3. ALTERNATIVES

3.1. INTRODUCTION

3.1.1. Chapter Purpose and Structure

The purpose of the Alternatives Chapter is to introduce a preliminary set of alternatives, screen these alternatives using and identify a refined set of alternatives to be carried forward into the second stage of the Alternatives Analysis process. The following section describes the screening process and outlines the evaluation criteria and performance measures used to screen the preliminary project alternatives.

The preliminary project alternatives build upon ones included in previous corridor studies and discussed throughout the scoping process. The No Build Alternative, presented in Section 3.2.1, represents the Corridor as it is today along with funded transportation improvements. The Build Alternatives, which are a combination of modal technologies and routing / terminus options that follow major travel markets in the Study Area, are described in Sections 3.2.2 through 3.2.5. Modal options investigated include Bus Rapid Transit (BRT), Light Rail Transit (LRT), Self-Propelled Railcars (SPR), Electric Multiple Unit (EMU) and Commuter Rail Transit (CRT). Off-corridor routing and terminus options forge connections to major regional destinations, and are connected to the northern, central and southern sections of the Metro-owned right-of-way (ROW). These modal and routing / terminus options are combined with relevant travel markets to form an initial list of Build Alternatives for the Harbor Subdivision Study Area. Build Alternatives include the Local North Alternative, Local South Alternative, Regional Alternative and Express Alternative. Lastly, Section 3.2.6 introduces the Transportation System Management (TSM) / Baseline Alternative which represents the benefits that can be implemented in the Corridor through operational improvements (but without a major capital investment).

Components of the Build Alternatives are then analyzed and screened in Section 3.3. This section highlights the benefits and potential impacts for each preliminary routing / terminus and modal option. Routing / terminus and modal options found to have significant flaws are eliminated from further analysis, while all others are recommended to be carried forward. A revised set of Build Alternatives is described in greater detail in Section 3.4.2. Generally, these alternatives are similar to those described in Section 3.2.5, but do not have as many potential routing / terminus and modal options. The No Build and TSM Alternatives are also carried forward for further analysis.

3.1.2. Project Objectives and Screening Criteria

As stated in the Purpose and Need Chapter, five core objectives have been established for the Harbor Subdivision Project. The Stage I evaluation criteria laid out in this section are designed to select alternatives best suited to address these project objectives:
• Improve mobility in southwestern Los Angeles County by introducing high-frequency transit service options.
• Enhance the regional transit network by interconnecting existing and planned rapid transit lines.
• Provide an alternative mode of transportation for commuters who currently use the congested I-405 and I-110 corridors.
• Improve transit accessibility for residents of communities along the corridor.
• Encourage a mode shift to transit, reducing air pollution and greenhouse gas emissions.

The alternatives evaluation process is divided into two stages: an initial screening and a later comparative performance evaluation. The initial screening analysis, performed in this chapter, subjects a comprehensive set of preliminary routing / terminus and modal options to a set of defined criteria to eliminate options that have significant flaws. These alternatives are eliminated from further considerations. The Stage II Evaluation consists of a comparative performance evaluation of the remaining alternatives that compares all alternatives against a pre-defined set of evaluation criteria, and is carried out later in the Alternatives Analysis (AA) Report.

3.1.2.1. Stage I Screening Criteria

The initial screening criteria cover the following major areas:

• **Travel Time** – The initial screening considers travel times to verify that passenger service along the Harbor Subdivision will provide efficient and competitive travel times to and from major destinations throughout the Study Area. Travel times will largely be affected by the type of transit chosen for the Corridor, whether it is local service that operates over a shorter distance at lower speeds with frequent stops or a more regional service that travels over a greater distance at greater speeds and with less frequent stops.

• **Transit Accessibility** – The Study Area provides opportunities to greatly improve transit accessibility to major trip generators and attractors outside of the downtown Los Angeles transit hub. Transit accessibility is defined here as the ability of a new transit service to enhance access to a larger number of destinations and activities above and beyond the existing transit system, and to attract new riders. The routing / terminus and modal options carried forward should meet one or more of the following criteria:
  o Provide more direct service with significantly lower travel times (through higher speeds and fewer transfers) than existing transit service;
  o Enhance connections to areas with limited express transit service;
  o Provide improved access to activity centers and destinations not currently served.

