

FINAL REPORT

LACTC Glendale Corridor Rail Transit Project

prepared for:

***City of Glendale
and
Los Angeles County
Transportation Commission***

submitted by:

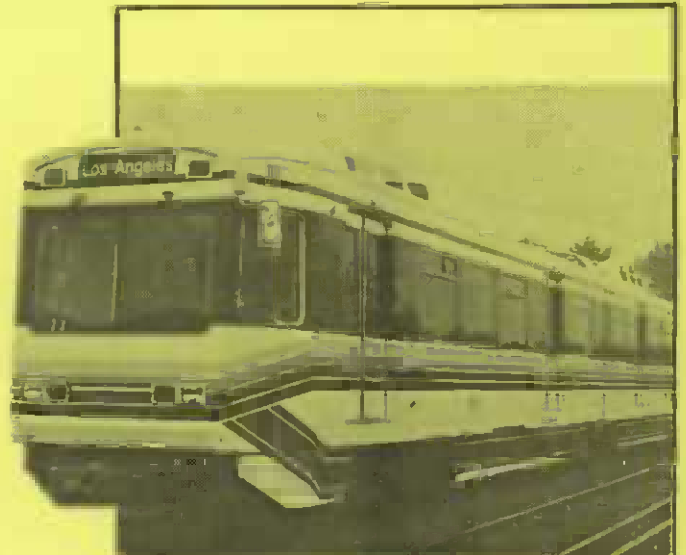


Gannett Fleming
ENGINEERS AND PLANNERS

in association with

**Miralles Associates, Inc.
Myra L. Frank & Associates, Inc.**

February 1991.



**GLENDALE FINAL REPORT
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1.0

Purpose and Context of Study

1.0 PURPOSE AND CONTEXT OF STUDY

The Glendale Corridor Rail Transit Study evaluated the feasibility of alternative alignments and technologies to provide rail transit service between Glendale and downtown Los Angeles. This link is one part of the regional network of Proposition A corridors that are either being studied for fixed rail implementation potential, are under construction, or are currently being operated (the Los Angeles to Long Beach "Blue Line"). This report presents the results of the study and summarizes the analysis process.

1.1 STUDY CHRONOLOGY

The study began with the identification of twelve potential alignments that would begin in the vicinity of the Los Angeles River and the Pasadena Freeway as a branch of the Pasadena Line alignment. The twelve alignments provided a broad spectrum of options with respect to both neighborhoods served and existing transportation infrastructure. A windshield survey and preliminary analysis of available right-of-way and implementation constraints provided a set of data that was used by the City of Glendale to select seven study alignments that provide service options to the central retail and commercial core areas.

These study alignments are:

ALIGNMENT A (SP RIGHT-OF-WAY ALTERNATIVE) - This alignment is within the Southern Pacific right-of-way and parallels San Fernando Road to its terminus at the city limits of Glendale. The entire alignment is at-grade.

ALIGNMENT B (CENTRAL ALTERNATIVE) - This alignment begins within the Southern Pacific right-of-way and parallels San Fernando Road to the Glendale Transportation Center where it diverts from the SP right-of-way, follows Cerritos Avenue to San Fernando Road, and proceeds northerly on Central Avenue to its terminus at Glenoaks Boulevard.

ALIGNMENT C (BRAND/GLENOAKS ALTERNATIVE) - This alignment begins within the Southern Pacific right-of-way and parallels San Fernando Road to the Glendale Transportation Center where it diverts from the SP right-of-way, follows Cerritos Avenue and proceeds northerly on Brand Boulevard to Glenoaks Boulevard. The alignment then turns westerly on Glenoaks Boulevard and southerly on Cleveland Road to its terminus at San Fernando Road.

ALIGNMENT D (BRAND/BROADWAY/SP ALTERNATIVE) - This alignment begins within the Southern Pacific right-of-way and parallels San Fernando Road to the Glendale Transportation Center where it diverts from the SP right-of-way, follows Cerritos Avenue and proceeds northerly on Brand Boulevard to Broadway. At that point, the alignment turns west on Broadway to San Fernando Road and the

Southern Pacific Railroad and proceeds northerly within the railroad right-of-way to its terminus at Milford Street.

ALIGNMENT E (COLORADO/BROADWAY ALTERNATIVE) - This alignment begins within the Southern Pacific right-of-way and parallels San Fernando Road to the Glendale Transportation Center where it diverts from the SP right-of-way, follows Cerritos Avenue and proceeds northerly on Brand Boulevard to Colorado Street. At that point, the alignment turns east on Colorado Street to Eagle Dale Avenue, north to Broadway and west to Brand Boulevard. At this point, the alignment ties back into itself, completing a loop.

ALIGNMENT F (CENTRAL/ORANGE ALTERNATIVE) - This alignment begins within the Southern Pacific right-of-way and parallels San Fernando Road to the Glendale Transportation Center where it diverts from the SP right-of-way, follows Cerritos Avenue to San Fernando Road, and proceeds northerly on Central Avenue to Harvard. At that point, the alignment turns east on Harvard Street to Orange Street, north to Doran Street, and back to Central Avenue. The alignment proceeds north on Central Avenue and west on the southern side of the Ventura Freeway to its terminus at San Fernando Road.

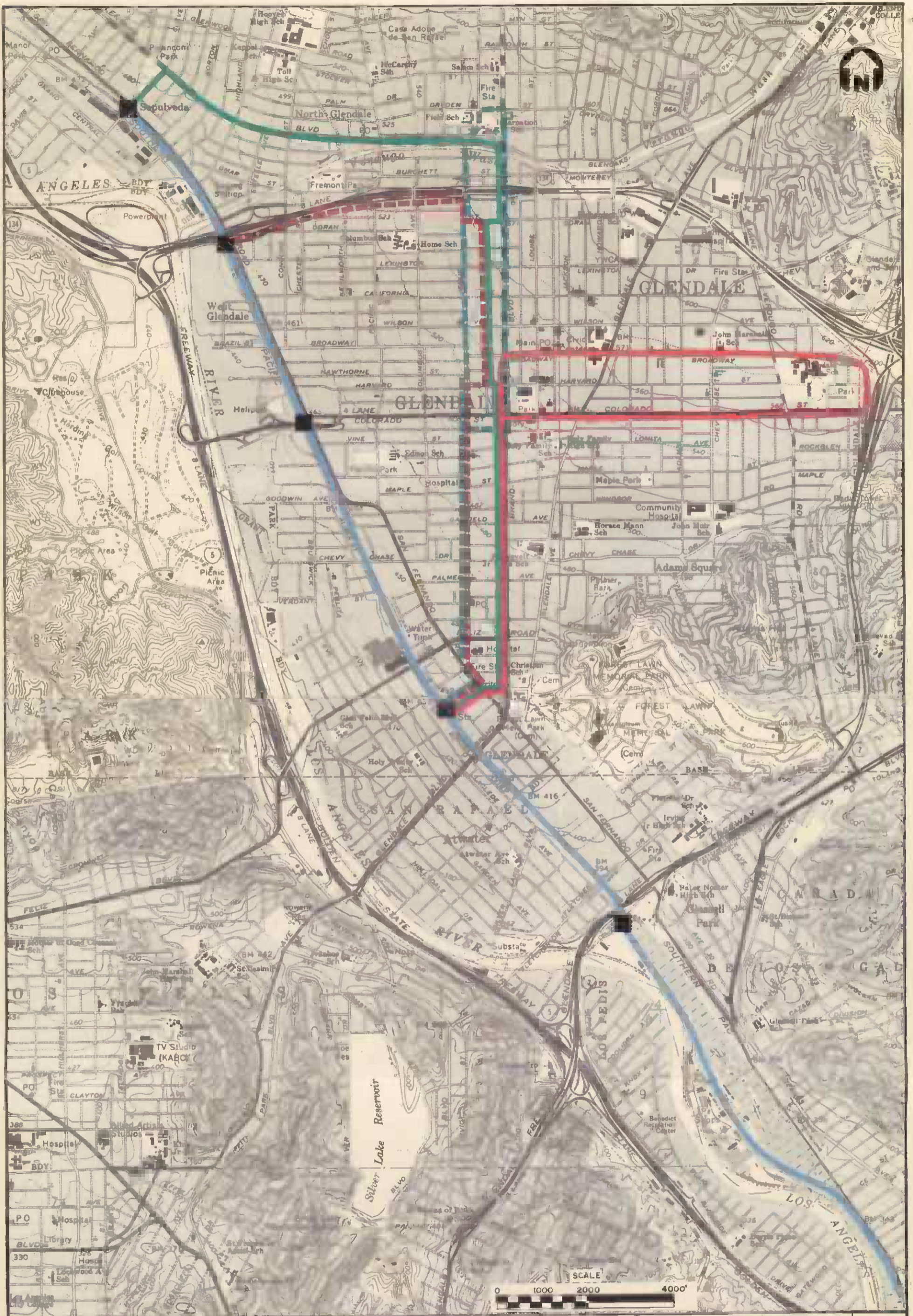
ALIGNMENT G (BRAND/ORANGE ALTERNATIVE) - This alignment begins within the Southern Pacific right-of-way and parallels San Fernando Road to the Glendale Transportation Center where it diverts from the SP right-of-way, follows Cerritos Avenue and proceeds northerly on Brand Boulevard to Harvard Street. At that point, the alignment turns west to Orange Street, north to Doran Street and back to Brand Boulevard, to the intersection with Glenoaks Boulevard. The alignment then turns westerly on Glenoaks Boulevard and southerly on Cleveland Road to its terminus at San Fernando Road.

For these seven corridors, preliminary environment and engineering issues studies were completed. Also, a study of alternative fixed guideway technologies was prepared to provide a better understanding of the available options as well as their implementation requirements.

The preliminary evaluation of these alternative alignments resulted in the selection, by the City of Glendale, of Alternatives E, F and G for consideration as circulation system alignments and the selection of Alternative A as the preferred light rail alignment. Also, a "loop" alignment was added as a circulation system alternative. This one-way loop follows Central Avenue north to Dryden Street (one block north of Glenoaks), then travels east on Dryden to Brand Boulevard, south on Brand to Elk Avenue and finally west on Elk to Central. These alignments are shown in Figure 1-1.

1.2 SELECTED ALTERNATIVES ANALYSIS

The alternative selection process resulted in the selection of four circulation system alignments and a preferred alignment for the light rail system. These alternatives are shown separately on Figures 1-2 through 1-5. The following sections of this report document the data used in the evaluation of the circulation alternatives, describe the light rail alternative that was developed in a separate study and provide cost estimates and evaluations of the alternatives and study conclusions. The evaluations have emphasized environmental and development impacts, traffic impacts and implementation and operating costs.



Los Angeles County
Transportation Commission.



City of Glendale

Alignments

- E
- F
- G
- Loop
- Light Rail

Glendale Corridor Rail
Transit Project

SCALE
1:24000

FINAL ALIGNMENT ALTERNATIVES

Figure
1-1



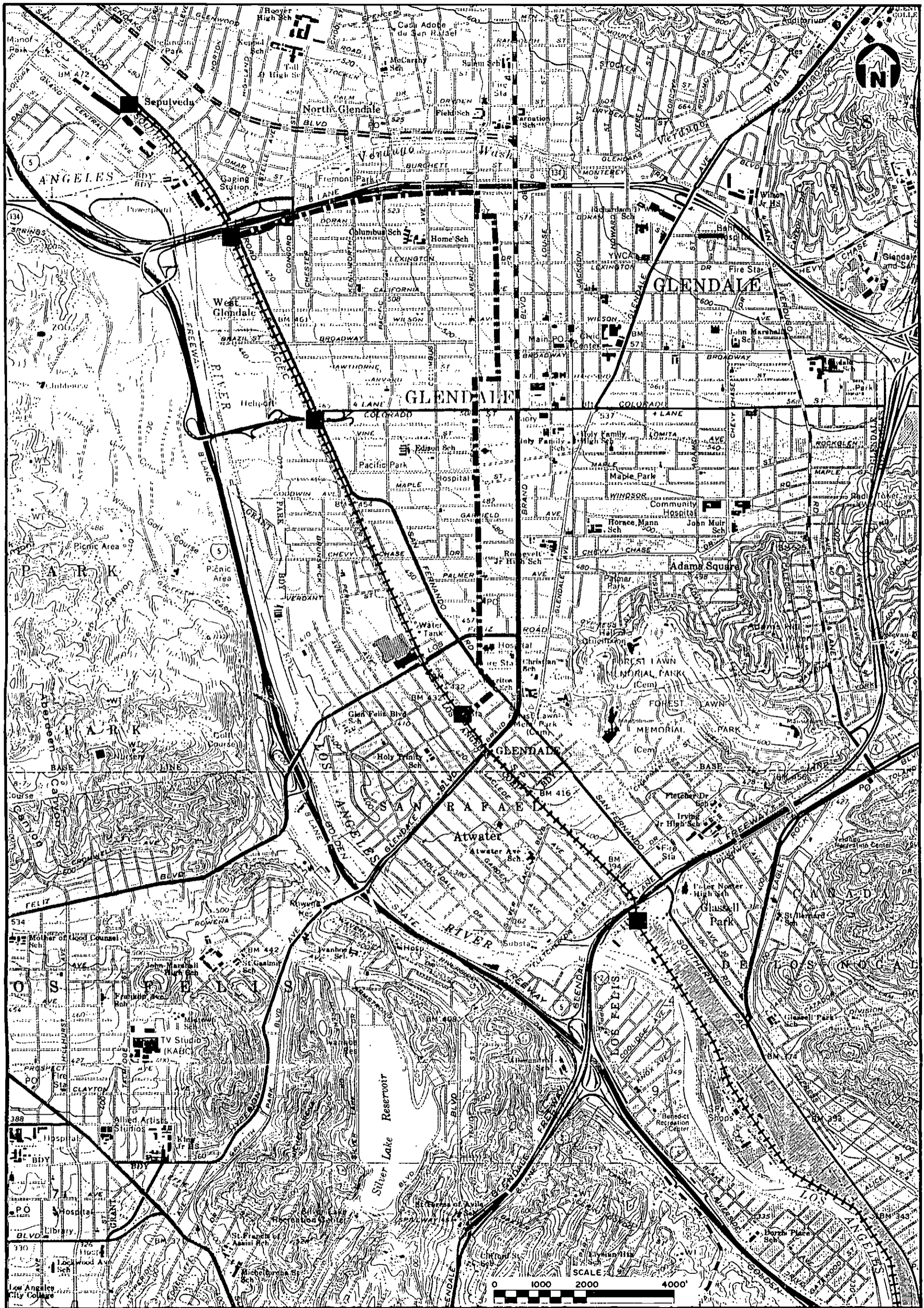

Los Angeles County Transportation Commission




City of Glendale

Alignments
 ■■■ E
 +++ Light Rail

GLENDALE CORRIDOR RAIL TRANSIT PROJECT
ALIGNMENT E

SCALE
 1:24000
Figure
 1-2






**Los Angeles County
Transportation Commission**

City of Glendale

Alignments
 ■■■ F
 +++ Light Rail

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**
ALIGNMENT F

SCALE
 1:24000
Figure
 1-3






**Los Angeles County
Transportation Commission**

City of Glendale

Alignments
 - - - - G
 - - - - Light Rail

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**
ALIGNMENT G

SCALE
 1:24000
Figure
 1-4




**Los Angeles County
Transportation Commission**

City of Glendale

Alignments
 ■■■ Loop
 + + + Light Rail

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**
LOOP ALIGNMENT

SCALE
 Figure 1-5

2.0

Line-Haul System

2.0 LINE-HAUL SYSTEM

The alignment for the light rail line-haul system was developed during the concurrent "Downtown Los Angeles to Sylmar/Santa Clarita Rail Transit Project". Details of the alignment are shown on plan and profile engineering drawings (at a scale of 1 inch = 200 ft) that are available separately. The light rail alignment, and those of the other technologies analyzed in the LA-Sylmar study, are illustrated in Figures 2-1 and 2-2.

2.1 DESCRIPTION





The light rail alignment starts at the Los Angeles Union Passenger Terminal and crosses the Los Angeles River on a double track bridge. There are two alternative alignments between Union Station and Taylor Yard. The east bank alignment would be shared with Southern Pacific freight traffic. Passenger train speeds would be restricted by this shared use, coupled with the high numbers of crossovers and sidings that occur in this area. The LRT alignment could cross the river south of Midway Yard and loop around the Los Angeles City Jail in following the east bank. The west bank alignment would utilize new track and would not carry freight traffic. One potential interference exists at a single track railroad bridge located between the Midway and Taylor rail yards. This bridge was originally two tracked and there is enough space on both sides of the river for two tracks to be located between the existing columns supporting the Pasadena Freeway. It also may be desirable to provide four tracks across the river and at the southern end of Taylor Yard. To accomplish this, a second two-track bridge may be required because of the physical restrictions of the Pasadena Freeway columns.

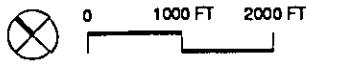
The alignment continues northwest through Taylor Yard. Although the precise location is dependent upon the locations ultimately selected for commuter rail and light rail maintenance facilities and other site development proposals, an alignment through the central portion of the yard should be available and could accommodate at least four tracks of light rail or other rail systems.

Exiting Taylor Yard, the light rail alignment utilizes the existing Amtrak passenger route that parallels San Fernando Road and continues west towards Burbank.

Potential LRT station sites were identified at China Town, the Glendale Freeway (near San Fernando Road), the Glendale Transportation Center (formerly the Glendale Amtrak station), Colorado, 134 Freeway and Grandview/Western/Sonora/Allen Avenue (Northwest Glendale). Station information was developed for the Glendale, Colorado, 134 (or Ventura Freeway), and Western Avenue stations and are shown on Figures 2-3 through 2-6. Also, a rendering of a prototypical light rail station are shown on Figure 2-7. This rendering emphasizes the need to develop the stations as intermodal transfer sites to increase the effectiveness of each component of the total transportation system. The station locations can be revised as necessary to coordinate with the alignment selected for the Glendale circulator system. This would probably affect the Colorado, 134 Freeway and Northwest Glendale station locations but would not have any significant affect on the operations of the line-haul system or through passenger service.

KEY

 Generalized Station Location
 LRT Station
 Commuter Rail Station
 High-Speed Rail Station

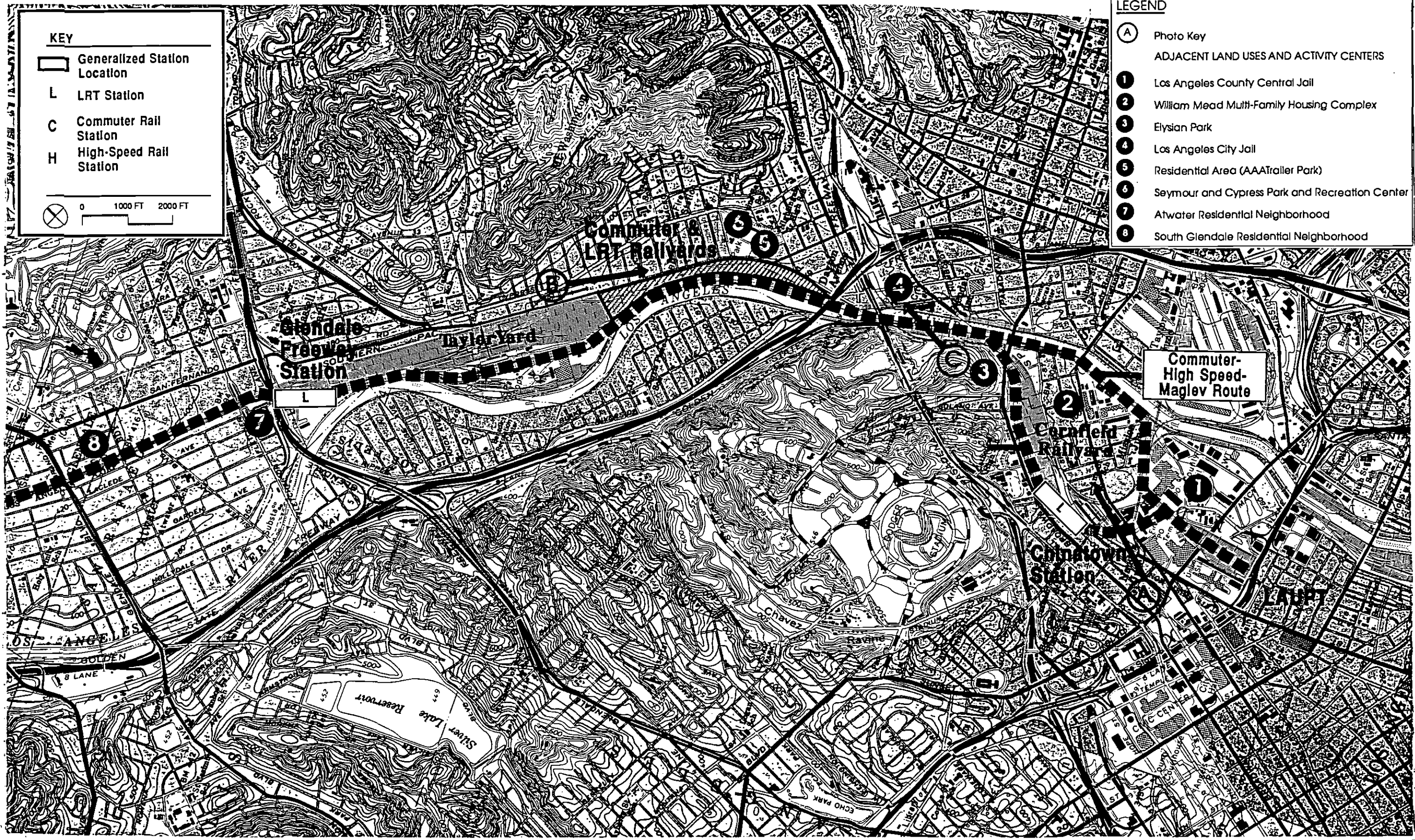
 0 1000 FT 2000 FT

LEGEND

(A) Photo Key

ADJACENT LAND USES AND ACTIVITY CENTERS

- 1 Los Angeles County Central Jail
- 2 William Mead Multi-Family Housing Complex
- 3 Elysian Park
- 4 Los Angeles City Jail
- 5 Residential Area (AAATrailer Park)
- 6 Seymour and Cypress Park and Recreation Center
- 7 Atwater Residential Neighborhood
- 8 South Glendale Residential Neighborhood



