share of commuters working in another county has gradually increased from 1970 to 2008. For example, in 1970, 2 percent of the total residents in Pulaski County worked in Faulkner County, and this share increased to 5 percent between 2006 and 2008. For Faulkner County, the proportion of people working in Pulaski County increased from 1 percent in 1970 to 6 percent in the 2006–2008 period. The share of people residing in Saline County and working in Pulaski County has increased from 4 percent in 1970 to 11 percent in the 2006–2008 period.

Table 12. Commuting Patterns

Working In	Residing In: Faulkner	Lonoke	Pulaski	Saline
1970				
Faulkner	98%	0%	2%	0%
Lonoke	0%	94%	6%	0%
Pulaski	1%	2%	93%	4%
Saline	0%	0%	8%	92%
1980				
Faulkner	96%	0%	4%	0%
Lonoke	0%	89%	11%	0%
Pulaski	2%	3%	88%	7%
Saline	0%	0%	9%	90%
1990				
Faulkner	95%	0%	5%	0%
Lonoke	1%	88%	10%	0%
Pulaski	3%	4%	84%	8%
Saline	0%	0%	10%	89%
2000				
Faulkner	93%	1%	5%	1%
Lonoke	2%	86%	11%	1%
Pulaski	5%	6%	78%	11%
Saline	1%	1%	11%	87%
2006-2008				
Faulkner	94%	1%	5%	0%
Lonoke	3%	85%	12%	0%
Pulaski	6%	7%	76%	11%
Saline	0%	1%	10%	89%

Source: 1970-2000: Bureau of Economic Analysis, April 2005
2006-2008: 3-year Estimates, American Community Survey, CTPP, U.S. Census Bureau

2.7 OTHER TRAVEL CHARACTERISTICS

Technology has changed significantly during the last twenty years, influencing how people travel and where they work. Table 13 shows the percentage of people working at home in central Arkansas (Little Rock MSA), the United States and other metropolitan areas in 2005 and 2010. The percentage of people working at home increased only marginally in central Arkansas (4.2 percent) from 2005 to 2010, but it might become a more important trend in the future. By comparison, the percentage of people working at home expanded by 46 percent and 17.2 percent in Austin and Oklahoma City, respectively.

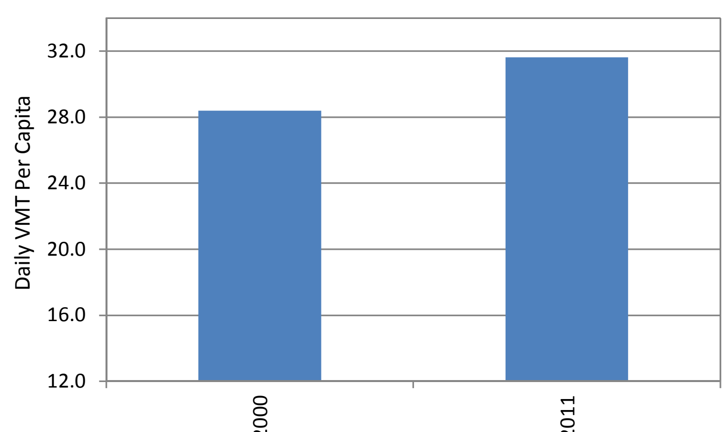
Table 13. Percentage of People Working at Home

Jurisdiction	2005	2010	Percentage Growth
United States	3.5%	4.3%	22.9%
Little Rock-North-Little Rock-Conway (MSA), AR	2.4%	2.5%	4.2%
Kansas City (MSA), MO-KS	3.9%	4.1%	5.1%
Oklahoma City (MSA), OK	2.9%	3.4%	17.2%
Dallas-Fort Worth-Arlington (MSA), TX	3.9%	4.6%	17.9%
Austin-Round Rock-San Marcos (MSA), TX	5.0%	7.3%	46.0%

Source: Home-Based Workers in the United States: 2010 Household Economic Studies; U.S. Department of Commerce
Note: Metropolitan Statistical Area (MSA)

Daily vehicle-miles-traveled (VMT) per capita for the Little Rock urbanized area increased from 28.4 miles in 2000 to 31.6 miles in 2011 (see Figure 12), an increase of 11.3 percent.

Figure 12: VMT Per Capita
(Little Rock Urbanized Area)



Source: Vehicle-Miles Traveled (VMT); Federal Highway Admistration

3.0 TRAVEL DEMAND MODEL REVIEW AND VALIDATION

This section describes the review of the CARTS TDM and the validation process to replicate existing traffic conditions.

3.1 DATA RECEIVED FROM AHTD

The CARTS travel demand model (CARTS TDM) is a TransCAD based four-step model composed of Trip Generation, Trip Distribution, Mode Choice, and Traffic Assignment steps. The Atkins team received databases for model years 2000, 2010, and 2030. Modeling files received include demographics and income data by Traffic Analysis Zone (TAZ), outcome files from Trip Generation, Trip Distribution, and Mode Choice procedures, roadway networks, 24-hour and peak period trip tables by vehicle mode and for commercial vehicles, and traffic assignment results for each model year. Peak period trip tables were mainly related to transit.

3.2 REVIEW OF HIGHWAY NETWORK ATTRIBUTES

Review of the highway networks included comparing the data collected from the site visit, such as number of lanes and speed limits with the attributes coded in the roadway network. Number of lanes for all freeways and major arterials were also compared against aerial images from Google Maps. Free-flow speeds coded in the network were compared against the speed limit data from the site visit. Year 2010 and 2030 networks were compared and checked for inconsistencies across years. The highway networks were also contrasted with the committed improvements from the latest long range transportation plan adopted by METROPLAN, Metro 2030.2. Questions were submitted to AHTD regarding number of lanes, speed limits, and area types for several highway links. Zone connectors were reviewed in and around the NBF study area, and minor changes were implemented.

3.3 VALUE OF TIME AND OPERATING COST ASSUMPTIONS

Value of time (VOT) and operating costs (OC) are very important parameters in the traffic assignment process. VOT was estimated using the mean hourly wage for the Little Rock-North Little Rock-Conway area included in Table 8 (Section 2.2). VOT was assumed to be 60 percent of the mean hourly wage resulting in a 2012 VOT value of $11.55 per hour. This value was similar and consistent with the original VOT incorporated into the CARTS TDM. The OC was estimated using information from the American Automobile Association for 2012. The 2012 OC was assumed to be $0.192 per mile for automobiles. A factor of 3.45 was used to estimate VOT and OC for commercial vehicles. Both OC and VOT are assumed to grow at an annual rate of 2.5 percent.

3.4 TRAFFIC ASSIGNMENT ALGORITHM

The User Equilibrium (UE) algorithm assignment algorithm is the most popular assignment algorithm used by metropolitan planning organizations in the USA. The UE assignment algorithm includes the generalized cost equation as the base to find the minimum path between origin and destination. The generalized cost equation is defined as:

Total Travel Cost = VOT * Travel Time + Operating Cost + Toll Cost

VOT = Value of time (see Section 3.3)

Travel time = Time between origin and destination

Operating Cost = The costs accrued by wear and tear on the vehicles and other associated costs (see Section 3.3)

Toll = The total toll fee for a given route. There are no toll facilities in the 2012 validation year.

3.5 MODEL VALIDATION RESULTS

The main purpose of the validation process is to ensure that the travel demand model replicates the existing traffic conditions. The validation effort in this study concentrated only on validating the traffic assignment process because it was assumed that trip generation, trip distribution, and mode choice algorithms and parameters have already been validated. Year 2012 was chosen as the validation year because traffic counts for 2012 were provided by AHTD (see Figure 6 and Tables 10 and 11, Section 2.3). The 2010 roadway network was used as the 2012 base-year network considering that no significant modifications have occurred from 2010 to 2012. The traffic assignment validation was performed at the daily level because the peak period trip tables do not completely reflect the congested conditions. The logit-based volume delay function (VDF) incorporated into the CARTS TDM was used in the assignment process.

The 24-hour trip tables from the CARTS TDM are composed of five vehicle modes: Single-Occupancy Vehicles (SOV), High-Occupancy Vehicles with two occupants (HOV2P), High-Occupancy Vehicles with three or more occupants (HOV3P), Trucks, and Commercial vehicles between external to external zones. During the traffic assignment process, all vehicle modes were loaded simultaneously using TransCAD's Multimodal-Multiclass Assignment (MMA).

The traffic count screenlines described in Section 2.3 (see Figure 6) were used to compare existing traffic against simulated traffic. The traffic assignment validation was performed using the guidelines published by the Federal Highway Administration in "Calibration and Adjustment of System Planning Models" in 1990 and the "Travel Model Validation and Reasonableness Checking Manual" in 2010.

Table 14 and Figure 13 show the validation results for each screenline. The yellow curve in Figure 13 depicts the maximum percent error allowed as a function of the total traffic in a screenline. With the exception of screenline 5 (minor difference), the percent of error for each screenline met the requirement for validation. Based on the relatively small difference for screenline 5 (22 percent allowed versus 24 percent estimated), and an insufficient number of available traffic counts for this screenline, no modifications to the trip tables were made.

Table 14. Screenline Validation Results

Screenline	Count Total	Model Total	Percent Error
1	231,100	222,432	-4%
2	45,600	55,622	22%
3	174,900	181,641	4%
4	93,700	98,519	5%
5	104,600	129,538	24%
6	101,000	120,161	19%

Figure 13: Maximum Percent Error Allowed

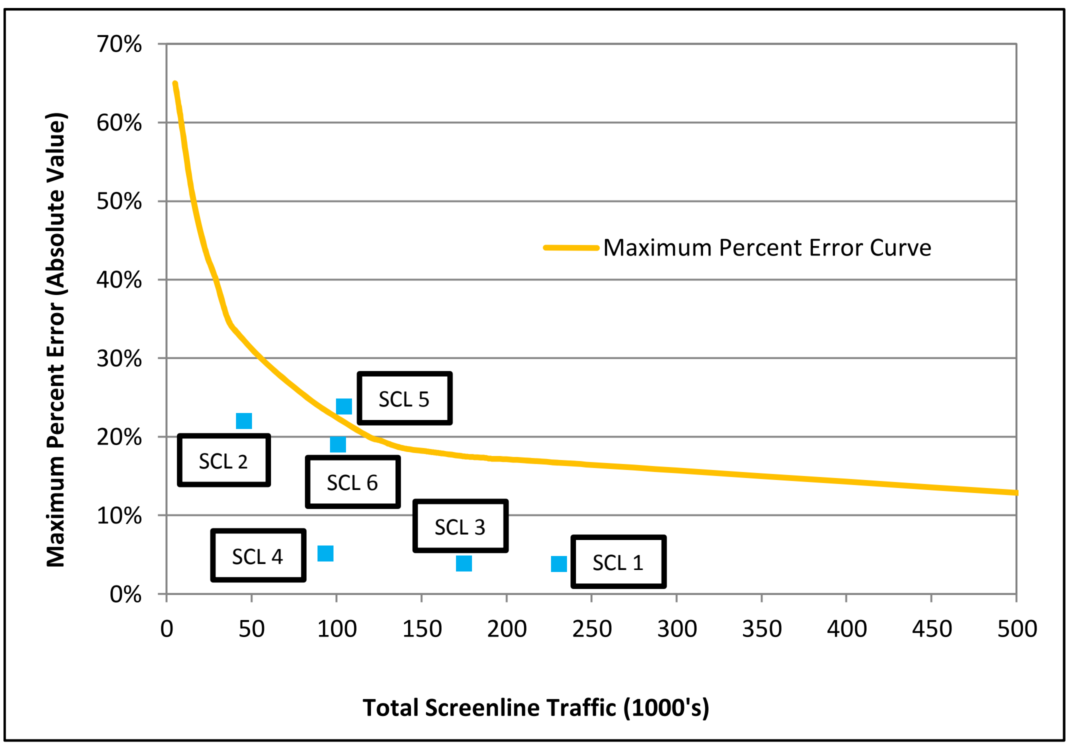


Table 15 shows the percent root squared error (%RMSE) for different functional classification and area type highway facilities. The lower the percent root square error, the better the validation. With the exception of minor arterials (not enough counts were available) the validation results show a consistent lower %RMSE. No changes were made to the trip tables to correct the RMSE for minor arterials/major collector because not enough traffic counts were available for such functional classification (five count locations only), and they carry low traffic volumes.

Table 15. Percent Root Mean Squared Error (%RMSE)

Type	# Links	RMSE	% RMSE
By Facility Type			
Freeway	18	4,931	18%
Major Arterial	14	680	14%
Minor Arterial/Major Collector	5	2,576	66%
By Area Type			
Urban	19	1,310	19%
Suburban/Rural	18	4,970	20%

4.0 TRAFFIC FORECAST

This section describes the traffic forecast process for the NBF including the methodology, sensitivity analysis, travel demand for 2020 and 2030, and impact analysis.

4.1 METHODOLOGY

The traffic forecast for 2020 (opening year) and 2030 (forecast year) was performed using the generalized cost equation (see Section 3.4) within the multi-modal user equilibrium assignment algorithm. Based on a comparison of the 2030 and 2010 highway network attributes and the absence of an available 2020 highway network, the 2010 highway network was selected as a proxy for the 2020 highway network. The 2020 trip table was obtained by linearly interpolating between the 2010 and 2030 trip tables. The NBF 2020 highway attributes, such as number of lanes and speed, were reviewed and determined to be consistent with the 2030 highway attributes. The access points to the NBF are illustrated on Figure 2.

A detailed select link/zonal analysis was conducted to identify major destination points along the corridor. The select link analysis was utilized to identify the origins and destinations of traffic using the NBF. After the zonal select link analysis was completed, the trip tables for 2020 and 2030 were divided into short distance and long distance trip tables. Long distance trips were assumed to have a trip length longer than 6 miles. The VOT for those long trips was increased by 50 percent to account for the value of reliability. Documents released recently by the Transportation Research Board (TRB) have stated that the value of time savings increase with trip distance or duration.

Traffic forecasts were developed for three conditions:

1. No Build: the NBF is not constructed (only year 2030)
2. Toll-Free: the NBF is constructed and operates as a toll-free highway facility
3. Base Scenario: the NBF is constructed and operates as a tolled highway facility

4.2 TOLL SENSITIVITY

The toll sensitivity analysis tests a series of toll rates to assist in the selection of a reasonable toll rate for the project. Future year toll sensitivity curves account for changes in traffic characteristics in the corridor including increasing demand and supply (highway improvements), value of time, and inflationary trends. Toll sensitivity curves are necessary in estimating the viability of future toll rate increases. The toll sensitivity curve suggests that when the toll rate increases, a portion of drivers will leave the toll facility and choose other routes. Consequently, as the toll rate increases, transactions decrease and revenue increases. The toll revenue increases until it reaches the highest revenue point where an additional toll increment would generate a decrease in toll revenue.

Toll sensitivity analyses were developed for the NBF corridor for the years 2020 and 2030. Toll rates, in actual year dollars, ranging from $0.00 per mile to $0.50 per mile were analyzed for each year. Figures 14 and 15 show the daily toll sensitivity curves for year the 2020 and year 2030. In 2020 and 2030, the maximum toll rate per mile that can be charged is $0.20 and $0.35, respectively. Based on these results, the maximum annual toll rate increase between 2020 and 2030 should be less than or equal to 5.8 percent (see Table 16).

Figure 14: 2020 Toll Sensitivity Curve

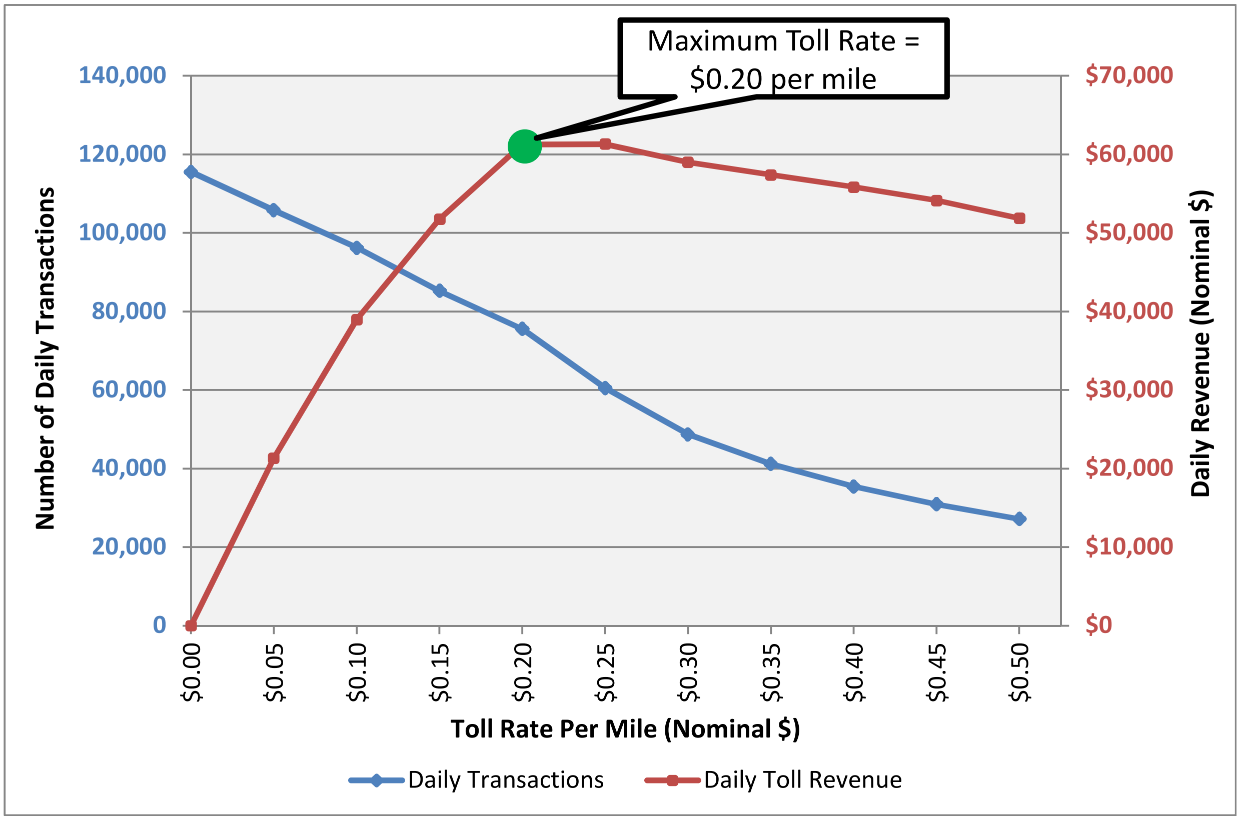


Figure 15: 2030 Toll Sensitivity Curve

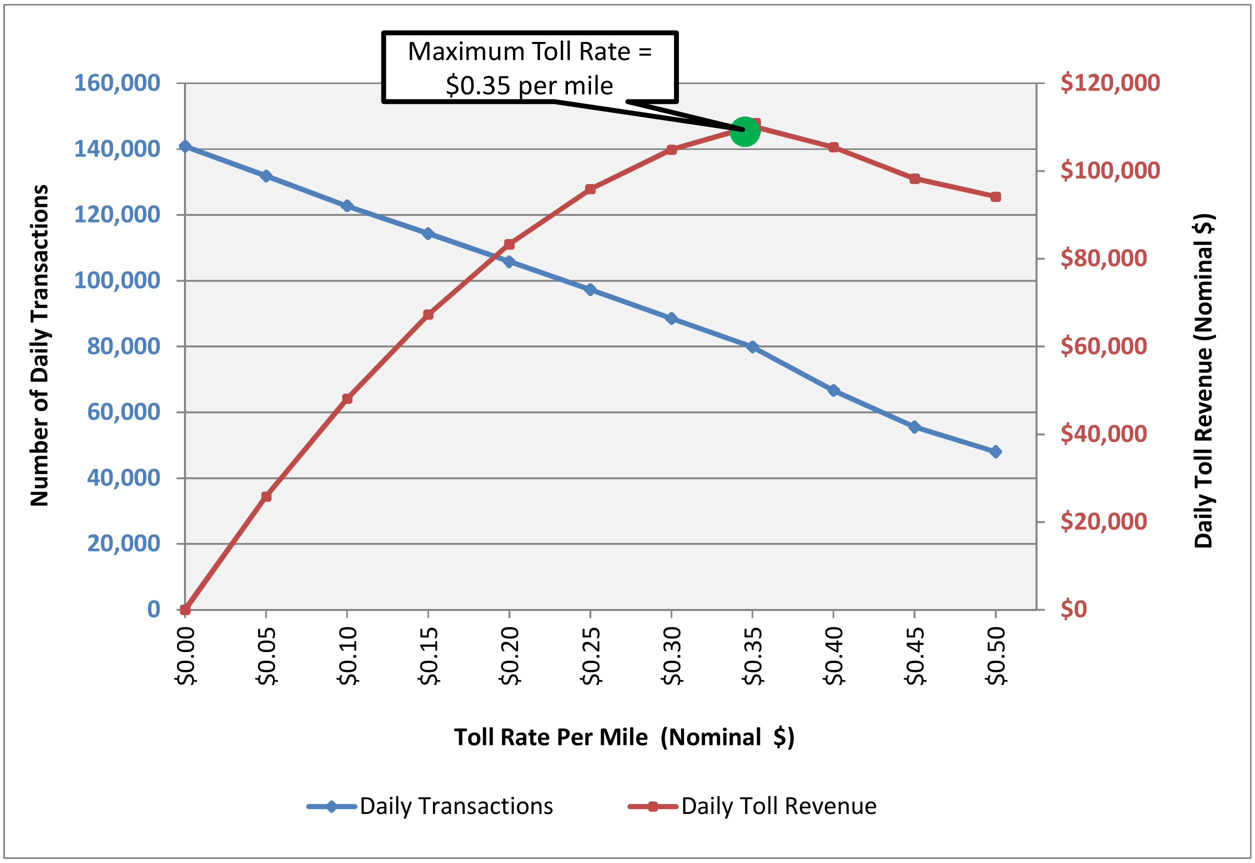


Table 16. Maximum Toll Per Mile

Year	Maximun
2020	$0.20
2030	$0.35
Annual Percentage Growth	
2020-2030	5.8%

4.3 DEFINITION OF TOLL BASE CASE SCENARIO

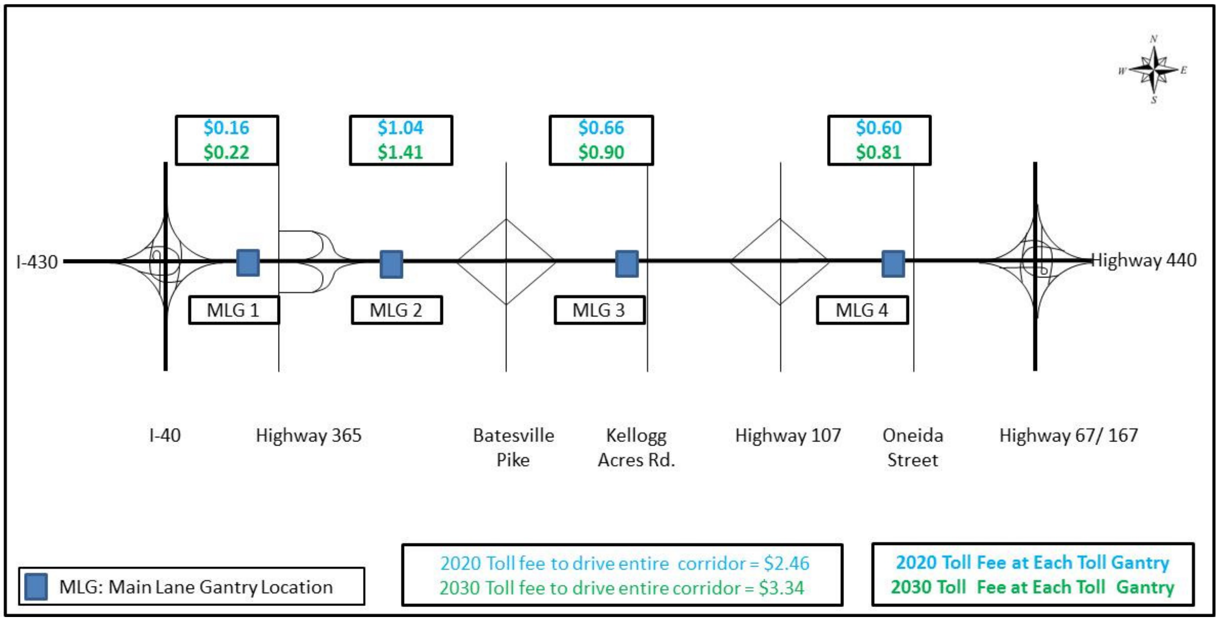
The base case represents an aggressive revenue scenario (maximum toll revenue) for the North Belt Freeway. The operational and revenue assumptions are as follows:

1. Electronic toll collection (Tag and Video)
2. Opening year: January 1, 2020
3. Number of lanes: Two lanes in each direction
4. Forecast period: 50 years
5. Operating free speed: 65 mph
6. Gantry locations as indicated on Figure 16
7. Toll rate (nominal dollars):
   a. Opening toll rate: $0.20 per mile rate (Maximum toll rate for 2020, see Figure 14)
   b. Escalation frequency: Annually
   c. Escalation percentage for revenue forecasts: 3.1% per year (based on CPI annual growth from 1980-2012, see Table 9)
   d. The tolls at each plaza for 2020 and 2030 are illustrated on Figure 16
8. Truck share: 10% (based on CARTS TDM)
9. Trucks axle factor = 3.3 (based on traffic counts provided by AHTD)
10. Tag/video shares: 70/30% in 2020 reaching 90/10% in 2030. It is assumed that AHTD will be conducting an aggressive marketing campaign to register drivers as Tag users
11. Video surcharge = 50% higher than Tag rate
12. Toll leakage:
    a. TollTag Leakage = 1%
    b. Video Leakage = 10% (Assumes adequate enabling legislation to prosecute toll violations)
13. Annualization Factor: 337 (based on traffic counts provided by AHTD)
14. Ramp-up period:
    a. 50 percent in 2020
    b. 60 percent in 2021
    c. 70 percent in 2022
    d. 80 percent in 2023
    e. 90 percent in 2024

f. 100 percent in 2025

15. Long-term transaction growth: 2.0% per year

Figure 16: Main Lane Gantry Toll Fee in 2020 and 2030



4.4 TRAFFIC FORECASTS

The North Belt Freeway's travel demand for 2020 and 2030 was estimated for the toll-free and tolled base case scenarios. Figures 17 and 18 show the average daily traffic at each plaza for both scenarios.

In the year 2020, toll-free traffic ranges from 19,100 vpd in MLG4 to 33,800 vpd in MLG 1 (see Figure 17). For the tolled base case scenario the traffic decreases to 8,300 vpd in MLG4 and to 24,900 vpd in MLG 1. The percentage of diversion (traffic loss due to tolling) in MLGs 1-4 is 26.3, 28.5, 39.8, and 56.5 percent. These percentages are consistent with the diversion observed on recently opened tolled facilities in Texas. The 2020 average daily tolled traffic along the NBF corridor is approximately 18,450 vpd.

In the year 2030, the toll-free traffic increased to 24,100 vpd in MLG4 and 42,400 in MLG1 (see Figure 18). Tolled traffic for MLG1 and MLG4 reached 30,600 and 12,300 vpd, respectively. The 2030 average daily tolled traffic is approximately 23,680 vpd, increasing by 28.3 percent between 2020 and 2030. The diversion percentages are lower in 2030 as a consequence of increased traffic congestion in alternative routes.

Figure 17: 2020 Average Daily Traffic Volumes
(Toll-Free and Tolled Base Case Scenarios)

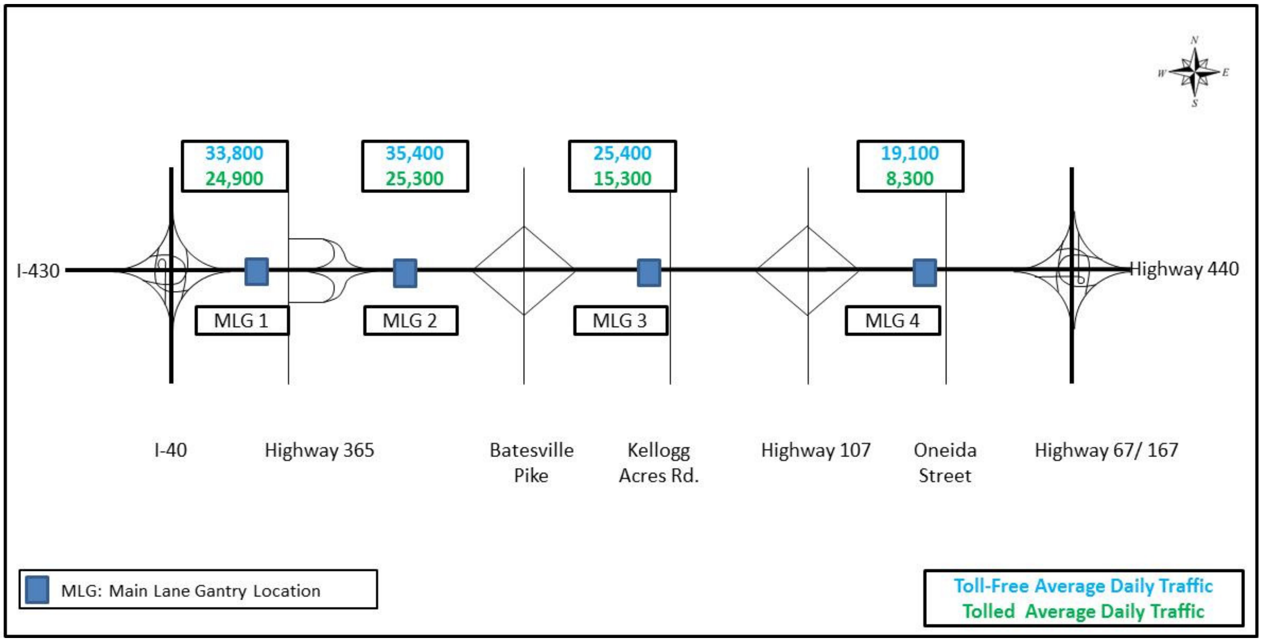
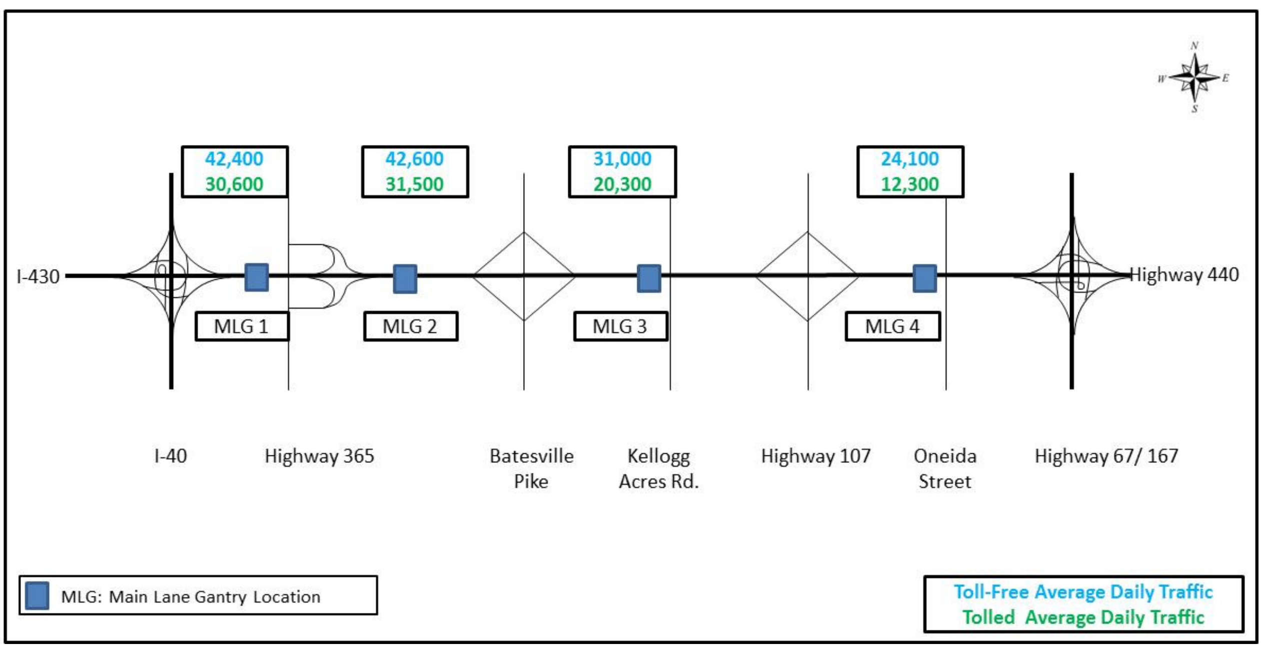


Figure 18: 2030 Average Daily Traffic Volumes
(Toll-Free and Tolled Base Case Scenarios)



4.5 TRAFFIC DIVERSION IMPACTS

Construction of the North Belt Freeway would influence the route choice for many daily trips in central Arkansas. Eight screenlines spread across central Arkansas were delineated to comprehensively assess the traffic diversion and level of service impact resulting from the proposed construction of the NBF. Figure 19 presents the screenline locations and Table 17 identifies the routes included in each screenline.

The traffic diversion in the Year 2030 was evaluated for three conditions:

1. No Build: the NBF is not constructed
2. Toll-Free: the NBF is constructed and operates as a toll-free facility
3. Base Scenario: the NBF is constructed and operates as a tolled facility

As illustrated in Table 18 (No Build vs. Toll-Free), construction of the NBF will divert traffic from most of the major highways and arterials in the area, including:

- I-40 (screenlines 1, 2, 4, 6, and 8),
- I-30 (screenline 3),
- Highway 67 (screenlines 2, 6, and 7),
- MacArthur Drive and Highway 107 (screenline 2),
- Highway 161 (screenline 6), and
- Highway 365 (screenline 8).

In 2030, traffic volumes increase for a few select arterials that serve as feeder routes to the NBF. For example, 2030 traffic volumes on Highway 365 (screenline 1) are forecasted to increase from 9,000 vpd for the No Build condition to 9,700 vpd for the Toll-Free condition and to 9,800 vpd for the Tolled condition.

Construction of the North Belt Freeway improves the traffic conditions for many routes. For example, in screenline 2, traffic on I-40 for the No Build scenario is 95,100 vpd. This volume decreases to 80,200 and 82,900 vpd for the toll-free and tolled alternatives, respectively.

Tolling reduces traffic volumes on the NBF by 49 percent on the east side of the corridor (screenlines 6 and 7) and by 26 percent on the west side of the corridor (screenline 8). This diversion percentage is consistent with the diversion observed on existing tolled projects located in metropolitan areas in Texas. The observed percentage of traffic diverted from toll facilities in Texas ranges from 20 percent (SRT in Dallas) to 60 percent (Loop 49 in Tyler).

Table 19 shows the change in 2030 daily volume-capacity (VC) ratio for each highway and arterial included in the screenlines. The VC ratio serves as a general guideline to evaluate the level of service (LOS) impact as a result of traffic diversion in response to implementing a toll on the NBF. A negative change in the VC ratio indicates an improvement in the operational speed of the facility. Figure 20 graphically illustrates the results in Table 19. The capacity for each facility was obtained from the CARTS TDM. It is important to clarify that a detailed LOS analysis for the peak period condition is outside the scope of this study.

