Tolls collected by the facility would be used to pay off bonds issued to fund the capital construction, operation, and maintenance of the facility. The CTE would collect revenues, issue bonds, and construct, operate, and maintain the facility. Detailed information on the philosophy, traffic engineering concepts, roadway design elements, tolling, and financial aspects is contained in the *C-470 Express Lanes Feasibility Study* (June 2005).

Toll Collection System

The express lanes would use electronic toll collection, by employing vehicle-mounted transponders and overhead toll collection gantries. This eliminates the need for traditional toll collection booths and allows drivers to maintain full travel speed. The lack of toll booths would minimize the environmental effects of the alternative due to the smaller footprint required. All drivers using the facility would be required to have a vehicle-mounted transponder to access the express lanes. The C-470 toll collection system would be interoperable with E-470 and Northwest Parkway, so the EXpressToll transponders currently used on these other Denver Metro toll facilities would also work on the C-470 express lanes. Enforcement would be conducted by photo and video surveillance, as well as conventional patrols.

Assumed Toll Schedule

A preliminary toll schedule was developed to estimate revenues and determine potential financial feasibility of the express lanes facility. Toll rates were established in the *C-470 Express Lanes Feasibility Study* (June 2005), based on travel demand and user acceptance, and are consistent with current toll rates on other toll roads in the Denver Metro area. The value of time used in toll diversion modeling is discussed in the *C-470 – Value of Time Analysis Technical Memo* (September 2004). The assumed toll schedule is shown in **Table 2-2**. While the values

Table 2-2
Assumed Toll Schedule

Time Period	Hours	2008 (Opening Year)		2025 (Planning Year)	
		Toll Rate/Mile ($)	Toll ($)	Toll Rate/Mile ($)	Toll ($)
AM Off-Peak	5:00–5:30	0.06	0.71	0.10	1.25
AM Shoulder	5:30–6:30	0.10	1.25	0.14	1.75
AM Peak	6:30–8:00	0.20	2.50	0.29	3.63
AM Shoulder	8:00–9:00	0.10	1.25	0.14	1.75
AM Off-Peak	9:00–12:00	0.06	0.75	0.10	1.25
PM Off-Peak	12:00–2:00	0.06	0.75	0.10	1.25
PM Shoulder	2:00–3:00	0.10	1.25	0.14	1.75
PM Peak	3:00–6:00	0.20	2.50	0.29	3.63
PM Shoulder	6:00–7:00	0.10	1.25	0.14	1.75
PM Shoulder	7:00–10:00	0.06	0.75	0.10	1.25

All dollar amounts are in 2005 dollars.
Through trip assumes travel on the entire 12.5-mile express lanes distance through the C-470 Corridor.

shown in **Table 2-2** reflect those used in the feasibility analysis, the CTE would ultimately determine the actual toll schedule based on additional, more detailed revenue studies that would be conducted if the EL Alternative is implemented.

The revenue analysis conducted for the *C-470 Express Lanes Feasibility Study* (June 2005) assumed a conservative scenario in which all tolls collected were at the lowest, two-axle passenger car rate. In reality, the expected toll structure for a potential express lanes facility would vary by number of axles; public transit buses would ride free, and HOVs would not be exempt from paying tolls. This toll schedule is assumed for planning purposes only; the actual toll schedule that would be charged for a potential facility would be established by the CTE during final design and implementation. The assumed toll schedule consists of three collection periods during weekdays and one period on weekends. The three weekday periods are peak, shoulder, and off-peak, while weekends would have only an off-peak period. The peak period toll rate for a 2008 opening would be $0.20 per mile in 2005 dollars, and the peak period toll rate for 2025 would be $0.29 per mile in 2005 dollars. These rates produce a toll of approximately $2.50 in 2008 and $3.63 in 2025 to travel the entire C-470 Corridor from Kipling Parkway to I-25 (all 2005 dollars).

Signing

Because the EL Alternative consists of two parallel and adjoining facilities, a separate set of signing would be necessary for each of the two roads. Signing of the express lanes would guide drivers to a different set of interchanges than the general purpose lanes, and dynamic message signs would notify express lanes users of projected time savings and toll prices. As a result, the number and intensity of signing on C-470 would be greater with the EL Alternative than with a conventional general purpose lane facility. This would result in two effects: an environment that would require more attention and decision-making by drivers on both roadways, and more intrusion of structural/signing elements into the visual landscape. These effects are discussed in **Sections 3.3.1** and **3.3.15** on transportation and traffic and visual resources, respectively.

2.4.3.4 Mobility Enhancement Elements

Mobility enhancement elements for the EL Alternative would be the same as for the GPL Alternative with a couple exceptions. Two particular differences of note between the two action alternatives are:

- The need for an incident management plan is especially important for the EL Alternative because it represents an unusual scenario where two parallel and adjoining facilities exist. The two facilities present not only the possibility that an incident in one could contribute to an effect on the other, but also, they afford the opportunity for one to provide an alternative relief route for the other. These potential strategies present technical, logistical, and operational challenges that would need to be resolved at a policy level before they could be implemented. The IMP would serve to accomplish this.

- The EL Alternative would require 8.1 miles of trail reconstruction. Other than specific differences at isolated locations along C-470, the trail would generally be relocated north 40 to 50 feet. The new trail layout would be essentially the same for the EL Alternative as it is for the GPL Alternative. The express lanes T-ramps at Colorado Boulevard would not conflict with the trail because they are in the center of the roadway. A separate discussion regarding effects to the C-470 trail is included in **Section 3.3.16**.

2.4.3.5 Cost

The EL Alternative cost was estimated at $385 million. Of this, the Santa Fe Drive interchange cost is $60 million. These costs are in 2005 dollars.

2.4.4 Opportunities for Transit in the C-470 Corridor

RTD believes that commuter service on C-470 might be a viable option if congestion levels are sufficiently reduced to permit reliable service to its patrons. The sections herein discuss how commuter bus service or LRT could be accommodated in each of the action alternatives should RTD choose to do so. It should be clear, however, that commuter bus service and LRT are not explicitly part of either action alternative.