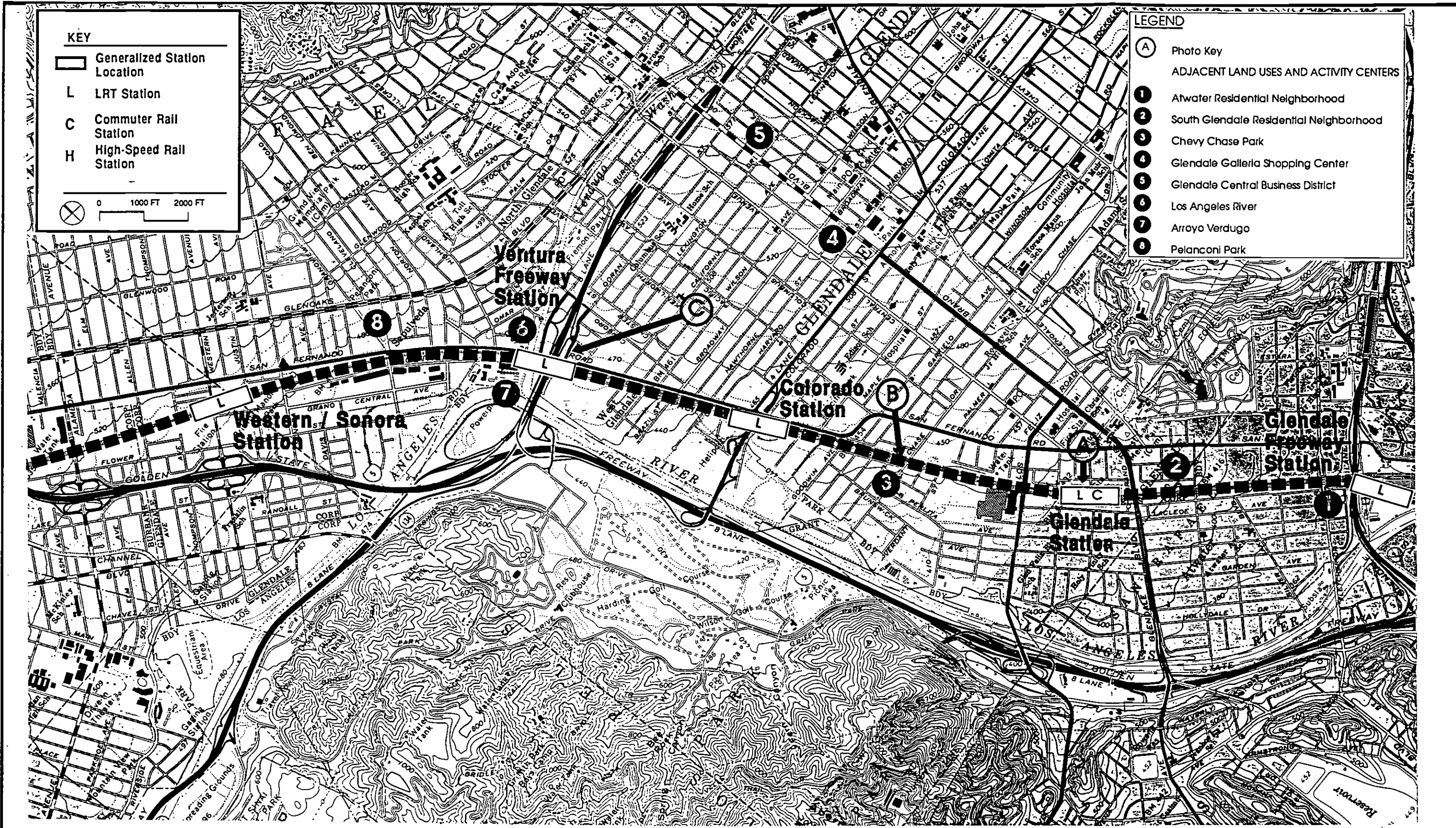
DOWNTOWN LOS ANGELES TO SYLMAR /SANTA CLARITA RAIL TRANSIT PROJECT

LOS ANGELES COUNTY TRANSPORTATION COMMISSION

GANNETT FLEMING · GRUEN ASSOCIATES

Figure 2-1

Downtown Los Angeles (LAUPT) to Glendale Area



DOWNTOWN LOS ANGELES TO SYLMAR /SANTA CLARITA RAIL TRANSIT PROJECT

LOS ANGELES COUNTY TRANSPORTATION COMMISSION
 GANNETT FLEMING • GRUEN ASSOCIATES

Figure 2-2

Glendale Area

Figure 2-3
GLENDALE STATION
Light Rail Transit & Commuter Rail

STATION TYPE:

At-grade center platform parallel to existing Glendale Station.

ADJACENT LAND USE:

Storage structures on the northwest and the southwest side of the proposed station platform. Residential area followed by light commercial, and an unloading dock on the southeast side.

PARKING:

The existing parking lot on the northeast side of existing station could be modified to accommodate approximately 420 cars.

KISS n' RIDE:

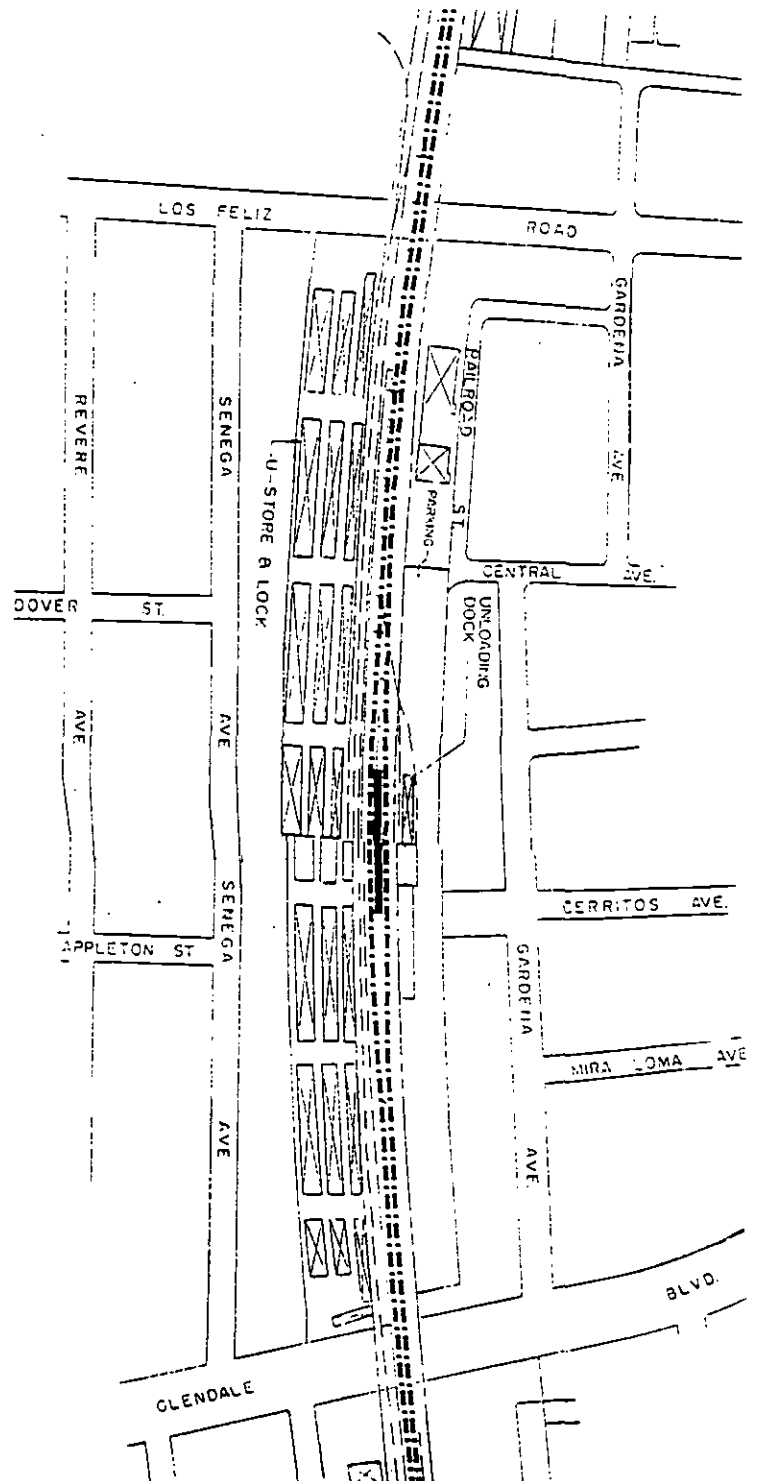
The southeast side of the station could be developed for curb side drop-off and temporary parking for approximately 20 cars.

BUS:

Drop-off points could also be developed to the southeast side of the station.

STATION ACCESS:

At-grade access to platform from Cerritos Avenue.



GLENDALE STATION

Figure 2-4
COLORADO STATION
Light Rail Transit only

STATION TYPE:

At-grade center platform located between Colorado and Harvard Street, parallel to the side walks of San Fernando Road.

ADJACENT LAND USE:

Baxter Hylam Division on southwest side, and mostly industrial area all around the proposed station. San Fernando Road runs along the railroad tracks.

PARKING:

Linear parking for cars could be provided along the railroad tracks, parallel to San Fernando Road.

BUS:

Stop could be developed on San Fernando Road.

STATION ACCESS:

At-grade access to station platform from San Fernando Road could be developed.

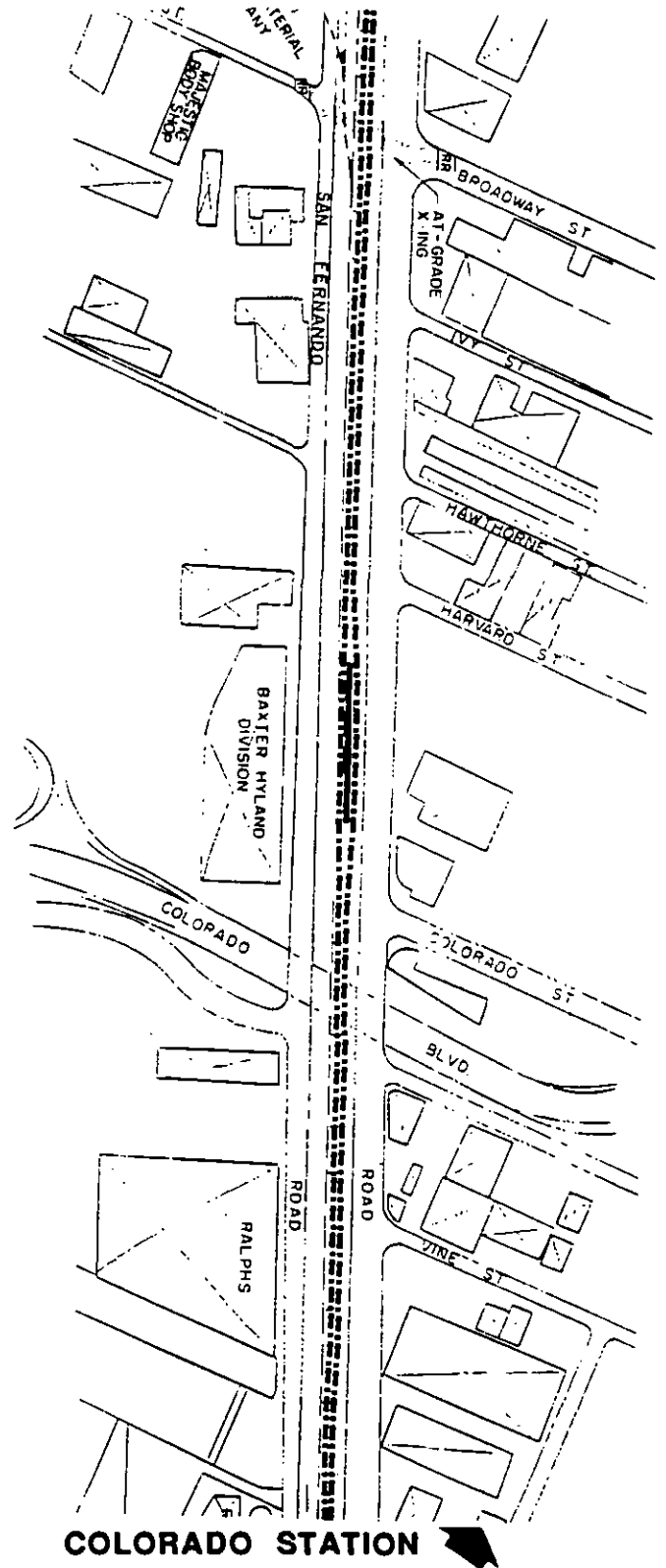


Figure 2-5
VENTURA FREEWAY
STATION
Light Rail Transit only

STATION TYPE:

At-grade center platform located below the Ventura Freeway on San Fernando Road.

ADJACENT LAND USE:

City of Glendale Steam Electric Generating Plant to the northwest side of the proposed platform. The rest of the area is predominantly low density light industrial.

PARKING:

Below Ventura Freeway, to the west of the station platform parking for approximately 300 cars could be developed.

KISS n' RIDE:

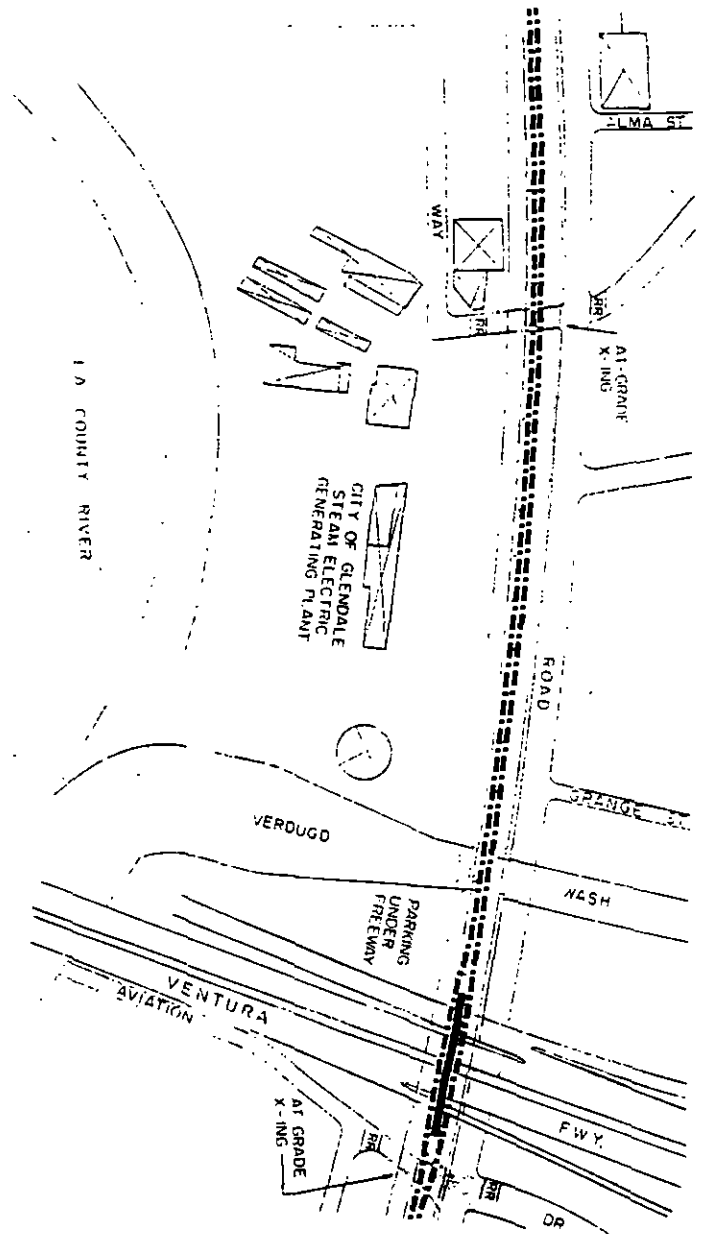
Along the Aviation Drive and San Fernando Road is possible.

BUS:

Existing bus stop on San Fernando Road could be developed to accommodate more buses.

STATION ACCESS:

At-grade access to platform from San Fernando Road, Verdugo, and Aviation Drive.



VENTURA FREEWAY STATION

Figure 2-6

**GRANDVIEW/WESTERN/SONORA/
ALLEN AVENUE
(NORTHWEST GLENDALE) STATION**

Light Rail Transit Only

STATION TYPE:

At-grade center platform located between Allen Avenue and Linden Avenue.

ADJACENT LAND USE:

Mostly light industrial and commercial area followed by the residential area.

PARKING:

For approximately 400 cars could be provided on northwest side of the station platform after acquiring vacant land for parking.

KISS n' RIDE:

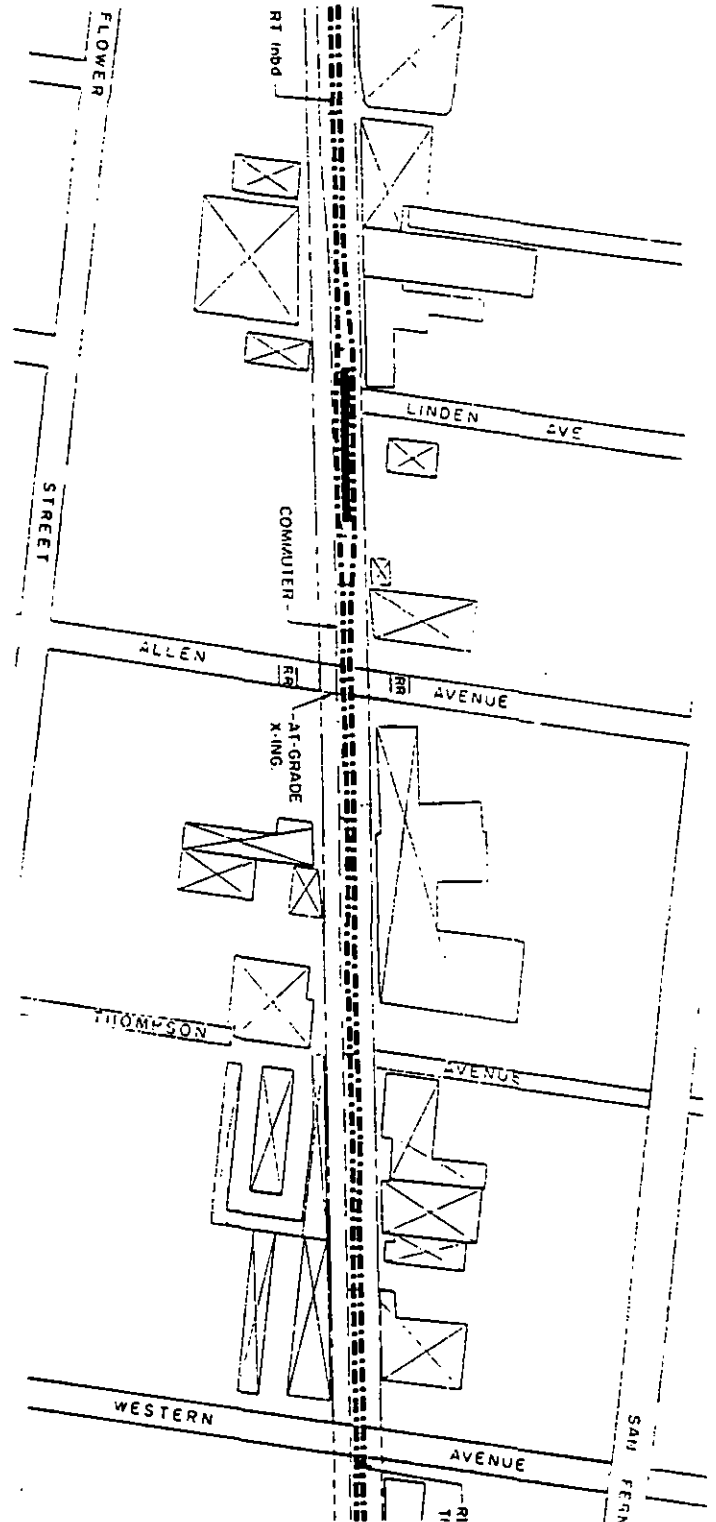
Part of the main parking area could be developed as short term parking.

BUS:

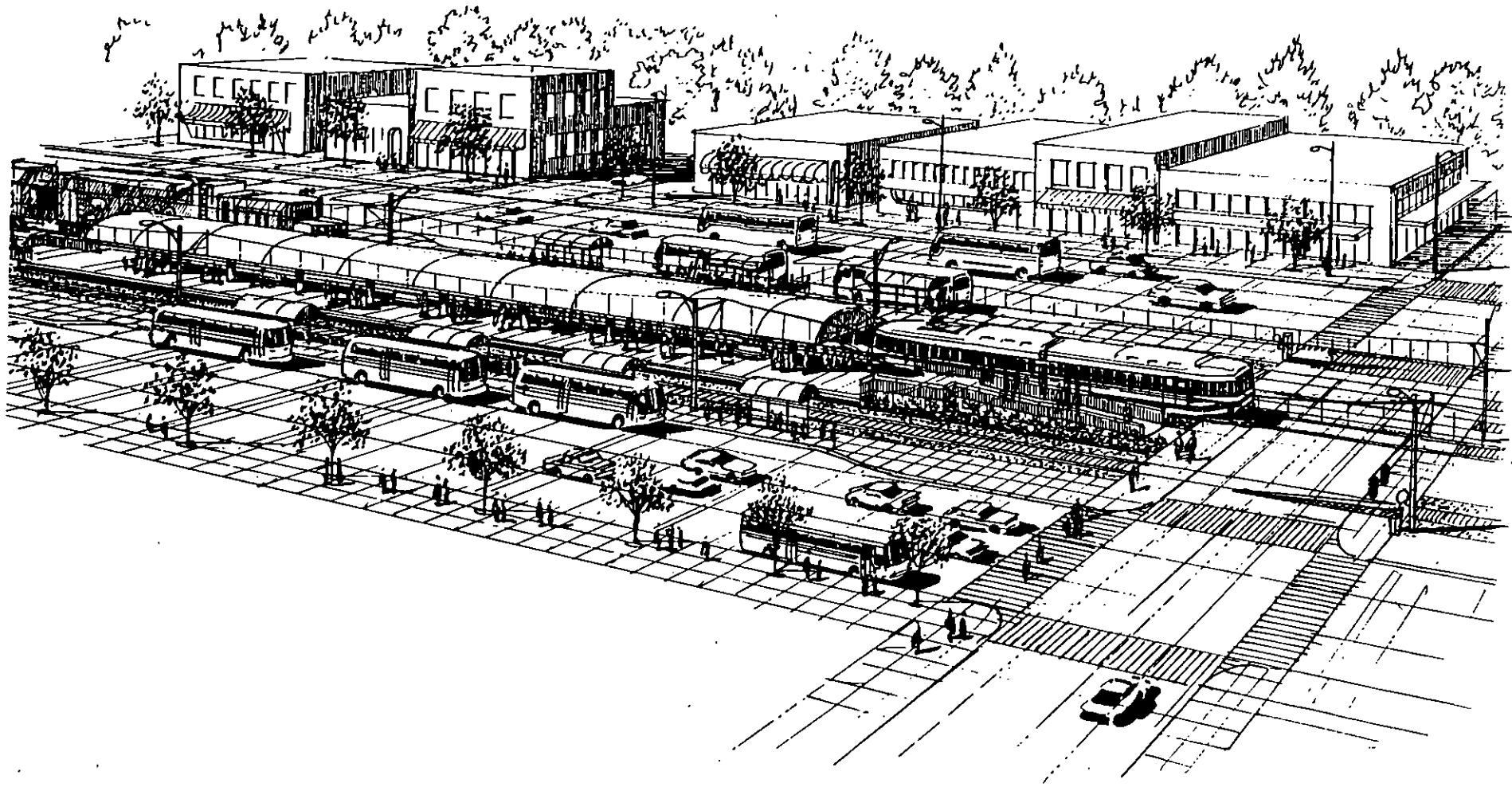
Stop should be developed on Allen Avenue.

STATION ACCESS:

At-grade access to platform from Allen Avenue.