• **Regional Connectivity** – The Harbor Subdivision provides a unique opportunity to support a regional rapid transit system that provides connections between branch lines that serve Los Angeles County’s major subregions. System connectivity can be made possible by the selection of a transit mode that enables interoperability of vehicles between multiple branch lines. In this project, the Harbor Subdivision can serve as the backbone of a
regional rapid transit system serving the South Bay, the Westside, and downtown Los Angeles, with the Los Angeles International Airport (LAX) area serving as another potential system hub.

- **Environmental Impacts / Safety** – The Harbor Subdivision right-of-way presents both opportunities and challenges. Chief among the challenges will be the issue of safety, particularly at grade crossings throughout the Corridor. Routing / terminus and modal options that create safety conflicts that cannot reasonably be mitigated – cost issues notwithstanding – are eliminated from further consideration. Routing / terminus and modal options that result in degradation of Level of Service (LOS) on already congested streets near major grade crossings are also evaluated closely. Finally, there may be sensitive receptors along the Corridor that are sensitive to visual and noise impacts.

- **Physical Fit** – The initial screening considers physical constraints such as right-of-way width in determining whether certain modal options can operate within the Corridor under existing railroad operating agreements and if off-corridor routing / terminus options provide ample width for passenger service. Some modal options may not feasibly fit into the existing Harbor Subdivision ROW or on off-corridor streets without significant impacts to the community, and these options are eliminated before a more detailed evaluation is undertaken.

- **Community Acceptability** – Public and stakeholder outreach has established what issues are important to residents of the Study Area. The comments received during the Early Scoping Meetings and other meetings inform which options best serve the community, and help avoid progressing alternatives that are not compatible with the surrounding communities.

Table 3.1 describes the Stage I Evaluation Criteria and Performance Measures that are used to screen the preliminary routing / terminus and modal options. These performance measures are discussed in a qualitative manner.
### Table 3.1. Stage I Evaluation Criteria & Performance Measures

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Performance Measures</th>
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<tbody>
<tr>
<td>Travel Time</td>
<td>• End-to-End travel times between Origin – Destination pairs in Study Area</td>
</tr>
<tr>
<td></td>
<td>• Average travel speeds (Build vs. No Build)</td>
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<tr>
<td></td>
<td>• Dwell time, transfer times, in-vehicle time</td>
</tr>
<tr>
<td>Transit Accessibility</td>
<td>• Access to major activity centers (e.g. LAX)</td>
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<td></td>
<td>• Access to major transportation centers (e.g, Union Station)</td>
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<td></td>
<td>• Proximity to residential areas and trip generators</td>
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<td></td>
<td>• Travel time savings for various origin-destination pairs</td>
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<td></td>
<td>• Ability to serve new markets</td>
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<td></td>
<td>• Ability to attract new riders</td>
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<td></td>
<td>• Located adjacent to areas with transit-oriented development (TOD) potential</td>
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<tr>
<td>Regional Connectivity</td>
<td>• Connections to Existing transit lines (Metro Green and Blue Lines and Harbor Transitway)</td>
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<tr>
<td></td>
<td>• Ability of proposed modal alternative to interline with other major transit lines (run proposed alternative on existing tracks of another line)</td>
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<td></td>
<td>• Ability to enable a one-seat ride between multiple branches of a regional rapid transit system</td>
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<td>Environmental Effects/Safety</td>
<td>• Extent of property displacements and relocations</td>
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<td>• Effect on current and future roadway LOS at major grade crossing intersections with and without the Project</td>
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<td></td>
<td>• Extent of visual impact to sensitive receptors</td>
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<td></td>
<td>• Number of at-grade crossings along the Corridor</td>
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<td></td>
<td>• Number of potential grade separations to minimize traffic impacts</td>
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<tr>
<td>Physical Fit</td>
<td>• Sections of corridor with very narrow right of way (less than 35’)</td>
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<td></td>
<td>• Sections of ROW with preserved Burlington Northern Santa Fe Railway (BNSF) access easements</td>
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<td>• Locations where modal alternatives cannot fit in the ROW because of constraints, such as preserving freight access</td>
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<tr>
<td>Community Acceptability</td>
<td>• Number of positive and/or negative comments received at public and stakeholder working sessions</td>
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</table>
3.2. **PRELIMINARY DEFINITION OF ALTERNATIVES**

Preliminary alternatives consist of the No Build Alternative, various Build Alternatives and the TSM / Baseline Alternatives. Each of these alternatives is described in more detail in the following sections.

