



NWARPC

NORTHWEST ARKANSAS REGIONAL PLANNING COMMISSION

TRANSIT ALTERNATIVES STUDY

Appendix A -
Cost Estimation Details

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1 APPENDIX A – CAPITAL COST AND ANNUALIZED COST ESTIMATES

1.1 CAPITAL COSTS

This section provides a high-level overview of capital cost estimates developed to support comparative analysis across transit alternatives. These estimates are intended to be “order of magnitude” estimates that are comparable between various transit alternatives.

- Estimates are derived from the anticipated quantity of work items required for each alternative
- Unit costs for each work item are informed by industry experience and national cost averages
- Each work item includes a contingency allowance ranging from 20% to 35%, reflecting uncertainty and variability in project scope
- Professional services, such as design, engineering, and management, are calculated as a percentage of total construction costs
- Costs associated with right-of-way acquisition and rolling stock procurement are estimated independently from construction-related expenses

A detailed worksheet is included below, followed by descriptions of each cost category.

Capital costs were estimated in 2025 US dollars using Federal Transit Administration (FTA) Standard Cost Categories (SCC) for capital projects, last updated on January 26, 2025. Capital cost estimates using the SCC worksheet are one of the required submittals when requesting entry into the engineering phase of a major capital investment supported by FTA grants. All three transit alternatives may be qualified to receive funding from FTA’s Capital Investment Grants (CIG) New Starts or Small Starts program.

These costs were then inflated to 2031 US dollars using estimates of inflation expectations developed by the Federal Reserve Bank of Cleveland¹. The expected inflation rates are shown in Table 9 below.

Table 1: Inflation Expectations Developed by Federal Reserve Bank of Cleveland, 2026-2031

Year	Expected Inflation
2026	2.79%
2027	2.56%
2028	2.45%
2029	2.40%
2030	2.37%
2031	2.35%

¹ Federal Reserve Bank of Cleveland, Indicators and Data, Inflation Expectations: <https://www.clevelandfed.org/indicators-and-data/inflation-expectations>. Last updated on July 15, 2025. Data retrieved on July 30, 2025.