2.4.4.1 Commuter Bus

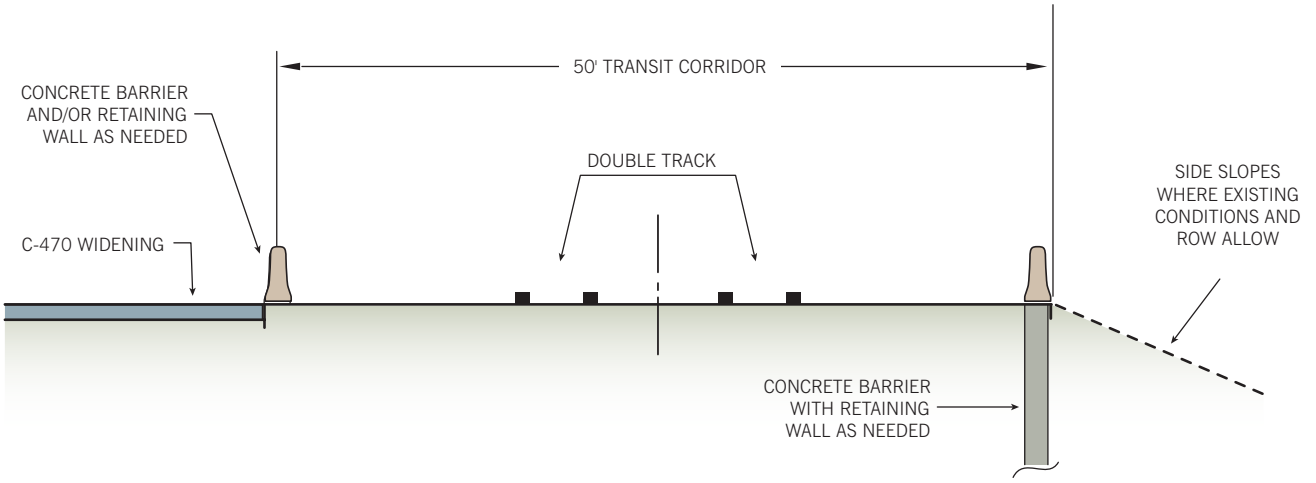
If RTD should choose to operate commuter bus service under the GPL Alternative, it would operate in mixed traffic in the general purpose lanes. As such, it would be subject to any delays that would result from congestion on the lanes. If RTD chooses to operate commuter bus service under the EL Alternative, it would operate in the express lanes. Because the express lanes are specifically managed to maintain LOS C or better, the commuter bus service would not be subject to delays due to congestion. They would, of course, still be subject to delays once they return to mixed traffic in the general purpose lanes.

Although no access to the express lanes is proposed east of the University Boulevard park-n-Ride, access could easily be provided if RTD determined there was sufficient demand. Discussions with RTD indicated there would not be sufficient demand for commuter bus service between University Boulevard and I-25 to warrant access at this time. The rationale was that because the distance is short, potential users would likely prefer to travel on arterial streets to their destinations.

2.4.4.2 Long-Term Light Rail Transit Vision

Although LRT and other forms of fixed-guideway transit were eliminated from consideration during the screening process, CDOT and RTD will continue to work with local agencies to accommodate the potential for future LRT in the C-470 Corridor at a conceptual level. As part of this EA, a cursory assessment of a potential LRT envelope adjacent to C-470 was performed in an effort to assist the City of Lone Tree and Douglas County in future land use planning and ROW preservation. No attempt was made to determine the actual LRT alignment, such as at interchange crossings. The assessment sought only to illustrate where additional ROW may need to be acquired, so that the respective planning departments could work to preserve the corridor as development occurs. A 50-foot LRT typical section was assumed, which accounted for track, platforms, barriers, and fences. **Figure 2-11** shows the assumed typical section used for this conceptual planning effort.

Figure 2-11
Light Rail Transit Typical Section Concept on the C-470 Corridor



The investigation identified several locations in which the conceptual alignment would lie outside of existing CDOT ROW. **Figure 2-12** shows the conceptual LRT alignment in the Corridor. After preliminary engineering, the number of locations requiring additional right-of -way could increase. Further, more ROW would be necessary to accommodate LRT stations and park-n-Ride facilities. A strong reliance on park-n-Ride capacity would be expected in this corridor due to the nature of the residential development patterns. These concepts were presented to and discussed with RTD, the Project Management Team, and Technical Working Group meetings throughout the screening process.

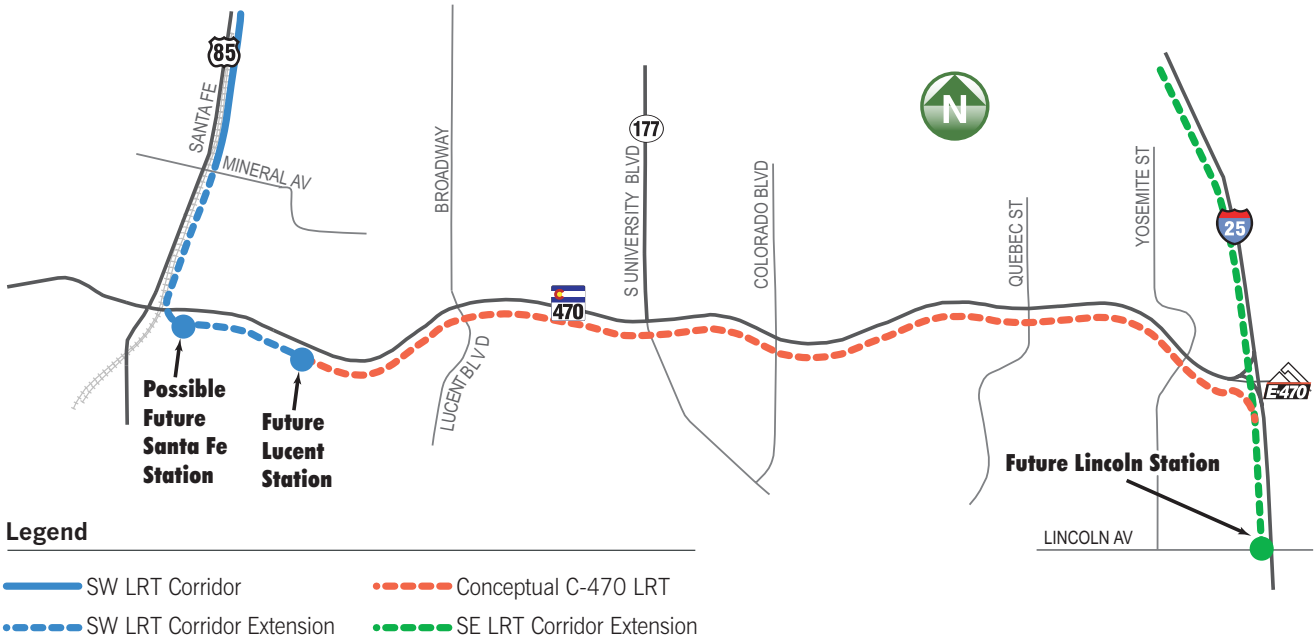
As part of the Master Inter-Governmental Agreement between CDOT and RTD signed in April 2004, CDOT will continue to work with local agencies to accommodate the potential for future light rail in the C-470 Corridor at a conceptual level, based on the following principles:

- Accommodation of a future rail line within the C-470 Corridor ROW should be made to the maximum extent possible so that an envelope might be available for future transit options
- Design of facilities (such as bridge structures or retaining walls) should not purposefully block future transit opportunities

2.5 PREFERRED ALTERNATIVE

Following the environmental analysis of the three alternatives carried forward, as discussed in **Section 2.4**, the FHWA and CDOT identified a Preferred Alternative. This was based on the ability to fund and implement one of the alternatives, as evaluated during the Financial Analysis and Implementation Committee (FAIC) process. This section describes the purpose and findings of the FAIC, and ultimately how the Preferred Alternative was identified.

Figure 2-12
Conceptual Light Rail Transit Alignment on the C-470 Corridor



2.5.1 Financial Analysis and Implementation Committee

The FAIC was developed as a collaborative process with cities, counties, and other agencies within the project area to investigate potential funding strategies for the two action alternatives and provide input to FWHA and CDOT on the identification of the preferred approach for improving C-470. The group was composed of representatives from jurisdictions with a direct financial interest in improvements to C-470 including the FHWA; CDOT; the CTE; the E-470 Public Highway Authority; RTD; Arapahoe, Douglas, and Jefferson Counties; the Cities of Centennial, Littleton, and Lone Tree; the Highlands Ranch Community Association, and the Highlands Ranch Metro District. Over the course of four months, this committee met as a group three times to evaluate potential strategies to create funding partnerships and consider potential mechanisms to fund improvements. Additional one-on-one meetings were also held with individual jurisdiction representatives to better understand funding opportunities and constraints within the context of C-470 improvements.

The FAIC investigated potential funding mechanisms and assessed the extent to which these mechanisms were practicable. The following sections summarize the findings for the two action alternatives.

2.5.1.1 General Purpose Lanes Alternative Funding

The Santa Fe Drive interchange is included in DRCOG's 2030 RTP. However, full funding for the interchange has not currently been identified. Funding for any other part of the GPL Alternative has not been identified and is not included in the RTP.

The primary potential funding source identified during the FAIC for the GPL Alternative was through the formation of a multi-jurisdictional, metro-wide Regional Transportation Authority (RTA) that would be determined by a vote of the people no earlier than November 2007. Through the RTA, participating jurisdictions would assess a sales tax which would be used to pay off bonds for C-470 improvements and other transportation improvements projects throughout the metropolitan area. The ability to implement the GPL Alternative would be demonstrated only if all potential members of the RTA made specific commitments to form the RTA, pursue a referendum for the sales tax, and earmark the necessary revenues specifically for these C-470 improvements. If all of these conditions were to be met, the GPL Alternative could be considered to have a viable funding source and could then be eligible for inclusion in DRCOG's RTP. However, to date these conditions have not yet been met.

2.5.1.2 Express Lanes Alternative Funding

The Santa Fe Drive interchange is included in DRCOG's 2030 RTP. However, full funding for the interchange has not currently been identified. Funding for any other part of the EL Alternative is not included in the RTP.

Based on the financial analysis completed as part of the *C-470 Express Lanes Feasibility Study* (June 2005), tolled revenue could cover approximately 70 to 80 percent of the $325 million capital construction cost of the EL Alternative, after payment of financing, annual operations and maintenance, and future rehabilitation. Refinements made to the express lanes traffic and revenue forecasts during the FAIC process demonstrated that the full $325 million capital cost could be funded with toll revenue. The CTE's detailed financial analysis also indicated that toll revenues could potentially fund the Santa Fe Drive interchange improvements. By demonstrating that toll revenues could fund the initial construction, annual operation and maintenance, and future rehabilitation on the C-470 Corridor, the EL Alternative has a viable funding source, which makes it eligible for inclusion in DRCOG's RTP. Prior to implementation of the tolled EL Alternative, the CTE

would perform an investment grade traffic and revenue study, which is required before funds can be secured for this alternative. Through this effort and procurement of a design/build contractor, the final financing and implementation steps would be formed, including specific strategies for construction phasing that may be necessary to achieve an investment grade rating.

2.5.2 Preferred Alternative Identification

Based on the funding information analyzed during the FAIC process, it was concluded that there is a reasonable expectation that the EL Alternative is financially self-supporting, and therefore is eligible for amendment into the fiscally-constrained DRCOG RTP and subsequent implementation. Financing options for the GPL Alternative are not yet finalized, therefore it is not considered to be implementable at this time.

While both action alternatives meet this project's purpose and need and have comparable environmental effects, only the EL Alternative has the demonstrated ability to be implemented. As a result, the FHWA and CDOT have identified the EL Alternative as the Preferred Alternative.

After the appropriate public review period and public hearing on this EA, the FHWA and CDOT will consider public comments and issue a decision document. If it is determined that the implementation of the Preferred Alternative would not result in significant adverse effects, then the FHWA would issue a Finding of No Significant Impact (FONSI) to finalize the decision to implement the Preferred Alternative. If it is determined that the Preferred Alternative would result in significant negative effects, then an EIS would be initiated. Until the decision document is issued, all of the alternatives are still under consideration and could be selected.

2.6 ALTERNATIVES CONSIDERED BUT ELIMINATED

The alternatives considered in the screening process but eliminated from consideration are summarized in **Table 2-3**. Detailed discussions of each alternative eliminated are contained in the remaining subsections of **Section 2.6**.

