

Nashville Southeast Corridor High-Capacity Transit Alternatives Analysis

Table of Contents

Chapter 1 – Introduction
Chapter 2 – Public Involvement Plan
Chapter 3 – Needs Assessment and Evaluation Methodology
Chapter 4 – Phase I Screening of Alternatives
Chapter 5 – Phase II Screening of Alternatives
Chapter 6 – Transit Technology Assessment
Chapter 8 – Travel Demand Forecasting
Chapter 9 – Capital and Operating/Maintenance Cost Estimates
Chapter 10 – Evaluation and Selection of the Locally Preferred Alternative Strategy
Chapter 11 – Financial Assessment

List of Figures

	Page
Figure 3-1	Southeast Corridor Study Area
Figure 3-2	Major Activity Centers
Figure 3-3	Commuting Patterns in the Region
Figure 3-4	Trips from Davidson and Rutherford Counties to Major Destinations within Study Area (2002 & 2005)
Figure 3-5	SE Corridor Interzonal and Intrazonal Trips, All Trip Purposes, 2002
Figure 3-6	SE Corridor, Distribution of Interzonal Trips, All Trip Purposes, 2002
Figure 3-7	SE Corridor Interzonal and Intrazonal Trips, All Trip Purposes, 2025
Figure 3-8	SE Corridor, Distribution of Interzonal Trips, All Trip Purposes, 2025
Figure 3-9	SE Corridor Interzonal and Intrazonal Home Based Work Trips, 2002
Figure 3-10	SE Corridor Interzonal Home Based Work Trips, 2002
Figure 3-11	SE Corridor Interzonal and Intrazonal Home Based Work Trips, 2025
Figure 3-12	SE Corridor Distribution of Interzonal Home Based Work Trips, 2025
Figure 3-13	Highway Level of Service (2003 & 2025)
Figure 3-14	Transit Routes
Figure 3-15	Three Step Evaluation Process
Figure 4-1	Three Step Evaluation Process
Figure 4-2	Candidate Alignments
Figure 4-3	Alternative 1 - I-24 Alignment, LRT/DMU or BRT
Figure 4-4	Alternative 2 - I-24 Alignment, BRTL
Figure 4-5	Alternative 3 - CSX Alignment, Commuter Rail, Conventional Railroad Equipment or FRA-Compatible DMU
Figure 4-6	Alternative 4 - CSX Alignment, LRT/DMU or BRT
Figure 4-7	Alternative 5 - Murfreesboro Road Alignment, LRT/DMU or BRT
Figure 4-8	Alternative 6 - Murfreesboro Road Alignment, BRTL
Figure 5-1	Alignment and Station Location for Alternative A, BRT on I-24
Figure 5-2	Alternative A Operating Concept - AM Peak Period
Figure 5-3	Alternative A Operating Concept - Mid-Day Period
Figure 5-4	Alignment and Station Location for Alternate B, Commuter Rail on CSX Alignment
Figure 5-5	Alternate B Operating Concept - AM Peak
Figure 5-6	Alternative B Operating Concept - Mid-Day Period

List of Figures (continued)

Figure 5-7	Alignment and Station Location for Alternative C, BRT on Murfreesboro Road/Old Nashville Pike	5-19
Figure 5-8	Alternative C Operating Concept - AM Peak	5-20
Figure 5-9	Alternative C Operating Concept - Mid-Day Peak	5-21
Figure 5-10	2030 Ridership for each alternative	5-27
Figure 5-11	Charts of costs for each alternative	5-41
Figure 6-1	Conventional Bus	6-3
Figure 6-2	Articulated Diesel Bus	6-4
Figure 6-3	E-800 Trolley Bus	6-4
Figure 6-4	Dual Mode Bus, Seattle, Washington	6-5
Figure 6-5	Los Angeles Express Bus/HOV Lane	6-7
Figure 6-6	HOV Lane -I-495 Long Island Expressway, New York	6-8
Figure 6-7	Silver Line, Boston	6-11
Figure 6-8	Queue Jump Lane	6-12
Figure 6-9	Median Busway, Richmond, Virginia	6-13
Figure 6-10	Guided Bus, Essen, Germany	6-13
Figure 6-11	Seattle Busway Tunnel	6-14
Figure 6-12	Los Angeles Blue Line LRT	6-17
Figure 6-13	Cleveland LRT	6-18
Figure 6-14	Portland LRT	6-18
Figure 6-15	Miami Metro HRT system	6-19
Figure 6-16	Chicago Metra Locomotive-Hauled Commuter Rail	6-21
Figure 6-17	New York Commuter Rail EMU	6-22
Figure 6-18	Diesel Multiple Unit	6-22
Figure 6-19	TGV High Speed Rail System, France	6-23
Figure 6-20	Vancouver BC SkyTrain	6-25
Figure 6-21	VAL People Mover System, Lille, France	6-26
Figure 6-22	Walt Disney World Monorail	6-27
Figure 6-23	Adtranz Monorail in Sydney, Australia	6-28
Figure 6-24	Hitachi Series 1000 Straddle Monorail Cars at the Tokyo Airport	6-28
Figure 6-25	German Trans-Rapid Maglev System	6-29
Figure 6-26	South Korean HML03 Maglev System at the Taejon Expo	6-29
Figure 6-27	Tram-On-Tires	6-30
Figure 6-28	Mobility Toolbox	6-31
Figure 8-1	Nashville Mode Choice Model Nesting Structure	8-2
Figure 8-2	Nashville Auto Ownership Submodel	8-3
Figure 8-3	Nashville No-Build 2030 Transit Network	8-8
Figure 8-4	Alignment and Station Locations for Alternative A, BRT on I-24	8-10
Figure 8-5	Alignment and Station Locations for Alternative B, Commuter Rail	8-12
Figure 8-6	Alignment and Station Locations for Alternative C, BRT	8-13
Figure 9-1	Bus Fleet Estimates for Detailed Alternatives	9-7
Figure 10-1	Alternative Selection Process	10-2
Figure 10-2	Proposed Locally Preferred Alternative Strategy	10-5
Figure 10-3	Proposed Locally Preferred Alternative Strategy - Bus Service Schematic Diagram	10-6
Figure 10-4	Sequential order of recommended improvements	10-7
Figure 10-5	Short-Term Improvements	10-9
Figure 10-6	Medium-Term Improvements	10-11