Figure 19: Screenline Locations

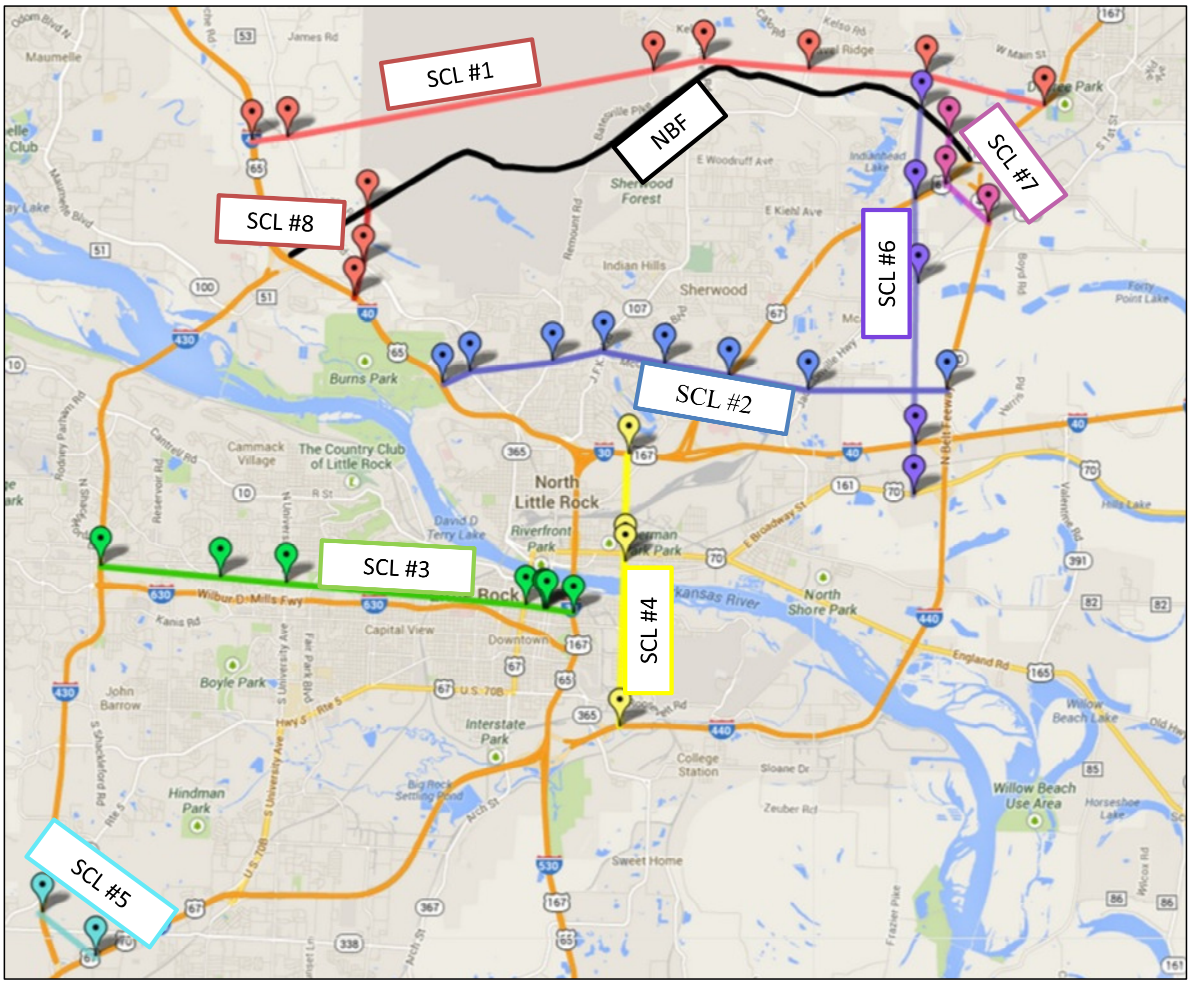


Table 17. Routes included in Each Screenline

Screenline 1: North of NBF	Screenline 2: South of NBF	Screenline 3: North of I-630	Screenline 4: East of I-30
I-40	I-40	I-30	I-440
Highway 365	MacArthur Dr.	I-30 Frtg.	E. Washington Ave.
Batesville Pike	Camp Robinson Rd.	Scott St.	E. Broadway St.
Kellogg Acres Rd.	Highway 107	Main St.	I-40
Highway 107	North Hills	Louisiana St.	
Oneida St.	Highway 67	Broadway St.	
Highway 67	Highway 67 Frtg.	S. University Ave.	
	Highway 161	S. Mississippi St.	
	Highway 440	I-430	

Screenline 5: SW Little Rock	Screenline 6: Eastern Side	Screenline 7: Southeast of NBF	Screenline 8: Southwest of NBF
I-430	NBF	NBF	NBF
I-30	Highway 67	Highway 67	Highway 365
	Highway 161	Highway 440	I-40
	I-40		
	Highway 70		

Table 18. 2030 Traffic for Each Screenline

Facility	No Build	Toll- Free	Base Scenario (Tolled)
Screenline1: North of NBF			
I-40	109,500	108,900	108,400
Highway 365	9,000	9,700	9,800
Batesville Pike	7,900	8,700	9,000
Kellogg Acres Rd.	6,500	6,500	6,300
Highway 107	28,400	32,600	33,200
Oneida St.	6,800	6,500	6,600
Highway 67	117,500	119,400	116,400
Total	285,600	292,300	289,700
Screenline 2: South of NBF			
I-40	95,100	80,200	82,900
MacArthur Dr.	12,500	11,800	11,900
Camp Robinson Rd.	15,800	14,900	15,800
Highway 107	36,700	31,200	32,400
North Hills	16,400	16,600	16,700
Highway 67	86,200	71,300	75,200
Highway Frtg.	24,400	24,800	24,900
Highway 161	8,900	8,300	8,500
Highway 440	47,800	42,700	43,400
Total	343,800	301,800	311,700
Screenline 3: North of I-630			
I-30	113,100	109,300	110,600
I-30 Frtg.	18,200	18,300	18,300
Scott St.	6,400	6,200	6,300
Main St.	7,700	7,600	7,700
Louisiana St.	5,000	5,000	5,000
Broadway St.	27,700	27,900	27,800
S. University Ave.	33,300	33,200	33,400
S. Mississippi St.	12,700	12,600	12,600
I-430	93,600	100,000	97,500
Total	317,700	320,100	319,200

Facility	No Build	Toll-Free	Base Scenario (Tolled)
Screenline 4: East of I-30			
I-440	59,600	56,900	57,600
E. Washington Ave.	10,100	9,000	9,100
E. Broadway St.	24,100	23,100	23,400
I-40	150,400	134,600	138,700
Total	244,200	223,600	228,800
Screenline 5: Southwest Little Rock			
I-430	92,500	91,600	91,800
I-30	109,600	108,200	108,600
Total	202,100	199,800	200,400
Screenline 6: Eastern Side			
NBF	0	24,100	12,300
Highway 67	86,800	76,900	80,300
Highway 161	13,400	11,800	12,100
I-40	48,300	45,000	45,700
Highway 70	10,300	9,400	9,500
Total	158,800	167,200	159,900
Screenline 7: Southeast of NBF			
NBF	0	24,100	12,300
Highway 67	86,800	76,900	80,300
Highway 440	39,400	36,200	35,600
Total	126,200	137,200	128,200
Screenline 8: Southwest of NBF			
NBF	0	42,600	31,500
Highway 365	13,000	9,400	9,400
I-40	105,300	86,800	90,100
Total	118,300	138,800	131,000

Table 19. Change in 2030 Daily Volume to Capacity Ratio

Facility	No Build v/s Base (Tolled)	Toll-Free v/s Base (Tolled)
Screenline1: North of NBF		
I-40	-0.02	-0.01
Highway 365	0.05	0.01
Batesville Pike	0.12	0.03
Kellogg Acres Rd.	-0.02	-0.02
Highway 107	0.17	0.02
Oneida St.	-0.02	0.01
Highway 67	-0.01	-0.04
Screenline 2: South of NBF		
I-40	-0.11	0.03
MacArthur Dr.	-0.04	0.01
Camp Robinson Rd.	0.01	0.06
Highway 107	-0.13	0.04
North Hills	0.01	0.00
Highway 67	-0.11	0.03
Highway 67 Frtg.	0.02	0.00
Highway 161	-0.03	0.01
Highway 440	-0.05	0.00
Screenline 3: North of I-630		
I-30	-0.01	0.01
I-30 Frtg.	0.00	0.00
Scott St.	-0.01	0.01
Main St.	-0.01	0.00
Louisiana St.	0.00	0.00
Broadway St.	0.01	0.00
S. University Ave.	0.00	0.01
S. Mississippi St.	0.00	0.00
I-430	0.03	-0.01

Facility	No Build v/s Base (Tolled)	Toll-Free v/s Base (Tolled)
Screenline 4: East of I-30		
I-440	-0.02	0.01
E. Washington Ave.	-0.07	0.01
E. Broadway St.	-0.02	0.02
I-40	-0.08	0.03
Screenline 5: Southwest Little Rock		
I-430	-0.01	0.00
I-30	-0.01	0.01
Screenline 6: Eastern Side		
NBF	N/A	-0.20
Highway 67	-0.07	0.04
Highway 161	-0.08	0.03
I-40	-0.04	0.01
Highway 70	-0.05	0.01
Screenline 7: Southeast of NBF		
NBF	N/A	-0.20
Highway 67	-0.07	0.04
Highway 440	-0.04	-0.01
Screenline 8: Southwest of NBF		
NBF	N/A	-0.18
Highway 365	-0.25	0.00
I-40	-0.17	0.03

Note: Negative value in the table indicates an increase in operational speed of the facility. A positive value reflects a decrease in operational speed

Figure 20: Change in 2030 Daily Volume to Capacity Ratio (by screenline)

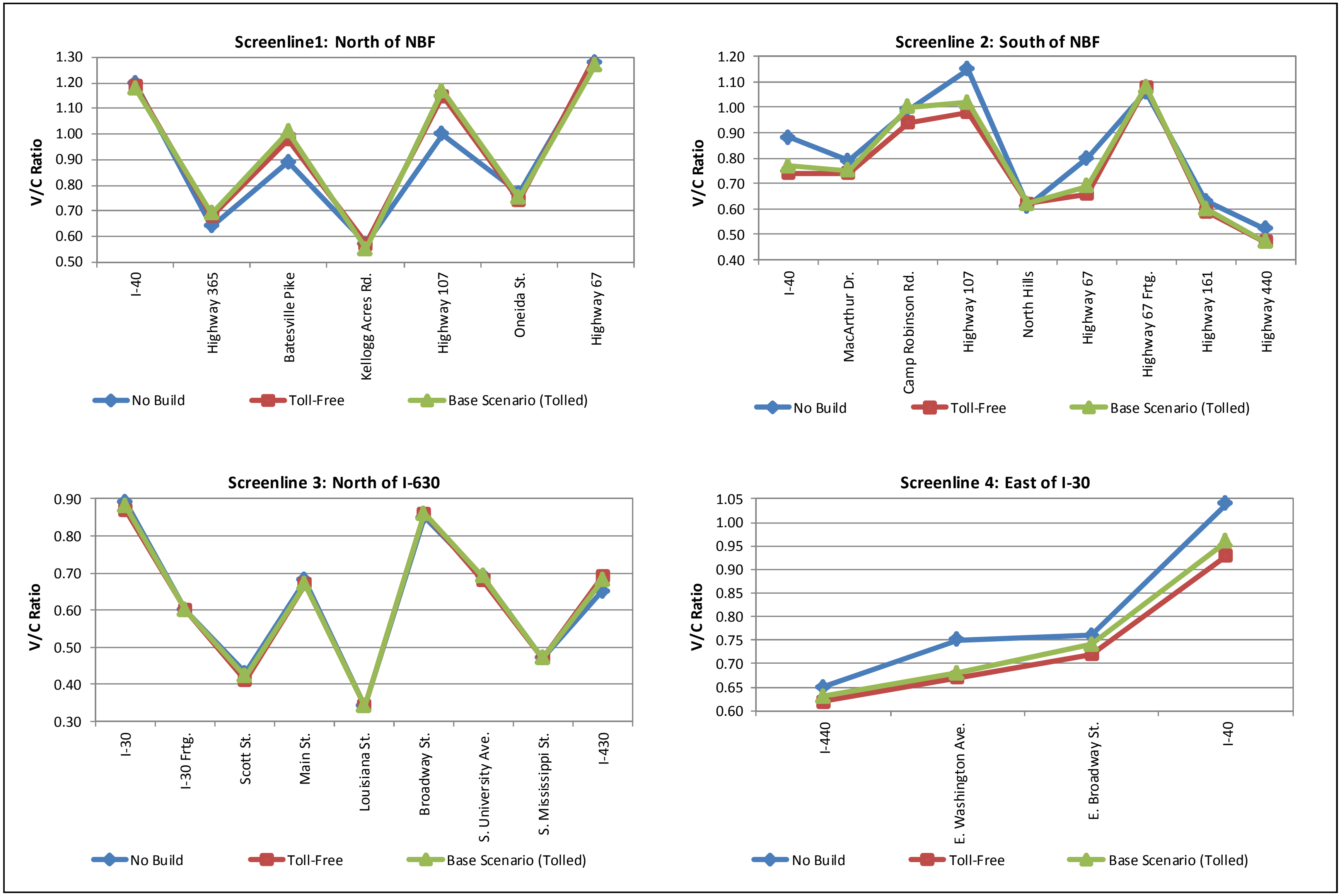
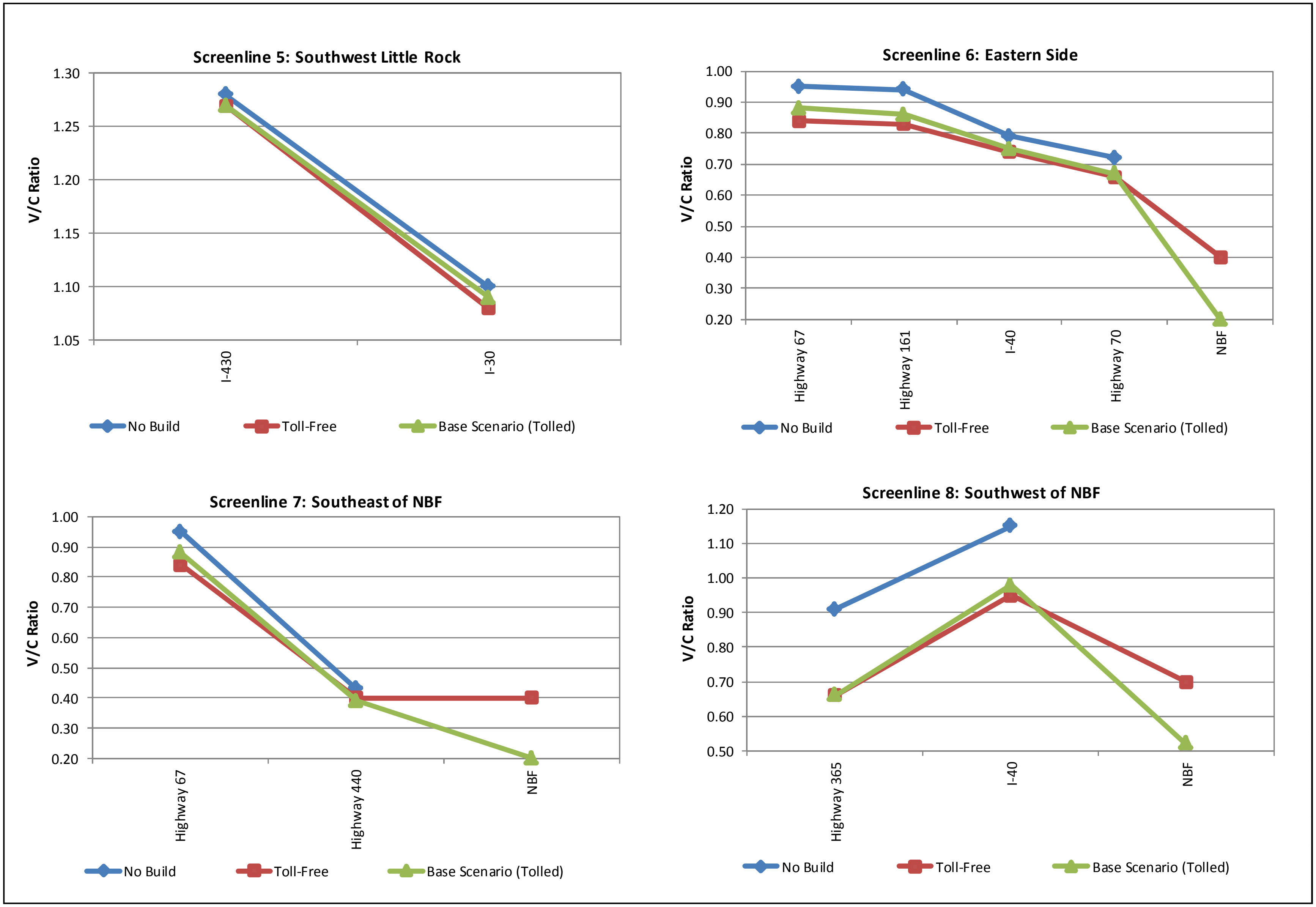


Figure 20: Change in 2030 Daily Volume to Capacity Ratio (by screenline) continued



Based on the data presented in Table 19 and Figure 20, construction of the NBF will improve the V/C ratio for the majority of the highways and arterials (No Build versus Tolled). The diversion (amount of traffic lost after tolling), in response to tolling the NBF, minimally improves the V/C ratio relative to the toll-free scenario for the majority of the highways and arterials, particularly for the facilities receiving the diverted traffic (in screenline 2, the change in the V/C ratio for Highway 67 is -0.11). In the case of Highway 107 (screenline 1), the change in V/C ratio indicates deterioration in operational speed under the toll-free and tolled scenarios because Highway 107 serves as a feeder to the NBF. However, as previously stated, in most cases the toll scenario V/C ratio changes demonstrate improved operational speed relative to the no-build scenario. The highways receiving the highest V/C ratio improvements from the construction of the NBF will be Highway 107 (screenline 2), I-40 (screenlines 2, 4, and 8), Highway 365 (screenline 8), and Highway 67 (screenlines 2 and 6).

4.6 ORIGIN AND DESTINATION ANALYSIS

A select link analysis for 2030 was conducted to identify the origin and destination of trips using the NBF. Figures 21 through 24 illustrate the select link results for two locations (shown by a green arrow) at the easternmost and westernmost segments of the NBF for both toll-free and tolled scenarios.

A total of 6,900 vpd, or 33 percent of the toll-free traffic originating at the westernmost segment traverses the entire NBF facility (see Figure21). The ramps located at the Batesville Pike are a major destination for both toll-free and tolled scenarios (see Figures 21 and 22). For the tolled scenario, only 21 percent of the traffic (3,300 vehicles) traverse the entire NBF (see Figure 21). Twenty-one percent of the tolled traffic continues northbound on Highway 167.

For the westbound/southbound movement, 60 percent of the traffic traverses the entire corridor. This represents 7,500 vpd under the toll-free scenario and 4,000 vpd under the tolled scenario (see Figures 23 and 24). Highway 107 ramps are the most heavily utilized ramps for traffic passing through the easternmost section of the corridor (see green arrow on Figures 23 and 24). Seventy-three and 27 percent of the traffic passing through the easternmost section is coming from Highway 167 and Highway 440, respectively, for the toll-free scenario. Under the tolled scenario, the percentage of traffic coming from Highway 167 and Highway 440 changes to 69 percent and 31 percent (see Figure 24).

In order to identify the origin of the trips using the NBF, a zonal select link evaluation was implemented for several political jurisdictions of central Arkansas (see Figure 25). Tables 20 and 21 present the results for the toll-free and tolled scenarios. The tables identify the following:

- Total number of trips produced/attracted from/to each jurisdiction
- Number of trips produced/attracted from/to those jurisdictions that are using the NBF corridor in the easternmost and westernmost segments
- Percent of trips produced/attracted from/to those jurisdictions that are using the NBF corridor in the easternmost and westernmost segments

Figure 21: Toll-Free 2030 Select Link at Westernmost Segment (northbound/eastbound)

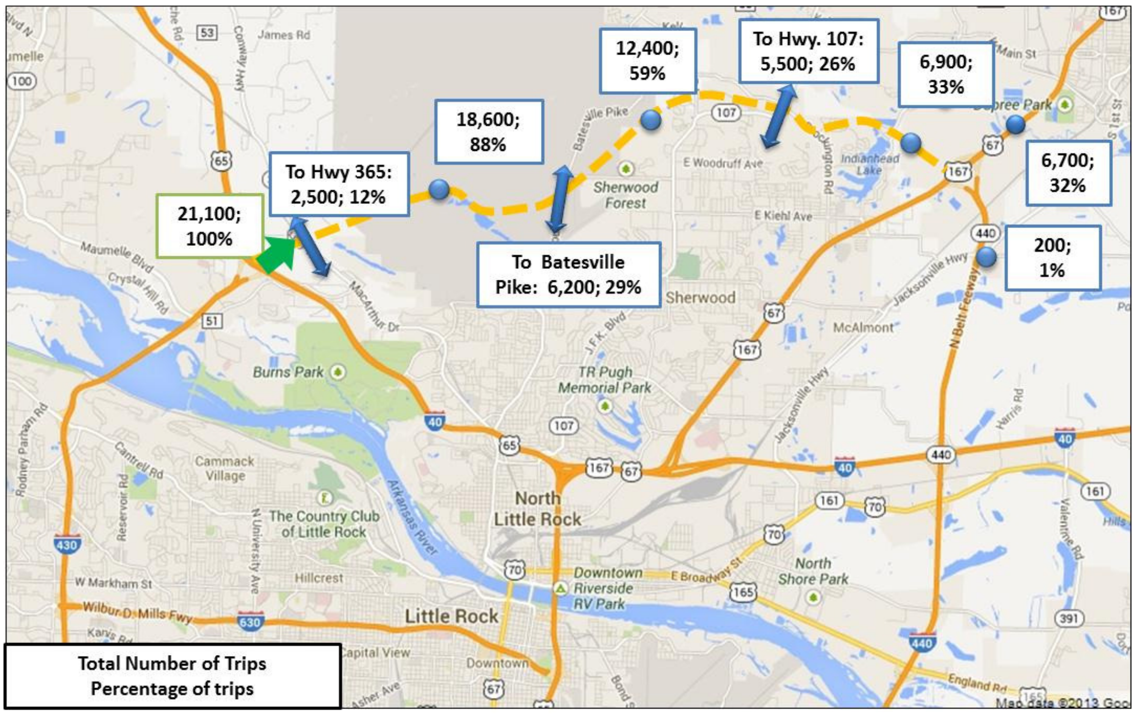


Figure 22: Tolled 2030 Select Link at Westernmost Segment (northbound/eastbound)

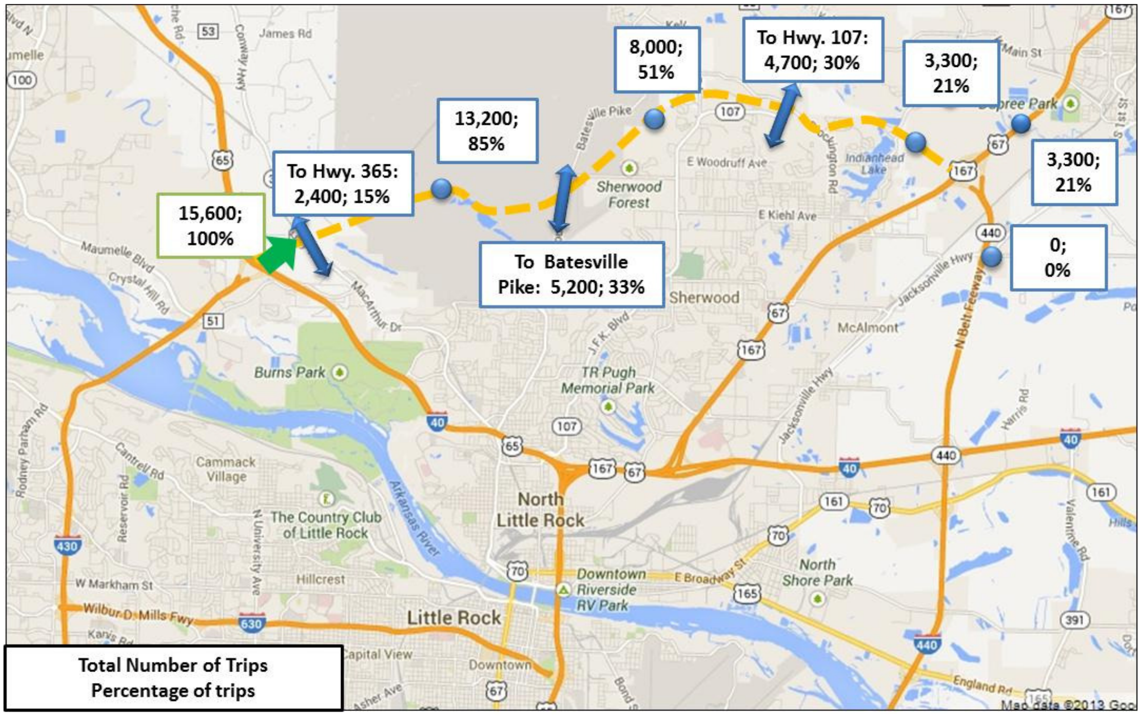


Figure 23: Toll-Free 2030 Select Link at Easternmost Segment (southbound/westbound)

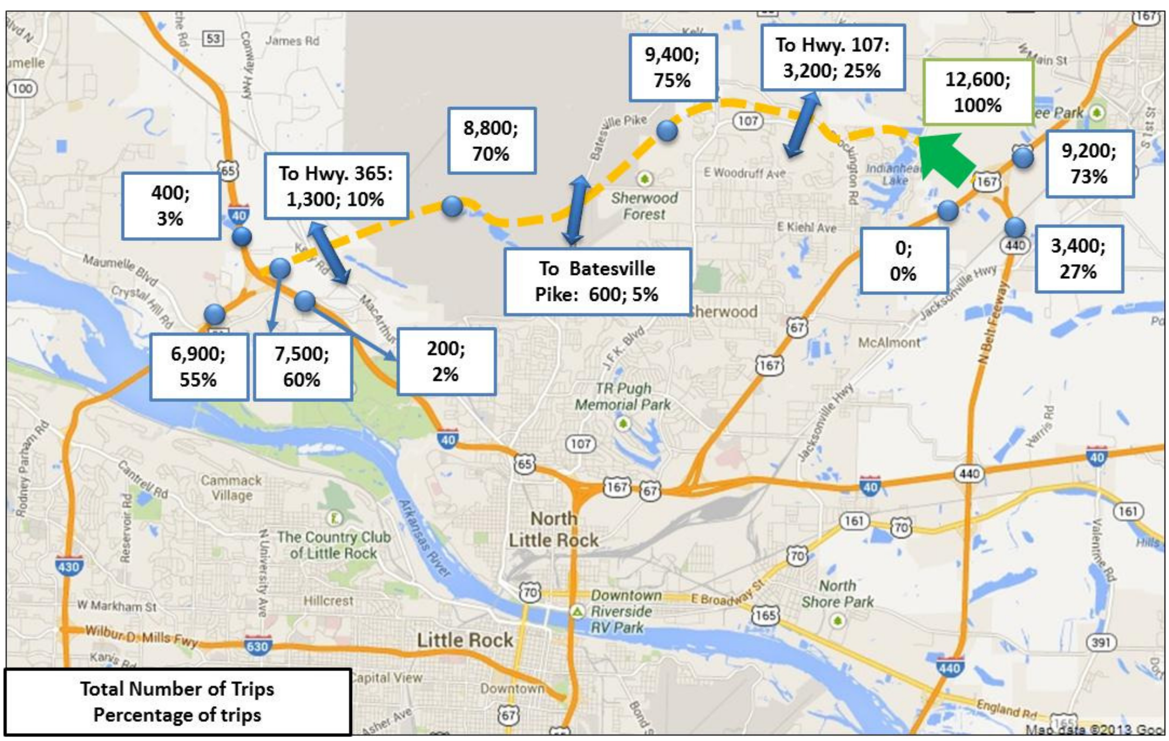


Figure 24: Tolled 2030 Select Link at Easternmost Segment (southbound/westbound)

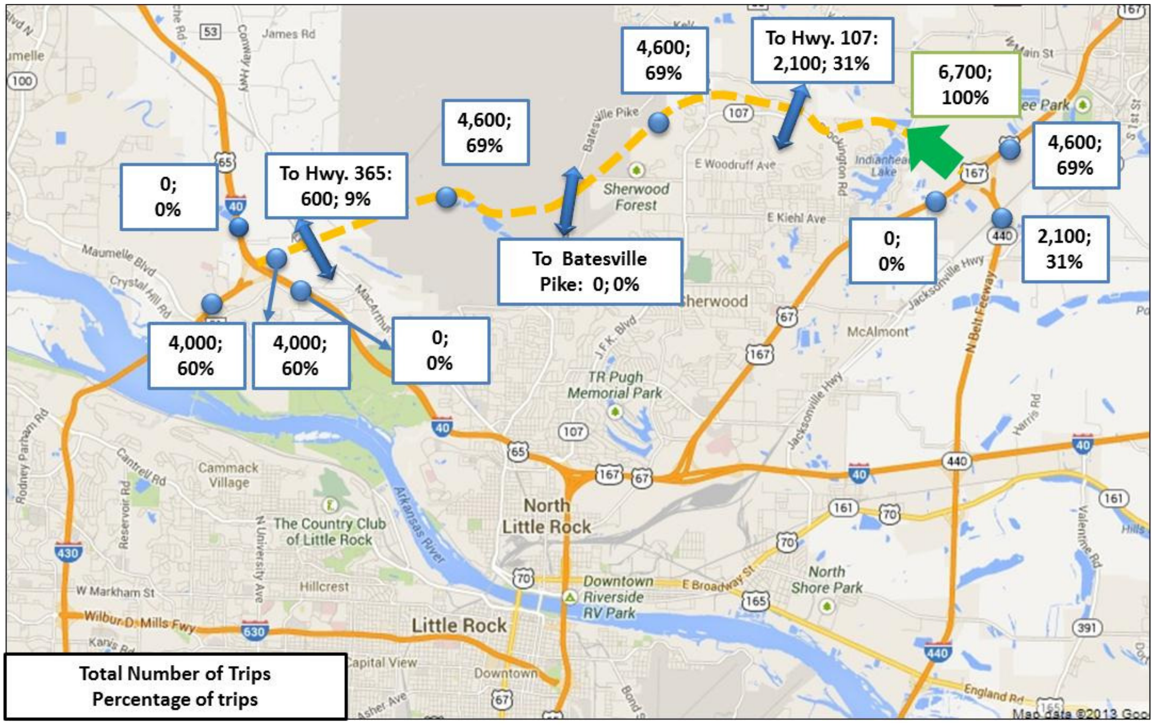
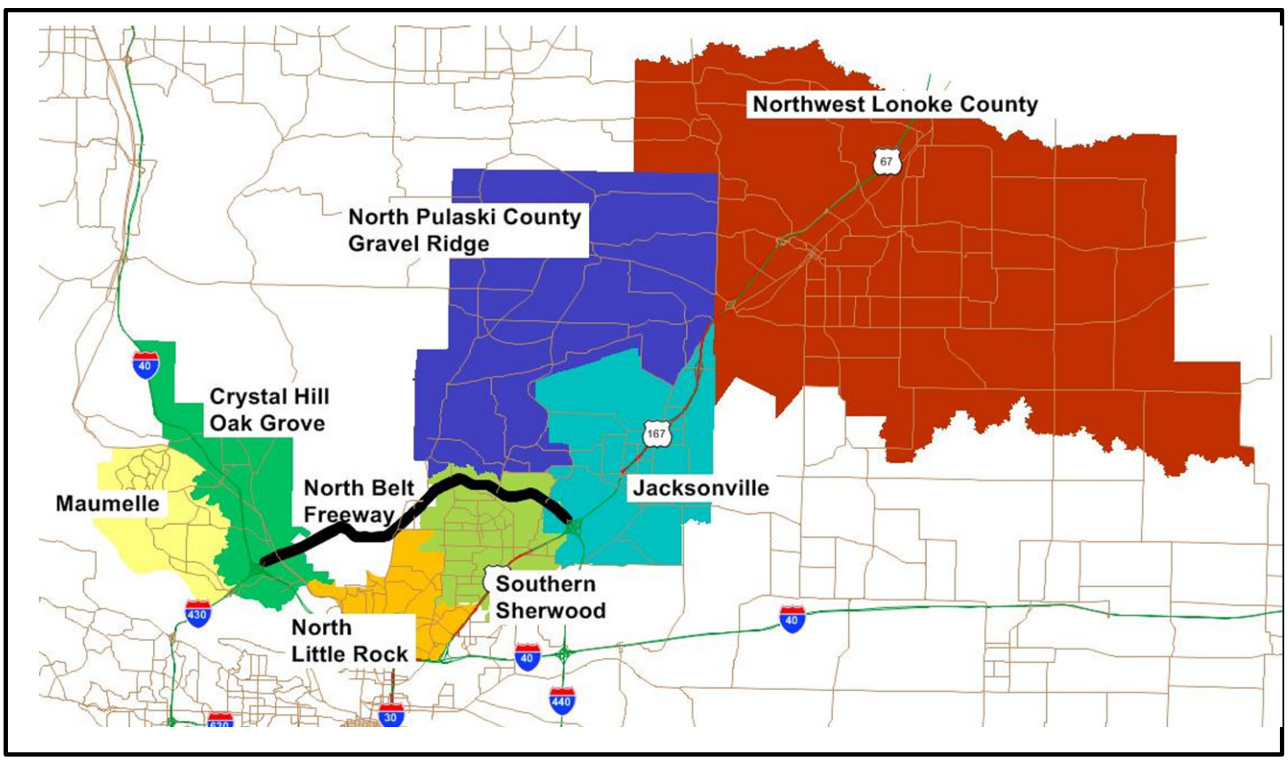


Figure 25: NBF Selected Jurisdictions



For both the toll-free and tolled conditions (see Tables 20 and 21), North West Lonoke County and Southern Sherwood generate the highest number of trips utilizing the NBF in the easternmost and westernmost segments, respectively. The jurisdiction with the smallest number of trips utilizing the NBF is North Little Rock with less than 1,000 trips for the toll-free scenario, and less than 200 trips for the tolled scenario.

4.7 TRAVEL TIME SAVINGS

A travel time savings comparison was conducted to evaluate the advantage offered by the North Belt Freeway in 2030. Four origin and destination scenarios were selected for analysis from six potential locations to compare travel time using the North Belt Freeway with the travel time using other toll-free routes. These locations are shown on Figure 26. Table 22 shows the travel time estimates offered by each route between each origin and destination scenario. As noted in Table 22, travel time savings range from negative 1.3 to 12.6 minutes. There is no travel time savings offered by the North Belt Freeway between Location B and Location D because the distance using the North Belt Freeway is much longer and the reduced congestion on the tolled route does not compensate for the added distance.

Table 20. 2030 Trips on the NBF from Selected Jurisdictions
Toll Free Scenario

Jurisdiction				Jurisdiction		
North West Lonoke County	**Trips**	**Share**		**North Little Rock**	**Trips**	**Share**
Total Daily Trips Produced	317,800	100%		Total Daily Trips Produced	239,463	100%
Trips at NBF Easternmost Segment	7,792	2.5%		Trips at NBF Easternmost Segment	930	0.4%
Trips at NBF Westernmost Segment	6,857	2.2%		Trips at NBF Westernmost Segment	927	0.4%
North Pulaski County Gravel Ridge	**Trips**	**Share**		**Crystal Hill Oak Grove**	**Trips**	**Share**
Total Daily Trips Produced	61,790	100%		Total Daily Trips Produced	58,602	100%
Trips at NBF Easternmost Segment	3,189	5.2%		Trips at NBF Easternmost Segment	2,152	3.7%
Trips at NBF Westernmost Segment	4,764	7.7%		Trips at NBF Westernmost Segment	6,817	11.6%
Jacksonville	**Trips**	**Share**		**Maumelle**	**Trips**	**Share**
Total Daily Trips Produced	207,368	100%		Total Daily Trips Produced	115,442	100%
Trips at NBF Easternmost Segment	7,482	3.6%		Trips at NBF Easternmost Segment	3,353	2.9%
Trips at NBF Westernmost Segment	8,442	4.1%		Trips at NBF Westernmost Segment	6,635	5.7%
Southern Sherwood	**Trips**	**Share**				
Total Daily Trips Produced	165,176	100%				
Trips at NBF Easternmost Segment	1,303	0.8%				
Trips at NBF Westernmost Segment	10,391	6.3%				

Table 21. 2030 Trips on the NBF from Selected Jurisdictions
Tolled Scenario

Jurisdiction			Jurisdiction		
North West Lonoke County	**Trips**	**Share**	**North Little Rock**	**Trips**	**Share**
Total Daily Trips Produced	317,800	100%	Total Daily Trips Produced	239,463	100%
Trips at NBF Easternmost Segment	4,701	1.5%	Trips at NBF Easternmost Segment	0	0.0%
Trips at NBF Westernmost Segment	5,064	1.6%	Trips at NBF Westernmost Segment	186	0.1%
North Pulaski County Gravel Ridge	**Trips**	**Share**	**Crystal Hill Oak Grove**	**Trips**	**Share**
Total Daily Trips Produced	61,790	100%	Total Daily Trips Produced	58,602	100%
Trips at NBF Easternmost Segment	2,019	3.3%	Trips at NBF Easternmost Segment	828	1.4%
Trips at NBF Westernmost Segment	3,778	6.1%	Trips at NBF Westernmost Segment	5,758	9.8%
Jacksonville	**Trips**	**Share**	**Maumelle**	**Trips**	**Share**
Total Daily Trips Produced	207,368	100%	Total Daily Trips Produced	115,442	100%
Trips at NBF Easternmost Segment	2,680	1.3%	Trips at NBF Easternmost Segment	2,345	2.0%
Trips at NBF Westernmost Segment	6,098	2.9%	Trips at NBF Westernmost Segment	5,892	5.1%
Southern Sherwood	**Trips**	**Share**			
Total Daily Trips Produced	165,176	100%			
Trips at NBF Easternmost Segment	717	0.4%			
Trips at NBF Westernmost Segment	6,782	4.1%			

Figure 26: Origin and Destination for Travel Time Saving Comparisons

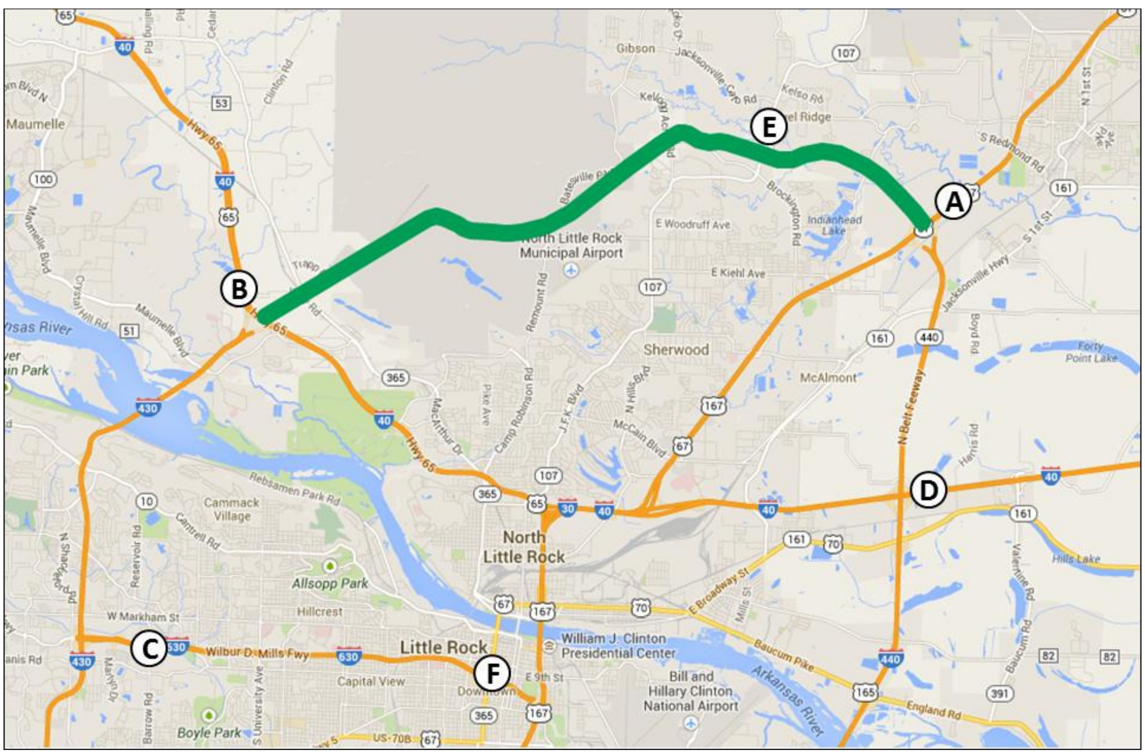


Table 22. Travel Time Savings Comparison

From	To	Toll-Free Route	Travel Time (mins.)	North Belt Freeway Route	Travel Time (mins.)	Travel Time Savings (min.)	Travel Time Savings (percent)
A	B	Highway 67/I-40	27.8	Highway 67/ North Belt Freeway/I-40	18.9	8.9	47%
A	C	Highway 67/I-40/ I-30/I-630	34.8	Highway 67/North Belt Freeway/I-430/I-630	29.3	5.5	19%
B	D	I-40	21.2	I-40/North Belt Freeway/ Highway 440/I-40	22.5	-1.3	-6%
E	F	Highway 107/I-30/I-630	47.6	Highway 107/North Belt Freeway/I-430/I-630	34.9	12.6	36%

5.0 REVENUE ESTIMATES

Toll revenue was estimated for a period of 50 years for the base scenario (aggressive toll revenue condition). The annual toll revenue is calculated using the following formula:

> Annual Revenue = number of average weekday transactions at each gantry * toll fee at each gantry * revenue days (factor to convert weekday number of transactions to annual transactions) * revenue leakage * ramp-up factor (during the first five years).

