
TECHNICAL MEMORANDUM

TASK 3 DELIVERABLES

**CONCEPTUAL ENGINEERING, IMPACTS, COSTS,
AND COST EFFECTIVENESS**

**HOLLYWOOD BOWL TO HOLLYWOOD-HIGHLAND STATION
CONNECTOR STUDY**

Prepared for

Southern California Rapid Transit District

Prepared by

**The Corradino Group
General Planning Consultants (GPC)**

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1. INTRODUCTION

The purpose of this technical memorandum is to support development of an Environmental Impact Statement / Environmental Impact Report (EIS/EIR) for provision of a transit connector from the Metro Rail Red Line to the Hollywood Bowl (Figure 1-1).

The Hollywood Bowl is a world famous 18,000 seat amphitheater located at the foot of the Santa Monica Mountains in north Los Angeles. It typically hosts more than 60 major events a year, selling out its seats on many occasions. In the exhaustive examination of alternative alignments that was undertaken by the Southern California Rapid Transit District (SCRTD) in developing the rail rapid transit system for the region, it was determined that the central Hollywood area would best be served by a Metro Rail station at Hollywood and Highland Avenue, some 3,600 feet south of the Hollywood Bowl entrance off of Highland Avenue. Final environmental documentation in support of the project (*Los Angeles Rail Rapid Transit Project Supplemental Environmental Impact Statement / Subsequent Environmental Impact Report*, SCRTD, July 1989) committed the city of Los Angeles to a study of direct transit linkages between the Metro Rail System and the Hollywood Bowl.

This technical memorandum supports the EIS/EIR that will fulfill that commitment. It covers the following areas of analysis:

- ◆ Conceptual Engineering
- ◆ Land Use Impacts
- ◆ Economic Impacts
- ◆ Social Impacts
- ◆ Natural Environmental Impacts
- ◆ Construction Impacts
- ◆ Capital Cost Estimates
- ◆ Operation and Maintenance Costs
- ◆ Cost-Effectiveness Analysis

To assess these impacts it is necessary to define the base against which impacts are measured. The next chapter describes the alternatives in sufficient detail to estimate the effects of each.

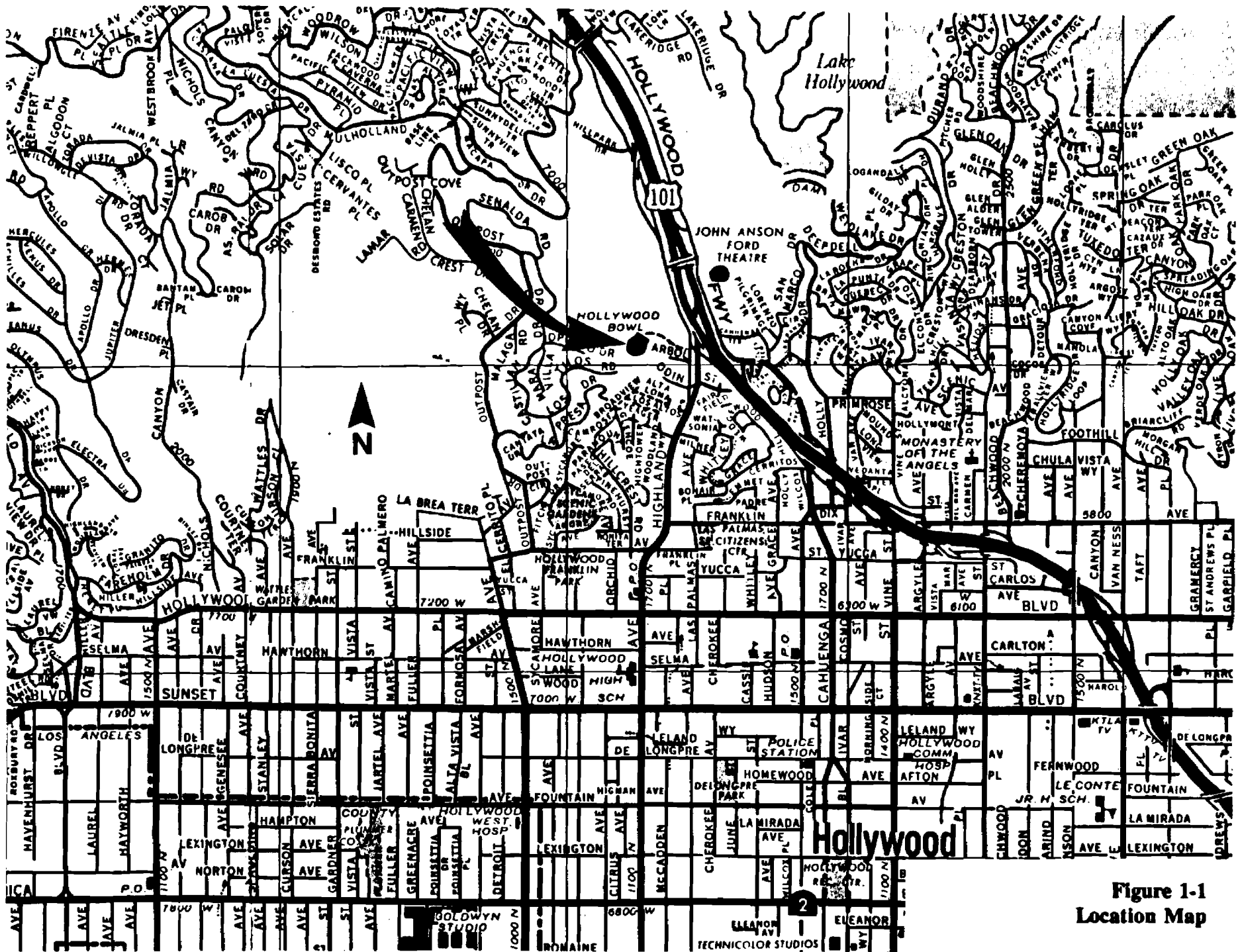


Figure 1-1
Location Map

2. ALTERNATIVES

A detailed description of alternatives was presented at a joint meeting of the Interagency Management Committee (IMC) and Transit Connector Advisory Committee (TCAC) held at the Southern California Rapid Transit District (SCRTD) on September 21, 1992. Previously many alternatives had been considered for analysis, but were rejected as infeasible or too costly. These will be documented in the DEIS/DEIR. At the conclusion of the September 21 meeting the following alternatives were approved for analysis in the DEIS/DEIR:

- ◆ No Action
- ◆ TSM
- ◆ TSM with Grade Separation Across Highland
- ◆ Subsurface Walkway
- ◆ Subsurface AGT

Each of these alternatives is defined below and shown in Figure 2-1. First, existing conditions are discussed to provide a framework for understanding the No Action Alternative.

2.1 EXISTING CONDITIONS





The Hollywood Bowl is eligible for the *National Register of Historic Places*, indicating its long history of providing a memorable setting for musical events. The Hollywood Bowl is an expansive 18,000 seat outdoor amphitheater that hosts performances of the Los Angeles Philharmonic Orchestra, the Hollywood Bowl Orchestra, other renowned orchestras, and internationally acclaimed classical, jazz and pop artists. Classical music has been at the heart of the Bowl experience since 1922. Upwards of sixty major events are now scheduled each year, of which many are sellouts. The season runs from the end of June to mid-September. Event patronage is about 650,000 annually. Other lease arrangements during the year bring in 150,000 people. Additionally, the Bowl is a major tourist attraction, generating on the order of another 1.5 million visitors a year. A children's festival is held from mid-July to mid August, attracting some 40,000 visitors. The Hollywood Bowl Museum has full summer hours and reduced off-season hours.

When thinking in terms of a transit connection to the Bowl it is reasonable to distinguish between service to events and service to activities occurring at other times. The principal difficulty with access to the Bowl is and will be related to events. Many of the Friday and Saturday nights of the season are sellouts, meaning 18,000 people are trying to move into and out of a highly congested area with a limited number of roadway access points. The limitations on roadway access and the development of Metro Rail make a high quality transit connection to the developing Red Line logical.

Figure 2-1
Alternatives



LEGEND

	TSM SURFACE BUS
	EXIST. PEDESTRIAN TUNNEL
	SUBSURFACE WALKWAY/AGT
	STATION ENTRANCE

2.1.1 Traffic Conditions

It is necessary to understand that even without the activity at the Bowl, Highland Avenue is among the most heavily traveled arterials in Los Angeles. This means that under the best conditions, Highland Avenue is going to experience a high level of congestion, and that any changes in operations have the potential to disrupt traffic on Highland. Planned improvements to Highland and upgrading of the traffic signal system in the area will offer some relief, but traffic forecasts reflect a continuation of traffic growth. To the extent that Highland Avenue can be avoided by a transit alternative, it will be desirable to do so. Also, parking at the Bowl is limited, and premium prices are charged. This offers a good climate for enhancing the high level of transit service now being sponsored by the Bowl.

During the afternoon peak period and for events, traffic cones are manually placed in Highland Avenue to allow for an additional lane of traffic in the peak direction. Left turns are prohibited from Highland Avenue to prevent conflicts. A substantial number of police and Bowl employees are used to manage traffic during events, especially to move the many buses serving events through the area.

There is a pedestrian tunnel under Highland Avenue, immediately north of Odin, so that pedestrians do not mix with traffic at the Bowl entrance during events. It connects the parking lots on the east side of Highland Avenue and the median area, where bus loading occurs after events, with the main interior walkway at the Bowl. Transit patrons are let off buses within the Bowl grounds, but board departing buses in the median of Highland. They take this tunnel back to buses so that they do not interfere at the surface level with traffic. Those who park on the east side of Highland Avenue also use the tunnel. The tunnel operates under jammed conditions after events, but this is considered preferable to having pedestrians at the surface level, where they would greatly disrupt traffic flow and transit operations. Jamming occurs principally because of the difficulty of loading buses. The "safe zones" for pedestrians between buses are very narrow and pedestrians move across in front of the buses queued in the median, interfering with bus departures.

Traffic is heavy on Hollywood Boulevard and Sunset Avenue throughout the summer evenings during Bowl events. The same is not true of Argyle, which presents a potential routing for a bus shuttle to the Hollywood/Vine Station. It has direct access to the Hollywood Freeway eastbound and westbound, but carries p.m. peak hour volumes of about 700 northbound (5-6 p.m.) and 200 southbound (3-4 p.m.). Two Friday counts indicate light traffic on Argyle in late evening hours (one count represented an event night at the Bowl in August). A field check during an event confirmed light traffic on Argyle, in late evening hours. Volumes would be expected to increase in the future, but Argyle does have residual capacity, especially in off-peak hours.

The Hollywood Freeway, a primary means of access to the Bowl is sometimes congested, even in late evening and nighttime. However, the entrance ramp westbound from Argyle is an auxiliary freeway lane (a lane addition), as is the eastbound entrance ramp from

Highland Avenue. This means vehicles entering the freeway at these points do not have to merge into mainline traffic. Traffic going to events is controlled by the exit via Odin to Highland Avenue. Traffic could back up from Highland Avenue to the off-ramp, if not controlled by police. Even with police control, backups do occur across Highland Avenue due to traffic queuing to the Bowl driveways.

Vehicles departing events to the south and east on the Hollywood Freeway can proceed immediately up the Hollywood freeway on-ramp. There are no constraints to the exit at Argyle (via the Franklin exit). There is even a dedicated right-turn lane from eastbound Franklin to southbound Argyle.

About 3,300 nearby parking spaces are under Bowl management. The Bowl has gone so far as to provide remote parking and a shuttle bus for employees to maximize parking for event-goers. There is understandably significant and ongoing concern in the neighborhood surrounding the Bowl with parking by non-residents. Police, in fact, control access to adjacent neighborhoods during events to prevent parking on neighborhood streets. Nevertheless, there certainly is parking by event-goers at remote locations. People walk from fairly distant locations in the Hollywood Boulevard area to the Bowl. Other, for-pay parking has developed in vacant lots and/or existing paved lots along Highland Avenue. This would indicate a "latent demand" for parking at the Bowl. This means more people would park at the Bowl, if the parking there were more readily available, or cheaper. Valet parking, available for some events is \$20. Normally reserved parking is \$10. Other rates are: the main lot on the west side of Highland Avenue - \$9; lots on the east side of Highland Avenue - \$8; and, the lot north of Hollywood Freeway at the Ford Theater - \$4. (Rates vary somewhat by event.) Parking at the Bowl is "stacked". That is cars are parked bumper to bumper with no circulation isles. Cars cannot depart until all the cars in front of them have departed. This means long waits for some parkers (up to 40 minutes), and prolonged congestion on Highland Avenue after events. It is another reason why transit is a competitive mode for many.

One consideration in developing a transit connection to Metro Rail is that there will be some patrons who will use the connection to access parking more distant from the Bowl. This would have financial implications for the Bowl, if it were unable to keep its lots full, or if it had to lower parking fees. This must be a consideration in the fare and boarding policies established for the connection.

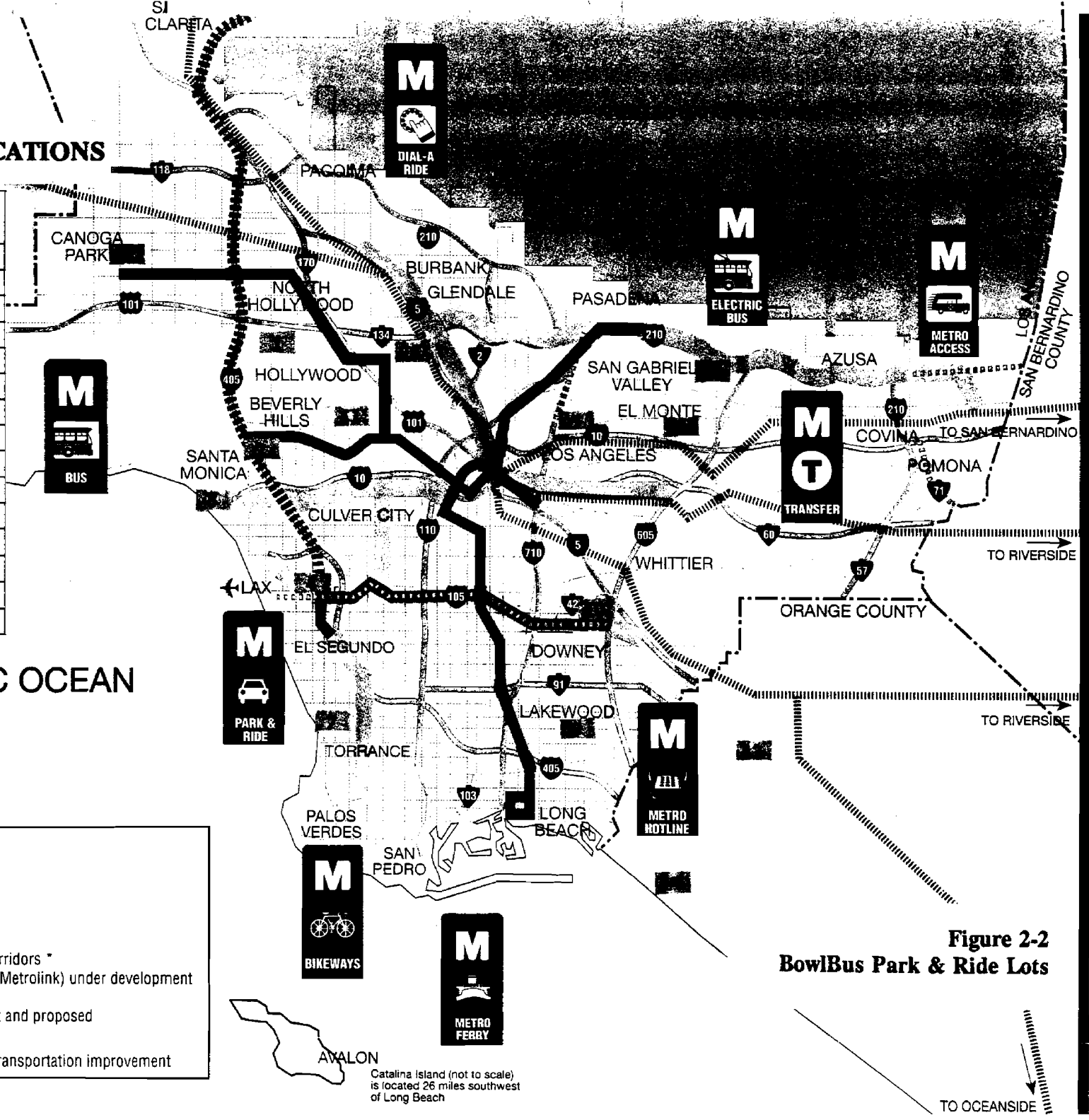
2.1.2 Existing Transit Conditions

More than thirty percent of event-goers (about 250,000 annually) now access the Bowl's remote park-and-ride lots located throughout the Los Angeles region (Figure 2-2). This is up from earlier years due to an aggressive effort on the part of the Bowl to promote transit and provide service to their patrons. Transit providers go to a special effort as well. SCRTD, for example washes all buses after they come off regular route service for the day, and before they are released for service to Bowl patrons.

TO MOORPARK

PARK-AND-RIDE LOCATIONS

Lot #	Location
1	Sherman Oaks
2	Westwood
3	Canoga Park
4	Westchester
5	Pasadena
6	El Monte
7	Torrance
8	Santa Monica*
9	Lakewood
10	Downey/Bellflower
11	W. Hollywood
12	Arcadia
13	Fullerton/Anahiem
14	Seal Beach
15	Griffith Park/Zoo



PACIFIC OCEAN

- Metro Blue Line
- Metro Red Line
- Metro Green Line
- Metro Orange Line
- LAX/Palmdale
- Candidate Corridors *
- Possible Candidate Corridors *
- Commuter Rail Lines (Metrolink) under development
- Bus Lines
- Carpool Lanes—current and proposed
- Highway Gap Closures
- * Rail or other major transportation improvement

**Figure 2-2
BowlBus Park & Ride Lots**

Catalina Island (not to scale) is located 26 miles southwest of Long Beach

TO OCEANSIDE

The Bowl has developed their network of "BowlBus" park-and-ride lots by contacting owners/ managers of lots in the region who are willing to provide space in the evenings for BowlBus users. Establishment of these lots is independent of SCRTD and other transit providers (Table 2-1).