**GRANDVIEW/WESTERN/SONORA/
ALLEN AVENUE
(NORTHWEST GLENDALE) STATION**



SOURCE: ANIL VERMA ASSOCIATES

DOWNTOWN LOS ANGELES TO SYLMAR / SANTA CLARITA RAIL TRANSIT PROJECT

LOS ANGELES COUNTY TRANSPORTATION COMMISSION
BARNETT FLEMING • BRUEN ASSOCIATES

Figure 2-7
Prototypical Light Rail Station

2.2 OPERATIONS

The LRT system is proposed to operate with 12 minute headways during the peak periods and 20 minutes off-peak. Train size would be variable in the range of one to three cars per train using vehicles equivalent to those currently in use on the LACTC Blue Line.

2.3 ENVIRONMENTAL ANALYSIS

The following environmental constraints and opportunities were noted for the LRT alignment.

LRT ALIGNMENT A

LAND USE: The existing commercial and light industrial uses along this alignment, many of which are oriented toward rail transportation, are considered to be compatible with a LRT system.

SENSITIVE RECEPTORS: Few sensitive receptors exist along this alignment. Two public parks are a block away. The only residential uses are two multi-family and five single-family dwellings.

PHYSICAL LIMITATIONS: As an existing rail line, this alignment is already physically amendable to an LRT system. Overhead utilities and a few heavily traveled street crossings present minor difficulties.

COMMUNITY SERVICES: Several community service facilities are located along this alignment. The City of Glendale operates its public services department, power plant, public works yard, sanitation yard, and pumping plant in the area. A post office, a bus depot, two parks and the former Amtrak/SP Depot, now the Glendale Transportation Center, are along the alignment. Improved public access to these facilities provided by an LRT system would be a beneficial effect, however access to these facilities may be diminished during construction of the LRT facilities.

HISTORIC/ARCHITECTURAL SIGNIFICANCE: The SP Depot is the only "first order" (i.e. eligible for city legal protection; "second order" landmarks receive recognition only) local landmark along this alignment. The former Grand Central Airport Tower, a second order local landmark, is also located along this alignment. A few additional industrial/commercial buildings may be worthy of note, but have not received any official recognition.

VISUAL QUALITY: No adverse visual effects are expected along this alignment. Construction of an LRT line could be considered a positive addition to the existing visual setting.

In summary, the LRT alignment:

- does not directly serve the Glendale CBD;
- few passenger destinations (e.g. retail, services, etc.) are located along the route;
- few trip origins (e.g. residential areas) are located along the route.

On the other hand, the LRT alignment:

- follows existing rail right-of-way;
- provides park and ride potential for commuters to L.A.;
- provides access to future San Fernando Valley lines;
- has lower disruption to existing highway traffic.

3.0

Local Circulator System

3.0 LOCAL CIRCULATOR SYSTEM

The local circulator system alternatives really perform two functions within Glendale. The first function is as a successor to the successful Beeline shuttle that has operated within Glendale since 1984. The original two-route system was expanded on October 1, 1990 to include a route between Glendale Transportation Center (formerly the Glendale Amtrak station) and the retail district to the north. The routes and schedules for the Beeline shuttles are shown on Figures 3-1 and 3-2. At present, Amtrak passengers do not represent a large percentage of Beeline users. When the Glendale Transportation Center is in full use as a rail and bus center, and as a light rail system (or other regional line-haul mode) is implemented, increasing demand will be placed on the Beeline in the form of higher ridership with increased peaking factors. At this point, the circulator system will perform the second function of distributor. This will probably require operational changes in the form of shorter AM and PM Peak headways and a change to larger vehicles. Thus, the shuttle becomes both a circulator and distributor, defining a new set of requirements for implementation and operation.

The following paragraphs describe the various aspects of the circulator alternatives and the impacts of those alternatives on Glendale.

3.1 TECHNOLOGIES AND OPERATIONS

Three basic technologies have typically been used in circulator/distributor applications in urban areas. They are buses, trolleys (or streetcars), and automated guideway transit (AGT) systems. As stated earlier, AGT systems, although they may be constructed at-grade, require exclusive rights-of-way when they are operated automatically (without on-board operators). For implementation in Glendale, on the selected alternative alignments, exclusive right-of-way for such systems is generally not available (unless private residential and commercial properties are purchased). This results in the need to construct aerial guideway structures and aerial stations. Aerial guideway and aerial stations were evaluated within the context of the existing Glendale development scale and the effects resulting from visual intrusion and degraded vistas. These effects, coupled with the increased system costs of aerial compared to at-grade implementation, led Glendale to view aerial systems as unacceptable. Therefore, AGT systems were not considered further in this study.

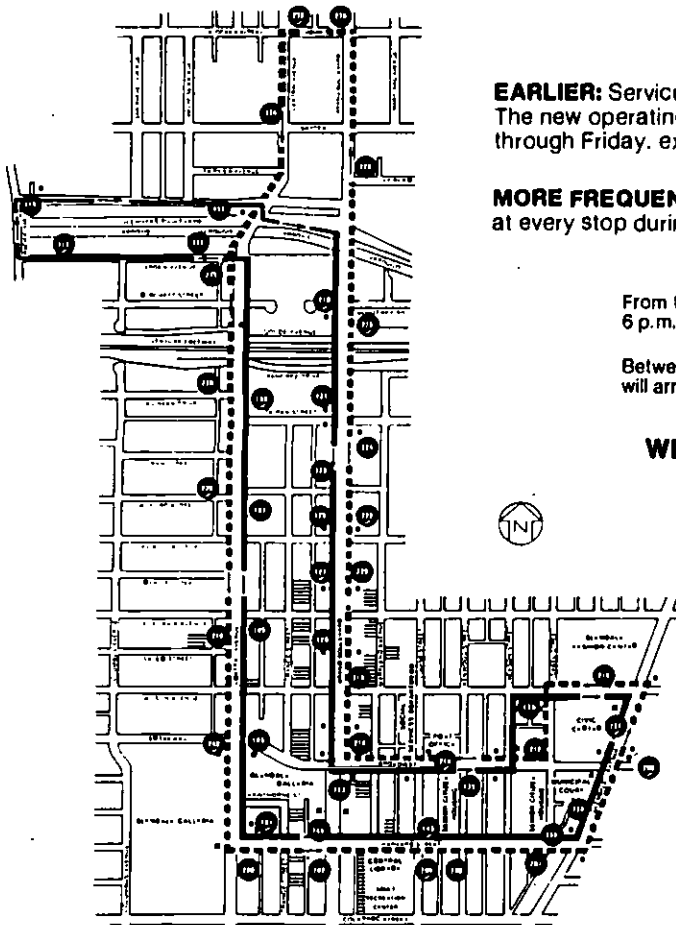
The two technologies that have been evaluated in greater detail in this study are an expanded bus shuttle system and a trolley system. A current Beeline vehicle is shown in Figure 3-3A. The bus used in the analysis is a 25 to 30 passenger bus equivalent to that used in the Los Angeles DASH system. It is about 29 feet long and is shown in Figure 3-3B. Depending upon forecast demand levels, this size vehicle, something larger, or decreased headways would provide a low capital cost system that could be expanded incrementally to meet demand. An alternative bus was considered for possible application in Glendale. This is the bus currently in use in Denver's Transit Mall. These vehicles have very wide doors (four at 55 inches wide each) making accessibility very good. The vehicles are electrically powered, however, and are too slow for application in mixed traffic. Also, because of the battery capacity and large door openings, it is not feasible to provide air

Take the **FREE**



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BEGINNING MONDAY, **OCTOBER 1, 1990**
 THE 2 ORIGINAL BEELINE ROUTES WILL OFFER
EARLIER OPERATING HOURS AND MORE FREQUENT SERVICE.



EARLIER: Service will begin two hours earlier in the morning. The new operating hours will be from 7 a.m. to 6 p.m., Monday through Friday, except major holidays.

MORE FREQUENT: Beeline vehicles will be arriving more often at every stop during every day of operation.

From the hours of 7 a.m. to 11 a.m. and from 2 p.m. to 6 p.m. a Beeline will arrive **every 10 minutes** and ...

Between the hours of 11 a.m. and 2 p.m. a Beeline will arrive **every 7½ minutes**.

WE'RE IMPROVING FOR YOU!!!

LEGEND

- ✓ **TIMED STOPS**
- **SHUTTLE STOPS**
- **HANDICAPPED ACCESS**
(Available on all Shuttle vehicles)
- * **RTD STOPS**

For more information call (818) 956-3961

STOP	STREETS	SOLID ROUTE	
101	CENTRAL/HARVARD	7:00	7:10
109	CENTRAL/PIONEER	7:06	7:16
113	ARDEN/PACIFIC	7:09	7:19
119	BRAND/GOODE	7:13	7:23
-27	BRAND/CALIFORNIA	7:16	7:26
133	BROADWAY/BRAND	7:18	7:28
137	GLENDALE/WILSON	7:23	7:33
143	HARVARD/LOUISE	7:26	7:36

STOP	STREETS	DASH ROUTE	
200	HARVARD/CENTRAL	7:00	7:10
204	HARVARD/LOUISE	7:02	7:12
208	GLENDALE/BROADWAY	7:04	7:14
214	BROADWAY/LOUISE	7:09	7:19
222	BRAND/LEXINGTON	7:13	7:23
226	BRAND/Monterey	7:15	7:25
232	STOCKER/CENTRAL	7:16	7:26
238	CENTRAL/MILFORD	7:23	7:33
242	CENTRAL/BROADWAY	7:26	7:36

**EVERY
10
MINUTES**

11:00	11:07
11:06	11:13
11:09	11:16
11:13	11:20
11:16	11:23
11:18	11:25
11:22	11:30
11:26	11:33

**EVERY
7½
MINUTES**

11:00	11:07
11:02	11:09
11:04	11:11
11:09	11:16
11:13	11:20
11:15	11:22
11:18	11:25
11:23	11:30
11:26	11:33

2:00	2:10
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2:09	2:19
2:13	2:23
2:16	2:26
2:18	2:28
2:23	2:33
2:26	2:36

**EVERY
10
MINUTES**

2:00	2:10
2:02	2:12
2:04	2:14
2:09	2:19
2:13	2:23
2:15	2:25
2:18	2:28
2:23	2:33
2:26	2:36

5:00	5:40
5:06	5:46
5:13	5:49
5:43	5:53
5:26	5:56
5:48	5:58
5:53	6:03
5:56	6:08

5:30	5:40
5:32	5:42
5:34	5:44
5:39	5:49
5:43	5:53
5:45	5:55
5:48	5:58
5:53	6:03
5:56	6:08

Figure 3-1

Take the FREE



S H U T T L E

WE'RE ADDING A ROUTE FOR YOU!

Beginning Monday, OCTOBER 1, 1990

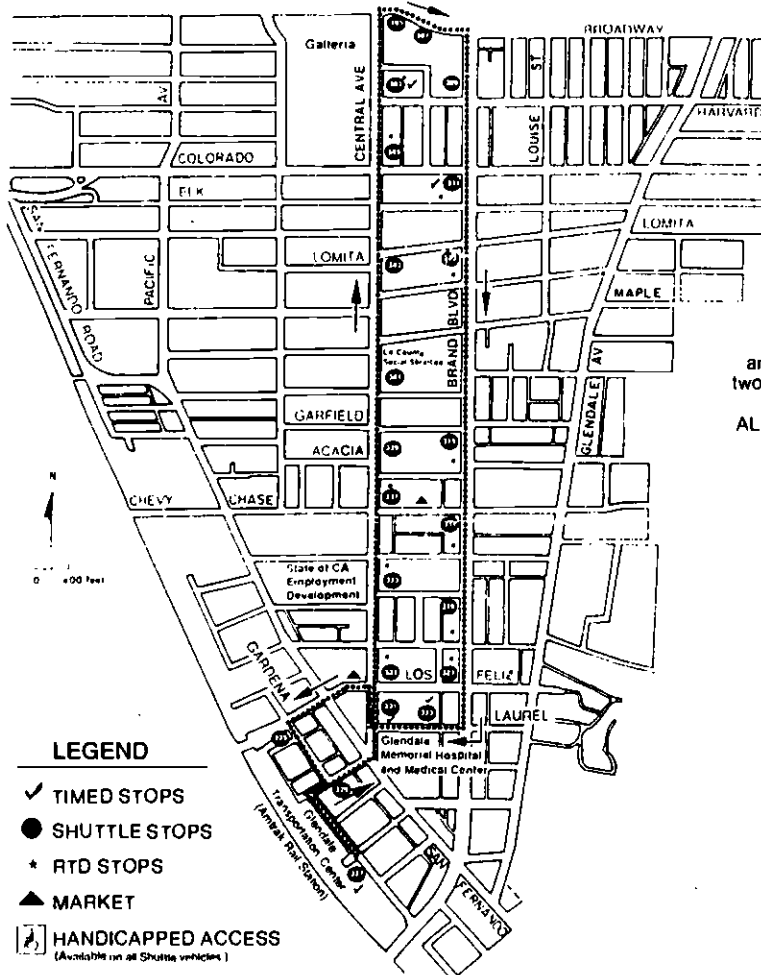
We're expanding our service to provide transportation south of the Glendale Central Business district to Los Feliz Road and the Glendale Transportation Center (Amtrak Rail Station). Operating hours for this new route and the 2 existing routes are from 7 A.M. to 6 P.M., Mondays through Fridays, except major holidays.

There is a stop at the GLENDALE GALLERIA and GLENDALE TRANSPORTATION CENTER and two stops at the GLENDALE MEMORIAL HOSPITAL and MEDICAL CENTER. BEELINE STOPS ARE ALSO CONVENIENTLY LOCATED near restaurants, auto dealers, dry cleaners, other businesses and RTD transfer points.

THIS NEW ROUTE MEETS THE TWO ORIGINAL BEELINE DOWNTOWN SHUTTLE ROUTES. You can transfer across from the Galleria at stop 303.

A clean, comfortable, temperature controlled Beeline will arrive EVERY 15 MINUTES.

BEELINE SOUTHERLY ROUTE SCHEDULE
For more information call (818) 956-3961



- LEGEND**
- ✓ TIMED STOPS
 - SHUTTLE STOPS
 - * RTD STOPS
 - ▲ MARKET
 - ♿ HANDICAPPED ACCESS
(Available on all Shuttle vehicles)

stop	Streets	7:00	7:15	7:30	7:45	8:00
303	CENTRAL/HARVARD					
305	BROADWAY/BRAND	7:01	7:16	7:31	7:46	8:01
307	BROADWAY/ORANGE	7:01	7:16	7:31	7:46	8:01
309	BRAND/HARVARD	7:03	7:18	7:33	7:48	8:03
311	BRAND/COLORADO	7:05	7:20	7:35	7:50	8:05
313	BRAND/LOMITA	7:07	7:22	7:37	7:52	8:07
315	BRAND/GARFIELD	7:13	7:28	7:43	7:58	8:13
317	BRAND/CHEVY CHASE	7:15	7:30	7:45	8:00	8:15
319	BRAND/MAGNOLIA	7:16	7:31	7:46	8:01	8:16
321	BRAND/LOS FELIZ ROAD	7:17	7:32	7:47	8:02	8:17
323	LAUREL/GLEN. MEMORIAL HOSP.	7:18	7:33	7:48	8:03	8:18
325	GARDENA/RAILROAD	7:19	7:34	7:49	8:04	8:19
327	AMTRAK/CERRITOS	7:20	7:35	7:50	8:05	8:20
329	CENTRAL/GARDENA	7:21	7:36	7:51	8:06	8:21
331	CENTRAL/GLEN. MEMORIAL HOSP.	7:22	7:37	7:52	8:07	8:22
333	CENTRAL/LOS FELIZ	7:22	7:37	7:52	8:07	8:22
335	CENTRAL/MAGNOLIA	7:23	7:38	7:53	8:08	8:23
337	CENTRAL/CHEVY CHASE	7:24	7:39	7:54	8:09	8:24
339	CENTRAL/ACACIA	7:24	7:39	7:54	8:09	8:24
341	CENTRAL/WINDSOR	7:28	7:41	7:56	8:11	8:26
343	CENTRAL/LOMITA	7:27	7:42	7:57	8:12	8:27
345	CENTRAL/COLORADO	7:28	7:43	7:58	8:13	8:28

5:00	5:15	5:30	5:45
5:01	5:16	5:31	5:46
5:01	5:16	5:31	5:46
5:03	5:18	5:33	5:48
5:05	5:20	5:35	5:50
5:07	5:22	5:37	5:52
5:13	5:28	5:43	5:58
5:15	5:30	5:45	6:00
5:16	5:31	5:46	6:01
5:17	5:32	5:47	6:02
5:18	5:33	5:48	6:03
5:19	5:34	5:49	6:04
5:20	5:35	5:50	6:05
5:21	5:36	5:51	6:06
5:22	5:37	5:52	6:07
5:22	5:37	5:52	6:07
5:23	5:38	5:53	6:08
5:24	5:39	5:54	6:09
5:24	5:39	5:54	6:09
5:26	5:41	5:56	6:11
5:27	5:42	5:57	6:12
5:28	5:43	5:58	6:13

**EVERY
15
MINUTES**

Figure 3-2



Beeline Shuttle Vehicle

Figure
3-3A



Los Angeles DASH Vehicle

Figure
3-3B

conditioning. Additionally, their original cost was over \$200,000 each and they are no longer available. Denver is currently in the process of specifying and acquiring a prototype bus with a 14 inch floor that is a modification of an existing coach body. The modifications are possible because of the short length and low speed requirements of the transit mall.

The trolley (or streetcar) system is very similar to the light rail system used on the Long Beach Blue Line and proposed for the Glendale corridor system. The major difference is that new concept trolleys currently available are lighter in weight and have very low floors. These low floors provide the option of having no-step loading with as low as a 13 1/4 inch "platform" height. This feature speeds loading (reducing station dwell times), reduces platform impacts on existing traffic, and improves handicapped and elderly accessibility. One version of this style of trolley is shown in Figure 3-4A. This articulated vehicle is 53-72 feet long (depending on configuration) and can carry about 116 passengers, depending upon seated/standee ratio and seating arrangement selected. A photo of the LA-Long Beach vehicle is shown in Figure 3-4B for comparison purposes. It is approximately 90 feet long.

The operation of the new shuttles is proposed to be the same as that of the current Beeline operation because it would have to provide at least that level of service to be competitive. Table 3-1 shows the number of vehicles of either technology required for each alternative alignment. The vehicle requirements are based on headway requirements rather than demand levels and are provided for comparative purposes only.

**TABLE 3-1
CIRCULATION SYSTEM
VEHICLE REQUIREMENTS**

<u>Alternative</u>	<u>Round Trip Length</u>	<u>RT Travel Time (Mins)*</u>	<u>No. Vehicles</u>		
			<u>@7.5 Min</u>	<u>@10 Min</u>	<u>@15 Min</u>
E	34,200 ft	31 mins	5	4	3
F	45,200 ft	40 mins	6	4	3
G	48,000 ft	42 mins	6	5	3
<u>Loop</u>					
Mini	16,400 ft	18 mins	3	2	2
Full	30,600 ft	29 mins	4	3	2

* Assumed average speed of 15 miles per hour (per Glendale) plus 5 minutes schedule pad, relief time, etc.



Low Floor Trolley Vehicle

Figure
3-4A



LA-Long Beach LRT Vehicle

Figure
3-4B

3.2 STATIONS

The shuttle technologies selected for the circulator alternatives provide opportunities for implementation within Glendale that are less intrusive than others. One particular advantage is that of small, inexpensive stations that could be either integrated with existing structures to continue a neighborhood theme or provide a separate, unique architectural image. For the purpose of this study, a unique theme has been developed that is adaptable to either bus or trolley and is modular to allow for more economical manufacture and erection and ease of expansion. The stations also assume the use of the barrier free or "honor fare" system that has been implemented on the LACTC Blue Line.

3.2.1 TROLLEY STATIONS

The trolley station is an end and side loading platform approximately nine feet by fifty feet in plan. Station plan and elevations are shown on Figure 3-5. The platform is elevated to the floor height of the trolley, approximately 13-14 inches above the rail, to allow level access to the trolley. This leaves the platform approximately eight inches above the sidewalk elevation. A ramp is located at one end of the platform for handicap access. Stairs are provided at the other end of the platform and along the back side for ease of access to and egress from the platform. An information bulletin board is located at each end of the platform to display trolley schedules and destinations. Ticket vending machines are also located at either end of the station. The canopy covers the entire platform area and extends over the trolley for weather protection.

3.2.2 BUS STATIONS

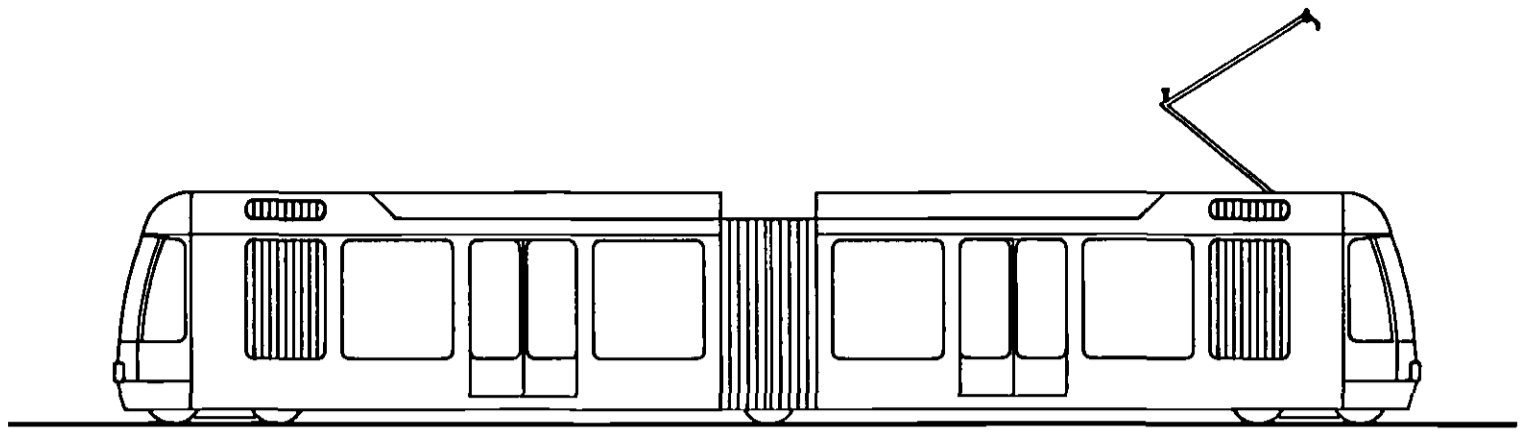
The bus station is approximately 6.5 feet by thirty feet in plan and is shown on Figure 3-6. The station area is not elevated. It has been assumed that the bus will provide whatever mechanism is necessary for handicap access. Information bulletin boards and ticket vending machines are also found at each bus station. The canopy covers the area of the bus stop and does not extend over the curb line.