Figure 1: Order of Magnitude Capital Cost Estimate

RAPID TRANSIT OPTIONS
Order of Magnitude Capital Cost Estimate

Cat. No.	Description	Unit	Quantity	Unit Cost	Base Amount	Contingency Range		Total Amount		Base Amount
						Low	High	Low	High	
10	GUIDEWAY & TRACK ELEMENTS									
	Guideway									
	Single Guideway									
10.01	Guideway: At-grade exclusive right-of-way	RF	0	\$600	\$0	25%	30%	\$0	\$0	\$0
10.02	Guideway: At-grade semi-exclusive	RF	0	\$950	\$0	25%	30%	\$0	\$0	\$0
10.03	Guideway: At-grade in mixed traffic	RF	0	\$1,260	\$0	25%	30%	\$0	\$0	\$0
10.04	Guideway: Aerial structure	RF	0	\$11,300	\$0	30%	35%	\$0	\$0	\$0
10.06	Guideway: Underground cut & cover	RF	0	\$40,000	\$0	30%	35%	\$0	\$0	\$0
10.07	Guideway: Underground tunnel	RF	0	\$28,000	\$0	30%	35%	\$0	\$0	\$0
10.08	Guideway: Retained cut or fill	RF	0	\$10,000	\$0	30%	35%	\$0	\$0	\$0
	Subtotal - Single Guideway	RF	0		\$0			\$0	\$0	\$0
	Double Guideway									
10.01	Guideway: At-grade exclusive right-of-way	RF	0	\$1,000	\$0	25%	30%	\$0	\$0	\$0
10.02	Guideway: At-grade semi-exclusive	RF	0	\$1,400	\$0	25%	30%	\$0	\$0	\$0
10.03	Guideway: At-grade in mixed traffic	RF	0	\$1,900	\$0	25%	30%	\$0	\$0	\$0
10.04	Guideway: Aerial structure	RF	0	\$17,000	\$0	30%	35%	\$0	\$0	\$0
10.06	Guideway: Underground cut & cover	RF	0	\$63,000	\$0	30%	35%	\$0	\$0	\$0
10.07	Guideway: Underground tunnel	RF	0	\$42,000	\$0	30%	35%	\$0	\$0	\$0
10.08	Guideway: Retained cut or fill	RF	0	\$15,000	\$0	30%	35%	\$0	\$0	\$0
	Subtotal - Double Guideway	RF	0		\$0			\$0	\$0	\$0
	Subtotal Guideway	RF	0		\$0			\$0	\$0	\$0
	Trackwork									
	Single Trackwork									
10.09	Direct Fixation Track	RF	0	\$900	\$0	20%	25%	\$0	\$0	\$0
10.10	Embedded Track	RF	0	\$1,200	\$0	20%	25%	\$0	\$0	\$0
10.11	Ballasted Track	RF	0	\$500	\$0	20%	25%	\$0	\$0	\$0
10.12	Special Trackwork	LS	1	25.0%	\$0	20%	25%	\$0	\$0	\$0
	Subtotal - Single Trackwork	RF	0		\$0			\$0	\$0	\$0
	Double Trackwork									
10.09	Direct Fixation Track	RF	0	\$1,800	\$0	20%	25%	\$0	\$0	\$0
10.10	Embedded Track	RF	0	\$2,400	\$0	20%	25%	\$0	\$0	\$0
10.11	Ballasted Track	RF	0	\$1,000	\$0	20%	25%	\$0	\$0	\$0
10.12	Special Trackwork	LS	1	25.0%	\$0	20%	25%	\$0	\$0	\$0
	Subtotal - Double Trackwork	RF	0		\$0			\$0	\$0	\$0
	Subtotal Trackwork	RF	0		\$0			\$0	\$0	\$0
	Total Category 10	RF	0		\$0			\$0	\$0	\$0
20	STATIONS, STOPS, TERMINALS, INTERMODAL									
	Single Guideway Stations									
20.01	At-grade station, stop	EA	0	\$10,000,000	\$0	25%	30%	\$0	\$0	\$0
20.02	Aerial station, stop	EA	0	\$30,000,000	\$0	30%	35%	\$0	\$0	\$0
20.03	Underground station, stop	EA	0	\$240,000,000	\$0	30%	35%	\$0	\$0	\$0
	Subtotal - Single Stations	EA	0		\$0			\$0	\$0	\$0
	Double Guideway Stations									
20.01	At-grade station, stop	EA	0	\$15,000,000	\$0	25%	30%	\$0	\$0	\$0
20.02	Aerial station, stop	EA	0	\$45,000,000	\$0	30%	35%	\$0	\$0	\$0
20.03	Underground station, stop	EA	0	\$300,000,000	\$0	30%	35%	\$0	\$0	\$0
	Subtotal - Double Stations	EA	0		\$0			\$0	\$0	\$0
	Station Facilities									
20.06	Parking Lots - Surface	Stall	0	\$8,000	\$0	25%	30%	\$0	\$0	\$0
20.06	Parking Garages	Stall	0	\$50,000	\$0	25%	30%	\$0	\$0	\$0
20.06	Pedestrian Overpasses	EA	0	\$1,500,000	\$0	25%	30%	\$0	\$0	\$0
	Subtotal - Station Facilities	LS	1		\$0			\$0	\$0	\$0
	Total Category 20	EA	0		\$0			\$0	\$0	\$0
30	SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS									
	Yards & Shops									
30.02	Maintenance Facility (per vehicle)	EA	0	\$3,000,000	\$0	30%	35%	\$0	\$0	\$0
	Total Category 30	LS	1		\$0			\$0	\$0	\$0
40	SITWORK & SPECIAL CONDITIONS (Calculated on Subtotal Cat. 10 - 30, excluding Subway Guideway)									
40.01	Demolition	RF	0	\$200	\$0	30%	35%	\$0	\$0	\$0
40.02	Utility Relocation	RF	0	\$1,500	\$0	30%	35%	\$0	\$0	\$0
40.04	Environmental	RF	0	\$90	\$0	30%	35%	\$0	\$0	\$0
40.06	Landscaping	RF	0	\$60	\$0	30%	35%	\$0	\$0	\$0
40.07	Roadway Modifications	RF	0	\$700	\$0	30%	35%	\$0	\$0	\$0
40.08	Temporary Facilities	LS	1	15.0%	\$0	30%	35%	\$0	\$0	\$0
	Total Category 40	LS	1		\$0			\$0	\$0	\$0
50	SYSTEMS									
	Single Guideway									
50.01	Train control and signals	RF	0	\$370	\$0	20%	25%	\$0	\$0	\$0
50.02	Traffic signals and crossing protection	RF	0	\$320	\$0	20%	25%	\$0	\$0	\$0
50.04	Traction power	RF	0	\$890	\$0	20%	25%	\$0	\$0	\$0
50.05	Communications, Guideway	RF	0	\$220	\$0	20%	25%	\$0	\$0	\$0
50.05	Communications, Station	EA	0	\$1,000,000	\$0	20%	25%	\$0	\$0	\$0
	Subtotal - Single Systems	RF	0		\$0			\$0	\$0	\$0
	Double Guideway									
50.01	Train control and signals	RF	0	\$650	\$0	20%	25%	\$0	\$0	\$0
50.02	Traffic signals and crossing protection	RF	0	\$340	\$0	20%	25%	\$0	\$0	\$0
50.04	Traction power	RF	0	\$1,100	\$0	20%	25%	\$0	\$0	\$0
50.05	Communications, Guideway	RF	0	\$260	\$0	20%	25%	\$0	\$0	\$0
50.05	Communications, Station	EA	0	\$1,500,000	\$0	20%	25%	\$0	\$0	\$0
	Subtotal - Double Systems	RF	0		\$0			\$0	\$0	\$0
50.06	Fare Collection (per station)	EA	0	\$1,200,000	\$0	20%	25%	\$0	\$0	\$0
	Total Category 50	RF	0		\$0			\$0	\$0	\$0
	Construction Subtotal (Sum Categories 10 - 50)				\$0			\$0	\$0	\$0