As shown in Figure 3.1, Build Alternatives are made up of three components: travel markets served, modal options and routing / terminus options. Travel markets are briefly discussed in Section 3.2.2, modal options are discussed in Section 3.2.3, and routing and terminus options are discussed in Section 3.2.4. Section 3.2.5 then describes the process of combining the markets, modes and routing / terminus options into preliminary Build Alternatives.

**Figure 3.1. Build Alternative Components**

**Market Served**
- Example: South Bay N-S Local

**Modal Option**
- Example: Light Rail

**Routing Option**
- Example: San Pedro via I-110

**Alternative**
- Example: Metro Green Line Extension South (Light Rail along ROW & I-110 w/ Stations approx. every mile)

Source: STV Incorporated

### 3.2.1. No Build Alternative

Federal and State Laws require that Build Alternatives are evaluated against a No Build Alternative in a project’s Environmental Impact Statement (EIS) and Environmental Impact Report (EIR). The No Build Alternative helps define mobility challenges in the Study Area and identifies the consequences of merely extending existing policies and plans without committing to larger capital improvements. The No Build Alternative represents the existing conditions in the Study Area in addition to the funded transportation improvements specified in the financially constrained portion of Metro’s 2001 Long Range Transportation Plan (LRTP).
3.2.1.1. Current and Planned Transportation Infrastructure

Current transportation infrastructure and funded improvements representative of the No Build Alternative are outlined in the Transportation Facilities and Services section of the Purpose and Need Chapter (Section 2.4). They include:

- **Freeways (Current)** – Interstates 110, 405, 710, 10, and 105, US Highway 101, and State Routes 47, 91, and 103
- **Fixed Guideway (Current)** – El Monte and Harbor Transitways (High-Occupancy Vehicle (HOV) / bus), Metro Blue, Green, and Gold Lines (LRT), Metro Red and Purple Lines (Heavy Rail Transit (HRT)), Metrolink San Bernardino, Riverside, 91, Orange County, Antelope Valley, and Ventura County Lines (CRT), Amtrak Pacific Surfliner, Coast Starlight, Southwest Chief, Sunset Limited and Texas Eagle (Intercity Rail)
- **Fixed Guideway Projects (Future)** – Metro Gold Line Eastside Extension (LRT), Exposition Line (LRT) Phase 1, Metro Crenshaw Transit Corridor (BRT or LRT), Los Angeles World Airports (LAWA) Automated People Mover.

In addition, the Study Area is served by an extensive bus network operated by Metro and a variety of municipal operators including Beach Cities Transit, Carson Circuit, Culver CityBus, Gardena Municipal Bus, Lawndale BEAT, Los Angeles Department of Transportation (LADOT), Long Beach Transit, Torrance Transit and Santa Monica Big Blue Bus. The Study Area is also served by LAWA FlyAway bus, a specialized express service that operates between Los Angeles Union Station (LAUS) and LAX.

Funded roadway and bus service improvements include various arterial upgrades and expansions to the Metro Rapid Bus system. A more detailed discussion of these improvements is presented in the Transportation Facilities and Services section of the Purpose and Need Chapter (Section 2.4). An overview of the No Build Alternative is shown in Figure 3.2.

An updated Metro LRTP which included a number of additional fixed guideway projects in its fiscally constrained plan was approved in October 2009. Many of these projects will receive funding from Measure R, which was passed by Los Angeles County voters in November 2008. Projects included in the 2009 Metro LRTP (but not the 2001 LRTP) include:

- Metro Westside Subway Extension
- Metro Regional Connector Transit Corridor
- Exposition Line – Phase II

To provide consistency with other recent corridor studies, the Harbor Subdivision No Project Alternative only includes projects from the 2001 Metro LRTP for activities such as ridership modeling. But, projects included in the 2009 LRTP have been taken into account during the course of this AA study, and these projects are shown on Harbor Subdivision project maps.
3.2.2. Preliminary Alternatives – Markets

As described in the Purpose & Need Chapter, five major travel markets can be characterized throughout the Study Area. Each travel market is briefly described below.

