

CityScale™ Wave

BRT Travel Improvement Plan

Dodger Stadium Case Study



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CityScale

T U R N E R
E N G I N E E R I N G
C O R P O R A T I O N

CityScale Wave BRT Travel Improvement Plan

Dodger Stadium Case Study

1 CityScale Wave and the Big Crowds

CityScale™ speeds light rail, bus, and bus rapid transit in dense urban and regional corridors, by:

- Strategic and tactical control of bus and train ‘best moves’ while coordinating traffic signal Transit Signal Priority and Preemption
- Giving new power tools to drivers, dispatchers, and planners, to manage schedule and headway, passenger loads, and dynamic incident responses.

CityScale Wave delivers major reductions in bus travel time, with reliable schedule performance, and is scalable to carry 10,000 or more attendees per hour to and from high density events at stadiums and major venues.

CityScale is Turner Engineering Corporation’s cloud-based suite of controls, communication, and data that uses and fuses today’s transit assets to deliver major reductions in travel time and improvements in schedule performance.

CityScale Wave is a highly cost-effective and flexible solution to bring Waves of express buses into and out of event centers, from / to all directions. CityScale Wave uses cloud-based dynamic and adaptive control of city and county traffic signal Transit Signal Priority (TSP) / Preemption, along with dedicated lanes and other traffic flow measures to dramatically reduce the travel time and improve the appeal of bus travel to special events.

The big crowds that come to event centers for games, shows, and events overwhelm everyday transit services and conventional solutions, leading to hours-long travel to and from the events by transit and cars. CityScale Wave provides a ‘flash mob’ of buses to handle the ‘flash mob’ of people who want to come to the big game or big show.

CityScale Wave builds on existing Metro services, staff, buses, and assets and will let Metro flexibly and dramatically expand on its present special services such as for the Taylor Swift concerts and Dodger Express.

CityScale Wave delivers great benefits:

- Utility and flexibility, to bring waves of people from all quadrants of LA county to a major event
- Speeding up bus traffic on city streets
- Cost-effectiveness, compatibility with Metro operations and equipment, and readiness for and ease of deployment
- Scalability, to handle global events like the Olympics as well as regular big events like ball games and concerts
- Support for Metro zero emission fleet deployment, and best use of zero emission fleet to deliver large-scale carbon reduction
- Easing of vehicle traffic at the venue, since each busload of people abates many car trips.

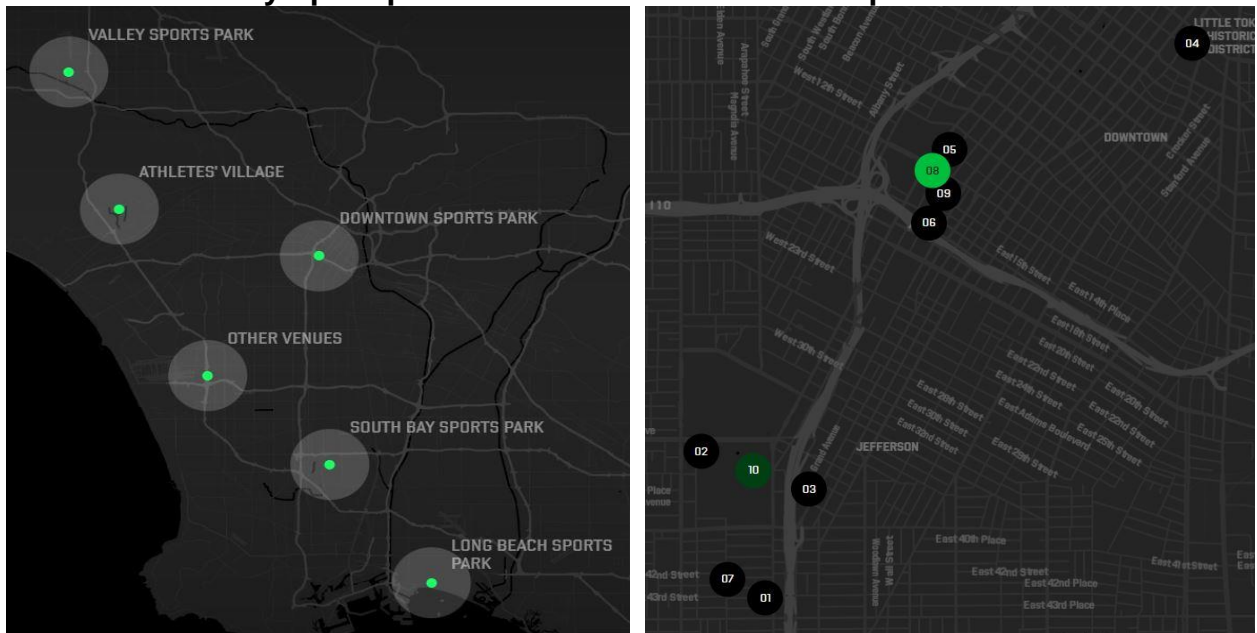
- Step up in transit equity, since Wave can and will serve neighborhoods near and far and provide low-cost, high quality service
- High vehicle service factor, since the same buses that provide Wave service can provide regular Metro service other than during Wave events