3.2.3 IMPLEMENTATION CONTEXT

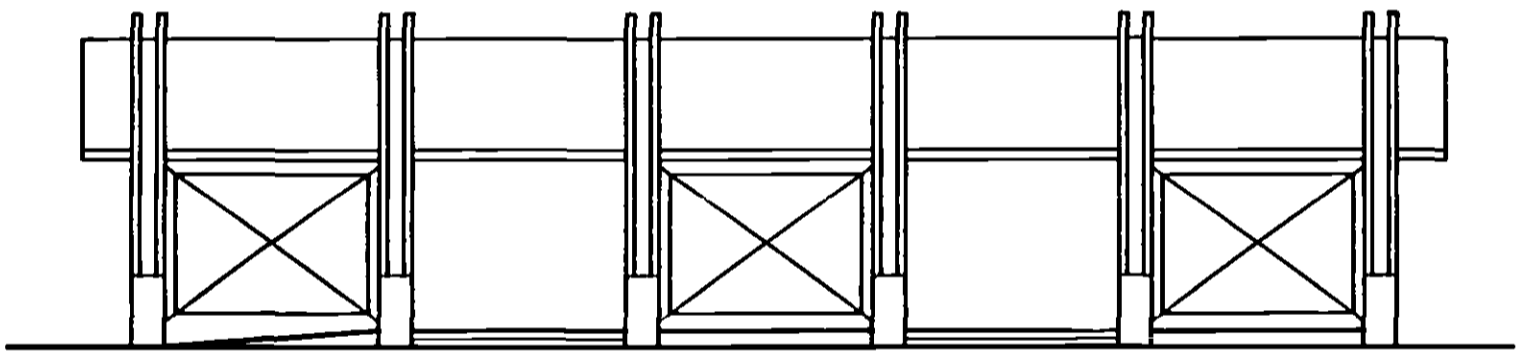
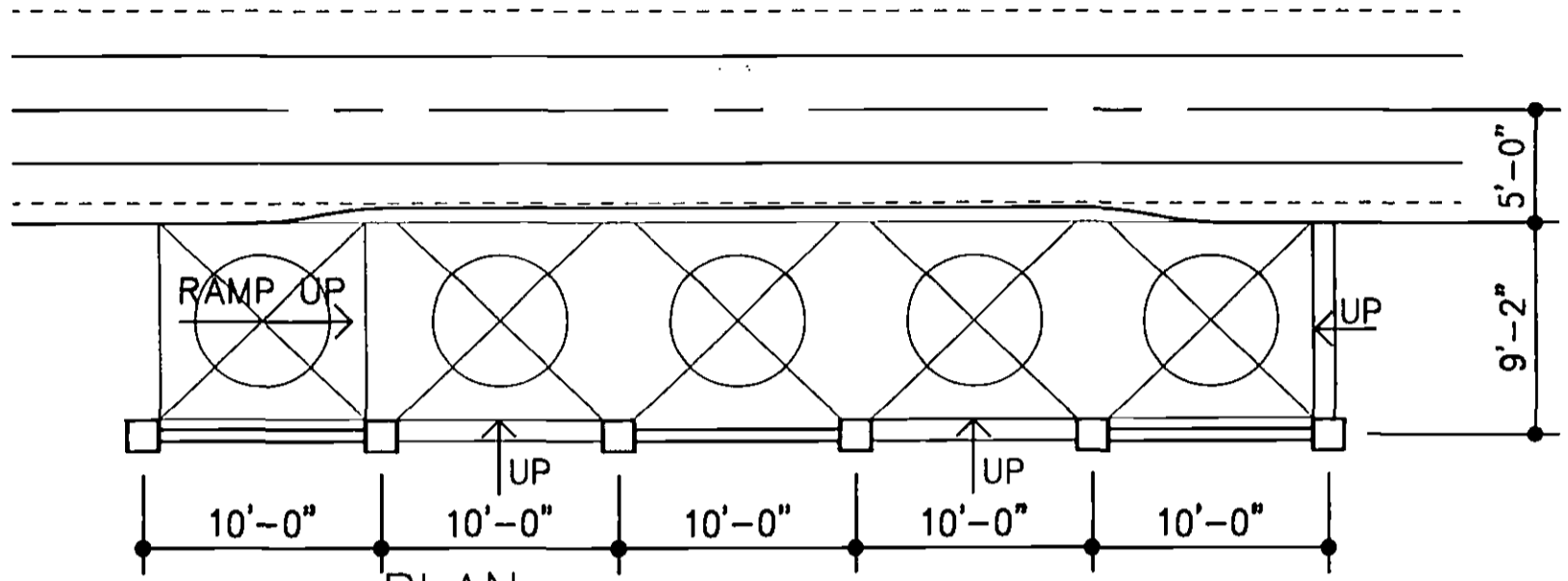
Four representative locations were selected to illustrate potential implementation scenarios along the circulator alignments. Plans and cross sections are provided for the four sites as described below.

BRAND BOULEVARD AND CALIFORNIA

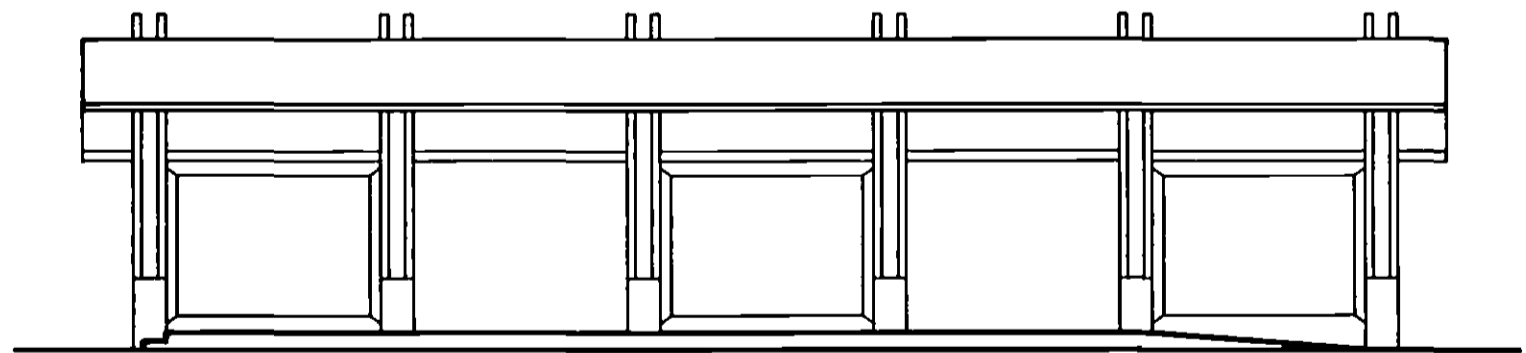
There are three Brand schemes, (Figures 3-7 through 3-9) locating the trolley stations on a central median. Pedestrians access the median from the crosswalks either at the intersections or mid block. Two of the Brand schemes show a one way trolley loop. One allows left turns and the other does not. Left turns pose a circulation problem with trolleys traveling in the same direction. Removing the left turn lane provides additional landscaping within the median. Both schemes can accommodate parallel parking. The third scheme



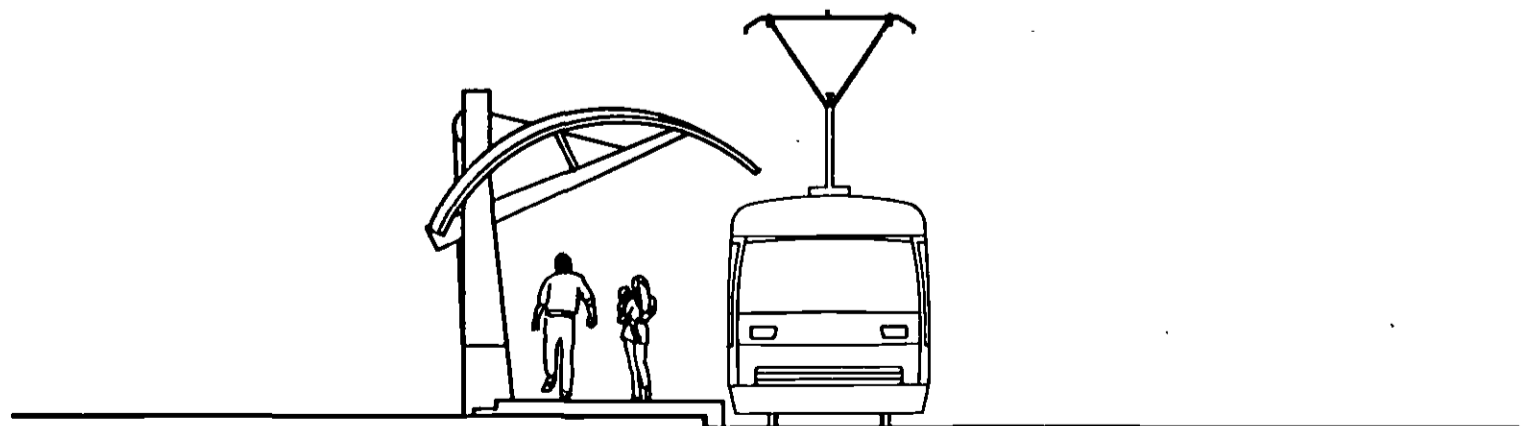
TROLLEY



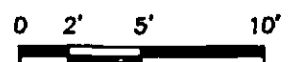
REAR ELEVATION



STREET ELEVATION



SIDE ELEVATION



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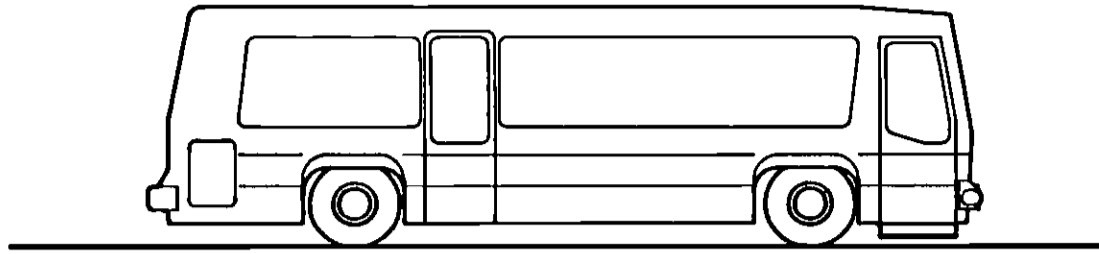
City of Glendale

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**

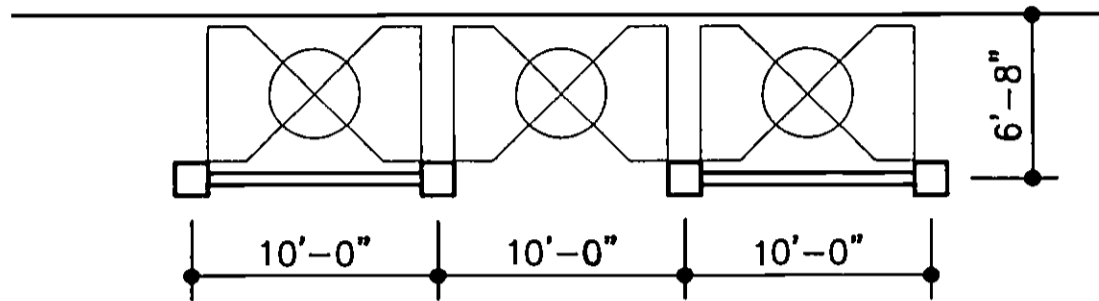
**TROLLEY STATION
PLAN AND ELEVATIONS**

SCALE
1"=8'

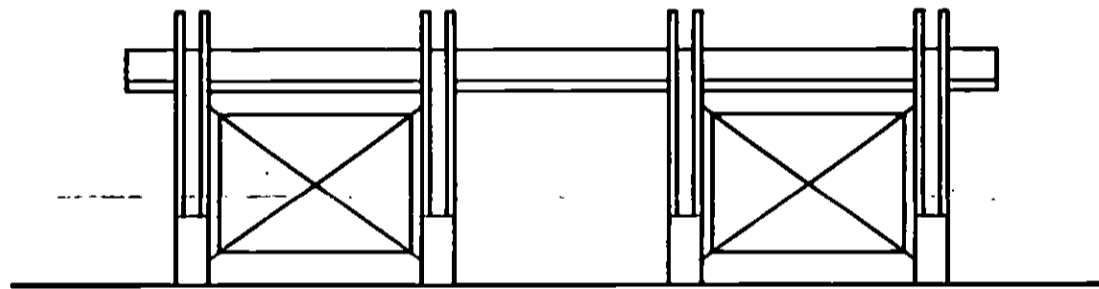
Figure
3-5



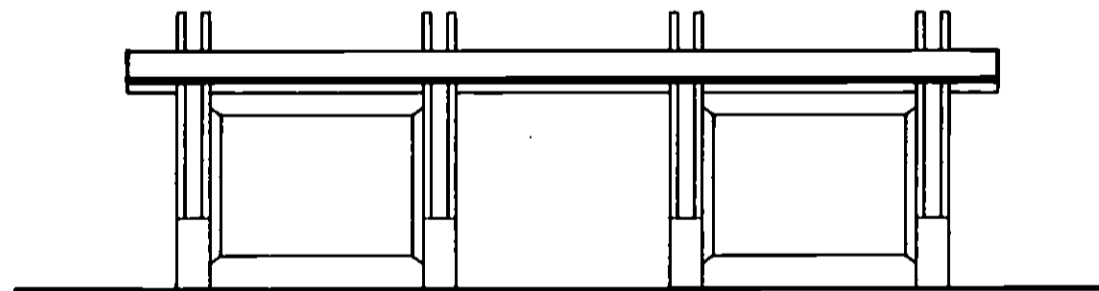
BUS



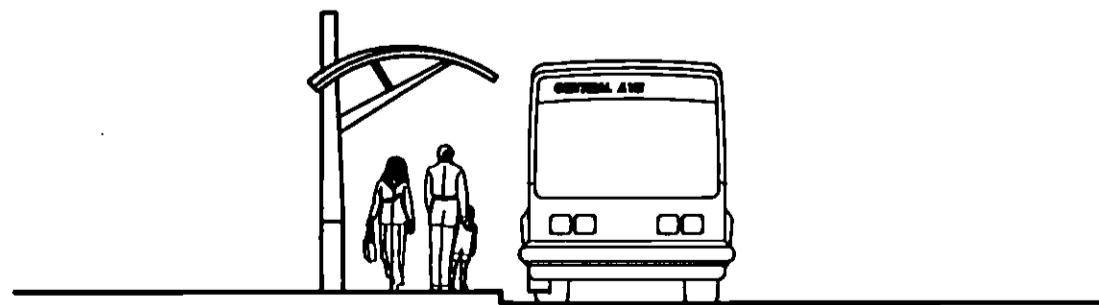
PLAN



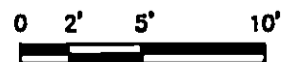
REAR ELEVATION



STREET ELEVATION



SIDE ELEVATION



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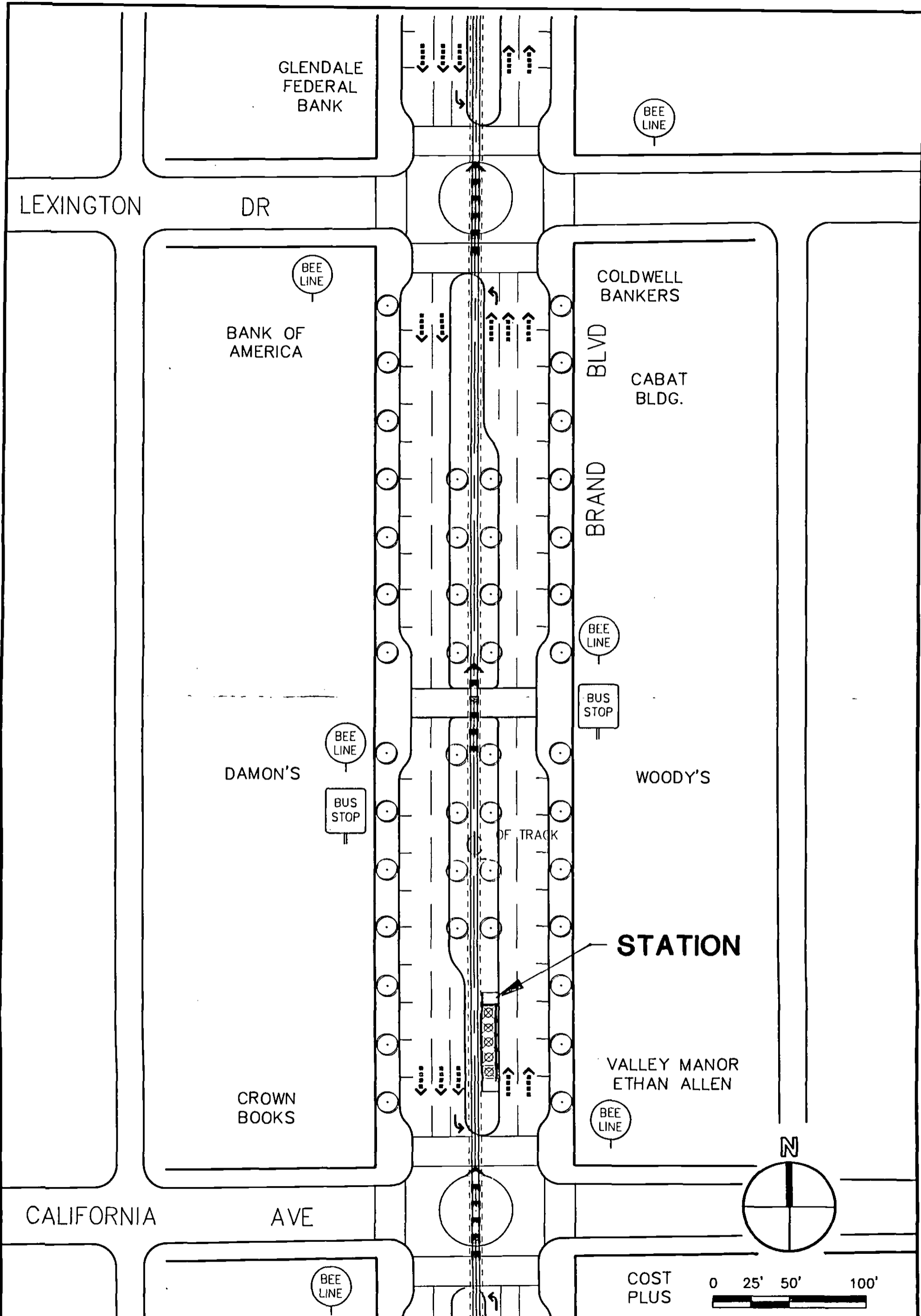
City of Glendale

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**

**BUS STATION
PLAN AND ELEVATIONS**

SCALE
1"=8'

Figure
3-6



Los Angeles County
Transportation Commission

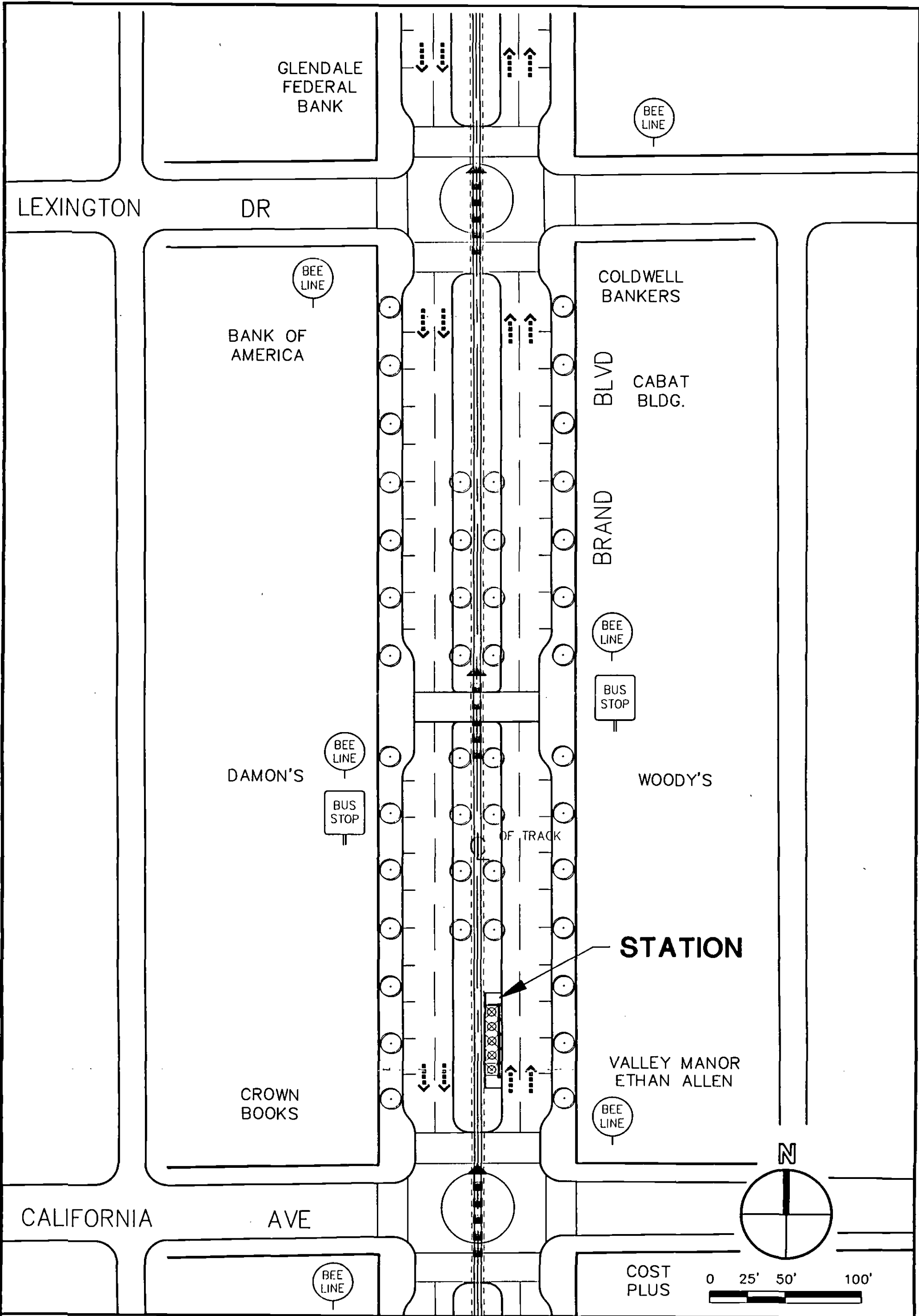
City of Glendale

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**

**TROLLEY STATION
BRAND BLVD - LEFT TURNS**

SCALE
1:720

Figure
3-7



Los Angeles County
Transportation Commission

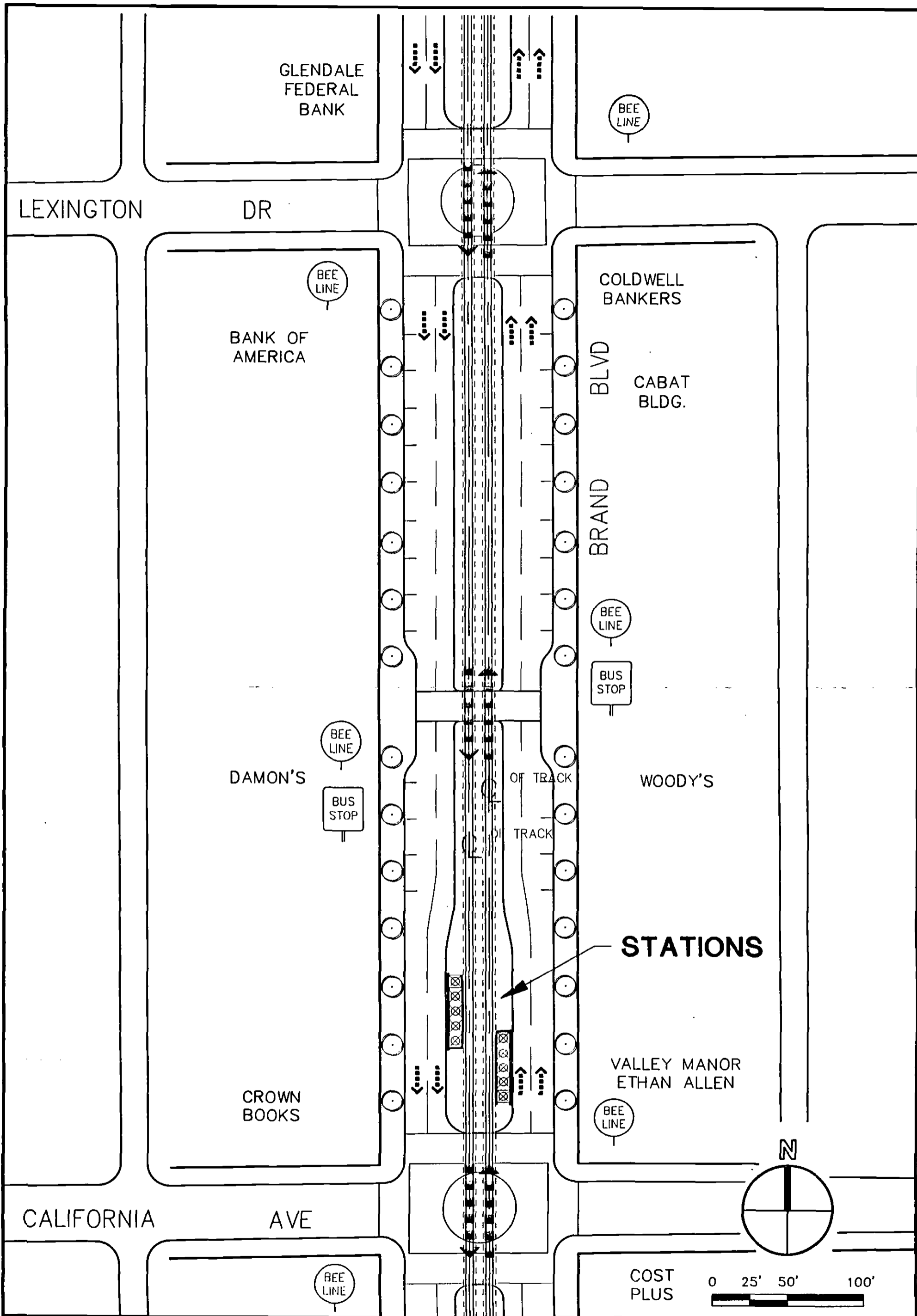
City of Glendale

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**

**TROLLEY STATION
BRAND BLVD. - NO LEFT TURN**

SCALE
1:720

Figure
3-8



Los Angeles County
Transportation Commission

City of Glendale

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**

**TROLLEY STATION
BRAND BLVD. - TWO WAY**

SCALE
1:720

Figure
3-9

provides a two-way trolley, no left turns, reduced parking and reduced landscaping. Figure 3-10 shows street cross sections of Brand Boulevard for these alternatives and, for comparative purposes, the existing conditions, which were field verified.