60 ROW, LAND, EXISTING IMPROVEMENTS (Calculated on Subtotal Cat. 10 - 30, excluding Subway Items)									
60.01 Right-of-Way	RF	0	\$1,200	\$0	45%	55%	\$0	\$0	
Total Category 60	LS	1		\$0			\$0	\$0	
70 VEHICLES									
70.01 Light Rail Vehicles	EA	0	\$4,800,000	\$0	20%	25%	\$0	\$0	
70.02 Locomotive	EA	0	\$3,400,000	\$0	20%	25%	\$0	\$0	
70.02 Single-Level Coach	EA	0	\$1,950,000	\$0	20%	25%	\$0	\$0	
70.02 Bi-Level Coach	EA	0	\$3,000,000	\$0	20%	25%	\$0	\$0	
70.04 Standard Bus	EA	0	\$600,000	\$0	20%	25%	\$0	\$0	
70.04 Articulated Bus	EA	0	\$1,500,000	\$0	20%	25%	\$0	\$0	
Total Category 70	LS	1		\$0			\$0	\$0	
80 PROFESSIONAL SERVICES (Calculated on Subtotal Cat. 10 - 50)									
80.01 Project Development	4.0%			\$0			\$0	\$0	
80.02 Engineering	12.0%			\$0			\$0	\$0	
80.03 Project Management for Design and Construction	8.0%			\$0			\$0	\$0	
80.04 Construction Administration & Management	6.0%			\$0			\$0	\$0	
80.05 Insurance	1.5%			\$0			\$0	\$0	
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.	0.5%			\$0			\$0	\$0	
80.07 Surveys, Testing, Investigation, Inspection	2.0%			\$0			\$0	\$0	
80.08 Start up	1.0%			\$0			\$0	\$0	
Total Category 80	LS	1		\$0			\$0	\$0	
90 UNALLOCATED CONTINGENCY (Calculated on Subtotal Cat. 10 - 80)									
Project Reserve	10%			\$0			\$0	\$0	
Total Category 90	LS	1		\$0			\$0	\$0	
Total Project	Mile	0.0		\$0			\$0	\$0	
Cost (Million per Mile)									
							\$0	\$0	