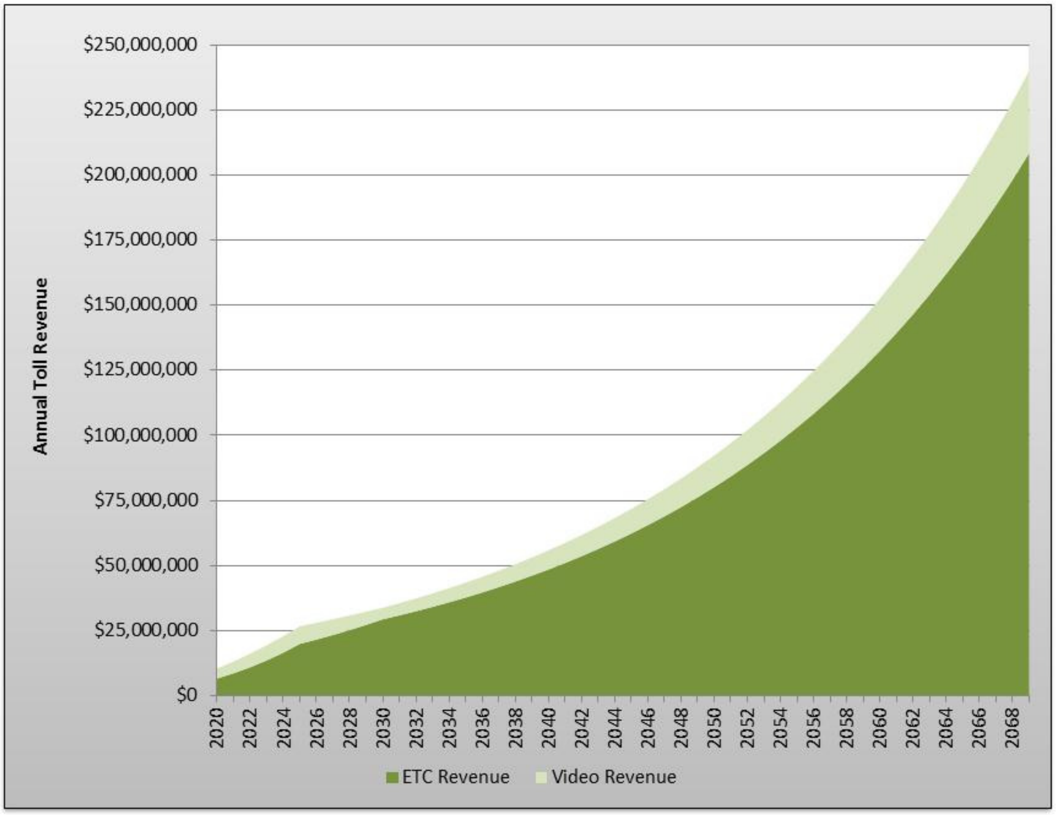
The revenue assumptions for the base case scenario are included in Section 4.3. Table 23 shows the annual transactions and toll revenue for a 50-year period. Toll revenue and transactions are disaggregated by electronic and video collection (ETC and Video). Annual toll revenue will increase from $10.3 million in 2020 to $33.7 million in 2030 and $240.1 million in 2069. From 2025 (after the ramp-up period) to 2069, toll revenue is expected to increase at an annual rate of 5.1%. During the 50-year period, the North Belt Freeway is expected to generate $4.47 billion in nominal currency for the base case scenario. Figure 27 illustrates the annual revenue trend.

The number of annual transactions will increase from 12.4 million in 2020 to 31.9 million in 2030 and to 69.1 million in 2069. The video transactions account for 30 percent in the opening year (2020) and decrease to 10 percent in 2030, and thereafter. From 2025 to 2069, the annual number of transactions will increase at an annual rate of 2.0 percent.

Table 23. Toll Revenue and Transactions Forecast for Base Case Scenario

Year	Annual Transactions			Annual Revenues		
	ETC	Video	Total	ETC	Video	Total
2020	8,704,700	3,730,600	12,435,300	$6,517,000	$3,809,000	$10,326,000
2021	11,048,400	4,296,600	15,345,000	$8,532,000	$4,524,000	$13,056,000
2022	13,612,700	4,782,800	18,395,500	$10,843,000	$5,194,000	$16,037,000
2023	16,406,000	5,180,900	21,586,900	$13,478,000	$5,804,000	$19,282,000
2024	19,436,900	5,482,200	24,919,100	$16,469,000	$6,335,000	$22,804,000
2025	22,713,800	5,678,500	28,392,300	$19,850,000	$6,767,000	$26,617,000
2026	23,859,200	5,237,400	29,096,600	$21,505,000	$6,437,000	$27,942,000
2027	25,032,800	4,768,100	29,800,900	$23,269,000	$6,044,000	$29,313,000
2028	26,234,500	4,270,700	30,505,200	$25,150,000	$5,583,000	$30,733,000
2029	27,464,500	3,745,100	31,209,600	$27,154,000	$5,049,000	$32,203,000
2030	28,722,500	3,191,400	31,913,900	$29,286,000	$4,438,000	$33,724,000
2031	29,297,000	3,255,200	32,552,200	$30,798,000	$4,666,000	$35,464,000
2032	29,882,900	3,320,300	33,203,200	$32,388,000	$4,907,000	$37,295,000
2033	30,480,600	3,386,700	33,867,300	$34,060,000	$5,160,000	$39,220,000
2034	31,090,200	3,454,400	34,544,600	$35,818,000	$5,427,000	$41,245,000
2035	31,711,900	3,523,600	35,235,500	$37,667,000	$5,707,000	$43,374,000
2036	32,346,200	3,594,000	35,940,200	$39,611,000	$6,002,000	$45,613,000
2037	32,993,100	3,665,900	36,659,000	$41,656,000	$6,311,000	$47,967,000
2038	33,653,000	3,739,200	37,392,200	$43,807,000	$6,637,000	$50,444,000
2039	34,326,100	3,814,000	38,140,100	$46,067,000	$6,980,000	$53,047,000
2040	35,012,600	3,890,300	38,902,900	$48,445,000	$7,341,000	$55,786,000
2041	35,712,800	3,968,100	39,680,900	$50,946,000	$7,719,000	$58,665,000
2042	36,427,100	4,047,400	40,474,500	$53,576,000	$8,118,000	$61,694,000
2043	37,155,600	4,128,400	41,284,000	$56,342,000	$8,536,000	$64,878,000
2044	37,898,700	4,211,000	42,109,700	$59,250,000	$8,977,000	$68,227,000
2045	38,656,700	4,295,200	42,951,900	$62,308,000	$9,441,000	$71,749,000
2046	39,429,800	4,381,100	43,810,900	$65,525,000	$9,928,000	$75,453,000
2047	40,218,400	4,468,800	44,687,200	$68,907,000	$10,441,000	$79,348,000
2048	41,022,800	4,558,100	45,580,900	$72,465,000	$10,979,000	$83,444,000
2049	41,843,300	4,649,200	46,492,500	$76,205,000	$11,546,000	$87,751,000
2050	42,680,200	4,742,200	47,422,400	$80,139,000	$12,142,000	$92,281,000
2051	43,533,700	4,837,100	48,370,800	$84,275,000	$12,769,000	$97,044,000
2052	44,404,400	4,933,800	49,338,200	$88,626,000	$13,428,000	$102,054,000
2053	45,292,500	5,032,500	50,325,000	$93,200,000	$14,122,000	$107,322,000
2054	46,198,400	5,133,100	51,331,500	$98,012,000	$14,850,000	$112,862,000
2055	47,122,300	5,235,800	52,358,100	$103,071,000	$15,617,000	$118,688,000
2056	48,064,800	5,340,500	53,405,300	$108,391,000	$16,423,000	$124,814,000
2057	49,026,100	5,447,300	54,473,400	$113,987,000	$17,270,000	$131,257,000
2058	50,006,600	5,556,300	55,562,900	$119,871,000	$18,162,000	$138,033,000
2059	51,006,700	5,667,400	56,674,100	$126,058,000	$19,100,000	$145,158,000
2060	52,026,900	5,780,700	57,807,600	$132,565,000	$20,086,000	$152,651,000
2061	53,067,400	5,896,400	58,963,800	$139,409,000	$21,122,000	$160,531,000
2062	54,128,700	6,014,300	60,143,000	$146,605,000	$22,212,000	$168,817,000
2063	55,211,300	6,134,600	61,345,900	$154,173,000	$23,359,000	$177,532,000
2064	56,315,500	6,257,300	62,572,800	$162,131,000	$24,565,000	$186,696,000
2065	57,441,900	6,382,400	63,824,300	$170,500,000	$25,833,000	$196,333,000
2066	58,590,700	6,510,100	65,100,800	$179,301,000	$27,167,000	$206,468,000
2067	59,762,500	6,640,300	66,402,800	$188,557,000	$28,569,000	$217,126,000
2068	60,957,700	6,773,100	67,730,800	$198,290,000	$30,044,000	$228,334,000
2069	62,176,900	6,908,500	69,085,400	$208,526,000	$31,595,000	$240,121,000
Total	**1,929,410,000**	**239,938,900**	**2,169,348,900**	**$3,853,581,000**	**$613,242,000**	**$4,466,823,000**

Figure 27: Toll Revenue for Base Case Scenario



APPENDIX A

List of Reference Documents

Appendix A
List of Reference Documents

Document Title	Category	Date	Filename
CARTS Base Year Model Development Final Report	Traffic and Revenue Forecast	October 2004	002CARTSModelDevRprt.pdf
Model Validation Final Report Revised for TransCAD 4.8	Traffic and Revenue Forecast	August 2008	003CARTSModelValidationRprt.pdf
CARTS Network and Traffic Analysis Zone Development Final Report	Traffic and Revenue Forecast	October 2004	004CARTSNetwrkTAZDevlpmntRprt.pdf
Special Generator Identification and Data Acquisition Final Report	Traffic and Revenue Forecast	October 2004	005CARTSSpclGeneratorRprt.pdf
Traffic Assignment Final Report	Traffic and Revenue Forecast	October 2004	006CARTSTrafficAssignmentRprt.pdf
Mode Choice Model Development Final Report	Traffic and Revenue Forecast	November 2004	013ModeChoiceModelDevlpmntRprt.pdf
Transit Network Final Development Final Report	Traffic and Revenue Forecast	October 2004	016TransitNetworkRprt.pdf
Development of the Regional Strategic Transportation Network	Traffic and Revenue Forecast	January 28, 2011	2011-01Regional_Strategic_Network.pdf
CARTS Annual Report 2011	Traffic and Revenue Forecast	2011	CARTS2011Rev.pdf
CARTS Area Roadway Design Standards and Implementation Procedures	Traffic and Revenue Forecast		CARTSDesignStandards083006
Metro Trends Economic Review and Outlook	Traffic and Revenue Forecast	October 2011	Econ2011.pdf
Central Arkansas Commuting Patterns	Traffic and Revenue Forecast		Four-County_Commute2000-2008.pdf
Metro 2025 An Update of the Metropolitan Transportation Plan	Traffic and Revenue Forecast		METRO2025execsum.pdf
Metro 2030.2 The Long Range Transportation Plan for Central Arkansas	Traffic and Revenue Forecast	March 2010	METRO2030.2Combined.pdf
The Northwest Arkansas Travel Demand Model Creation and Results	Traffic and Revenue Forecast		TDM_Eureka.pdf
Average Travel Time to Work (in minutes) for Central Arkansas County Residents	Traffic and Revenue Forecast		TravelTimeCounty90-08.pdf
Little Rock – North Little Rock – Conway MSA and CARTS Area	Traffic and Revenue Forecast		Study Area.pdf
LR-NLR-Conway MSA City and County Employment by Place of Work	Traffic and Revenue Forecast		1990-2000 employment by county.pdf
Unified Planning Work Program CARTS FY 2012	Traffic and Revenue Forecast	May 2011	2012UPWPFinal01.pdf
Total Population by County and Development District Projections 2011-2020	Traffic and Revenue Forecast		AR state data center projections.pdf
Documentation for Arkansas’ Single-Age Cohort Population Projections by Race 2011-2020	Traffic and Revenue Forecast	June 2012	DocumentationProj2011_2020.pdf
Hispanic and Non-Hispanic Population in Arkansas, 1990-2020	Traffic and Revenue Forecast	September 2006	HispProjections1990_2020.pdf

Appendix A
List of Reference Documents

Document Title	Category	Date	Filename
Major Employers The North Little Rock Chamber of Commerce	Traffic and Revenue Forecast	January 2013	Major Employers North Little Rock Chamber of Commerce.pdf
Major Employers	Traffic and Revenue Forecast	October 2004	Major Employers.pdf
Central Arkansas Population by Age Group 2000-2030	Traffic and Revenue Forecast	2004	MSA-AgeGroups2000-2030.pdf
Four-County Little Rock-NLR-Conway Region Employment 2000 With Forecasts 2005-2030	Traffic and Revenue Forecast	2004	MSA-EmpProj2030Table.pdf
Four-County Little Rock-NLR-Conway Region Households 2000 With Forecasts 2010-2030	Traffic and Revenue Forecast	2004	MSA-EmpProj2030Table.pdf
Four-County Little Rock-NLR-Conway Region Population 2000 With Forecasts 2005-2030	Traffic and Revenue Forecast	2004	MSA-Proj2030Table._3.pdf
A Description of the FAF3 Regional Database and How it is Constructed	Traffic and Revenue Forecast	June 16, 2011	A Description of the FAF3 Regional Database And How It Is Constructed.pdf
FAF3 Freight Traffic Analysis	Traffic and Revenue Forecast	March 23, 2011	FAF3 Freight Traffic Analysis.pdf
Freight Analysis Framework 3 User Guide	Traffic and Revenue Forecast	June 2012	Freight Analysis Framework 3 User Guide.pdf
The Freight Analysis Framework, Version 3: Overview of the FAF3 National Freight Flow Tables	Traffic and Revenue Forecast	October 28, 2010	Overview of the FAF3 National Freight Flow Tables.pdf
FAF3 Tables: Commodity, izone, izone_long, Mode, Trade, Zone, Zone_Longfaf34_data, faf34_prov	Traffic and Revenue Forecast		FAF3.4_access03.mdb
FAF3 Tables: faf34_02rep, faf34_97rep, faf34_prov, faf34_stateOD, Commodity, izone, izone_long, Mode, State, Trade	Traffic and Revenue Forecast		FAF3.4_access03_State.mdb
FAF34 Network Shape File	Traffic and Revenue Forecast		FAF3.4_Network.shp
FAF3_4_TransCAD Network File	Traffic and Revenue Forecast		FAF3_4_TransCAD.dbd
FAF34 Zone Shape File	Traffic and Revenue Forecast		FAF3-Zone.shp
FAF3_4_TransCAD Zone File	Traffic and Revenue Forecast		FAF3-Zone.dbd
FAF3 Highway Network Output Database Data Dictionary	Traffic and Revenue Forecast		fafdb_datadictionary.pdf
FAF3 Model Output: 2007, 2040	Traffic and Revenue Forecast		faf3_4_data.dbf
Shipments Within, From, and To U.S. States - Value by Domestic Mode: 1997	Traffic and Revenue Forecast		FAF3.3 State summary by Dmsmode and Trade, 1997.xlsx
Shipments Within, From, and To U.S. States - Value by Domestic Mode: 2002	Traffic and Revenue Forecast		FAF3.3 State summary by Dmsmode and Trade, 2002.xlsx
Shipments Within, From, and To U.S. States by Commodity: 1997 (all trades combined)	Traffic and Revenue Forecast		FAF3.3 State Summary by SCTG2, 1997.xlsx
Shipments Within, From, and To U.S. States by Commodity: 2002 (all trades combined)	Traffic and Revenue Forecast		FAF3.3 State Summary by SCTG2, 2002.xlsx

Appendix A
List of Reference Documents

Document Title	Category	Date	Filename
Shipments Within, From, and To U.S. States - Value by Domestic Mode: 2040	Traffic and Revenue Forecast		FAF3.4 State summary by Dmsmode and Trade, 2040.xlsx
Shipments Within, From, and To U.S. States by Commodity: 2007, and 2011 (all trades combined)	Traffic and Revenue Forecast		FAF3.4 State Summary by SCTG2, 2007, and 2011.xlsx
Shipments Within, From, and To U.S. States by Commodity: 2040 (all trades combined)	Traffic and Revenue Forecast		FAF3.4 State Summary by SCTG2, 2040.xlsx
2012 Average Daily Traffic	Traffic and Revenue Forecast		ADT_2012.mdb
2003 Traffic Volumes Map of Little Rock North Little Rock	Traffic and Revenue Forecast		2003 littlerock_nlr.pdf
2003 Annual Average Daily Traffic Estimates State Highway Route and Section Map Pulaski County Arkansas	Traffic and Revenue Forecast		2003 Pulaski.pdf
2006 Annual Average 2005 Annual Average Daily Traffic Estimates State Highway Route and Section Map Pulaski County Arkansas	Traffic and Revenue Forecast		2007 tpula.pdf
2006 Annual Average 2005 Annual Average Daily Traffic Estimates	Traffic and Revenue Forecast		2007 tpula_insetA.pdf
2011 Annual Average 2010 Annual Average Daily Traffic Estimates State Highway Route and Section Map Pulaski County Arkansas	Traffic and Revenue Forecast		2011 PULASKI.pdf
2011 Annual Average 2010 Annual Average Daily Traffic Estimates	Traffic and Revenue Forecast		2011 Pulaski_60A.pdf
2012 Annual Average 2011 Annual Average Daily Traffic Estimates State Highway Route and Section Map Pulaski County Arkansas	Traffic and Revenue Forecast		2012 PULASKI.pdf
2012 Annual Average 2011 Annual Average Daily Traffic Estimates	Traffic and Revenue Forecast		2012 Pulaski_60A.pdf
2007 Little Rock Central Traffic Counts	Traffic and Revenue Forecast		lr_central_51.pdf
2007 Little Rock East Traffic Counts	Traffic and Revenue Forecast		lr_east_21.pdf
2007 North Little Rock Traffic Counts	Traffic and Revenue Forecast		nlr_12.pdf
2007 North Little Rock East Traffic Counts	Traffic and Revenue Forecast		nlr_east_26.pdf
2007 North Little Rock West Traffic Counts	Traffic and Revenue Forecast		nlr_west_13.pdf
2007 Sherwood Traffic Counts	Traffic and Revenue Forecast		sherwood_11.pdf
2011 Little Rock Central Traffic Counts	Traffic and Revenue Forecast		lr_central_51.pdf
2011 Little Rock East Traffic Counts	Traffic and Revenue Forecast		lr_east_59.pdf
2011 Little Rock North Little Rock Traffic Counts	Traffic and Revenue Forecast		lr_nlr_59.pdf

Appendix A
List of Reference Documents

Document Title	Category	Date	Filename
2011 Mcalmont Traffic Counts	Traffic and Revenue Forecast		mcalmont_57.pdf
2011 North Little Rock Central Traffic Counts	Traffic and Revenue Forecast		nlr_cen_58.pdf
2011 West Little Rock Traffic Counts	Traffic and Revenue Forecast		wlr_60.pdf
2011 Annual Average Daily Traffic Estimates On the State Highway System	Traffic and Revenue Forecast		2011 Statewide ADT.pdf
2009 Truck Percentages on State Highway System State of Arkansas	Traffic and Revenue Forecast		Truck_Percent_2009Counts.pdf
2010 Truck Percentages on State Highway System State of Arkansas	Traffic and Revenue Forecast		Truck_Percent_2010Counts.pdf
2011 Truck Percentages on State Highway System State of Arkansas	Traffic and Revenue Forecast		2011 Truck Percent Map.pdf
2012 Truck Percentages on State Highway System State of Arkansas	Traffic and Revenue Forecast		2012 Truck Percent Map.pdf
The Population in Arkansas: Past, Present, and Future Demographics, 1980-2020	Traffic and Revenue Forecast	January 2000	IEA 2000 Forecasts.pdf
Income Data (2007) Tax Year 2007 County Income Data Based on Individual Income Tax Returns: Arkansas	Traffic and Revenue Forecast	February, 23, 2010	Income Data (2007) - Institute for Economic Advancement.pdf
Estimated Median Household Income for Arkansas Counties: 2011	Traffic and Revenue Forecast	December 18, 2012	UALR - Institute for Economic Advancement-2011.pdf
Estimated Median Household Income for Arkansas Counties: 1995	Traffic and Revenue Forecast	December 18, 2012	UALR - Institute for Economic Advancement-1995.pdf
Estimated Median Household Income for Arkansas Counties: 2000	Traffic and Revenue Forecast	December 18, 2012	UALR - Institute for Economic Advancement-2000.pdf
Income Data (1989) Tax Year 1989 County Income Data Based on Individual Income Tax Returns: Arkansas	Traffic and Revenue Forecast	February, 23, 2010	Income Data (1989) - Institute for Economic Advancement.pdf
Income Data (2000) Tax Year 2000 County Income Data Based on Individual Income Tax Returns: Arkansas	Traffic and Revenue Forecast	February, 23, 2010	Income Data (2000) - Institute for Economic Advancement.pdf
Metro Trends 2010 Demographic Review and Outlook	Traffic and Revenue Forecast	June 2010	2010DemR_O.pdf
Metro Trends Demographic Review and Outlook	Traffic and Revenue Forecast	June 2012	Demo2012.pdf
Metro Trends Demographic Review and Outlook	Traffic and Revenue Forecast	June 2011	DemographicReview2011.pdf
Metro Trends 2004 Demographic Review and Outlook	Traffic and Revenue Forecast	August 2004	Dem2004.pdf
Metro Trends 2005 Demographic Review and Outlook	Traffic and Revenue Forecast	June 2005	Dem2005.pdf
Metro Trends Demographic Review and Outlook 2006	Traffic and Revenue Forecast		Dem2006.pdf
Metro Trends Demographic Review and Outlook 2007	Traffic and Revenue Forecast		2007DemR_O.pdf
Metro Trends Demographic Review and Outlook 2008	Traffic and Revenue Forecast	May 2008	2008DemR_O.pdf

Appendix A
List of Reference Documents

Document Title	Category	Date	Filename
Metro Trends 2009 Demographic Review and Outlook	Traffic and Revenue Forecast	May 2009	2009DemR_O.pdf
Metro Trends 2003 Economic Review and Outlook	Traffic and Revenue Forecast	October 2003	Econ2003.pdf
Metro Trends 2004 Economic Review and Outlook	Traffic and Revenue Forecast	November 2004	Econ2004.pdf
Metro Trends 2005 Economic Review and Outlook	Traffic and Revenue Forecast	December 2005	Econ2005.pdf
Metro Trends Economic Review and Outlook 2006	Traffic and Revenue Forecast		Econ2006.pdf
Metro Trends Economic Review and Outlook 2007	Traffic and Revenue Forecast		Econ2007.pdf
Metro Trends Economic Review and Outlook 2008	Traffic and Revenue Forecast	November 2008	Econ2008.pdf
Metro Trends 2009 Economic Review and Outlook	Traffic and Revenue Forecast	January 2010	Econ2009.pdf
Mileage and Daily Vehicle-Miles of Travel – 1992 Urbanized Areas with a Population of 200,000 or More	Traffic and Revenue Forecast	September 1993	1992.pdf
Miles and Daily Vehicle-Miles of Travel – 1993 By Urbanized Area	Traffic and Revenue Forecast	November 1994	1993.pdf
Miles and Daily Vehicle-Miles of Travel – 1994 By Urbanized Area	Traffic and Revenue Forecast	October 1995	1994.pdf
Miles and Daily Vehicle-Miles of Travel – 1995 By Urbanized Area	Traffic and Revenue Forecast	October 1996	1995.xls
Urbanized Areas – 1996 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	October 1997	1996.xlw
Urbanized Areas – 1997 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	October 1998	1997.xls
Urbanized Areas – 1998 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	October 1999	1998.xls
Urbanized Areas – 1999 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	October 2000	1999.xls
Urbanized Areas – 2000 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	October 2002	2000.xls
Urbanized Areas – 2001 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	June 2004	2001.xls
Urbanized Areas – 2002 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	October 2003	2002.xls
Urbanized Areas – 2003 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	October 2004	2003.xls
Urbanized Areas – 2004 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	October 2005	2004.xls
Urbanized Areas – 2005 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	October 2006	2005.xls

Appendix A
List of Reference Documents

Document Title	Category	Date	Filename
Urbanized Areas – 2006 Miles and Daily Vehicle-Miles Traveled	Traffic and Revenue Forecast	October 2007	2006.xls
Urbanized Areas – 2007 Miles and Daily Vehicle-Miles Traveled	Traffic and Revenue Forecast	October 2008	2007.xls
Urbanized Areas – 2008 Miles and Daily Vehicle-Miles Traveled	Traffic and Revenue Forecast	October 2009	2008.xls
Urbanized Areas – 2010 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	December 2012	2010.xls
Urbanized Areas – 2011 Miles and Daily Vehicle-Miles Traveled	Traffic and Revenue Forecast	February 2013	2011.xls
Annual Vehicle-Miles of Travel – 1992 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	September 1993	1992.pdf
Annual Vehicle-Miles of Travel – 1993 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	November 1994	1993.pdf
Annual Vehicle-Miles of Travel – 1994 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	October 1995	1994.pdf
Annual Vehicle-Miles of Travel – 1995 Miles and Daily Vehicle-Miles of Travel	Traffic and Revenue Forecast	October 1996	1995.pdf
Functional System Travel - 1996 Annual Vehicle-Miles	Traffic and Revenue Forecast	October 1997	1996.pdf
Functional System Travel - 1997 Annual Vehicle-Miles	Traffic and Revenue Forecast	October 1998	1997.pdf
Functional System Travel - 1998 Annual Vehicle-Miles	Traffic and Revenue Forecast	October 1999	1998.pdf
Functional System Travel - 1999 Annual Vehicle-Miles	Traffic and Revenue Forecast	October 2000	1999.xls
Functional System Travel - 2000 Annual Vehicle-Miles	Traffic and Revenue Forecast	October 2002	2000.pdf
Functional System Travel - 2001 Annual Vehicle-Miles	Traffic and Revenue Forecast	June 2004	2001.pdf
Functional System Travel - 2002 Annual Vehicle-Miles	Traffic and Revenue Forecast	October 2003	2002.pdf
Functional System Travel - 2003 Annual Vehicle-Miles	Traffic and Revenue Forecast	October 2004	2003.xls
Functional System Travel - 2004 Annual Vehicle-Miles	Traffic and Revenue Forecast	October 2005	2004.xls
Functional System Travel - 2005 Annual Vehicle-Kilometers	Traffic and Revenue Forecast	October 2006	2005.pdf
Functional System Travel - 2006 Annual Vehicle-Kilometers	Traffic and Revenue Forecast	October 2007	2006.pdf
Functional System Travel - 2007 Annual Vehicle-Miles	Traffic and Revenue Forecast	October 2008	2007.xls
Functional System Travel - 2008 Annual Vehicle-Miles	Traffic and Revenue Forecast	November 2009	2008.xls
Functional System Travel - 2009 Annual Vehicle-Miles	Traffic and Revenue Forecast	December 2011	2009.xls
Functional System Travel - 2010 Annual Vehicle-Miles	Traffic and Revenue Forecast	December 2012	2010.xls
Functional System Travel - 2011 Annual Vehicle-Miles	Traffic and Revenue Forecast	November 2012	2011.xls

Appendix A
List of Reference Documents

Document Title	Category	Date	Filename
Historical VMT Report	Traffic and Revenue Forecast	June 2013	Historicvmt.xls
Google Earth based Traffic Count Stations	Traffic and Revenue Forecast	June 2013	Stations.kml
US Counties FIPS Codes	Traffic and Revenue Forecast		US_FIPS_CountyCodes_092309.xls
DP03: SELECTED ECONOMIC CHARACTERISTICS	Traffic and Revenue Forecast	2010	ACS_10_1YR_DP03.xls
GDP By Metropolitan Area (millions of current dollars)	Traffic and Revenue Forecast	February 22, 2013	Little Rock MSA GDP.xls
Consumer Price Index – All Urban Consumers	Traffic and Revenue Forecast	June 2013	South CPI.xlsx
Table C1. Median Household Income by County: 1969, 1979, 1989	Traffic and Revenue Forecast	September 16, 2010	Income - Table C1. Median Household Income by County_ 1969, 1979, 1989 – U.pdf
Faulkner County Economic Statistics by Tract	Traffic and Revenue Forecast	2006-2010	Faulkner County 2006-2010.pdf
Lonoke County Economic Statistics by Tract	Traffic and Revenue Forecast	2006-2010	Lonoke County 2006-2010.pdf
Pulaski County Economic Statistics by Tract	Traffic and Revenue Forecast	2006-2010	Pulaski County 2006-2010.pdf
Saline County Economic Statistics by Tract	Traffic and Revenue Forecast	2006-2010	Saline County 2006-2010.pdf
Faulkner County Income and Poverty by Census Tract, 1999	Traffic and Revenue Forecast	2000	Faulkner 1999.pdf
B19013: MEDIAN HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2011 INFLATION-ADJUSTED DOLLARS) - Universe: Households	Traffic and Revenue Forecast	2007-2011	Median HH Income 2007-2011 ACS.xls
1989-2010 Historical Median Household Income Arkansas Counties	Traffic and Revenue Forecast		historical median household income.xlsx
DP03: SELECTED ECONOMIC CHARACTERISTICS	Traffic and Revenue Forecast	2011	ACS_11_1YR_DP03.xls
Residence County to Workplace County Flows for Arkansas	Traffic and Revenue Forecast	March 6, 2003	2000 Residence County.xls
Residence County to Workplace County Flows for Arkansas	Traffic and Revenue Forecast	March 6, 2003	2000 Work County.xls
32100 - County-County - Total workers (1) (Workers 16 years and over)	Traffic and Revenue Forecast	2006-2008	2006-2008 ACS.xls
1990-2012 Unemployment Rates Arkansas Counties	Traffic and Revenue Forecast	June 2013	1990-2012 employment unemployment rate.xls
Local Area Unemployment Statistics	Traffic and Revenue Forecast	June 2013	Arkansas.xls
Local Area Unemployment Statistics	Traffic and Revenue Forecast	June 2013	Little rock MSA.xls
Labor Force Statistics from the Current Population Survey	Traffic and Revenue Forecast	June 2013	US.xls
Arkansas Regions Employment Projections	Traffic and Revenue Forecast	June 2013	2008-2018 Projected Employment.xls
FIPS Codes for US Counties	Traffic and Revenue Forecast	June 2013	US_FIPS_CountyCodes_092309.xls

Appendix A
List of Reference Documents

Document Title	Category	Date	Filename
B19013: MEDIAN HOUSEHOLD INCOME IN THE PAST 12 MONTHS (IN 2011 INFLATION-ADJUSTED DOLLARS) - Universe: Households	Traffic and Revenue Forecast	2012	Median HH Income 2007-2011 ACS by tract.xls
P053: MEDIAN HOUSEHOLD INCOME IN 1999 (DOLLARS) [1] - Universe: Households	Traffic and Revenue Forecast	2000	Median HH Income 1999 by tract.xls
P053: MEDIAN HOUSEHOLD INCOME IN 1999 (DOLLARS) [1] - Universe: Households	Traffic and Revenue Forecast	June 2013medianme	Median HH income 1999 by block group.xls
1990,2000, 2010 Median Household Income by Tract	Traffic and Revenue Forecast	June 2013	Historical HH income growth from census.xlsx
Average Weekly Wage for Arkansas Counties by Ownership	Traffic and Revenue Forecast	June 2013	All Counties Avg weekly Wage.xlsx
Quarterly Census of Employment and Wages	Traffic and Revenue Forecast		Faulkner Avg. Weekly Wage.xls
Quarterly Census of Employment and Wages	Traffic and Revenue Forecast		Lonoke Avg. Weekly Wage.xls
Quarterly Census of Employment and Wages	Traffic and Revenue Forecast		Pulaski Avg. Weekly Wage.xls
Quarterly Census of Employment and Wages	Traffic and Revenue Forecast		Saline Avg. Weekly Wage.xls
QT-P23: Journey to Work: 2000	Traffic and Revenue Forecast	2000	2000 Census SF3.xls
1970-2000 journey to work by county and state	Traffic and Revenue Forecast	June 2013	jtw_total_commuters.xlsx
Historical and Population projections: Counties	Traffic and Revenue Forecast		Arkansas_Counties_A-F.xls
Historical and Population projections: Counties	Traffic and Revenue Forecast		Arkansas_Counties_G-N.xls
Historical and Population projections: Counties	Traffic and Revenue Forecast		Arkansas_Counties_O-Z.xls
Arkansas Population Projections: 2003-2025	Traffic and Revenue Forecast		Arkansas_Population_Projections_2003-2025.pdf
Historical and Population projections: Regions	Traffic and Revenue Forecast		Geographic_Regions.xls
Historical and Population projections: Non Arkansas Counties and Parishes	Traffic and Revenue Forecast		Non-Arkansas_Counties_and_Parishes.xls
Arkansas Population Projections: 2003-2030 DRAFT	Traffic and Revenue Forecast		population_projections_2005_-_2030.pdf
Arkansas State Highway and Transportation Department – Road and Street Report Data Year 2008	Traffic and Revenue Forecast		Road and Street Mileage Report – 2008.pdf
Arkansas State Highway and Transportation Department – Road and Street Report Data Year 2009	Traffic and Revenue Forecast		Road and Street Mileage Report – 2009.pdf
Arkansas State Highway and Transportation Department – Road and Street Report Data Year 2010	Traffic and Revenue Forecast		Road and Street Mileage Report – 2010.pdf
Arkansas State Highway and Transportation Department – Road and Street Report Data Year 2011	Traffic and Revenue Forecast		Road and Street Mileage Report – 2011.pdf
Arkansas State Highway and Transportation Department – Road and Street Report Data Year 2012	Traffic and Revenue Forecast		Road and Street Mileage Report – 2012.pdf

Appendix A
List of Reference Documents

Document Title	Category	Date	Filename
1970-200 county commuters average wage	Traffic and Revenue Forecast		county_commuters_avgwage.csv
1970-200 state commuters average wage	Traffic and Revenue Forecast		state_commuters_avgwage.csv
County Employment and Wages in Arkansas – Fourth Quarter 2012	Traffic and Revenue Forecast		County Employment and Wages in Arkansas.pdf
Median Household Income by Tract	Traffic and Revenue Forecast		Median HH Income 2007-2011 ACS 6 counties by tract.xls
Metroplan Block Groups Layer	Traffic and Revenue Forecast		Metroplan Block Groups.dbd
Metroplan Tracts layer	Traffic and Revenue Forecast		Metroplan Tracts.dbd
AHTD Classification Counts	Traffic and Revenue Forecast		AHTD Counts.xlsx
2009 classification data	Traffic and Revenue Forecast		2009_atr_class_data.accdb
7 day counts	Traffic and Revenue Forecast		600272 7 day class.xls
2009 Truck Percentages	Traffic and Revenue Forecast		Truck_Percent_2009Counts.pdf
2010 Truck Percentages	Traffic and Revenue Forecast		Truck_Percent_2010Counts.pdf
Truck percent 1996-2012	Traffic and Revenue Forecast		Truck percent history.xlsx
2009 National Household Travel Survey, Summary of Travel Trends	Traffic and Revenue Forecast	June 2011	National Household Survey.pdf
Improving Our Understanding of How Highway Congestion and Pricing Affect Travel Demand; SHRP 2 Capacity Project C04	Traffic and Revenue Forecast	2013	SHRP2_C04UnabridgedChapter3.pdf
Incorporating Reliability Performance Measures into the Transportation Planning and Programming Processes	Traffic and Revenue Forecast	2013	SHRP2prepubL05Report.pdf

APPENDIX G

Diversion Memorandum (Base Case Scenario)

North Belt Freeway Feasibility Study
Diversion Memorandum
(Base Case Scenario)

Developed by:

Baez Consulting, LLC

In Consultation with:

ATKINS

FINAL

April 2014

This memo summarizes the traffic diversion produced by the North Belt Freeway (NBF) in 2030 for the tolled base case scenario. In general, the tolled base case scenario assumes:

1. Opening year: January 1, 2020
2. Number of lanes: Two lanes in each direction
3. Opening toll rate: $0.20 per mile
4. Increasing toll rate: The toll rate will increase 3.1 percent each year. The toll rate in Year 2030 will be $0.27 per mile.