- **I-405 Corridor** – Includes local to semi-regional trips within the South Bay and also regional trips from the South Bay north to the Westside and south to Long Beach and Orange County.

- **South Los Angeles East – West Local Corridor** – Includes local trips traveling east-west across the Slauson Corridor between Culver City, Inglewood, Hyde Park, Chesterfield Square, South Los Angeles, Huntington Park, the Gateway Cities, and downtown Los Angeles.

- **South Bay North – South Local Corridor** – Includes local trips traveling north-south through the South Bay, generally traveling between Inglewood, Hawthorne, Lawndale, Redondo Beach, Torrance and Palos Verdes.

- **Los Angeles International Airport** – Includes regional trips from throughout the Los Angeles Basin including the South Bay, Gateway Cities, West Los Angeles and Central Los Angeles.

- **South Bay – Downtown Regional Corridor** – Includes regional trips from the South Bay to the employment, civic, and transportation facilities located in downtown Los Angeles.

3.2.3. Preliminary Alternatives – Modal Options

A number of transit modes are explored for implementation along the Harbor Subdivision. As listed below, Harbor Subdivision modal options generally fall into three categories: Bus Rapid Transit (BRT), LRT-compatible vehicles serving more local trips, and freight rail-compatible vehicles serving more regional trips. LRT-compatible vehicles travel at moderate speeds and stop frequently, with numerous stations located in close proximity (approximately every mile). Freight-compatible vehicles travel at high speeds and stop relatively infrequently, allowing stations to be located farther apart (approximately every four to five miles). Safety regulations vary for LRT-compatible and freight-compatible transit vehicles when operating in a freight or railroad corridor. These regulations and various modal options are described in more detail in the following sub-sections. Other transit modes that are unsuitable for service along the Harbor Subdivision are also discussed.

**Bus Rapid Transit:**
3.2.3.2 Bus Rapid Transit (BRT)

**Modes which can run on Light Rail Tracks (LRT-Compatible):**
3.2.3.3 Light Rail Transit (LRT)
3.2.3.4 Self-Propelled Railcars (SPR)
Modes which can run on Freight Tracks (Freight-Compatible):
3.2.3.5 Self-Propelled Railcars (SPR)
3.2.3.6 Electric Multiple Unit (EMU)
3.2.3.7 Commuter Rail Transit (CRT)

3.2.3.1. LRT / Freight Compatibility Issues

The Federal Railroad Administration (FRA) is the national regulatory agency which enforces safety and operations rules on the nation’s railroads. The Harbor Subdivision, as an active and future freight railroad line, is subject to FRA regulations. The most relevant FRA regulations for the Harbor Subdivision study deal with vehicle safety. Under existing regulations, LRT-compatible modal technologies (including the LRT and SPR modes) cannot operate on the same track as freight trains or the freight-compatible modal options (SPR, EMU, CRT) because the LRT-compatible vehicles are not designed to meet several freight rail strength and crash-worthiness standards. These regulatory issues mean that LRT-compatible and freight-compatible vehicles can not operate over the same tracks at the same time.

In areas of the Harbor Subdivision that are wider than approximately 50 feet, both LRT-compatible or BRT guideways and freight-compatible guideways can be built with a physical barrier to allow joint operations. In areas narrower than 50 feet wide, this capability is not available (unless extensive property takes are used to widen the Metro-owned ROW or unless a decision is made to construct additional tracks at a different grade). In those cases, temporal separation would be needed to operate LRT-compatible transit vehicles while also allowing for freight operations. Temporal separation means that only one service can use the ROW at a time, ensuring there is no interaction between passenger and freight operations. Passenger service vehicles would likely operate during the day and freight operations would be pushed to late night or early morning hours. As explained further in the following sections, temporal separation is necessary in the section of the Corridor northeast of Crenshaw Boulevard, where the ROW is only 30 feet wide for much of its length (but freight volumes are light). There, it could be possible to build capacity for LRT-compatible modal technologies with the capability of accommodating an occasional freight train via temporal separation.