CENTRAL AVENUE AND BURCHETT STREET

This scheme (Figure 3-11) shows a one-way trolley as part of a north-on-Brand, south-on-Central loop. The trolley along Central Avenue is in the curb side traffic lane. The station also operates as a bus stop and the bus shares the same lane. The scheme allows for left turn lanes at intersections. Removing the possibility of left turns from Central Avenue, in this area, provides adequate space for a separate trolley and bus lane. Central Avenue cross sections and existing conditions are shown on Figure 3-12.

BROADWAY AND GLENDALE AVENUE

This scheme (Figure 3-13) shows one stop of a trolley loop that heads east along Colorado Street and west along Broadway. A separate trolley lane is possible where street parking is removed. The trolley will intersect the curb side traffic lane if left turn lanes remain on Broadway. Broadway cross section options and existing conditions are shown on Figure 3-14.

ORANGE STREET AND CALIFORNIA AVENUE

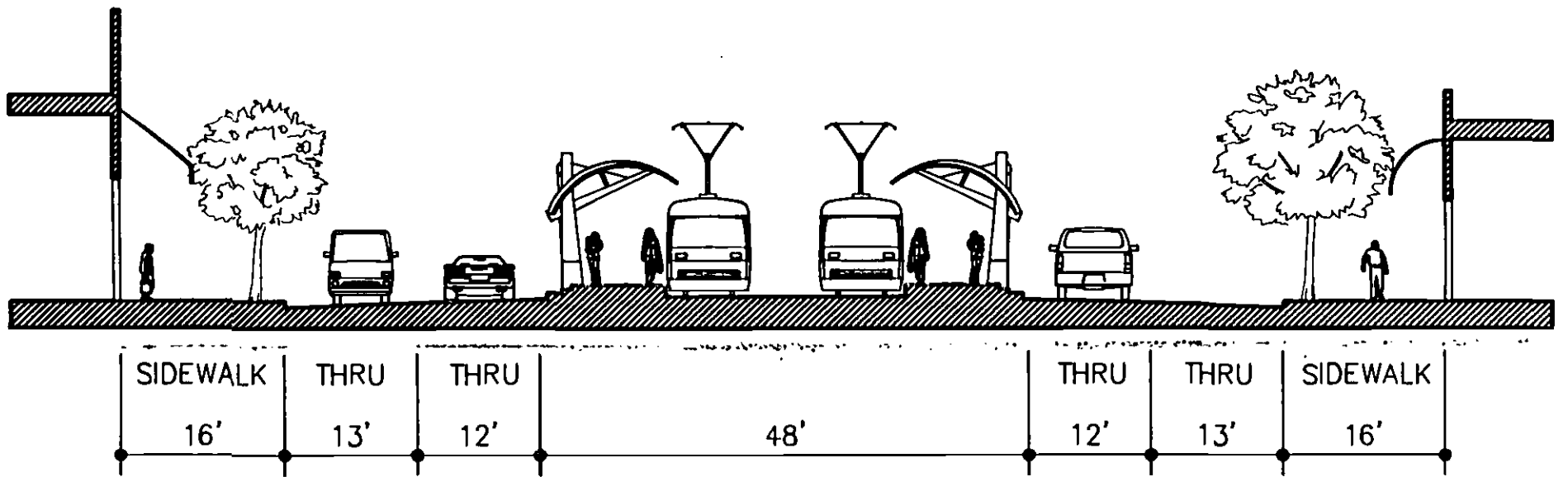
The Orange Street scheme (Figure 3-15) adds bus stops in the existing parallel parking lane. The scheme maintains the existing two-way left turn lane. Adding a one-way trolley lane at the curb will exclude parallel parking and left turn lanes along Orange Street. Orange Street cross sections are shown on Figure 3-16 with existing conditions.

3.3 ENVIRONMENTAL/DEVELOPMENT

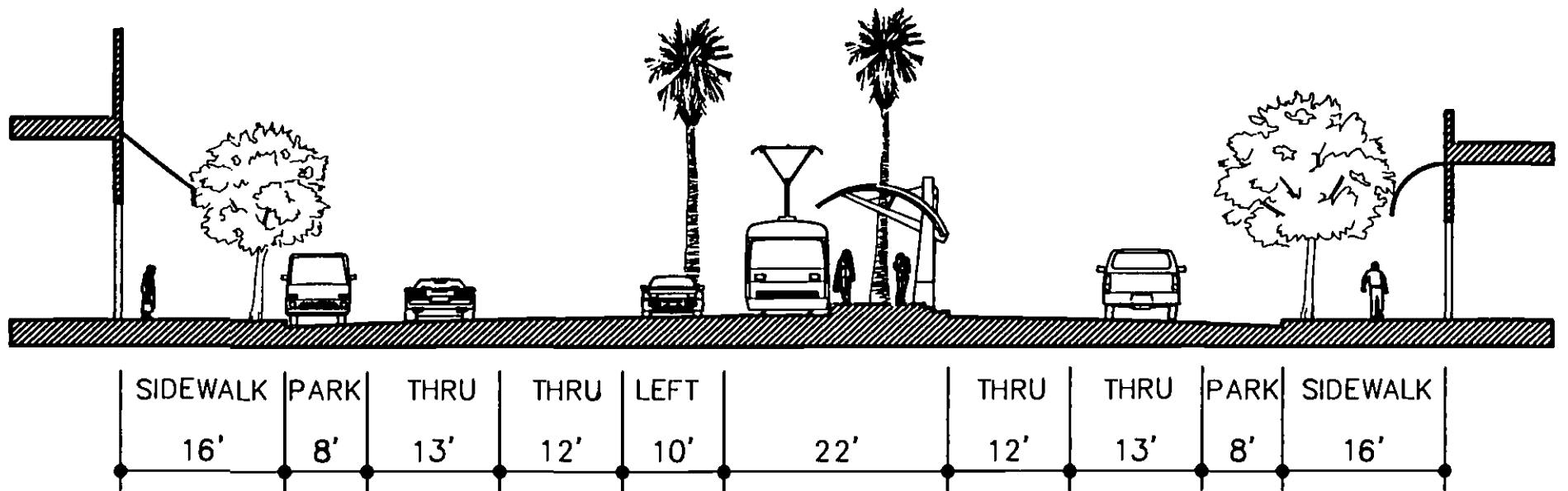
The purpose of this section is to present comparative environmental information about the four circulator system alternatives. This environmental information will be used in the overall evaluation of the alternatives. Potential land use, visual quality, and historic/architectural impacts are identified, as are sensitive receptors, physical limitations, and community services. Where applicable, beneficial impacts have also been identified.

3.3.1 METHODOLOGY

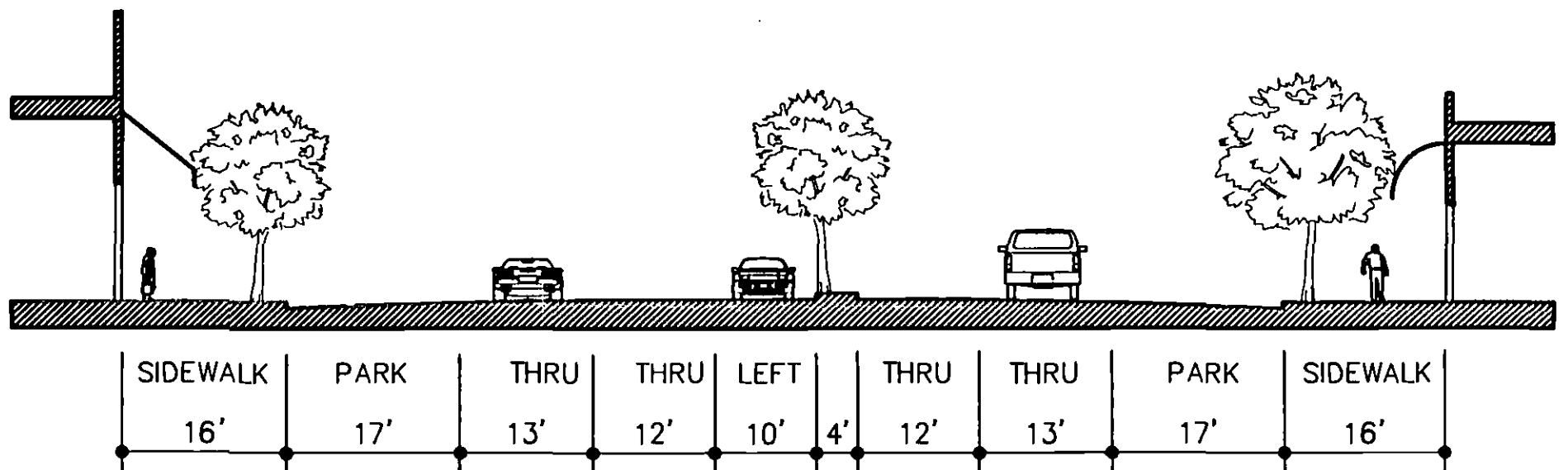
The impact analysis presented in this report is based on field surveys of each of the proposed alignments. Land uses and other data for parcels fronting the proposed alignments were noted on a standard double-line map of the Glendale area. A City of Glendale zoning map (1986) and land use plan (1987) were also consulted.



2 WAY TROLLEY

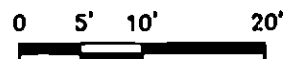


ONE WAY TROLLEY



EXISTING CONDITIONS

SECTIONS BETWEEN CALIFORNIA AND LEXINGTON



Los Angeles County
Transportation Commission

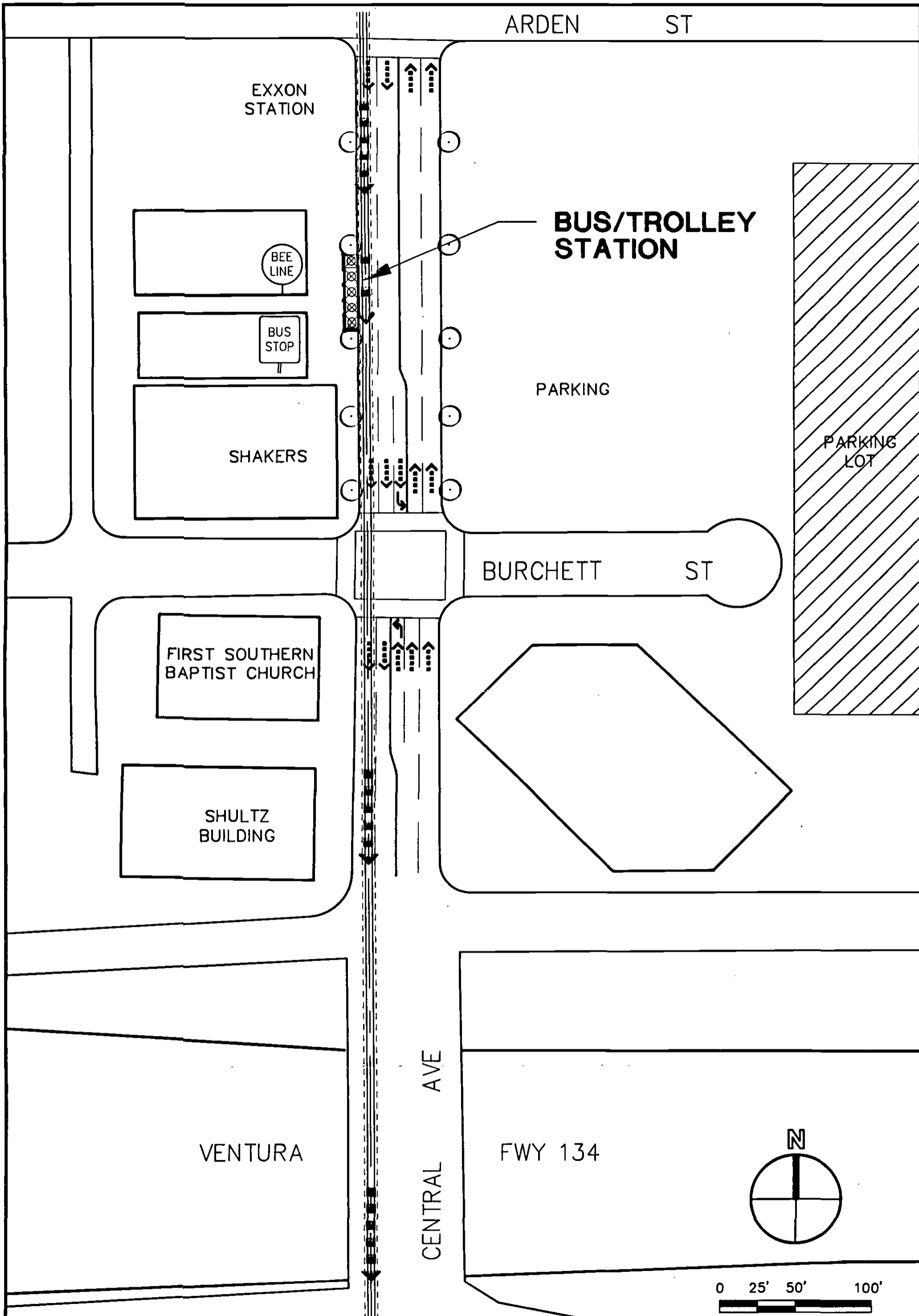
City of Glendale

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**

**TROLLEY STATION
BRAND BLVD. SECTIONS**

SCALE
1"=16'

Figure
3-10



Los Angeles County
Transportation Commission

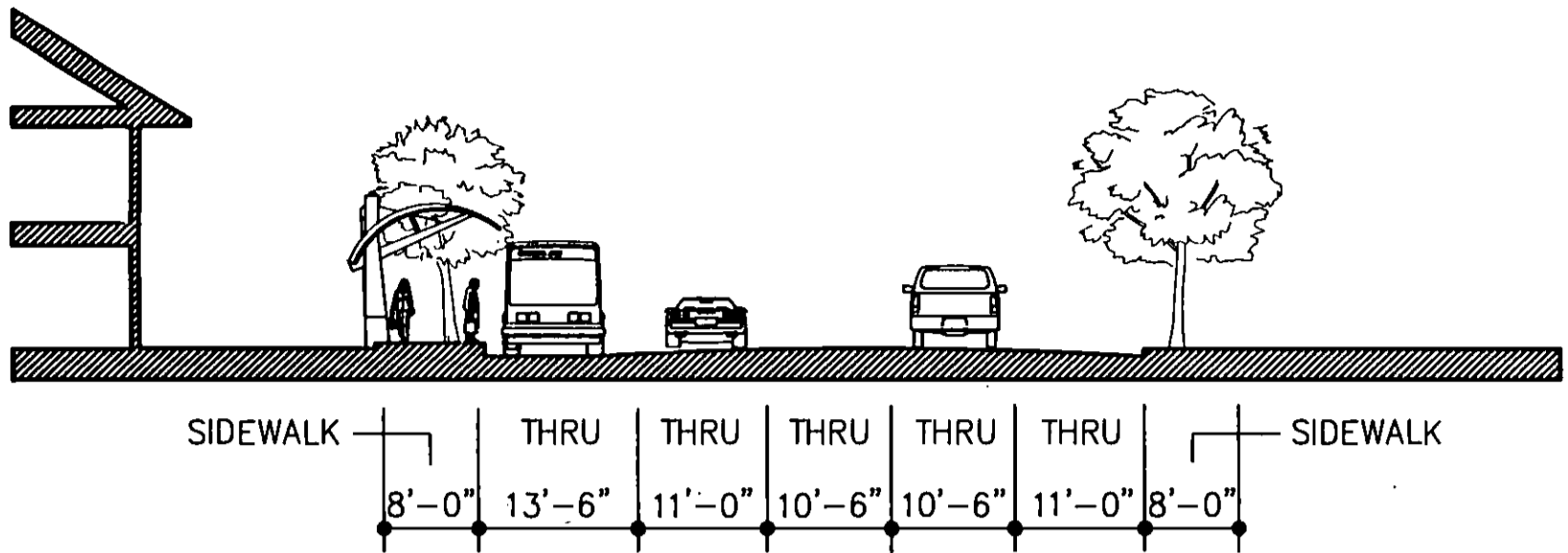
City of Glendale

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**

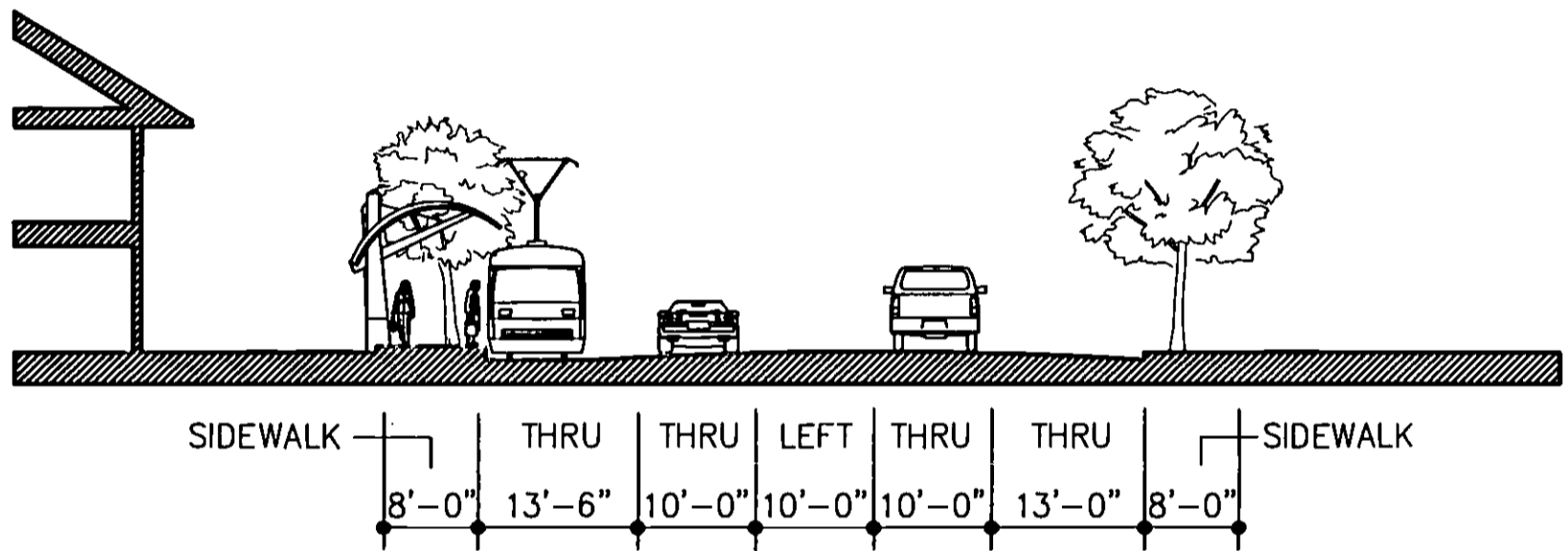
**BUS/TROLLEY STATION
CENTRAL AVENUE**

SCALE
1:720

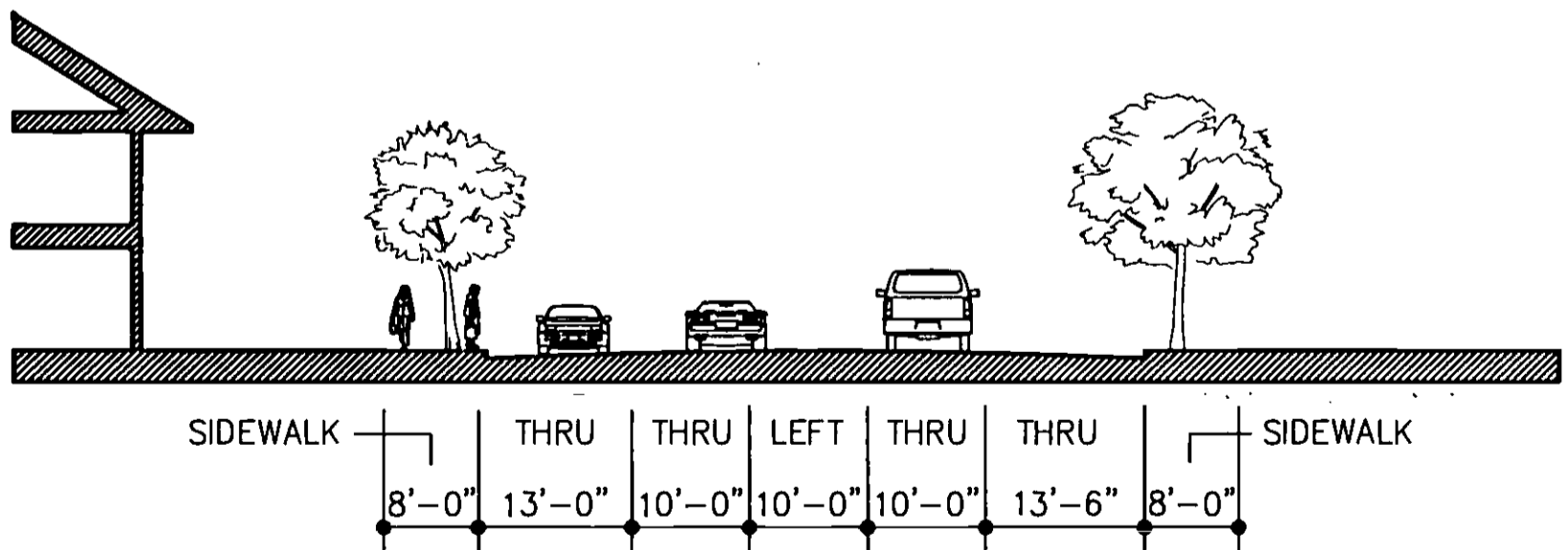
Figure
3-11



BUS AND TROLLEY LANE

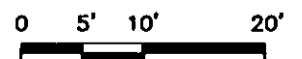


TROLLEY AT CURB



EXISTING CONDITIONS

SECTIONS BETWEEN BURCHETT AND ARDEN



Los Angeles County
Transportation Commission

City of Glendale

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**

**BUS/TROLLEY STATION
CENTRAL AVENUE SECTIONS**

SCALE
1"=16'