2.6.1 Transit

The transit family consisted of fixed guideway and non-fixed guideway alternatives. These technologies included LRT, commuter rail, monorail, MagLev, and bus rapid transit. They require substantial capital investment in infrastructure design and construction and are less compatible with adjacent corridor technologies. RTD's FasTracks plan does not include the extension of any form of fixed guideway transit between the proposed Southwest Corridor LRT Extension and Southeast Corridor LRT line. Many factors, such as regional plans, service type, difficulties in serving the dispersed land use base, origin and destination patterns, low potential ridership, and lack of congestion reduction were considered in the decision to eliminate these alternatives. It was recognized however, that other transit service, such as a commuter bus, is beneficial to the community and can provide some limited congestion relief, as discussed in **Section 2.4.4.1.** A long-term vision for LRT along the C-470 Corridor is discussed in **Section 2.4.4.2**.

2.6.2 Mobility Enhancements

The mobility enhancement family included several minimal action strategies that could contribute to relieving congestion and delay on the C-470 Corridor and improve reliability. Because these strategies in themselves do not have the ability to address the purpose and need, this family was eliminated from further consideration as a stand alone action alternative. Some elements of the family, however, were carried forward for repackaging with the action alternatives. Those elements are discussed with the

Table 2-3
Alternatives Considered But Eliminated

Alternative/Family	Alternative Description	Reason Eliminated
Transit		
Fixed Guideway and Non-Fixed Guideway	LRT, commuter rail, monorail, MagLev, and bus rapid transit	Regional plans, service type, difficulties in serving the dispersed land use base, origin and destination patterns, low potential ridership, cost, and lack of congestion reduction, collectively lead to elimination of this alternative family
Mobility Enhancements		
	The mobility enhancement family included several minimal action strategies that could contribute to relieving congestion and delay and improve reliability	These strategies by themselves do not have the ability to address the purpose and need, so this family was eliminated from further consideration as a standalone action alternative. Some elements of the family were carried forward for repackaging with the action alternatives
	Teleworking. Establish home-based employment programs	Does not provide the ability to divert sufficient numbers of vehicles off of C-470 to effectively reduce congestion and delay and improve reliability
	Variable Work Hours. Alternative work hours made available by major employment centers in the region	Does not provide the ability to divert sufficient numbers of vehicles off of C-470 to effectively reduce congestion and delay and improve reliability
	Incentives and Subsidies. Employer and employee-based rewards, cash, time off, or recognition for commuters	Does not provide the ability to divert sufficient numbers of vehicles off of C-470 to effectively reduce congestion and delay and improve reliability
	Connective Transit Service. Linkage to transit services within the C-470 Corridor, such as park-n-Rides and LRT stations, with a bus feeder system	Does not provide the ability to divert sufficient numbers of vehicles off of C-470 to effectively reduce congestion and delay and improve reliability
	Transportation Management Organizations. Cooperate with employers, residents, and homeowners associations to support and encourage transportation programs that reduce traffic congestion and offer commuters viable options	The Southeast Business Partnership already serves as southeast Denver's Transportation Management Association and could expand its outreach to the C-470 Corridor
	Ramp Metering. Monitors and manages traffic flow on freeways by metering on-ramp flows	Ramp metering is already in place on the corridor

Table 2-3
Alternatives Considered But Eliminated (Continued)

Alternative/Family	Alternative Description	Reason Eliminated
Mobility Enhancements (continued)		
	Parking Information System. Employ signing to indicate remaining capacity at parking facilities	Emerging technology to implement this system is not well proven
	Telecommunication. Computerized electronics that connect a driver or a vehicle to external services, such as navigation systems, pricing, and emergency signals	Does not provide the ability to divert sufficient numbers of vehicles off of C-470 to effectively reduce congestion and delay and improve reliability
	Improved Bicycle/Pedestrian Trails. Provide connections between the C-470 trail and other trails in nearby communities	Existing or improved trail system would not generate sufficient usage to reduce congestion and delay on C-470 to improve reliability
	Marketing/Promotion for Bicycle/ Pedestrian Trails	Does not provide the ability to divert sufficient numbers of vehicles off of C-470 to effectively reduce congestion and delay and on C-470 to improve reliability
General Purpose Lanes Family		
Six-Lane General Purpose Lanes Alternative	Could be implemented within the existing median without widening to the outside	Existing and future traffic volumes produce operations from LOS D to F during peak hours, resulting in unpredictable travel times
Six-Lane General Purpose Lanes with Auxiliary Lanes Alternative	Same as Six-Lane GPL Alternative but with a 12-foot auxiliary lane in each direction	The auxiliary lanes provide some congestion relief, but it does not provide active management of reliability, especially between Quebec Street and Broadway
Six-Lane General Purpose Lanes with HOV Lanes Alternative	Same as Six-Lane GPL Alternative, but an HOV Lane is added	Low usage of HOV lanes results in minimal improvement of congestion over the Six-lane GPL Alternative. Reliability in HOV Lanes can not be actively managed
Six-Lane General Purpose Lanes with Auxiliary and HOV Lanes Alternative	This alternative combines the capacity improvements of the Six-Lane GPL with Auxiliary Lanes Alternative with an HOV Lane	Operations are only slightly improved over the Six-Lane GPL Alternative. No active management of reliability
Eight-Lane General Purpose Lanes Alternative	Four general purpose lanes in each direction	Operations were good except in the highest-volume segments where they broke down. No active management of reliability

Table 2-3
Alternatives Considered But Eliminated (Continued)

Alternative/Family	Alternative Description	Reason Eliminated
Express Lanes Family		
Reversible Express Lanes	Two lanes in between the general purpose lanes, in which the direction of travel can be reversed to accommodate the peak period flows	Because the express lanes are only available to one direction of travel, the volumes are effectively cut in half, as are the revenues. The feasibility is marginally reduced. High volumes in opposite direction of travel experience no benefit
2-Lane Express Lanes	A single express lane in each direction, buffer separated	The addition of a single lane in each direction would not provide enough capacity to meet the project's purpose and need. Revenues are cut in half with this alternative, negating the cost savings. The inability to pass slower vehicles makes it less attractive to potential customers and further reduces revenue
Express Lanes Access Locations		
Platte Canyon Road	N/A	As a minor interchange, Platte Canyon Road did not attract sufficient numbers of users
Santa Fe Drive	N/A	Only moderate demand was forecasted at Santa Fe Drive, which was more than offset by complexity and cost of providing access. Slip ramps could not provide adequate operations, and direct ramps were too costly
University Boulevard	N/A	Average peak hour express lanes ramp volumes at University Boulevard were moderate compared to others
Yosemite Street	N/A	The proximity to Quebec Street and I-25 made it infeasible to provide access
Santa Fe Interchange Family		
Split Diamond Interchange	Split Diamond with west ramps at Santa Fe Drive and east ramps at Blakeland to redistribute traffic	Required additional signalized intersections on County Line Road. Larger footprint was undesirable due to increased environmental effects
Three-Level Diamond Interchange (a)	Northbound and southbound through movements would be separated from turning movements by placing them on flyover structures above a standard diamond interchange	The lane configuration at the Santa Fe Drive/Blakeland Drive intersection precludes certain movements or adds separate signal phases that were undesirable