CityScale Wave enables important collateral development benefits, including:

- Driving traffic to malls whose parking lots can serve as Wave collection points
- Marketing and communication channels to targeted groups of riders
- Helping venues with limited parking minimize locals impacts by subsidizing Wave, reducing auto traffic
- Useful information about origins, destinations, travel patterns, and riders.

CityScale Wave is the solution for global events like the 2026 World Cup and the 2028 Olympics, and for the many games and shows at sports stadiums and amphitheaters across the region. The 2028 Olympics will play at 32 major sites across six LA region ‘Sport Parks,’ shown on the left in Figure 1-1. The right hand figure is a detail of sites in downtown LA.

Figure 1-1
2028 Olympic Sport Parks and the Downtown Sports Park Sites



Following sections cover:

- CityScale Wave Overview
- Dodger Stadium Case Study, with possible CityScale Wave Stadium Routes
- CityScale Wave by the Numbers
- Stadium Transportation Alternatives.

2 CityScale Wave Overview

CityScale Wave will use cloud-based control to speed waves of express bus rapid transit (BRT) traffic in and out of event centers:

- Using traffic signal Preemption and/or Transit Signal Priority (TSP) to provide lowest delay safe and expedited travel routes for the buses
- Use platoons of buses to minimize disruption of cross traffic and allow continuously adaptable capacity
- Using dedicated lanes where available
- To and from the event centers, to nearby and distant transfer points, destinations, and communities, in all directions.

CityScale Wave will cost-effectively reduce congestion, improve fan experience and satisfaction, serve the Metro region, provide electric transportation service, deliver transit equity, and make best use of Metro and county resources.

2.1 Foundation and Enabling Technology

CityScale Wave uses proven second-by-second bus position reports and sophisticated prediction algorithms to drive traffic control systems (traffic lights) to expedite the travel of each bus on its route, traffic light by traffic light. Applying CityScale Wave to stadium and venue traffic provides an event-specific flow pattern only for the buses that are in this express service.

CityScale Wave operates on a cloud computing platform, communicating with:

- The traffic control systems of the City of LA, and LA County cities and unincorporated areas
- Each bus in the CityScale Traffic Wave, via a simple, safe, rugged two-way digital display to give guidance to the bus operator.

CityScale Wave can work with any bus, with LA Metro, Dash, Santa Monica, Montebello, Foothill, etc. For any buses not already equipped with the basic communication pieces, a portable communication / driver display package can be placed on the bus for the event and removed after.

Importantly, prioritizing CityScale Wave buses will improve traffic conditions before and after events. Waves of buses carrying 100+ people reduce the number of cars approaching venues. The brief impacts of CityScale Wave buses on competing traffic and cross traffic are small compared to the flood of cars, and the precise control of traffic signals ensures that the impacts at each intersection are minimized.

Buses can be run in ‘soft platoons,’ where two or more buses travel together under driver control, minimizing occupancy of intersections with major avenues. In a useful scenario, 3 buses in a soft platoon could depart every 15 minutes, providing the same capacity as 1 bus every 5 minutes, but with reduced cross-traffic impact. Buses can be dynamically added to a platoon at the origin or along the way, to match real-time demand.

The great advantages of CityScale Wave compared to other approaches are:

- Buses can be used for everyday service when there's no game
- Charter buses can provide peak capacity service, by adding a portable communication / display package
- Electric buses provide zero emission service and can be charged at Metro divisions
- Buses, communication equipment, traffic control systems, and CityScale services are all proven, in many cases already installed, and readily available
- Capital and operating costs are very low, and asset utilization and efficiency is high.