Figure
3-12

ISABEL

COUNTY COURTHOUSE

CITY HALL

STATION

BEE LINE

BUS STOP

BUS STOP

CITY HALL

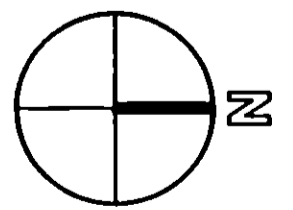
GLENDALE AVE

BEE LINE

BUS STOP

6 STORY BUILDING

BROADWAY



0 25' 50' 100'

Los Angeles County
Transportation Commission

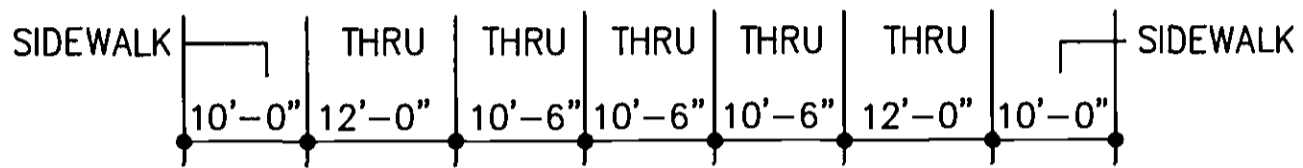
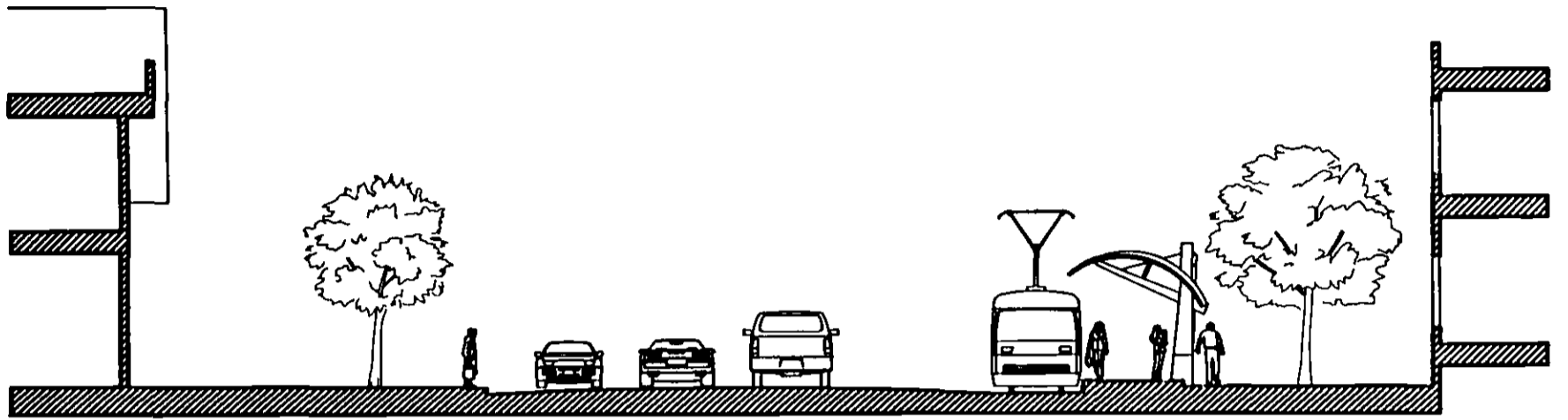
City of Glendale

GLENDALE CORRIDOR RAIL
TRANSIT PROJECT

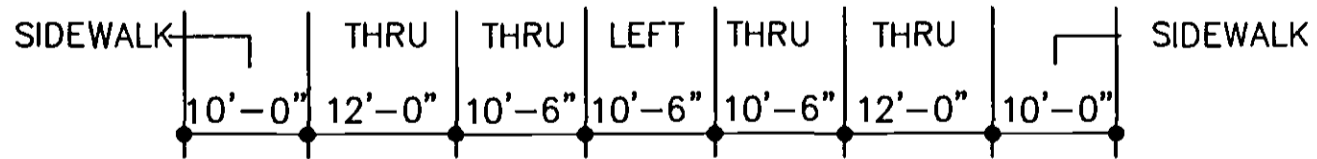
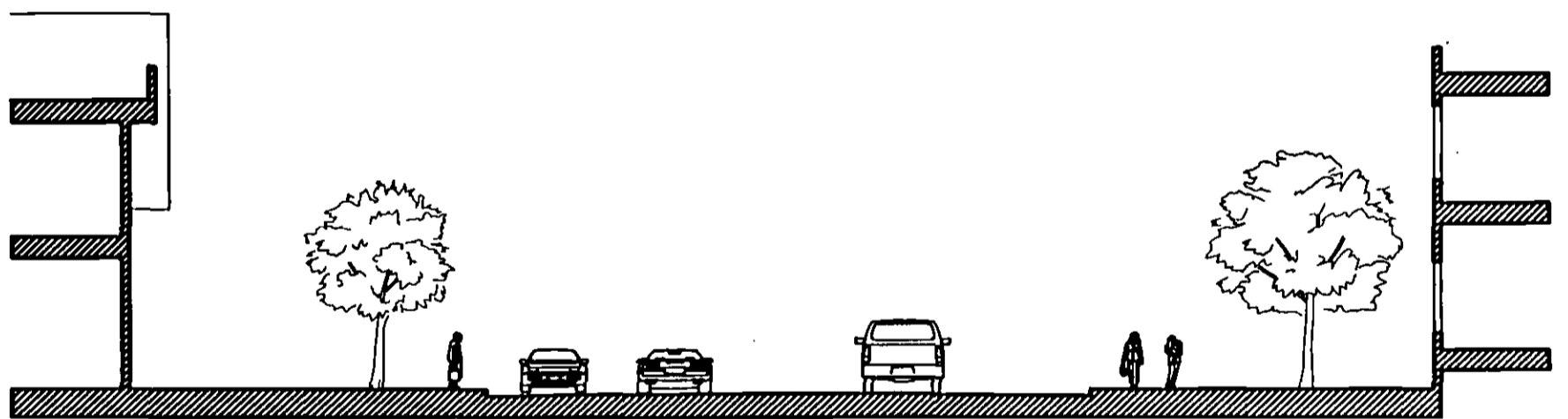
TROLLEY STATION
BROADWAY

SCALE
1:720

Figure
3-13

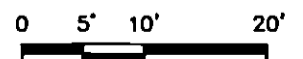


TROLLEY AT CURB



EXISTING CONDITIONS

SECTIONS BETWEEN GLENDALE AND ISABEL



Los Angeles County
Transportation Commission

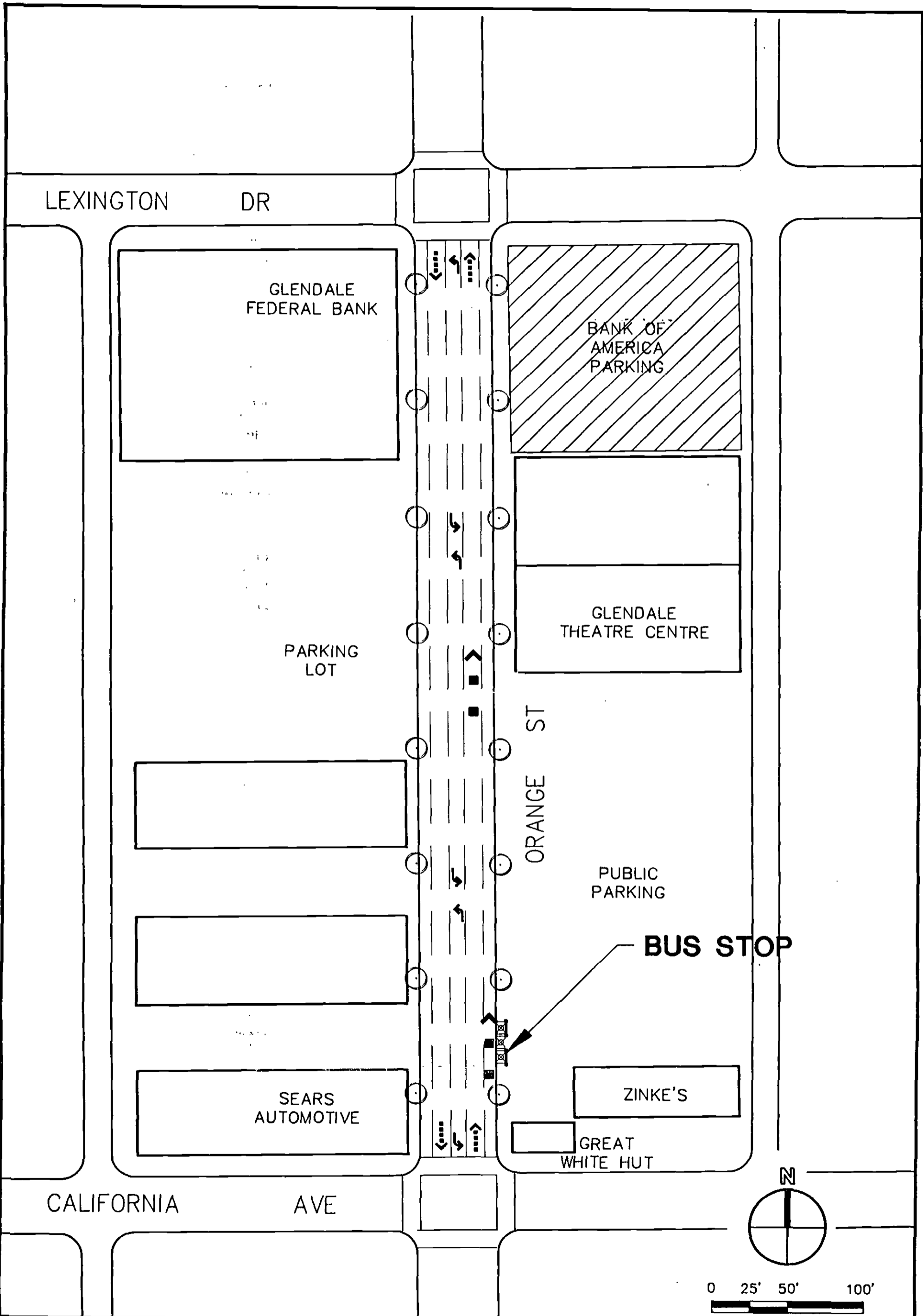
City of Glendale

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**

**TROLLEY STATION
BROADWAY SECTIONS**

SCALE
1"=16'

Figure
3-14



Los Angeles County
Transportation Commission

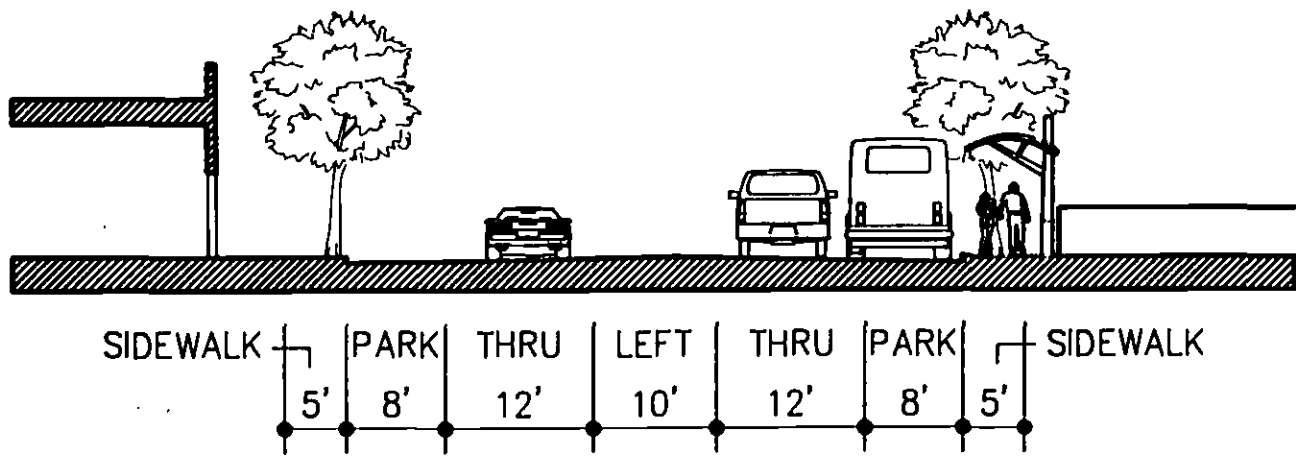
City of Glendale

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**

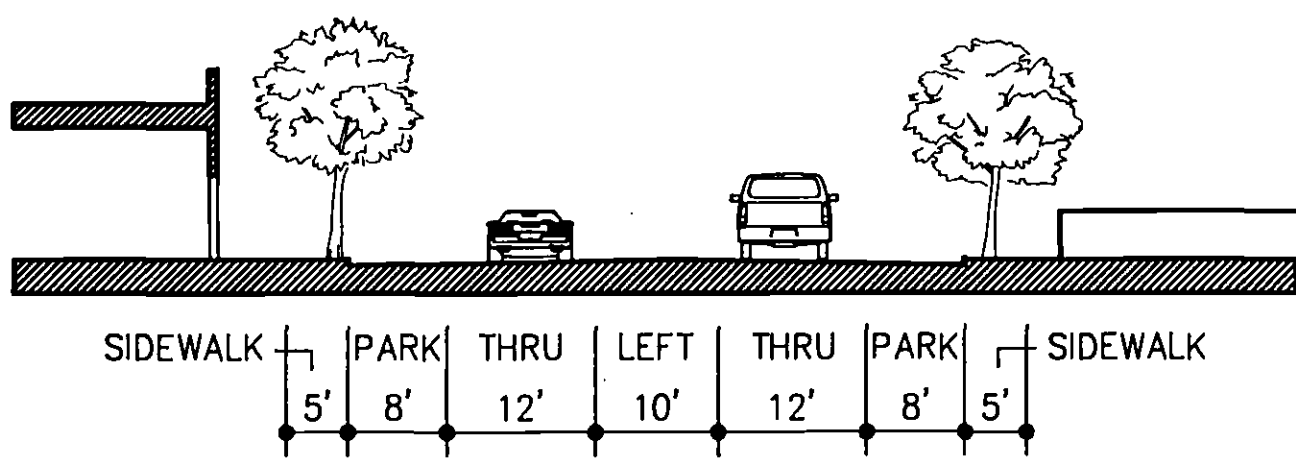
**BUS STATION
ORANGE STREET**

SCALE
1:720

Figure
3-15

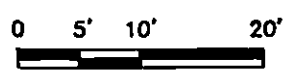


BUS AT CURB



EXISTING CONDITIONS

SECTIONS BETWEEN CALIFORNIA AND LEXINGTON



Los Angeles County
Transportation Commission

City of Glendale

**GLENDALE CORRIDOR RAIL
TRANSIT PROJECT**

**BUS STATION
ORANGE STREET SECTIONS**

SCALE
1"=16'

Figure
3-16

Sensitive receptors and community services were identified from field surveys and written sources. Written materials consulted include the City of Glendale planning division's Facts About Glendale publication (1984) and the County of Los Angeles Community Resource Information Bank listings for the Glendale/Burbank area (1982).

Local, state and national historic registers were used to identify cultural, historic, or architecturally significant sites along each of the alignments. Additional sites observed in field surveys and considered to be potentially significant were also noted. Table 3-2 lists the historic sites and Figure 3-17 is a map of those sites. Also, the Glendale redevelopment project is shown in Figure 3-18.

Physical limitations and visual impacts were assessed on the basis of readily apparent problems or opportunities.

3.3.2 IMPACT ANALYSIS BY ALIGNMENT

Table 3-3 briefly highlights the environmental constraints and opportunities for each of the circulation alignment alternatives.

Each of the proposed Glendale alignments has been evaluated in terms of six categories: land use; sensitive receptors; physical limitations; community services; historic and architecturally significant resources; and visual quality.

Sensitive receptors includes those uses that are sensitive to noise or visual impacts such as residences, churches, hospitals community services, and historic and architecturally significant resources have been evaluated in a quantitative manner. The number of receptors, services and resources in proximity to the proposed alignments have been counted. Proximity to the LRT is an indication of the potential exposure to adverse impacts such as noise.

Land use, physical limitations, and visual quality required a more qualitative assessment. Land use relationships are typically defined in terms of "compatibility." Compatibility relates to the ability of different uses to function together in a manner that is mutually supportive. For example, a transit facility in an area of high commercial activity is a compatible use because it provides an efficient way for people to reach the commercial center, and the presence of the commercial center, in turn, generates riders for the system. Uses with high compatibility to a bus transit center or trolley/LRT station would therefore include office commercial and multi-family residential uses. Uses with moderate compatibility are single-family residential, heavy and light industry, and institutional uses. Open space is considered to be incompatible with a transit facility. Physical limitations refer to overhead obstacles, narrow street widths, the presence of mature landscaping, or other items that could constrain the design and location of the alignment. Visual quality is a qualitative assessment of the compatibility of proposed structures (e.g. catenary poles, station areas and platforms) with the character and scale of the surrounding visual environment. Visual quality also addresses existing views and assesses the potential for obstruction or impairment of those views.

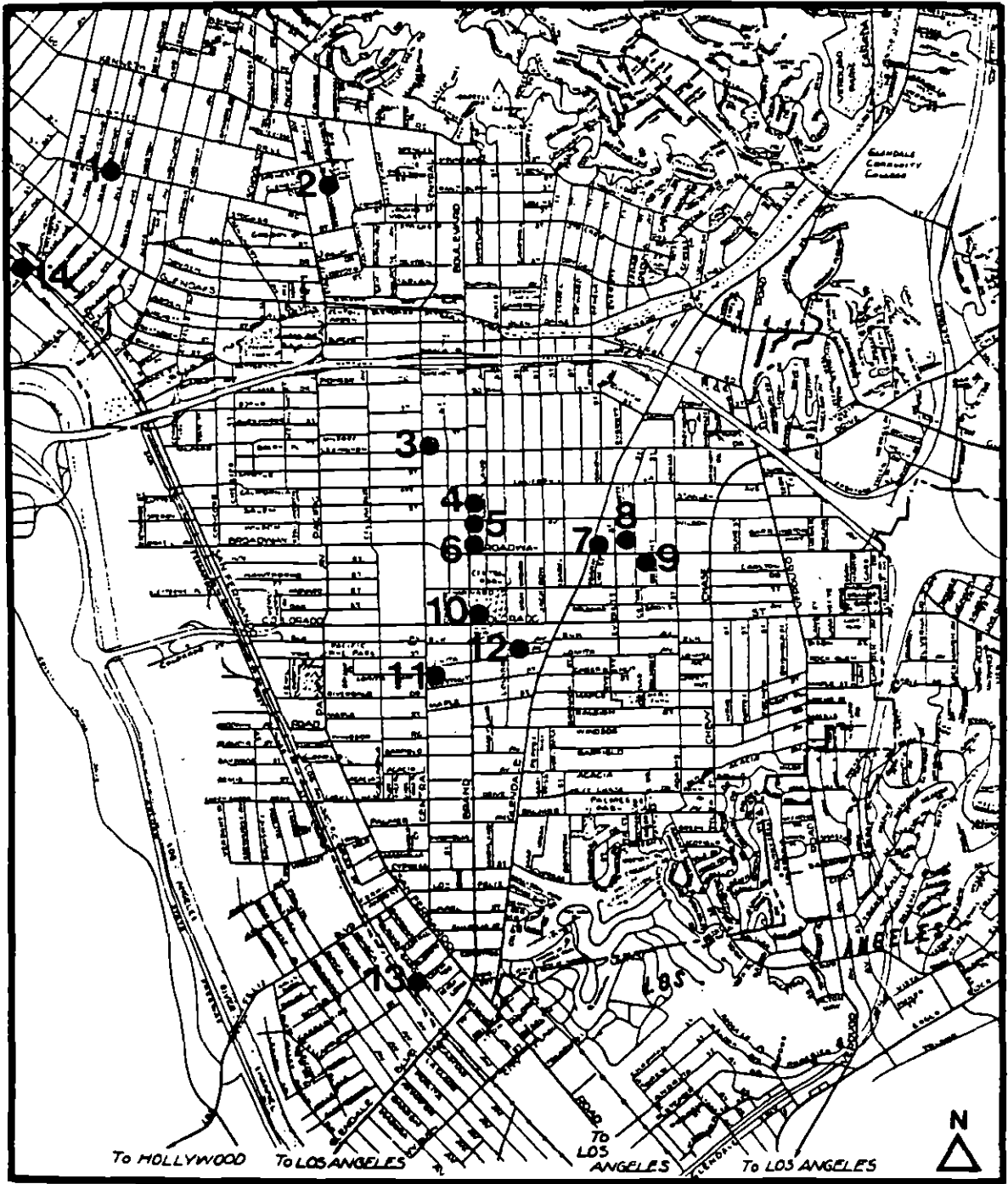
TABLE 3-2

GLENDALE AREA HISTORIC SITES

Listed below are historic sites that may be affected by the proposed LRT system in Glendale. Only those sites within a reasonable distance (approx. 1/2 mile) from the six alignment alternatives have been identified. See also figure A-1.