List of Figures (continued)

Figure 10-7	Example of a queue jumping lane intersection improvement	10-12
Figure 10-8	Potential bus lane cross section	10-13
Figure 10-9	Long-Term Improvements	10-13
Figure 10-10	Distinctive Vehicle for Commuter Express or Busway Services	10-15
Figure 10-11	Proposed Composite Local and Skip-Stop Bus Headways on Murfreesboro Road (US 41)	10-17
Figure 10-12	Examples of skip stop station improvements	10-18
Figure 10-13	Estimates of System-Wide increase in ridership	10-23
Figure 10-14	Year 2030 Transit Boardings in the corridor	10-23

List of Tables

		Page
Table 2-1	September 8-9, 2004 Public Involvement Activity Schedule for Public Forums	2-7
Table 3-1	Number of Jobs and Other Generating Factors for Activity Centers in the Southeast Corridor Study Area	3-13
Table 3-2	Traffic Volumes at I-24 Interchanges, 2004	3-17
Table 3-3	Daily Average HOV Usage on I-24 between Old Hickory Blvd. and Waldron Road, 1999-2005	3-18
Table 3-4	Traffic Volumes on Roads Crossing Murfreesboro Road, 2004	3-18
Table 3-5	SE Corridor Distribution of Interzonal Trips, All Trip Purposes, 2002	3-22
Table 3-6	SE Corridor All Trip Purposes, 2002	3-23
Table 3-7	SE Corridor All Trip Purposes, 2025	3-24
Table 3-8	SE Corridor Home Based Work Trips, 2002	3-26
Table 3-9	SE Corridor Home Based Work Trips, 2025	3-28
Table 3-10	I-24 from Downtown to Rutherford/Coffee County Line	3-29
Table 3-11	Murfreesboro Road from Downtown Nashville to US-231 in Murfreesboro	3-30
Table 3-12	Current Planned Roadway Improvements	3-30
Table 3-13	Study Area Transit Routes & Service	3-34
Table 3-14	Average Monthly Ridership (September 2003 through May 2004)	3-37
Table 3-15	Current Planned Transit Service Route Improvements	3-38
Table 3-16	Existing Park and Ride Lots	3-39
Table 3-17	FTA Project Justification Criteria and Measures	3-50
Table 4-1	Transit Type/Corridor Matrix	4-9
Table 4-2	Initial Alternative Screening-Goal 1 Criteria	4-29
Table 4-3	Initial Alternatives Screening-Goal 2 Criteria	4-32
Table 4-4	Initial Alternatives Screening-Goal 3 Criteria	4-34
Table 4-5	Initial Alternatives Screening-Goal 4 Criteria	4-36
Table 4-6	Initial Alternatives Screening-Goal 5 Criteria	4-39
Table 5-1	Current Planned Transit Service Route Improvements	5-3
Table 5-2	Detailed Alternatives Screening - Goal 1 Criteria	5-24
Table 5-3	Estimated 2030 Total Daily Station Ridership for Alternative A (I-24 BRT)	5-25
Table 5-4	Estimated 2030 Total Dial Station Ridership for Alternative B (CSX Commuter Rail)	5-26
Table 5-5	Estimated 2030 Total Daily Station Ridership for Alternative C (Murfreesboro/Old Nashville BRT)	5-26
Table 5-6	Estimated Ridership by Trip Purpose for Detailed Alternatives	5-28
Table 5-7	Change in Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT) for Detailed Alternatives	5-28