For parking at the CityScale Wave collection points, large regional mall parking lots could provide added benefits:

- Event times generally differ from peak business hours, so it's a new and added use for the mall parking lots
- Most importantly, malls will benefit by increased traffic, food court sales, or outdoor 'faire' sales
- Rideshares could also deliver passengers to the malls rather than all the way to the venue
- A modest share of Wave ticket revenue could cover incremental parking lot operating costs, if needed

CityScale Wave will include controls so that authorized public safety and first responders can immediately take control for an intersection, a location, a line, or the system.

3 Dodger Stadium Case Study

Travel in and out of Dodger Stadium for games is slow. The stadium capacity is 56,000 people. The parking lot holds 16,000 vehicles. Present service is by car, bus, rideshare, LA Metro Dodger Stadium Express (DSE), etc.

CityScale Wave will use cloud-based control to speed waves of express bus rapid transit (BRT) traffic in and out of Dodger Stadium:

LA Metro DSE presently runs two routes in prevailing traffic, from Union Station and from South Bay (Harbor Gateway Transit Center Service).

Following subsections are example CityScale Wave Dodger Stadium BRT routes. Traffic studies will refine these example routes, and show how CityScale Wave will dramatically improve travel to and from the stadium, in all directions, across the LA region. Any route can be extended / branched to connect to other transit hubs, park & rides, etc.

3.1 Dodger Stadium Parking Lot Traffic Flow

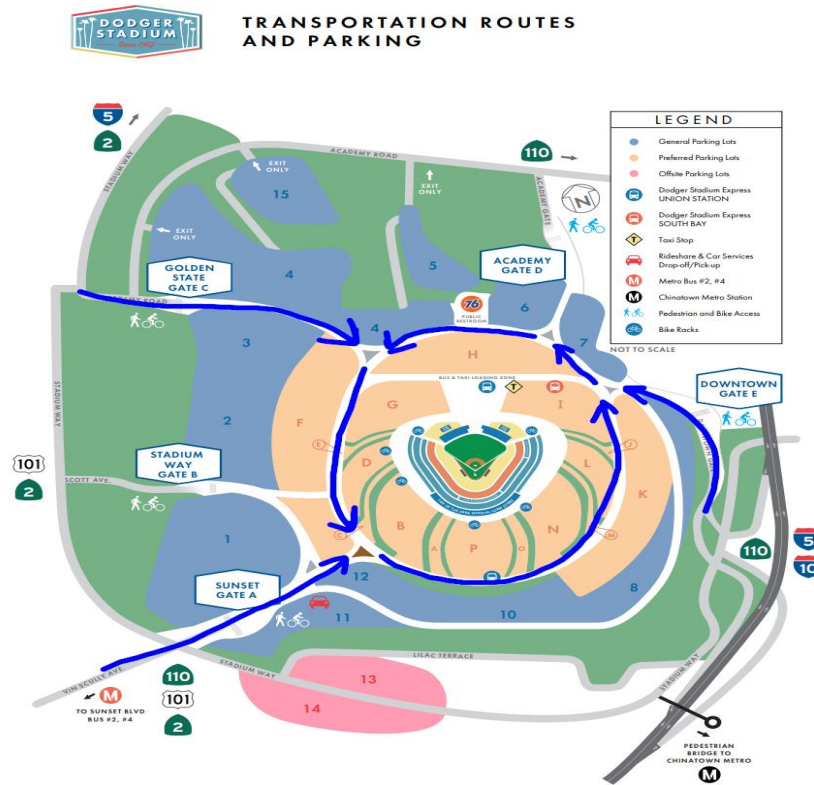
At Dodger Stadium, CityScale Wave will use a single-direction loop where multiple bus routes enter through a gate, circle the stadium and drop riders off at equally-spaced stops, then exit through the same gate. Riders enter and exit the bus at the same location, increasing passenger familiarity with their route back out of the stadium.

This example uses Gates A, C, and E for efficient flow of CityScale Wave buses. This excludes:

- Gate B / Scott Ave due to limited right of way, proximity to candidate Gate A, and poor access to the CityScale Wave loop
- Gate D due to poor access to the Wave loop.