Table 2-3
Alternatives Considered But Eliminated (Continued)

Alternative/Family	Alternative Description	Reason Eliminated
Santa Fe Interchange Family (continued)		
Three-Level Diamond Interchange (b)	This variation of the Three-Level Diamond Interchange (a) Alternative extends the through-lane bypass beyond the Santa Fe Drive/Blakeland Drive intersection	Higher cost, effects to existing railroad bridges south of the Santa Fe Drive/ Blakeland Drive intersection, and effects to Chatfield State Park were more severe than other alternatives
Southwest Partial Cloverleaf Interchange	A loop ramp in the southwest quadrant of the interchange for the southbound to eastbound movement	LOS at County Line Road and C-470 ramp terminal intersections is not greatly improved. Eastbound on-ramp traffic would have difficulty merging with C-470 traffic due to steep grade and lower entrance speed. Eastbound off-ramp terminal would be too close to Blakeland Drive. Extensive effects at Chatfield State Park were more severe than other alternatives
Southwest Partial Cloverleaf Interchange with One Flyover	A variation of the Southwest Partial Cloverleaf, with the addition of a flyover ramp for the northbound to westbound movement	This alternative resulted in the same operational and environmental issues as the Southwest Partial Cloverleaf. The flyover did not improve operations sufficiently to change the disposition
Southwest Partial Cloverleaf Interchange with Two Flyovers	A variation of the Southwest Partial Cloverleaf, with the addition of two flyover ramps for the northbound to westbound and eastbound to northbound movements	This alternative provides optimal operations for three of the four movements at this interchange, but it resulted in the greatest environmental effects, especially at Chatfield State Park. The operational improvement of the northbound to westbound flyover was not sufficient to warrant the additional effects
Improved Diamond Interchange	An expanded version of the existing interchange. Add lanes to Santa Fe Drive over C-470 and improve signal phasing at ramp intersections	The operation of this alternative is less than optimal and by itself does not meet the congestion and delay aspects of the project's purpose and need
Improved Diamond with Two Flyovers	A variation of the Improved Diamond, with flyover ramps for northbound to westbound and eastbound to northbound movements	The operational improvement of the northbound to westbound flyover was not sufficient to warrant the additional environmental effects to the Wolhurst Community
Single Point Urban Interchange	All through- and left-turning movements at this interchange would converge at a single traffic signal on a raised structure above C-470	This alternative could not provide sufficient operational results. Size and cost of structure required, and difficulty to construct while maintaining traffic were all greater than other alternatives

Table 2-3
Alternatives Considered But Eliminated (Continued)

Alternative/Family	Alternative Description	Reason Eliminated
Santa Fe Interchange Family (continued)		
Single Point Urban Interchange with One Flyover	A variation of the Single Point Urban Interchange, with one flyover for the southbound to eastbound movement	This alternative provides optimal operations. However, the size and cost of required structure and difficulty to construct while maintaining traffic outweighed the operational benefits
Single Point Urban Interchange with Two Flyovers	A variation of the Single Point Urban Interchange, with two flyovers for the southbound to eastbound and northbound to westbound movements	Northbound to westbound flyover was not necessary to achieve adequate traffic operations
SW/NE Partial Cloverleaf Interchange (a)	Loop ramps in the southwest and northeast quadrants for southbound to eastbound and northbound to westbound movements	The loop ramp in the northeast quadrant did not meet design standards for safety and speed requirements. Westbound C-470 would intersect with County Line Road rather than Santa Fe Drive, adding traffic to the Santa Fe Drive/County Line Road intersection
SW/NE Partial Cloverleaf Interchange (b)	Same as the SW/NE Partial Cloverleaf (a) except the Santa Fe Drive alignment was shifted west to improve the northeast loop geometry	The westerly shift to Santa Fe Drive resulted in adverse effects to the Wolhurst Community
SW/NE Partial Cloverleaf Interchange (c)	Same as the SW/NE Partial Cloverleaf (a) and (b), except the Santa Fe Drive alignment was shifted further west to provide direct access ramps from C-470 to Santa Fe Drive	The westerly shift to Santa Fe Drive resulted in adverse effects to the Wolhurst Community. Design inadequacies included a substandard NE loop ramp and substandard intersection spacing between County Line Road and the westbound exit ramp intersection
SW/NW Partial Cloverleaf Interchange	Loop ramps in both the northwest and southwest quadrants. Northwest loop allows direct access from westbound C-470 to northbound Santa Fe Drive without an additional intersection	The Santa Fe Drive alignment was shifted east to provide room for the northwest loop ramp. The resulting design for the loop ramp in the northwest quadrant did not meet design standards for safety and speed
Directional Interchange	Flyover ramps would handle all left-turns; right turns would be accomplished with free-flow right turns, eliminating signalized intersections	Future traffic volumes do not warrant fully directional ramps for all intersection movements. This alternative does not provide relief for the Santa Fe Drive/ Blakeland Drive and Santa Fe Drive/ County Line Road intersections

Table 2-3
Alternatives Considered But Eliminated (Continued)