\$0 Allocated Contingency
 \$0 Unallocated Contingency
 \$0 Total Contingency
 0.0% Total Contingency

Table 10 below summarizes the estimated total capital costs for each alternative.

Table 2: Estimated Capital Costs in 2031 US Dollars for Each Alternative

	BRT	LR	CR
Estimated Capital Costs	\$209,960,685	\$5,787,797,658	\$1,130,021,188

1.1.1 Category 10 – Guideway and Track Elements

Guideway is the supporting infrastructure that supports roadway and railroad tracks. This category includes various types of single and double guideway – single guideway represents a single “lane” or “track” while double guideway represents a wider guideway that can support two “lanes” or “tracks”, often to accommodate bi-directional travel. Since the BRT alternative is envisioned to be operated on existing roads in mixed traffic, guideway estimates were only applicable to the rail alternatives.

Guideways and trackwork for LR are split into two sub categories – in places where the LR tracks are identified to be outside of existing roadway pavement, LR is envisioned to use double guideways with double direct fixation tracks to accommodate bi-directional travel; elsewhere, LR is envisioned to occupy the outside lanes on the existing roadways, with single guideway and single embedded tracks on both sides of the road.

Guideways and trackwork for CR are also split into two sub-categories – guideway work is assumed to be not needed along the existing A&M railroad, and a single ballasted track would be constructed to allow for 30-minute bi-directional service; beyond NWACC station, where the A&M railroad ends, CR is envisioned to be on double guideway with double ballasted track to Bella Vista Station.

1.1.2 Category 20 – Terminals, Intermodal

This category includes estimates for stations and associated station facilities, such as parking infrastructure and pedestrian bridges. All three alternatives are expected to feature simple, at-grade stations, without additional facilities. For BRT alternatives, only stations located in densely populated² areas are expected to feature a full suite of TWE amenities; for this analysis, only the stations featuring a full suite of TWE amenities are included in the estimates. Other stations would receive improvements of incidental cost, such as bus stop signs and, at some locations, concrete landing pads.

1.1.3 Category 30 – Support Facilities

This category includes estimates for maintenance facilities. It is assumed that all three alternatives would require building maintenance facilities large enough to accommodate daily maintenance needs for the entire fleet required to operate the service.

1.1.4 Category 40 – Sitework & Special Conditions

This category includes estimates for various siteworks required to prepare construction sites for guideways, stations, and other necessary facilities. While the construction activities would likely require removing some of the existing roadway elements, the planning team determines that it is unlikely that any of the alternatives would require demolition of existing structures. Thus, it is assumed that the alternatives would not require demolition.

² This is estimated based on the Troost MAX line in Kansas City, which similarly features more built-out stations in denser areas and minimal station amenities/signage in others. This study estimated the population + employment density (persons + jobs per square mile) around ½ mile planar buffer around of all Troost MAX stations. On average, stations that feature more completed TWE amenities recorded 16,306 persons + jobs per square mile, while stations that feature minimal amenities and signage recorded 3,917 persons + jobs per square mile, using the 2023 5-year American Community Survey (ACS) and 2022 Longitudinal Employer-Household Dynamics (LEHD) data. The latter was rounded to 3,900 persons + jobs per square mile, which was used as a threshold to estimate the number of BRT stations with and without complete TWE amenities.