Figure 3-1 shows the proposed CityScale Wave stadium entrance / exit gates.

**Figure 3-1
Possible Wave Routes In and Out of Dodger Stadium**



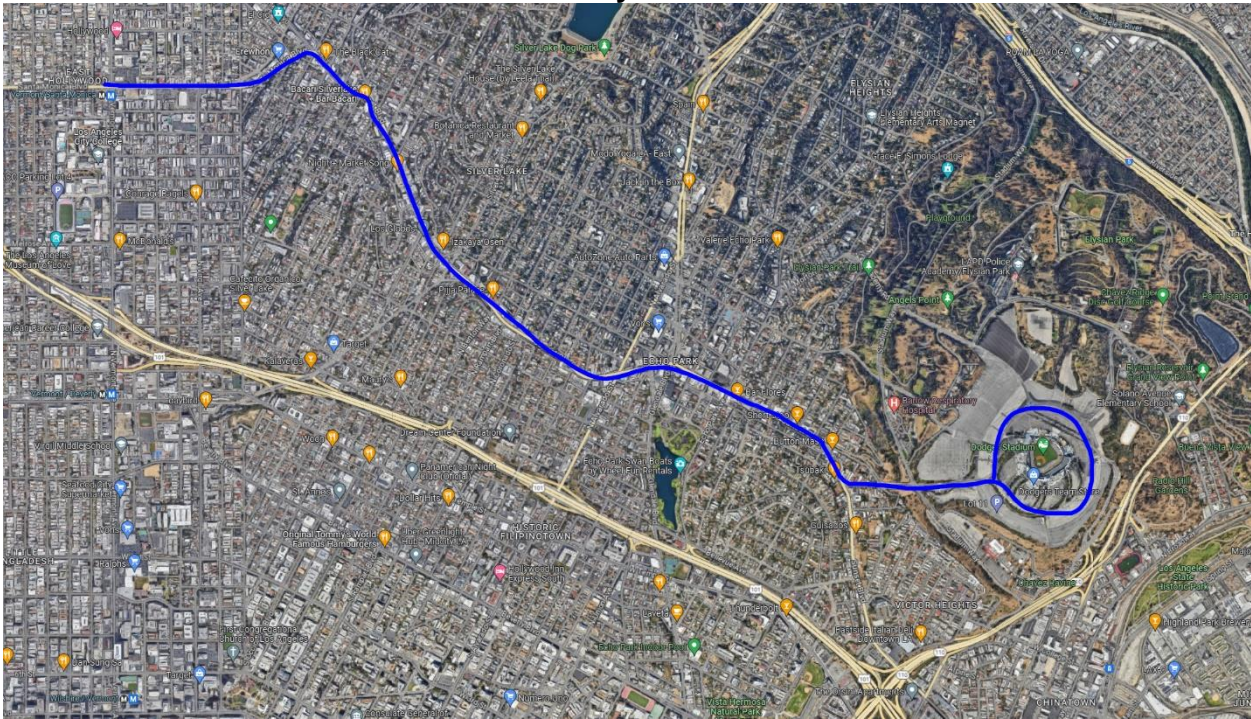
3.2 B Line Subway Station Route

This example route closely follows LA Metro Bus 4 on Sunset Ave. CityScale Wave can use potential future LA Metro dedicated bus lanes on this route.

The route starts at the Vermont / Santa Monica Red Line station, with stops at Vermont / Sunset Station and Sunset / Vin Scully Station. Riders from the San Fernando Valley and Hollywood can transfer from the subway to a Wave bus to get to Dodger Stadium.

Figure 3-2 shows the proposed B Line Subway Station Route.