Potential lots are identified and the owners are approached to try to get free use of the lots. Use of the lots is after hours for most owners in most cases and provision of spaces is a demonstration of community commitment. The Bowl provides security at the lots. The Bowl has developed the BowlBus program so that it is convenient for users. Patrons wishing to attend an event can purchase a bus ticket together with the admittance ticket through a ticket outlet. Tickets also can be ordered by mail. One-way (\$2) or round trip (\$4) tickets can be purchased. The patron drives to the designated park-and-ride lot, boards the bus, and is delivered to the Bowl. At the Bowl the buses pause in the median area between the northbound and southbound lanes of Highland Avenue for a ridership check and then proceed into the main Bowl entrance for unloading at the main ticketing area (Figures 2-3a and 2-3b). For the ridership check, a Bowl employee boards the bus and instructs patrons where to meet the bus for the journey home. The purpose of the bus count is to determine how many buses will be needed for service after the event. Whereas inbound buses can in some instances make return trips, outbound buses after events make only one trip (with the exception of the BowlBus Shuttle). The ridership count establishes how many buses must be positioned for departure prior to the end of an event. Buses depart from the median area, with buses outbound to any given location always queuing in the same location from event to event. This establishes a pattern for patrons and bus drivers.

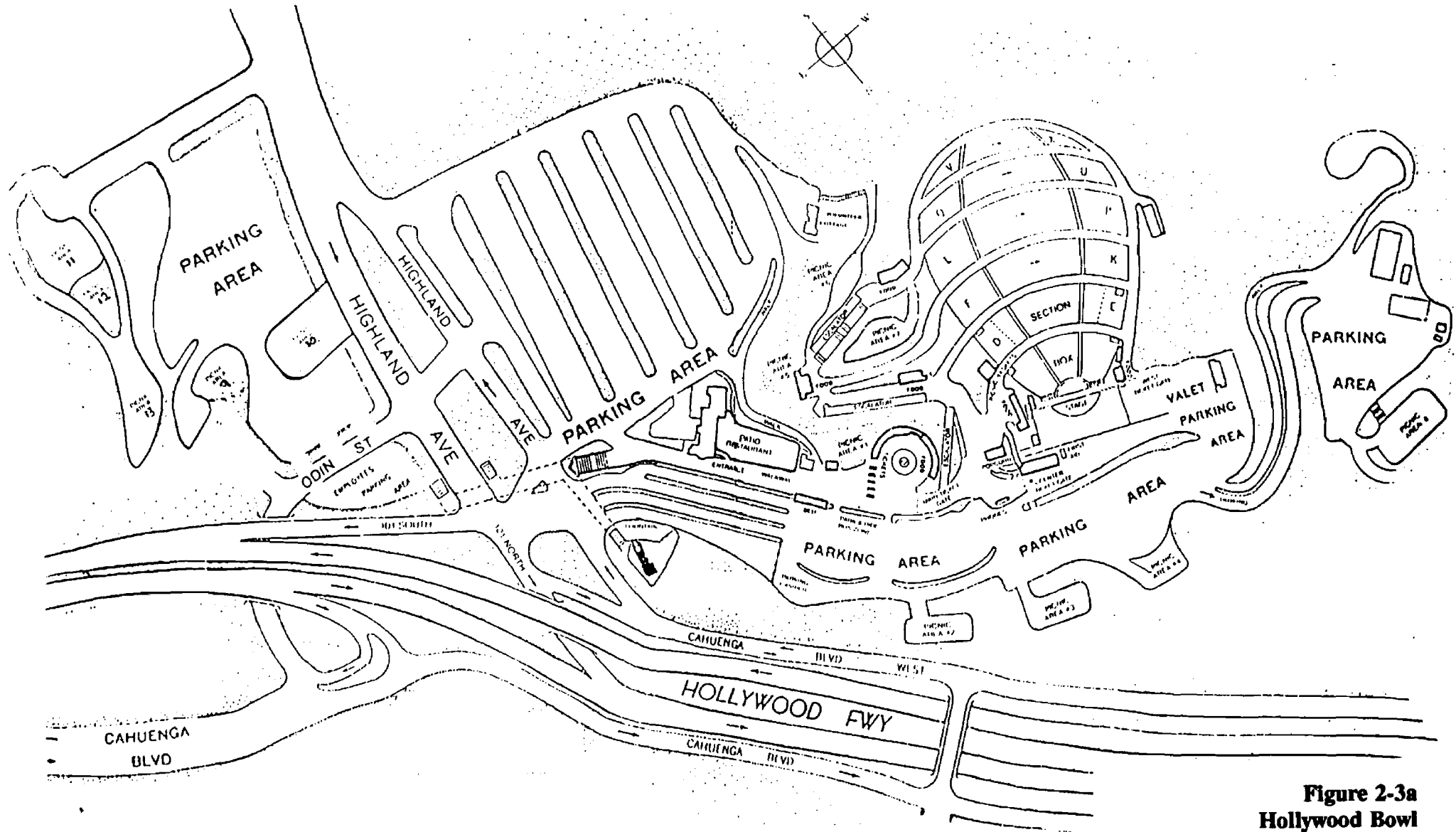
Four nearby parking lots are served by a special BowlBus Shuttle service. Parking is free, but there is a cash fare of \$2 for a round-trip. Service is contracted from a private operator. Lot locations and service characteristics are as follows:

- ◆ 10801 Ventura Boulevard - Just off the Hollywood Freeway between Lankershim and Vineland. Departures every ten minutes from 6:00 to 8:30 p.m. Parking lot capacity is about 1300 vehicles. Inbound distance to the Bowl is about 4.0 miles.
- ◆ Lockheed Company Lot #19 - On the west side of Hollywood Way, south of the Burbank Airport. Departures every twenty minutes from 6:00 to 8:30 p.m. Parking lot capacity is about 1200. Inbound distance to the Bowl is about 3.8 miles.
- ◆ Barham Boulevard - Just north of the Hollywood Freeway on the west side. Departures every fifteen minutes from 6:00 to 8:30 p.m. Parking lot capacity is about 400. Inbound distance to the Bowl is about 3.3 miles.
- ◆ Hollywood/La Brea - South of Hollywood Boulevard on the west side of La Brea Avenue. Departures every twenty minutes from 6:00 to 8:30 p.m. Parking lot capacity is about 400. Inbound distance to the Bowl is about 1.3 miles.

TABLE 2-1
PARK-&-RIDE RIDERSHIP

Lot	Location	Provider	Rt.#	1991			1990		
				Patronage	# Buses	Percent	Patronage	# Buses	Percent
1	Sherman Oaks	RTD	651	14,150	422	6	12,018	375	6
2	Westwood	RTD	652	48,062	1,348	20	34,719	889	17
3	Canoga Park	RTD	653	29,942	915	13	25,078	786	12
4	Westchester	Santa Monica	654	12,676	349	5	12,336	321	6
5	Pasadena	RTD	655	28,716	874	12	22,986	729	11
6	El Monte	Foothill	656	4,094	162	2	4,061	149	2
7	Torrance	RTD	657	38,030	1,020	16	31,347	852	15
8	Santa Monica	Santa Monica	658	0	0	0	9,995	283	5
9	Lakewood	RTD	660	13,066	397	6	11,488	356	6
10	Downey/Bellflower	Foothill	661	3,706	157	2	3,688	148	2
11	W. Hollywood	RTD	662	5,756	227	2	5,124	194	3
12	Acadia	Foothill	663	9,166	303	4	8,816	287	4
13	Fullerton/Anaheim	RTD	664	16,466	490	7	13,058	397	6
14	Seal Beach	Long Beach	667	11,392	383	5	10,035	319	5
15	Griffith Park/Zoo (new route)	RTD	NA	NA	NA	NA	NA	NA	NA
TOTAL				235,222	7,047	100	204,749	6085	100

HOLLYWOOD BOWL



UNRESERVED PARKING
 FAIRFIELD
 ODIN
 FORD
 (GREEN)

RESERVED PARKING
 BOWL LOT
 (YELLOW)

PARKING AREA - FORD THEATER

Figure 2-3a
 Hollywood Bowl
 (not to scale)

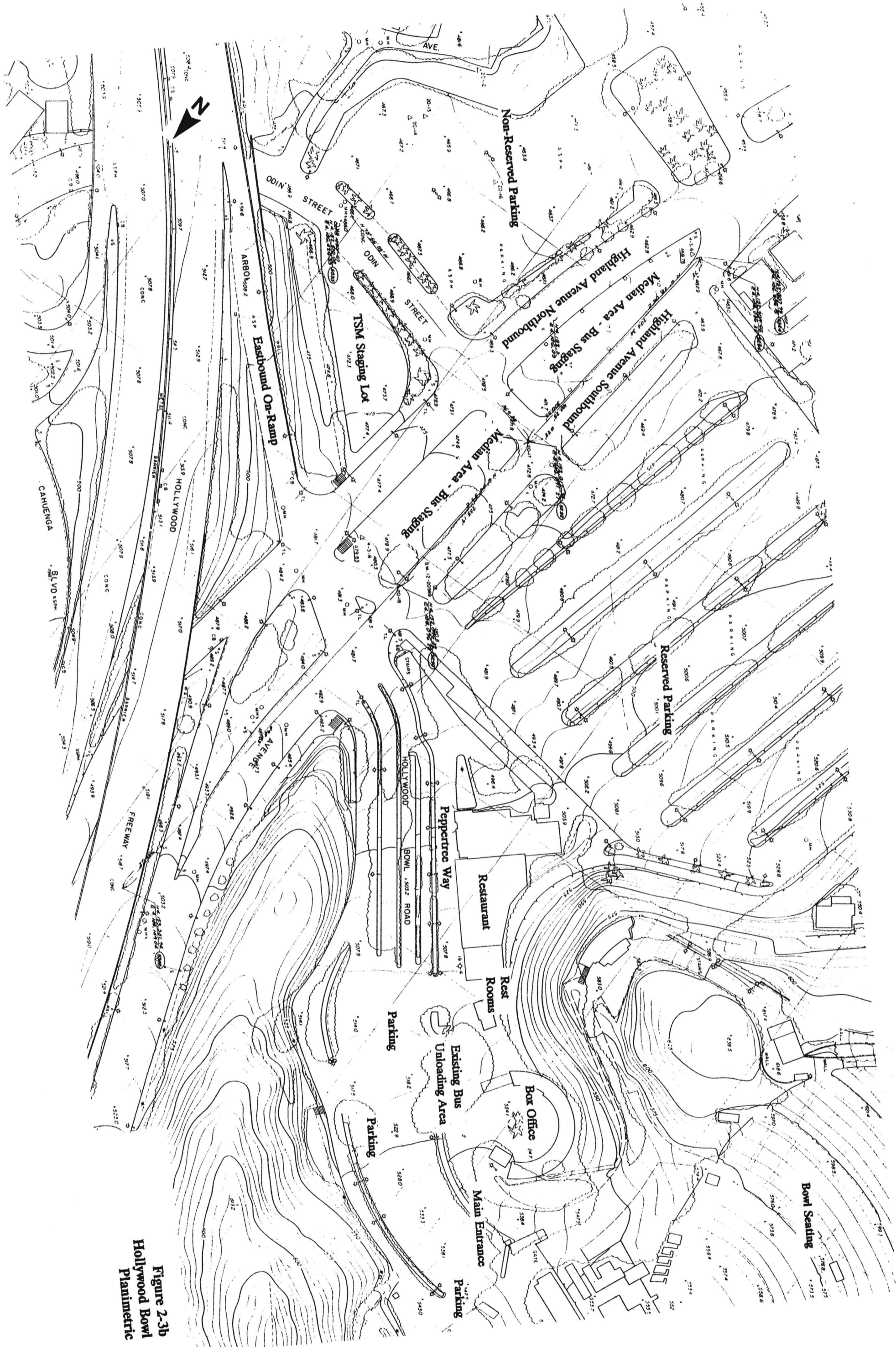


Figure 2-3b
Hollywood Bowl
Planimetric

The shuttle service to nearby parking is available on concert evenings only, but on these evenings almost 40 shuttle buses enter the Bowl in addition to the 100+ buses that routinely provide BowlBus service. Bus entries to the Bowl have been as high as 165 for a single event.

All buses access the Bowl area (with the exception of the Hollywood/La Brea shuttle) via Odin. Buses from the west go east past the Bowl on the Hollywood Freeway to the Cahuenga exit, then double back to the north and west via Cahuenga and Odin. They then dogleg across Highland Avenue to the Bowl entrance, which is offset slightly to the north from Odin. The buses drop passengers near the box office north of the Patio Restaurant then depart the Bowl. About 80 percent of the BowlBus service is contracted through SCRTD. These buses return to the garage or go to other routing assignments after dropping passengers. Other buses queue in the median area of Highland Avenue and in two northbound lanes of Highland Avenue and await departing patrons.

2.1.3 Metro Rail Development

The horizon year for patronage analysis is 2008, fifteen years from the present. At that time the Metro Rail system will be in place (Orange, Red, Green, and Blue lines), except for the Red Line west of Sepulveda Boulevard and the Orange Line west of Century City. Fifteen years is the planning horizon suggested in the Federal Transit Administration's (FTAs) *Procedures and Technical Methods for Transit Project Planning* (draft sections through September 1990). On the other hand, the transit connector is to be in place "in time for its simultaneous opening with the Metro Rail System in Hollywood," (city of Los Angeles resolution). The Red Line is to be in operation to the Hollywood/Vine Station by 1998 and to beyond the Hollywood/Highland Station by 2000. Thus, as the alternatives are described below it should be understood that alternatives serving the Hollywood/Vine Station could be in operation two years earlier (1998) than those serving the Hollywood/Highland Station (2000).

2.2 ALTERNATIVES

This section describes the physical and operating characteristics of each alternative, including the system capacity, the time it would take each alternative to satisfy exit demand from the Bowl, and the expected patronage that each alternative might generate for comparison with the Transportation System Management (TSM) Alternative.

2.2.1 No Action Alternative

The conditions cited above in Section 2.1 are presumed to continue for the most part as time goes on, but there would be some changes.

With respect to traffic the principal difference in physical conditions in the area will be that Highland Avenue and intersections on major arterials such as Hollywood Boulevard will be controlled by a new system known as ATSAC (automated traffic surveillance and control). Video monitors in key locations will allow traffic operations personnel to adjust traffic

signals in real time to respond to ever-changing traffic conditions. The second significant change will be the widening of Highland Avenue between the two sections of Franklin Avenue from seven to nine lanes, and the addition of an eastbound to southbound right-turn lane on Franklin Avenue. These modifications will improve the level of service in this highly congested section of Highland Avenue, both during daily peak traffic periods and during Bowl events. The modifications will have little effect on conditions at the Bowl entrance, which approached gridlock conditions prior to several events during the summer 1992 season.

The Metro Rail Red Line will be in operation to the Hollywood/Vine Station by 1998 and to Hollywood/Highland by 2000. There will be some pedestrian activity from Metro Rail, even if no transit connector is provided. It is likely that this activity would occur from the Hollywood/Highland Station, but not from the Hollywood/Vine Station, which is more distance and does not have a direct physical and psychological linkage to the Bowl equivalent to Highland Avenue.

With the development of Metro Rail some park-and-ride operations could be redirected to Metro Rail stations. However, it is important to consider that the existing bus service is high quality, point-to-point service. Any redirection of this high quality service to Metro Rail could result in a loss of transit patronage. Only the Westwood and Santa Monica routes appear easily transferable. But even these would require travel to the Metro Rail station at Universal City, based on a design horizon of 2008. The Canoga Park area would be a candidate later when Metro Rail extended to that area. For the patronage analysis it is assumed that some ridership from Westwood and Santa Monica would revert to the auto mode, if BowlBus service from those locations was terminated.

2.2.2 TSM Alternative

The TSM Alternative is understood to include only low capital cost improvements. It is the base against which cost and patronage projections are compared. For purposes of discussion, this alternative will be referred to as the Metro Shuttle. In evaluating the expenditures for significant capital projects, it is reasonable to determine first what may be achieved by low-cost investments. An examination of many options led to the conclusion that a bus shuttle between the Bowl and the Hollywood/Vine Metro Rail Station, via Argyle, the Hollywood Freeway, and Odin would be the most viable low-cost option.

Buses would load at the Hollywood/Vine Station, either along the south curb of Hollywood Boulevard between Vine and Argyle (the next street east of Vine), or within the proposed bus terminal planned at that station. There are several options for access and egress at this terminal as outlined in the section below on master planning at the Vine Station.

On Hollywood Boulevard traffic signals are set to have a long cycle benefiting "cruising" vehicles. When buses had to cross Hollywood Boulevard, the new automated traffic control system with its video monitoring could be used to facilitate the crossings. Buses would optimally proceed north on Argyle to Franklin, where there is a westbound on-ramp to the Hollywood Freeway. Hourly traffic counts on Argyle indicate low volumes at this time of

the evening (a two-way volume of fewer than 500 vehicles). Once on the freeway, no merge is necessary. The entrance ramp is an added lane. This lane ends, becoming an exit only to Highland, via Odin. Uncongested travel time to Highland Avenue via the Hollywood Expressway (101) is about three minutes. After exiting onto Odin buses would pull into the parking lot on the east side of Highland Avenue north of Odin where passengers would be dropped. Patrons would proceed into the Bowl via the pedestrian tunnel under Highland Avenue. Other bus operations would continue to operate as they do today, except where the new transit connector replaced existing transit service.

After discharging passengers buses would proceed immediately onto the eastbound on-ramp to the Hollywood Freeway. Like the westbound trip, no merge is necessary. Exiting at Vine, buses would optimally proceed east on Franklin one block to Argyle, where there is a dedicated right-turn lane. Merging left in the next block of Argyle, buses would cross Hollywood Boulevard to reenter the bus terminal area to pick up the next load of Bowl-bound patrons. Alternatively, if loading occurs on the south side of Hollywood Boulevard buses would turn right from the ramp end to Vine, go south on Vine and then turn left (east) onto Hollywood Boulevard.

After events buses would load in the same lot as the dropoff, then make a sweeping right turn onto the eastbound Hollywood Freeway on-ramp. The return dropoff at the Vine Station would be the same as the repeat shuttle trips made for pickups prior to events.

General patronage considerations are discussed next to set the stage for the discussion of operations. Annual patronage estimates are used in the benefit/cost analysis. Single event patronage determines the "size" of the system.

2.2.2.1 Patronage Considerations - Annual

Patronage is of concern in two major respects. First, the number of persons expected to use the service annually is a direct input to the cost-effectiveness of the system. Second, because the intentioned service provides a peak service, it is necessary to determine peak demand to plan system capacity properly.

