V – Cost Analysis

Capital and operating cost estimates were completed for all three route alignments. Identical capital costs for busway and LRT were assumed for transit stations, park-and-ride lots, utilities, communications and fare collection systems, all of which were assumed to be compatible with either busway or LRT service. Capital cost differences were limited to those infrastructure elements unique to busway (i.e., roadway) or LRT (i.e., guideway, traction and electrification and signals needed to operate light-rail vehicles) and vehicle fleet requirements. Detailed capital cost estimates are included in Appendix C.

Fleet Requirements

Fleet requirements were estimated by using vehicle capacity, projected ridership demand and "headway", defined as the frequency of vehicles operated in an hour. Although for purposes of forecasting future ridership, policy headways were established and were identical for both busway and LRT (see "Service Frequencies" in Chapter IV) in practice, busway headways would be shorter due to projected ridership exceeding bus capacity during peak periods Estimations of fleet requirements for busway and LRT are presented in Table 10.

For the purposes of this study, a hybrid diesel-electric bus was assumed to have a passenger capacity of 80 and a light-rail vehicle (LRV) passenger capacity of 120. As a result, service on the 29th Street alignment for both busway and LRT would remain on the policy headway of 10 minutes and would require 4 buses or 3 LRVs for operation.

The 29th Street and Southwest Corridor alignment would require 12 buses or 9 LRVs due to peak hour passenger demand. As a result, the busway headways would be 5 minutes and the LRT headways approximately 7 minutes.

The Southwest to Minneapolis CBD Alignment would require 22 buses and 15 LRVs. Due to peak hour passenger demand, the headways would be increased to approximately 3 minutes for a busway and 4 minutes for LRT.

Table 10 – Fleet Requirements (includes assumption of 15 percent spares)

Alternative	29th Street Corridor (W. Lake – Hiawatha)	29th Street and Southwest Corridors (Hopkins – Hiawatha)	Southwest Corridor to Minneapolis CBD (Hopkins – Mpls.. CBD)
Busway	5	14	28
LRT	4	11	18

Capital Costs

Capital cost estimates, which include construction, vehicles, stations, bridges and retaining walls, are presented in Table 11. A range of costs is presented for the Southwest Corridor to Minneapolis CBD. This range reflects the potential alignments for a downtown connection, via either exclusive right-of-way or surface street. Detailed cost estimates are contained in Appendix C.

Table 11 – Capital Costs (2005 dollars)

Alternative	29th Street Corridor (W. Lake – Hiawatha)	29th Street and Southwest Corridor (Hopkins – Hiawatha)	Southwest Corridor to Minneapolis CBD (Hopkins – Mpls.. CBD)
Busway	$59 M	$104 M	$84 M - $95 M0
LRT	$122 M	$234 M	$244 M – $289 M

Annual Operating and Maintenance Costs

Annual operating and maintenance (O&M) costs for busway and LRT were computed and are presented in Table 12. These figures take into account administration, labor (operations and maintenance), route miles traveled and energy. Busway operating costs include refinements for additional fare collection requirements, system monitoring, station maintenance, vehicle maintenance and roadway maintenance. LRT operating cost adjustments include drive labor savings resulting from "training" of vehicles where possible.

Table 12 – Annual Operating and Maintenance Costs (2005 dollars)

Alternative	29th Street Corridor (W. Lake – Hiawatha)	29th Street and Southwest Corridor (Hopkins – Hiawatha)	Southwest Corridor to Minneapolis CBD (Hopkins – Mpls.. CBD)
Busway	$2.0 M	$4.9 M	$9.1 M
LRT	$2.3 M	$4.9 M	$8.4 M

Cost Effectiveness Measures

Two measures of cost-effectiveness are presented here: passengers-per-revenue hour and cost per new passenger.

Passengers-per-Revenue Hour

Passengers-per-revenue hour is a measure of transit route productivity used by many transit agencies, including Metro Transit. This figure represents the average number of passengers riding any transit route per hour of revenue operation. The higher the number of passengers-per-revenue hour, the greater efficiencies are realized and the more productive is the route. In this instance, passengers-per-revenue hour have been calculated, using the ridership forecasts (see Chapter IV) and the expected hours of transit service. Table 13 summarizes the projected passengers-per-revenue hour for both busway and LRT.

Regional standards for passengers-per-revenue hour have been established by the Metropolitan Council and are described in their Transit Redesign 1996 report. All busway and LRT alignment alternatives far exceed the minimum threshold of 15 passengers-per-revenue hour for large bus fixed-route service and 50 passengers-per-revenue hour for LRT.

Table 13 – Passengers-per-Revenue Hour of Service

Alternative	29th Street Corridor (W. Lake – Hiawatha)	29th Street and Southwest Corridor (Hopkins – Hiawatha)	Southwest Corridor to Minneapolis CBD (Hopkins – Mpls.. CBD)
Busway	99	73	64
LRT	105	119	162

Cost per New Passenger

Cost per new passenger is the measure of cost-effectiveness the United States Department of Transportation relies upon to rank proposed new transit projects. Although other factors enter into the equation, it is primarily a calculation of the number of new transit riders attracted to a proposed service (as opposed to those riders diverted from existing transit routes or services) divided by total project capital costs (see Appendix B for further explanation).

New passenger costs for both busway and LRT are presented in Table 14.

Table 14 – Cost per New Passenger

Alternative	29th Street Corridor (W. Lake – Hiawatha)	29th Street and Southwest Corridor (Hopkins – Hiawatha)	Southwest Corridor to Minneapolis CBD (Hopkins – Mpls.. CBD)
Busway	$29	$26	$15
LRT	$44	$37	$23

Busway Conversion to LRT

The cost to convert a busway into LRT operations was estimated to determine if constructing a busway precludes future conversion to LRT. Conversion costs were estimated using the 29th Street and Southwest Corridors alignment.

Constructing a busway in the 29th Street and Southwest Corridors does not preclude future conversion to LRT. Capital elements such as stations, fare-collection systems and infrastructure improvements to bridges and retaining walls constructed for a busway are assumed to remain for LRT. The service conversion would then require removal of the busway roadway and installing that infrastructure necessary to operate light-rail vehicles.

The incremental cost to convert a busway to LRT in the future is approximately 17 percent greater than the cost of constructing LRT with no initial provision of busway service. These costs are presented in Table 15.

Table 15 – Busway Conversion to LRT (29th Street and Southwest Corridors)

Cost Element	Cost (2005 dollars)
Roadway Removal (8.44 miles)[1]	$ 1 M
Guideway (8.54 miles)	$ 13 M
Trackwork (8.54 miles)	$ 24 M
LRT Equipment Signals	$ 23 M
Traction/Electrification (8.54 miles)	$ 17 M
Vehicles	$ 46 M
Yards and Shops	$ 11 M
Agency/Engineering/Insurance	$ 34 M
Total Conversion Cost	$169 M

[1] Roadway removal costs were assumed at $20.00 per linear foot.