<u>NAME</u>	<u>LOCATION</u>	<u>TYPE</u>	<u>ALIGNMENT(S) AFFECTED</u>
1. Taylor House	1027 Glenwood Road	local (1st order)	C
2. Casa Adobe de San Rafael	1330 Dorothy Drive	state, local (1st order)	C
3. Tuesday Afternoon Club*	Central/Lexington	local (2nd order)	B
4. The Alex Theater	216 No. Brand Blvd.	local (2nd order)	C F G
5. Egyptian Village Cafe	130 No. Brand Blvd.	local (1st order)	C F G
6. Security Bank Building	Brand/Broadway	local (2nd order)	C D E F G
7. Glendale Hotel	Broadway/Glendale	local (2nd order)	E
8. Goode House	119 No. Cedar St.	local (1st order)	E
9. Harrower Lab	Broadway/Belmont	local (2nd order)	E
10. Masonic Temple	232 So. Brand Blvd.	local (2nd order)	C D E F G
11. St. Mary's Church	500 So. Central Ave.	local (2nd order)	B
12. Holy Family R.C. Church	214 E. Elk St.	local (2nd order)	C D E
13. SP/Amtrak Depot	Gardena/Cerritos	local (1st order)	A B C D E
14. Grand Central Airport Tower	1310 Air Way	local (2nd order)	A

*demolished



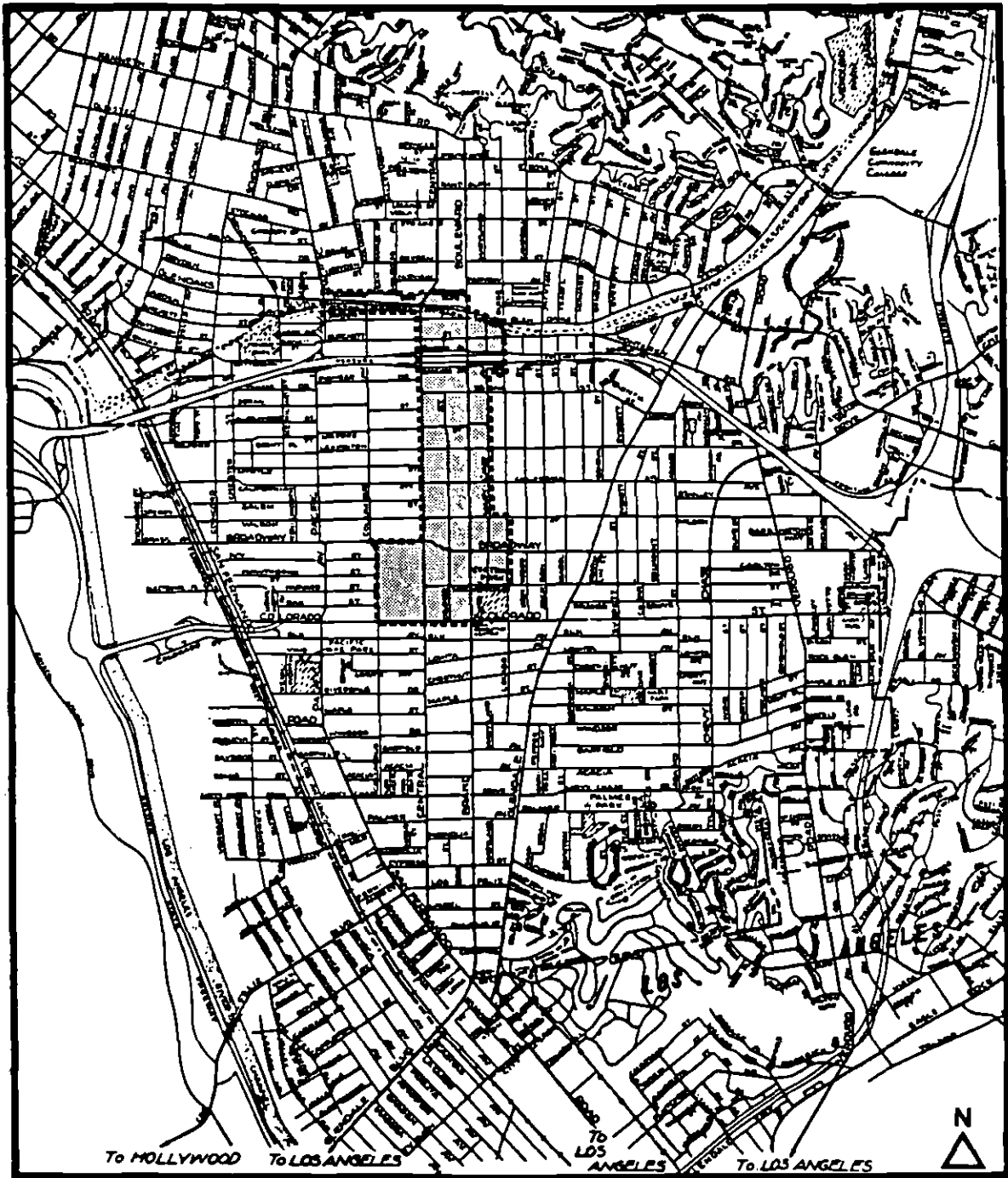
**Glendale Rail Project
Preliminary Environmental Analysis**

Figure 3-17

Historic Sites

Myra L. Frank & Associates

Source: City of Glendale, Myra L. Frank & Associates, 1989



**Glendale Rail Project
Preliminary Environmental Analysis**

Myra L. Frank & Associates

Figure 3-18

**Location of
Glendale Redevelopment Project**

Source: Myra L. Frank & Associates, 1989

**TABLE 3-3
CIRCULATION SYSTEM ALTERNATIVES
SUMMARY OF ENVIRONMENTAL CONSTRAINTS AND OPPORTUNITIES**

<u>ALIGNMENT</u>	<u>CONSTRAINTS</u>	<u>OPPORTUNITIES</u>
LRT ALTERNATIVE		
A: SPTC R-O-W	<ul style="list-style-type: none"> -does not directly serve CBD -few passenger destinations (e.g. retail, services, etc.) -few trip origins (e.g. residential areas) 	<ul style="list-style-type: none"> -existing rail R-O-W -park & ride potential for commuters to L.A. -access to future SF Valley lines -fewer street crossings
CIRCULATION ALTERNATIVES		
E: BRAND/BROADWAY/ EAGLEDALE/COLORADO	<ul style="list-style-type: none"> -numerous sensitive uses along eastern end of loop -narrow R-O-W along Broadway and Colorado 	<ul style="list-style-type: none"> -direct service to CBD -service to Civic Center
F: CENTRAL/ORANGE/ VENTURA FWY/	<ul style="list-style-type: none"> -very narrow R-O-W along Orange -Galleria overpass and delivery area -could limit access to several parking structures -sensitive residential areas along Ventura Freeway 	<ul style="list-style-type: none"> -avoids problems with No. Brand Boulevard -park and ride potential
G: BRAND/ORANGE/ GLENOAKS	<ul style="list-style-type: none"> -very narrow R-O-W along Orange -Galleria overpass and delivery area -could limit access to several parking structures -numerous sensitive uses along Glenoaks 	<ul style="list-style-type: none"> -avoids problems with No. Brand Boulevard -park and ride potential
ONE-WAY LOOP	<ul style="list-style-type: none"> -narrow R-O-W along Central -Galleria pedestrian overpass -some adjacent sensitive uses -requires alteration of existing streetscape along No. Brand Boulevard 	<ul style="list-style-type: none"> -best serves CBD

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E: BRAND/BROADWAY/ EAGLEDALE/COLORADO	-numerous sensitive uses along eastern end of loop -narrow R-O-W along Broadway and Colorado	-direct service to CBD -service to Civic Center
F: CENTRAL/ORANGE/ VENTURA FWY/	-very narrow R-O-W along Orange -Galleria overpass and delivery area -could limit access to several parking structures -sensitive residential areas along Ventura Freeway	-avoids problems with No. Brand Boulevard -park and ride potential
G: BRAND/ORANGE/ GLENOAKS	-very narrow R-O-W along Orange -Galleria overpass and delivery area -could limit access to several parking structures -numerous sensitive uses along Glenoaks	-avoids problems with No. Brand Boulevard -park and ride potential
ONE-WAY LOOP	-narrow R-O-W along Central -Galleria pedestrian overpass -some adjacent sensitive uses -requires alteration of existing streetscape along No. Brand Boulevard	-best serves CBD

ALIGNMENT E

LAND USE: The alignment passes through a city-designated "Automotive Commercial Center" along the southern portion of Brand Boulevard with auto sales extending north to Colorado Street. These commercial uses are considered to be compatible with bus or trolley facilities. However, a loss of on-street customer parking would be considered an adverse impact to auto dealers in this area, as would the elimination of mid-block left turns, which may result from implementation of a trolley system. As the alignment proceeds eastward along Broadway, land use compatibility would not be an issue. Broadway is predominantly residential with both single- and multi-family residences from Chevy Chase Drive to the Glendale city line. Eagledale Avenue also is bordered by residential uses. Land uses along the Colorado Street portion of this alignment are largely community commercial, and therefore compatible with a trolley system. Isolated public and residential uses are also interspersed throughout this area. Loss of accessibility to businesses due to the elimination of on-street parking and restrictions on left turns would be an adverse effect.

SENSITIVE RECEPTORS: Several sensitive receptors, which could be adversely affected by noise impacts, are located along this alignment. The most significant sensitive uses along Brand Boulevard are Forest Lawn Memorial Park (1 block away), Cerritos Elementary School, and Roosevelt Junior High School. Five churches and three schools (including Glendale High) are on or near the Broadway portion of the alignment. Also, as mentioned above, a residential area is located along the eastern segment of Broadway. Sensitive sites along Colorado Street include eight motels, three churches, and two parks.

PHYSICAL LIMITATIONS: As a former Pacific Electric Railway right-of-way, most of Brand Boulevard in this alignment is physically well-suited to a trolley system. From Colorado to Broadway, however, the presence of a landscaped median and wider pedestrian areas created during redevelopment give the area a definition and identity that could be altered by the imposition of a trolley line. The section of the alignment where it turns from Brand onto Broadway may present a problem. The narrow street right-of-way along Broadway and the fact that the area is fully developed and historically important may make it difficult to accommodate a trolley line within the existing right-of-way. The elimination of on-street parking may be necessary to accommodate a trolley line. The transition from Eagledale to Colorado Street is immediately adjacent to the Ventura Freeway/Glendale Freeway interchange where traffic is heavy. Eagledale Avenue is a narrow one-way street providing the only easy access from Broadway to the southbound Glendale Freeway on-ramp. Narrow street right-of-way along Colorado, similar to that on Broadway, may also be a problem.

COMMUNITY SERVICES: A number of community services are located along this alignment, including schools and churches. Emergency access from the two fire stations along Brand Boulevard could be adversely affected. A trolley line could potentially create an obstruction to emergency vehicles. Another area of concern is the civic center near Broadway and Glendale. Auto access to government facilities and parking could be adversely affected. This is also true for the Colorado Street side of Central Park where a senior citizens' center and recreational facilities are adjacent to the proposed alignment.

HISTORIC/ARCHITECTURAL SIGNIFICANCE: The proposed alignment passes through the older commercial district in Glendale where several sites have been designated by the city as historically or architecturally significant. No "first order" local landmarks are on the alignment. Seven "second order" landmarks are on or near the alignment. Other old commercial buildings appearing significant but not officially recognized were noted during field surveys. Future revisions of the City of Glendale's historic preservation element may or may not give these sites landmark status.

VISUAL QUALITY: The presence of a trolley system with an overhead power system would modify the existing visual character in this area as well as add new elements to the visual setting. The residential area at the eastern end of Broadway would be particularly sensitive to this new visual element.

ALIGNMENT F

LAND USE: Although the predominant land use along Central Avenue is commercial, there are several isolated uses including residences, convalescent homes and churches. Although residential and institutional uses are considered compatible with transit facilities, they are land uses that are sensitive to potential increases in noise levels. Land uses along Harvard and Orange Streets are almost exclusively commercial. The trolley alignment may require the elimination of on-street parking and mid-block left turns, as well as reduced sidewalk widths. Adjacent to the alignment following the Ventura Freeway right-of-way are residential uses including both single- and multi-family units. All of these constitute adverse effects on businesses and a number of parking facilities in particular.

SENSITIVE RECEPTORS: The potential land uses along Central Avenue which are sensitive to potential noise or visual impacts include residences, convalescent homes and churches. Most of these are located south of the Glendale Galleria between San Fernando Road and Colorado Street. Of particular significance are the Glendale Memorial Hospital, St. Mary's Church, and the First Southern Baptist Church. Sensitive receptors along Orange Street are limited to three motels, a theater, and one multi-family residence. A church, a hotel and numerous single- and multi-family residences are located along the Ventura Freeway right-of-way.

PHYSICAL LIMITATIONS: Access from the Southern Pacific rail line to Central Avenue via Cerritos Avenue may be difficult due to the presence of residential and light industrial uses. Once on Central, the alignment would be confined to a fairly narrow street right-of-way for its entire length. A trolley line may also eliminate mid-block left turns reducing property access. Some on-street parking may also be eliminated. The narrow width of Orange Street would make it difficult to accommodate both a trolley line and continued automobile use. The alignment would also have to pass beneath the Galleria in an area currently used for deliveries and parking structure access. Vertical clearance in this area is very limited. Access to Brand Boulevard or Central Avenue from Orange Street could require right-of-way acquisition in an area of well-established commercial development. If the alignment were to continue along the Ventura Freeway, problems with right-of-way and access to freeway ramps would require special treatment.

COMMUNITY SERVICES: Five community service facilities have been identified along this section of Central Avenue. There are two government buildings, a Salvation Army Mission, a church and the Glendale Memorial Hospital. Emergency access to and from the hospital would require special consideration. Medical offices and labs in the immediate vicinity may also be of concern. The main fire station serving the Glendale CBD is located at Orange/Harvard. Implementation of a trolley line may have an adverse effect on emergency vehicle access at the fire station. A church is located along the Ventura Freeway right-of-way.

HISTORIC/ARCHITECTURAL SIGNIFICANCE: One "second order" local landmark, St. Mary's Armenian Apostolic Church, (formerly the Christian Science Church), is located along this section of Central Avenue. No official historic landmarks have been designated along Orange and the Ventura Freeway. No structures appearing otherwise significant were observed in the field, though the area is in the older commercial center of the city.

VISUAL QUALITY: Existing views in the area are primarily of the Verdugo Mountains to the north. Introduction of trolley line with an overhead catenary power system would introduce new visual elements into the existing environment. In the area of the Glendale Galleria, a substantial visual complexity already exists. A trolley system could add to this complexity. A trolley system would also contribute to an existing sense of narrowness along Orange Street. Along the Ventura Freeway a trolley line would add a visual element that could create a distraction to motorists and could impair views from the adjacent residential area.

ALIGNMENT G

LAND USE: The section of Brand Boulevard, which this alignment would follow, passes through a city-designated "Automotive Commercial Center." Auto dealerships extend north along Brand Boulevard to Colorado. These commercial land uses are considered to be highly compatible with transit facilities. However, a loss of on-street customer parking would be considered an adverse impact to auto dealers in this area, as would the elimination of mid-block left turns, which could result from implementation of a trolley line. The land uses along the section of Brand north of Dryden are primarily regional commercial office buildings which are also highly compatible with transit facilities. Land uses along Orange Street are almost exclusively commercial. As the alignment proceeds west on Glenoaks it enters an area that is almost entirely residential including both single- and multi-family units. Pelanconi Park is located immediately to the north of the proposed route along Cleveland Road and a residential area is located immediately south.

SENSITIVE RECEPTORS: Several sensitive receptors including residences and motels, which may be adversely affected by potential noise impacts, are located along this section of Brand Boulevard. Other significant sensitive receptors include Forest Lawn Memorial Park (one block away), Cerritos Elementary School and Roosevelt Junior High School. Sensitive receptors along Orange are limited to a theater and one multi-family residence.

The numerous sensitive uses along Glenoaks Boulevard include two churches, over 100 residential buildings, and a park.

PHYSICAL LIMITATIONS: As a former Pacific Electric Railway right-of-way, most of Brand Boulevard is physically well-suited to a trolley system. North of Colorado, however, the presence of a landscaped median and wider pedestrian areas created during redevelopment give the area a definition and identity that could be altered by the imposition of a trolley system. The narrow width of Orange Street would make it difficult to accommodate both a trolley line and continued automobile use. The alignment would also have to pass beneath the Galleria in an area currently used for deliveries and parking structure access. Vertical clearance in this area is very limited. Access to Brand Boulevard from Orange Street could require right-of-way acquisition in an area of well-established commercial development. The Glenoaks portion of the alignment is well-suited to a trolley line due to the presence of a wide, grassy median from Pacific Avenue west to Cleveland Road. Use of the median for a trolley line may, however, require the removal or relocation of existing landscaping.

COMMUNITY SERVICES: A number of community services are located along this alignment, including schools, a post office and churches. A trolley line could potentially affect emergency vehicle access at the fire stations located on Brand Boulevard and near the intersection of Orange and Harvard. This latter station is the main fire station serving the Glendale central business district.

HISTORIC/ARCHITECTURAL SIGNIFICANCE: A "second order" landmark, a Masonic Temple, is located at 232 South Brand Boulevard. No official historic landmarks have been designated along the Orange Street section of the alignment and based on field observations, there are no structures which appear to be significant.

VISUAL QUALITY: A trolley line with a catenary power system would modify the existing visual character in this area as well as add new elements to the visual setting. A trolley line could also contribute to an existing sense of narrowness along Orange Street and complicate the visual setting around the Glendale Galleria. The trolley line may also be a visually intrusive element in the residential neighborhoods along Glenoaks. Removal of median landscaping to accommodate a trolley line could have an adverse visual impact.

ONE-WAY LOOP

LAND USE: Although the predominant land use along Central Avenue is commercial, there are several isolated uses including residences, convalescent homes and churches. Although residential and institutional uses are compatible with transit facilities, they are land uses that are sensitive to potential increases in noise levels. Dryden Street from Central to Brand is bordered by apartments on the north. The section of Brand Boulevard from Dryden to Elk Avenue is bordered by regional and community commercial uses which are considered highly compatible with a transit facilities. Two churches are located along Brand Boulevard near Dryden Street. A hotel is located on Brand between California and Lexington. Some multi- and single-family residences are located along Elk Avenue.

SENSITIVE RECEPTORS: The residences, convalescent homes and churches along Central Avenue are also considered to be sensitive receptors. Of particular significance are the Glendale Memorial Hospital and St. Mary's Church, which is on Central Avenue just north of Elk Avenue. Other sensitive receptors include multi- and single-family residences along Elk, a motel near Colorado and Brand, and a library, hotel, and churches along Brand Boulevard.

PHYSICAL LIMITATIONS: Access from the Southern Pacific rail line to Central Avenue via Cerritos Avenue may be difficult due to the presence of established residential and light industrial uses. Once on Central, the alignment would be confined to a fairly narrow street right-of-way for its entire length. Mid-block left turns may be eliminated, reducing property access. Some on-street parking could also be eliminated. At the Glendale Galleria, an enclosed pedestrian overpass between Galleria buildings is quite low and there may not be sufficient vertical clearance to accommodate a trolley line. Along Brand Boulevard from Colorado to Glenoaks, there are also serious limitations to a trolley line. The presence of a landscaped median and wider pedestrian areas created during redevelopment give the area a definition and identity that could be significantly altered by the imposition of a trolley line.

COMMUNITY SERVICES: Seven community service facilities have been identified along Central Avenue. There are two churches, a social club, two government buildings, a Salvation Army Mission, and the Glendale Memorial Hospital. Emergency access to and from the hospital would require special consideration. Medical offices and labs in the immediate vicinity may also be of concern. A trolley line could also potentially diminish access at the fire station located near the intersection of Brand Boulevard and Dryden Street. Central Park which includes an Adult Recreation Center and the Central Library, are located on the east side of Brand Boulevard. Two churches are located on Brand near Dryden.

HISTORIC/ARCHITECTURAL SIGNIFICANCE: Two second order local landmarks are located along Central Avenue. One, the Tuesday Afternoon Club, has been demolished and replaced with a small park for the Glendale Federal Bank. A plaque is the only indication of the site's significance. Since there is no structure remaining, no impact is expected unless right-of-way acquisition is necessary. The other landmark, the former Christian Science Church, is now occupied by St. Mary's Armenian Apostolic Church. A few other commercial buildings appearing worthy, but without official recognition, were also observed in the field. Brand Boulevard passes through the older commercial district in Glendale where several sites have been designated by the city as historically or architecturally significant. These include one "first order" and three "second order" landmarks along Brand Boulevard.

VISUAL QUALITY: Existing views in the area are primarily of the Verdugo Mountains to the north. Introduction of an overhead catenary power system would introduce a new visual element into the existing environment. In the area of the Glendale Galleria, a substantial visual complexity already exists. A trolley system could add to this complexity. The section of Brand Boulevard from Dryden to Elk, which is bordered by high rise office buildings, would be less sensitive to visual impacts and obstruction of views. However,

removal of Brand Boulevard median landscaping to accommodate a trolley line could have an adverse visual impact.

3.3.3 SUMMARY AND CONCLUSIONS

Based on previous preliminary studies of seven proposed LRT alignment alternatives, a regional LRT line operating on the Southern Pacific right-of-way adjacent to San Fernando Road was established as the preferred alignment. An LRT system operating along the existing railroad right-of-way would be the least intrusive of the seven alternatives with fewer potential traffic/circulation, noise, visual, right-of-way and economic impacts. However, the preferred LRT alignment would not provide service directly to the Glendale central business district. As a result, the second phase of the route refinement study concentrated on defining alternatives which would provide circulation service between the regional LRT and the central business district. Four circulation alignment alternatives, which are described in the previous sections, were developed. Although both at-grade and aerial configurations are possible and have been considered, the City of Glendale has indicated that aerial is not acceptable. The proposed vehicle technologies to operate along these alignments would be either a medium capacity bus or a trolley-type vehicle. The potential differences in environmental impacts of these technologies are identified below:

- Right-of-way Impacts - Little or no additional right-of-way would be required for a bus line. An LRT or trolley system may require additional right-of-way to accommodate tracks and the catenary pole system, station areas and platforms.
- Noise Impacts - Buses create slightly less noise than trolley or LRT systems which rely on steel wheel on steel rail technology. For example, the noise level at 50 feet from a bus traveling at 35 miles per hour (MPH) would be about 74 dBA while the noise level 50 feet from an at-grade LRT vehicle traveling at 35 MPH on welded track would be about 76 dBA. Normally, the smallest change in noise levels most persons can detect is two to three decibels.
- Visual Impacts - A bus system would be less visually intrusive than trolley or LRT systems which require an overhead power system with catenary poles, and station platforms or structures.
- Traffic/Circulation/Parking Impacts - Buses would operate similar to other motor vehicles sharing the streets and highways while trolley or LRT vehicles would operate on fixed tracks adjacent to or within streets right-of-way. The potential for conflicts between motor vehicles (and pedestrians) and the rail vehicles could be an adverse effect. The LRT and trolley systems could also affect circulation patterns and diminish access by prohibiting left turns across the tracks. Right-of-way required for the LRT or trolley system could also result in a loss of motor vehicle lanes or on-street parking

- Air Quality - A bus system relying on vehicles that burn gasoline or diesel fuel could increase air emissions and have a potentially adverse impact on air quality. Because the southern California area is a non-attainment area for several pollutants, any increase in emissions could be considered significant. LRT or trolley vehicles would be powered by electricity and therefore would be less polluting than buses especially if non-fossil fuel sources are used to generate the electricity consumed by the rail vehicles. In addition, one of the recognized objectives in developing a regional mass transit system for southern California is to provide commuters with an alternative means of transportation. Increased transit patronage would reduce congestion and have a resulting beneficial impact on air quality.