The NBF will complete a loop around the Little Rock-North Little Rock area and is expected to relieve traffic congestion on I-40, Highway 67, I-30 and local major arterials. The corridor spans approximately 13 miles, completing the connection between I-430 in the west and Highway 440 in the east (see Figure 1).

Eight screenlines spread across the Little Rock metropolitan area were delineated to comprehensively assess the traffic diversion and level of service impact resulting from construction and possibly tolling of the NBF. Figure 2 presents the screenline locations and Table 1 identifies the routes included in each screenline.

Table 2 presents the 2030 traffic diversion results for three conditions:

1. No Build: the NBF is not constructed
2. Toll-Free: the NBF is constructed and operates as a toll-free facility.
3. Base Scenario: the NBF is constructed and operates as a tolled facility.

As illustrated by the data in Table 2 (No Build vs. Toll-Free), in general, construction of the NBF will divert traffic from most of the major highways and arterials in the area, including:

- I-40 (screenlines 1, 2, 4, 6, and 8),
- I-30 (screenline 3),
- Highway 67 (screenlines 2, 6, and 7),
- MacArthur Drive and Highway 107 (screenline 2),
- Highway 161 (screenline 6), and
- Highway 365 (screenline 8).

In 2030, traffic volumes increase for a few select arterials that serve as feeder routes to the North Belt Freeway. For example 2030 traffic volumes on Highway 365 (screenline 1) are forecast to increase from 9,000 vehicles per day (vpd) for the No Build condition to 9,700 vpd for the toll-free condition and 9,800 vpd for the tolled condition.

Figure 1. Proposed North Belt Freeway Project Location Map

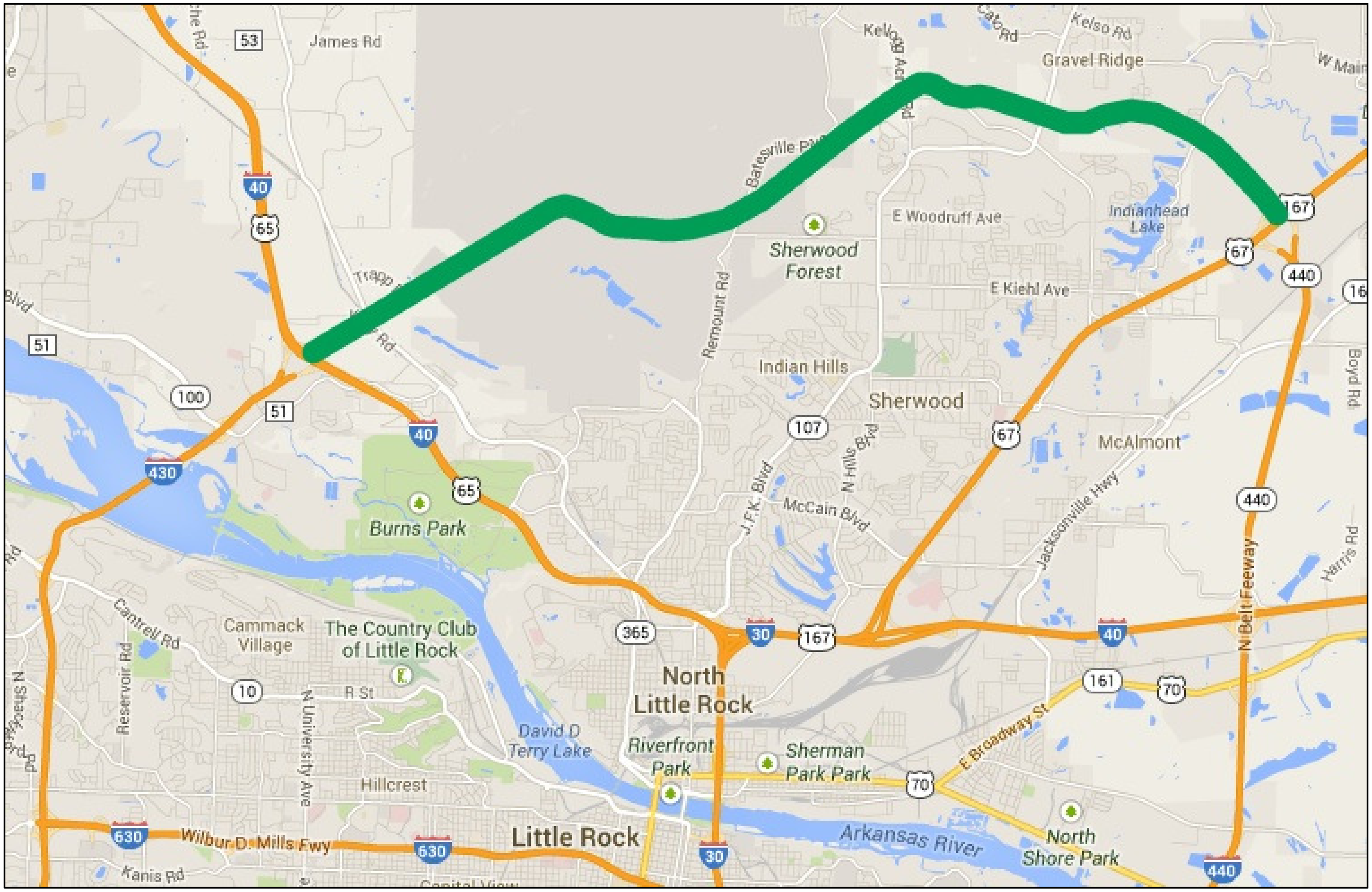


Figure 2. Screenline Locations

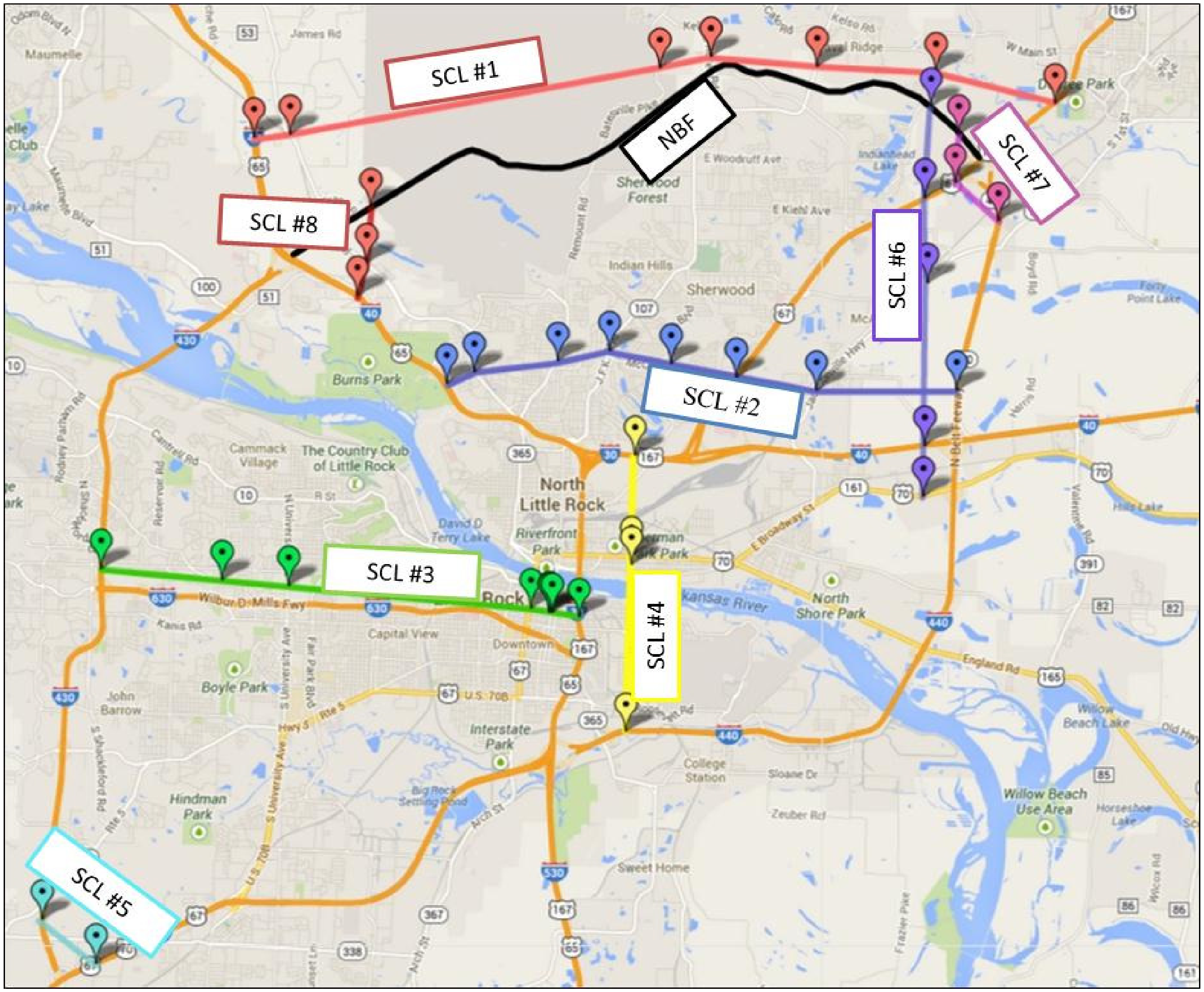


Table 1. Routes included in Each Screenline

Screenline 1: North of NBF	Screenline 2: South of NBF	Screenline 3: North of I-630	Screenline 4: East of I-30
I-40	I-40	I-30	I-440
Highway 365	MacArthur Dr.	I-30 Frtg.	E. Washington Ave.
Batesville Pike	Camp Robinson Rd.	Scott St.	E. Broadway St.
Kellogg Acres Rd.	Highway 107	Main St.	I-40
Highway 107	North Hills	Louisiana St.	
Oneida St.	Highway 67	Broadway St.	
Highway 67	Highway 67 Frtg.	S. University Ave.	
	Highway 161	S. Mississippi St.	
	Highway 440	I-430	
Screenline 5: SW Little Rock	**Screenline 6: Eastern Side**	**Screenline 7: Southeast of NBF**	**Screenline 8: Southwest of NBF**
I-430	NBF	NBF	NBF
I-30	Highway 67	Highway 67	Highway 365
	Highway 161	Highway 440	I-40
	I-40		
	Highway 70		

Construction of the North Belt Freeway improves the traffic conditions for many routes. For example, in screenline 2, traffic on I-40 for the No Build scenario is 95,100 vpd. This volume decreases to 80,200 vpd and 82,900 vpd for the toll-free and tolled alternatives, respectively.

Tolling reduces traffic volumes on the NBF by 49 percent on the east side of the corridor (screenlines 6 and 7) and by 26.1 percent on the west side of the corridor (screenline 8). This diversion percentage is consistent with the diversion observed on existing tolled projects located in metropolitan areas in Texas. The observed percentage of traffic diverted (amount of traffic lost after tolling) from toll facilities in Texas ranges from 20 percent (Sam Rayburn Turnpike in Dallas) to 60 percent (Loop 49 in Tyler).

Table 3 shows the daily volume-capacity (VC) ratio results for each highway and arterial included in the screenlines. The VC ratio serves as a general guideline to evaluate the level of service (LOS) impact as a result of traffic diversion in response to implementing a toll on the North Belt Freeway. A VC ratio higher than 1.0 indicates the facility is significantly congested. The capacity for each facility was obtained from the CARTS TDM. It is important to clarify that a detailed LOS analysis for the peak period condition was not included in this study.

Table 2. 2030 Traffic for Each Screenline

Facility	No Build	Toll- Free	Base Scenario (Tolled)
Screenline1: North of NBF			
I-40	109,500	108,900	108,400
Highway 365	9,000	9,700	9,800
Batesville Pike	7,900	8,700	9,000
Kellogg Acres Rd.	6,500	6,500	6,300
Highway 107	28,400	32,600	33,200
Oneida St.	6,800	6,500	6,600
Highway 67	117,500	119,400	116,400
Total	285,600	292,300	289,700
Screenline 2: South of NBF			
I-40	95,100	80,200	82,900
MacArthur Dr.	12,500	11,800	11,900
Camp Robinson Rd.	15,800	14,900	15,800
Highway 107	36,700	31,200	32,400
North Hills	16,400	16,600	16,700
Highway 67	86,200	71,300	75,200
Highway Frtg.	24,400	24,800	24,900
Highway 161	8,900	8,300	8,500
Highway 440	47,800	42,700	43,400
Total	343,800	301,800	311,700
Screenline 3: North of I-630			
I-30	113,100	109,300	110,600
I-30 Frtg.	18,200	18,300	18,300
Scott St.	6,400	6,200	6,300
Main St.	7,700	7,600	7,700
Louisiana St.	5,000	5,000	5,000
Broadway St.	27,700	27,900	27,800
S. University Ave.	33,300	33,200	33,400
S. Mississippi St.	12,700	12,600	12,600
I-430	93,600	100,000	97,500
Total	317,700	320,100	319,200

Facility	No Build	Toll-Free	Base Scenario (Tolled)
Screenline 4: East of I-30			
I-440	59,600	56,900	57,600
E. Washington Ave.	10,100	9,000	9,100
E. Broadway St.	24,100	23,100	23,400
I-40	150,400	134,600	138,700
Total	244,200	223,600	228,800
Screenline 5: Southwest Little Rock			
I-430	92,500	91,600	91,800
I-30	109,600	108,200	108,600
Total	202,100	199,800	200,400
Screenline 6: Eastern Side			
NBF	0	24,100	12,300
Highway 67	86,800	76,900	80,300
Highway 161	13,400	11,800	12,100
I-40	48,300	45,000	45,700
Highway 70	10,300	9,400	9,500
Total	158,800	167,200	159,900
Screenline 7: Southeast of NBF			
NBF	0	24,100	12,300
Highway 67	86,800	76,900	80,300
Highway 440	39,400	36,200	35,600
Total	126,200	137,200	128,200
Screenline 8: Southwest of NBF			
NBF	0	42,600	31,500
Highway 365	13,000	9,400	9,400
I-40	105,300	86,800	90,100
Total	118,300	138,800	131,000

Table 3. 2030 Daily Volume to Capacity Ratio

Facility	No Build	Toll-Free	Base Scenario (Tolled)
Screenline1: North of NBF			
I-40	1.20	1.19	1.18
Highway 365	0.64	0.68	0.69
Batesville Pike	0.89	0.98	1.01
Kellogg Acres Rd.	0.57	0.57	0.55
Highway 107	1.00	1.15	1.17
Oneida St.	0.77	0.74	0.75
Highway 67	1.28	1.31	1.27
Screenline 2: South of NBF			
I-40	0.88	0.74	0.77
MacArthur Dr.	0.79	0.74	0.75
Camp Robinson Rd.	0.99	0.94	1.00
Highway 107	1.15	0.98	1.02
North Hills	0.61	0.62	0.62
Highway 67	0.80	0.66	0.69
Highway 67 Frtg.	1.06	1.08	1.08
Highway 161	0.63	0.59	0.60
Highway 440	0.52	0.47	0.47
Screenline 3: North of I-630			
I-30	0.89	0.87	0.88
I-30 Frtg.	0.60	0.60	0.60
Scott St.	0.43	0.41	0.42
Main St.	0.68	0.67	0.67
Louisiana St.	0.34	0.34	0.34
Broadway St.	0.85	0.86	0.86
S. University Ave.	0.69	0.68	0.69
S. Mississippi St.	0.47	0.47	0.47
I-430	0.65	0.69	0.68

Facility	No Build	Toll-Free	Base Scenario (Tolled)
Screenline 4: East of I-30			
I-440	0.65	0.62	0.63
E. Washington Ave.	0.75	0.67	0.68
E. Broadway St.	0.76	0.72	0.74
I-40	1.04	0.93	0.96
Screenline 5: Southwest Little Rock			
I-430	1.28	1.27	1.27
I-30	1.10	1.08	1.09
Screenline 6: Eastern Side			
NBF	0.00	0.40	0.20
Highway 67	0.95	0.84	0.88
Highway 161	0.94	0.83	0.86
I-40	0.79	0.74	0.75
Highway 70	0.72	0.66	0.67
Screenline 7: Southeast of NBF			
NBF	0.00	0.40	0.20
Highway 67	0.95	0.84	0.88
Highway 440	0.43	0.40	0.39
Screenline 8: Southwest of NBF			
NBF	0.00	0.70	0.52
Highway 365	0.91	0.66	0.66
I-40	1.15	0.95	0.98

Based on the data presented in Table 3, construction of the North Belt Freeway will improve the V/C ratio for the majority of the highways and arterials (No Build versus Toll-Free, and No Build versus Tolled). The diversion (amount of traffic lost after tolling) in response to tolling the North Belt Freeway minimally increases the V/C ratio relative to the toll free scenario for the majority of the highways and arterials, particularly for the facilities receiving the diverted traffic (in screenline 2 the V/C ratio for Highway 67 increases from 0.66 for toll-free to 0.69 for tolled). In the case of Highway 107 (screenline 1), the V/C ratio deteriorates under the toll-free and tolled scenarios because Highway 107 serves as a feeder to the North Belt Freeway. However, as previously stated, in most cases the toll scenario V/C ratios are below the no-build V/C ratios. The highways receiving the highest V/C ratio improvements from the construction of the North Belt Freeway will be I-40 (screenlines 2, 4 and 8) and Highway 67 (screenline 2 and 6).

A select link analysis for 2030 was conducted to identify the origin and destination of trips using the North Belt Freeway. Figures 3 through 6 illustrate the select link results for two locations (shown by a green arrow) at the easternmost and westernmost segments of NBF for both toll-free and tolled scenarios.

6,900 vpd, or 33 percent of the toll-free traffic originating at the westernmost segment traverses the entire North Belt Freeway facility (see Figure 3). The ramps located at Batesville Pike are a major destination for both toll-free and tolled scenarios (see Figures 3 and 4). For the tolled scenario only 21 percent of the traffic (3,300 vehicles) traverse the entire NBF (see Figure 4). Twenty one percent of the tolled traffic continues northbound in Highway 167.

For the westbound/southbound movement, 60 percent of the traffic traverses the entire corridor. This represents 7,500 vpd under the toll free scenario and 4,000 vpd under the tolled scenario (see Figures 5 and 6). Highway 107 ramps are the most heavily utilized ramps for traffic passing through the easternmost section of the corridor (see green arrow in Figures 5 and 6). Seventy-three and twenty-seven percent of the traffic passing through the easternmost section is coming from Highway 167 and Highway 440, respectively, for the toll-free scenario. Under the tolled scenario the percentage of traffic coming from Highway 167 and Highway 440 changes to 69 percent and 31 percent (see Figure 5). For the southbound/westbound movement, the Batesville destination is the least desirable under both the toll-free and toll scenarios.

In order to identify the origin of the trips using the NBF, a zonal select link evaluation was implemented for several political jurisdictions of central Arkansas (see Figure 7). Tables 4 and 5 present the results for the toll-free and tolled scenarios. The tables identify the following:

- Total number of trips produced/attracted from/to each jurisdiction,
- Number of trips produced/attracted from/to those jurisdictions that are using the NBF corridor in the easternmost and westernmost segments.
- Percent of trips produced/attracted from/to those jurisdictions that are using the NBF corridor in the easternmost and westernmost segments.

For both the toll-free and tolled conditions (see Tables 4 and 5), North West Lonoke County and Southern Sherwood generate the highest number of trips utilizing the NBF in the easternmost and westernmost segments, respectively. The jurisdiction with the smallest number of trips utilizing the North Belt Freeway is North Little Rock with less than 1,000 trips for the toll-free scenario, and less than 200 trips for the tolled scenario.

Figure 3
Toll-Free 2030 Select Link at Westernmost Segment (northbound/eastbound)

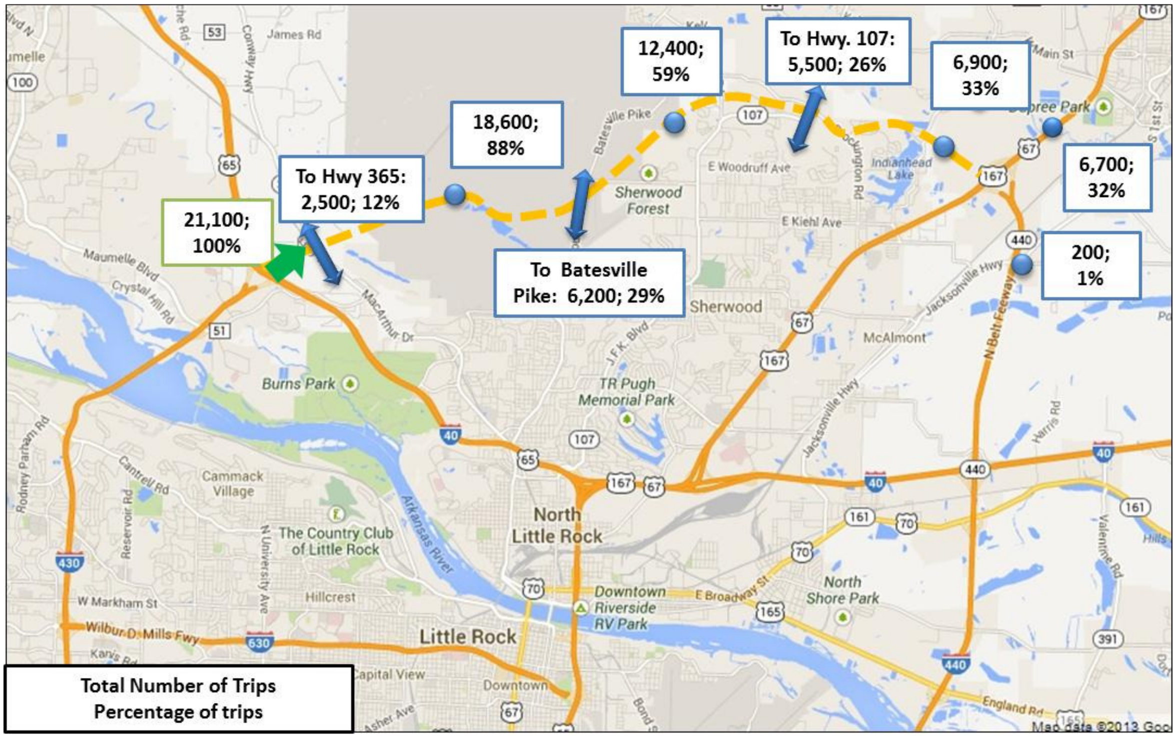


Figure 4
Tolled 2030 Select Link at Westernmost Segment (northbound/eastbound)

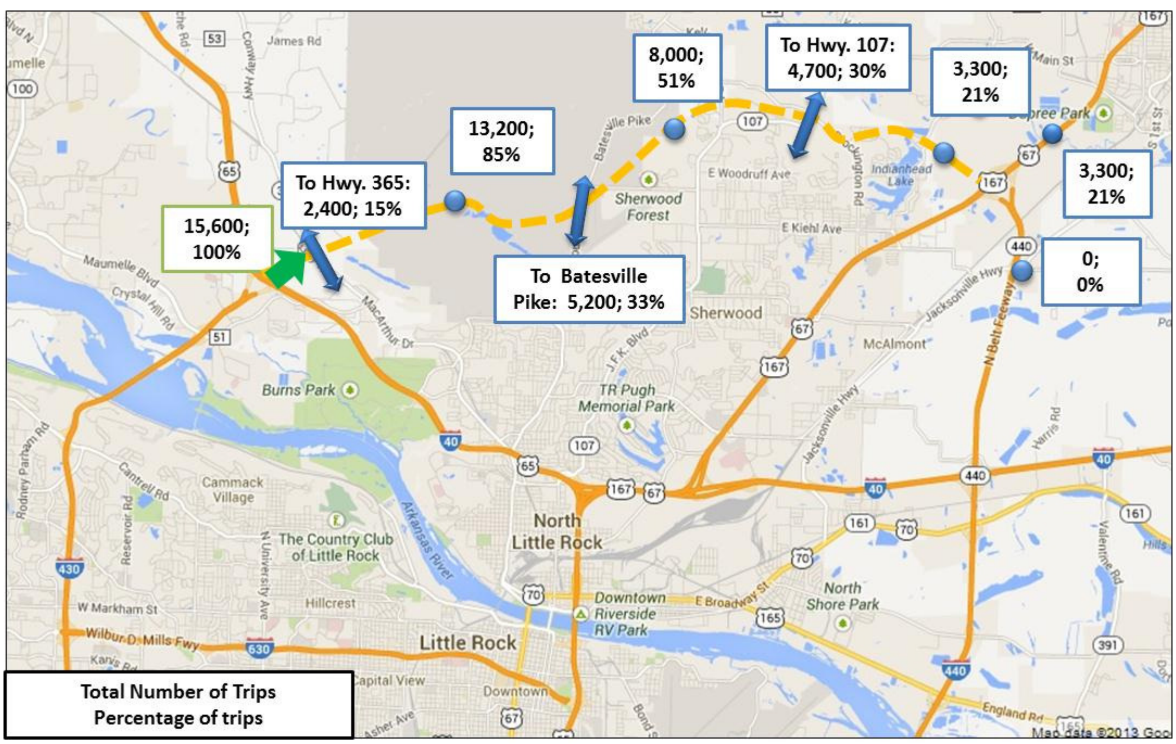


Figure 5
Toll-Free 2030 Select Link at Easternmost Segment (southbound/westbound)

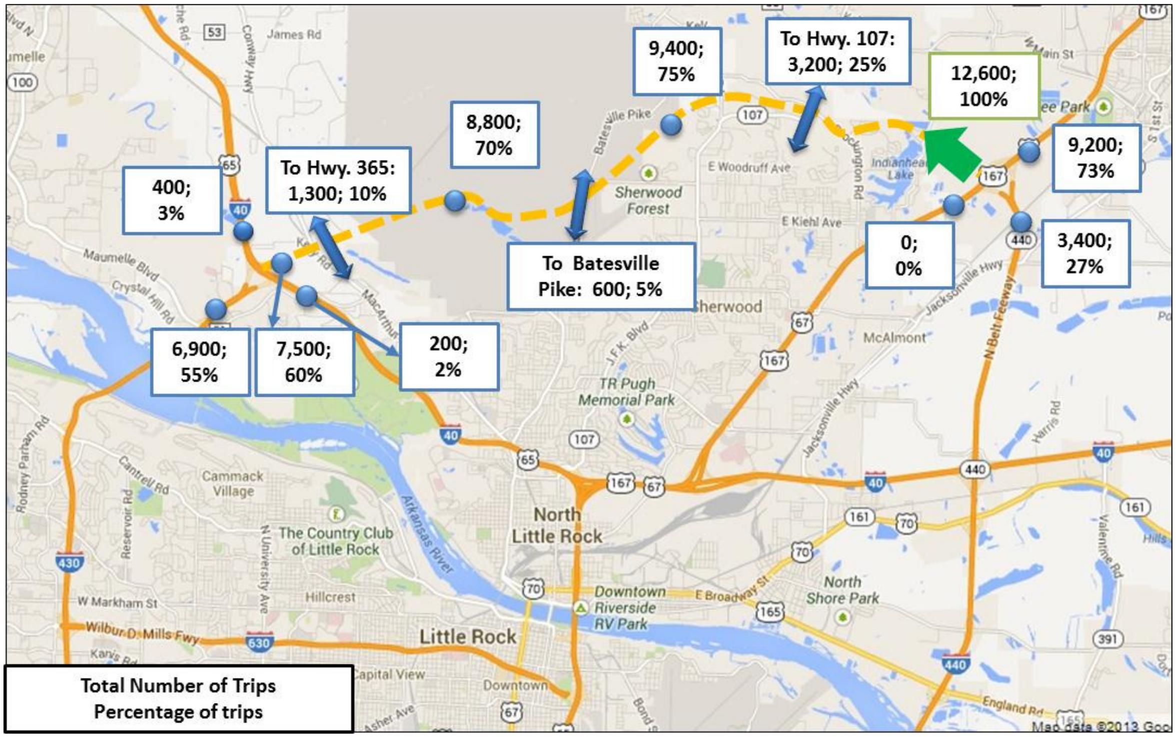


Figure 6
Tolled 2030 Select Link at Easternmost Segment (southbound/westbound)

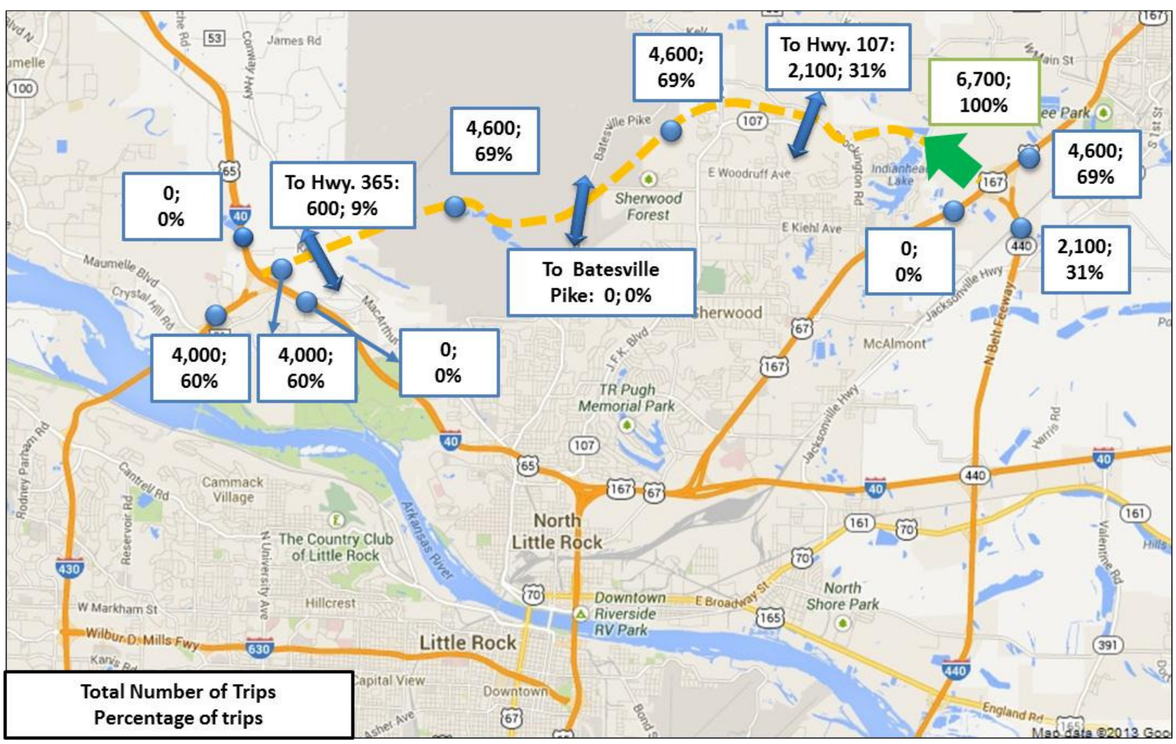


Figure 7. NBF Selected Jurisdictions

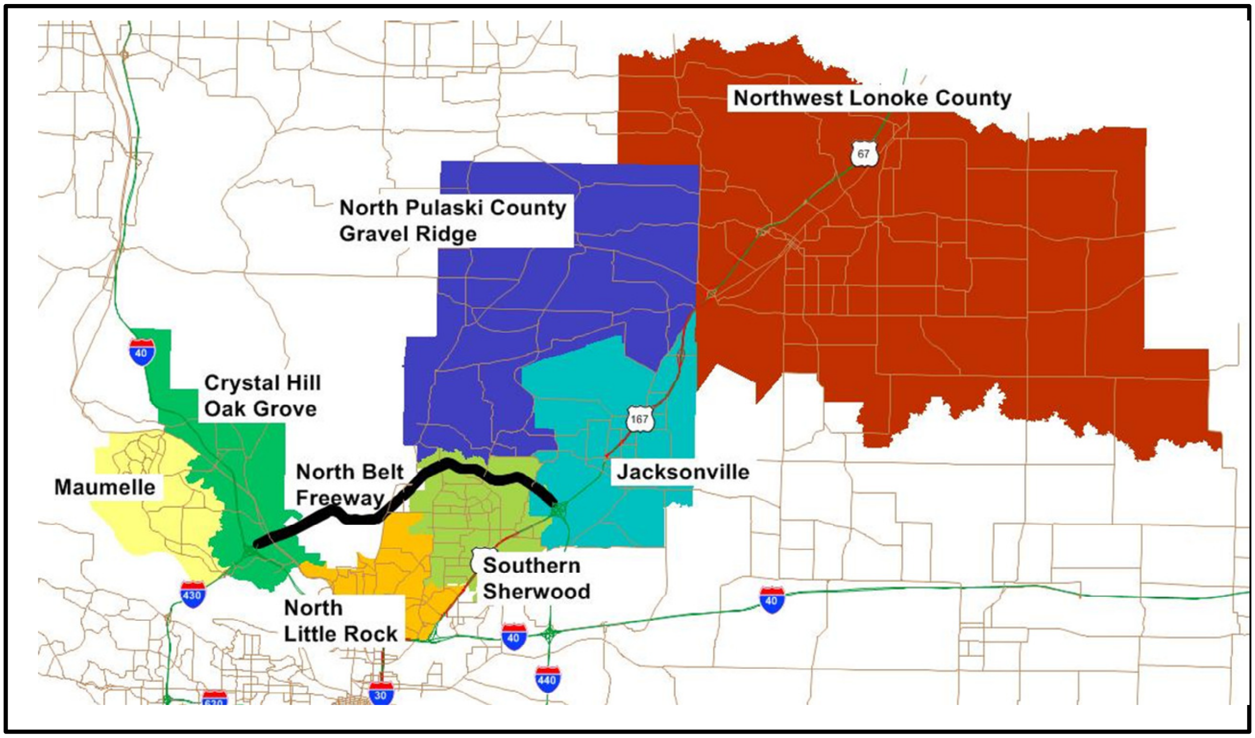


Table 4
2030 Trips On the NBF from Selected Jurisdictions
Toll Free Scenario

Jurisdiction				Jurisdiction		
North West Lonoke County	**Trips**	**Share**		**North Little Rock**	**Trips**	**Share**
Total Daily Trips Produced	317,800	100%		Total Daily Trips Produced	239,463	100%
Trips at NBF Easternmost Segment	7,792	2.5%		Trips at NBF Easternmost Segment	930	0.4%
Trips at NBF Westernmost Segment	6,857	2.2%		Trips at NBF Westernmost Segment	927	0.4%
North Pulaski County Gravel Ridge	**Trips**	**Share**		**Crystal Hill Oak Grove**	**Trips**	**Share**
Total Daily Trips Produced	61,790	100%		Total Daily Trips Produced	58,602	100%
Trips at NBF Easternmost Segment	3,189	5.2%		Trips at NBF Easternmost Segment	2,152	3.7%
Trips at NBF Westernmost Segment	4,764	7.7%		Trips at NBF Westernmost Segment	6,817	11.6%
Jacksonville	**Trips**	**Share**		**Maumelle**	**Trips**	**Share**
Total Daily Trips Produced	207,368	100%		Total Daily Trips Produced	115,442	100%
Trips at NBF Easternmost Segment	7,482	3.6%		Trips at NBF Easternmost Segment	3,353	2.9%
Trips at NBF Westernmost Segment	8,442	4.1%		Trips at NBF Westernmost Segment	6,635	5.7%
Southern Sherwood	**Trips**	**Share**				
Total Daily Trips Produced	165,176	100%				
Trips at NBF Easternmost Segment	1,303	0.8%				
Trips at NBF Westernmost Segment	10,391	6.3%				

Table 5
2030 Trips On the NBF from Selected Jurisdictions
Tolled Scenario

Jurisdiction				Jurisdiction		
North West Lonoke County	**Trips**	**Share**		**North Little Rock**	**Trips**	**Share**
Total Daily Trips Produced	317,800	100%		Total Daily Trips Produced	239,463	100%
Trips at NBF Easternmost Segment	4,701	1.5%		Trips at NBF Easternmost Segment	0	0.0%
Trips at NBF Westernmost Segment	5,064	1.6%		Trips at NBF Westernmost Segment	186	0.1%
North Pulaski County Gravel Ridge	**Trips**	**Share**		**Crystal Hill Oak Grove**	**Trips**	**Share**
Total Daily Trips Produced	61,790	100%		Total Daily Trips Produced	58,602	100%
Trips at NBF Easternmost Segment	2,019	3.3%		Trips at NBF Easternmost Segment	828	1.4%
Trips at NBF Westernmost Segment	3,778	6.1%		Trips at NBF Westernmost Segment	5,758	9.8%
Jacksonville	**Trips**	**Share**		**Maumelle**	**Trips**	**Share**
Total Daily Trips Produced	207,368	100%		Total Daily Trips Produced	115,442	100%
Trips at NBF Easternmost Segment	2,680	1.3%		Trips at NBF Easternmost Segment	2,345	2.0%
Trips at NBF Westernmost Segment	6,098	2.9%		Trips at NBF Westernmost Segment	5,892	5.1%
Southern Sherwood	**Trips**	**Share**				
Total Daily Trips Produced	165,176	100%				
Trips at NBF Easternmost Segment	717	0.4%				
Trips at NBF Westernmost Segment	6,782	4.1%				

APPENDIX H

Financial Feasibility Analysis Methodology Technical Memorandum

North Belt Freeway Feasibility Study

Financial Feasibility Analysis Methodology Technical Memorandum

Developed by:

PFM®

KSD Consulting, Inc.