On an annual basis, ridership on a Metro Bus Shuttle could be considered to have the following components (Table 2-2):

- ◆ Diversion from the existing BowlBus Park-&-Ride Service
- ◆ Diversion from the existing BowlBus Shuttle Service
- ◆ Diversion from the balance of event attendance (auto users)
- ◆ Diversion due to greater access to event parking with the bus shuttle (auto users who chose to park at a more distant location)
- ◆ Diversion from non-event Bowl attendance
- ◆ New ridership due to use of Bowl parking as a location for Metro Rail park-and-ride service.

TABLE 2-2
POTENTIAL ANNUAL PATRONAGE
TSM BUS SHUTTLE TO VINE

Diversion From Existing BowlBus Park & Ride					
Lot #	Location	Potential for Diversion	1991 Patronage	% Shift to Metro Rail	Shuttle Use
1	Sherman Oaks	No change, no station close enough	14,150	0	0
2	Westwood	West end of Orange Line	48,062	80	38,450
3	Canoga Park	No change, Red Line not complete until 2017	29,942	0	0
4	Westchester	On Green Line, but double transfer required	12,676	0	0
5	Pasadena	No change, no station close enough	28,716	0	0
6	El Monte	No change, no station close enough	4,094	0	0
7	Torrance	No change, no station close enough	38,030	0	0
8	Santa Monica*	West end of Orange Line	9,995	60	5,997
9	Lakewood	No change, rail not competitive	13,066	0	0
10	Downey/Bellflower	On Green Line, but double transfer required	3,706	0	0
11	W. Hollywood	No change, no station close enough	5,756	0	0
12	Arcadia	No change, indirect travel via Blue Line	9,166	0	0
13	Fullerton/Anahiem	No change, rail not competitive	16,466	0	0
14	Seal Beach	No change, rail not competitive	11,392	0	0
15	Griffith Park/Zoo	No change, no station close enough	0	0	0
SUBTOTAL			245,217	NA	44,447
* Patronage for Santa Monica is for 1990.					
Diversion From Existing BowlBus Shuttle Service			No Data		
Metro Rail would not provide competitive service			Est. 90,000	0	0
Diversion from Balance of Event Attendance					
Event Attend. (700,000) less [P&R (245,000) & Shuttle (90,000)]			365,000	10	36,500
Diversion Due to Greater Access to Parking with Bus Shuttle					
64 Events x 400 spaces x 2.5 persons per car			NA	NA	64,000
Diversion from Non-Event Attendance					
Tourist Traffic - Auto and especially Tour Buses (Excluded from total below - service not cost-effective)			1,500,000	2	30,000
Metro Rail Park-and-Ride Use					
(Double transfer, Parkers must exit prior to events, Universal Lot)			NA	NA	0
TOTAL POTENTIAL ANNUAL BUS SHUTTLE USE					144,947

An unresolved consideration with respect to a Metro Bus Shuttle serving the Bowl is its temporal operation. It is clear that it would operate prior to and after events, just as the BowlBus services do today. This means service provision 60+ times a year from late June to mid-September, during evenings. The possibility always exists that the season may be extended, if sufficient transit service and other improvements can be instituted that minimize impacts of such an extension, but such a season extension is not assumed here. It is less clear whether service would be provided during the rest of the year for tourists and employees, and if so what level of service would be provided (see discussion below). Most employment at the Bowl is a function of events so that the potential ridership from this source is a marginal increase in the event ridership, rather than representing a large, year-round pool of riders.

BowlBus Park-&-Ride Service

As noted previously much of the BowlBus service is believed to be non-elastic. This means that the group who ride is generally satisfied with service, and consists of many repeat users who know how to use the system and find it convenient. Metro Rail would not extend to all locations, especially to the west by the planning horizon of 2008. Those who wished to travel to the Bowl who do not have direct access to the Red Line would have to transfer to get to the Red Line. They would then transfer again to the bus shuttle. In the transit industry double transfers are anathema, especially when discretionary riders are concerned. The genuine transit dependent will double transfer because he has no alternative. Others generally will not.

For purposes of analysis, it has been assumed that BowlBus service from Santa Monica and Westwood would be terminated, or that service would be redirected to terminate at the Century City Metro Rail Station, the westernmost station projected for completion on the Orange Line in 2008. Annual patronage for these two lines is estimated to be on the order of 58,000, of which 44,450 might transfer to Metro Rail. The value for Santa Monica was drawn from 1990 data as there was a service lapse in 1991. Service was reinstated in 1992.

BowlBus Shuttle Service

The parking locations of the BowlBus Shuttle service are so close to the Bowl compared to any service by Metro Rail that no diversion from this group is anticipated.

Diversion from Balance of Event Attendance

It is anticipated that some portion of those now driving their own vehicles to the Bowl could be attracted to the Metro Rail system. These, unlike the BowlBus patrons above would be considered new transit riders. Estimating the diversion of this group to Metro Rail must rely on judgement. It would have much to do with the successful targeting of this market group. Again, it must be remembered that the Bowl patronage falls in the discretionary rider category, and that a transfer would be required to get to the Bowl from most locations. Whereas parking is expensive, the cost is typically split between several individuals. Thus for example, the standard \$8-9 cost is only \$3.50 per person, whereas the BowlBus Park &

Ride cost is \$4.00 and the BowlBus Shuttle cost is \$2.00 per person. If even a nominal fare were charged for the Metro Shuttle, that was in addition to the Metro Rail fare itself (assumed to be at least \$2.00 for a round trip), the total cost for access by Metro Rail would approach that of driving and parking at the main Bowl lots.

For purposes of analysis a ten percent mode split has been considered a reasonable maximum for this group. On an annual basis, this could generate ridership of 36,500.

Diversion Due to Greater Access to Event Parking with Bus Shuttle

There is a good deal of vacant parking in the immediate vicinity of the Hollywood/Vine Station (more than in the Hollywood/Highland area). With a Metro Bus Shuttle, those parking near the Vine Station would have ready access to the Bowl. On the order of 800 parking spaces are located within a block of the station. If half of these spaces were available at a competitive price and were used by Bowl patrons (at 2.5 persons per car), the annual ridership on the Metro Shuttle from this source could be 64,000.

This raises a question with respect to operations policy. If more parking is opened up near the Vine Station it would soften the market for Bowl parking, depending on the fare charged for the Metro Shuttle service and the price of parking near the station. One option would be to allow shuttle use only by those using Metro Rail (showing one's ticket to board the shuttle, for example). Such a decision would have to be weighed carefully, because there would clearly be some who would be opposed to such an exclusionary policy. Presumably the best course is to reduce pressure for parking at the Bowl and the related auto congestion by whatever means is acceptable.

Diversion from Non-Event Attendance

Non-event Metro Rail patronage to the Bowl is expected to be very low. Most non-event visits to the Bowl are now made as a part of tourist tour bus operations, or by vacationers from out of town in their private vehicles. There could be little penetration of this market and little expectation that ridership could be diverted from this source. The assumption for planning purposes is that two percent of the estimated 1.5 million annual visitors might divert to Metro Rail. This estimate is more likely to overestimate use, rather than the reverse. Such an assumption would yield an annual estimated ridership of 30,000.

Frequent regular route service is now provided on Highland Avenue by Route 420. In the future this route will provide a good day-in, day-out transit connection with Metro Rail, throughout the year. The Hollywood/Vine Station is now planned for opening two years before the Hollywood/Highland Station. There is no direct regular route service from the Hollywood/Vine Station area to the Bowl; a transfer is required. Given the mandate that the transit connection should be in place at the time of Metro Rail opening, there would be a two-year gap before regular, year-round, all-day service connected the Bowl and Metro Rail, if the mandate covers non-event service. To fill this gap temporary all-day service could be provided to the Bowl, after the opening of the Hollywood/Vine Station, but prior to the opening of Highland/Hollywood Station. However, based on the two percent mode

diversion indicated above, a probable daily ridership of a little over 100 persons per day would result. It seems unlikely that service to such a small group would be justifiable. The level of service that could be provided would be lacking from the standpoint of the visitor. The alternative to such an approach would be private sector involvement. It could be possible to have tours of Hollywood originate or serve the Hollywood/Vine station area.

For purposes of this analysis, serving the projected annual ridership of 30,000 for a two-year period does not appear cost-effective. Hence while it is shown in Table 2-2 as a line entry, it is not included in the total. It is assumed that this ridership would ultimately be accommodated on Route 420.

Metro Rail Park-and-Ride Use

The suggestion has been advanced that the Bowl parking spaces be used for as a park-and-ride lot for Metro Rail, with the transit connector providing the necessary linkage. While this is a highly desirable goal, practical considerations indicate significant obstacles to such use. First, a double transfer is required (auto to bus shuttle to rail). As noted previously, double transfers are not accepted by the public when there is a choice. Second, the Bowl lots must be emptied prior to events. The biggest problem here is one of communication. Whereas most of the time, most of the people using the lot could be gone before events, there are enough special circumstances that some people would manage to get parked in occasionally. Third, a large parking lot is being planned in connection with the Universal Studio Station just to the west. This lot would not require a bus connection to Metro Rail. Actually, the lots at the Bowl probably offer more opportunity as park-and-ride lots for local residents who use the Hollywood Freeway, than they do for access to Metro Rail. The low potential ridership for Metro Rail park-and-ride use raises the same question regarding the level of service that could be provided. And, Route 420 provides a high level of service today throughout the day, but especially during peak periods. This service would continue when Metro Rail opens. No additional special shuttle service would be required.

Summary - Potential Annual Ridership

A summation of the market segments in Table 2-2 indicates that about 145,000 riders might use a shuttle system to Metro Rail at the Hollywood/Vine Station. This assumes event service only. Year-round, day-long service will be provided by the existing frequent transit service on Highland Avenue.

2.2.2.2 Patronage Considerations - Single Event

The elements of the annual patronage shown in Table 2-2 that would be served during events include diversion from BowlBus Park & Ride service (44,000), diversion from the private automobile (37,000), and diversion due to greater event parking accessibility (64,000). Aggregated on an annual basis this would be about 145,000 persons. This equates to an average of about 2,250 potential patrons per event. For sizing a shuttle system an additional 33 percent is assumed, for an estimated base patronage of 3,000. This represents

the expected maximum patronage that might ride the shuttle at a major (as opposed to average) event.

The patronage forecast is for 2008. The full complement of Metro Rail ridership using the shuttle would not be active until that date, some ten years after the proposed date of the opening of the Hollywood/Vine Station. On the other hand those wishing to park at a remote location could do so as soon as the shuttle went into operation. Diversion from the auto mode would continue to increase over time as the Metro Rail system developed. This would be true beginning in the year 1998 with the opening of the Vine Station and continuing into the indefinite future as the Red Line and other system elements were concluded. It must be understood that the bulk of the discussion that follows in this report reflects the patronage for 2008. A discussion of vehicular diversions related to patronage is included in Chapter 5.

2.2.2.3 Operational Characteristics

The operational characteristics of service to the Bowl and from the Bowl must each be considered. Access and egress at the Hollywood/Vine Station is also very important to operations, and is discussed in a separate subsection below.

Before each event today's BowlBus Shuttle service runs from 6 p.m. to 8:30 p.m. The length of this service points out the fact that delivery to the Bowl is less intensive than departures from the Bowl after events. The assumption has been made that the Metro Shuttle would operate over a similar period with the following pattern:

- ◆ 6 p.m. to 7 p.m. - 800 patrons @ 40 per bus @ 3 minute headways = 20 runs
- ◆ 7 p.m. to 8 p.m. - 2,000 patrons @ 50 per bus @ 90 second headways = 40 runs
- ◆ 8 p.m. to 8:30 p.m. - 200 patrons @ 40 per bus @ 6 minute headways = 5 runs

Ten standees per bus are assumed during the heaviest delivery time. A policy of standees would have to be adopted, but 50 passengers on a 40 seat bus is a reasonable load for such a short trip. An 18 minute round-trip has been assumed, consisting of three minutes to load, six minutes of travel to the Bowl, four minutes to unload (due to the in-line queuing of buses at the discharge lot, and five minutes to return from the Bowl. This point-to-point travel time is liberal under relatively free flow conditions, wherein police and Bowl employees manage traffic. The measured drive time under uncongested conditions from south of Hollywood Boulevard to Highland and Odin is under four minutes. This includes more than a minute of delay in crossing Hollywood Boulevard. The above travel times assume access and egress to the bus terminal at the Hollywood/Vine Station is via Argyle. If Argyle were closed (see discussion below) the travel time could increase somewhat. Travel time assumptions, including times to enter and exit Metro Rail stations are shown in Table 2-3. Travel times are between the Bowl box office area and the Metro Rail station platform. The travel time from the Metro platform for the base TSM Alternative is estimated to be 20 minutes.

TABLE 2-3

TRAVEL TIME ASSUMPTIONS – STATION MEZZANINE TO BOX OFFICE AREA

Alternative	To the Bowl		From the Bowl			
	First Patron	Time	First Patron	Time	Last Patron	Time
No Action	Exit Station Platform	2	800' inside Bowl @ 250 fpm	3	800' inside Bowl @ 50 fpm	16
	3600' on Highland @ 200 fpm	18	3600' on Highland @ 200 fpm	18	3600' on Highland @ 200 fpm	18
	800' inside Bowl @ 150 fpm	5	Enter Station Platform	2	Enter Station Platform	2
	TOTAL	25		23		36
TSM	Exit Station Platform	2	800' inside Bowl @ 250 fpm	3	Last Bus leaves Bowl	34
	Load Shuttle Bus	3	Load Shuttle Bus	5	Travel to Vine Station	5
	Travel to Highland/Odin	6	Travel to Vine Station	5	Unload Bus	2
	Unload Bus	4	Unload Bus	2	Enter Station Platform	2
	800' inside Bowl @ 150 fpm	5	Enter Station Platform	2		
	TOTAL	20		17		43
TSM Tunnel	Exit Station Platform	2	Enter Tunnel	2	Last Bus leaves Bowl	23
	Load Shuttle Bus	3	Load Shuttle Bus	3	Travel to Vine Station	6
	Travel to Box Office Area	6	Travel to Vine Station	6	Unload Bus	2
	Unload Bus	2	Unload Bus	2	Enter Station	2
	Exit Tunnel	3	Enter Station	2		
	TOTAL	16		15		33
Subsurface Walkway	Exit Station Platform to Mezz.	1	3900' @ 420 fpm	9	Wait at Walkway Entrance	13
	3900' @ 420 fpm	9	Enter Station Plat. from Mezz.	1	3900' @ 300 fpm	13
	TOTAL	10		10	Enter Station Plat. from Mezz.	1
						27
Subsurface AGT	Exit Station Platform to Mezz.	1	Board AGT	1	Wait at Entrance	22
	Board AGT	1	Travel	2	Board AGT	1
	Travel	2	Exit AGT	1	Travel	2
	Exit AGT	1	Enter Station Plat. from Mezz.	1	Exit AGT	1
	TOTAL	5		5	Enter Station Plat. from Mezz.	1
						26

The above considerations result in the following bus needs: 6 to 7 p.m. - 6 buses; 7 to 8 p.m. - 13 buses; and, 8 to 8:30 p.m. - 3 buses.

The TSM Metro Shuttle operation, as planned, has been set up to minimize activity and conflicts at Highland Avenue. Buses exiting the freeway would enter the dropoff lot before getting to Highland (Figure 2-4). After passing under the Hollywood Freeway from the off-ramp, the buses would continue the tight turn movement right into the lot. Pausing only long enough to discharge passengers, buses would proceed out an exit onto Highland Avenue for a sweeping right turn onto the eastbound entrance ramp to the Hollywood freeway to return to the Vine Station.

Assuming thirteen buses would be required to provide the shuttle service to the Bowl, payment upon boarding through a single door, and boarding in individual berths, four berths would be required for loading at the Hollywood/Vine Station, during the peak 7 to 8 p.m. period. Where loading occurs would be a function of the final planning at the Hollywood/Vine Metro Rail Station.

Station Master Planning at Hollywood/Vine Station

Station master planning is not final at the Hollywood/Vine Station, particularly with regard to the planned bus terminal. Several considerations have a bearing on the final layout and design of the facility, including: plans by LADOT to widen Argyle; the potential for developing a bus terminal that extends on either side of Argyle, with no access to Hollywood Boulevard; possible access to such a configuration from Selma Avenue only, or Selma and El Centro Avenue; and, the potential for an entrance portal to Metro Rail from the northeast corner of Hollywood/Argyle. Decisions on the layout and accessibility of the bus terminal have a bearing on the speed and convenience of the shuttle service to the Bowl.

Sixteen bus bays are now planned for the bus terminal in the short term, during the period when the Hollywood/Vine Station will be the west terminus of the Red Line. Subsequently, the number of bays will be reduced to eight to allow for additional joint development on the site. The non-peak nature of the service for events could be accommodated by the ultimate eight-bay assumption at the proposed bus facility, if that facility is properly sized for its own peak period needs. This presumes that four bays would be available for Metro Shuttle use prior to events and six bays after events. The assumption for service to the Bowl is based on 2000 passengers arriving at the Metro Rail station in a peak hour between 7 and 8 p.m., after the typical bus peak hour. Bus bay needs after events are discussed in the next section.