Alternative/Family	Alternative Description	Reason Eliminated
I-25 Interchange Family		
I-25 Direct Connection A	This alternative includes a direct connection from southbound I-25 to westbound express lanes and eastbound express lanes to the existing northbound I-25 flyover ramp. No connection is provided from northbound I-25 to westbound C-470 express lanes or from eastbound C-470 express lanes to southbound I-25	This alternative by itself was not feasible to provide adequate operations to and from I-25. However, this concept was combined with Slip Ramp Alternative B to provide express lanes access to I-25 to and from the south
I-25 Direct Connection B	This alternative is a variation of Alternative A, but with a direct connection from southbound I-25 to the westbound C-470 express lanes. This alternative provides a separate flyover for eastbound C-470 express lanes to northbound I-25, bypassing the existing C-470 ramps	As in Alternative A, this concept does not include a direct connection from northbound I-25 to westbound C-470 express lanes or from eastbound C-470 express lanes to southbound I-25
I-25 Direct Connection C	This alternative varies slightly from Alternative A, but it lacks access to Yosemite Street from the eastbound express lanes	Contains substandard geometry
I-25 Direct Connection D	This alternative varies slightly from Alternative B, and consists of a separate flyover for eastbound C-470 express lanes to northbound I-25	As with Alternative C, the ramp geometry is substandard
I-25 Slip Ramp Alternative A	Slip ramps provide full access to and from the express lanes between Yosemite Street and the existing directional interchange at C-470 /I-25	Inability to serve traffic to and from Yosemite Street
I-25 Slip Ramp Alternative B	Similar to Slip Ramp Alternative A, but has full access to and from the express lanes west of I-25 from the general purpose lanes. Because the slip ramps are located further west than in Alternative A, this alternative allows access to and from Yosemite Street and I-25 traffic	This alternative by itself was determined not feasible to provide adequate operations to and from I-25. However, this concept was combined with Direct Connection Alternative A to provide access to I-25 to and from the south
I-25 Slip Ramp Alternative with Westbound Collector Distributor	With the introduction of a westbound collector-distributor, this modification of Slip Ramp Alternative A provides access to and from Yosemite Street	Although an improvement over the other slip ramp alternatives, it does not provide adequate operations for all movements to and from I-25

action alternatives. Elements eliminated from further consideration are shown here.

- Telecommuting. Establish home-based employment programs
- Variable Work Hours. Alternative work hours made available by major employment centers in the region
- Incentives and Subsidies. Employer and employee-based rewards, cash, time off, or recognition for commuters
- Connective Transit Service. Linkage to transit services within the C-470 Corridor, such as park-n-Rides and LRT stations, with a bus feeder system
- Transportation Management Organizations. Works with employers, residents, and homeowners associations to support and encourage transportation projects and programs that reduce traffic congestion and offer commuters viable options
- Parking Information System. Employ signing to indicate remaining capacity at parking facilities
- Telecommunication. Computerized electronics that connect a driver or a vehicle to external services, such as navigation systems, pricing, and emergency signals
- Traffic Management Centers. Monitors roadway conditions to coordinate traffic control, emergency response and warning systems, roadbed sensors, and traveler information

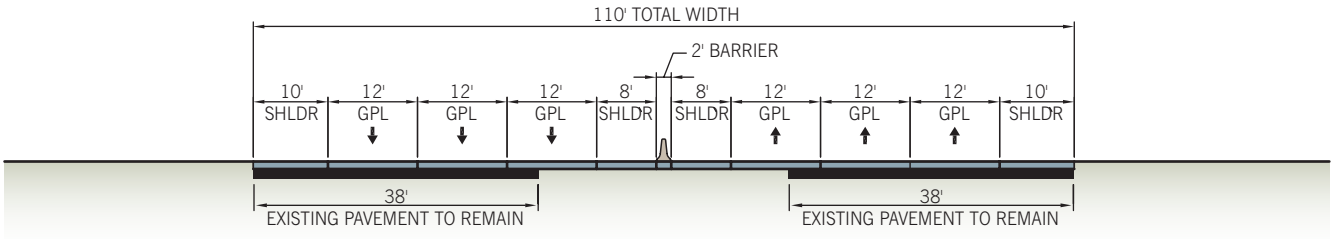
2.6.3 General Purpose Lane Alternatives

The general purpose lane alternatives family included all non-tolled capacity expansion options, including combinations with HOV lanes.

2.6.3.1 Six-Lane General Purpose Lanes Alternative

The typical section for the Six-Lane GPL Alternatives consists of three 12-foot lanes in each direction, with 10-foot shoulders and a barrier median, as shown in **Figure 2-13**. Generally, this set of alternatives had the distinct advantage of ease of implementation; most variations of it could be implemented within the existing median without widening to the outside. This alternative affords minimal relief to congestion and delay and it does not provide the means to actively manage reliability. Current and projected traffic volumes indicate that operational LOS for the C-470 Corridor will range from LOS D to F during peak hours, resulting in unpredictable travel times for all but the section between Wadsworth Boulevard and Kipling Parkway. Because a six-lane typical section provides acceptable traffic operations for this part of the Corridor, it was included as part of the GPL Alternative from Wadsworth Boulevard to Kipling Parkway. This alternative was not advanced for further consideration for

Figure 2-13
Six-Lane General Purpose Lanes Alternative



the majority of the Corridor because it does not meet the project's purpose and need, nor does it provide the means by which to actively manage reliability.

2.6.3.2 Six-Lane General Purpose Lanes with Auxiliary Lanes Alternative

This alternative is the same as the Six-Lane GPL Alternative but with the addition of a 12-foot auxiliary lane in each direction, as shown in **Figure 2-14**. The auxiliary lanes act as continuous acceleration/deceleration lanes between interchanges and facilitate better traffic operations at interchanges, thus increasing capacity. While the addition of auxiliary lanes provides some additional congestion relief, operationally, the facility would still only achieve LOS E on several segments, thus it still does not address the project's reliability goal, nor does it provide active management of reliability. Because the congestion relief was not determined significant enough to create consistently reliable travel times on the C-470 Corridor, especially between Quebec Street and Broadway, this alternative was eliminated from further consideration because it does not meet the project's purpose and need.

2.6.3.3 Six-Lane General Purpose Lanes with High-Occupancy Vehicle Lanes Alternative

This alternative includes the addition of one 12-foot HOV lane in each direction to the Six-Lane GPL Alternative, as shown in **Figure 2-15**. While the HOV lane provides the potential for increased reliability due to lower expected volumes, there is no mechanism to ensure that volumes do not increase to a level at which congestion degrades reliability. While this concept does provide some congestion relief for the general purpose lanes, volume forecasts indicated that the overall operations of the facility are still not acceptable in many eastern highway segments, largely due to limited usage of the HOV lanes. Because this alternative does not provide appropriate levels of congestion and delay relief, it was removed from further consideration, as it did not meet the project's purpose and need.