In Consultation with:

ATKINS

Final

October 2013

Table of Contents

1. Introduction

The objective of the financial feasibility analysis is to perform an initial assessment of the capacity to fund the planned North Belt project's entire lifecycle costs from toll revenues generated by the users of the facility. This technical memorandum describes the approach the Atkins Team will undertake to perform the feasibility analysis. The financing structures developed for this analysis will be based on market standards for the type of credit and debt structures utilized to finance start-up toll road projects. A separate technical memorandum under development by the Atkins Team will describe the financing goals and risks and will include examples of successful financing structures for three start-up toll road projects.

The financial feasibility analysis will identify any potential gaps between the financing capacity of the project and its lifecycle costs. As part of this effort, the Atkins Team will identify potential gap closing measures such as direct up front or on-going infusions of public equity and/or external credit enhancement and define their ability to close the gap. The financial feasibility analysis will be an iterative process where the Atkins Team will work closely with the Arkansas State Highway and Transportation Department (AHTD) and Metroplan to define funding, financing and project implementation options, assess the magnitude of funding gaps and identify the effects of gap closing solutions on financial feasibility.

Section 2 of this technical memorandum describes the approach that will be used to undertake the financial feasibility analysis including key data inputs, financing structures considered, feasibility measures and gap closing options. Section 3 describes the structure and capabilities of the financial model that will be utilized to conduct the feasibility analysis, while Section 4 identifies next steps.

2. Financial Feasibility Analysis Approach

The financial feasibility analysis will center on the development and assessment of strategies to fund and finance the project's lifecycle costs to the greatest extent possible from toll revenues. A comprehensive financial planning model, described in Section 3, will be used to structure and test project financing strategies. Key data inputs to the analysis include:

1. The results of the toll traffic and revenue forecasting effort which will project over a 40-year period annual toll revenues based on the underlying economic and demographic conditions projected for the area served by the North Belt Toll Road, estimated traffic demand and the toll rate structure.

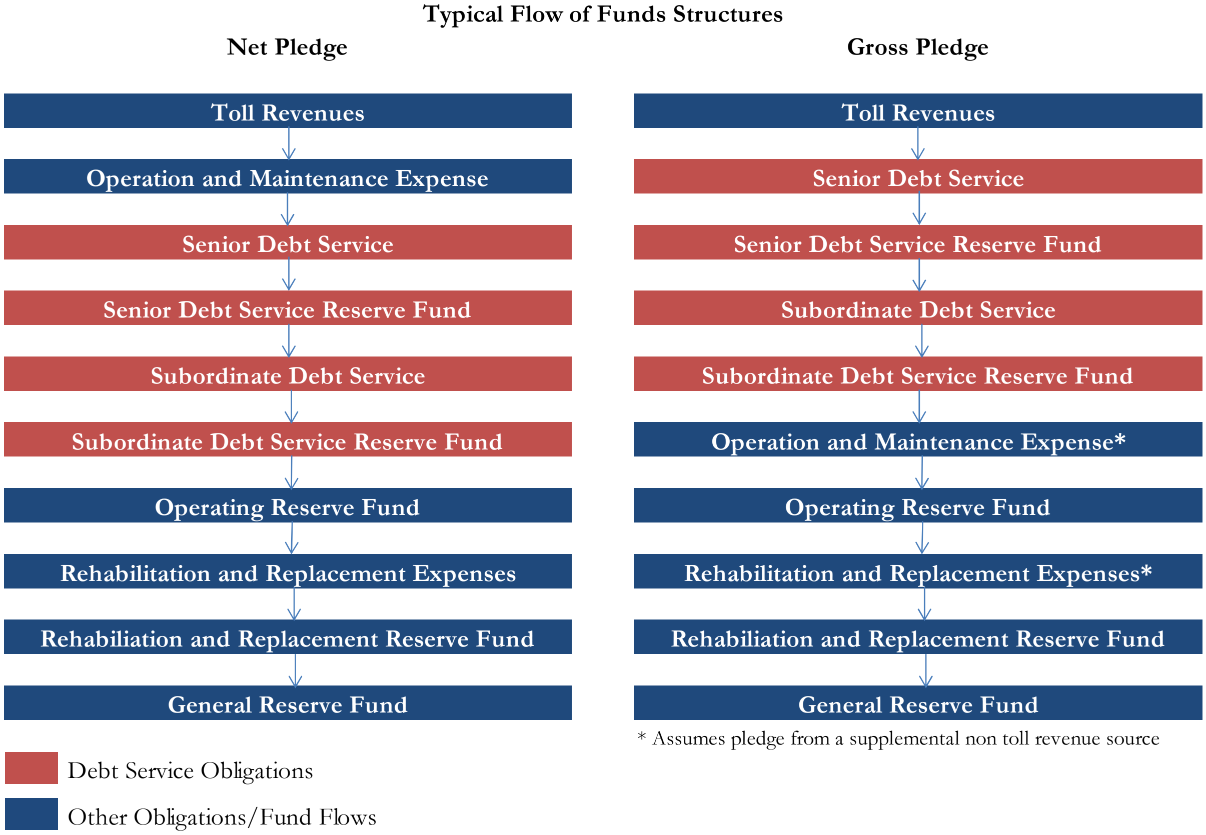
2. The costs to construct the project in annual year of expenditure dollars based on an assumed construction schedule and cost inflation factor.

3. Annual operations and maintenance costs in year of expenditure dollars to cover the cost for on-going operations of the toll road and to ensure the project is maintained in a state of good repair. These costs will be derived from the engineering analysis.

4. Periodic rehabilitation and replacement (R&R) expenses, determined based on the engineering analysis, expressed in year of expenditure dollars to provide for major maintenance needs.

Debt financing will be used to leverage the projected future flow of toll revenues to provide capital to fund the project's construction needs. The degree to which toll revenues are leveraged will be governed by rating agency and market standards for debt secured by prospective revenues of a start-up toll road. For a toll road financing solely secured by the project's revenues, investors and rating agencies require that toll revenues be used first to pay for the project's operations and maintenance cost to ensure that revenues are available to meet on-going operating needs so that the toll road can generate the necessary net revenues to cover annual debt service expenses and other obligations (Net Pledge Structure). Alternatively, debt service may be secured by all toll revenues if there is back-up pledge by the State or its DOT to fund any deficiencies in operations and maintenance and R&R expenses (Gross Pledge Structure). Exhibit 1 below shows the typical flow of funds for both a Net Pledge and Gross Pledge Structure.

Exhibit 1
Typical Flow of Funds Structures



As part of the project's flow of funds structure, reserve funds are established to provide adequate cash flow and reserves to accommodate risks such as a short term disruption in or lower than expected revenues. In addition, reserves allow cash to be tapped over time to smooth out the funding requirements for periodic R&R projects. Debt service reserve funds are funded from bond proceeds while operating, rehabilitation and replacement and general reserve funds are funded from cash flow. The minimum size for the reserve funds will be defined as part of the development of the financial analysis.

The analysis will first seek to finance project construction costs to the maximum extent possible utilizing senior lien toll revenue bonds secured by net revenues. Recognizing that pledged net revenues are based on the prospective performance of the project and not from an established revenue stream, the goal is to secure a rating for the debt in the BBB/BBB- range, which is the lowest investment grade rating category. Such a rating is contingent on demonstrating the strength of the service area to generate traffic demand, essentiality of the project as an alternative to nearby non-tolled facilities, and the value of travel time savings offered relative to the planned tolling regime. Additionally, structural protections incorporated into the debt structure are key rating requirements. These include:

1. Capitalized interested where a portion of bond proceeds are used to pay interest on the bonds through the period of construction and the first year of operations to allow the project to build up internal liquidity to accommodate the ramp-up of demand once the project opens and provide protection in the event of a delayed opening.
2. Pledged revenues provide an annual debt service coverage ratio of approximately 2.50-2.75x to provide cushion in the event actual revenues are less than forecasted.
3. A generally escalating debt structure that increases at a rate that is somewhat less than projected annual revenue growth.
4. A debt service reserve and other reserves that are available to fund debt service obligations in the event net toll revenues are insufficient to meet debt service obligations.

If senior lien bond capacity is not sufficient to meet the financing needs of the project, subordinate lien debt structures will then be considered. This can include non-investment grade capital markets debt or a Transportation Infrastructure Finance and Innovation Act (TIFIA) Loan. TIFIA provides a more cost effective alternative than subordinate capital markets debt because the interest rate on the loan is tied to the Federal treasury rate. TIFIA repayment terms are flexible—interest payments are not required until the fifth year after project completion, principal payments generally begin in the tenth year and final repayment is 35 years after completion. While the TIFIA statute allows loans up to 49% of eligible costs, project sponsors are encouraged to request loans for no more than 33% of project costs. TIFIA requires that senior lien obligations be rated at least BBB-. Annual debt service coverage requirements are lower than senior lien bonds, typically 1.25x-1.50x against combined senior and TIFIA debt service, thus providing additional financing capacity.

Based on this analytical approach, the Atkins Team will determine whether the project's lifecycle costs can be funded on a standalone basis, or if there is a funding gap. At this point, the Atkins Team will identify and test alternative credit structure and funding strategies to close the gap. Such measures could include:

1. Evaluating a gross pledge structure where a non-cash credit enhancement such as commitment by AHTD or the State can be used to cover operations and maintenance and R&R expenses to the extent toll revenues are not sufficient. Allowing senior lien and subordinate lien debt to be paid prior to operating expenses increases the capacity to finance the project. However, a gross pledge would mean that this supplemental commitment would cover O&M costs entirely, to increase coverage of toll revenues over the debt service.
2. A commitment by AHTD or the State, determined based on a review of State Statutes, to cover any draws on the debt service reserve fund, if any. This enhancement would raise the rating on the senior lien toll revenues bonds from a BBB/BBB- targeted stand-alone rating to potentially a A/A+ rating. This would have the benefit of lowering both the interest cost on the bonds by about 50 basis points as well as debt service coverage requirements to about 1.75x-2.00x.
3. Alternatively, some or all of the bonds could be structured as full faith and credit general obligations of the State. This would yield the highest possible rating (Aa1/AA by Moody's and S&P, respectively) and the lowest possible cost for the project (about 80-90 basis points lower than a BBB credit). However, this option would need to be evaluated and prioritized within the context of the State's overall general obligation debt capacity and needs.
4. An up-front public equity from AHTD to cover the funding gap.
5. An annual revenue stream from a highly rated revenue source (A+ or higher rated) such as a portion of the State's Motor Fuel Taxes that would be used to provide another source of financing to close the funding gap.

In addition, the analysis will include a high level discussion of alternative project delivery options, also referred to as public private partnerships that may be considered as part of a subsequent, more detailed analysis of the project's financing and delivery. The results of the financial analysis will be presented to AHTD and Metroplan for review and comment. The Atkins Team will revise the analysis based on feedback provided by AHTD and prepare an interim financial feasibility report.

3. Financial Model Structure

The Atkins Team will develop an Excel-based comprehensive financial planning model to structure and test alternative project funding and financing strategies and identify a recommended approach. The model will have the capacity to forecast the project's cash flow over a 40-year planning period. The financial planning model will encompass the following modules that will be used to define and test alternatives:

- **Revenue Module**: This module will incorporate the year-by-year forecasts of traffic and toll revenues developed as part of the feasibility analysis. The revenue schedule will form the basis to size and structure bonds to finance the project's needs.

- **Operations and Maintenance and Rehabilitation and Replacement Module**: This includes the annual projection of operations and maintenance expenses and periodic R&R expenses in year of expenditure dollars. As part of this module, calculations will be performed to size the operating reserve and the R&R reserve. Both of these reserves will be sized to equal 3 months of projected operating expenses and R&R expenses, respectively.

- **Capital Program Module**: The capital program module will be utilized to estimate annual capital spending based on the North Belt project's construction costs, implementation schedule and spend down.

- **Debt Module**: The debt module will be used to assess debt capacity and to perform the calculations for sizing and structuring bonds to finance the project's capital needs. The module will include a mix of alternative structures to be tested including senior tax exempt long term bonds, short term bond anticipation notes and flexible repayment TIFIA loans. The module will include projected base interest rates reflecting the ten year historical average of the 'AAA' bench mark index and spreads applicable to the credits to be evaluated. Exhibit 2 summarizes the type of long term tax exempt structures that will be tested in the analysis.

Exhibit 2
Senior Lien Debt Structure Options

Current Interest Bonds (CIBs)	Capital Appreciation Bonds (CABs)	Convertible CABs (CCABs)
Periodic interest payments begin roughly six months after sale	Pay no periodic interest until maturity because interest accretes over time	Defer periodic interest payments until bond "converts".
Typically cheaper than CABs and Convertible CABs	Typically the most expensive form of debt	While these are not as inexpensive as Current Interest Bonds, they tend to be cheaper than CABs
May be structured to meet a level debt service pattern, or to ensure revenues cover debt service uniformly or proportionally	Useful for creating an ascending debt service pattern	May be structured to meet a blended level and ascending debt service pattern

- **Cash Flow Output Module**: The results of the financial planning model will be presented in tabular and graphical exhibits to facilitate the definition and evaluation of alternatives. The tabular exhibits will include the full cash flow of the project that traces through each element of the flow of funds on an annual basis. The table will also include calculations of debt service coverage and liquidity ratios to assess financial flexibility and feasibility. Graphical outputs will present annual operations and maintenance, debt service, and R&R expenses relative to pledged revenues as well as debt service coverage. Exhibits 3 and 4 present examples of these outputs.

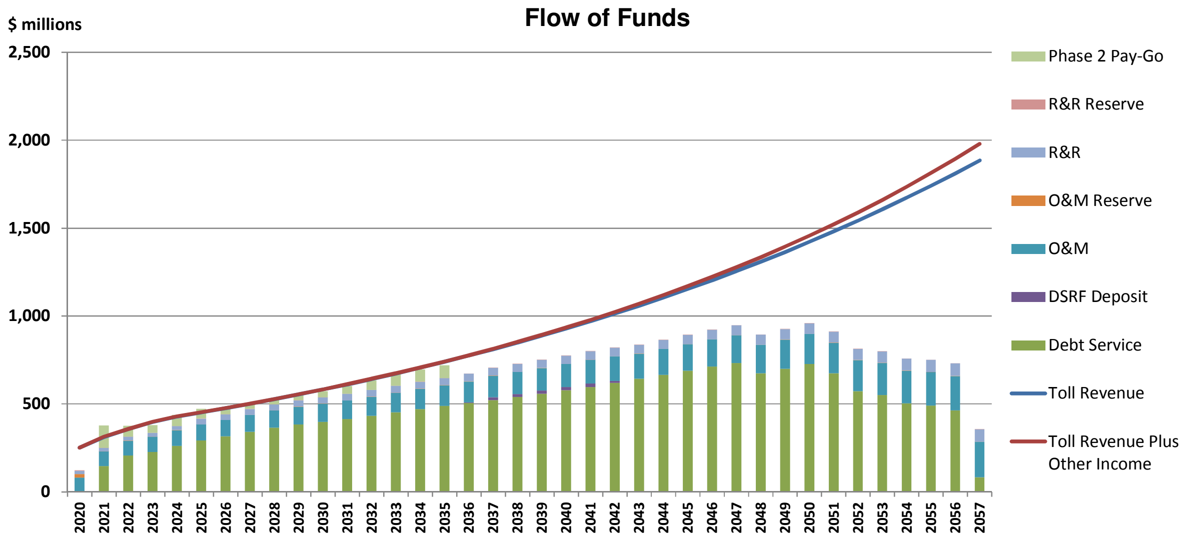
Exhibit 3
Example Financial Model Cash Flow Table—Gross Pledge Structure

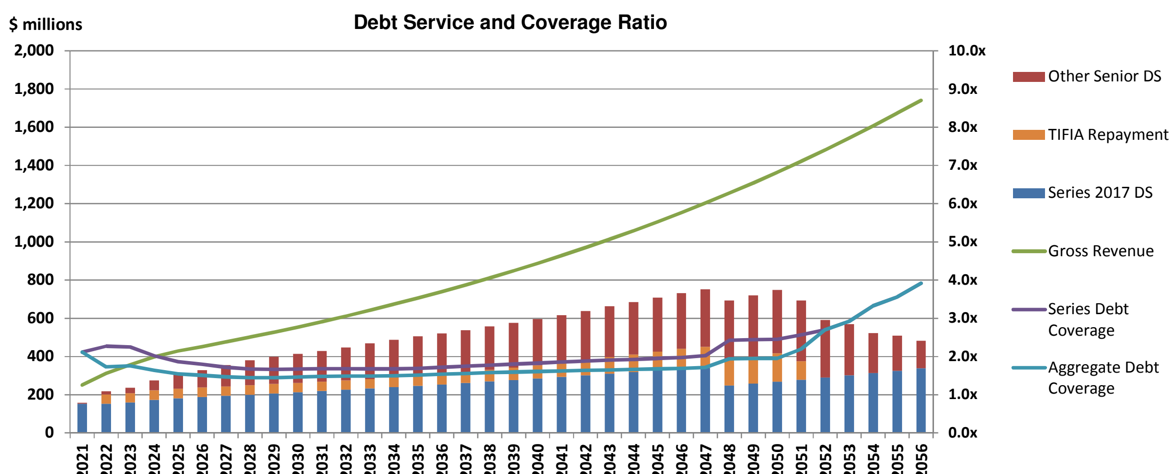
Period	Ending 12/31	Total Revenue	Gross Senior Debt Service	DSRF Income	Net Senior Debt Service	Senior DSRF Ongoing Deposit	TIFIA Repayment
1	2020	250,445					
2	2021	311,973	156,741	9,156	147,586		
3	2022	357,099	167,013	9,745	157,268		49,689
4	2023	397,490	187,671	10,652	177,018		49,689
5	2024	428,399	224,337	11,965	212,372		49,689
6	2025	451,715	255,306	12,535	242,771		49,689
7	2026	475,930	278,789	13,342	265,447		49,689
8	2027	501,073	305,799	14,164	291,636		49,689
9	2028	527,176	330,021	14,642	315,378		49,689
10	2029	554,271	348,582	14,893	333,689		49,689
11	2030	582,391	364,152	15,058	349,094		49,689
12	2031	611,571	378,991	15,205	363,786		49,689
13	2032	641,846	397,181	15,639	381,542		49,689
14	2033	673,252	418,209	15,988	402,221		49,689
15	2034	705,828	437,358	16,197	421,161		49,689
16	2035	739,611	453,174	16,197	436,977		51,559
17	2036	774,642	467,076	16,276	450,799	2,644	54,886
18	2037	810,963	481,354	16,768	464,586	16,377	56,382
19	2038	848,616	496,030	17,273	478,757	16,832	60,436
20	2039	887,644	511,112	17,792	493,320	17,306	64,661
21	2040	928,094	526,611	18,326	508,285	17,793	69,064
22	2041	970,011	542,545	18,874	523,671	18,294	73,651
23	2042	1,013,444	558,922	19,249	539,673	12,473	79,569
24	2043	1,058,442	575,754	19,249	556,506		86,884
25	2044	1,105,057	593,060	19,249	573,812		92,159
26	2045	1,153,341	610,854	19,249	591,605		97,648
27	2046	1,203,349	629,148	19,249	609,900		103,356
28	2047	1,255,136	641,621	19,249	622,373		110,433
29	2048	1,308,760	558,546	19,249	539,297		135,039
30	2049	1,364,281	578,640	19,249	559,391		141,416
31	2050	1,421,761	599,383	19,249	580,134		148,028
32	2051	1,481,261	596,863	19,249	577,615		96,551
33	2052	1,542,848	590,801	19,249	571,552		
34	2053	1,606,589	569,758	19,249	550,510		
35	2054	1,672,552	522,080	19,249	502,831		
36	2055	1,740,809	508,852	19,249	489,604		
37	2056	1,811,434	481,828	19,249	462,580		

Exhibit 3
Example Financial Model Cash Flow Table—Gross Pledge Structure

Period	Ending 12/31	O&M Expenditure	O&M Reserve Deposit	R&R Expenditure	R&R Reserve Deposit	O&M and R&R Reserve Income	General Reserve Fund Income	Reserve Fund Income	Remaining Revenue	General Reserve Beginning Balance	Withdraw from General Reserve	Remaining Revenue Deposit	General Reserve Ending Balance	Senior Debt Coverage	Sub. Debt Coverage	Period
1	2020	80,714	20,178	18,285	4,571	247		247	126,944			126,944	126,944			1
2	2021	82,732	504	19,628	336	256	1,269	1,525	62,712	126,944	126,944	62,712	62,712	2.11x	2.11x	2
3	2022	84,800	517	21,035	352	265	627	892	44,329	62,712	62,712	44,329	44,329	2.27x	1.73x	3
4	2023	86,920	530	21,431	99	271	443	714	62,517	44,329	44,329	62,517	62,517	2.25x	1.75x	4
5	2024	89,093	543	22,909	369	280	625	905	54,328	62,517	62,517	54,328	54,328	2.02x	1.63x	5
6	2025	91,320	557	31,908	2,250	308	543	851	34,072	54,328	54,328	34,072	34,072	1.86x	1.54x	6
7	2026	93,603	571	32,791	221	316	341	657	34,265	34,072	34,072	34,265	34,265	1.79x	1.51x	7
8	2027	95,944	585	33,468	169	324	343	666	30,249	34,265	34,265	30,249	30,249	1.72x	1.47x	8
9	2028	98,342	600	34,365	224	332	302	634	29,211	30,249	30,249	29,211	29,211	1.67x	1.44x	9
10	2029	100,801	615	35,312	237	340	292	632	34,562	29,211	29,211	34,562	34,562	1.66x	1.45x	10
11	2030	103,321	630	36,116	201	349	346	694	44,035	34,562	34,562	44,035	44,035	1.67x	1.46x	11
12	2031	105,904	646	37,282	292	358	440	798	54,771	44,035	44,035	54,771	54,771	1.68x	1.48x	12
13	2032	108,551	662	38,173	223	367	548	915	63,920	54,771	54,771	63,920	63,920	1.68x	1.49x	13
14	2033	111,265	678	39,086	228	376	639	1,015	71,099	63,920	63,920	71,099	71,099	1.67x	1.49x	14
15	2034	114,047	695	40,206	280	386	711	1,097	80,847	71,099	71,099	80,847	80,847	1.68x	1.50x	15
16	2035	116,898	713	41,184	245	395	808	1,204	93,240	80,847	73,235	93,240	100,851	1.69x	1.51x	16
17	2036	119,820	731	42,609	356	406	1,009	1,415	104,211	100,851		104,211	205,062	1.72x	1.53x	17
18	2037	122,816	749	43,674	266	416	2,051	2,467	108,580	205,062		108,580	313,642	1.75x	1.56x	18
19	2038	125,886	768	44,766	273	427	3,136	3,563	124,460	313,642		124,460	438,103	1.77x	1.57x	19
20	2039	129,033	787	45,886	280	437	4,381	4,818	141,190	438,103		141,190	579,293	1.80x	1.59x	20
21	2040	132,259	806	47,033	287	448	5,793	6,241	158,807	579,293		158,807	738,100	1.83x	1.61x	21
22	2041	135,566	827	48,208	294	459	7,381	7,840	177,341	738,100		177,341	915,441	1.85x	1.62x	22
23	2042	138,955	847	49,414	301	471	9,154	9,625	201,837	915,441		201,837	1,117,277	1.88x	1.64x	23
24	2043	142,429	868	50,649	309	483	11,173	11,655	232,453	1,117,277		232,453	1,349,731	1.90x	1.65x	24
25	2044	145,989	890	51,915	317	495	13,497	13,992	253,966	1,349,731		253,966	1,603,697	1.93x	1.66x	25
26	2045	149,639	912	53,213	324	507	16,037	16,544	276,543	1,603,697		276,543	1,880,240	1.95x	1.67x	26
27	2046	153,380	935	54,543	333	520	18,802	19,322	300,224	1,880,240		300,224	2,180,464	1.97x	1.69x	27
28	2047	157,215	959	55,907	341	533	21,805	22,337	330,247	2,180,464		330,247	2,510,710	2.02x	1.71x	28
29	2048	161,145	983	57,305	349	546	25,107	25,653	440,296	2,510,710		440,296	2,951,006	2.43x	1.94x	29
30	2049	165,174	1,007	58,737	358	560	29,510	30,070	468,268	2,951,006		468,268	3,419,275	2.44x	1.95x	30
31	2050	169,303	1,032	60,206	367	574	34,193	34,767	497,457	3,419,275		497,457	3,916,732	2.45x	1.95x	31
32	2051	173,536	1,058	61,711	376	588	39,167	39,755	610,170	3,916,732		610,170	4,526,902	2.56x	2.20x	32
33	2052	177,874	1,085	63,254	386	603	45,269	45,872	774,570	4,526,902		774,570	5,301,472	2.70x	2.70x	33
34	2053	182,321	1,112	64,835	395	618	53,015	53,633	861,049	5,301,472		861,049	6,162,521	2.92x	2.92x	34
35	2054	186,879	1,140	66,456	405	633	61,625	62,259	977,100	6,162,521		977,100	7,139,620	3.33x	3.33x	35
36	2055	191,551	1,168	68,117	415	649	71,396	72,045	1,062,000	7,139,620		1,062,000	8,201,620	3.56x	3.56x	36
37	2056	196,340	1,197	69,820	426	665	82,016	82,682	1,163,753	8,201,620		1,163,753	9,365,373	3.92x	3.92x	37

Exhibit 4
Example Financial Model Graphical Exhibits





4. Next Steps

The Atkins Team will refine the financial feasibility analysis methodology based on feedback provided by AHTD and Metroplan. While work is underway to develop the traffic and revenue forecasts, the project construction costs and implementation schedule, and operations and maintenance and R&R costs, the Atkins Team will structure the financial analysis model. Once the model is structured and data is available from the traffic and revenue and project costing efforts, the Atkins Team will then begin developing and evaluating project financing options in concert with AHTD.

APPENDIX I

Alternative Project Delivery (APD) Options for Stand-Alone, Start-Up Toll Projects (SASUTPs) Technical Memorandum

Alternative Project Delivery (APD) Options for Stand-Alone, Start-Up Toll Projects (SASUTPs)

Technical Memorandum

Developed by:

PFM

KSD Consulting, Inc.

In Consultation with:

ATKINS

FINAL

April 2014

Table of Contents

I. INTRODUCTION TO ALTERNATIVE PROJECT DELIVERY: BENEFITS, CHALLENGES, AND ROLES

Alternative Project Delivery (APD) encompasses a large menu of "non-traditional" project delivery options with varying amounts of private sector involvement and project risk transfer from the project sponsor to a private entity. Public-Private Partnerships (P3) is another common term for APD. APD can be as basic as a Design/Build contract or as complex as a long term toll concession, but in all cases the APD options should provide real, incremental monetary benefits to the project sponsor, and therefore the public, when compared to a traditional approach.

This memorandum will narrowly compare and discuss the Design-Build-Finance-Operate-Maintain (DBFOM) approach to the more traditional project delivery approach used by project sponsors for SASUTPs. This traditional approach was discussed in the Traditional Financing of Stand-Alone, Start-Up Toll Project (SASUTPs) memorandum (October 2013). The DBFOM approach includes two distinct models where a "pure" DBFOM structure relies on periodic governmental payment to the private sector entity as compensation, and the "concession" DBFOM structure where the private sector entity receives compensation from a user charge paid by the public end users of the project.

A more-comprehensive discussion of all aspects of APD/P3s can be found at the following:

FHWA's Innovative Program Delivery, P3 Site at: http://www.fhwa.dot.gov/ipd/p3/index.htm

For SASUTPs, some form of APD will be involved. At a minimum, in order to achieve an investment grade credit rating, a SASUTP financed with toll revenue bonds will necessitate the use of a guaranteed, fixed price Design/Build (D/B) contract with its inherent full transfer of construction risk to the private sector. A further incremental approach can involve a Design-Build-Operate-Maintain (DBOM) contract where long term operations risk is additionally transferred to the private sector. A final incremental evolution can involve a Design-Build-Finance-Operate-Maintain (DBFOM) option where the responsibility for financing the life cycle costs of the project are also transferred to the private sector.

The D/B and DBOM options are essentially short term service contracts with the private sector and little or no long term control of the asset is transferred to a private entity. The DBFOM option bundles traditional short term contracts for design, build, operate, and maintain activities into a single long term contract that includes a commitment from the private entity to finance the upfront and on-going capital costs of the project. In other words, the private partner/entity becomes responsible to lenders and equity investors for the ongoing success of the project and seeks to make a profit by assuming the project's life cycle cost risks. This added dimension necessitates the transfer of significant control of the asset to the private partner/entity – as set out in a single long term agreement. While ownership of the asset can always remain with the public project sponsor, each APD increment, D/B to DBOM to DBFOM, adds more complexity, more project risk transfer to the private sector, and accordingly more control of the project by the private sector partner. Each APD increment adds to the scope of some form of cost-benefit analysis by the project sponsor/public partner to confirm the economic preference of the APD approach. Selected detailed definitions follow in Section 2.

Potential benefits for a project sponsor using an APD approach include the potential:

- For early project delivery
- To reduce the construction, reoccurring operations and maintenance (OPEX), and the periodic capital maintenance (CAPEX) costs of the project
- For financing the project on a private balance sheet, not the project sponsor's balance sheet
- To introduce a new source of capital for the project – private equity
- To shift project related risk to a private entity
- For "life cycle cost" efficiencies through the dynamics of a single contractor being responsible for multiple project phases and the inherent, in theory, motivation to be innovative in controlling all costs

Potential concerns for a project sponsor using an APD approach include the potential:

- For significant reduced control of the project by the public project sponsor
- For extremely high transaction costs as compared to traditional procurement methods
- For extended delays in completing the APD transaction, in particular if a complex APD procurement process is unproven and inefficient.
- For "non-compete" or similar contract provisions that attempt to restrict the public project sponsor's future ability to deliver other needed infrastructure
- For excessive private sector profits through poorly written APD agreements and/or lack of sufficient public sector oversight and monitoring of the private sector entity's performance
- In toll concession/lease structures for the loss of potentially valuable public revenues by trading away future excess toll cash flows as compensation to the private sector entity for assuming the life cycle cost risks of the project
- For poorly written APD enabling legislation that, among other things, may not emphasize adequate transactional transparency or may include requirements that unknowingly hinder a vigorous competitive procurement

Table 1 describes some typical aspects of the various project delivery models discussed in this memorandum. Table 2 illustrates how major project risks are incrementally transferred to the private sector for the same project delivery models identified in Table 1.

Table 1. Summary of Alternative Project Delivery Methods

Project Delivery Model	Definition	Capital Financing Responsibility
Design-Bid-Build (DBB)	Typical approach to project delivery in design and construction are contracted separately and sequentially to private firms.	Public Agency
Design-Build (DB)	Bundles the design and construction into one guaranteed, maximum price contract with a single private entity.	Public Agency
Design-Build-Operate-Maintain (DBOM)	Bundles design, construction, operations and maintenance of an asset into one contract with a single private entity for a specific extended time period, meeting contractually defined performance standards.	Public Agency
Design-Build-Finance-Operate-Maintain (DBFOM)	A variation of DBOM by further requiring the private entity to provide the project's capital financing.	Private Entity

Table 2. Alternative Project Delivery Model Risk Allocations

Project Delivery Model	Design Risk	Construction Risk	OPEX* Risk	CAPEX** Risk	Finance Risk
DBB	Public	Public	Public	Public	Public
DB	Private	Private	Public	Public	Public
DBOM	Private	Private	Private	Private	Public
DBFOM	Private	Private	Private	Private	Private

*OPEX- reoccurring operations and maintenance expenses
**CAPEX- periodic capital rehabilitation expenses, also called "renewal and replacement costs"

Much has been written during the last ten years on the subject of APD/P3s and the applicability of this project delivery option to the public infrastructure market in the U.S. The "real world" value of these analyses has improved in the later years as states and other governmental jurisdictions have experimented with the APD/P3 procurement option, with varying degrees of success, given problems such as poorly designed contracts, political bias, and less than reasonable expectations. As of July 2013 for the twenty year period 1993–2013 there were 14 P3 projects, nominal project costs totaling $13.3 billion, in operation in the U.S., three of which are in default and two of which were asset monetizations.

Today, real world "lessons learned" are available for a public project sponsor to assist in diligently analyzing the pros and cons of the APD/P3 option to their specific project situation prior to "deciding on" and "committing to" the APD/P3 option. Ideally, the project sponsor/public partner will approach any analysis and decision applicable to the use of the APD/P3 option by diligently developing a comprehensive understanding of this very complex subject.

II. SELECTED DEFINITIONS

Availability Payment Structure: A form of DBFOM where the public entity retains the right to establish and collect the ongoing toll revenues of the SASUTP, and therefore maintains greater control of the asset by the public entity and eliminates the need for non-compete provisions. The public entity agrees to make periodic payments to the private entity for their successfully and continually keeping the SASUTP available for use by the public and by diligently meeting the extensive service/performance standards specified in the DBFOM contract. These "availability payments" are negotiated upfront so as to be adequate to fund the life cycle costs of the project by the private entity.

Pre-determined "withholdings" from the periodic availability payment are made when the project specific private entity fails to meet the aforementioned service/performance standards. Continued failure to perform would result in a private sector default and the resultant loss of the entire private equity investment. Availability payments are typically non-specific as to their source but represent an ongoing contractual liability of the public project sponsor subject to normal governmental appropriation processes.

If the source of an availability payment is derived from a public sponsor's general funds or tax revenues, the debt issued by the private entity and secured by the availability payments may not be considered to be an off balance sheet transaction for the public sponsor. The treatment of these transactions is dependent upon a state's statutory or constitutional definition of tax supported and self-supported debt. In addition rating agencies may also treat such debt as an on-balance sheet transaction.

Design-Build-Finance-Operate/Maintain (DBFOM): A long term contractual arrangement between a public project sponsor entity and a private sector entity, typically a project-specific special purpose corporation. Such arrangements usually involve a public entity contracting with a private entity to perform specific services including the design, construction, ongoing operations and maintenance, periodic capital maintenance and financing of a long dated asset such as a SASUTP.

While the public entity will retain ownership of the asset, the private entity will be given significant decision rights pertinent to the assumed services in order to successfully achieve agreed-to service/performance standards and to manage the risks applicable to such services. Compensation for performing such services will be in the form of either the rights to the toll revenues from the SASUTP (Toll Concession) or periodic payments from the public entity for continually making the SASUTP available to the public (Availability Payment Structure). The maximum contract term of the DBFOM agreement is set by the applicable authorizing legislation but in practice terms can be up to 50 years.

Private Activity Bonds (PABs): A bond issued on behalf of a local or state entity in order to finance a project that will benefit a private entity. If properly qualified, the interest on such bonds is generally tax exempt. However, the interest on such bonds is subject to the Federal Alternative Minimum Tax and as such the market yields on such bonds are higher because of this special tax treatment. Today, PABs are the primary debt component of a DBFOM for a SASUTP in the U.S. The availability of such "highway" PABs was first authorized in SAFETEA-LU. This law limited such PABs to a maximum of $15 Billion. The Moving Ahead for Progress in the 21st

Century Act (MAP-21) retained the PAB program but did not provide any increase to the national cap. As of May 2013, only $6.8 Billion remained unallocated. A project sponsor must apply to the USDOT for a specific project allocation.