If temporary all-day shuttle service were provided to the Bowl, after opening of the Vine Station but prior to the opening of Highland/Hollywood Station, there could be a need for one additional bus bay, if peak hour demand at the bus terminal took all sixteen planned bays. The additional bay could be shared with another route, as long as the presumption for operations is not a pulsed system, where all routes arrived and departed simultaneously, filling all the bays. Even if other routes were pulsed, the Metro Shuttle would not have to be tied to a pulsed system, because the purpose of the shuttle is not transfers but service

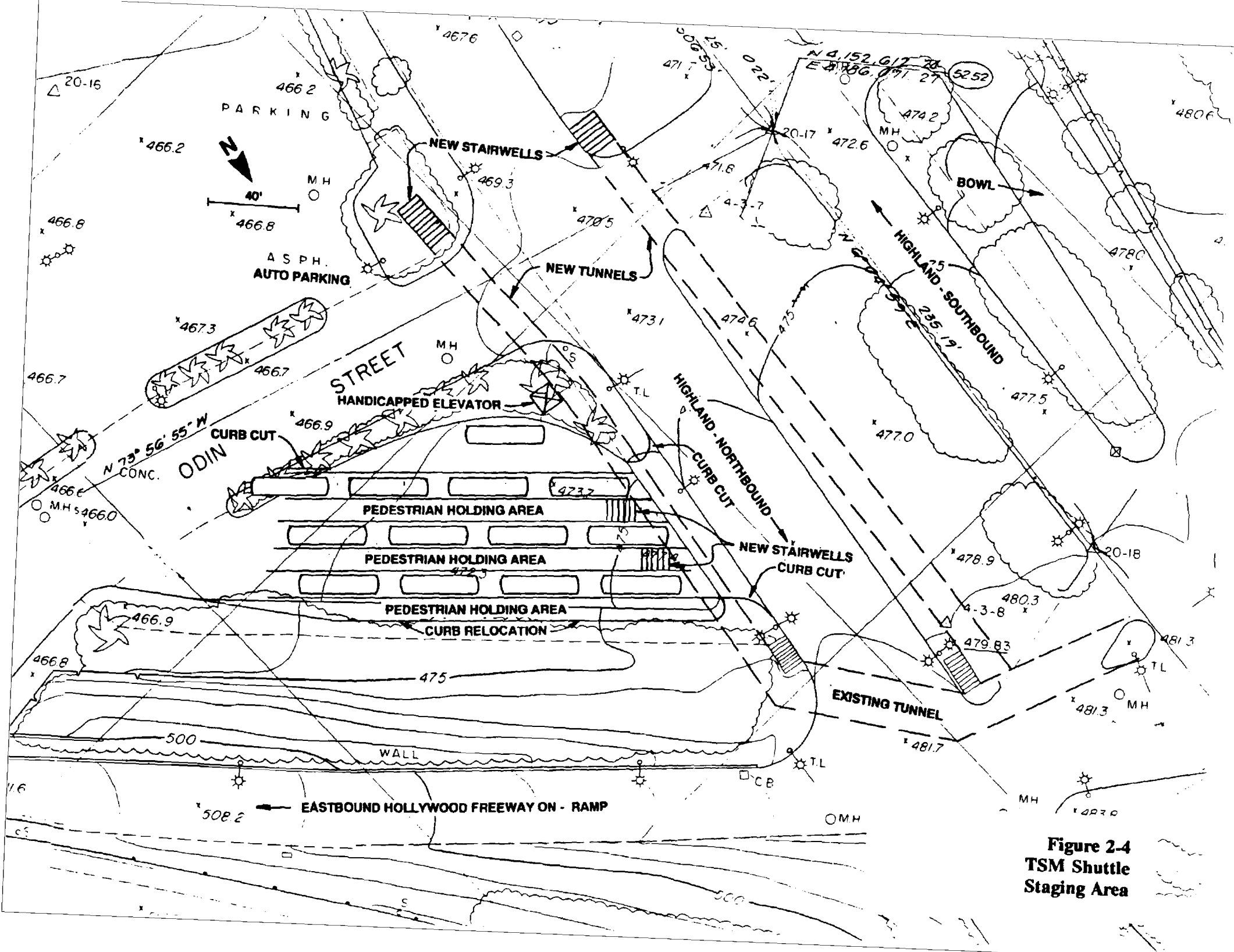


Figure 2-4
TSM Shuttle
Staging Area

between the Vine Station and the Bowl. This being so, a bay should be available under a pulsed system.

In summary, with respect to the number of bays for service to the Bowl, there would only be a problem if non-event service were provided to the Bowl between the dates of opening of the Vine and Highland stations, and only if all sixteen bays available during this period were fully used.

The proposed draft master planning for the Hollywood/Vine Station calls for closing Argyle. This planning strategy emphasizes the plaza-like character of the station area. On the other hand the LADOT is planning to widen Argyle and maintain it as a through street in conjunction with station development. It is anticipated that during the period between design and construction all planning considerations will be resolved, but it is not certain that Argyle will remain open. Closing Argyle would present a challenge to serving Bowl patrons with a high level of service. An Argyle entry to the bus terminal is desired because of its directness. Transit patrons generally do not like to "backtrack." Backtracking would be required if a Selma/Vine routing were used to go to the Bowl. If a Selma/Vine routing were used northbound, shuttle buses would have to go to the Bowl via surface streets (Yucca or Franklin to Cahuenga) or double-back to Argyle to get onto the freeway. If a Selma/El Centro or direct El Centro exit were used, a left turn onto Hollywood Boulevard from El Centro would be required, with a subsequent right turn onto Argyle. Any of these routings would be a disincentive to ridership. The change in travel time would not be great, but its perception could be, due to the short length of the trip. The Bowl patron is generally a discretionary rider. The convenience factor must be very high to capture potential users. Two mode transfers - auto to Metro Rail, then Metro Rail to shuttle bus - are already required. An indirect routing would be an additional disincentive to shuttle use. On the other hand Metro Rail patronage to the Bowl would be small compared to overall Metro Rail station use, and so station use and planning must focus first on the majority of Metro Rail ridership.

After events the trip from the Bowl south on Vine, then east on Selma, then into the bus facility is not as great a problem as the trip to the Bowl. This is in part due to the psychology of travel. Most people going to work or an event want to "get there." The return trip can be somewhat more leisurely as there is no start time that drives the trip purpose.

In examining the proposed short- and long-term proposals of the draft station master planning for Vine, workable solutions were apparent. In the short term, it may be feasible to use the curb space along the south side of Hollywood Boulevard between Vine and Argyle for loading passengers for the trip to the Bowl and discharging passengers after events. About 400 feet of curb space are available. Use of this curb space could be a good solution. Shuttle buses could approach the station southbound on Vine, pick up passengers on the south side of Hollywood Boulevard, then turn left (north) onto Argyle for the trip to the Bowl.

In the long term, if a pedestrian portal were developed on the northeast corner of Argyle and Hollywood Boulevard, the buses could operate in a similar way, but pick up passengers on Argyle after making the turn. For Metro Shuttle service on-street loading has the advantage of speed, directness, and the fact that buses can queue-up single file and depart immediately after loading.

A variation to the current master planning effort that could offer an alternative to on-street loading on Hollywood Boulevard would be to leave Argyle open to buses, at least northbound, to prevent route circuitry. In the short term the kiss-and-ride lot with its access from Argyle could maintain the linkage, if access were allowed between the bus area and the kiss-and-ride lot. In the long term the linkage could be maintained. It is certainly not uncommon to have buses operate over short stretches of tile, brick, or other paving materials. A one-way northbound travel lane could be maintained over whatever paving material is chosen for the portal plaza area, with only Metro Shuttle buses using this routing. Locking bollards could even be placed at other times to prevent access by undesired vehicles. A drawback to this scheme would be the desire of SCRTD to prevent conflicts between pedestrians and buses. If Argyle were closed and the south side of Hollywood Boulevard became continuous sidewalk these conflicts could occur.

System Capacity and Operations from the Bowl

Providing egress from the Bowl is more challenging than providing access, because when an event ends everyone is ready to go at once. Many people arrive at the Bowl early to picnic or eat dinner. Departure is much more rapid. Therefore, passengers returning to the Vine Station after a Bowl event would peak more sharply, requiring more bays than are needed for loading for the trip to the Bowl. Fortunately, bus bay availability would be greater at the Vine Station by 10:30 p.m., than earlier in the evening.

A potential layout of loading conditions for departures from the Bowl at the Metro Shuttle staging area is shown in Figure 2-4. At the end of an event, buses would form three queues. Independent demarcated pedestrian loading zones would store pedestrians as they emerged from the tunnel under Highland Avenue from the existing, and two new stairwells. There would be an extension of the tunnel south under the sidewalk along the east side of Highland Avenue to the stair portals serving each queue. It would also provide access to an elevator for the handicapped. Each queue of buses would thus have independent pedestrian access, as would the handicapped. It is recommended that the tunnel be extended south across Odin to reduce conflicts between buses and pedestrians going to parked cars in the lot south of Odin. This extension has been assumed here for analysis purposes. It would reduce conflicts with the Metro Shuttle operation. A new tunnel and staircase are also assumed in the median, because it is understood that access to the median is the primary bottleneck in the tunnel. These tunnel improvements would alleviate the jamming in the tunnel by providing more outlet capacity, allowing this alternative to perform as planned. To meet the requirements of the Americans with Disabilities Act, an elevator probably would be required at each end of the pedestrian tunnel, and so an elevator on the west side of Highland Avenue has also been assumed for the cost estimate. A possible alternative may be to provide protected assistance across Highland on the surface.

There would be two queues of four buses and one queue of five. A separate berth could be added adjacent to the elevator for handicapped person, if desired. Buses could all load simultaneously, because of the separate pedestrian staging areas associated with each queue. When a queue of buses was fully loaded, the queue, with police assistance, would move out and make the turn onto the freeway on-ramp. When buses in the next queue filled, that queue would move out. As a queue of buses moved out, another set of four (or five) buses would move into position. At the same time the pedestrians would be filling their marked area, so that as soon as the buses were positioned the doors would open and the buses would fill with already-positioned boarders. It is assumed that the first queue of buses would take about five minutes to load, with two minutes to load each queue thereafter. After initial loading the headway would be 13 buses per six minutes or just under every 30 seconds.

After Bowl events a full compliment of buses is present on-site to carry away patrons. This means every bus makes a single outbound trip. Thus, more buses are used for outbound service than inbound service, when buses can make repeat trips (due to the 2.5 hour service prior to events). (The only exception is the BowlBus Parking Shuttle. Some of these buses make more than one outbound trip.) To get the many buses positioned for loading and takeoff, Highland Avenue is closed northbound north of Odin, and filled solid with parked buses. To allow Metro Rail Shuttle buses access to Highland Avenue so that they can make the turn to the freeway, some buses now stacked in this area would have to be relocated. They could be replaced by Metro Shuttle buses that would fill first and directly access the freeway, then clear the area for the subsequent Metro Shuttle buses.

There is additional bus staging space within the closed lanes of Highland Avenue further south near Camrose. Buses displaced by the Metro Shuttle could use this area. Bus route staging would have to be shifted somewhat to accommodate the adjusted pattern of bus staging.

Assuming service to 3,000 shuttle users, and 50 persons per 40 passenger bus, 60 bus runs would be required. It is assumed the first boarder could get to the first bus in three minutes. With a five minute load time for the initial queue, the first bus would leave at minute eight. With a five minute travel time to the Vine Station, two minutes to unload, and two minutes to enter the station, the first passenger could get to the Vine Station platform in seventeen minutes. The last bus would depart the Bowl at minute 34, and the last passenger would arrive at the Vine Station platform at about 43 minutes after the event release (Table 2-3).

If the first bus leaves at minute five, takes five minutes to Vine, two minutes to unload, and six minutes to return, a minimum of 30 buses would be required to provide the desired service. Each bus would make two runs, on the maximum crowd example assumed here.

Note that this scenario is believed to allow for reasonable loading and travel times, but would always be subject to any anomalies resulting from traffic breakdowns. The position of the lot is such that most conflicts can be avoided, as long as the protected right turn to the freeway can be maintained at appropriate intervals during the traffic release cycle. It

should be noted, however, that the buses that do not initially queue in the staging lot must be close at hand and be able to move unrestricted into the staging lot. Only thirteen buses, plus a handicapped/backup bus can fit into the lot with a high degree of safety. Thus, the scenario presented here is a "best case" scenario. The only way to reduce the overall exit time would be to increase the number of passengers per bus. The trip is short, and it is reasonable to expect some standing passengers, but the discretionary nature of the ridership suggests that loading at 120 percent is probably a reasonable assumption.

Once buses have departed the Bowl area, they would proceed to the Vine Station. Buses can unload more quickly than they can load, because there is no fare collection, and both front and back doors can be used. With thirteen berths provided for loading at the Bowl, it is clear that fewer than thirteen bays would be needed at the Vine Station. Interruptions such as crossing Hollywood Boulevard would tend to bunch buses. Under ideal conditions a bus could unload and move through a bay every two minutes. With 27.5 second headways five bays would in theory be adequate, but for analysis purposes six bays are assumed for unloading at Vine. This would leave two bays for other routes in this very late evening hour (10 to 11 p.m.).

As noted previously, Argyle access to the bus terminal is to be preferred. However, there would be less effect on buses traveling to the Vine Station than from the Vine Station, if Argyle were to be closed. Eastbound buses could exit the Hollywood Freeway at Franklin/Vine and turn south on Vine, rather than proceeding east to Argyle. They could then go south on Vine to Selma Avenue and proceed into the bus terminal. Alternatively, buses could drop off passengers on the south curb of Hollywood Boulevard, to reduce trip time and/or reduce bus bay demand at the terminal, if necessary.

2.2.3 TSM Alternative with Grade Separation at Highland

This alternative would extend on the TSM concept presented above by providing a tunnel under Highland Avenue so that buses did not have to dogleg from Odin to the Bowl entrance when inbound to events. Instead they would enter a portal in the same parking lot identified above as the staging area for the shuttle. "Short" and "long" tunnel options are described. A bridge over Highland Avenue was also considered, but was rejected because it would require too steep a grade.

2.2.3.1 Patronage Considerations - Annual and Event

Most of the analysis presented for the TSM Alternative is applicable to this alternative, as well. The in-bus travel time would be slightly longer, because the buses would cross Highland and enter the Bowl, while the walk time would be reduced. Rather than dropping passengers at the lot east of Highland Avenue and having patrons walk to the ticketing area via the pedestrian tunnel and the interior Bowl walkway, bus riders would be dropped off near the ticketing area, as BowlBus patrons are today. The walk trip reduction would be a function of the actual dropoff point. There is a greater convenience factor for patrons than time benefit, because buses would advance slowly through the tunnel. It is believed

that one element supporting bus ridership is the fact that bus riders are delivered up the hill, whereas auto users must walk.

To determine the potential patronage that might be achieved by each of the alternatives, in comparison with the TSM Alternative, the travel time assumptions in Table 2-3 were aggregated into walk, wait, and in-vehicle times for each alternative for a trip from a Metro Rail station to the Bowl and from the Bowl. Travel time to the Bowl ranges from five to twenty minutes. Trips from the Bowl represent the first, last, and mean patron (Table 2-4). This allowed calculation of the total travel time difference from the TSM Alternative. Travel time data were put into SCRTD's home-based, non-work logit model to determine how travel time differences might affect the transit market share (Table 2-5). The model was applied to the 36,500 persons who were assumed in Table 2-2 to be the potential market share (called "Balance of Event Attendance") of the universe of those who access the Bowl by auto. This figure of 36,500 persons was factored down to an average event total of 5,700 market trips. Assuming a base ten percent mode shift the base TSM transit ridership drawn from the auto-user mode would be 570. Table 2-6 then aggregates the alternative ridership from this source with that from the BowlBus Park & Ride diversion and the diversion from those parking near the stations and using the Metro Shuttle to access the Bowl.

As can be seen in the tables, the TSM with Tunnel Alternative would have a ridership of about 300 more persons than the base TSM Alternative due to the reduced travel time. The BowlBus service would become marginally more attractive also, if the tunnel bays provided more predictable, convenient service. Dropoff times before events would be reduced slightly by the improved underground access connection. These secondary benefits have not been quantified.

2.2.3.2 Operational Characteristics

System Capacity and Operations to the Bowl

BowlBus bus service carries patrons to the box office area today, and so delivery of Metro Shuttle users to the door is consistent with current operations. All buses come into the Bowl area via Odin and cross Highland. Traffic conditions on many evenings is near the point of breakdown, and it is believed by Bowl staff that additional buses cannot be accommodated across Highland and into the Bowl without severely compromising operations for autos and buses alike. For this reason grade separation at Highland was proposed. An elevated option was examined, but dropped because it is not possible to get up and over Highland Avenue from Odin (a minimum 12 % grade would be required, and a 10% grade is considered the maximum allowable for buses), and an overhead connection would have obvious aesthetic drawbacks (Figure 2-5). The topography does allow a subsurface connection. If the tunnel came back to grade within the Bowl, however, an upgrade at a ten percent would be required (in this case 500 feet long). This is unacceptable for fully-loaded bus operations, especially when the buses are operating under stop-and-go conditions. The grade compares to 400 feet of eight percent grade at the existing Bowl entrance. The eastbound on-ramp to the Hollywood Freeway also has an existing steep grade, 300 feet of

TABLE 2-4

TRAVEL TIME COMPARISON

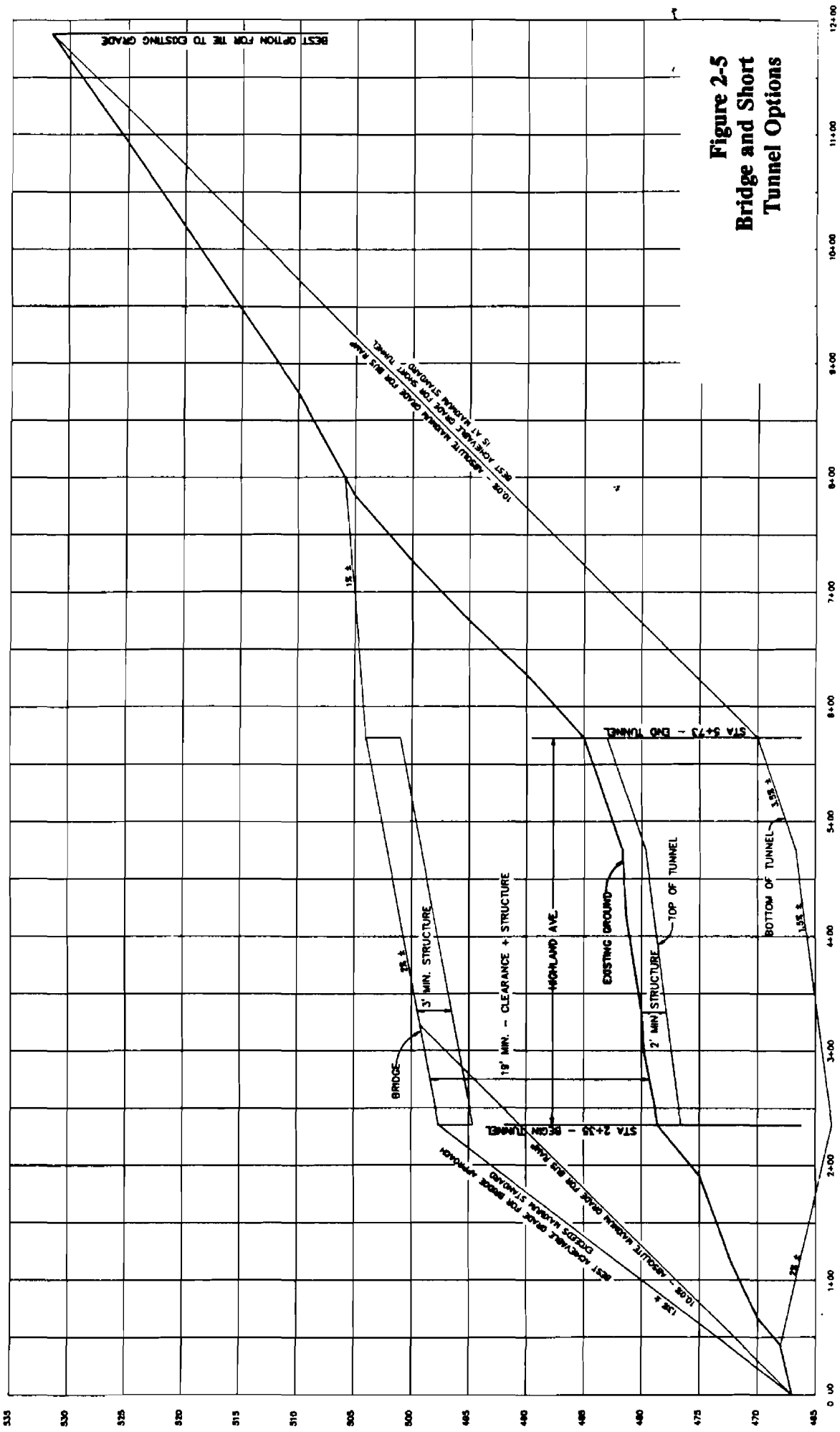
Alternative	Travel Time To Bowl	Travel Time from Bowl			Total To/From	Percent Of TSM	Difference From TSM (min.)	
		First	Last	Median				
TSM	Walk	11	7	4	6	17	100%	0
	Wait	3	5	34	20	23	100%	0
	In-Vehicle	6	5	5	5	11	100%	0
	Total	20	17	43	30	50	100%	0
TSM - Tunnel	Walk	7	6	4	5	12	71%	-5
	Wait	3	3	23	13	16	71%	-7
	In-Vehicle	6	6	6	6	12	109%	1
	Total	16	15	33	24	40	79%	-10
Subsurface Walkway	Walk	1	1	13	7	8	47%	-9
	Wait	0	0	13	6	6	29%	-16
	In-Vehicle	9	9	1	5	14	131%	3
	Total	10	10	27	19	29	57%	-22
Subsurface AGT	Walk	2	2	2	2	4	24%	-13
	Wait	1	1	23	12	13	57%	-10
	In-Vehicle	2	2	2	2	4	34%	-7
	Total	5	5	26	16	21	41%	-30