Figure 2-14
Six-Lane General Purpose Lanes with Auxiliary Lanes Alternative

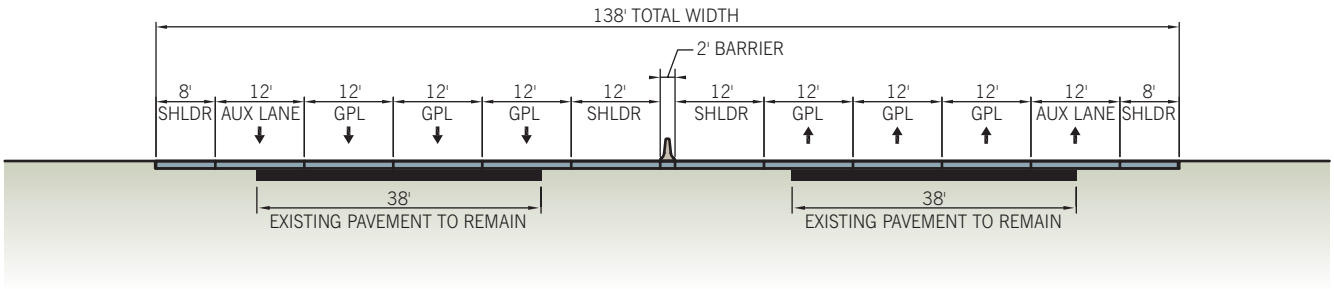
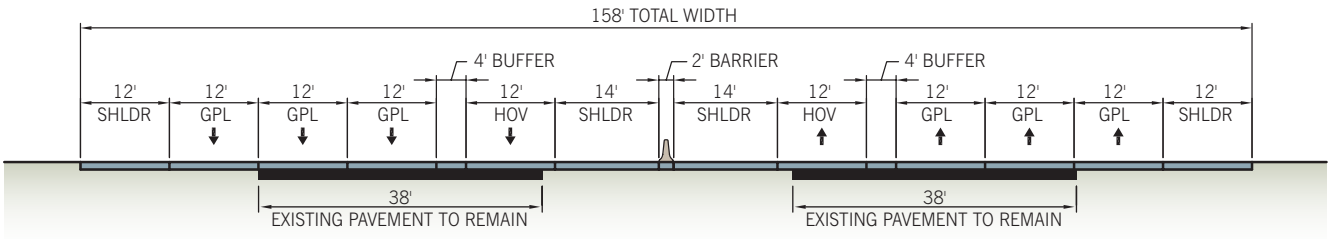


Figure 2-15
Six-Lane GPL with High-Occupancy Vehicle Lanes Alternative



2.6.3.4 Six-Lane General Purpose Lanes with Auxiliary and High-Occupancy Vehicle Lanes Alternative

This alternative combines the capacity improvements of the Six-Lane GPL with Auxiliary Lanes Alternative with one 12-foot HOV lane in each direction, as shown in **Figure 2-16**. With the additional capacity from the auxiliary lanes and reliability component of the HOV lanes, the traffic volume forecasts for this alternative indicate only slightly improved operations over the Six-Lane GPL Alternative. Reliability is similar to that discussed under Six-Lane GPL with HOV Alternative. Because this alternative does not provide necessary levels of congestion and delay relief, it was eliminated from further consideration.

2.6.3.5 Eight-Lane GPL Alternative

The Eight-Lane GPL Alternative is the same as the Six-Lane GPL Alternative, but with the addition of one additional 12-foot lane in each direction, as shown in **Figure 2-17**. This alternative provides comparable operational improvements to the Six-Lane GPL with Auxiliary Lanes Alternative. However, the Eight Lane GPL Alternative provides four continuous lanes in each direction. Traffic volume forecasts indicate that this alternative provides optimal traffic operations for western sections of the corridor (Santa Fe Drive to Wadsworth Boulevard) during the peak period, with operational breakdown in the highest-volume segments between Quebec Street and Santa Fe Drive. Because an eight-lane typical section addresses the purpose and need for part of the corridor, it was included in the GPL Alternative from Santa Fe Drive to Wadsworth Boulevard. The uncertainty of the consistent reliability for the eastern segments led this alternative to be eliminated from further consideration as a typical section from I-25 to Santa Fe Drive.

2.6.4 Express Lanes Alternatives

All express lane alternatives discussed here assume four general purpose lanes are included in the alternative. In other words, the express lanes element would essentially be added to the existing four-lane general purpose lanes. Further, each alternative has varying access

Figure 2-16
Six-Lane General Purpose Lanes with Auxiliary and High-Occupancy Vehicle Lanes Alternative

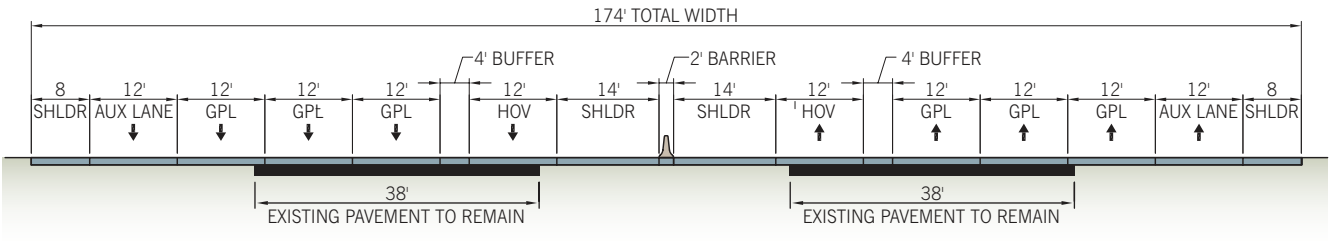
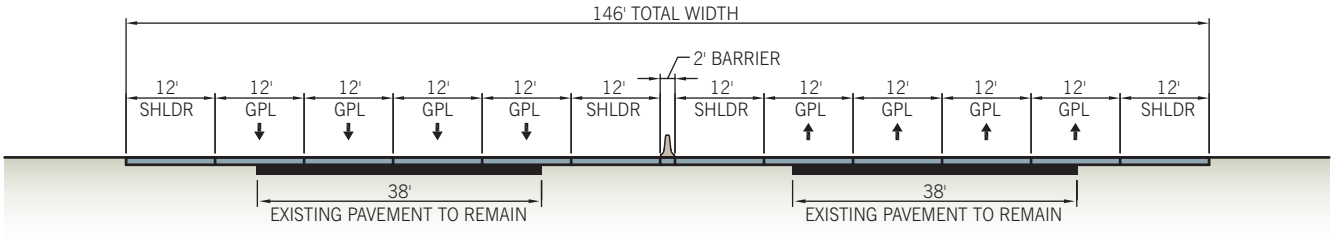


Figure 2-17
Eight-Lane General Purpose Lanes



types and locations. Express lanes feasibility was studied in the *C-470 Express Lanes Feasibility Study* (June 2005).