Private Equity: A direct, capital investment in the project that is not debt and therefore cannot default. Similar to stock equity in a corporation, this private equity represents a new source of project capital that is available in the DBFOM option. Private Equity represents a strategic investment in the project-specific private entity by third party investors who have no right to any compensation except the right to the excess free cash from the project during the term of the DBFOM contract. Excess free cash is realized annually if the revenues of the project-specific private entity exceed its annual expenses. Annual excess free cash is then distributed as dividends to the private equity investors. As such these private equity investors are last in line and expose themselves to all the cost and revenue vagaries/risks of managing the project in accordance with the terms of the DBFOM contract that has a term well into the future. Accordingly, these equity investors will expect commensurate pretax cash returns to compensate them for their long term risk exposure. It is this equity investment that, in theory, aligns the long term interests of the private sector with the objectives of the public project sponsor, since failure to perform under the terms of the DBFOM contract risks the loss of this investment.

TIFIA: A federal loan/credit enhancement program (FHWA) authorized under the Transportation Infrastructure Finance and Innovation Act. Typically, large projects can receive up to 33% of their project costs as a subordinate loan, repayable under favorable terms and conditions. TIFIA allows a transportation project sponsor the opportunity to increase the leverage of a project's revenues/user charges on a subordinate loan, fixed rate, 35 year term. Increasing a project's leverage reduces the need for external public equity. Applicants must comply with certain conditions including an investment grade credit rating on the TIFIA assistance

Toll Concession: A form of DBFOM where the private sector entity is given the right to set, collect and apply the ongoing toll revenues of the SASTUP for an extended term of years. The toll revenues represent the funding stream for the project specific private entity to fund the life cycle costs of the project. A Toll Concession is typically configured as a long term lease so that the private entity achieves "tax ownership" and therefore can enjoy the tax benefits of depreciating the SASUTP improvements during the term on the concession. The private entity's right to set tolls is typically severely limited by the terms of the concession. In order to protect the SASUTP's future toll revenues from external deterioration, the concession typically limits the public entity's ability to construct future new highway capacity that might compete with the SASUTP.

Value for Money (VfM): What a government judges to be the optimum combination of quantity, quality, features and price expected over the whole of a project's life cycle. VfM attempts to encapsulate the interests of the public as taxpayers and recipients of the service derived from the project.

III. BRIEF OVERVIEW OF DBFOM

Figure 1 presents the structure and contractual relationships in a DBFOM. As illustrated in Figure 1, the DBFOM structure relies on a series of interrelated contracts that distribute tasks and risks to a project-specific private entity from a governmental project sponsor. The project-specific private entity then enters into back-to-back contracts with other private entities to further distribute some of the tasks and risks to those best able to perform such tasks.

Figure 1. DBFOM Structure and Contractual Relationships

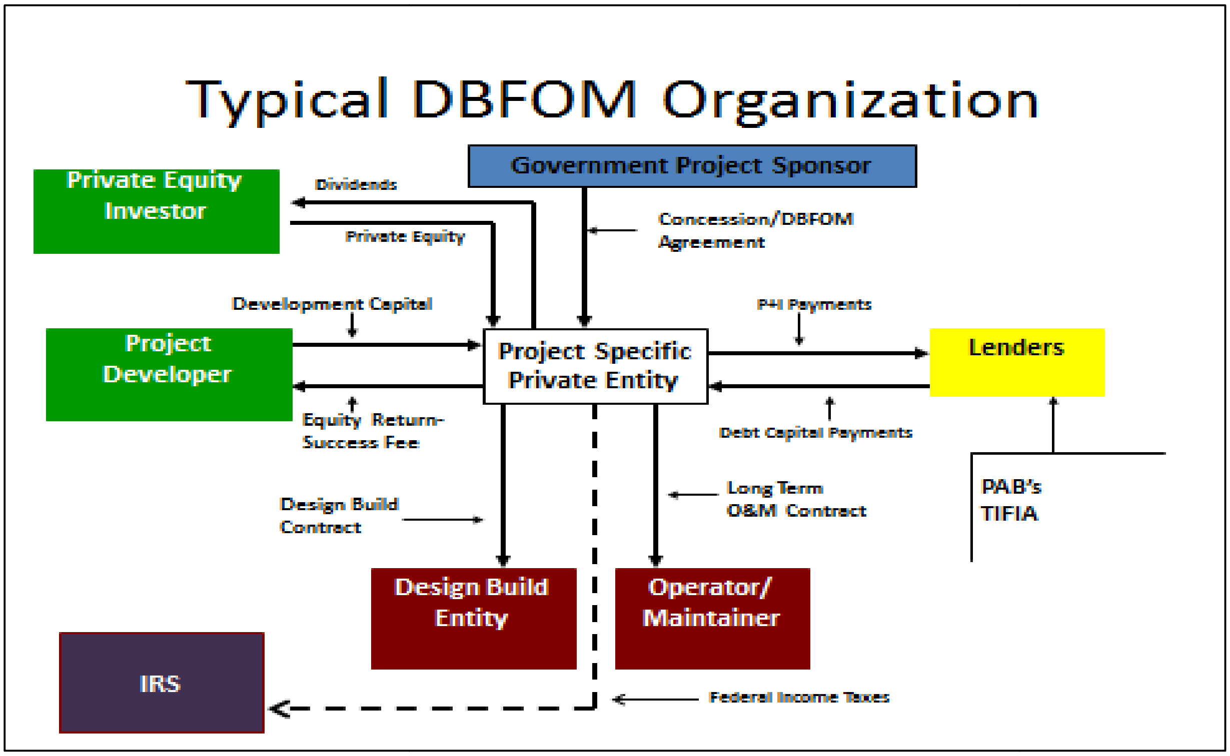
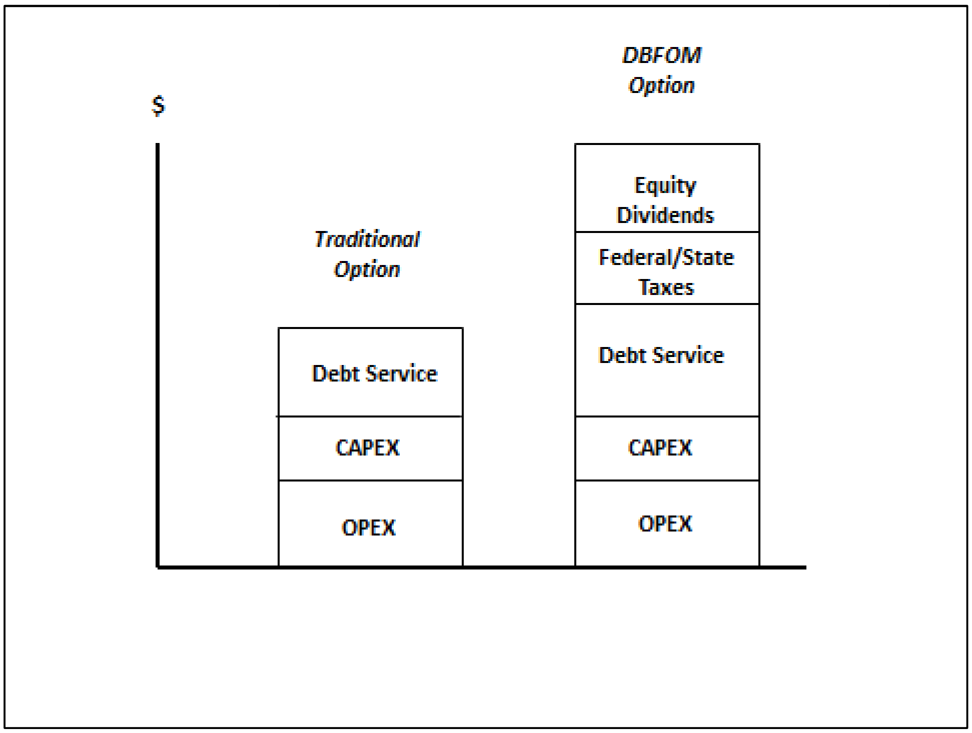


Figure 2 presents a stacked chart that illustrates the cash outflow components of the traditional and the DBFOM delivery models. Cash outflows are preferably funded from the ongoing toll revenues of the SASUTP. In the traditional delivery approach, if toll revenues, over time, exceed all cash outflow requirements, then surplus toll revenues or "toll equity" remain to be used by the project sponsor.

As illustrated on Figure 2, the DBFOM model includes two additional cash outflow components, or ongoing expenditure requirements, that are not present in the traditional project delivery approach. First, the Project Specific Private Entity is a taxable entity and therefore must pay federal and possibly state income taxes. Second, while the availability of private equity as a source of capital can be a new valuable benefit, it comes with a significant risk premium. In a SASUTP toll concession, with its inherent toll revenue risk, the upfront equity investment may be as much as 40% of the initial debt and equity capital structure., This equity investment can have an equity pretax return expectation of plus-or-minus 12%. In an availability payment DBFOM, without toll revenue risk, the upfront equity investment may be closer to 20% with an equity pretax return expectation of plus-or-minus 10%. The debt and private equity structure of a

DBFOM results in a significant higher weighted average cost of capital as compared to the traditional option. These higher finance costs plus federal tax payments can add significantly to a DBFOM life cycle cash outflow totals, all other items considered equal. Assuming comparable toll rates, a SASUTP is a zero sum endeavor with the total toll revenues of the project remaining the same regardless of which delivery option is used. The following table illustrates the different ongoing cash outflow requirements that the same total toll revenues of a SASUTP must attempt to fund. As illustrated in Figure 2, the DBFOM option is more expensive and it is this incremental expense impact that must be weighed in comparison to the benefits of transferring project related risks to the private partner.

Figure 2. Traditional and DBFOM Cash Outflow Components



IV. THE VALUE FOR MONEY (VFM) PARADOX

Since the early 1990s, there has been an increased use of DBFOM structures to deliver critical infrastructure in the world's developed countries such as the United Kingdom, Canada, Australia, France, Germany, and South Korea. Eventually, these procurement methods found their way to the U.S. in the early 2000s where there has been limited success as well as notable failures. However, unlike the P3 markets in these other developed countries who have a single, national, specialized P3 procuring agency, the U.S. market is highly fragmented with numerous transportation agencies, at the state and local levels, attempting to implement a DBFOM procurement.

The driving dynamic in the use of such non-traditional procurements is the pursuit of VfM. In other words, which delivery option, either the traditional or DBFOM, can result in the lowest life cycle cost regime without sacrificing the quality of service to the public. Since any VfM analysis includes both a qualitative as well as a quantitative component, ultimately some level of "judgment" is brought to bear by the public procuring agency. For any public project sponsor this judgment is enhanced with real experience with both delivery options.

In general, any government procurement should strive to achieve VfM, but this is particularly true in the U.S. when considering a DBFOM because little or no real experience with successful DBFOM procurements exist within U.S. government procurement agencies. A DBFOM procurement requires the public procuring agency, typically the public project sponsor, to shift gears dramatically. They must figure out how to competitively bid a complex transaction that is completely different from the low bid, short term contracts with which they have extensive experience. This new transaction includes a newly designed long term services contract:

- Involving multiple service components (design, build, operate, maintain and finance); and
- Encompassing a complicated risk allocation paradigm between the public and private sector based on the principle of allocating a risk to the party best able to cost efficiently manage the risk.

It is this transfer of risk to the private sector that allows the private entity to operate efficiently and to deliver VfM, while making a reasonable profit, both in the short and long term, on each of the multiple service components. It requires a very sophisticated approach on the part of the public procuring agency to design and ultimately negotiate a risk allocation paradigm that maximizes VfM for a specific project. The list of risks that must be allocated is long and varied and many risks are ultimately shared, not simply transferred or retained in whole by either party. There is a natural propensity for an inexperienced public procuring agency to over-allocate risks to the private sector. This will result in an inflated risk premium charged by the private sector without any offsetting benefit to the government or the public. Additionally, the public project sponsor must strive to eliminate any bias for one option or the other in the procurement process.

Accordingly, some form of ex ante ("before procurement") and ex post ("after procurement") VfM analysis is essential to

1. Support the public project sponsor's decision to move away from a traditional procurement,
2. Provide a template of the most "VfM productive" risk allocation, and
3. Confirm, after the procurement, that forecasted VfM values held up through the procurement and contract negotiation processes.

As previously mentioned, a VfM analysis includes both a quantitative and qualitative component. The quantitative component generally involves some sort of cost/benefit analysis that compares the full term, life cycle cost cash flows of the DBFOM option against the comparable cash flows of the traditional procurement approach, the in-house option. One of the inherent challenges in comparing these cash flows is to objectively "risk-adjust" the in-house or traditional option cash flows so that a comparison with the "risk loaded" cash flows of the DBFOM option is fair. Risk adjusting the in-house option involves some form of quantifying the cost of the retained project risks and adding this "risk premium" to the public project sponsor's raw estimate of the project's life cycle costs.

In the end, it is critical that the quantitative VfM analysis be free of bias. In order for the project sponsor to have confidence in the results of the VfM analysis, the VfM analysis must be firewalled from any subjective preferences for either the traditional or for the APD approach.

Suffice to say that no DBFOM procurement should be undertaken without some sort of VfM analysis so as to pragmatically underpin the ultimate procurement decision and also bolster the political will to ultimately procure and negotiate a successful DBFOM transaction, if such is the preferred approach.

V. WHEN IS THE DBFOM OPTION THE PREFERRED APPROACH FOR A SASUTP?

One take-away from the discussion of VfM is the notion that a public project sponsor should not consider the DBFOM option if there is no real need to transfer project related risk to a private, third party. For example, a mature, experienced toll agency such as the Florida Turnpike Enterprise is less likely to find VfM in a DBFOM option given their long, successful history of traditionally designing, constructing, financing and operating similar toll projects. All other things equal, the risk premium that will be charged by the private party will exceed the cost of retaining the risk by a sophisticated project sponsor.

Early on, ideal project candidates for a DBFOM option tend to demonstrate attributes such as:

- Strong stakeholder group support for the project
- Minimum apparent regulatory challenges
- Potential for accelerated development
- Sufficient size to attract equity investor attention
- Levels of complexity that suggest project risk transfer would be desirable

Assuming appropriate P3 authorizing legislation, a SASUTP public project sponsor can, in theory, deliver the project using either a traditional approach or by using an APD option such as a DBFOM structure. There is a reasonable probability that the project sponsor and/or a major project stakeholder already has experience with the traditional approach and is therefore legally and procedurally sophisticated at accomplishing the SASUTP's procurement and delivery using this method. That, however, may not be the case with a DBFOM structure where the lack of experience and skills in analyzing, procuring and negotiating this complex form of transaction can lead to less than optimum results.

Some of the more prevalent mistakes made by project sponsors when implementing a DBFOM structure include failure to:

1) Understand the initial, and ongoing, costs and time commitments applicable to designing, procuring, and negotiating the DBFOM option.
2) Equitably balance risk allocation between the public sponsor and the private sector.
3) Understand the ongoing costs and commitment to monitoring the long term activities of the private sector project entity over the extended term of the DBFOM services contract.
4) Develop and implement a DBFOM procurement process that maximizes hard dollar competition among a large group of qualified DBFOM applicants.
5) Secure a "bullet proof" political commitment to the DBFOM option prior to initiating the DBFOM procurement.
6) Secure sufficient statutory authority to procure and implement a DBFOM option.
7) Assemble a sufficiently experienced and skilled DBFOM procurement team that will be able to "match up" with the private sector team sitting across the negotiating table.

8) Adequately design and continually implement a sophisticated VfM analysis for the project.

To avoid these common pitfalls, public project sponsors who wish to implement a DBFOM option should:

- Anticipate and learn to be long term “partners” with shared responsibilities and decision rights with the private sector.
- Become highly knowledgeable in the subjects of project risks and analysis.
- Be committed to implementing a DBFOM procurement that maximizes competition.
- Develop and continually test the VfM potential of the DBFOM option versus the traditional approach of delivering a project.

APPENDIX J

How Stand-Alone, Start-up Toll Road Projects (SASUTPs) Are Traditionally Financed Technical Memorandum

North Belt Freeway Feasibility Study

How Stand-Alone, Start-up Toll Road Projects (SASUTP's) Are Traditionally Financed

Technical Memorandum

Developed by:

KSD Consulting, Inc.

In Consultation with:

FINAL

October 2013

Table of Contents

1. Introduction

During the last thirty years, more and more state and local governmental entities have turned to the “toll road” option to meet their needs for new interstate-like, congestion relief highways. This happened coincident with the real dollar shrinkage of tax supported highway funding throughout the country, the dramatic increase in urban traffic congestion, and the prevailing unwillingness of elected officials to increase traditional transportation taxes.

While many of these new toll highway projects were simply “extensions or additions” to mature existing toll highway systems, such as an extension of a state turnpike, a growing number are pure green-field projects. “Greenfield” refers to a new toll highway within a corridor alignment where no highway currently exists and as such it will not enjoy the traffic demand predictability that would be present if the new toll highway was replacing or expanding an existing highway. A greenfield project can be better termed as a “stand-alone, start-up toll project” (“SASUTP”).

In today’s reality adjusted financial markets, SASUTP’s are complex project finance endeavors. New SASUTP infrastructure is primarily financed with non-recourse debt secured by the project’s future toll revenues. In very few cases, are the future cash flows from a SASUTP sufficient to fully fund the life cycle costs of the asset. This “cash flow insufficiency” dynamic then becomes the central focus of the project finance team for an SASUTP.

Over the last 25 years, as more and more SASUTP’s have been successfully financed, a menu of reliable, market proven, supplemental funding enhancements have become available for a SASUTP project sponsor to consider.

The following Section 2 provides the definition of selected key terms used in the assessment of a SASUTP’s financial feasibility. Section 3 outlines the funding goals and objectives for a SASUTP, while Section 4 defines typical SASUTP project risks and Section 5 identifies financing challenges and sources. Finally Section 6 presents examples of successfully financed SASUTPs and Section 7 provides concluding remarks.

2. Selected Definitions

The following lists defined terms that are typically used related to the financing of SASUTP’s.

Annual Debt Service Coverage: a multiple that indicates the amount that annual toll revenues, after paying OPEX (“net revenues”), exceeds that year’s debt payments (principal + interest). Investors and credit rating agencies expect to see higher multiples for SASUTP’s because of the inherent risk of relying upon long term forecasts of toll revenues and life cycle costs. Higher annual debt service coverage minimums constrain the amounts of toll debt that the project can support for construction. This calculation is made using the equation below:

$$\textbf{Annual Debt Service Coverage} = \frac{(\textit{Annual Net Toll Revenues})}{(\textit{Annual Debt Service})}$$

For SASUTP's this annual calculation usually exceeds 2.0x's for the project's senior debt. Often a similar calculation is done that compares the total of Net Toll Revenues to Total Annual Debt Service during the term of the toll debt, many times this period exceeds thirty years. This **"Aggregate Debt Service Coverage Ratio"** is a basic indication of how much over-collateralization was necessary to secure an investment grade credit and satisfy bond investors that any toll revenue or life cycle cost anomalies can be absorbed by the project's cash flows without resulting in a debt default.

CAPEX: periodic capital investment to fund the renewal and replacement costs (R&R) of the toll highway.

Credit Rating: A grade given to a bond issue that indicates the credit quality of debt issued by a Project Sponsor to be repaid on a full and timely basis. A credit rating is typically assigned by an independent third party rating agency. A project's bonds sold publicly should have an investment grade rating. The higher the credit rating, the less likelihood the bonds will default. A lower default probability will result in a lower interest rate charged by lenders or buyers of the bonds.

Life Cycle Costs: Total cost of ownership of the highway during its useful life. Typically this includes cost of design, construction, acquisition, operations, maintenance, renewal and replacement and finance.

Non-Recourse Toll Project Debt: Typically bonds or loans secured only by the toll revenues from the toll highway. The lenders have no right to the asset, or toll highway, and must rely only on the sufficiency of the project's toll revenues.

Project Feasibility: Using long term forecasts of toll revenues and life cycle costs, a calculation of the sufficiency of toll revenues to fund all such costs. A feasibility ratio of 1.0 or greater suggests that the toll project is self-sufficient and "toll revenue feasible". A ratio of less than 1.0 indicates the need for other sources of supplemental non-toll capital and/or ongoing operating funds. A very low ratio of say less than 0.5 may suggest that the candidate highway project is simply not currently suitable for tolling. There are no hard and fast rules for this determination but suffice to say that some limited access, multi-lane highway projects, will not enjoy sufficient traffic demand and therefore will not produce sufficient toll revenues to minimally overcome their life cycle cost burden.

$$\textit{Toll Feasibility Ratio} = \frac{(\textit{Aggregate of Future Toll Revenues})}{(\textit{Aggregate of Future Life Cycle Costs})}$$

OPEX : Reoccurring cost to operate and maintain (O&M) the toll highway.

Project Sponsor: Typically the lead governmental entity that will finance, construct and operate/maintain the toll project. Such functions may be done directly by the project sponsor or out sourced, contractually, to another government agency or private entity. This lead entity may be a state DOT, an existing toll agency, or even a county or city.

Project Stakeholder Group: Narrowly defined to include the project sponsor and other public entities who commit to investing public equity in the toll highway project. Project stakeholders, other than the project sponsor, typically will derive some form of real benefit from the SASUTP and can include USDOT, a state DOT, an existing toll agency, a county or city, and even special purpose taxing districts.

Public Equity: For traditionally financed toll projects by governmental project sponsors, this refers to the direct or indirect investment of non-toll public funds used to assist in meeting the life cost funding needs of the toll project when the project is not toll revenue feasible. Public equity effectively allocates a portion of the project's risks over a larger, diversified financial base.

3. Funding Goals and Objectives for SASUTPs

SASUTP's are notorious for having life cycle costs in excess of potential toll revenues, resulting in a feasibility ratio less than 1.0. Accordingly, the hard reality of financing a SASUTP is how to convert project stakeholder support for the project into sufficient public equity commitments, so that the project can move forward. Each project has its own history and set of specific challenges. When we look closely at a SASUTP's nominal, long term, cash flow forecasts, we find rough approximations of life cycle costs as follows:

Type of Life Cycle Cost	Allocation	Time Frame	Source of Funding
OPEX	**20%**	**Over Time**	**Toll Revenues**
CAPEX	**5%**	**Over Time**	**Toll Revenues**
Finance	**30%**	**Over Time**	**Toll Revenues**
Construction	**45%**	**Upfront**	**Toll Debt/Loans**
Total	**100%**		

It is important that project stakeholders, who are making public equity commitments, diligently analyze the risks of such commitments, especially for those associated with life cycle costs that are long term in nature.

Funding Goal#1- Maximize the project's toll revenues in order to minimize the amount of public equity.

Not all new highway projects are good candidates for tolling. First, toll highways are expensive in terms of life cycle costs and second substantial traffic demand or traffic congestion is typically required in order to potentially qualify a project for tolling. Higher traffic demand equates to a higher potential toll rate which equates to more future toll revenues which then reduces or eliminates the need for public equity. However, in all cases, there is a toll rate at which additional toll revenues will not be achieved. That toll rate will be relatively higher, and the project more feasible, with higher levels of pent up traffic demand, such as found in highly congested corridors. The aim of Funding Goal #1 is to identify that toll rate which maximizes toll revenues and to determine its influence on the SASUTP's public equity requirement.

Funding Goal #2 – Minimize the SASUTP's cost of capital.

Referring back to the previous matrix, finance costs are one of the dominant life cycle cost items. Finance or debt costs are a function of the capital structure and the project's weighted cost of capital. For traditionally financed public toll projects, the project's weighted cost of capital equates to the weighted interest rate on the project's bonds and loans. Project sponsors typically issue investment grade, tax exempt toll revenue bonds prior to the start of construction. The proceeds from these bonds and other project loans will be sufficient to fund the project's construction and the interest payments on such debt prior to the initiation of toll operations.

The primary financing tool for a SASUTP are toll revenue bonds secured by the project's future toll revenues, net of OPEX (Net Pledge Structure). Such bonds typically have an initial credit rating at the minimum investment grade level of BBB-. This low credit rating is a consequence of the higher default risk associated with financing a high risk, start-up asset. Bond investors will require a higher interest rate on such debt in order to compensate them for the incurred risks. An illustration of this credit rating versus interest rate relationship, in today's market, is shown below:

Credit Rating	Interest Rate on 30 year Bond	Difference or Spread from AAA
AAA	**4.45%**	**0.00%**
AA	**4.75%**	**0.30%**
A	**5.16%**	**0.71%**
BBB	**5.56%**	**1.11%**
BBB-	**5.85%**	**1.40%**

Based on Thomson Reuters' Municipal Market Data as of August 28, 2013

4. Project Risks

An SASUTP starts as a project with no operable assets and no toll revenue or operating history, based only on a set of toll revenue and whole life cost forecasts available to convince debt investors to lend capital to the project. Imbedded within the credit rating is a detailed examination of how capable the project sponsor will be to manage and mitigate the project's inherent risks. These major risks include:

Construction Risk - the risk applicable to the construction of the SASUTP on time and on-budget. Failure to complete the project on time means that toll operations cannot begin as forecasted and toll revenues do not start as anticipated by investors. Failure to complete the project on-budget means additional, unanticipated, capital funds must be sourced to complete the project, initiate toll operations and begin collecting tolls.

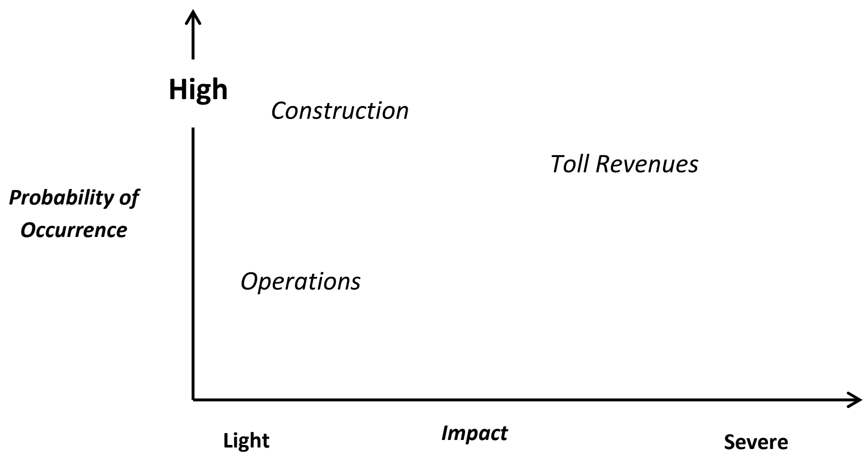
Construction Risk is managed through the use of Design-Build construction contracts, contracting with highly qualified and experienced contractors, project completion insurance, and third party construction completion guarantees.

Toll Revenue Risk - the risk that actual toll revenues will be less than forecasted. Toll revenues can be less because base traffic demand for the project does not occur as forecasted, annual traffic demand growth does not occur as forecasted, and actual economic conditions are different than assumed in the forecasts. These risks are managed by developing reliable toll traffic and revenue forecasts by highly qualified and experienced consultants and by limiting the amount of construction debt secured by toll revenues, thereby maintaining high levels of aggregate debt service coverage.

There are inherently significant levels of uncertainty applicable to SASUTP traffic and toll revenue forecasts. Toll roads are not monopolistic and future traffic demand will be influenced by many factors that are not necessarily easily modeled and forecasted, particularly over an elongated future time frame of say 30-40 years. This is particularly true for SASUTP's since their traffic forecasts almost always incorporate some level of periodic toll rate adjustment to offset inflation and maximize the toll revenue potential of the asset. Independent traffic and revenue forecasts have also demonstrated a certain level of optimism bias. Rating agencies and lenders have learned the hard way to "haircut" toll revenue forecasts in order to minimize their exposure to cash flow deficiencies, particularly during the initial years of operation.

Operations Risk – the risk that actual OPEX and or CAPEX costs will exceed forecasts with the result that less net toll revenues will be able to service the project's debt/loans. OPEX/CAPEX costs can be greater than expected due to poor forecasting, poor implementation of the required technology and processes, inexperienced operators/personnel, actual economic conditions such as inflation different from those assumed in the forecasts, etc. These risks are managed by utilizing a highly qualified, independent consultant to forecast life OPEX and CAPEX cost, sourcing the ongoing operations and maintenance of the asset to an experienced operator, and providing a third party OPEX/CAPEX guarantee.

The following graphic illustrates the probability and level of impact of these three risks on the SASUTP.



5. Financing Challenges and Typical Sources of SASUTP Funding

When viewed from a distance, the financing of an SASUTP really boils down to overcoming two primary challenges:

Challenge #1- How to source sufficient capital and ongoing operating funds

Challenge #2- How to structure an investment grade credit rating

Failure to solve these challenges either dooms the delivery of the SASUTP, or to struggle and possibly fail over time. Given the propensity for SASUTP's to have feasibility ratios less than 1.0, both challenges almost always exist together for a given SASUTP. Inevitably, the solution to these challenges begins with a strong, sophisticated project stakeholder group which will ultimately commit, in various forms, to investing sufficient public equity to make the project feasible.

Public equity comes in two forms: direct public equity or indirect public equity. Direct public equity is a direct investment of non-toll funds either to supplement upfront construction funding or to unconditionally provide continued, ongoing supplemental funding for finance, OPEX or CAPEX. Indirect public equity involves some form of credit enhancement through the use of a non-recourse contractual pledge to provide contingent or conditional, future non-toll funding for construction, finance, OPEX or CAPEX. Project stakeholders are the source of public equity and in any SASUTP there may be multiple stakeholders contributing multiple sources of either direct or indirect public equity. There are no fixed solutions only a willingness of the project stakeholder group to find a collaborative finance solution for their SASUTP. Some common examples of direct public equity include:

1. Construction grants or loans from non-toll sources of public funds
2. Construction grants or loans from bonds secured by non-toll sources of revenues
3. Contributions of land or existing highway infrastructure
4. Unconditional pledges of specific amounts of non-toll funding to be made available to supplement toll revenues

The USDOT has become an important "direct public equity" stakeholder in many new toll project financings through the workings of the Transportation Infrastructure Finance and Innovation Act ("TIFIA"). Created in the late 1990's this program makes low cost, subordinate loans secured by future toll revenues.

Some common examples of indirect public equity include:

1. A secondary or backup pledge of non-toll revenue to the project's toll revenue bonds
2. A secondary or backup commitment to appropriate funds in order to make up an annual debt service deficiency of the project's toll revenue debt
3. A project completion guarantee secured by the balance sheet of one or more of the project's stakeholders
4. A guarantee to appropriate non-toll funds to pay OPEX and/or CAPEX, if toll revenues are insufficient, allowing for a gross pledge structure

6. Selected Examples of Successfully Financed SASUTP's

The following "Finance Structure Matrix for SASUTP Examples" attempts to illustrate the funding collaborations created by project stakeholder groups to actually get a SASUTP financed and under construction. Three projects were chosen that collectively demonstrate the range of options utilized in recent years.

1. **The Central Texas Project in Texas**
   Financed in 2002 and opened to traffic in 2008, this 67 mile, $2.9 billion SASUTP generally provides a toll highway bypass alternative around Austin, Texas and the highly congested I-35 corridor. The project sponsor was the Texas Turnpike Authority with a project stakeholder group that included the Texas Department of Transportation (TxDOT), USDOT, and local, affected governments.
2. **The Triangle Expressway Project in North Carolina**
   Financed in 2009 and opened to traffic in 2012**,** this 19 mile, $878 million SASUTP is the southwest portion of an outer beltway highway around Raleigh, NC. The project sponsor was the North Carolina Turnpike Authority with a project stakeholder group that included the

North Carolina Department of Transportation (NCDOT), USDOT, and the State of North Carolina

3. The Grand Parkway Project in Texas

Financed in 2013 and to be opened to traffic in 2016, this 55 mile, $2.4 billion SASUTP provides a northwest portion of an outer beltway around Houston, Texas. The project sponsor is the Grand Parkway Transportation Corporation, a special purpose non-profit entity created by TXDOT. The project stakeholder group includes TXDOT and USDOT.

7. Conclusion

Hopefully it is evident that creating and implementing a viable, publicly-sponsored finance solution for a SASUTP is much about the project stakeholder group's willingness to maximize the project's toll revenues and to ultimately contribute sufficient amounts of required public equity to fund the project's life cycle costs. Past experience has proven that an early, credible feasibility analysis of the project by the Project Sponsor can significantly assist in managing the expectations of all parties as regards the suitability of the new highway as a SASUTP. This feasibility analysis will also illustrate the magnitude of any public equity requirement and begin to allow the development of various options for achieving this requirement.

Finance Structure Matrix for SASUTP Examples

Project Name	Initial Toll Rate/Mile (Pass. Car)	Approx. Cost per Mile (millions)	Toll Bonds' Aggregate Debt Service Coverage Ratio	State DOT Construction Funding	USDOT Construction Funding	State/Local Government Construction Funding	Donations of Assets or Right-of-Way	Toll Revenue Bond Credit Support	OPEX/CAPEX Funding Support or Guarantees
Central Texas Project (TXDOT)	12.5 cents (2008$)	$33.5	1.91 x's	- $700 million of construction funds	- $900 million TIFIA Subordinated Construction Loan	-$512 million for ROW acquisition from local governments			- TXDOT covenant to cover any OPEX or CAPEX shortfalls - TXDOT covenant to complete construction
Triangle Expressway (NCDOT)	15.0 cents (2013$)	$46.2	2.96 x's	- $ 25 million from the State - $ 160 million of prior development costs paid by NCDOT	- $387 million TIFIA Subordinated Construction Loan	- $ 353 million from State Appropriation Bonds	- 2.8 miles of existing highway donated by NCDOT -$15 million local ROW contribution	- Limited pledge of State Approp	- NCDOT covenant to replace draws from OPEX reserve - NCDOT covenant to complete construction - NCDOT covenant to fund any unforeseen CAPEX shortfalls
Grand Parkway (TxDOT)	19.0 cents (2015$)	$44.5	2.15 x's	- TxDOT advance construction funding	TxDOTseeking $1.2 billion TIFIA Subordinated Loan to refinance interim construction financing and taxable bonds			- $9.6 Billion TxDOT Toll Equity Loan available to pay debt service deficiencies on certain Toll bonds	- $9.6 Billion TxDOT Toll Equity Loan available to pay OPEX and CAPEX deficiencies

APPENDIX K

Interim Financial Feasibility Report

Interim Financial Feasibility Report

Developed by:

KSD Consulting, Inc.

In Consultation with:

FINAL

June 2014

Table of Contents

1. INTRODUCTION

The Arkansas State Highway and Transportation Department (AHTD), similar to other transportation agencies across the nation, is facing tremendous challenges in providing needed transportation improvements with limited local, state, and federal funds. In light of declining revenues and increasing demands for transportation infrastructure, the AHTD partnered with Metroplan to evaluate the feasibility of tolling the North Belt Freeway as a means to accelerate development of this strategic project. The feasibility analysis includes an assessment of project costs, toll revenues, and financial strategies based on a net toll revenue scheme.

The North Belt Freeway is proposed as a new alignment four-lane divided, controlled-access facility between Interstate 40 (I-40) and Highway 67 in central Arkansas. The corridor spans approximately 13 miles completing the connection between I-430 in the west and Highway 440 in the east.

The objective of the financial feasibility analysis is to assess the capacity of toll revenues generated by the North Belt Freeway to support initial construction costs and on-going lifecycle costs. It is important to note that toll revenues for start-up, stand-alone toll projects like the North Belt Freeway are not typically sufficient to meet all initial construction and on-going life-cycle costs. Consequently, they are dependent upon some level of external support in addition to toll revenues. Such support, typically referred to as "public equity", can be in the form of a non-cash credit enhancement such as a commitment by a public entity to cover operating costs and/or debt service costs to the extent toll revenues are insufficient. In addition, public equity can be direct funding contributions from a public entity for either construction or to support the ongoing life cycle costs.

Three scenarios were tested to assess the funding feasibility of the project's toll revenues. The Base Case considered the capacity of annual net toll revenues, after the payment of annual operations and maintenance expenses (Net Pledge). Next, two non-cash, credit enhancement structures were considered (referred to as Gap Analysis 1 and 2). Gap Analysis 1 assumed operations and maintenance expenses would be covered by an external public entity funding source to the extent toll revenues are insufficient. This allows debt service to be paid prior to operating and maintenance expenses (Gross Pledge) and consequently increases the amount to toll debt that can be supported. Gap Analysis 2 also assumes use of the Gross Pledge and includes a commitment by a public entity to fund debt service payments to the extent toll revenues are not sufficient (Gross Pledge plus Public Entity Back-up). This scenario provides additional financing capacity because the commitment by an external source to pay debt service is expected to improve the project's credit quality, lower its debt service expense and reduce the annual debt service coverage ratio requirement. Table 1 summarizes the three scenarios that were tested.