3.2.3.2. Bus Rapid Transit (BRT)

Bus Rapid Transit (BRT) incorporates specialized buses operating on dedicated lanes with enhanced stations to provide rail-like service without the same level of capital investment. An example of BRT in Los Angeles County is the San Fernando Valley’s Metro Orange Line, shown in Figure 3.3.

Service and Operations

BRT operates with higher frequency, speed and reliability compared to traditional bus systems. Improved service and operational efficiency can be attributed to several BRT features. Not only does BRT typically operate at higher frequencies all day or at peak periods
(ten minute headways or less), but dedicated bus lanes or an exclusive guideway facilitates greater speeds and improved reliability of service. Preferential treatment of buses at signalized intersections, including the extension of green light time or actuation of the green light upon detection of an approaching bus also increases the speed and reliability of service. In addition to stations, low-cost infrastructure like bus turnouts, boarding islands and curb realignments can further enhance the BRT service.

As noted earlier, BRT is not a freight-compatible mode and cannot operate in the same corridor as freight trains unless the services are physically or temporally separated; BRT would have to operate on-street or freight movement would have to be pushed to late night or early morning hours in areas where the ROW is not wide enough to accommodate both passenger and freight operations.

Figure 3.3. BRT Example – Metro Orange Line

Source: Metro
Figure 3.4. Harbor Subdivision Corridor Segments

- Northern Terminus Connections – Redondo Junction
- Crenshaw Corridor – Imperial Highway
- Redondo Junction – Crenshaw Corridor
- Imperial Highway – Redondo Beach
- Redondo Beach – Watson Yard
- Watson Yard – Southern Terminus Connections

Source: AE LLC, STV Incorporated
Physical Characteristics

The BRT mode’s configuration can vary throughout the Study Area and is based on the physical constraints of the Corridor. For the purposes of this discussion, the Corridor is divided into six sections as shown in Figure 3.4 and described below. Many of these sections are described in more detail in Section 3.2.4.

- **Northern Terminus Connections – Redondo Junction** – If on-street routing options are chosen, the BRT alternative would run on-street from downtown Los Angeles to Redondo Junction. Whether BRT would operate on shared or dedicated lanes is still under consideration. The BRT alternative is not suitable to operate on the routing option adjacent to the Los Angeles River due to constrained ROW and the regulatory issues with mixing bus and freight rail traffic. Section 3.2.4.1 describes the northern terminus options in more detail.

- **Redondo Junction – Crenshaw Corridor** – Because the ROW in this portion of the Corridor is only 30 feet wide, a track for freight operations would have to be embedded in the center of the busway. In this portion of the Corridor, passenger service and freight operations would have to be time separated. If a busway with rail embedded in the roadway cannot be feasibly designed, buses would travel on-street along Slauson, Western and Florence Avenues and operate very similarly to the TSM Alternative explained in Section 3.2.6.1. A potential spur traveling from the ROW into Huntington Park would also require the BRT option to run on-street.

- **Crenshaw Corridor – Imperial Highway** – If BRT is chosen as the Locally Preferred Alternative (LPA) for the Crenshaw Corridor project, the Harbor Subdivision BRT option would utilize this infrastructure. In terms of a potential spur traveling from Century Boulevard to the LAX terminals, the BRT option could either switch to on-street operations or travel on a dedicated guideway. Section 3.2.4.2 describes LAX area routing / terminus options in more detail.

- **Imperial Highway – Redondo Beach** – The BRT option would not be able to utilize the existing Metro Green Line LRT infrastructure, and due to existence of a bridge over Rosecrans Avenue, it will also not be able to use the Harbor Subdivision ROW through this section. The BRT would most likely operate on-street for this section due to difficulty in moving on and off the ROW.

- **Redondo Beach – Watson Yard** – With the Harbor Subdivision ROW much wider in this portion of the Corridor (generally 100 feet), the BRT option would run parallel to the freight tracks in the Metro-owned ROW. BRT passenger service and freight service could run simultaneously in this portion of the Corridor as long as there was physical separation of the two services (fence, wall, etc). A potential spur traveling south to Del Amo Fashion Center in Torrance would require the BRT option to switch to on-street operation or an aerial structure along Hawthorne Boulevard. Section 3.2.4.3 describes central routing / terminus options in more detail.