In addition, as described in previous sections and summarized below, the alternatives differ with respect to potential environmental impacts to land use, sensitive receptors, historic resources, community services, and visual quality.

Although, the land uses along the proposed alignments would be generally compatible with transit facilities, the areas that contain intensive commercial or regional commercial development (high rise offices) would be considered highly compatible. Those areas that contain a high density of multi-family residential units would also be considered highly compatible. Areas with single-family residences and heavy and light industry or institutional uses would be less compatible. Open space areas are land uses with low compatibility. Of the four alternatives, the one-way loop alignment which follows Central and Brand with short segments along Dryden and Elk, probably best serves the more intensively developed and "transit compatible" commercial areas in Glendale. Although, Alignment E serves the highly compatible "automotive commercial center" along Brand Boulevard, there are a number of single-family residences along the eastern section of Broadway and along Eagle Dale which are considered only moderately compatible with transit facilities. Alignment E also does not provide service to the regional commercial uses along the northern section of Brand Boulevard. Because of the number of single-family residences along the Ventura Freeway and along Glenoaks and Cleveland, Alignments F and G also would be less compatible with adjacent land uses than the one-way loop alternative. Alignments F and G could also affect the greatest number of sensitive receptors due to the presence of these numerous single- and multi-family residences. The one-way loop would probably affect the fewest sensitive receptors. Alignment E could affect a number of residences along Broadway and Eagle Dale.

There are a number of community service facilities along Brand, Broadway and Colorado which may be affected by Alignment E. Although a transit system would have the beneficial effect of providing transit service to these facilities, a trolley line may affect access to the facilities by prohibiting left turns or eliminating on-street parking. Slightly fewer community services may be affected by Alignments F and G and the one-way loop.

Only a few historic resources are located along Alignments F and G. The one-way loop and Alignment E would pass through the older commercial sections of the City and could affect a greater number of historic resources than the other alignments.

Since an aerial alignment is not proposed, the visual impacts of any of the alternatives are not expected to be significant. However, sensitive land uses including residences and historic buildings could be affected by the potential visual impacts of the catenary poles required for the trolley system. In addition, the one-way loop and Alignment G could intrude into existing landscaped medians along Brand and Glenoaks requiring the removal or relocation of existing vegetation. The loss of landscaping would be an adverse visual impact on the environment.

Because it would provide service to areas that are predominantly commercial and highly compatible with transit facilities and because there are fewer sensitive receptors along the alignment that could be adversely affected by noise or visual impacts, the one-way loop could have potentially fewer adverse impacts than the other alternatives. However, the issue of the adequacy of the vertical clearance at the Glendale Galleria needs to be addressed.

3.4 TRAFFIC IMPLICATIONS

One of the motivations for the implementation of line-haul rail and circulator systems to and through Glendale is to improve the current traffic situation and reduce future congestion expected from increases in traffic levels. Extensive traffic studies were not performed as a part of this study. Traffic studies have been performed separately by the City of Glendale and data from these studies have been used in this analysis. It has been assumed that intersection capacity and congestion may be used as indicators of highway network congestion and level-of-service in both current and projection years. To perform this analysis, available intersection data have been analyzed and levels of service calculated. Level-of-Service definitions are provided in Table 3-4 and the levels of service for the intersections (for the years 1990 and 1995) are shown in Table 3-5. Those intersections with asterisks indicate levels-of-service worse than LOS F (which means that traffic flow is forced, volumes are below capacity and the facility acts as a storage area).

These data was then used to do additional analysis of intersection capacity to compare "before" conditions with those after implementation of a trolley system. Four intersections were selected for this "before and after" comparison with five study cases:

- Case 1: Add a trolley system northbound and southbound on Orange Street;
- Case 2: Add a trolley system eastbound and westbound on Colorado Street;
- Case 3: Add a trolley system northbound and southbound on Brand Boulevard;
- Case 4: Add a trolley system from east on Glenoaks Boulevard to south on Brand Boulevard and from north on Brand Boulevard to west on Glenoaks Boulevard;
- Case 5: Add a trolley system one-way, eastbound, on Colorado Street.

The Federal Highway Administration - sponsored computer program Highway Capacity Software (HCS) was used for the analysis. HCS is based on the 1985 Highway Capacity Manual. The results of this analysis are shown in Table 3-6 and confirm that each of the intersections except the one at California Avenue and Orange Street degrades to a level-of-

TABLE 3-4

LEVEL OF SERVICE DEFINITIONS FOR SIGNALIZED INTERSECTIONS

Level of Service for signalized intersections is defined in terms of delay. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time.

Level-of-Service "A" describes operations with very low delay, i.e., less than 5.0 sec per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

Level-of-Service "B" describes operations with delay in the range of 5.1 to 15.0 sec per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS "A", causing higher levels of average delay.

Level-of-Service "C" describes operations with delay in the range of 15.1 to 25.0 sec per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear in this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

Level-of-Service "D" describes operations with delay in the range of 25.1 to 40.0 sec per vehicle. At level "D", the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

Level-of-Service "E" describes operations with delay in the range of 40.1 to 60.0 sec per vehicle. This is considered to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.

Level-of-Service "F" describes operations with delay in excess of 60.0 sec per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation, i.e., when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

TABLE 3-5

SIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY

04/22/91

INTERSECTION	1990 LOS			1995 LOS		
	A. M. PEAK	MIDDAY PEAK	P. M. PEAK	A. M. PEAK	MIDDAY PEAK	P. M. PEAK
CALIFORNIA/ORANGE	B(B)	B(B)	B(B)	B(B)	B(B)	B(B)
COLORADO/CENTRAL	C(D)	*(*)	*(*)	*(*)	*(*)	*(*)
COLORADO/BRAND	C(D)	D(E)	E(F)	*(*)	D(F)	*(*)
COLORADO/GLENDALE	C(D)	C(D)	E(F)	C(D)	*(*)	*(*)
BROADWAY/GLENDALE	B(B)	B(F)	*(*)	*(*)	*(*)	*(*)
BROADWAY/CENTRAL	B(C)	*(*)	*(*)	B(C)	*(*)	*(*)
BROADWAY/BRAND	B(B)	B(D)	B(D)	B(B)	C(F)	C(F)
BROADWAY/ORANGE	B(B)	B(B)	B(B)	B(C)	B(B)	B(C)
CENTRAL/SANCHEZ	C(F)	*(*)	E(F)	*(*)	*(*)	*(*)
CENTRAL/GOODE	B(C)	D(F)	*(*)	C(D)	C(D)	*(*)
CENTRAL/GLENOAKS	C(D)	C(F)	*(*)	C(D)	C(F)	*(*)
SANCHEZ/EB 134 OFF RAMP/BRAND	*(*)	*(*)	*(*)	*(*)	*(*)	*(*)
GOODE/WB OFF RAMP/BRAND	*(*)	*(*)	*(*)	*(*)	C(D)	*(*)
GLENOAKS/BRAND	C(D)	C(F)	C(E)	C(D)	C(D)	D(F)

NOTE: LEVEL OF SERVICE SHOWN AS OVERALL INTERSECTION (WORST LANE)

* INDICATES DELAY AND LEVEL OF SERVICE NOT MEANINGFUL (V/C IS GREATER THAN 1.2)

TABLE 3-6

CITY OF GLENDALE, CALIFORNIA

SIGNALIZED INTERSECTION CAPACITY ANALYSIS SUMMARY
 INSTALLATION OF A TROLLEY SYSTEM CONCEPT

12/07/90

INTERSECTION	1990 LOS (EXISTING CONDITIONS)	1990 LOS (WITH TROLLEY)
	P. M. PEAK	P. M. PEAK
CASE 1: ADD A TROLLEY NORTHBOUND & SOUTHBOUND ON ORANGE ST. CALIFORNIA/ORANGE WITH NB & SB RIGHT-TURN MOVEMENTS ALLOWED	B(B)	B(B)
	N/A	B(B)
CASE 2: ADD A TROLLEY EASTBOUND & WESTBOUND ON COLORADO ST. COLORADO/BRAND WITH EB & WB RIGHT-TURN MOVEMENTS ALLOWED	E(F)	*(*)
	N/A	*(*)
CASE 3: ADD A TROLLEY NORTHBOUND & SOUTHBOUND ON BRAND BLVD. COLORADO/BRAND WITH NB & SB RIGHT-TURN MOVEMENTS ALLOWED	E(F)	*(*)
	N/A	*(*)
CASE 4: ADD A TROLLEY EASTBOUND GLENOAKS TO SOUTHBOUND BRAND & NORTHBOUND BRAND TO WESTBOUND GLENOAKS GLENOAKS/BRAND WITH ALL TRAFFIC MOVEMENTS ALLOWED	C(E)	*(*)
CASE 5: ADD A TROLLEY ONE-WAY ON COLORADO ST. EASTBOUND COLORADO/GLENDALE WITH EB RIGHT-TURN MOVEMENT ALLOWED	E(F)	*(*)
		()

NOTE: LEVEL OF SERVICE SHOWN AS OVERALL INTERSECTION (WORST LANE)

* INDICATES DELAY AND LEVEL OF SERVICE NOT MEANINGFUL (V/C RATIO GREATER THAN 1.2)

service worse than LOS F. (The Highway Capacity Manual indicates that performance indicators below LOS F are, for analysis purposes, meaningless.)

The signalized intersection of California Avenue at Orange Street operates favorably with very low delays (LOS B). Even with the addition of the proposed trolley system on northbound and southbound Orange Street, this intersection will still operate at LOS B. However, the signalized intersection of Colorado Street at Brand Boulevard operates at LOS E with very high delays that are unacceptable to most drivers. By adding a trolley system on eastbound and westbound Colorado Street, delays experienced by motorists will be increased and congestion will become more prevalent.

Further, these two intersections were used as the basis for an additional analysis of total intersection delay before and after trolley implementation. The Federal Highway Administration - sponsored computer program Signal Operations Analysis Package (SOAP) was used to calculate these delays. Two measures of delay are used in this analyses: seconds per vehicle and vehicle-hours. Delay in seconds per vehicle (SEC/VEH) is an average value used to quantify the average delay experienced by vehicles in an intersection or movement through an intersection. Delay in vehicle-hours (VEH-HRS) is a quantity used to describe the overall operation of an intersection or part of an intersection. The average vehicle delay is multiplied by the vehicular volume in a time period (the peak hour for this analysis) to provide the total average intersection delay. Intersection delay can be used to quantify the economic and environmental effects of proposed intersection revisions or the deferral of such revisions. Values of time for vehicle occupants and vehicle emission levels have not been used in this study because the delay values are only being used as indicators of overall street system congestion where level of service rankings are not meaningful.

It is clear from the results of this second analysis (shown in Table 3-7) that significant additional transportation costs result from these increases in delay. The addition of a trolley system on northbound and southbound Orange Street will cause the overall intersection delay to increase slightly from 4.31 vehicle-hours to 4.63 vehicle-hours or 7.4 percent. However, the addition of a trolley system on eastbound and westbound Colorado Street will increase the intersection delay significantly: from 63.40 vehicle-hours to 281.21 vehicle-hours or an increase of over 400 percent. This increase in delay will also have a serious impact on the surrounding roadway network.

Also, given any realistic implementation scenario for a fixed rail circulator system, background traffic levels can only be expected to increase beyond the 1995 projections.

Why, then, is it reasonable to consider taking an existing traffic lane and converting it to exclusive use by transit vehicles? It is because a transit lane has a higher capacity for moving people than an automobile lane. Green light times range from 20 to 40 seconds out of 70 or 90 second cycles on Orange, Colorado, Brand and Glendale. These provide a range of 200 to 340 vehicles per hour at the study intersections. Using the value of 1.15 person per vehicle in the peak period (from LACTC data), this translates to a maximum of 391 persons per lane, per hour. If the same lane were converted to use by a trolley system with

TABLE 3-7

CITY OF GLENDALE, CALIFORNIA

SUMMARY OF INTERSECTION DELAY AND CONGESTION
INSTALLATION OF A TROLLEY SYSTEM CONCEPT

12/07/90

INTERSECTION/MOVEMENT	1990	1990 (EXIST. CONDITIONS)	1990	1990 (EXIST. CONDITIONS)
	WITH TROLLEY P. M. PEAK AVERAGE UNIT DELAY (SECONDS/VEHICLE)	P. M. PEAK AVERAGE UNIT DELAY (SECONDS/VEHICLE)	WITH TROLLEY P. M. PEAK/OVERALL INTERSECTION DELAY (VEHICLE-HOURS)	P. M. PEAK/OVERALL INTERSECTION DELAY (VEHICLE-HOURS)
CASE 1: ADD A TROLLEY NORTHBOUND & SOUTHBOUND ON ORANGE ST.				
CALIFORNIA/ORANGE			4.63	4.31
NORTHBOUND THROUGH	9	14	-	-
NORTHBOUND LEFT	15	20	-	-
SOUTHBOUND THROUGH	9	14	-	-
SOUTHBOUND LEFT	17	21	-	-
EASTBOUND THROUGH	14	8	-	-
WESTBOUND LEFT	13	8	-	-
CASE 2: ADD A TROLLEY EASTBOUND & WESTBOUND ON COLORADO ST.				
COLORADO/BRAND			281.21	63.40
NORTHBOUND THROUGH	189	73	-	-
NORTHBOUND LEFT	489	86	-	-
SOUTHBOUND THROUGH	55	23	-	-
SOUTHBOUND LEFT	612	185	-	-
EASTBOUND THROUGH	285	19	-	-
EASTBOUND LEFT	663	34	-	-
WESTBOUND THROUGH	47	16	-	-
WESTBOUND LEFT	1540	429	-	-

NOTE: P. M. PEAK - A P. M. PERIOD OF SIXTY CONSECUTIVE MINUTES WITH THE MAXIMUM NUMBER OF VEHICLES

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a headway of 7.5 minutes (one train every 7.5 minutes) and two-car trains carrying 92 persons per train (at an 80% load factor), the person carrying capacity of the lane would be 1472 passengers per hour or over 3.7 times the number that a highway lane could carry. This represents significant additional mobility.

It should also be noted that the construction of a trolley system on any of the study alignments should include fundamental changes in traffic circulation patterns (e.g. establishment of one-way pairs), changes in parking policies in specific locations (e.g. Brand Blvd.), or both. In addition, TSM options may be effective in reducing both peak period travel and total passenger car travel to reduce traffic impacts.

4.0

Cost Estimate

4.0 COST ESTIMATES

Capital and operating cost estimates have been developed for the light rail alternative and each of the four circulation system alignments. Trolley and shuttle bus alternatives have been included for the circulation alternatives.

4.1 LIGHT RAIL SYSTEM

The estimated capital cost of the light rail system is based on the unit costs developed for the separate LA-Sylmar study. The distance from the proposed maintenance facility location in Taylor Yard to the Northwest Glendale Station is approximately 5.5 miles and there are five stations between Taylor Yard and the Northwest Glendale Station. It has been assumed that there are no right-of-way costs or maintenance facility costs directly associated with Glendale Corridor LRT implementation. Because the length of the Glendale route (from Union Station) is about one-half the total LA-Sylmar corridor, it has been assumed that one-half the number of vehicles would be required.

Base unit costs are \$7.83 million per mile for trackwork, electrification and signalling related items, \$600,000 per station, and \$1.2 million per LRT vehicle. The total construction estimate for the LRT alternative is \$85.4 million. Applying the factors required by the LACTC estimating procedure (includes contingencies, mobilization, insurance and other project related factors) the total project cost estimate becomes \$198.1 million.

If the regional light rail system were to be implemented in phases, the first phase, to the Glendale Transportation Center, would have a construction cost estimate of \$56.8 million, and the project cost estimate would be \$131.9 million.

Operations costs for the LA-Sylmar study were estimated at \$5.51 per vehicle mile. It is not anticipated that this value would be noticeably different for a system one-half the size. These costs assumed operation by RTD in a manner consistent with the LA-Long Beach line.

4.2 CIRCULATION SYSTEMS

Capital costs for the trolley and bus shuttle circulation systems are based on trolley installation costs from other locations and current shuttle bus costs. Circulation system station costs were estimated for the specific designs developed for this study.

TROLLEY SYSTEM

It has been assumed that the base guideway unit costs will be equivalent to the LRT at-grade guideway costs of \$7.11 million per mile. This is because the labor costs are comparable and, though the materials would be different for rail right-of-way versus street installation, the materials costs elements would result in approximately the same total cost. Where single track installation would be implemented, a factor of 65% of the double track cost has been used, or \$4.62 million per mile.

The vehicle costs are based on comparisons of the Breda VLC vehicle (undergoing revenue testing in Italy) to the LA-Long Beach vehicle, in terms of size, weight and component requirements. Based on this analysis, a base cost of \$750,000 per vehicle has been used.

The station costs are based on quantity take-offs and unit prices for the station design concept described and shown in Section 3.2 of this report. The base cost of a trolley station is estimated to be about \$124,500. The number of stations for each alternative has been based on current Beeline station spacing, modified to reflect the alternative routes and specific activity centers along each route. These stations were selected for analysis purposes only and may be revised to reflect specific local requirements.

The following costs are reflective of the base construction cost estimate and the overall project construction cost estimate. The construction cost estimate consists of all fixed facility improvements and vehicles. The project construction cost estimate includes the construction cost estimate plus the following implementation costs: testing and operations mobilization, Owner's insurance, force account work, project design costs, public art, and contingencies. The implementation costs are consistent with the standard LACTC policies.

The following base construction cost estimate and project cost estimate are estimated costs as follows:

	<u>Construction Cost Estimate</u>	<u>Project Cost Estimate</u>
Alignment E	\$ 32,240,000	\$74,820,000
Alignment F	35,380,000	82,090,000
Alignment G	38,760,000	89,950,000
Loop Alignment	29,300,000	67,980,000

Operating costs of a trolley system could be expected to be very similar to those of an LRT system, although the operating speed would be lower due to operation in mixed traffic. Costs in the area of \$5.00 per vehicle mile would provide a realistic order-of-magnitude estimate.

SHUTTLE BUS SYSTEM

Vehicle costs for the shuttle bus systems are based on the use of one of the types of vehicle currently in use on the LA Dash system. This bus, including an alternative fuel (propane) engine is estimated by the manufacturer to cost approximately \$125,000, each.

The shuttle bus stations are very similar to those designed for the trolleys, but are shorter and without a platform. The base cost of a bus station/stop is estimated to be approximately \$56,500. The number of bus stations for each alignment has been assumed to be the same as for the trolley system alternatives to allow for better comparisons between the alternatives.

Estimated costs (base and with LACTC estimating factors) for the bus alternatives are:

	<u>Construction Cost</u> <u>Estimate</u>	<u>Project Cost</u> <u>Estimate</u>
Alignment E	\$1,740,000	\$4,040,000
Alignment F	1,350,000	3,130,000
Alignment F	1,810,000	4,200,000
Loop Alignment	1,790,000	4,150,000

Operating costs for a shuttle bus system are expected to be very similar to those currently experienced for the Beeline which is operated by a private contractor and must meet specified availability and level of service values. The current contract is for \$28.90 per vehicle-hour and bids for next years service have been received and are in the range of \$27.35 to \$53.55 per vehicle hour. Because the assumed shuttle bus is larger than the Beeline buses, operating costs may be higher. Labor costs for a contractor would be equivalent but consumables and fuel costs could be 10 to 15 percent higher. Durability of the larger vehicles should be as good as or better than the smaller vehicles reflecting the ability to incorporate additional transit service tested components, especially in the drive train and braking systems.

These cost estimates are intended for comparative purposes only. Detailed analyses of operational requirements and patronage forecasts should be used to tailor cost-effective alternatives along the most promising alignment(s). An example of this would be to eliminate some of the double track sections and provide passing sidings at strategic locations. The trade-off with that strategy is with operational flexibility, reliability, and round trip travel times. These factors should be considered in any subsequent study.

5.0

Evaluation

5.0 EVALUATION AND CONCLUSIONS

The evaluation of the data (qualitative and quantitative) provided in the previous sections of this report are presented in two parts. The first is for the LRT system. The study alignment is preferred as a line-haul LRT alignment by the City of Glendale because it has a much lower physical impact on the city in terms of both trackwork and stations. The station impacts could be severe because of traffic access, congestion and parking requirements, particularly if the line were to terminate (even temporarily) in the retail or commercial centers of the downtown area. This land use would not be supportive of the zoning plan and development goals for the community because of the high parking space requirements. In summary, the selected LRT alignment provides an effective, unobtrusive access to the regional rail system while offering opportunities to interface with private sector developments along the corridor as they are planned and implemented.

The second part of the evaluation is of the circulation systems. The alignments were selected because of their common service of the retail core and service to various residential areas and the commercial core area. Alignment E, given the heavy through and local traffic levels on Colorado and potentially negative impacts on single family residential areas, is the least acceptable route for a trolley system, even though it has the second lowest cost. Alignment F is higher in cost but is not as effective in serving the northern end of the retail core and the commercial core. Alignment G provides a very high level of service to all areas, including the LRT system but is also the most expensive as either a trolley or bus route. The Loop alignment is the least costly trolley alignment but could impact historic structures or prove to be incompatible with the Galleria at Orange Street. In general, the bus shuttle is less intrusive but may not, even with propane power, adequately address pollution concerns.

Implementation of the trolley along any of the alignments would necessitate a very thorough and detailed study of traffic impacts. As illustrated with just a few intersections, level of service and vehicle delay are severely impacted resulting in increased congestion. This would be the result from implementing either a fixed rail or expanded bus system that was designed to operate in an exclusive right-of-way or transit way. The use of an exclusive right-of-way provides significant increases in level-of-service and safety for passengers and the public. Operation in mixed traffic, on the other hand, limits the new system to the average speeds of the roadway, increases average trip times, and tends to result in lower levels of transit and public safety. The increased congestion could actually serve to increase pollution and energy consumption. Creative traffic planning strategies would be necessary to accommodate the trolley system while preserving mobility and improving accessibility of Glendale for residents, employees and visitors. On the other hand, fixed rail transit is better suited to influence development and minimize sprawl than is a bus alternative, because a bus route is not perceived to be a long term or permanent infrastructure improvement.

One of the most important conclusions to be derived from this study concerns the exclusive versus non-exclusive transit use of an existing traffic lane. As described in Section 3.4, an exclusive transit lane could carry over three times the number of people that could be carried by individual vehicles. Based on this analysis of selected intersections, it appears

likely that implementation of such a lane would significantly affect existing traffic patterns. Therefore, it is very important that the City of Glendale begin now to plan for such transit options. The beginning phases of transit implementation could utilize lower cost bus alternatives and expand to fixed rail systems as demand increases to levels more supportive of the higher capital investment requirements of rail systems.

The next step in the analysis of circulation system opportunities and alternatives is the EIR process. This process provides the framework for the assessment of future transportation needs, impacts and costs in a quantifiable manner based upon sufficient data and community involvement. This effort would include a more comprehensive analysis of city-wide traffic conditions and traffic impacts.

The selection of a specific transit technology does not need to be made at this time. Rather, the need is to determine, in conjunction with development and land use plans, the transit route that will best serve the future vision of Glendale.