Table 1
Financing Scenarios

Approach	Revenue	Debt Payment Priority	Public Entity payment obligation?
Net pledge (Base case)	Toll revenues less O&M	After OPEX	No
Gross pledge (Gap Analysis 1)	Toll revenues	Before OPEX	Yes, if toll revenues are less than OPEX
Gross pledge plus potential Public Entity backup (Gap Analysis 2)	Toll revenues	Before OPEX	Yes, if toll revenues are less than OPEX and Debt Service

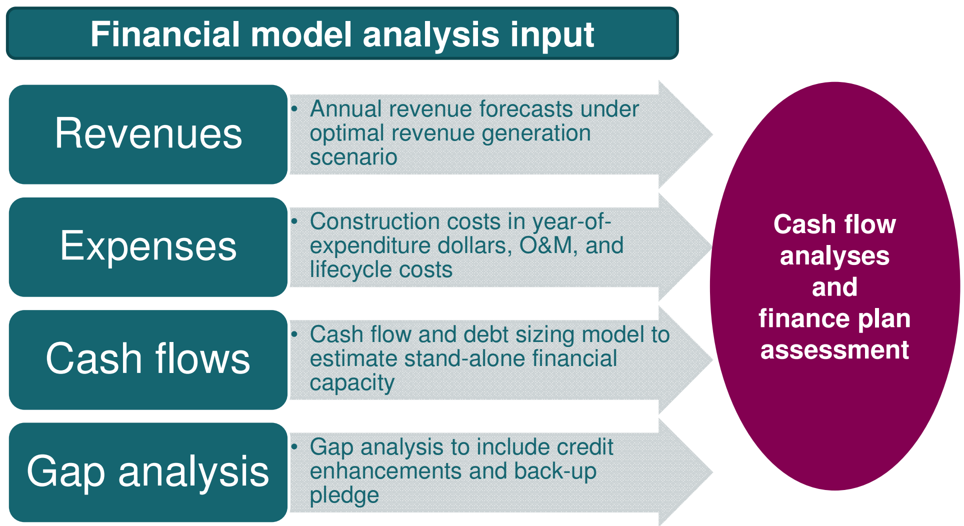
As described more fully in this technical memo, the results of the financial analysis indicate there is a significant funding gap between the project's financing capacity and its needs. While the gap scenarios do improve the project's funding, a gap of at least $453 million remains. As a result, the financial feasibility of the project is highly dependent upon significant, up-front, external funding support.

Following this introduction, Section 2 describes the approach that was undertaken for the financial analyses, while Section 3 provides the analyses results. Section 4 presents the summary findings. The Appendix provides the detailed cash flows for the analysis scenarios.

2. APPROACH

The financial analysis integrates the results of the traffic and revenue forecasting, capital costing, operations and maintenance and rehabilitation and replacement costing efforts into a comprehensive cash flow model. Table 2 summarizes the approach.

Table 2
Financial Analysis Approach



A. Data Inputs

The first step in conducting the toll feasibility analysis was to develop an estimate of the project costs which includes capital costs to construct the facility and annual operations and maintenance and periodic rehabilitation and replacement costs. The total construction cost for the North Belt Freeway is estimated to be $459 million in 2013 dollars. The bridge structures represent approximately 40% of this total. The total project cost increases to approximately $575 million in 2013 dollars when including the other project cost elements required to implement the project.

For purposes of this analysis, it was assumed the project would be completed in 2020. To meet this opening date, construction is anticipated to begin in January 2018. Therefore, the construction cost estimate was adjusted for inflation. Year of expenditure (YOE) costs are calculated by applying a 2.5% annual inflation rate to base year (2013) cost estimates. Based on the project's construction schedule and spend down, total year of expenditure cost was estimated to be $647.9 million.

Costs to operate and maintain the North Belt Freeway over the life of the facility were estimated and incorporated into the feasibility analysis. Toll operations costs represent costs that are incurred to process toll transactions and maintain the toll systems. The toll operations costs are the largest component of the total costs. Roadway maintenance costs include expenses to cover routine maintenance activities, such as litter management, mowing, signing, and pavement marking and striping. The last cost component is the renewal and replacement costs. These are major maintenance costs that are incurred on a periodic basis to rehabilitate the roadway assets and toll systems.

A forecast of potential traffic and toll revenue (T&R) was also developed. The traffic and revenue forecasts were based on a sketch level analysis to quantify the expected toll revenue of the project. Consistent with the project implementation schedule, the T&R forecast is based on an opening date of 2020. A toll sensitivity analysis was performed to arrive at a base toll rate of $0.20 per mile for passenger vehicles in the opening year. This rate was increased by 3.1 percent annually throughout the forecast years based on regional CPI annual growth from 1980-2012.

B. Financial Model

A comprehensive financial planning model was developed to assess the financial capacity of the North Belt Freeway's toll revenues to fund its initial construction needs and on-going operations, maintenance, and rehabilitation and replacement (R&R) costs. Debt secured by toll revenues is issued to finance the project's initial construction costs. Debt is assumed to be based on a tax exempt structure and similar to other start-up stand-alone toll roads. It would include a mix of debt products including current interest bonds, capital appreciation bonds and convertible capital appreciation bonds. This approach allows annual debt service payments to be structured based on the projected growth in toll revenues, using an escalating back-loaded profile and a 40-year term. Given any expected financing for the project would be several years away, interest rate assumptions included additional basis points to account for future rate variability. Base rates reflect the ten year average of the AAA, tax exempt index, and include an additional 50 basis points to address the potential for future interest rate variability. It is assumed that the Base Case and Gap Analysis 1 structures, if feasible, would receive the lowest investment grade rating BBB-. As a result, reflecting the credit quality of the debt, current interest bonds would have additional spread of 186 basis points, while convertible capital appreciation bonds and capital appreciation bonds would have additional spreads of up to 281 and 315 basis points, respectively. Gap Analysis 2, which assumes the commitment of a public entity to pay debt service if needed, would result in an 'A' rating on the bonds. As a result, the spread for current interest bonds, convertible capital appreciation bonds and capital appreciation bonds for this scenario would be lower at up to 110, 185 and 230 basis points, respectively. Given the above interest rate and debt structuring assumptions, the true interest cost for the Base Case and Gap Analysis 1 structures, consistent with their rating was assumed to be 7.2%, while the Gap Analysis 2 structure was assumed to have a true interest cost of 6.3%.

Since toll revenues for start-up stand-alone toll road projects are subject to variability given their reliance on forecasts of future economic, demographic and travel conditions, the capital markets and rating agencies require pledged toll revenues to exceed debt service by a significant multiple, known as a debt service coverage ratio. For the Base Case and Gap Analysis 1 structures, a financially feasible project would have an average annual debt service coverage ratio of 2.5 times annual debt payments (2.5x). A gross pledge plus public entity back-up (Gap Analysis 2) offers more protection to bondholders and requires a lower debt service coverage ratio, averaging about 2.0x.

3. RESULTS

A. Present Value Feasibility Analysis

As a first step, a high level present value analysis was conducted to define the capacity of toll revenues to meet project needs. A discount rate equal to the 7.2% true interest cost for the Base Case was assumed. The present value analysis shows a funding gap of $375.2 million between toll revenues and project costs, indicating the project requires significant external funding support (see Table 3).

Table 3
High Level Present Value Feasibility Analysis

Revenue/Cost Item	Present Value Revenues/Costs
Toll Revenues	$358,261,000
Construction Cost	$574,791,000
Operations and Maintenance Cost	$117,408,000
Rehabilitation and Replacement Cost	$41,242,000
Net	($375,180,000)

B. Cash Flow Analysis

Following this initial assessment, a more detailed year-by-year cash flow analysis was undertaken to evaluate the magnitude of the funding gap based on capital market requirements and the three alternative financing structures. Similar to other start-up stand-alone toll road projects, the North Belt Freeway's initial capital costs would primarily be debt financed. Table 4 presents a summary of the results for each scenario, while Appendix A provides the detailed cash flows.

Table 4
Summary of Financial Analysis Options

Approach	Revenue Available	O&M Coverage/ Backup	Public Entity Debt Payment Obligation (Y/N)	Available Total Sources ($M)	Bond Rating/ Required Coverage Ratio	Remaining Funding Gap ($M)
Net pledge (Base case; optimum revenue)	Toll revenues less O&M	Toll revenues only	No	117.4	BBB-/2.5x	(561.7)
Gross pledge (Gap Analysis 1)	Toll revenues	Public Entity provides backup	No	170.7	BBB-/2.5x	(517.5)
Gross pledge plus Public Entity credit enhancement (Gap Analysis 2)	Toll revenues	Public Entity provides backup	Yes	252.9	A/2.0x	(453.1)

4. SUMMARY

Based on capital markets and rating agency debt service coverage ratio and reserve requirements, the funding gap for each of the scenarios is higher than under the high level present value analysis. While the gap analysis scenarios do reduce the funding gap to some degree, it remains at least $453 million. Given the significant gap between resources and needs, an alternative delivery approach/public private partnership would also be infeasible. As a result, the project's funding would be heavily reliant on external funding sources. However, a portion of the external funding could be re-paid over the project's lifecycle from the amount of revenues providing excess coverage on annual debt service.

APPENDIX A
FINANCIAL ANALYSIS CASH FLOW SCENARIOS

Arkansas State Highway and Transportation Department

North Belt Freeway

Net Revenue Pledge (Base Case)

As of February 14, 2014

Table of Contents

Plan of Finance

A. Assumptions

Issuance Timing

Project Revenue Bonds	1/1/2016

Interest Rates

Project Revenue Bonds	10 year average MMD (Municipal Market Data)
Cushion	50 bps
Credit	BBB-

Fund Annual Earning Rates

Short-Term Fund	Rate	Applied Period
Construction Fund	0.50%	All years
Capitalized Interest Fund	0.50%	
Debt Service Fund	0.50%	
Revenue Fund	0.25%	

Long-Term Fund	Rate	Applied Period
Debt Service Reserve Fund	0.50%	All years
General O&M Fund	0.50%	

A. Interest Rate Assumptions

Year	10-year Average AAA MMD	Cushion	Project Revenue Bonds					
			Current Interest Bonds		Convertible Capital Appreciation Bonds		Capital Appreciation Bonds	
			Spread	Rate	Spread	Rate	Spread	Rate
2016	1.42%	50 bps	70 bps	2.62%	165 bps	3.57%	315 bps	5.07%
2017	1.65%	50 bps	90 bps	3.05%	185 bps	4.00%	315 bps	5.30%
2018	1.83%	50 bps	110 bps	3.43%	205 bps	4.38%	315 bps	5.48%
2019	2.03%	50 bps	120 bps	3.73%	215 bps	4.68%	315 bps	5.68%
2020	2.24%	50 bps	130 bps	4.04%	225 bps	4.99%	315 bps	5.89%
2021	2.45%	50 bps	140 bps	4.35%	235 bps	5.30%	315 bps	6.10%
2022	2.64%	50 bps	150 bps	4.64%	245 bps	5.59%	315 bps	6.29%
2023	2.82%	50 bps	160 bps	4.92%	255 bps	5.87%	315 bps	6.47%
2024	2.99%	50 bps	170 bps	5.19%	265 bps	6.14%	315 bps	6.64%
2025	3.12%	50 bps	180 bps	5.42%	275 bps	6.37%	315 bps	6.77%
2026	3.24%	50 bps	180 bps	5.54%	275 bps	6.49%	315 bps	6.89%
2027	3.35%	50 bps	180 bps	5.65%	275 bps	6.60%	315 bps	7.00%
2028	3.45%	50 bps	180 bps	5.75%	275 bps	6.70%	315 bps	7.10%
2029	3.53%	50 bps	180 bps	5.83%	275 bps	6.78%	315 bps	7.18%
2030	3.61%	50 bps	180 bps	5.91%	275 bps	6.86%	315 bps	7.26%
2031	3.69%	50 bps	180 bps	5.99%	275 bps	6.94%	315 bps	7.34%
2032	3.75%	50 bps	180 bps	6.05%	275 bps	7.00%	315 bps	7.40%
2033	3.82%	50 bps	180 bps	6.12%	275 bps	7.07%	315 bps	7.47%
2034	3.88%	50 bps	180 bps	6.18%	275 bps	7.13%	315 bps	7.53%
2035	3.94%	50 bps	180 bps	6.24%	275 bps	7.19%	315 bps	7.59%
2036	3.99%	50 bps	180 bps	6.29%	275 bps	7.24%	315 bps	7.64%
2037	4.05%	50 bps	180 bps	6.35%	275 bps	7.30%	315 bps	7.70%
2038	4.09%	50 bps	180 bps	6.39%	275 bps	7.34%	315 bps	7.74%
2039	4.13%	50 bps	180 bps	6.43%	275 bps	7.38%	315 bps	7.78%
2040	4.15%	50 bps	180 bps	6.45%	275 bps	7.40%	315 bps	7.80%
2041	4.04%	50 bps	180 bps	6.34%	275 bps	7.29%	315 bps	7.69%
2042	4.09%	50 bps	180 bps	6.39%	275 bps	7.34%	315 bps	7.74%
2043	4.12%	50 bps	180 bps	6.42%	275 bps	7.37%	315 bps	7.77%
2044	4.15%	50 bps	180 bps	6.45%	275 bps	7.40%	315 bps	7.80%
2045	4.21%	50 bps	180 bps	6.51%	275 bps	7.46%	315 bps	7.86%
2046	4.21%	50 bps	182 bps	6.53%	277 bps	7.48%	315 bps	7.86%
2047	4.21%	50 bps	184 bps	6.55%	279 bps	7.50%	315 bps	7.86%
2048	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2049	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2050	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2051	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2052	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2053	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2054	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2055	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%

B. Sources and Uses and Financing Statistics

Sources	
CIBS Par Amount	$54,445,000
CCABS Par Amount	46,028,026
CABS Par Amount	13,396,323
+Premium/-Discount	-
Bonds Proceeds	113,869,349
Construction Fund Earnings	3,560,339
Total Sources	**117,429,688**
Uses	
Total Construction Fund	$647,918,000
Debt Service Reserve Fund	11,386,935
Capitalized Interest Fund	17,418,570
Underwriters' Discount	740,151
Cost of Issuance	284,673
O&M Reserve	1,355,680
Funding Gap	(561,674,321)
Total Uses	**117,429,688**

Coverage	
Average Coverage Ratio	2.50x
Interest Cost	
True Interest Cost (TIC)	7.1925%

C. Flow of Funds

Period	Pledged Revenue			Total Gross Revenues	General O&M		Net Revenue
		Fund Earnings					
	Toll Revenues	Revenue Fund	General O&M Reserve		Annual Cost	Annual Reserve Deposit	
2016							
2017							
2018							
2019							
2020	10,326,000			10,326,000	(5,422,719)		4,903,281
2021	13,056,000	8,492	6,778	13,071,270	(6,262,469)	(209,938)	6,598,864
2022	16,037,000	11,118	7,828	16,055,946	(7,142,279)	(219,952)	8,693,716
2023	19,282,000	14,026	8,928	19,304,954	(8,060,974)	(229,674)	11,014,306
2024	22,804,000	17,233	10,076	22,831,310	(9,017,204)	(239,058)	13,575,048
2025	26,617,000	20,760	11,272	26,649,031	(10,009,295)	(248,023)	16,391,714
2026	27,942,000	22,111	12,512	27,976,623	(10,253,145)	(60,962)	17,662,516
2027	29,313,000	23,525	12,816	29,349,341	(10,492,970)	(59,956)	18,796,416
2028	30,733,000	25,006	13,116	30,771,122	(10,728,203)	(58,808)	19,984,110
2029	32,203,000	26,556	13,410	32,242,966	(10,958,175)	(57,493)	21,227,298
2030	33,724,000	28,177	13,698	33,765,875	(11,182,274)	(56,025)	22,527,577
2031	35,464,000	29,785	13,978	35,507,763	(11,636,037)	(113,441)	23,758,285
2032	37,295,000	31,482	14,545	37,341,027	(12,109,064)	(118,257)	25,113,707
2033	39,220,000	33,272	15,136	39,268,409	(12,602,222)	(123,290)	26,542,897
2034	41,245,000	35,161	15,753	41,295,914	(13,116,409)	(128,547)	28,050,958
2035	43,374,000	37,152	16,396	43,427,547	(13,652,474)	(134,016)	29,641,057
2036	45,613,000	39,252	17,066	45,669,318	(14,211,345)	(139,718)	31,318,255
2037	47,967,000	41,466	17,764	48,026,230	(14,794,157)	(145,703)	33,086,370
2038	50,444,000	43,803	18,493	50,506,295	(15,401,882)	(151,931)	34,952,483
2039	53,047,000	46,264	19,252	53,112,517	(16,035,648)	(158,442)	36,918,426
2040	55,786,000	48,862	20,045	55,854,906	(16,696,561)	(165,228)	38,993,117
2041	58,665,000	51,599	20,871	58,737,470	(17,385,798)	(172,309)	41,179,362
2042	61,694,000	54,487	21,732	61,770,219	(18,104,699)	(179,725)	43,485,794
2043	64,878,000	57,529	22,631	64,958,160	(18,854,406)	(187,427)	45,916,328
2044	68,227,000	60,738	23,568	68,311,306	(19,636,453)	(195,512)	48,479,342
2045	71,749,000	64,121	24,546	71,837,667	(20,452,154)	(203,925)	51,181,588
2046	75,453,000	67,687	25,565	75,546,253	(21,303,053)	(212,725)	54,030,475
2047	79,348,000	71,447	26,629	79,446,076	(22,190,603)	(221,887)	57,033,585
2048	83,444,000	75,409	27,738	83,547,148	(23,116,585)	(231,495)	60,199,067
2049	87,751,000	79,585	28,896	87,859,481	(24,082,623)	(241,509)	63,535,349
2050	92,281,000	83,988	30,103	92,395,092	(25,090,306)	(251,921)	67,052,865
2051	97,044,000	88,628	31,363	97,163,991	(26,141,807)	(262,875)	70,759,308
2052	102,054,000	93,519	32,677	102,180,196	(27,238,807)	(274,250)	74,667,139
2053	107,322,000	98,673	34,049	107,454,722	(28,383,474)	(286,167)	78,785,081
2054	112,862,000	104,105	35,479	113,001,584	(29,577,901)	(298,607)	83,125,077
2055	118,688,000	109,830	36,972	118,834,802	(30,824,069)	(311,542)	87,699,191
Total	1,992,952,000	1,744,851	701,680	1,995,398,531	(592,168,243)	(6,350,338)	1,396,879,950

C. Flow of Funds

Period	DSRF Deposit		M&R		General Reserve Fund		
	Net Senior DS	Senior DSRF Deposit/Release	Annual Reserve Deposit	Residual Toll Revenues after Expenses and Reserve	Beginning Balance	Deposit	Ending Balance
2016							
2017							
2018							
2019							
2020				4,903,281		4,903,281	4,903,281
2021	(3,511,484)		(3,064,890)	22,488	4,903,281	22,488	4,925,769
2022	(3,511,484)		(3,064,890)	2,117,340	4,925,769	2,117,340	7,043,109
2023	(4,266,484)		(3,064,890)	3,682,931	7,043,109	3,682,931	10,726,040
2024	(5,251,484)		(3,064,890)	5,258,673	10,726,040	5,258,673	15,984,712
2025	(6,341,484)		(3,064,890)	6,985,338	15,984,712	6,985,338	22,970,050
2026	(6,756,484)		(3,064,890)	7,841,140	22,970,050	7,841,140	30,811,190
2027	(7,191,484)		(3,705,770)	7,899,159	30,811,190	7,899,159	38,710,349
2028	(7,643,941)	(3,017,561)	(3,705,770)	5,616,838	38,710,349	5,616,838	44,327,187
2029	(8,111,397)		(3,705,770)	9,410,131	44,327,187	9,410,131	53,737,318
2030	(8,611,397)		(3,705,770)	10,210,409	53,737,318	10,210,409	63,947,727
2031	(9,106,397)		(3,705,770)	10,946,118	63,947,727	10,946,118	74,893,846
2032	(14,332,794)		(3,705,770)	7,075,143	74,893,846	7,075,143	81,968,988
2033	(14,332,794)		(3,705,770)	8,504,333	81,968,988	8,504,333	90,473,321
2034	(14,332,794)		(3,711,950)	10,006,214	90,473,321	10,006,214	100,479,535
2035	(14,332,794)		(3,711,950)	11,596,313	100,479,535	11,596,313	112,075,848
2036	(14,332,269)	(210,000)	(3,711,950)	13,064,036	112,075,848	13,064,036	125,139,884
2037	(14,331,178)	(226,446)	(3,711,950)	14,816,796	125,139,884	14,816,796	139,956,679
2038	(14,330,020)	(236,455)	(3,711,950)	16,674,057	139,956,679	16,674,057	156,630,737
2039	(14,322,643)	(2,714,339)	(3,711,950)	16,169,506	156,630,737	16,169,506	172,800,243
2040	(14,523,324)	(1,013,309)	(3,711,950)	19,744,546	172,800,243	19,744,546	192,544,789
2041	(14,744,556)	(1,072,519)	(8,639,254)	16,723,033	192,544,789	16,723,033	209,267,822
2042	(14,975,522)	(1,123,028)	(8,639,254)	18,747,990	209,267,822	18,747,990	228,015,813
2043	(17,684,082)	(1,188,647)	(8,639,254)	18,399,345	228,015,813	18,399,345	246,415,158
2044	(18,691,280)	(1,255,616)	(7,721,599)	20,810,846	246,415,158	20,810,846	267,226,004
2045	(19,757,341)	(1,327,700)	(7,721,599)	22,374,947	267,226,004	22,374,947	289,600,951
2046	(20,873,560)	(1,396,032)	(7,721,599)	24,039,284	289,600,951	24,039,284	313,640,235
2047	(22,055,034)	(1,472,968)	(7,721,599)	25,783,996	313,640,235	25,783,996	339,424,231
2048	(23,303,064)	(1,561,537)	(14,492,679)	20,841,801	339,424,231	20,841,801	360,266,032
2049	(24,622,760)	(1,640,092)	(14,492,679)	22,779,818	360,266,032	22,779,818	383,045,849
2050	(25,996,878)		(14,492,679)	26,563,308	383,045,849	26,563,308	409,609,158
2051	(27,469,846)		(14,492,679)	28,791,783	409,609,158	28,791,783	438,400,941
2052	(29,031,383)		(14,492,679)	31,143,078	438,400,941	31,143,078	469,544,019
2053	(30,671,475)		(14,492,679)	33,620,927	469,544,019	33,620,927	503,164,946
2054	(32,408,795)		(14,492,679)	36,223,603	503,164,946	36,223,603	539,388,549
2055	(34,234,337)	34,406,369		87,871,222	539,388,549	87,871,222	627,259,771
Total	(555,994,043)	14,950,119	(228,566,293)	627,259,771		627,259,771	

D. Debt Service

	Project Revenue Bonds													
	Current Interest Bonds			Capital Appreciation Bonds			Convertible Capital Appreciation Bonds				Total Gross		DSRF Interest	Net
Period	Principal	Interest	Debt Service	Principal	Accretion	Debt Service	Principal	Accretion	Interest	Debt Service	Debt Service	Capitalized Interest	Earnings	Debt Service
2016		1,784,210	1,784,210								1,784,210	3,568,421		
2017		3,568,421	3,568,421								3,568,421	3,568,421		
2018		3,568,421	3,568,421								3,568,421	3,568,421		
2019		3,568,421	3,568,421								3,568,421	3,568,421		
2020		3,568,421	3,568,421								3,568,421	3,568,421		
2021		3,568,421	3,568,421								3,568,421		56,936	3,511,484
2022		3,568,421	3,568,421								3,568,421		56,936	3,511,484
2023		3,568,421	3,568,421	468,153	286,847	755,000					4,323,421		56,936	4,266,484
2024		3,568,421	3,568,421	998,969	741,031	1,740,000					5,308,421		56,936	5,251,484
2025		3,568,421	3,568,421	1,503,126	1,326,874	2,830,000					6,398,421		56,936	6,341,484
2026		3,568,421	3,568,421	1,592,614	1,652,386	3,245,000					6,813,421		56,936	6,756,484
2027		3,568,421	3,568,421	1,667,813	2,012,187	3,680,000					7,248,421		56,936	7,191,484
2028		3,568,421	3,568,421	1,731,514	2,408,486	4,140,000					7,708,421		64,480	7,643,941
2029		3,568,421	3,568,421	1,779,775	2,835,225	4,615,000					8,183,421		72,024	8,111,397
2030		3,568,421	3,568,421	1,817,871	3,297,129	5,115,000					8,683,421		72,024	8,611,397
2031		3,568,421	3,568,421	1,836,490	3,773,510	5,610,000					9,178,421		72,024	9,106,397
2032		3,568,421	3,568,421						10,836,397	10,836,397	14,404,818		72,024	14,332,794
2033		3,568,421	3,568,421						10,836,397	10,836,397	14,404,818		72,024	14,332,794
2034		3,568,421	3,568,421						10,836,397	10,836,397	14,404,818		72,024	14,332,794
2035		3,568,421	3,568,421						10,836,397	10,836,397	14,404,818		72,024	14,332,794
2036		3,568,421	3,568,421						10,836,397	10,836,397	14,404,818		72,549	14,332,269
2037		3,568,421	3,568,421						10,836,397	10,836,397	14,404,818		73,640	14,331,178
2038		3,568,421	3,568,421						10,836,397	10,836,397	14,404,818		74,797	14,330,020
2039		3,568,421	3,568,421						10,836,397	10,836,397	14,404,818		82,174	14,322,643
2040	210,000	3,568,421	3,778,421						10,836,397	10,836,397	14,614,818		91,494	14,523,324
2041	450,000	3,554,867	4,004,867						10,836,397	10,836,397	14,841,264		96,708	14,744,556
2042	715,000	3,526,322	4,241,322						10,836,397	10,836,397	15,077,719		102,197	14,975,522
2043	1,015,000	3,480,661	4,495,661				801,050	1,657,322	10,836,397	13,296,397	17,792,058		107,976	17,684,082
2044	1,350,000	3,415,486	4,765,486				1,097,823	2,287,177	10,654,881	14,039,881	18,805,367		114,087	18,691,280
2045	1,725,000	3,328,435	5,053,435				1,420,500	2,999,500	10,404,451	14,824,451	19,877,886		120,545	19,757,341
2046	2,135,000	3,216,154	5,351,154				1,786,342	3,788,659	10,074,761	15,649,761	21,000,914		127,354	20,873,560
2047	2,595,000	3,076,758	5,671,758				2,191,496	4,668,504	9,657,803	16,517,803	22,189,561		134,527	22,055,034
2048	3,105,000	2,906,810	6,011,810				2,640,448	5,649,552	9,143,367	17,433,367	23,445,177		142,113	23,303,064
2049	3,670,000	2,702,841	6,372,841				3,146,879	6,733,121	8,520,037	18,400,037	24,772,878		150,117	24,622,760
2050	4,290,000	2,461,756	6,751,756				3,707,456	7,932,544	7,777,154	19,417,154	26,168,910		172,032	25,996,878
2051	4,975,000	2,179,943	7,154,943				4,326,958	9,256,449	6,901,935	20,486,935	27,641,878		172,032	27,469,846
2052	5,730,000	1,853,132	7,583,132				5,013,347	10,726,653	5,880,282	21,620,282	29,203,415		172,032	29,031,383
2053	6,555,000	1,476,725	8,031,725				5,769,809	12,345,191	4,696,782	22,811,782	30,843,507		172,032	30,671,475
2054	7,465,000	1,046,123	8,511,123				6,604,305	14,130,695	3,334,704	24,069,704	32,580,827		172,032	32,408,795
2055	8,460,000	555,743	9,015,743				7,521,614	16,093,386	1,775,626	25,390,626	34,406,369		172,032	34,234,337
Total	54,445,000	126,208,064	180,653,064	13,396,323	18,333,677	31,730,000	46,028,026	98,268,754	218,858,547	363,158,547	575,541,611	17,842,104	3,489,674	555,994,043

E. Debt Service Coverage

Debt Service Coverage - Toll Revenue Pledged Debt			
Period	**Pledged Revenues (1)**	**Project Revenue Bonds Net Debt Service (2)**	**Project Revenue Bonds Coverage (3)=(1)/(2)**
2020	4,903,281		
2021	6,598,864	3,511,484	1.88x
2022	8,693,716	3,511,484	2.48x
2023	11,014,306	4,266,484	2.58x
2024	13,575,048	5,251,484	2.58x
2025	16,391,714	6,341,484	2.58x
2026	17,662,516	6,756,484	2.61x
2027	18,796,416	7,191,484	2.61x
2028	19,984,110	7,643,941	2.61x
2029	21,227,298	8,111,397	2.62x
2030	22,527,577	8,611,397	2.62x
2031	23,758,285	9,106,397	2.61x
2032	25,113,707	14,332,794	1.75x
2033	26,542,897	14,332,794	1.85x
2034	28,050,958	14,332,794	1.96x
2035	29,641,057	14,332,794	2.07x
2036	31,318,255	14,332,269	2.19x
2037	33,086,370	14,331,178	2.31x
2038	34,952,483	14,330,020	2.44x
2039	36,918,426	14,322,643	2.58x
2040	38,993,117	14,523,324	2.68x
2041	41,179,362	14,744,556	2.79x
2042	43,485,794	14,975,522	2.90x
2043	45,916,328	17,684,082	2.60x
2044	48,479,342	18,691,280	2.59x
2045	51,181,588	19,757,341	2.59x
2046	54,030,475	20,873,560	2.59x
2047	57,033,585	22,055,034	2.59x
2048	60,199,067	23,303,064	2.58x
2049	63,535,349	24,622,760	2.58x
2050	67,052,865	25,996,878	2.58x
2051	70,759,308	27,469,846	2.58x
2052	74,667,139	29,031,383	2.57x
2053	78,785,081	30,671,475	2.57x
2054	83,125,077	32,408,795	2.56x
2055	87,699,191	34,234,337	2.56x
Total	1,396,879,950	555,994,043	Avg: 2.5

F. O&M Expenses

General O&M							
Annual Cost		Reserve					
Year	Total	Balance Requirement[1]	Beginning Balance	Deposit	Fund Interest	Interest Drawn	Ending Balance
2018							
2019							
2020	5,422,719	1,355,680		1,355,680			1,355,680
2021	6,262,469	1,565,617	1,355,680	209,938	6,778	(6,778)	1,565,617
2022	7,142,279	1,785,570	1,565,617	219,952	7,828	(7,828)	1,785,570
2023	8,060,974	2,015,243	1,785,570	229,674	8,928	(8,928)	2,015,243
2024	9,017,204	2,254,301	2,015,243	239,058	10,076	(10,076)	2,254,301
2025	10,009,295	2,502,324	2,254,301	248,023	11,272	(11,272)	2,502,324
2026	10,253,145	2,563,286	2,502,324	60,962	12,512	(12,512)	2,563,286
2027	10,492,970	2,623,242	2,563,286	59,956	12,816	(12,816)	2,623,242
2028	10,728,203	2,682,051	2,623,242	58,808	13,116	(13,116)	2,682,051
2029	10,958,175	2,739,544	2,682,051	57,493	13,410	(13,410)	2,739,544
2030	11,182,274	2,795,568	2,739,544	56,025	13,698	(13,698)	2,795,568
2031	11,636,037	2,909,009	2,795,568	113,441	13,978	(13,978)	2,909,009
2032	12,109,064	3,027,266	2,909,009	118,257	14,545	(14,545)	3,027,266
2033	12,602,222	3,150,556	3,027,266	123,290	15,136	(15,136)	3,150,556
2034	13,116,409	3,279,102	3,150,556	128,547	15,753	(15,753)	3,279,102
2035	13,652,474	3,413,119	3,279,102	134,016	16,396	(16,396)	3,413,119
2036	14,211,345	3,552,836	3,413,119	139,718	17,066	(17,066)	3,552,836
2037	14,794,157	3,698,539	3,552,836	145,703	17,764	(17,764)	3,698,539
2038	15,401,882	3,850,470	3,698,539	151,931	18,493	(18,493)	3,850,470
2039	16,035,648	4,008,912	3,850,470	158,442	19,252	(19,252)	4,008,912
2040	16,696,561	4,174,140	4,008,912	165,228	20,045	(20,045)	4,174,140
2041	17,385,798	4,346,450	4,174,140	172,309	20,871	(20,871)	4,346,450
2042	18,104,699	4,526,175	4,346,450	179,725	21,732	(21,732)	4,526,175
2043	18,854,406	4,713,601	4,526,175	187,427	22,631	(22,631)	4,713,601
2044	19,636,453	4,909,113	4,713,601	195,512	23,568	(23,568)	4,909,113
2045	20,452,154	5,113,038	4,909,113	203,925	24,546	(24,546)	5,113,038
2046	21,303,053	5,325,763	5,113,038	212,725	25,565	(25,565)	5,325,763
2047	22,190,603	5,547,651	5,325,763	221,887	26,629	(26,629)	5,547,651
2048	23,116,585	5,779,146	5,547,651	231,495	27,738	(27,738)	5,779,146
2049	24,082,623	6,020,656	5,779,146	241,509	28,896	(28,896)	6,020,656
2050	25,090,306	6,272,577	6,020,656	251,921	30,103	(30,103)	6,272,577
2051	26,141,807	6,535,452	6,272,577	262,875	31,363	(31,363)	6,535,452
2052	27,238,807	6,809,702	6,535,452	274,250	32,677	(32,677)	6,809,702
2053	28,383,474	7,095,869	6,809,702	286,167	34,049	(34,049)	7,095,869
2054	29,577,901	7,394,475	7,095,869	298,607	35,479	(35,479)	7,394,475
2055	30,824,069	7,706,017	7,394,475	311,542	36,972	(36,972)	7,706,017
Total	592,168,243			7,706,017	701,680	-701,680	

Note:

1. The requirement equals to 4 months of expenses for the current fiscal year

Arkansas State Highway Commission

North Belt Freeway

Gross Revenue Pledge (Gap Analysis 1)

As of February 14, 2014

Table of Contents

Plan of Finance

A. Assumptions

Issuance Timing

Project Revenue Bonds 1/1/2016

Interest Rates

Project Revenue Bonds	10 year average MMD (Municipal Market Data)
Cushion	50 bps
Credit	BBB-

Fund Annual Earning Rates

Short-Term Fund	Rate	Applied Period
Construction Fund	0.50%	All years
Capitalized Interest Fund	0.50%	
Debt Service Fund	0.50%	
Revenue Fund	0.25%	

Long-Term Fund	Rate	Applied Period
Debt Service Reserve Fund	0.50%	All years

A. Interest Rate Assumptions

Year	10-year Average AAA MMD	Cushion	Project Revenue Bonds					
			Current Interest Bonds		Convertible Capital Appreciation Bonds		Capital Appreciation Bonds	
			Spread	Rate	Spread	Rate	Spread	Rate
2016	1.42%	50 bps	70 bps	2.62%	165 bps	3.57%	315 bps	5.07%
2017	1.65%	50 bps	90 bps	3.05%	185 bps	4.00%	315 bps	5.30%
2018	1.83%	50 bps	110 bps	3.43%	205 bps	4.38%	315 bps	5.48%
2019	2.03%	50 bps	120 bps	3.73%	215 bps	4.68%	315 bps	5.68%
2020	2.24%	50 bps	130 bps	4.04%	225 bps	4.99%	315 bps	5.89%
2021	2.45%	50 bps	140 bps	4.35%	235 bps	5.30%	315 bps	6.10%
2022	2.64%	50 bps	150 bps	4.64%	245 bps	5.59%	315 bps	6.29%
2023	2.82%	50 bps	160 bps	4.92%	255 bps	5.87%	315 bps	6.47%
2024	2.99%	50 bps	170 bps	5.19%	265 bps	6.14%	315 bps	6.64%
2025	3.12%	50 bps	180 bps	5.42%	275 bps	6.37%	315 bps	6.77%
2026	3.24%	50 bps	180 bps	5.54%	275 bps	6.49%	315 bps	6.89%
2027	3.35%	50 bps	180 bps	5.65%	275 bps	6.60%	315 bps	7.00%
2028	3.45%	50 bps	180 bps	5.75%	275 bps	6.70%	315 bps	7.10%
2029	3.53%	50 bps	180 bps	5.83%	275 bps	6.78%	315 bps	7.18%
2030	3.61%	50 bps	180 bps	5.91%	275 bps	6.86%	315 bps	7.26%
2031	3.69%	50 bps	180 bps	5.99%	275 bps	6.94%	315 bps	7.34%
2032	3.75%	50 bps	180 bps	6.05%	275 bps	7.00%	315 bps	7.40%
2033	3.82%	50 bps	180 bps	6.12%	275 bps	7.07%	315 bps	7.47%
2034	3.88%	50 bps	180 bps	6.18%	275 bps	7.13%	315 bps	7.53%
2035	3.94%	50 bps	180 bps	6.24%	275 bps	7.19%	315 bps	7.59%
2036	3.99%	50 bps	180 bps	6.29%	275 bps	7.24%	315 bps	7.64%
2037	4.05%	50 bps	180 bps	6.35%	275 bps	7.30%	315 bps	7.70%
2038	4.09%	50 bps	180 bps	6.39%	275 bps	7.34%	315 bps	7.74%
2039	4.13%	50 bps	180 bps	6.43%	275 bps	7.38%	315 bps	7.78%
2040	4.15%	50 bps	180 bps	6.45%	275 bps	7.40%	315 bps	7.80%
2041	4.04%	50 bps	180 bps	6.34%	275 bps	7.29%	315 bps	7.69%
2042	4.09%	50 bps	180 bps	6.39%	275 bps	7.34%	315 bps	7.74%
2043	4.12%	50 bps	180 bps	6.42%	275 bps	7.37%	315 bps	7.77%
2044	4.15%	50 bps	180 bps	6.45%	275 bps	7.40%	315 bps	7.80%
2045	4.21%	50 bps	180 bps	6.51%	275 bps	7.46%	315 bps	7.86%
2046	4.21%	50 bps	182 bps	6.53%	277 bps	7.48%	315 bps	7.86%
2047	4.21%	50 bps	184 bps	6.55%	279 bps	7.50%	315 bps	7.86%
2048	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2049	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2050	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2051	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2052	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2053	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2054	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%
2055	4.21%	50 bps	186 bps	6.57%	281 bps	7.52%	315 bps	7.86%