List of Tables (continued)

Table 5-8	Detailed Alternatives Screening - Goal 2 Criteria	5-31
Table 5-9	Linear Distance from Stations to Major Employers and Activity Centers	5-32
Table 5-10	Detailed Alternatives Screening - Goal 3 Criteria	5-34
Table 5-11	Initial Alternatives Screening - Goal 4 Criteria	5-37
Table 5-12	Detailed Alternatives Screening - Goal 5 Criteria	5-40
Table 5-13	Detailed Alternatives Screening - Goal 6 Criteria	5-42
Table 6-1	Bus Service Summary	6-15
Table 6-2	Levels of BRT Summary	6-16
Table 6-3	Summary of Available System Technology Operating Characteristics	6-32
Table 8-1	Trip Rates for HBW and HBO Auto Ownership Markets	8-3
Table 8-2	Coefficients for the Nashville Mode Choice Model	8-4
Table 8-3	Constants for the Nashville Mode Choice Model	8-5
Table 8-4	Regional Daily Mode choice Target Totals	8-6
Table 8-5	Transit Distance Coefficient	8-6
Table 8-6	Year 2030 Transit Linked-Trip Summary	8-14
Table 8-7	Year 2030 Transit Boardings in the Corridor	8-15
Table 8-8	VMT and VHT for Alternatives, Region-Wide	8-15
Table 9-1	Phase I Screening Alternative Capital Cost Estimates (2003 Dollars)	9-2
Table 9-2	TSM Alternative (Enhanced Bus on I-24) Infrastructure Capital Cost Estimate (2005 Dollars)	9-4
Table 9-3	Alternative A (BRT on I-24) Infrastructure Capital Cost Estimate (2005 Dollars)	9-5
Table 9-4	Alternative C (BRT on I-24) Infrastructure Capital Cost Estimate (2005 Dollars)	9-6
Table 9-5	Bus Capital Costs for the Detailed Phase Alternatives (2005 Dollars)	9-8
Table 9-6	Infrastructure Capital Costs for Alternative C (CSX Commuter Rail) (2005 Dollars)	9-9
Table 9-7	Cost Model for Nashville Regional Transit Services (2005 Dollars)	9-11
Table 9-8	Operating Cost Estimate for Alternative A (BRT on I-24)	9-13
Table 9-9	Operating Cost Estimate for Alternative B (Commuter Rail on CSX Alignment)	9-13
Table 9-10	Operating Cost Estimate for Alternative C (BRT on Murfreesboro Road)	9-13
Table 9-11	Annualization Factor for LPA Operating and Maintenance Cost Estimates	9-14
Table 9-12	Capital Costs of Locally Preferred Alternative Infrastructure	9-15
Table 9-13	Estimated Operating Cost of No-Build Scenario (2005 Dollars)	9-16
Table 9-14	Estimated Operating Cost of Proposed LPA at Full Build Out (2005 Dollars)	9-16
Table 9-15	Costs by Implementation Phase for Infrastructure, Vehicles, and Incremental Annual Operating Costs (2005 Dollars)	9-16
Table 9-16	Breakdown of Infrastructure Costs, 0-5 yrs	9-17
Table 9-17	Breakdown of Infrastructure Costs, 5-10 yrs	9-18
Table 9-18	Cost Detail for LPA Capital Infrastructure Investments, Initial Phase (Years 0-5) (2005 Dollars)	9-19
Table 9-19	Cost Detail for LPA Capital Infrastructure Investments, Second Phase (Years 5-10) (2005 Dollars)	9-20
Table 10-1	Increase in System Wide Ridership Generated by Alternatives A, B, and C, Proposed LPA, and Proposed LPA with Concentrated Land Use	10-22
Table 10-2	Year 2030 Transit Boardings in the Corridor	10-22
Table 10-3	Comparison of change in Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT) for Detailed Alternatives and Locally Preferred Alternatives	10-24
Table 10-4	Operating and Capital Costs for Proposed LPA, by Development Phase (in millions of 2005 \$)	10-25
Table 10-5	Infrastructure Cost Worksheet for Proposed LPA (2005 \$)	10-28

List of Tables (continued)

Table 11-1	Capital Costs of Proposed LPA	11-4
Table 11-2	Capital Costs of Proposed LPA	11-4
Table 11-3	Existing Local Tax Sources	11-8
Table 11-4	Potential Local Funding Options Revenue Summary 2008 (\$ 1000 YOE)	11-11
Table 11-5	Operating Costs of Proposed LPA (\$ Millions)	11-12
Table 11-6	Required Action to Utilize Revenue Sources	11-13