TABLE 2-5
ALTERNATIVE RIDERSHIP DERIVED FROM AUTO MODE

Alternative	Event Market Trips	Event Transit Trips	Transit Share	Change In-Vehicle Time	Change Out-Vehicle Time	Revised Transit Share	Revised Transit Trips
TSM	5700	570	0.1	0	0	0.10	570
TSM - Tunnel	5700	570	0.1	0.5	-5.5	0.15	870
Subsurface Walkway	5700	570	0.1	1.5	-12.5	0.25	1413
Subsurface AGT	5700	570	0.1	-3.5	-11.5	0.26	1473

TABLE 2-6
SINGLE EVENT TRANSIT CONNECTOR RIDERSHIP SUMMARY

Single Event Transit Patronage	TSM	TSM Tunnel	Subsurface Walkway	Subsurface AGT
Diversion from BowlBus P & R	694	694	694	694
Diversion from Auto Mode	570	870	1,413	1,473
Diversion to Additional Parking	1,000	1,000	500	500
TOTAL AVERAGE EVENT	2,264	2,564	2,607	2,667
TOTAL MAXIMUM EVENT	3,011	3,410	3,467	3,547
TOTAL ANNUAL	144,896	164,098	166,855	170,682



**Figure 2-5
Bridge and Short
Tunnel Options**

eight percent grade. The option of coming to grade within the Bowl lot called the "short tunnel" option appears to be infeasible. It would push fully-loaded buses to their maximum grade climbing ability over a long distance, under stop-and-go conditions.

Information from the Bowl indicates that with a tunnel or bridge, if buses are brought to the surface within the Bowl for dropoffs, the introduction of this additional bus traffic into the box office area would overload the system and cause traffic breakdown. Presently, buses pull up the hill into the Bowl, using the central of three driveways. Near the box office they make a broad circle and discharge passengers. Cars also are entering via the northernmost driveway. As cars fill the area, and the intensity of their activity increases, the area for bus maneuvers is reduced.

The alternative to a bridge or "short" tunnel that avoids unacceptable grades and congestion would be to assume much more extensive underground construction. This is called the "long" tunnel option. Instead of a simple cut-and-cover tunnel under Highland Boulevard, the tunnel would continue west, swing a broad arc under the pavement outside of the box office area and then emerge from the ground in the outbound direction, such that buses came out at-grade to cross Highland (Figure 2-6).

Sawtooth bus bays could be provided within the tunnel for dropoffs (Figure 2-7). If a sawtooth arrangement were used, about twelve bays could be provided. Bays allow independent activity in each berth with a full bypass lane. Alternatively, buses could be stacked with provision of pulloff lanes for disabled vehicles. This would allow for simultaneous dropoff by about sixteen buses, but would require fully coordinated movement of buses. The bay configuration has been assumed. Presently, eight to nine buses can drop passengers, and so the bay arrangement would be an improvement. While it is believed that an underground arrangement would provide adequate dropoff capacity, the option would always remain to allow some surface dropoffs. With the bulk of dropoffs below ground, for instance, the Metro Rail shuttle could operate above-ground, if this were perceived to be a more premium service.

If an underground system were constructed, a change in the bus passenger count procedure would be required, and additional provisions would have to be instituted to ensure that riders could find their buses after the event.

The tunnel would not operate two-way. It would be inbound into the Bowl only. Exiting buses do not have to dogleg to Odin. They either turn left at Highland Avenue to go west on the Hollywood Freeway or pull directly across Highland onto the eastbound on-ramp to the Hollywood Freeway. The latter is the pattern the Metro Shuttle would follow.

System Capacity and Operations from the Bowl

All buses are now positioned for takeoff prior to event conclusion. For departure there is no loading within the Bowl at the dropoff point used before events. Rather, all buses are stacked in the median area of Highland and in the northbound lanes of Highland Avenue. It is anticipated that most of the departing buses would continue to queue and load in the

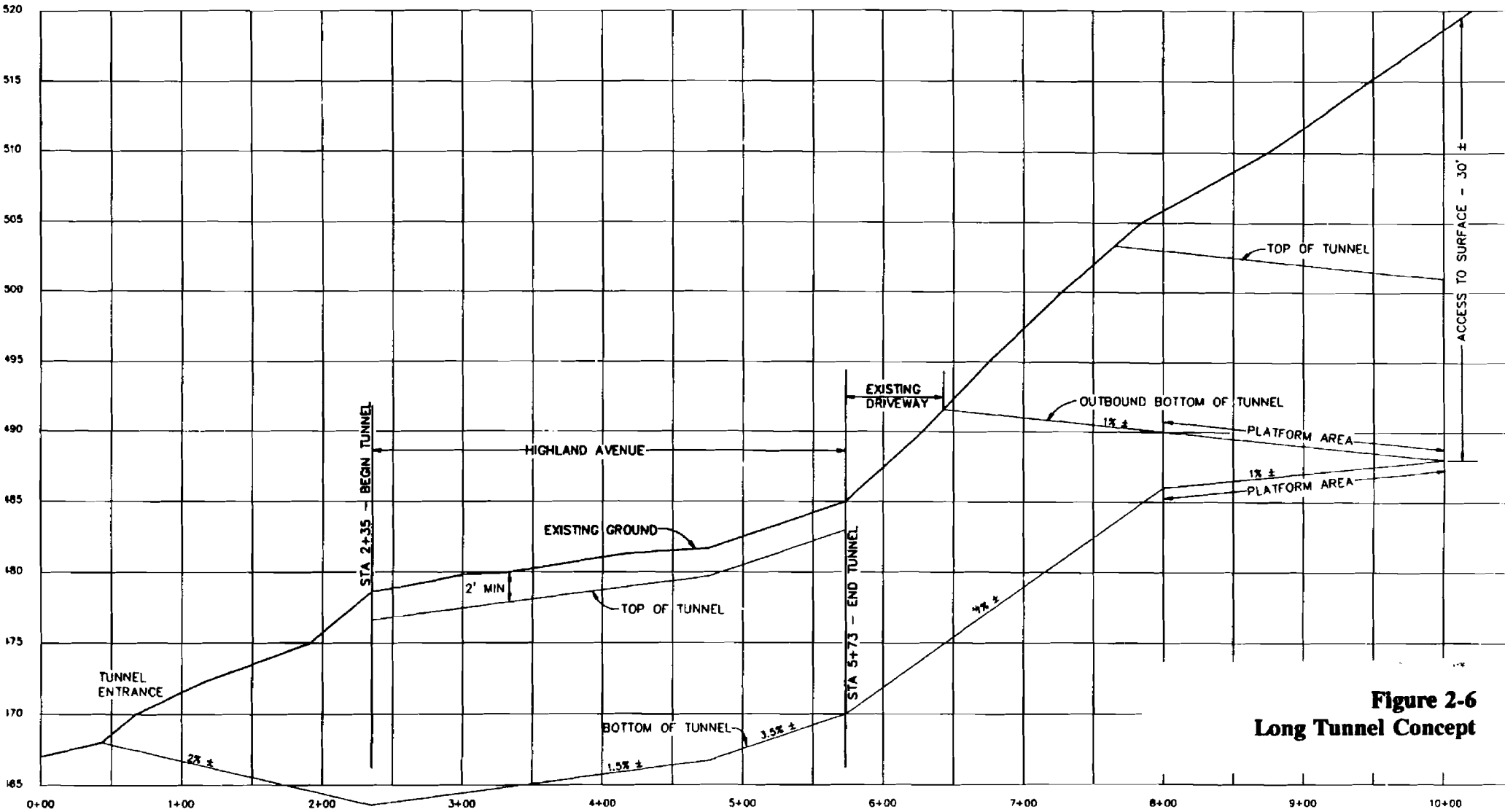
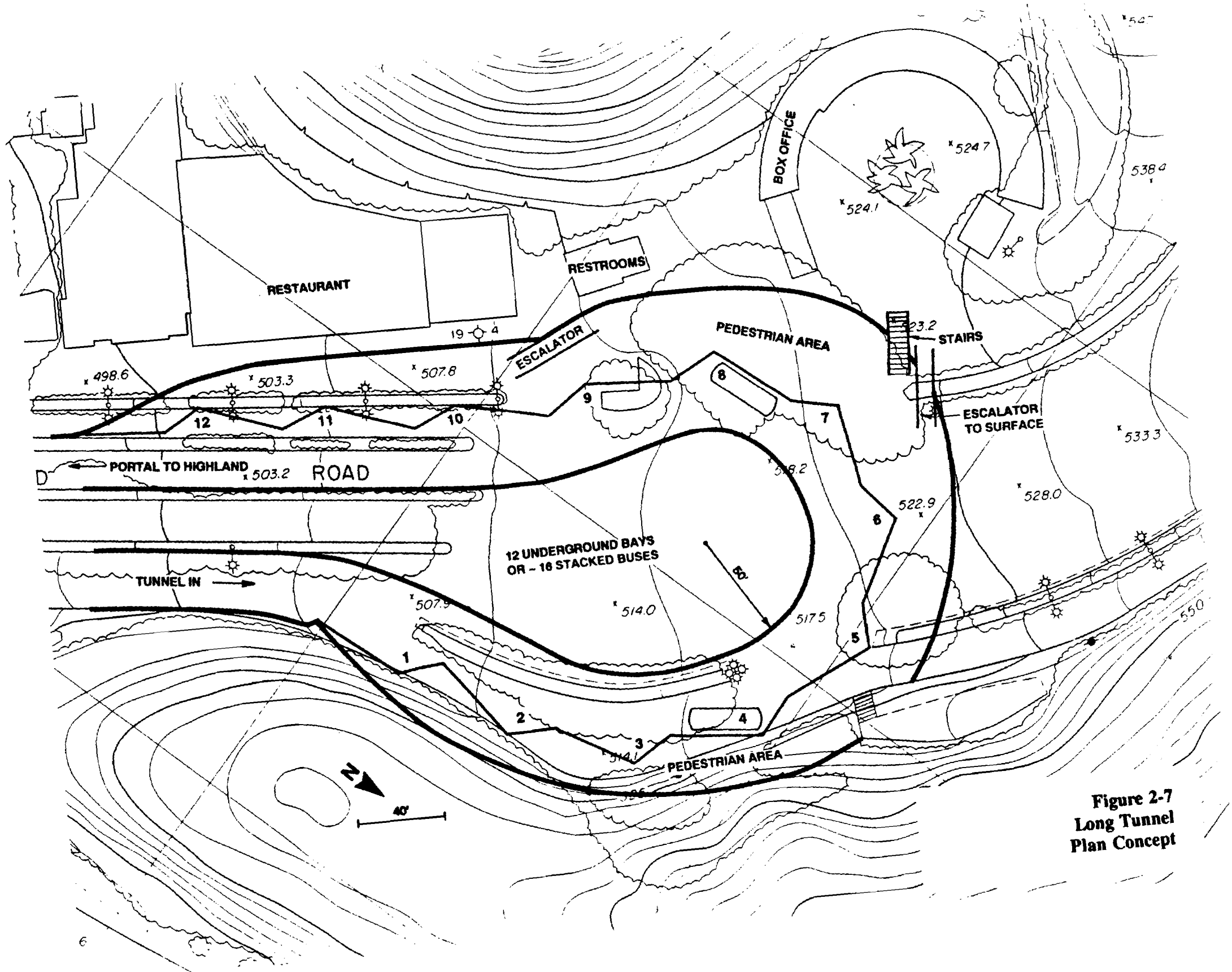


Figure 2-6
Long Tunnel Concept



**Figure 2-7
Long Tunnel
Plan Concept**

median and lanes of Highland Avenue. This is because of the great intensity of departures, and the greater number of buses at departure.

It is presumed that the first priority for tunnel use would be for a Metro Shuttle service, not other service. Whereas all routes could probably be accommodated by the tunnel prior to events, the crunch after events would not allow this. Other buses could only use the tunnel to the extent that there were residual capacity.

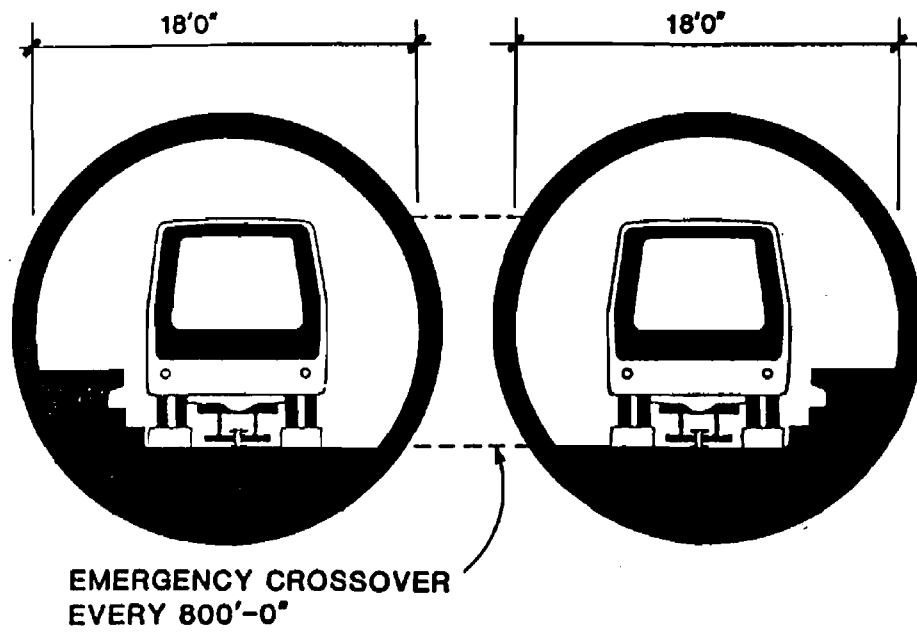
With the TSM Tunnel Alternative about 68 bus runs would be needed for Metro Rail Shuttle service under the anticipated worst case crowd to carry patrons from the Bowl to the Hollywood/Vine Station after events. This raises a question of how service would be provided. To provide optimal headways 68 buses would need to be positioned for service delivery. As a practical matter the choice may be for 34 buses each making two runs. However, the patronage estimate for this alternative assumes the full compliment of buses. Otherwise the event exit time would almost double. The round-trip time is such that a bus making a second run would not get back for the second pickup until minute 23, about the same time that the last bus would clear if all 68 buses were initially provided. Using 68 buses means off-site bus readiness because only about 30 buses could be queued in the tunnel and bays prior to event release.

The capacity of unloading areas at the Vine Station would be the initial controlling factor on headways. If twelve buses were released in the first flush of buses from the Bowl (representing the 12 bays), these could be accommodated by use of curb space on the south side of Hollywood Boulevard in conjunction with seven bays within the terminal. Full use of both curb spaces and bays would mean up to fifteen buses could be received in the initial flush of buses. If an eight minute loading is assumed for the first twelve buses, and a three-minute loading per set of twelve buses thereafter (for an effective continuing headway of fifteen seconds), the last bus would leave the Bowl at about minute 23. Once the initial flush of buses moved through the Vine Station, the number of bays for discharge could be reduced, as the discharge of passengers takes less time per bus than loading at the Bowl.

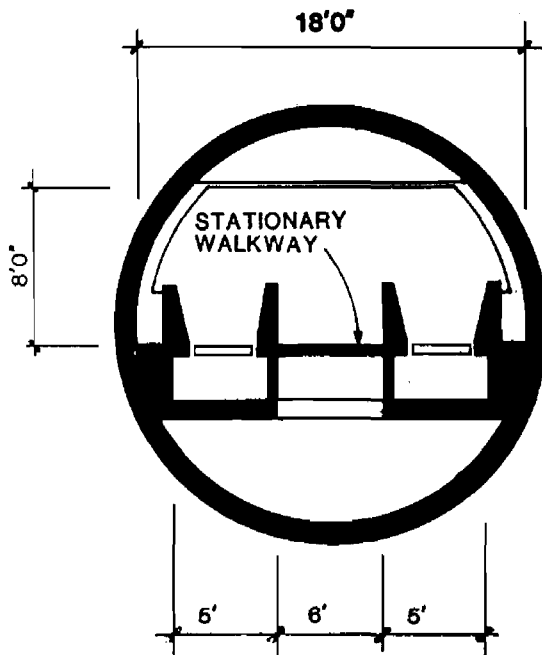
2.2.4 Subsurface Walkway Alternative

The subsurface alternatives (walkway and AGT) would link the mezzanine level of the Hollywood/Highland Station to the Bowl. These alternatives are essentially the same as outlined in the 1988 *Hollywood Bowl Connector Study* (Figures 2-8 and 2-9). A principal difference in the proposal herein is that the tunnel alternatives are assumed to emerge from the hillside between the rest rooms and the box office area, rather than the median of Highland Avenue (see Figure 2-7).