B. Sources and Uses and Financing Statistics

Sources	
CIBS Par Amount	$77,125,000
CCABS Par Amount	64,735,323
CABS Par Amount	25,301,103
+Premium/-Discount	-
Bonds Proceeds	167,161,425
Construction Fund Earnings	3,560,339
Total Sources	**170,721,765**
Uses	
Total Construction Fund	$647,918,000
Debt Service Reserve Fund	16,716,143
Capitalized Interest Fund	22,108,093
Underwriters' Discount	1,086,549
Cost of Issuance	417,904
Funding Gap	**(517,524,924)**
Total Uses	**170,721,765**

Coverage	
Average Coverage Ratio	1.85x
Interest Cost	
True Interest Cost (TIC)	7.1698%

C. Flow of Funds

Period	Revenue: Toll Revenues	Revenue: Revenue Fund Earnings	Total Gross Revenues	DSRF Deposit: Net Debt Service	DSRF Deposit: Senior DSRF Deposit/Release	O&M: Annual Deposit	M&R: Annual Deposit	Residual Revenues After Debt Service, O&M and R&R	General Reserve Fund: Beginning Balance	General Reserve Fund: Deposit/ Shortfall	General Reserve Fund: Ending Balance
2016											
2017											
2018											
2019											
2020	10,326,000	12,908	10,338,908			(5,422,719)		4,916,188		4,916,188	4,916,188
2021	13,056,000	16,320	13,072,320	(5,035,142)		(6,262,469)	(3,064,890)	(1,290,184)	4,916,188	(1,290,184)	3,626,004
2022	16,037,000	20,046	16,057,046	(6,205,142)		(7,142,279)	(3,064,890)	(355,267)	3,626,004	(355,267)	3,270,737
2023	19,282,000	24,103	19,306,103	(7,475,142)		(8,060,974)	(3,064,890)	705,093	3,270,737	705,093	3,975,830
2024	22,804,000	28,505	22,832,505	(8,855,142)		(9,017,204)	(3,064,890)	1,895,266	3,975,830	1,895,266	5,871,096
2025	26,617,000	33,271	26,650,271	(10,350,142)		(10,009,295)	(3,064,890)	3,225,941	5,871,096	3,225,941	9,097,037
2026	27,942,000	34,928	27,976,928	(10,870,142)		(10,253,145)	(3,064,890)	3,788,748	9,097,037	3,788,748	12,885,785
2027	29,313,000	36,641	29,349,641	(11,410,142)		(10,492,970)	(3,705,770)	3,740,755	12,885,785	3,740,755	16,626,541
2028	30,733,000	38,416	30,771,416	(11,956,286)	(3,542,677)	(10,728,203)	(3,705,770)	838,478	16,626,541	838,478	17,465,018
2029	32,203,000	40,254	32,243,254	(12,522,429)		(10,958,175)	(3,705,770)	5,056,879	17,465,018	5,056,879	22,521,897
2030	33,724,000	42,155	33,766,155	(13,122,429)		(11,182,274)	(3,705,770)	5,755,682	22,521,897	5,755,682	28,277,579
2031	35,464,000	44,330	35,508,330	(13,802,429)		(11,636,037)	(3,705,770)	6,364,094	28,277,579	6,364,094	34,641,673
2032	37,295,000	46,619	37,341,619	(20,158,167)		(12,109,064)	(3,705,770)	1,368,618	34,641,673	1,368,618	36,010,291
2033	39,220,000	49,025	39,269,025	(20,158,167)		(12,602,222)	(3,705,770)	2,802,866	36,010,291	2,802,866	38,813,156
2034	41,245,000	51,556	41,296,556	(20,158,167)		(13,116,409)	(3,711,950)	4,310,030	38,813,156	4,310,030	43,123,187
2035	43,374,000	54,218	43,428,218	(20,157,767)	(160,000)	(13,652,474)	(3,711,950)	5,746,026	43,123,187	5,746,026	48,869,213
2036	45,613,000	57,016	45,670,016	(20,156,655)	(284,775)	(14,211,345)	(3,711,950)	7,305,291	48,869,213	7,305,291	56,174,503
2037	47,967,000	59,959	48,026,959	(20,155,179)	(305,760)	(14,794,157)	(3,711,950)	9,059,912	56,174,503	9,059,912	65,234,415
2038	50,444,000	63,055	50,507,055	(20,153,617)	(319,012)	(15,401,882)	(3,711,950)	10,920,594	65,234,415	10,920,594	76,155,010
2039	53,047,000	66,309	53,113,309	(20,302,291)	(4,211,417)	(16,035,648)	(3,711,950)	8,852,003	76,155,010	8,852,003	85,007,012
2040	55,786,000	69,733	55,855,733	(20,573,186)	(1,340,511)	(16,696,561)	(3,711,950)	13,533,536	85,007,012	13,533,536	98,540,548
2041	58,665,000	73,331	58,738,331	(20,872,069)	(1,410,633)	(17,385,798)	(8,639,254)	10,430,603	98,540,548	10,430,603	108,971,151
2042	61,694,000	77,118	61,771,118	(21,183,826)	(1,491,447)	(18,104,699)	(8,639,254)	12,351,905	108,971,151	12,351,905	121,323,056
2043	64,878,000	81,098	64,959,098	(25,387,584)	(1,571,845)	(18,854,406)	(8,639,254)	10,506,021	121,323,056	10,506,021	131,829,077
2044	68,227,000	85,284	68,312,284	(26,720,035)	(1,652,395)	(19,636,453)	(7,721,599)	12,576,814	131,829,077	12,576,814	144,405,892
2045	71,749,000	89,686	71,838,686	(28,122,177)	(1,743,815)	(20,452,154)	(7,721,599)	13,793,942	144,405,892	13,793,942	158,199,833
2046	75,453,000	94,316	75,547,316	(29,604,706)	(1,823,277)	(21,303,053)	(7,721,599)	15,094,694	158,199,833	15,094,694	173,294,527
2047	79,348,000	99,185	79,447,185	(31,167,157)	(1,934,283)	(22,190,603)	(7,721,599)	16,428,555	173,294,527	16,428,555	189,723,082
2048	83,444,000	104,305	83,548,305	(32,809,640)	(2,030,580)	(23,116,585)	(14,492,679)	11,098,822	189,723,082	11,098,822	200,821,904
2049	87,751,000	109,689	87,860,689	(34,543,026)	(2,140,852)	(24,082,623)	(14,492,679)	12,601,510	200,821,904	12,601,510	213,423,414
2050	92,281,000	115,351	92,396,351	(36,337,824)		(25,090,306)	(14,492,679)	16,470,542	213,423,414	16,470,542	229,893,956
2051	97,044,000	121,305	97,165,305	(38,272,108)		(26,141,807)	(14,492,679)	18,258,712	229,893,956	18,258,712	248,152,668
2052	102,054,000	127,568	102,181,568	(40,302,688)		(27,238,807)	(14,492,679)	20,147,394	248,152,668	20,147,394	268,300,062
2053	107,322,000	134,153	107,456,153	(42,443,539)		(28,383,474)	(14,492,679)	22,136,460	268,300,062	22,136,460	290,436,522
2054	112,862,000	141,078	113,003,078	(44,695,912)		(29,577,901)	(14,492,679)	24,236,586	290,436,522	24,236,586	314,673,108
2055	118,688,000	148,360	118,836,360	(47,068,847)	47,305,374	(30,824,069)		88,248,817	314,673,108	88,248,817	402,921,926
Total	1,992,952,000	2,491,190	1,995,443,190	(793,108,899)	21,342,094	(592,168,243)	(228,566,293)	402,921,926		402,921,926	

D. Debt Service

Period	Project Revenue Bonds													
	Current Interest Bonds			Capital Appreciation Bonds			Convertible Capital Appreciation Bonds				Total Gross Debt Service	Capitalized Interest	DSRF Interest Earnings	Net Debt Service
	Principal	Interest	Debt Service	Principal	Accretion	Debt Service	Principal	Accretion	Interest	Debt Service				
2016		2,524,363	2,524,363								2,524,363	2,524,363		
2017		5,048,726	5,048,726								5,048,726	5,048,726		
2018		5,048,726	5,048,726								5,048,726	5,048,726		
2019		5,048,726	5,048,726								5,048,726	5,048,726		
2020		5,048,726	5,048,726								5,048,726	5,048,726		
2021		5,048,726	5,048,726	50,860	19,140	70,000					5,118,726		83,584	5,035,142
2022		5,048,726	5,048,726	839,195	400,805	1,240,000					6,288,726		83,584	6,205,142
2023		5,048,726	5,048,726	1,577,058	932,942	2,510,000					7,558,726		83,584	7,475,142
2024		5,048,726	5,048,726	2,263,163	1,626,837	3,890,000					8,938,726		83,584	8,855,142
2025		5,048,726	5,048,726	2,896,215	2,488,785	5,385,000					10,433,726		83,584	10,350,142
2026		5,048,726	5,048,726	2,934,313	2,970,687	5,905,000					10,953,726		83,584	10,870,142
2027		5,048,726	5,048,726	2,955,870	3,489,130	6,445,000					11,493,726		83,584	11,410,142
2028		5,048,726	5,048,726	2,961,490	4,038,510	7,000,000					12,048,726		92,441	11,956,286
2029		5,048,726	5,048,726	2,954,705	4,620,296	7,575,000					12,623,726		101,297	12,522,429
2030		5,048,726	5,048,726	2,937,850	5,237,150	8,175,000					13,223,726		101,297	13,122,429
2031		5,048,726	5,048,726	2,930,385	5,924,615	8,855,000					13,903,726		101,297	13,802,429
2032		5,048,726	5,048,726						15,210,738	15,210,738	20,259,464		101,297	20,158,167
2033		5,048,726	5,048,726						15,210,738	15,210,738	20,259,464		101,297	20,158,167
2034		5,048,726	5,048,726						15,210,738	15,210,738	20,259,464		101,297	20,158,167
2035		5,048,726	5,048,726						15,210,738	15,210,738	20,259,464		101,697	20,157,767
2036		5,048,726	5,048,726						15,210,738	15,210,738	20,259,464		102,809	20,156,655
2037		5,048,726	5,048,726						15,210,738	15,210,738	20,259,464		104,286	20,155,179
2038		5,048,726	5,048,726						15,210,738	15,210,738	20,259,464		105,848	20,153,617
2039	160,000	5,048,726	5,208,726						15,210,738	15,210,738	20,419,464		117,174	20,302,291
2040	455,000	5,038,502	5,493,502						15,210,738	15,210,738	20,704,240		131,053	20,573,186
2041	790,000	5,009,262	5,799,262						15,210,738	15,210,738	21,010,000		137,931	20,872,069
2042	1,160,000	4,958,274	6,118,274						15,210,738	15,210,738	21,329,012		145,186	21,183,826
2043	1,575,000	4,884,691	6,459,691				1,266,806	2,603,194	15,210,738	19,080,738	25,540,429		152,845	25,387,584
2044	2,035,000	4,784,110	6,819,110				1,672,110	3,461,262	14,926,830	20,061,830	26,880,940		160,905	26,720,035
2045	2,540,000	4,653,438	7,193,438				2,124,296	4,424,082	14,548,135	21,098,135	28,291,573		169,396	28,122,177
2046	3,105,000	4,489,653	7,594,653				2,611,213	5,513,788	14,063,366	22,188,366	29,783,019		178,314	29,604,706
2047	3,735,000	4,287,547	8,022,547				3,164,148	6,709,250	13,457,317	23,332,317	31,354,864		187,707	31,167,157
2048	4,425,000	4,043,686	8,468,686				3,776,017	8,043,983	12,718,573	24,538,573	33,007,259		197,620	32,809,640
2049	5,190,000	3,753,890	8,943,890				4,451,177	9,523,823	11,832,184	25,807,184	34,751,074		208,048	34,543,026
2050	6,025,000	3,412,956	9,437,956				5,209,231	11,144,176	10,781,395	27,136,395	36,574,351		236,527	36,337,824
2051	6,950,000	3,017,170	9,967,170				6,048,505	12,941,495	9,551,464	28,541,464	38,508,634		236,527	38,272,108
2052	7,965,000	2,560,620	10,525,620				6,972,184	14,917,816	8,123,594	30,013,594	40,539,215		236,527	40,302,688
2053	9,080,000	2,037,395	11,117,395				7,989,823	17,095,177	6,477,672	31,562,672	42,680,066		236,527	42,443,539
2054	10,300,000	1,440,924	11,740,924				9,109,386	19,490,614	4,591,515	33,191,515	44,932,439		236,527	44,695,912
2055	11,635,000	764,310	12,399,310				10,340,427	22,124,573	2,441,063	34,906,063	47,305,374		236,527	47,068,847
Total	77,125,000	177,781,498	254,906,497	25,301,103	31,748,897	57,050,000	64,735,323	137,993,233	306,041,963	508,776,963	820,733,460	22,719,268	4,905,293	793,108,899

E. Debt Service Coverage

Debt Service Coverage - Toll Revenue Pledged Debt					
Period	Toll Revenues	Revenue Fund Earnings	Total Gross Revenues (1)	Project Revenue Bonds Net Debt Service (2)	Project Revenue Bonds Coverage (3)=(1)/(2)
2020	10,326,000	12,908	10,338,908		
2021	13,056,000	16,320	13,072,320	5,035,142	2.60x
2022	16,037,000	20,046	16,057,046	6,205,142	2.59x
2023	19,282,000	24,103	19,306,103	7,475,142	2.58x
2024	22,804,000	28,505	22,832,505	8,855,142	2.58x
2025	26,617,000	33,271	26,650,271	10,350,142	2.57x
2026	27,942,000	34,928	27,976,928	10,870,142	2.57x
2027	29,313,000	36,641	29,349,641	11,410,142	2.57x
2028	30,733,000	38,416	30,771,416	11,956,286	2.57x
2029	32,203,000	40,254	32,243,254	12,522,429	2.57x
2030	33,724,000	42,155	33,766,155	13,122,429	2.57x
2031	35,464,000	44,330	35,508,330	13,802,429	2.57x
2032	37,295,000	46,619	37,341,619	20,158,167	1.85x
2033	39,220,000	49,025	39,269,025	20,158,167	1.95x
2034	41,245,000	51,556	41,296,556	20,158,167	2.05x
2035	43,374,000	54,218	43,428,218	20,157,767	2.15x
2036	45,613,000	57,016	45,670,016	20,156,655	2.27x
2037	47,967,000	59,959	48,026,959	20,155,179	2.38x
2038	50,444,000	63,055	50,507,055	20,153,617	2.51x
2039	53,047,000	66,309	53,113,309	20,302,291	2.62x
2040	55,786,000	69,733	55,855,733	20,573,186	2.71x
2041	58,665,000	73,331	58,738,331	20,872,069	2.81x
2042	61,694,000	77,118	61,771,118	21,183,826	2.92x
2043	64,878,000	81,098	64,959,098	25,387,584	2.56x
2044	68,227,000	85,284	68,312,284	26,720,035	2.56x
2045	71,749,000	89,686	71,838,686	28,122,177	2.55x
2046	75,453,000	94,316	75,547,316	29,604,706	2.55x
2047	79,348,000	99,185	79,447,185	31,167,157	2.55x
2048	83,444,000	104,305	83,548,305	32,809,640	2.55x
2049	87,751,000	109,689	87,860,689	34,543,026	2.54x
2050	92,281,000	115,351	92,396,351	36,337,824	2.54x
2051	97,044,000	121,305	97,165,305	38,272,108	2.54x
2052	102,054,000	127,568	102,181,568	40,302,688	2.54x
2053	107,322,000	134,153	107,456,153	42,443,539	2.53x
2054	112,862,000	141,078	113,003,078	44,695,912	2.53x
2055	118,688,000	148,360	118,836,360	47,068,847	2.52x
Total	1,992,952,000	2,491,190	1,995,443,190	793,108,899	Avg: 2.5

Arkansas State Highway and Transportation Department

North Belt Freeway

Gross Revenue Pledge with Credit Enhancement[1] (Gap Analysis 2)

As of February 14, 2014

Table of Contents

Plan of Finance

[1] Back-up pledge of public entity to cover draws on debt service reserve fund (moral obligation)

A. Assumptions

Issuance Timing

Project Revenue Bonds 1/1/2016

Interest Rates

Project Revenue Bonds	10 year average MMD (Municipal Market Data)
Cushion	50 bps
Credit	A

Fund Annual Earning Rates

Short-Term Fund	Rate	Applied Period
Construction Fund	0.50%	All years
Capitalized Interest Fund	0.50%	
Debt Service Fund	0.50%	
Revenue Fund	0.25%	

Long-Term Fund	Rate	Applied Period
Debt Service Reserve Fund	0.50%	All years

A. Interest Rate Assumptions

Year	10-year Average AAA MMD	Cushion	Project Revenue Bonds Spreads					
			Current Interest Bonds		Convertible Capital Appreciation Bonds		Capital Appreciation Bonds	
			Spread	Rate	Spread	Rate	Spread	Rate
2016	1.42%	50 bps	70 bps	2.62%	185 bps	3.77%	230 bps	4.22%
2017	1.65%	50 bps	90 bps	3.05%	185 bps	4.00%	230 bps	4.45%
2018	1.83%	50 bps	110 bps	3.43%	185 bps	4.18%	230 bps	4.63%
2019	2.03%	50 bps	110 bps	3.63%	185 bps	4.38%	230 bps	4.83%
2020	2.24%	50 bps	110 bps	3.84%	185 bps	4.59%	230 bps	5.04%
2021	2.45%	50 bps	110 bps	4.05%	185 bps	4.80%	230 bps	5.25%
2022	2.64%	50 bps	110 bps	4.24%	185 bps	4.99%	230 bps	5.44%
2023	2.82%	50 bps	110 bps	4.42%	185 bps	5.17%	230 bps	5.62%
2024	2.99%	50 bps	110 bps	4.59%	185 bps	5.34%	230 bps	5.79%
2025	3.12%	50 bps	110 bps	4.72%	185 bps	5.47%	230 bps	5.92%
2026	3.24%	50 bps	110 bps	4.84%	185 bps	5.59%	230 bps	6.04%
2027	3.35%	50 bps	110 bps	4.95%	185 bps	5.70%	230 bps	6.15%
2028	3.45%	50 bps	110 bps	5.05%	185 bps	5.80%	230 bps	6.25%
2029	3.53%	50 bps	110 bps	5.13%	185 bps	5.88%	230 bps	6.33%
2030	3.61%	50 bps	110 bps	5.21%	185 bps	5.96%	230 bps	6.41%
2031	3.69%	50 bps	110 bps	5.29%	185 bps	6.04%	230 bps	6.49%
2032	3.75%	50 bps	110 bps	5.35%	185 bps	6.10%	230 bps	6.55%
2033	3.82%	50 bps	110 bps	5.42%	185 bps	6.17%	230 bps	6.62%
2034	3.88%	50 bps	110 bps	5.48%	185 bps	6.23%	230 bps	6.68%
2035	3.94%	50 bps	110 bps	5.54%	185 bps	6.29%	230 bps	6.74%
2036	3.99%	50 bps	110 bps	5.59%	185 bps	6.34%	230 bps	6.79%
2037	4.05%	50 bps	110 bps	5.65%	185 bps	6.40%	230 bps	6.85%
2038	4.09%	50 bps	110 bps	5.69%	185 bps	6.44%	230 bps	6.89%
2039	4.13%	50 bps	110 bps	5.73%	185 bps	6.48%	230 bps	6.93%
2040	4.15%	50 bps	110 bps	5.75%	185 bps	6.50%	230 bps	6.95%
2041	4.04%	50 bps	110 bps	5.64%	185 bps	6.39%	230 bps	6.84%
2042	4.09%	50 bps	110 bps	5.69%	185 bps	6.44%	230 bps	6.89%
2043	4.12%	50 bps	110 bps	5.72%	185 bps	6.47%	230 bps	6.92%
2044	4.15%	50 bps	110 bps	5.75%	185 bps	6.50%	230 bps	6.95%
2045	4.21%	50 bps	110 bps	5.81%	185 bps	6.56%	230 bps	7.01%
2046	4.21%	50 bps	110 bps	5.81%	185 bps	6.56%	230 bps	7.01%
2047	4.21%	50 bps	110 bps	5.81%	185 bps	6.56%	230 bps	7.01%
2048	4.21%	50 bps	110 bps	5.81%	185 bps	6.56%	230 bps	7.01%
2049	4.21%	50 bps	110 bps	5.81%	185 bps	6.56%	230 bps	7.01%
2050	4.21%	50 bps	110 bps	5.81%	185 bps	6.56%	230 bps	7.01%
2051	4.21%	50 bps	110 bps	5.81%	185 bps	6.56%	230 bps	7.01%
2052	4.21%	50 bps	110 bps	5.81%	185 bps	6.56%	230 bps	7.01%
2053	4.21%	50 bps	110 bps	5.81%	185 bps	6.56%	230 bps	7.01%
2054	4.21%	50 bps	110 bps	5.81%	185 bps	6.56%	230 bps	7.01%
2055	4.21%	50 bps	110 bps	5.81%	185 bps	6.56%	230 bps	7.01%

B. Sources and Uses and Financing Statistics

Sources	
CIBS Par Amount	$121,910,000
CCABS Par Amount	93,636,083
CABS Par Amount	33,833,644
+Premium/-Discount	-
Bonds Proceeds	249,379,727
Construction Fund Earnings	3,560,339
Total Sources	**252,940,066**
Uses	
Total Construction Fund	$647,918,000
Debt Service Reserve Fund	24,937,973
Capitalized Interest Fund	30,909,637
Underwriters' Discount	1,620,968
Cost of Issuance	623,449
Funding Gap	**(453,069,961)**
Total Uses	**252,940,066**

Coverage	
Average Coverage Ratio	2.00x
Interest Cost	
True Interest Cost (TIC)	6.3006%

C. Flow of Funds

	Revenue			DSRF Deposit		O&M	M&R		General Reserve Fund		
Period	Toll Revenues	Revenue Fund Earnings	Total Gross Revenues	Net Debt Service	Senior DSRF Deposit/Release	Annual Deposit	Annual Deposit	Residual Revenues After Debt Service, O&M and R&R	Beginning Balance	Deposit/ Shortfall	Ending Balance
2016											
2017											
2018											
2019											
2020	10,326,000	12,908	10,338,908			(5,422,719)		4,916,188		4,916,188	4,916,188
2021	13,056,000	16,320	13,072,320	(7,230,961)		(6,262,469)	(3,064,890)	(3,486,000)	4,916,188	(3,486,000)	1,430,189
2022	16,037,000	20,046	16,057,046	(7,220,961)		(7,142,279)	(3,064,890)	(1,371,083)	1,430,189	(1,371,083)	59,106
2023	19,282,000	24,103	19,306,103	(7,765,961)		(8,060,974)	(3,064,890)	414,278	59,106	414,278	473,384
2024	22,804,000	28,505	22,832,505	(10,195,961)		(9,017,204)	(3,064,890)	554,450	473,384	554,450	1,027,835
2025	26,617,000	33,271	26,650,271	(11,610,961)		(10,009,295)	(3,064,890)	1,965,126	1,027,835	1,965,126	2,992,961
2026	27,942,000	34,928	27,976,928	(12,035,961)		(10,253,145)	(3,064,890)	2,622,932	2,992,961	2,622,932	5,615,893
2027	29,313,000	36,641	29,349,641	(12,480,961)		(10,492,970)	(3,705,770)	2,669,940	5,615,893	2,669,940	8,285,833
2028	30,733,000	38,416	30,771,416	(12,940,961)		(10,728,203)	(3,705,770)	3,396,481	8,285,833	3,396,481	11,682,315
2029	32,203,000	40,254	32,243,254	(13,415,961)		(10,958,175)	(3,705,770)	4,163,347	11,682,315	4,163,347	15,845,662
2030	33,724,000	42,155	33,766,155	(13,905,961)		(11,182,274)	(3,705,770)	4,972,150	15,845,662	4,972,150	20,817,812
2031	35,464,000	44,330	35,508,330	(14,465,961)		(11,636,037)	(3,705,770)	5,700,562	20,817,812	5,700,562	26,518,374
2032	37,295,000	46,619	37,341,619	(15,051,794)	(3,666,663)	(12,109,064)	(3,705,770)	2,808,327	26,518,374	2,808,327	29,326,701
2033	39,220,000	49,025	39,269,025	(15,662,628)		(12,602,222)	(3,705,770)	7,298,405	29,326,701	7,298,405	36,625,105
2034	41,245,000	51,556	41,296,556	(16,316,928)	(280,000)	(13,116,409)	(3,711,950)	7,871,269	36,625,105	7,871,269	44,496,375
2035	43,374,000	54,218	43,428,218	(17,000,217)	(404,193)	(13,652,474)	(3,711,950)	8,659,383	44,496,375	8,659,383	53,155,758
2036	45,613,000	57,016	45,670,016	(28,457,129)	(425,167)	(14,211,345)	(3,711,950)	(1,135,575)	53,155,758	(1,135,575)	52,020,183
2037	47,967,000	59,959	48,026,959	(28,444,858)	(4,483,288)	(14,794,157)	(3,711,950)	(3,407,295)	52,020,183	(3,407,295)	48,612,888
2038	50,444,000	63,055	50,507,055	(28,709,160)	(1,795,852)	(15,401,882)	(3,711,950)	888,212	48,612,888	888,212	49,501,099
2039	53,047,000	66,309	53,113,309	(29,104,154)	(1,883,677)	(16,035,648)	(3,711,950)	2,377,879	49,501,099	2,377,879	51,878,979
2040	55,786,000	69,733	55,855,733	(29,519,643)	(1,987,467)	(16,696,561)	(3,711,950)	3,940,110	51,878,979	3,940,110	55,819,089
2041	58,665,000	73,331	58,738,331	(33,992,727)	(2,094,179)	(17,385,798)	(8,639,254)	(3,373,627)	55,819,089	(3,373,627)	52,445,462
2042	61,694,000	77,118	61,771,118	(35,777,836)	(2,202,955)	(18,104,699)	(8,639,254)	(2,953,627)	52,445,462	(2,953,627)	49,491,835
2043	64,878,000	81,098	64,959,098	(37,650,205)	(2,320,102)	(18,854,406)	(8,639,254)	(2,504,869)	49,491,835	(2,504,869)	46,986,966
2044	68,227,000	85,284	68,312,284	(39,625,771)	(2,440,795)	(19,636,453)	(7,721,599)	(1,112,334)	46,986,966	(1,112,334)	45,874,632
2045	71,749,000	89,686	71,838,686	(41,707,437)	(2,564,497)	(20,452,154)	(7,721,599)	(607,000)	45,874,632	(607,000)	45,267,632
2046	75,453,000	94,316	75,547,316	(43,897,219)	(2,704,643)	(21,303,053)	(7,721,599)	(79,197)	45,267,632	(79,197)	45,188,435
2047	79,348,000	99,185	79,447,185	(46,203,437)	(2,848,684)	(22,190,603)	(7,721,599)	482,862	45,188,435	482,862	45,671,296
2048	83,444,000	104,305	83,548,305	(48,629,624)	(2,994,690)	(23,116,585)	(14,492,679)	(5,685,272)	45,671,296	(5,685,272)	39,986,024
2049	87,751,000	109,689	87,860,689	(51,178,757)	(3,150,769)	(24,082,623)	(14,492,679)	(5,044,138)	39,986,024	(5,044,138)	34,941,886
2050	92,281,000	115,351	92,396,351	(53,841,438)		(25,090,306)	(14,492,679)	(1,028,072)	34,941,886	(1,028,072)	33,913,815
2051	97,044,000	121,305	97,165,305	(56,690,122)		(26,141,807)	(14,492,679)	(159,302)	33,913,815	(159,302)	33,754,512
2052	102,054,000	127,568	102,181,568	(59,684,812)		(27,238,807)	(14,492,679)	765,270	33,754,512	765,270	34,519,783
2053	107,322,000	134,153	107,456,153	(62,835,580)		(28,383,474)	(14,492,679)	1,744,420	34,519,783	1,744,420	36,264,202
2054	112,862,000	141,078	113,003,078	(66,154,914)		(29,577,901)	(14,492,679)	2,777,585	36,264,202	2,777,585	39,041,787
2055	118,688,000	148,360	118,836,360	(69,652,459)	70,002,472	(30,824,069)		88,362,303	39,041,787	88,362,303	127,404,090
Total	1,992,952,000	2,491,190	1,995,443,190	(1,079,059,417)	31,754,852	(592,168,243)	(228,566,293)	127,404,090		127,404,090	

D. Debt Service

Period	Project Revenue Bonds													
	Current Interest Bonds			Capital Appreciation Bonds			Convertible Capital Appreciation Bonds				Total Gross Debt Service	Capitalized Interest	DSRF Interest Earnings	Net Debt Service
	Principal	Interest	Debt Service	Principal	Accretion	Debt Service	Principal	Accretion	Interest	Debt Service				
2016		3,532,825	3,532,825								3,532,825	3,532,825		
2017		7,065,651	7,065,651								7,065,651	7,065,651		
2018		7,065,651	7,065,651								7,065,651	7,065,651		
2019		7,065,651	7,065,651								7,065,651	7,065,651		
2020		7,065,651	7,065,651								7,065,651	7,065,651		
2021		7,065,651	7,065,651	220,516	69,484	290,000					7,355,651		124,690	7,230,961
2022		7,065,651	7,065,651	199,956	80,044	280,000					7,345,651		124,690	7,220,961
2023		7,065,651	7,065,651	551,471	273,529	825,000					7,890,651		124,690	7,765,961
2024		7,065,651	7,065,651	2,031,315	1,223,685	3,255,000					10,320,651		124,690	10,195,961
2025		7,065,651	7,065,651	2,716,306	1,953,695	4,670,000					11,735,651		124,690	11,610,961
2026		7,065,651	7,065,651	2,760,573	2,334,427	5,095,000					12,160,651		124,690	12,035,961
2027		7,065,651	7,065,651	2,793,157	2,746,843	5,540,000					12,605,651		124,690	12,480,961
2028		7,065,651	7,065,651	2,813,400	3,186,600	6,000,000					13,065,651		124,690	12,940,961
2029		7,065,651	7,065,651	2,822,258	3,652,742	6,475,000					13,540,651		124,690	13,415,961
2030		7,065,651	7,065,651	2,819,989	4,145,011	6,965,000					14,030,651		124,690	13,905,961
2031		7,065,651	7,065,651	2,828,572	4,696,428	7,525,000					14,590,651		124,690	14,465,961
2032		7,065,651	7,065,651	2,832,500	5,287,500	8,120,000					15,185,651		133,857	15,051,794
2033		7,065,651	7,065,651	2,827,303	5,912,697	8,740,000					15,805,651		143,023	15,662,628
2034		7,065,651	7,065,651	2,816,809	6,578,191	9,395,000					16,460,651		143,723	16,316,928
2035		7,065,651	7,065,651	2,799,518	7,280,482	10,080,000					17,145,651		145,434	17,000,217
2036		7,065,651	7,065,651						21,538,985	21,538,985	28,604,636		147,507	28,457,129
2037		7,065,651	7,065,651						21,538,985	21,538,985	28,604,636		159,778	28,444,858
2038	280,000	7,065,651	7,345,651						21,538,985	21,538,985	28,884,636		175,476	28,709,160
2039	700,000	7,049,843	7,749,843						21,538,985	21,538,985	29,288,828		184,675	29,104,154
2040	1,165,000	7,010,011	8,175,011						21,538,985	21,538,985	29,713,996		194,353	29,519,643
2041	1,675,000	6,943,299	8,618,299				1,159,642	2,880,358	21,538,985	25,578,985	34,197,284		204,557	33,992,727
2042	2,245,000	6,846,917	9,091,917				1,648,744	3,976,256	21,276,218	26,901,218	35,993,136		215,300	35,777,836
2043	2,870,000	6,720,223	9,590,223				2,142,828	5,227,173	20,916,590	28,286,590	37,876,813		226,607	37,650,205
2044	3,560,000	6,557,032	10,117,032				2,687,563	6,617,437	20,442,248	29,747,248	39,864,280		238,510	39,625,771
2045	4,320,000	6,353,357	10,673,357				3,288,835	8,156,165	19,840,102	31,285,102	41,958,459		251,023	41,707,437
2046	5,160,000	6,105,034	11,265,034				3,920,304	9,879,696	19,096,381	32,896,381	44,161,414		264,196	43,897,219
2047	6,080,000	5,805,286	11,885,286				4,660,332	11,744,668	18,191,230	34,596,230	46,481,516		278,079	46,203,437
2048	7,085,000	5,452,095	12,537,095				5,474,222	13,795,778	17,115,216	36,385,216	48,922,311		292,687	48,629,624
2049	8,185,000	5,040,523	13,225,523				6,366,233	16,043,767	15,851,285	38,261,285	51,486,808		308,051	51,178,757
2050	9,390,000	4,565,051	13,955,051				7,344,888	18,510,112	14,381,399	40,236,399	54,191,450		350,012	53,841,438
2051	10,705,000	4,019,580	14,724,580				8,417,290	21,212,710	12,685,554	42,315,554	57,040,134		350,012	56,690,122
2052	12,140,000	3,397,720	15,537,720				9,589,120	24,165,880	10,742,104	44,497,104	60,034,824		350,012	59,684,812
2053	13,700,000	2,692,500	16,392,500				10,870,321	27,394,679	8,528,092	46,793,092	63,185,592		350,012	62,835,580
2054	15,400,000	1,896,659	17,296,659				12,269,415	30,920,585	6,018,267	49,208,267	66,504,926		350,012	66,154,914
2055	17,250,000	1,002,063	18,252,063				13,796,345	34,768,655	3,185,408	51,750,408	70,002,472		350,012	69,652,459
Total	121,910,000	246,434,338	368,344,337	33,833,644	49,421,356	83,255,000	93,636,083	235,293,917	337,504,005	666,434,005	1,118,033,343	31,795,429	7,178,497	1,079,059,417

E. Debt Service Coverage

Debt Service Coverage - Toll Revenue Pledged Debt					
Period	Toll Revenues	Revenue Fund Earnings	Total Gross Revenues (1)	Project Revenue Bonds Net Debt Service (2)	Project Revenue Bonds Coverage (3)=(1)/(2)
2020	10,326,000	12,908	10,338,908		
2021	13,056,000	16,320	13,072,320	7,230,961	1.81x
2022	16,037,000	20,046	16,057,046	7,220,961	2.22x
2023	19,282,000	24,103	19,306,103	7,765,961	2.49x
2024	22,804,000	28,505	22,832,505	10,195,961	2.24x
2025	26,617,000	33,271	26,650,271	11,610,961	2.30x
2026	27,942,000	34,928	27,976,928	12,035,961	2.32x
2027	29,313,000	36,641	29,349,641	12,480,961	2.35x
2028	30,733,000	38,416	30,771,416	12,940,961	2.38x
2029	32,203,000	40,254	32,243,254	13,415,961	2.40x
2030	33,724,000	42,155	33,766,155	13,905,961	2.43x
2031	35,464,000	44,330	35,508,330	14,465,961	2.45x
2032	37,295,000	46,619	37,341,619	15,051,794	2.48x
2033	39,220,000	49,025	39,269,025	15,662,628	2.51x
2034	41,245,000	51,556	41,296,556	16,316,928	2.53x
2035	43,374,000	54,218	43,428,218	17,000,217	2.55x
2036	45,613,000	57,016	45,670,016	28,457,129	1.60x
2037	47,967,000	59,959	48,026,959	28,444,858	1.69x
2038	50,444,000	63,055	50,507,055	28,709,160	1.76x
2039	53,047,000	66,309	53,113,309	29,104,154	1.82x
2040	55,786,000	69,733	55,855,733	29,519,643	1.89x
2041	58,665,000	73,331	58,738,331	33,992,727	1.73x
2042	61,694,000	77,118	61,771,118	35,777,836	1.73x
2043	64,878,000	81,098	64,959,098	37,650,205	1.73x
2044	68,227,000	85,284	68,312,284	39,625,771	1.72x
2045	71,749,000	89,686	71,838,686	41,707,437	1.72x
2046	75,453,000	94,316	75,547,316	43,897,219	1.72x
2047	79,348,000	99,185	79,447,185	46,203,437	1.72x
2048	83,444,000	104,305	83,548,305	48,629,624	1.72x
2049	87,751,000	109,689	87,860,689	51,178,757	1.72x
2050	92,281,000	115,351	92,396,351	53,841,438	1.72x
2051	97,044,000	121,305	97,165,305	56,690,122	1.71x
2052	102,054,000	127,568	102,181,568	59,684,812	1.71x
2053	107,322,000	134,153	107,456,153	62,835,580	1.71x
2054	112,862,000	141,078	113,003,078	66,154,914	1.71x
2055	118,688,000	148,360	118,836,360	69,652,459	1.71x
Total	1,992,952,000	2,491,190	1,995,443,190	1,079,059,417	Avg: 2