- **Watson Yard – Southern Terminus Connections** – Regardless of the specific route chosen to several terminus locations, the BRT option would switch to on-street operation in the Harbor area. Whether BRT would operate on shared or dedicated lanes is still under
consideration. Section 3.2.4.4 describes southern routing / terminus options in more detail.

Vehicles and Facilities

BRT systems utilize high capacity articulated buses with low floors. Low floors and level platforms speed up passenger boarding and enhance accessibility. BRT stations often include customized bus stop amenities such as automated ticketing kiosks, real-time message signs, and a proof-of-payment fare system has been demonstrated to accelerate passenger boardings and reduce station dwell times. Another benefit of BRT is that the articulated buses have maintenance needs similar to traditional buses, and can leave the guideway to reach existing Metro bus maintenance facilities.

3.2.3.3. Light Rail Transit (LRT)

Light Rail Transit (LRT) consists of an electric railway with lightweight passenger rail cars that operate at moderate speeds and have a passenger-carrying capacity greater than buses, but less than that of larger vehicles such as HRT or CRT. LRT can be integrated into mature communities, as it only requires a narrow ROW, has lower vehicle floor heights and smaller platform sizes, and can be designed as a street-running operation. LRT can also utilize infrastructure associated with other lines already in operation in the Corridor such as the Metro Green Line. Examples of LRT lines in Los Angeles include the existing Metro Blue, Green and Gold Lines and the Expo Line currently under construction. A typical Metro LRT vehicle is shown in Figure 3.5.

Service and Operations

Like BRT, LRT is most appropriate for serving shorter, more localized trips. If LRT operates on dedicated ROW, it offers greater speeds and reliability than buses. Even with shorter distances between stations, LRT can reach speeds of 55 miles per hour and above partly because electric cars can accelerate more quickly than diesel operated vehicles. However, speeds often decrease with frequent stations, crossings, and in-street segments. Electric cars also emit fewer pollutants and generate less noise.

LRT cannot operate on railroad tracks at the same time as freight trains; freight and LRT service must be physically or temporally separated because of FRA safety regulations. Freight movement would have to be pushed to late night or early morning hours in areas where the tracks would be shared between LRT and freight trains.
Physical Characteristics

Like BRT, the LRT alternative’s configuration varies throughout the Study Area and is based on the physical constraints of the Corridor. For the purpose of this discussion, the Corridor is divided into segments as shown previously in Figure 3.4. It is important to note that the configuration described below includes the overhead contact system (OCS) as well as power substations located approximately every mile along the Corridor.

- **Northern Terminus Connections – Redondo Junction** – LRT trains could follow all potential routes into downtown Los Angeles described in Section 3.2.4.1. Most options are on-street or use existing infrastructure, with the Los Angeles River alignment on a new guideway also a possibility.

- **Redondo Junction – Crenshaw Corridor** – Because the ROW in this portion of the Corridor is only 30 feet wide, the LRT alternative would share tracks with freight operations. LRT and freight service cannot operate on the same track at the same time, making it necessary to move freight operations in this section of the Corridor to late night or early morning hours. A potential spur from the ROW to Huntington Park would require LRT to switch to on-street operation.

- **Crenshaw Corridor – Imperial Highway** – If LRT is chosen as the LPA for the Crenshaw Corridor, the Harbor Subdivision LRT alternative would utilize the planned Crenshaw Corridor infrastructure. Two passenger rail tracks would run parallel to one freight track,
enabling passenger and freight service to operate simultaneously. A potential spur traveling from Century Boulevard to the LAX terminals would require the LRT vehicles to either switch to on-street operation or travel on an elevated guideway. Section 3.2.4.2 describes LAX area routing / terminus options in more detail.

- **Imperial Highway – Redondo Beach** – The LRT option would utilize Metro’s Green Line tracks and infrastructure between the Aviation and Redondo Beach stations.

- **Redondo Beach – Watson Yard** – With the Harbor Subdivision ROW much wider in this portion of the Corridor (generally 100 feet), the LRT option would run parallel to freight tracks in the Metro-owned ROW. LRT passenger service and freight service could run simultaneously in this portion of the Corridor as long as there was physical separation of the two services (fence, wall, etc). A potential spur traveling south to Del Amo Fashion Center in Torrance would require the LRT option to switch to an aerial structure along Hawthorne Boulevard. Section 3.2.4.3 describes central routing / terminus options in more detail.