2.6.4.1 Reversible Express Lanes Alternative

Forecasted 2025 volumes showed no distinct directional split, indicating that the demand for the facility was approximately the same in both directions. As a result, the reversible lanes concept is less appropriate to handle the volumes in both directions. Usually this approach works only when the volumes are heavy in one direction and light in the other, thus allowing the facility to be reversed in the middle of the day. A typical reversible lanes facility is shown in **Figure 2-18**. By building only half of the express lanes facility, the construction cost would also be approximately half. However, only half the volumes and revenue are realized. Because revenue generation was determined insufficient to construct, maintain, and operate the facility, this concept was eliminated from further consideration.

2.6.4.2 Two-Lane Express Lanes Alternative

Another variation of the express lanes studied was a two-lane concept (one lane in each direction), as shown in **Figure 2-19**. As with the Reversible Express Lanes Alternative, the construction, operation, and maintenance costs would be about half. This single-lane section does not provide the capacity and operational improvements to meet the project's purpose and need. It would also not provide the reliability that is expected in an express lanes facility because it does not provide the opportunity for slower vehicles to be passed. As a result, the demand for these express lanes was considerably less, offsetting the cost savings and making this alternative not feasible. It was therefore eliminated from further consideration.

2.6.4.3 Express Lanes Access Locations

The screening of access locations sought to evaluate existing and proposed interchange locations to determine the locations that had enough demand to warrant access to the express lanes. Access locations were screened in three steps, with an increasing level of detail. The

Figure 2-18
Reversible Express Lanes Alternative

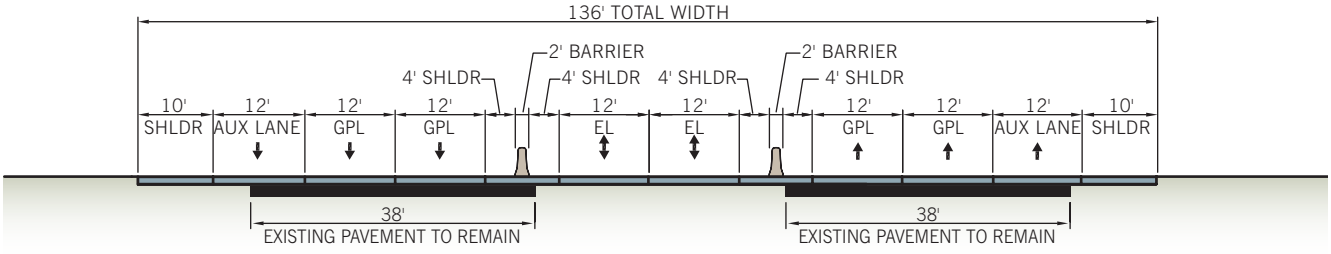
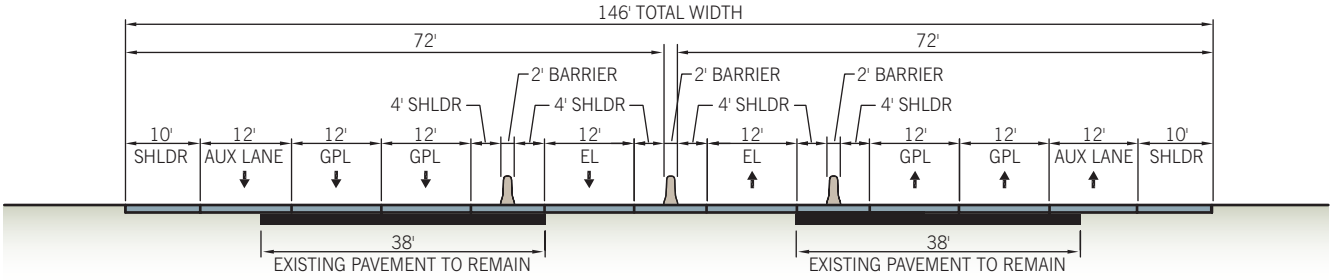


Figure 2-19
Two-Lane Express Lanes Alternative



locations eliminated during the screening process are described below.

Platte Canyon Road

As a minor interchange, Platte Canyon Road did not attract sufficient numbers of users, and was therefore eliminated from consideration.

Santa Fe Drive

Based on model results, average AM and PM peak hour ramp volumes to and from the express lanes at Santa Fe Drive were moderate compared to other interchange locations. Slip ramp access did not provide acceptable traffic operations due to the seven percent grade and proximity of the Lucent Boulevard interchange. Braided ramps were too costly for the lower volume of traffic that would be served. The presence of both freight and light rail combined with other topographic constraints caused the braided ramps to be too complex.

University Boulevard

Average peak hour express lanes ramp volumes at University Boulevard were moderate compared to others. A strong consideration was the RTD park-n-Ride location in the southwest quadrant. However, due to the short trip length from University Boulevard to I-25, RTD did not feel that access at University Boulevard was critical, especially if access would be provided further east and west for longer trips through the C-470 Corridor. Ultimately, this location was eliminated from further consideration because it did not attract enough drivers to the express lanes.

Yosemite Street

Because of the proximity of Yosemite Street to Quebec Street and I-25, it was not feasible to provide access. Slip ramps are proposed in the vicinity of I-25, but for the purpose of access to Quebec Street and I-25, not Yosemite Street.

2.6.5 Santa Fe Drive Interchange Alternatives

Although this EA generally studied mainline congestion and reliability more so than interchanges, the Santa Fe Drive interchange is unique in that it currently has severe congestion and safety issues. For these reasons, new interchange configurations were studied at Santa Fe Drive to address congestion, delay, and safety. Numerous alternatives were developed and modified through the screening process. The following sections discuss the alternatives eliminated from further consideration.

2.6.5.1 Split Diamond Interchange Alternative

The Split Diamond Interchange Alternative was developed to alleviate extreme congestion at the Santa Fe Drive/County Line Road intersection. This concept would split access between two locations – Santa Fe Drive and the Blakeland Drive Extension. **Figure 2-20** shows the concept. Traffic volume projections indicate that this alternative operates well during the peak hour. However, as a function of the interchange

Figure 2-20
Split Diamond Interchange Alternative

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Planned Southwest Corridor Light Rail Extension — Flyovers — Roadway