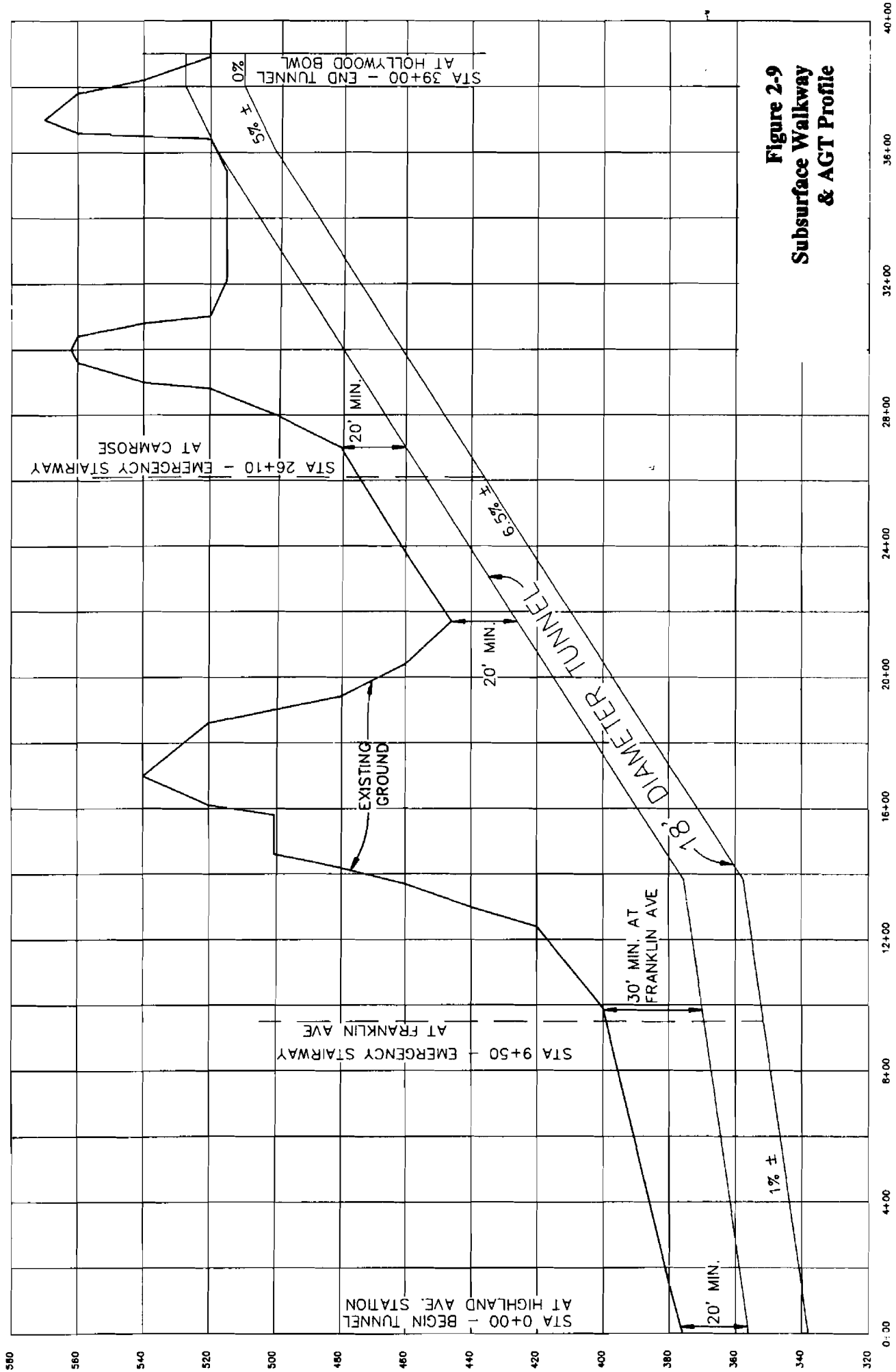
The Walkway Alternative in particular is a "keep it simple" solution. A bored tunnel would connect the "public" area of the mezzanine level of the station to the box office area via a "knockout" panel already planned into station construction. The transfer to the walkway tunnel would be almost without time penalty, because the walkway would accept people on a continuous basis, directly from the mezzanine level. The walkway does not require a maintenance area or vehicles. Maintenance can be performed by regular contractors who



TYP. SECTION
THRU BORED TUNNELS



TYP. SECTION
THRU BORED TUNNEL



serve walkway and escalator systems. (The Bowl already has ramps in operation.) A single tunnel would accommodate two moving walkways (one for walkers and one for those who wish to stand) with a standard sidewalk positioned in the middle or to one side. It would be completely isolated from all surface congestion - pedestrian or vehicular. Both walkways would move in the direction of event flow. The stationary sidewalk could serve the opposite direction should anyone have to move against peak flow.

The topography of the Bowl would allow the tunnel to emerge from the hillside at the north end without a grade change. This makes ramps and special design for disabled persons unnecessary.

Consideration was given to connecting the tunnel from the Hollywood/Highland Station to the existing pedestrian tunnel under Highland Avenue, with an improved pedestrian connection up the hill to the box office area. The purpose was to serve both Metro Rail patrons and the general public attending Bowl events - both BowlBus and auto users. Examination of this concept found that the linkage up the hill would provide no gain over a separate link for those coming up from Highland and would make for a longer trip for Metro Rail users. A ramp from the west end of the existing pedestrian tunnel under Highland could replace the staircase, but could not extend very far because of the facilities along Peppertree Way, the pedestrian way internal to the Bowl, leading up the hill to the box office. At best the walk for the general public could only be reduced by 200 feet, because of the length of the portal associated with a ramp versus an escalator. An improved pedestrian connection could be provided from under Highland and up the hill, if escalators were used to reduce the portal area at the top of the hill, but there appears no justification for routing Metro Rail users over this additional link, especially when escalators would be needed at the end of the link.

If the walkway were connected directly to the box office area, there would be a superior link for those coming from Metro Rail. The tradeoff appears in favor of the direct tie to the box office area.

On a conventional moving beltway (120 feet per minute is the typical belt speed) persons standing could traverse the 3,900 foot distance in the tunnel in about 33 minutes. Those walking on the walkway could cover the same distance in under thirteen minutes. This assumes some friction on the walkway by slow walkers with an equivalent speed of 120 plus 200 feet per minute (fpm), or 320 fpm.

It is anticipated that by 2000, when the Hollywood/Highland Station will be open, that a system moving at up to 300 fpm will be commercially viable. Such a system is now in operation in the airport in Brisbane, Australia. Westmont Industries is exploring implementation of such systems in the U.S. Such a system would reduce the tunnel trip time to just over thirteen minutes for those standing (300 fpm), and under eight minutes for those who walk (500 fpm). This means travel time from the Metro Rail station platform at the Hollywood/Highland Station to the Bowl box office area would be ten minutes. Based on a capacity of 16,000 persons per hour, the 3,500 projected patrons at a major event (Table 2-6) would queue for a maximum of thirteen minutes. Combining this with a

maximum return travel time of fourteen minutes, the last patron would arrive at the station platform 27 minutes after the conclusion of an event (Table 2-3).

2.2.5 Subsurface AGT Alternative

This alternative is essentially the same as that outlined in the 1988 *Hollywood Bowl Connector Study*. It assumes the greater capacity of the Westinghouse system. Because a significant portion of the cost of a subsurface system is for the tunnel, and dual tunnels would be required in any case, there is little advantage to a lighter system such as the Universal system. The Westinghouse system is the most widespread and proven in the world, and offers the best working model for analysis. It would have the basic advantages of the subsurface walkway, with a superior travel time, but at a higher cost. It would also require a maintenance facility and personnel and parts specific to that technology. This means special training programs and parts inventories.

If the maintenance facility were above-ground, it would potentially have an intrusive effect on the Bowl and would take land that is in very short supply. For this reason and the potential compactness of a facility that was directly on-line, an underground location under the preferred parking area on the west side of Highland (Figure 2-1) is assumed.

The system proposed in 1988 assumed use of the C-100 vehicle, in two-car trains, at two minute headways. The standard capacity was assumed to be 108 passengers per vehicle with a crush capacity of double that value, 216. The earlier analysis assumed an effective operating capacity of 162 persons per car, for an hourly capacity of 9,700. Based on these figures and dwell times at each end of the system the travel time to an event would be very rapid, five minutes (Table 2-3). Exit time from the box office area to the station platform would also be the fastest of the alternatives, 26 minutes. If three car trains were used the exit time or load factors could be reduced, but the assumed system here is two-car trains.

Because of the two-way system operation, two tunnels are required so that vehicles can pass one another. On the other hand, loading and unloading would occur from a single track. When a vehicle pulls up to the platform, it simultaneously discharges to one side while loading from the other (though virtually all flow would be in one direction), rather than pulling forward and then backing into a separate loading slot. This is called "pinched loop" operation.

For example, as the train approaches the Highland Station travelling south on the western guideway, it will transition from double track to single track just north of the platform. After discharging passengers, the train would reverse direction, pulling back north. It would then switch to the east track, allowing the next train to approach the station platform area. It is the switching process that controls the headway.

3. CONCEPTUAL ENGINEERING

This section explains important engineering considerations related to each alternative. The capital costs of the alternatives are discussed in Chapter 9.

3.1 NO ACTION ALTERNATIVE

There would be no engineering associated with the No Action Alternative.

3.2 TSM ALTERNATIVE

The base TSM Alternative would rely on Metro Shuttle service to the lot on the northeast corner of Odin and Highland Avenue. The existing curb cut and entranceway into the lot would be maintained, but modified slightly. A new curb cut would be necessary opening the lot westward to Highland Avenue. The dimension of this curb cut would be dictated by the geometry of the site, such that queues of buses could be accommodated with twelve foot pedestrian holding areas associated with each of the queues. The lot itself would be extended six or eight feet into the hillside to gain more space. In addition, a space for a bus positioned near the elevator for handicapped patrons would be located in the southwest corner of the lot nearest to the intersection. Handicapped persons may be accommodated on any bus, but it would be desirable to have a bus positioned by the elevator, which could be in the southwest corner of the lot.

The existing pedestrian tunnel would be left in place under the base TSM scenario. This tunnel would be extended south some 280 feet from the existing stairwell on the east side of Highland Avenue. Two new stairwells would be added north of Odin, so that each queue of buses had independent access. And, another stairwell would serve as the outlet for the new pedestrian tunnel extension to the south under Odin. This last stairwell would be for auto parkers in the lot south of Odin and east of Highland Avenue. The preliminary cost estimate for this alternative includes the cost of elevators on either side of Highland Avenue to allow handicapped persons to use the existing pedestrian tunnel.

Also included in the cost estimate is a new pedestrian tunnel in the median with a new stairwell south of Odin. This enhancement to the existing pedestrian system is needed to allow the TSM Alternative to function properly. The single stairwell to the median is inadequate to serve demand and acts as a plug to other pedestrian traffic in the tunnel, as the majority of people in the tunnel are trying to get to the median. Those coming out of the existing median stairwell must cross in front of departing buses, causing delays and vehicle/pedestrian conflicts. Thus the new tunnel and stairwell will have an additional safety benefit, as well as providing capacity relief to the main tunnel serving the Metro Shuttle.

No special utility relocation is known at this time. Certainly there are utilities in Highland, but Highland has been avoided to the extent feasible. There would be some landscaping associated with this alternative due to the removal of some of the trees that have been

planted at the periphery of the existing lot. Additional signage, pavement markings, and lighting would be required to guide pedestrians and provide for their safety.

3.3 TSM WITH GRADE SEPARATION

Three options were considered under this alternative: a bridge, a short tunnel and a long tunnel. The bridge was not feasible due to the required grade change and consequent twelve percent grade. This exceeds the criteria for bus operations of ten percent. The short tunnel option had a similar, if not so severe problem, requiring about 500 feet of ten or slightly more percent grade. This combined with operational problems led to its rejection as well.

The long tunnel would require considerable more excavation on the west side of Highland Avenue to accommodate the loop bus bay arrangement and pedestrian areas. The underground loop would include a bypass lane, the bus bays themselves, and then on the outside of the loop sufficient pedestrian sidewalk to accommodate the crowds. For planning purposes, two escalators are assumed to provide access to the surface, from a depth of about 30 feet.

Because of the extensive underground area and the number of buses that would be circulating through this area, extensive ventilation would be necessary to clear the air of engine fumes. Due to mandates of the Clean Air Act, it is anticipated that buses in the year 1998 would be cleaner burning than they are today. Nevertheless, for purposes of this analysis, it is assumed that a significant number of existing buses would still be in service in that year. Therefore, the ventilation element of the cost estimate has been developed to reflect a significant turnover of air. As with other alternatives, handicapped elevators are assumed as is, landscaping, signage and lighting.

3.4 SUBSURFACE WALKWAY

The same boring equipment that would be used in the construction of Metro Rail could be used to bore the tunnel for the walkway. The Hollywood/Highland Station has been proposed as a "mined" station. It is anticipated the walkway tunnel would be bored from the north, from a cut-and-cover area located in the parking lot on the west side of Highland Avenue across from Odin. Its location would allow excavated materials to be loaded onto haul vehicles that would have direct access to the Hollywood Freeway.

A single, straight tunnel is assumed. The vertical alignment could begin relatively flat at the Highland Station to stay well below the developed private property overhead. North of Franklin Avenue, the alignment would climb at about six percent to point near the north end of the tunnel, where it would reduce to five percent. This would allow a minimum depth over tunnel of 30 feet near the First Methodist Church on Franklin and 20 feet for all points beyond, except within the material excavation point in the parking lot. Here the tunnel would be covered with the minimum acceptable overburden to allow the tunnel portal to come out of the hillside just to the north, and to maximize the efficiency of the excavation.

The bored tunnel would comprise the bulk of the cost of the project. Other design elements that would be required are relatively minimal. At the Highland Station end, the tunnel would connect to the section of the mezzanine level that is the "public" area (no fare is necessary in this portion of the mezzanine). This would allow travel to and from both directions on Metro Rail by means the escalators down to the central station platform, one level below. The connection to the walkway tunnel would be through a "knockout" panel that is already planned into station design. This panel is designed for future access and would not compromise the structural integrity of the station. The panel dimension is twelve feet high by twenty feet wide. This dimension is adequate for the planned walkway system. Design at each end of the tunnel would be dependent upon fare collection procedures. At a minimum, a landing would constructed on the outside of the knockout panel to add pedestrian storage area, space for fare collection, and vending or other elements not accommodated by the space on the mezzanine.

A seismically significant, active fault crosses the proposed alignment, the Hollywood Fault. It passes east-west about midway through the project length. The estimated maximum single-event displacement, based on geologic data on fault slip rates, is 1.0 foot. It is very unlikely that this displacement would occur during any reasonable project service life. The displacement in the Hollywood Fault crossing would be expected to occur an average of once every 60-70,000 years (Converse Ward Davis Dixon, Earth Sciences Associates, and Geo/Resource Consultants, 1981. *Geotechnical Investigation Report, Vol. I and II*. Prepared for Southern California Rapid Transit District Metro Rail Project.) Geologic logs and geophysical surveys indicate a 170 to 400 foot vertical offset of the bedrock surface at the Hollywood Fault. This fault is not expected to move during the useful life of Metro Rail and so this assumption is extended to the walkway (Converse Consultants, 1982. *Seismological Investigation and Design Criteria, Draft Report, Vol. I, Seismological Investigation*. Prepared for Southern California Rapid Transit District Metro Rail Project.)

Emergency lighting would be provided. The need for emergency power and access would be determined during more detailed engineering analysis and in conjunction with regulating agencies. In the event of a power failure or other emergency, pedestrians could simply walk out. With access to either end the escape distance would be a maximum of 2,000 feet (about eight minutes of walk time), even if no intermediary access were provided. Intermediary access could be provided at Franklin and at Camrose (Figure 2-9). These points would require vertical connections of about 30 and 20 feet, respectively, unless additional analysis indicates that depth to top of tunnel could be reduced. The escape shafts could be developed in conjunction with vent or fan shafts.

The accelerating walkway proposed for this application operates through use of a series of belts. The passenger steps onto the first of two belts each about 20 inches long. The first foot reaches the second belt as the second foot reaches the first belt. In half a second both feet are passed to an eight-foot third belt operating at the same speed as the handrail. At the end of the third belt a hand grip transfer is made to a second hand grip traveling at the running speed of the main belt. Just beyond the hand transfer, one's feet pass over two more short belts that bring one to the final "cruising" speed. The reverse occurs with deceleration. The described pattern is for a system speed of 300 fpm. Higher speeds are

possible, but require more belt and handgrip changes.

The moving walkway could be built without breaks, except the handgrip change at each end, and grip changes necessary due to the maximum length the grip can be driven by a motor.

Handrail breaks are a necessary part of this system already, because they are required at the acceleration and deceleration points in the system. If there were additional breaks in the system, pedestrians would have to decelerate, move across regular stationary pavement at intervals, and then reaccelerate. If escape stairwells are required, the intervals would be located at these points in the system. In airports and similar applications, it is normal to break walkways, because periodic access is required. In the tunnel no such access is required, unless to safety escapeways. Continuity of the system becomes a safety issue. It is this consideration that has limited the length of systems in the USA in the past. The beltway of the proposed system can be essentially unbroken. The belts are flexible enough that one's foot transitions from belt to belt without a significant break. The manufacturer makes this claim even for spike heels. The handrail presents a more difficult transition, because the radius of the handrail where it turns down is much greater. The handrail transition is probably the biggest obstacle to US installation. Both belts and handrails have a maximum drive distance. That is, the friction of their motion limits the length over which motors can drive them. The handrail is more restrictive in this regard. A handrail transition would be required about every 500 feet in any case. If breaks in the system are required at handrail transitions at these 500 foot intervals, the accelerating/decelerating system would face an uncertain future. It would certainly be a less attractive system if acceleration/deceleration were required seven times over the course of the tunnel. The probability of accidents would also increase with the addition of the acceleration/deceleration points.

The standard unit of the system would have a belt width of 39" with an outside dimension of 61". The capacity of the walkway for standing persons would be about 10,000 persons per hour. The capacity of the beltway for persons walking would be about 6,000 persons per hour. The latter capacity is lower because walking persons occupy more space. This extra space more than makes up for the higher speed of the walkers. The regular sidewalk interposed between the moving walkways would offer additional capacity, but this capacity has not been included in the determination of outbound flow rates after an event. In this sense the system has residual capacity.