**Figure 3-2
B Line Subway Station Route**

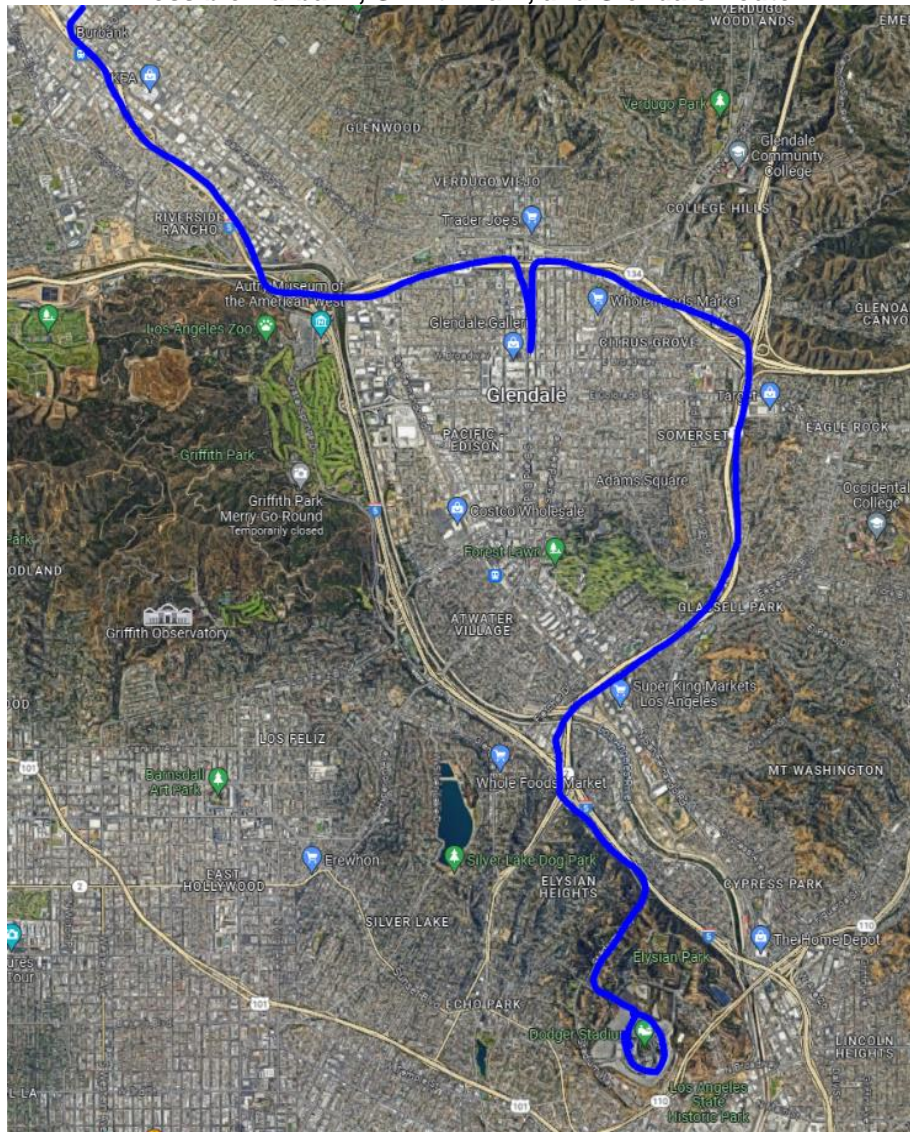


3.3 Glendale / Burbank Area Route

The example Glendale / Burbank Area Wave route connects Burbank and Glendale to Dodger Stadium. It starts at the Burbank Metrolink Station and makes stops at the LA Zoo and the Glendale Galleria, running on the freeway and using park & ride access.

Figure 3-3 shows the proposed Glendale/Burbank area route.

Figure 3-3
Possible Burbank, Griffith Park, and Glendale Route



3.4 Pasadena / Foothills and El Monte Area Routes

The example Pasadena / Foothills Area Wave express route connects Pasadena and the Foothill Area to Dodger Stadium. It starts at the A Line APU/Citrus College Station, stopping at A Line stations in a few Foothill cities along I-210 and downtown Pasadena before continuing to Dodger Stadium:

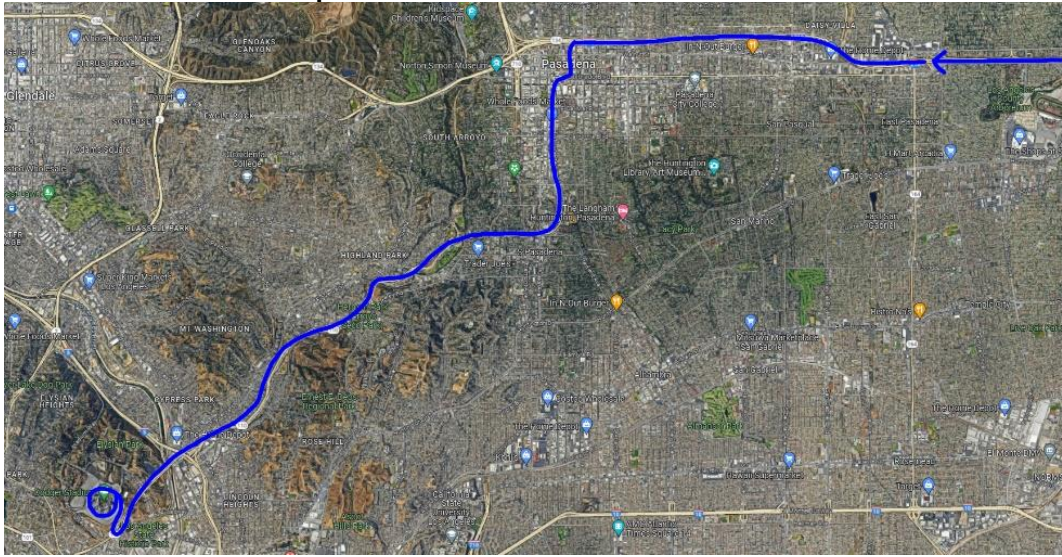
- APU/Citrus College Station
- Monrovia Station
- Sierra Madre Station
- Downtown Pasadena.

The El Monte Area route stops at J Line stations along the I-10:

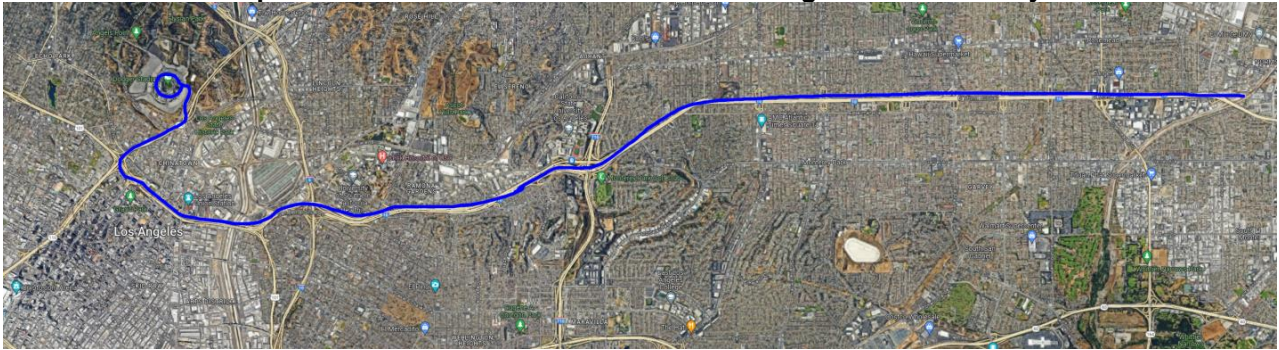
- El Monte Station
- Cal State LA Station
- LAC+USC Medical Center Station.

Figure 3-4a and 3-4b show example Pasadena / Foothills and El Monte Area Routes.