The construction of BRT stations may involve some degree of utility relocation, landscaping, and roadway modifications. However, the necessity of these works is highly dependent on the specific site conditions, and the final costs are likely insignificant compared to the total project costs. Thus, it is assumed that none of the costs in this category would apply to BRT.

For LR, the entire alignment would likely require relocation of some utilities, environmental, and roadway modifications to accommodate the addition of light rail tracks. Landscaping work is assumed to only apply to segments with double guideways.

Since the majority of the CR corridor would be located away from existing roadway, the construction of additional tracks and new guideway likely won't require significant utility relocation efforts or roadway modifications, except at some intersections/crossings. Thus, it is assumed that most of the work in this section would be environmental mitigation for the entire corridor and landscaping work for the section between NWACC and Bella Vista.

1.1.5 Category 50 – Systems

This category only applies to LR and CR alternatives. Both would require installation of signals, crossing protections, traction power, and communication systems throughout the entire length of the corridors. These two alternatives are also envisioned to feature off-board fare collection at each station, as opposed to the on-board fare collection on the BRT alternative.

1.1.6 Category 60 – Right-of-Way

This category only applies to LR and CR alternatives as both would likely require a significant amount of land acquisition or easement to accommodate portions of the corridor. For LR, the portion that cannot be accommodated within the existing roadway is assumed to need right-of-way acquisition. For CR, the segment between NWACC and Bella Vista is assumed to need right-of-way acquisition. While the construction of some BRT stations may also require some degrees of right-of-way acquisition or easement, often the stations can be entirely contained within the existing roadway right-of-way.

1.1.7 Category 70 – Vehicles

The number of vehicles required for each alternative is determined by the operating plan – the number of vehicles required to maintain peak service, plus an additional 20% as spare vehicles, rounded to the nearest integer. The BRT alternative is assumed to feature a standard 40-foot bus, the LR alternative is assumed to be operated with a short streetcar or light rail vehicle in single-car consists, and the CR alternative is assumed to be operated with diesel-multiple-units in two-car consists.

1.1.8 Category 80 – Professional Services

This category includes various professional services often associated with the lifecycle of transportation infrastructure projects – project development, engineering, design, and construction management, construction administration and management, insurance, legal, surveys, testing, investigation, inspections, and start-up. These services are assumed to be percentages of the total construction costs (categories 10 through 50), ranging from 0.5% to 12%.

1.1.9 Category 90 – Unallocated Contingency

This category includes a final 10% contingency as a project reserve for when some work items inevitably exceed their allocated budget due to unforeseen reasons or unexpected discoveries (such as unmapped utility).

1.1.10 Summary of Capital Costs

Table 11 below summarizes the capital cost estimates for the three transit alternatives based on 2025 dollars in millions.

Bus Rapid Transit spans 32 miles with 142 stations and 20 revenue vehicles. It has the lowest total project cost, ranging from \$181.21M to \$188.41M, with a unit cost of \$5.66M–\$5.89M per mile. Key cost categories like guideway and track elements are listed as \$0, while stations and support facilities contribute modestly to the overall cost.

Light Rail Transit covers 30 miles with 98 stations. It has the highest estimated costs, ranging from \$3,478.15M to \$3,618.43M. Significant expenses are attributed to guideway and track elements (\$858.64M–\$893.82M) and stations (\$1,225M–\$1,274M). Unit costs are not specified but are substantially higher than BRT.

Commuter Rail spans 33 miles with only 8 stations. Its total project cost ranges from \$606.09M to \$630.96M. Major costs include guideway and track elements (\$252.38M–\$262.77M) and support facilities (\$31.60–\$32.40M), positioning it between BRT and LRT in terms of overall expense.