3.5 SUBSURFACE AGT

As indicated earlier a Westinghouse AGT system is assumed for costing and engineering purposes. The data presented in the 1988 *Hollywood Bowl Connector Study* remains valid, except for the horizontal and vertical alignment. This analysis assumes that the Metro Rail tunnel is deep enough that a direct connection to the mezzanine level by the AGT is possible, so that patrons would need to make only one level change, rather than going up to the Metro Rail mezzanine, then back down to the platform level of the AGT. This would have to be verified by more detailed engineering studies, if this option is pursued.

The horizontal alignment has been held straight, on the same line as the walkway.

At the north end the loading/unloading platform would be located just south of the box office area with a short pedestrian tunnel emerging from the hillside at the same point as the proposed walkway.

Considerations apart from the basic pinched loop operation described in Chapter 2 would be operations and maintenance. For safety purposes crossover tracks would be provided every 800 feet. Escape routes to the surface would be at the same locations as with the moving walkway, if required. The crossover may be allowed to substitute for escapeways, because evacuees could access the other tunnel via the crossovers. The other tunnel could provide a safe haven. Auxiliary power and lighting systems would also be required. "Blue light" (emergency) stations would be placed at intervals in the tunnel so that in the event of an emergency, passengers would have telephone access to the control room to define evacuation procedures. The blue light station would also have a traction power emergency disconnect device.

At the south end of the line a spur track would be provided for disabled vehicles and temporary storage. At the north end of the line the spur track would be incorporated into the underground operations and maintenance facility.

It is assumed the cut-and-cover area used for tunnel excavation could later be used as the site of the underground maintenance facility. As conceptually planned this could be on the east side of the line in the parking lot just south of the restaurant. The site would support the following operations: facilities for staff, a storage area, the control center, automated train control systems, and the traction power systems. It would also house areas for scheduled maintenance, corrective maintenance (tool storage, work pits, electrical and machine shops), component testing and repair, parts storage, and vehicle cleaning.

Given the likelihood that the AGT would be provided at limited times, it would be reasonable to determine if there were any ways to increase the economy of operation or reduce facility needs. It might be possible to consolidate all functions except pure maintenance into existing Bowl offices. This would reduce the need for staff facilities (office space, control room, rest rooms, etc.) that would only be occupied part-time. This would be subject to the space needs of the Bowl. The communications functions, in particular could be integrated into the surface management of traffic flow as well.

4. LAND USE IMPACTS

This section describes the land use impacts anticipated with each of the alternatives.

The Metro Rail Transit Connector could influence land use in several ways. First, right-of-way could be taken directly. Second, land use itself can be influenced by the activity level of the transit service to be provided. Here, a fundamental consideration is whether the transit service is provided during events only or throughout the day and throughout the year. As noted above, it is anticipated that a transit connector to Metro Rail would only be supplied during events, because with the opening of the Hollywood Highland Metro Rail Station, a good surface transportation link will be available in the form of Route 420.

With transit service limited to event periods only, the influence on land use would be diminished. Essentially the influence on land use would be a function of the activity level at the street level. This means that the subsurface alternatives would have virtually no influence on land use.

4.1 NO ACTION ALTERNATIVE

The No Action Alternative is the base condition for environmental impacts and, therefore, by definition, there would be no impacts to land use by this alternative.

4.2 TSM ALTERNATIVE

A TSM Metro Shuttle would increase activity at the Hollywood/Vine Station in the evening hours. The details of master planning at this station have not been finalized, therefore it is unknown precisely where the loading of the Metro Shuttle would occur with respect to the station pedestrian portal. The portal itself will be on the south side of Hollywood Boulevard east of Vine, and it is expected that the portal would front to the south facing the bus terminal area. Trips to the Hollywood Bowl are spread over time and sometimes include eating. Picnicking and dinner are encouraged at the Bowl. Some patrons of Metro Rail who use the Metro Shuttle might stop for dinner along Hollywood Boulevard on the way to an event at the Bowl. Similarly, those departing the Bowl after an event might stop for entertainment in the form of after-event eating or drinking near the Hollywood/Vine Station. In either case, it is anticipated that there would be a net increase in pedestrian circulation and activity on the nights of Bowl events.

There is parking in the immediate vicinity of the Hollywood/Vine Station that might experience increased demand during events. This would not change land use, but could increase its already designated use.

4.3 TSM WITH GRADE SEPARATION

The land use impacts of the TSM with Grade Separation Alternative would be the same as those with the TSM Alternative itself. All options would have the same basic operation at the Vine Station. The closer headways of the Metro Shuttle after events with the long

tunnel concept would require use of the south curb of Hollywood Boulevard as well as the bays in the planned bus terminal.

4.4 SUBSURFACE WALKWAY

Because this alternative would be entirely subsurface end-to-end, with no access to street level except via the Metro Station pedestrian portal at Highland Avenue, there would be virtually no impact on land use. The only right-of-way requirement would be for midpoint evacuation staircases, if these are determined to be necessary. These would occupy land but would not influence land use. Most probably any evacuation point would be located within public right-of-way.

It is likely that there would be some very small marginal increase in activity at the surface level of Hollywood Boulevard as a consequence of the increased through-movement of people at the Hollywood/Highland Station. However, it is unlikely that the magnitude of this increase in person flow would have an affect on land use. There would be no reason to emerge from underground on the trip to or from the Bowl, unless a walk down Hollywood Boulevard were incorporated into the evening out.

4.5 SUBSURFACE AGT

The comments with regard to land use for Subsurface AGT are the same as for the Subsurface Walkway.

5. ECONOMIC IMPACTS

This section describes how the alternatives may affect the local economic environment, including the Bowl operations.

5.1 NO ACTION ALTERNATIVE

The No Action Alternative serves as the base for comparison, therefore, by definition there would be no impacts under this alternative.

5.2 TSM ALTERNATIVE

There would be several influences of possible economic consequence. Economic effects on the local business community would be very minor, but positive, with the TSM Alternative, based on a slight increase in person throughput at the Hollywood/Vine Metro Rail Station.

Otherwise, the economic impacts would largely focus on and be related to financing of the Metro Shuttle bus operation itself and how this affects the economics of the Hollywood Bowl operation and SCRTD. Traffic operations at the Bowl now require extensive monitoring and control before and after events. The shift of individuals from auto to buses and from BowlBus buses to Metro Shuttle buses would affect operations, but it is believed that the number of people employed and the total hours of employment at the Bowl would not decrease substantially. Rather, activities on the part of the individuals would change somewhat as traffic patterns shifted. Even with reductions in auto demand at the Bowl, parking is still expected to fill at all major events, and background traffic on Highland will continue to increase.

Changes resulting from the alternatives related to parking and vehicular demand are summarized in Table 5-1. As can be seen the TSM Alternative would have the least effect on local traffic volumes, with a net decrease in demand compared to supply of 520 vehicles. This figure is derived by examining several effects. First parking supply at the Bowl would be decreased by about 70 spaces when the lot north of Odin is taken for Metro Shuttle operations. Second, it is assumed that termination of BowlBus service to Westwood and Santa Monica would result in some autos back on the road (+113). Next, some persons would be attracted out of their autos to use Metro Rail (-303). Finally, some drivers would no longer park at the Bowl, but at cheaper parking near the Vine Station (-400). This results in a net change of 520 fewer vehicles with respect to parking supply, or 590 fewer autos on the road, near the Bowl entrance. There would, however, be about 45 more buses. Bus activity would be limited to Odin and the Hollywood Freeway, just touching on Highland.

The change in auto demand versus supply demonstrates what has been referred to earlier as a softening of demand for Bowl parking. It could influence the pricing of parking at the Bowl. In examining this issue, several things should be kept in mind. The patronage forecast is for 2008, and so Metro Rail ridership using the shuttle would not reach the

estimated level until that date. Thereafter it would continue to increase. On the other hand, those wishing to park at a remote location could do so as soon as the shuttle went into operation. The data in the table also reflect a major event. Effects would be lesser at lesser events or in earlier years. The effect on parking demand would depend upon the year and the size of the event.

TABLE 5-1

CHANGES IN PARKING AND VEHICULAR DEMAND - MAJOR EVENT

Type of Change	TSM	TSM TUNNEL	WALK- WAY	AGT
Change in Supply				
Loss of spaces in lot north of Odin	-70	-70	0	0
Change in Demand				
Increase in autos from BowlBus Park & Ride	+113	+113	+113	+113
Diversion from auto mode	-303	-462	-751	-783
Use of add. 400 spaces near Vine Station	-400	-400	0	0
Use of add. 200 spaces near Highland Station	0	0	-200	-200
Net Change in Supply Minus Demand	-520	-679	-838	-870
Changes in Buses After a Major Event				
Decrease in BowlBus Park & Ride	-15	-15	-15	-15
Increase with Metro Shuttle after Event	+60	+68	0	0

The TSM Alternative would result in the loss of about 70 parking spaces now used by the public during events. The typical parking charge in this lot is \$8 per car. Assuming full use of this lot for 64 events would result in a loss of revenue to the Bowl of \$36,000 annually. For smaller events when the lots do not fill to capacity and latent demand for parking does not fill the lots, an additional loss to the Bowl would be expected.

The Bowl's marginal loss in parking charges would be a marginal gain for the private sector in the Vine Station area. If a parking charge of \$2 were imposed by lot owners and an annual average of 300 spaces were used per event (400 for peak events), then such owners could realize \$38,000 in the year 2008.

If the Metro Rail Shuttle were a service fully funded by SCRTD as an extension of Metro Rail, and the service resulted in reduced BowlBus service requirements, the Bowl would

gain. Presently, the Bowl pays the difference between the bus service assigned by public providers and the fares received. For 1991 the net cost to the Bowl for BowlBus Park & Ride service, provided by SCRTD, Santa Monica (to Westchester), Foothill Transit, and Long Beach was about \$650,000. This figure does not include service to downtown Santa Monica or the Zoo, that was instituted in 1992. If service to Westwood and Santa Monica were terminated there would be a savings to the Bowl of about \$120,000, annually.

If the Bowl made up the difference between the cost incurred by the Metro Rail Shuttle service provider and the fares received, there could be a considerable increase in the financial burden on the Bowl.

5.3 TSM WITH GRADE SEPARATION

The comments for the TSM Alternative are applicable to this alternative as well. To the extent that patronage on a Metro Shuttle were higher with this alternative, the economic effects would run in parallel. If 68 buses were used to make runs after major events, the bus demand for this alternative would be more than double that of the TSM Alternative. If the Metro Rail Shuttle required a subsidy from the Bowl, there would be an additional financial burden on the Bowl.

5.4 SUBSURFACE WALKWAY

There is less parking available in the Hollywood/Highland station area than in the Hollywood/Vine station area. Therefore, the transit linkage supplied in the form of a subsurface walkway would be less liable to expand parking opportunities than would the Metro Shuttle service to the Vine Station. At the same time, those using the subsurface walkway would connect at the mezzanine level of the Hollywood/Highland Station; therefore, those parking at a remote location in this area would have to go through a grade change, down to the walkway from street level. The combination of the grade level change and less available parking in the Hollywood/Highland station area would appear to indicate that the market share of ridership on a subsurface connection to the Bowl would be diminished, compared to the market share at Vine.

The principal economic effect of this alternative would be the question of ownership, operation, and funding of a subsurface walkway.

5.5 SUBSURFACE AGT

The comments with respect to the subsurface walkway are also applicable to this alternative.

6. SOCIAL IMPACTS

This section focuses on impacts to people, principally Bowl patrons, and those who live near the Bowl.

6.1 NO ACTION ALTERNATIVE

The No Action Alternative is the base for comparison of the environmental impacts. With it the quality of transit service to the Bowl would not be improved, congestion at the Bowl would not be reduced, and the mandate of the city of Los Angeles to provide a transit link would not be fulfilled.

6.2 TSM ALTERNATIVE

There would be no residential or business relocations under any of the alternatives, therefore, the principal impact in terms of social effects would be on users, that is to say Bowl patrons and local neighborhoods. Dealing with the latter first, the principal change with the TSM Alternative would be the substitution of some buses for auto traffic in the immediate Bowl area. These changes are noted in Table 5-1. They would reduce congestion and its attendant deleterious consequences for the local neighborhoods. Auto trips would decrease, but bus trips would increase. These bus trips, however, would not be in areas that exposed neighborhoods to increased bus traffic, assuming an Argyle/Hollywood Freeway routing.

Pedestrian tunnel construction would occur in the sidewalk on the east side of Highland Avenue, if utility avoidance supports this location. The intent is to minimize interference with traffic on Highland Avenue, as well as utility relocation costs. The tunnel extension under Odin would require brief closings of the lanes on Odin. Not all lanes of Odin would have to closed at once. Construction could be at night (subject to community review) for the most part to avoid traffic conflicts, and would not be during the Bowl season.

Handicapped access to the Bowl would be improved with installation of elevators at either end of the pedestrian tunnel under Highland Avenue.

6.3 TSM WITH GRADE SEPARATION

Comments for this alternative would be the same as TSM Alternative. There would be some additional impacts related to this alternative due to the construction requirements of the tunnel under Highland Avenue and on the Bowl site. With respect to impacts on people, the construction within Highland Avenue would be of greatest concern.

Tunnel construction and utility relocation would require temporary closing of Highland Avenue. Because Highland has a median at this point, and because northbound an Odin/Cahuenga detour is available, there are options for traffic flow mitigation. The

intense volumes on this roadway make it clear, however, that the construction will have to be staged carefully and incrementally, to minimize traffic delays.

This alternative would require a change in the bus passenger count procedure, and additional provisions would have to be instituted to ensure that riders could find their buses after the event.

6.4 SUBSURFACE WALKWAY

This alternative, like the TSM Alternative, would marginally reduce auto traffic in the Bowl area but without increasing bus activity. Thus, it and the Subsurface AGT Alternative would have the most beneficial effect with respect to traffic congestion. Construction impacts would be minimal due to the tunnel boring procedure and the fact that excavated material would be removed from the parking lot at the Bowl. Haul vehicles would have direct access to the Hollywood Freeway and would not have to traverse local streets.

A potential issue could be the construction of escape hatches, or outlets for fan and vent shafts, from the underground system. Assuming that a surface footprint would be required, the positioning of surface construction would be subject to local debate. It is uncertain whether escape stairways would be required with the walkway system. If they were required they could possibly be located at Franklin and Camrose. If a headhouse (an above-ground shelter at the point where the escape route emerged from the ground) were required, it would have to be positioned to minimize visual conflict, while maintaining safety. Alternatively the use of flip-up escape hatches, flush with the sidewalk could be explored. Visual intrusion could be an issue with respect to the First Methodist Church, which is potentially eligible for the *National Register of Historic Places*, and the neighbors on Camrose.

The subsurface alternatives would provide the best access for disabled persons between Metro Rail and the Bowl. This is particularly so because there would be no grade level changes required except that within the Hollywood/Highland Metro Rail Station itself, from the platform to mezzanine level. The underground alternatives similarly have the advantage of ease of use. The underground walkway would be subject to safety considerations and the unavoidable problems associated with belt and handrail changes.

6.5 SUBSURFACE AGT

The comments for the Subsurface Walkway apply for to the AGT, as well.

The AGT traditionally has an outstanding safety record.

7. NATURAL ENVIRONMENT IMPACTS

Because the alternatives would either operate at the surface with very minor physical changes or subsurface, the impacts to the natural environment would be very minor. This section describes those impacts by issue area. The issues of greatest concern are air quality, noise, ecologically sensitive areas, cultural resources, and aesthetics.

The No Action Alternative serves as the basis for analysis of environmental impacts and so by definition there would be no impacts, except insofar as the pattern of congestion at the Bowl entrance before and after events would continue and the mandate of the city of Los Angeles to provide a transit link between Metro Rail and the Bowl would be unfulfilled.

7.1 AIR QUALITY IMPACTS

Air quality impacts are a function of the anticipated auto vehicle miles of travel (VMT) reduction expected with the alternatives, and any reduction in congestion with the project. The congestion around the immediate area of the Bowl is obviously very intense before and after major events. Each event is slightly different depending on the number of buses that come in from the various BowlBus locations and the overall event crowd size. Taken together with variations in the background traffic at the early evening hour, on week nights and on weekends, it is extremely difficult to characterize the congestion level on any given night. However, several observations can be made.

Diversions from existing Bowl attendance that would result in the greatest air quality benefit would be from those who are now auto drivers for their entire trip to the Bowl. The benefit accruing from the alternatives is the relative diversion of this market share for each of the alternatives. While every shift to Metro Rail is significant from the standpoint of being a plus for air quality, the marginal differences in patronage among the alternatives are negligible against the backdrop of traffic volumes on the adjacent Hollywood Freeway and on Highland Avenue, especially considering the number of event nights out of the total year.

Using the distribution of trips available from BowlBus Park-&-Ride data, it was determined that the average trip length of auto drivers (if the pattern is similar to that of bus users) is approximately 25 miles, one-way. The diversion of persons from existing autos to transit under the TSM Alternative is 36,500. The annual shift back to the auto from discontinued Westwood (8 miles, one-way) and Santa Monica (10 miles, one-way) Bowlbus service would be an estimated 13,600 persons. Based on these data and an assumed auto occupancy rate of 2.5, the net annual reduction in vehicle miles of auto travel would be about 500,000.

The annual decrease in pollutant burden resulting from reduced automobile ridership would be about: carbon monoxide - 4.4 tons; total hydrocarbons - 0.44 tons; non-methane hydrocarbons - 0.38 tons; oxides of nitrogen - 0.87 tons; sulfur oxides - 0.11 tons; and, particulates - 0.16 tons. The benefits would be offset marginally with the TSM alternatives, because there would be more buses in service. The benefits of diversion from the auto mode are shown in Table 7-1.

TABLE 7-1**POLLUTANT BURDEN REDUCTION
(Year 2008 in Tons)**

Pollutant	Alternatives			
	TSM	TSM - Tunnel	Sub. Walkway	Sub. AGT
Carbon Monoxide	4.37	6.67	10.83	11.37
Total Hydrocarbons	0.44	0.67	1.09	1.14
Non-Methane Hydrocarbons	0.38	0.57	0.94	0.98
Nitrogen Oxides	0.87	1.33	2.16	2.25
Sulfur Oxides	0.11	0.17	0.27	0.28
Particulates	0.16	0.24	0.40	0.41

The subsurface alternatives are presumed to have a greater benefit than the TSM alternatives, apart from the mode shift, due to the fact that both buses and autos are substituted for, either by a moving beltway or electrically powered AGT vehicles. The technology of the buses that would be in service in the year 2000, or later in 2008, remains to be determined. Electric or other alternatively fueled vehicles are possible, at least as part of the fleet. Needless to say, however, buses will continue to be "cleaner" due to the mandates of the Clean Air Act. By 2008 complete fleet turnover will have occurred such that all vehicles will at a minimum meet the new PM10 (fine particulate) standard.