**Figure 3-4a
Proposed Pasadena / Foothill Area Route**



**Figure 3-4b
Proposed Pasadena / Foothill Area Route Using El Monte Busway**



3.5 Existing Dodger Stadium Express Routes

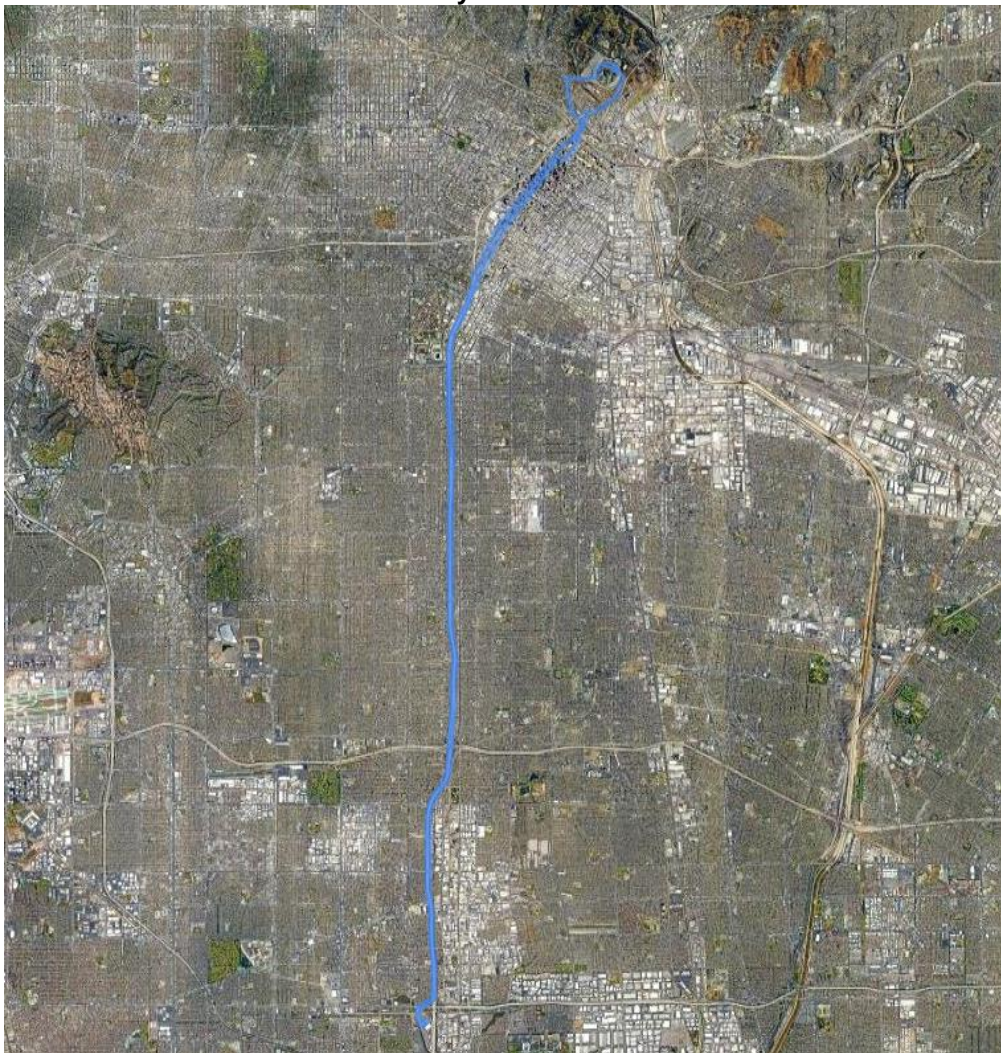
CityScale Wave can incorporate and build on the existing DSE routes, increasing capacity and decreasing travel time. See Section 6 for existing DSE route details.

3.5.1 Harbor Gateway Transit Center Route

The example Harbor Gateway Transit Center Wave express route follows the same Harbor Transitway route as today's South Bay DSE. It starts at the Harbor Gateway Transit Center in Artesia, with stops at J Line stations Slauson, Manchester, Harbor Freeway, and Rosecrans along the 110 freeway.

Figure 3-5 shows the Harbor Gateway Transit Center Route.

Figure 3-5
Harbor Gateway Transit Center Route



3.5.2 Union Station Routes

The Union Station DSE route directly connects Union Station to Dodger Stadium with two routes:

- Sunset Blvd to Vin Scully Ave to Gate A
- Alameda St to College St to Stadium Way to Gate E.

Figure 3-6 shows the Union Station Center Routes.

**Figure 3-6
Union Station Route**



4 CityScale Wave by the Numbers

For the example routes above, Table 5-1 shows the number of buses and the per-hour capacity for service across the LA region.

Table 5-1

CityScale Wave BRT Travel Improvement Plan Dodger Stadium Case Study						
Time Between Buses (min)		5				
Bus Capacity (passengers)		100				
Buses per platoon		1				
Routes						
#	Name	Length (mi)	Service Travel Time (min)	Round Trip Travel Time (min)	Buses to Provide Service	Passengers Per Hour
1	B Line Subway	4.0	21.5	35.6	8	1,200
2	Glendale / Burbank	13.7	35.3	57.5	12	1,200
3	Pasadena / Foothills	26.7	50.1	98.3	20	1,200
4	El Monte	14.1	31.3	63.0	13	1,200
5	DSE Harbor Gateway	15.9	42.5	70.9	15	1,200
6	DSE Union Station Gate A	1.8	8.3	18.6	4	1,200
7	DSE Union Station Gate E	1.7	8.0	22.8	5	1,200
Total per hour					77	8,400
Total per game			Operating hours	2.5		21,000

Key points about the capacity and cost:

Capacity: Capacity can be increased by adding:

- Additional routes: Each route can have the service level needed to serve demand, e.g., headways of 5, 10, or 15 minutes
- Buses in platoons. Buses can be platooned dynamically, to add capacity only in the key hour and key locations before and after an event.