Table 3: Rapid Transit Options- Order of Magnitude Capital Cost Estimate (2025 Dollars in Millions)

SCC No.	Description	BRT		Light Rail		Commuter Rail	
		Low	High	Low	High	Low	High
	Length (Mile)	32.0	32.0	30.0	30.0	33.0	33.0
	Number of Stations	142	142	98	98	8	8
	Number of Revenue Vehicles	20	20	7	7	12	12
10	GUIDEWAY & TRACK ELEMENTS	\$0.00	\$0.00	\$858.64	\$893.82	\$252.38	\$262.77
20	STATIONS, STOPS, TERMINALS, INTERMODAL	\$65.25	\$67.86	\$1,225.00	\$1,274.00	\$44.00	\$45.76
30	SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	\$39.00	\$40.50	\$27.30	\$28.35	\$31.20	\$32.40
40	SITWORK & SPECIAL CONDITIONS	\$0.00	\$0.00	\$597.36	\$620.34	\$24.67	\$25.62
50	SYSTEMS	\$0.00	\$0.00	\$769.85	\$801.92	\$253.84	\$264.42
	Construction Subtotal (Sum Categories 10- 50)	\$104.25	\$108.36	\$3,478.15	\$3,618.43	\$606.09	\$630.96
60	ROW, LAND, EXISTING IMPROVEMENTS	\$0.00	\$0.00	\$121.55	\$129.93	\$82.00	\$87.65
70	VEHICLES	\$24.00	\$25.00	\$40.32	\$42.00	\$48.96	\$51.00
80	PROFESSIONAL SERVICES	\$36.49	\$37.93	\$1,217.35	\$1,266.45	\$212.13	\$220.84
90	UNALLOCATED CONTINGENCY	\$16.47	\$17.13	\$137.92	\$505.68	\$26.11	\$27.18
	Total Project Cost	\$181.21	\$188.41	\$4,995.29	\$5,562.49	\$975.29	\$1,017.63

1.2 ANNUALIZED CAPITAL COSTS

Annualized capital costs were estimated based on the useful life for each item, listed below in Table 12.

Table 4: Items by Years of Useful Life

Category	Items	Years of Useful Life
10 GUIDEWAY & TRACK ELEMENTS		
10.01	Guideway: At-grade exclusive right-of-way	125
10.02	Guideway: At-grade semi-exclusive (allows cross-traffic)	30
10.03	Guideway: At-grade in mixed traffic	20
10.09	Track: Direct fixation	30
10.10	Track: Embedded	20
10.11	Track: Ballasted	35
20 STATIONS, STOPS, TERMINALS, INTERMODAL		
20.01	At-grade station, stop, shelter, mall, terminal, platform	70
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS		
30.02	Light Maintenance Facility	50
40 SITEWORK & SPECIAL CONDITIONS		
40.01	Demolition, Clearing, Earthwork	125
40.02	Site Utilities, Utility Relocation	125
40.04	Environmental mitigation, e.g. wetlands, historic/archeological, parks	125
40.06	Pedestrian/bike access and accommodation, landscaping	20
40.07	Automobile, bus, van accessways, including roads, parking lots	20
40.08	Temporary Facilities and other indirect costs during construction	100
50 SYSTEMS		
50.01	Train control and signals	30
50.02	Traffic signals and crossing protection	30
50.03	Traction power supply: substations	50
50.04	Traction power distribution: catenary and third rail	30
50.05	Communications	20
50.06	Fare collection system and equipment	25
60 ROW, LAND, EXISTING IMPROVEMENTS		
60.01	Purchase or lease of real estate	125
70 VEHICLES		
70.01	Light Rail	25
70.03	Commuter Rail	25
70.04	Bus	12

The resulting annualized costs were inflated to 2031 US Dollars using the 30-year inflation expectations data described previously. Table 13 below summarizes the estimated annualized capital costs for each alternative.

Table 5: Estimated Annualized Capital Costs in 2031 US Dollars for Each Alternative

	BRT	LR	CR
Estimated Capital Costs	\$7,292,563	\$211,577,371	\$44,920,041