Traditionally, bus queuing in a tunnel could lead to substantial air quality problems. Regardless of the technology of the buses to be used in the design year for service in an underground configuration, it is clear that the ventilation system in the tunnel will have to be adequate to deal with these bus pollutants. Presuming the continuation of a diesel fuel technology, a substantial amount of air flow would be necessary to reduce the intensity of diesel fumes in the tunnel. If electric buses were used, the need for ventilation would be greatly reduced. Liquid natural gas, methanol, and propane fuel buses have superior emission characteristics, but ventilation would have to take into effect the outputs of these engine types as well.

7.2 NOISE

Noise issues with respect to all the alternatives would be virtually negligible. The Metro Shuttle operations would operate over one section of Argyle where there is housing. However, the proximity and the elevation of the Hollywood Freeway at this point, as well as surface street traffic on Hollywood Boulevard and Franklin would overshadow any noise generated by the bus shuttle. Otherwise its operations would be on the freeway itself or confined to the immediate Bowl area where it would contribute only marginally to the noise and congestion associated with operations there today. Both the subsurface walkway and AGT have very minimal noise effects as anyone who has used these systems will observe. There would be no noise impacts from either of these technologies because of the depth of their tunnels.

7.3 ECOLOGICALLY SENSITIVE AREAS

The only impact on any ecological sensitive area would be related to removal of landscape materials at the Bowl. The TSM Alternative would require the removal of some materials for the cut-and-cover construction of the pedestrian tunnel on the east side of Highland Avenue. Vegetation would also be removed where elevators for the handicapped were constructed.

The TSM with Tunnel Alternative would require removal of vegetation outside the box office area within the Hollywood Bowl, if the "long tunnel" option were implemented. The cut-and-cover tunnelling technique that would be used to implement the underground bus loop within the Bowl would require total removal of any surface landscaping above the cut-and-cover section (see Figure 2-7). One can also see the likely portal location for a subsurface walkway or AGT, which would be located between the restaurant and the rest rooms. It is anticipated that this portal area would have minimal impact due to the steepness of the hillside from which the tunnel would emerge. (If the portal were to emerge into a flat area, a long open area would be necessary, extending from the portal.)

The Subsurface AGT Alternative could also result in removal of trees from the parking area on the west side of Highland Avenue south of the main Bowl entrance (Figure 2-3b). It is anticipated that, if the Subsurface AGT Alternative were implemented, the maintenance facility would be built in this area with cut-and-cover construction. The extent of tree removal would depend on the size and location of the maintenance facility. There would be no known impacts to any sensitive species or habitat areas as a function to any of the alternatives.

7.4 CULTURAL RESOURCES

The Hollywood Bowl is eligible for the *National Register of Historic Places*. Consequently, the State Historic Preservation Office will have an interest in any modifications to the Bowl or its immediate environs. It was due in part to these considerations that a grade separation overhead across Highland Avenue was eliminated. For the same reason, it is recommended that any pedestrian connections be placed underground rather than overhead. Any overhead

pedestrian connections serving the Metro Shuttle or BowlBus Park-&-Ride buses that use the median area of Highland Avenue would have similar concerns. It is anticipated that the State Historic Preservation Office might object to implementation of such overhead structures as an adverse effect on the Bowl.

All of the alternatives would enhance the viability of the Hollywood Bowl from the standpoint of its operations. This has a positive effect on the National Register status of the Bowl, as it supports the traditional use of the Bowl as an entertainment facility. This means it reinforces the attributes of the Bowl that are important to its eligibility for the *Register*.

The greatest concern with respect to cultural resources would be the need for and nature of any above-ground facilities related to emergency escape from the walkway or AGT tunnels, or to elevator headhouses. These might have an effect on National Register or National Register eligible properties. Further engineering analysis and discussion with appropriate regulatory agencies would be necessary to determine the need for and nature of emergency escapeways, and any above-ground features associated therewith.

7.5 AESTHETICS

The aesthetics of the alternatives are closely related to impacts on ecologically sensitive areas and cultural resources. None of the alternatives would call for the construction of major above-ground facilities. The exception could be headhouses at emergency escape points, or fan and vent shafts.

The Metro Bus Shuttle would be blended into the bus terminal now in the master planning review process at the Hollywood/Vine Station. The TSM Alternative would require curb cuts and the removal of some of the landscaping in the triangular parking lot north of Odin and west of Highland Avenue where the Metro Rail Shuttle staging area would be developed. Where elevators were installed, the housing over the shaft would introduce a new visual element that would have to be integrated into the Bowl landscape.

When modifying the underground pedestrian system under any of the alternatives, it is recommended that the materials around the staircases, especially the railings, be preserved. New staircases could be designed to match the existing design with its Art Deco railings.

8. CONSTRUCTION IMPACTS

Construction impacts can be significant in highly congested areas, especially where maintaining access is a problem. This section reviews anticipated construction impacts related to traffic maintenance, access, noise, congestion, and other construction-related considerations.

8.1 NO ACTION ALTERNATIVE

There will be no construction impacts under the No Action Alternative.

8.2 TSM ALTERNATIVE

There will be very minor impacts due to construction at the TSM Metro Rail Shuttle staging lot on the east side of Highland Avenue north of Odin. Curb cuts would be made off of Odin where there is an existing driveway and a new curb cut would be constructed from Highland Avenue. These construction elements should be performed with the minimum of impact to street traffic. The pedestrian tunnels planned for improved provision of pedestrian access to the staging areas would be built using cut-and-cover construction techniques within the sidewalk of Highland Avenue on the east side north of Odin, and in the median of Highland. These linkages would to the south side of Odin. The cut-and-cover construction used for the crossing of Odin would result in temporary traffic delays, however, the relatively narrow width and depth of the cut would allow it to be covered and traffic maintained overhead during most of the construction. Relocation of utilities in this area could result in the greatest time requirement. All of this construction activity would occur outside the event season.

8.3 TSM WITH GRADE SEPARATION

The impacts of this alternative would be similar to, but of greater magnitude than the TSM Alternative. Both the bus tunnel and pedestrian tunnel would be constructed across Highland Avenue, necessitating delays and detours. Excavation would be segmented and sequenced to minimize impacts.

8.4 SUBSURFACE WALKWAY

Construction activity would have to be closely integrated with development of Metro Rail to assure the most cost-effective means of coordinating construction activity, especially excavation.

The seasonal nature of activity at the Bowl and the presumed availability of the parking lot on the west side of Highland Avenue as both an excavation point and a construction staging area, help alleviate much of the potential for construction impacts. Immediate access to the Hollywood Freeway for haul vehicles would also help minimize impacts.

8.5 SUBSURFACE AGT

Construction impacts would be the same as for the Subsurface Walkway Alternative, except that two tunnels would be bored and the maintenance area would also be excavated. These facts would lengthen the construction period.

9. CAPITAL COSTS

This section delineates anticipated capital costs for each alternative, including design, right-of-way acquisition, construction, procurement, agency and insurance, and construction management and contingencies. Contingency, design, and construction management costs have generally been assumed to be 40 percent of construction/procurement costs. Insurance and agency cost have been assumed to be 20 percent of construction/procurement costs. Costs for the alternatives are summarized in Table 9-1. These are preliminary capital cost estimates for planning purposes only and do not represent engineers' estimates.

9.1 NO ACTION ALTERNATIVE

No costs are assumed to be associated with this alternative.

9.2 TSM ALTERNATIVE

The bus needs for this alternative are as follows: 6 to 7 p.m. - 6 buses; 7 to 8 p.m. - 11 buses; 8 to 8:30 p.m. - 4 buses; and, after the event - 26. If SCRTD were to provide the transit service, the most critical period of bus need would be from 6 to 7 p.m. on week nights. SCRTD now provides the majority of buses for BowlBus service. The buses that are used early in the evening are drawn from the normal pool of "spares" that SCRTD keeps available at all times as backup vehicles. Presently SCRTD has more than a twenty percent spare availability. In future the percentage of spares will drop to FTA's guideline of twenty percent. This will inhibit SCRTD's ability to provide special services, such as the BowlBus Park & Ride service. SCRTD is also in the process of redefining its "peak period" and will likely lengthen the evening period to 7 p.m. Buses must come off the regular run and be cleaned before being sent out to provided service to the Bowl. Based on discussion with SCRTD staff, if SCRTD were the service provider for the Metro Shuttle, it may be that six additional buses would have to be acquired, if the spare ratio were reduced, because the first hour of service to the Bowl would be during the 6 to 7 p.m. time frame to be considered within the SCRTD peak. That is service to the Bowl would increase peak period demand by six buses. The demand for buses at the Bowl later from 7 to 8 p.m. and 8 to 8:30 p.m. is greater, but is outside SCRTD's peak. The assumption of a need for six buses has been made for the capital cost estimate. Depending on the funding source a vendor could also provide the service. If this were so, there would be no capital cost.

The non-bus capital cost elements of the TSM Alternative are confined to the Bowl area. It is assumed that the ultimate resolution of master planning for the Hollywood/Vine Station can accommodate the Metro Shuttle needs without major adjustment or retrofit.

At the Bowl curb cuts would be made to allow access and egress at the staging lot. The pedestrian tunnel under Highland would be left in tact, but would be extended south under the median of Highland Avenue and under the sidewalk on the east side of Highland Avenue to the south side of Odin. There would be new entry stairways, and elevators for the handicapped. Cost has been assumed for an elevator on the west side of Highland, as

TABLE 9-1
PRELIMINARY CAPITAL COSTS
(1,000s of 1993 Dollars)

Alternatives		Construction & Procurement	Contingency, Design & Cons. Management	Right- of- Way	Insurance & Agency	TOTAL
TSM						
1	Buses - 6	2,358	943	0	472	3,773
2	Curb Cuts	33	13	0	7	53
3	Pedes. Tunnel East	1,000	400	0	200	1,601
4	Pedes. Tunnel Median	1,072	429	0	214	1,715
5	Stairwells - 4	40	16	0	8	64
6	Handicapped Elev. - 2	150	60	0	30	240
7	Utility Relocation	Unknown	0	0	0	0
8	Landscaping	23	9	0	5	37
9	Signage & Lighting	46	18	0	9	73
	TOTAL	4,722	1,889	0	944	7,556
TSM - Long Tunnel						
1	Buses - 7	2,751	1,100	0	550	4,402
2	Curb Cuts	20	8	0	4	32
3	Pedestrian Tunnel	1,501	600	0	300	2,401
4	Ped. Tun. Stairwells - 3	30	12	0	6	48
5	Ped. Tun. Elevators - 2	150	60	0	30	240
6	Bus Tunnel	18,480	7,392	0	3,696	29,568
7	Bus Tun. Escalators - 2	1,500	600	0	300	2,400
8	Bus Tun. Stairwell - 1	15	6	0	3	24
9	Ventilation	1,000	400	0	200	1,600
10	Bus Tun. Handicp. Elev.	100	40	0	20	160
11	Utility Relocation	Unknown	0	0	0	0
12	Landscaping	217	87	0	43	347
13	Signage & Lighting	217	87	0	43	347
	TOTAL	25,980	10,392	0	5,196	41,568
Subsurface Walkway						
1	Tunnel	18,330	7,332	500	3,666	29,828
2	Escape Stairs - 2	400	160	0	80	640
3	Walkway	8,580	3,432	0	1,716	13,728
4	Ventilation	500	200	0	100	800
5	Lighting/Elec.	117	47	0	23	187
	TOTAL	27,927	11,171	500	5,585	45,183
Subsurface AGT						
1	Tunnel	36,660	14,664	540	7,332	59,196
2	Escape Stairs - 2	400	160	0	80	640
3	Platform Areas - 2	300	120	0	60	480
4	Vehicles & Control	16,537	6,615	0	3,307	26,459
5	Trackway	7,910	3,164	0	1,582	12,656
6	Storage and Main.	3,703	1,481	0	741	5,925
7	Ventilation	500	200	0	100	800
8	Lighting/Elec.	351	140	0	70	562
	TOTAL	66,361	26,544	540	13,272	106,718

well. Other costs would be for utilities, landscaping, and making other minor site improvements. Utility costs are unknown at this time. This figure could vary substantially, depending on the actual nature of utilities present at the site.

9.3 TSM WITH GRADE SEPARATION

The higher patronage associated with this alternative means an additional bus would be required in the peak hour and so a capital requirement of seven buses is assumed.

The cost of the bus tunnel would be high, and would represent most of the cost of this alternative. Potentially lower cost bridge and tunnel alternatives proved infeasible.

9.4 SUBSURFACE WALKWAY

The principal cost associated with this alternative is the tunnel cost. This cost estimate was based on a single bore tunnel using unit costs for Metro Rail from the Rail Construction Corporation as a guide.

9.5 SUBSURFACE AGT

The principal cost of this alternative would be the double bored tunnels. This alternative would have the highest capital cost due to the tunnel, but also the need for special vehicles and an operation and maintenance facility. For this system no spare vehicles have been assumed. The costs presented for vehicles, trackwork, train control, maintenance equipment, and other elements apart from the basic tunnel and maintenance structure were developed in conjunction with AEG Westinghouse.

10. OPERATING COSTS

The alternatives vary in operating costs due to the varying characteristics of the systems. This section gives a realistic overview of potential operating costs. These costs reflect service to events only. This means there would be activity on 60+ evenings a year.

10.1 NO ACTION ALTERNATIVE

There would be no costs associated with this alternative.

10.2 TSM ALTERNATIVE

Section 15 data available from the Federal Transit Administration indicate a cost per hour for bus service of \$81 for fiscal year 89-90 for SCRTD. Based on the number of buses required for service prior to and after events and the assumption that buses deadhead (non-revenue service) to and from division storage points both before and after events, the estimated annual operating cost for this alternative would be \$300,000 (Table 10-1).

TABLE 10-1
ANNUAL OPERATING COSTS

Alternative	Annual Operating Cost
TSM	\$300,000
TSM - Tunnel	596,000
Subsurface Walkway	90,000
Subsurface AGT	\$1,390,000

10.3 TSM WITH GRADE SEPARATION

The additional bus requirement, especially after events, when buses each made a single run rather than two runs, would almost double the operating cost of this alternative over the basic TSM Alternative. It is possible that the reduced vehicular conflicts and improved pedestrian connections with this alternative could reduce staffing needs slightly on the part of the Bowl during some events.

10.4 SUBSURFACE WALKWAY

The proposed system can be maintained by vendors who service escalators and moving walkway systems. The Bowl has moving ramp systems in place already and so it has

experience with such vendors. The proposed system uses standard parts: passenger belts, drive belts, handrails and ball bearings. Assuming equivalent standard agreements based on existing systems that include all parts and maintenance and calculating energy use at six hours per event, the annual operating cost of the subsurface walkway would be about \$90,000 per year.

10.5 SUBSURFACE AGT

Discussion with Westinghouse indicate expected operation and maintenance costs for a three month period to be \$1,390,000.

11. COST EFFECTIVENESS

This section relates operating and capital cost data to the patronage that each alternative is expected to generate over and above that which could be attracted by a TSM Alternative. The formula used by the Federal Transit Administration compares the costs of the "build" alternatives to the TSM base. Incrementally increased annualized capital costs are added to annual operation and maintenance costs. The travel time savings of TSM riders are then subtracted from this figure (recognizing it as a benefit. This resultant dollar figure is then divided by the incremental, "new" ridership that would be attracted by the "build" alternatives over the TSM condition. The result is the cost-effectiveness index. These are shown in the lower right corner of Table 11-1.

**TABLE 11-1
COST EFFECTIVENESS**

CAPITAL COSTS (Discount Rate = 10%)					
	Economic Life	Cap.Recov.Factor	Total Cost	Annual Cost	
TSM					
- Construction	30	0.106079	\$2,364,000	\$250,771	
- Engineering	30	0.106079	\$2,834,000	\$300,629	
- Buses	12	0.146763	\$2,358,000	\$346,068	
TOTAL			\$7,556,000	\$897,468	
TSM Long Tunnel					
- Construction	30	0.106079	\$23,229,000	\$2,464,115	
- Engineering	30	0.106079	\$15,588,000	\$1,653,563	
- Buses	12	0.146763	\$2,751,000	\$403,746	
TOTAL			\$41,568,000	\$4,521,424	
				Annual Difference from TSM	\$3,623,956
Subsurface Walkway					
- Construction	30	0.106079	\$27,927,000	\$2,962,475	
- Engineering	30	0.106079	\$16,756,000	\$1,777,464	
- Right-of-way	100	0.100007	\$500,000	\$50,004	
TOTAL			\$45,183,000	\$4,789,943	
				Annual Difference from TSM	\$3,892,475
Subsurface AGT					
- Construction	30	0.106079	\$66,361,000	\$7,039,525	
- Engineering	30	0.106079	\$39,817,000	\$4,223,757	
- Right-of-way	100	0.100007	\$540,000	\$54,004	
TOTAL			\$106,718,000	\$11,317,286	
				Annual Difference from TSM	\$10,419,819

ANNUAL OPERATING AND MAINTENANCE COSTS		
	Annual Cost	Diff. from TSM
TSM	\$300,000	\$0
TSM Long Tunnel	\$596,000	\$296,000
Subsurface Walkway	\$90,000	(\$210,000)
Subsurface AGT	\$1,390,000	\$1,090,000

TRAVEL TIME SAVINGS FOR EXISTING RIDERS (valued at \$2.00/hr.)					
	Annual Riders	Annual New Riders	Hrs. Saved / Trip	Hrs. Saved / Year	\$s Saved / Year
TSM	144896	0	0.000	0	\$0
TSM Long Tunnel	164098	19202	0.083	12075	(\$24,149)
Subsurface Walks	166855	21959	0.183	26564	(\$53,129)
Subsurface AGT	170682	25786	0.250	36224	(\$72,448)

COST EFFECTIVENESS INDEX					
	Annualized Change in			Annual New Riders	CEI
	Capital Cost	Oper./Main. Costs	Travel Time Costs		
TSM	\$0	\$0	\$0	0	NA
TSM Long Tunnel	\$3,623,956	\$296,000	(\$24,149)	19202	\$205
Subsurface Walks	\$3,892,475	(\$210,000)	(\$53,129)	21959	\$170
Subsurface AGT	\$10,419,819	\$1,090,000	(\$72,448)	25786	\$449