Cost: The dominant cost element in deploying CityScale Wave is the cost of electric articulated buses which costs about \$1 million per bus. The buses can be used in everyday transit service when not in Wave service. The number of buses to be purchased can be managed against usage projections by contracting charter buses to handle peak needs.

Regardless, the capital and operating cost of CityScale Wave are small compared to any other mode, while the beneficial effects are broader, deeper, and more flexible than alternatives.

5 Dodger Stadium Express

DSE presently runs two routes. Partial funding for DSE is from a grant from the Mobile Source Air Pollution Reduction Review Committee.

For comparison to the two routes of the DSE, Hollywood Bowl Park & Ride and Shuttle run to 15 distant locations and 4 nearby locations.

5.1 Current LA Union Station Dodger Stadium Express Service

DSE runs a direct route from LA Union Station (LAUS) to the stadium:

- 10 min headways
- Average travel time: ~20 min
- Starts 90 min before game-time, through the end of the second inning.

Return service runs until 45 min after the final out or 20 min after post-game events:

- 2 stops at the stadium
- Metro Operations staff indicate that buses run every 5 to 10 min, with a 7.5 min frequency being typical (8 bus trips/hr) (DEIR)
- Buses typically take approximately 5 min to load passengers (DEIR)
- A minimum of 7 buses are in operation for this service, with 11 total buses available. (DEIR)
- Metro operates the DSE with 45 ft buses, which have 46 seats. The DSE holds an average of approximately 65 passengers, inclusive of seated and standing capacity (load factor of 1.41), though on higher attendance games, the DSE can hold up to approximately 70 passengers
- With an average of 7.5 min service frequency and an average of 65 passengers per bus, the existing DSE has a capacity of 1,040 riders/hr.

5.2 Harbor Gateway Transit Center Service

The DSE Harbor Gateway Transit Center Service runs:

- 30 min headways
- Passengers can board at Harbor Gateway Transit Center or at intermediate stations at Slauson, Westchester, Harbor Freeway and Rosecrans.
- Starts 2 hrs prior to the start of the game and ends 45 min after games are over or 20 min after a post-game event.
- 1 deboard / board stop at stadium.

6 Stadium Transportation Alternatives

CityScale Wave can augment and improve transportation to Dodger Stadium and similar urban venues. CityScale Wave contributes its significant advantages in concert with today's status quo and other transportation alternatives and developments.

Today's situation and alternatives will benefit from the key advantages of CityScale Wave:

- Flexibility
- Scalability up to very high service levels
- Cost-effectiveness
- Continued utility of principal assets on game days and all other days
- Bringing new consumer traffic and revenue to large regional malls
- Delivering social equity in access to the stadium
- Reducing carbon by using electric buses
- Compatible with established safety and security measures and agencies.

6.1 LA-ART

The LA Aerial Rapid Transit Project (LA-ART) is a proposed aerial gondola in to connect LA Union Station to the Dodger Stadium property, with an intermediate station at the Los Angeles State Historic Park / Chinatown Gold Line Station. The present cost estimate is \$300 m to build, and \$10 m/yr to operate.

6.2 Rideshare

Rideshare services contribute to DSE congestion:

- **Rideshare:** Uber and Lyft use the bus lane to enter Dodger Stadium parking lot, slowing DSE service
- **LA Metro Report:** The increase in the public's usage of rideshare companies (e.g.: Uber, Lyft, etc.) resulted in an increased influx of cars at Dodger Stadium's Sunset Gate. Rideshare cars don't purchase parking and so must enter in the same lane as the DSE. This creates a bottleneck and increases trip times for DSE passengers. The Dodger Transportation Manager and staff made several adjustments to accommodate rideshare, including relocating them to a parking lot prior to the gate to decrease the time they block the entry lane, and rerouting rideshare vehicle exit to avoid U-turn delays on inbound traffic.