- **Watson Yard – Southern Terminus Connections** – There are several off-corridor options for a southern terminus, all of which are suitable for LRT service. Section 3.2.4.4 describes southern routing / terminus options in more detail.

### Vehicles and Facilities

In addition to vehicles, LRT requires overhead catenaries, substations located approximately every mile and maintenance facilities. Metro already uses several standard light rail vehicle models for service along their existing transit lines, served by maintenance facilities in Long Beach (Metro Blue Line), Hawthorne (Metro Green Line), and downtown Los Angeles (Metro Gold Line). A new maintenance facility would be needed to serve the Harbor Subdivision, if LRT service is implemented. Preliminary locations could include the proposed Metro Consolidated Yard in the downtown Los Angeles area, locations being investigated as part of the Crenshaw Corridor project, and several locations in the industrial South Bay (Torrance and Wilmington). Maintenance facility locations will be studied in more detail as the design of the alternatives progresses.

#### 3.2.3.4. LRT-Compatible Self-Propelled Railcar (SPR)

Self-Propelled Railcars (SPR) are trains consisting of multiple carriages powered by fuel sources such as diesel, natural gas, fuel cells, hybrid technology, or other non-electric sources. There are two types of SPRs that could be suitable for the Harbor Subdivision: those that are LRT-compatible and those that are freight-compatible. This section discusses LRT-compatible SPRs, while Section 3.2.3.6 discusses freight-compatible SPRs. An example of an LRT-compatible SPR is the Sprinter line that operates between Oceanside and Escondido, California. A Sprinter vehicle is shown in Figure 3.6.
Service and Operations

LRT-compatible SPRs best serve short localized trips similar to BRT and LRT, although they can also serve slightly longer routes than LRT vehicles given their larger size. For this study, their operating parameters will be assumed to be similar to LRT vehicles, but with on-board power instead of overhead electrical wires and power substations. LRT-compatible SPRs in general are less vulnerable to single-point-of-failure outages than standard commuter rail locomotives, because SPRs have multiple engines.

Like LRT, LRT-compatible SPRs cannot operate on railroad tracks at the same time as freight trains; freight trains and LRT-compatible vehicles must be physically or temporally separated. Freight service would have to be moved to late night or early morning hours in areas where the tracks would be shared between LRT-compatible SPRs and freight trains.

Physical Characteristics

The physical characteristics of LRT-compatible SPRs are very similar to that of the LRT option, except that the LRT-compatible SPRs do not require catenary or substation infrastructure. It is expected that LRT-compatible SPR vehicles will have similar dimensions to the existing Metro LRT fleet, to allow vehicles from the Harbor Subdivision project to potentially run on other
existing and planned Metro light rail lines (also known as interlining). Refer to Section 3.2.3.3 for further detail on the configuration of the LRT modal option.

**Vehicles and Facilities**

LRT-compatible SPR vehicles are similar in size to light rail vehicles, although slightly larger and lacking equipment for overhead electric power use. They generally operate at similar speeds to LRT vehicles, but have slower acceleration and longer braking distances because of their heavier weight.

There are several options for a maintenance facility to serve LRT-compatible SPR vehicles. One is to build a new facility along the Corridor similar to the LRT maintenance facility discussed in Section 3.2.3.3. Preliminary locations could include areas in close proximity to the intermodal transit centers planned for Redondo Beach and Torrance. Also, it may be possible to utilize Taylor Yard – the location of existing Metrolink maintenance facilities north of LAUS, which already services Metrolink locomotives. However, Taylor Yard is near capacity and may not be able to accommodate additional trains. These options will be studied further as design progresses.

**3.2.3.5. Freight-Compatible Self-Propelled Railcar**

Self-Propelled Railcars can also be built to be compatible with existing freight services. The trains must be built heavier to do so, but are then able to operate on the same tracks at the same time as freight or conventional passenger trains such as Metrolink and Amtrak vehicles. An example of a freight-compatible SPR is the US Railcar (formerly Colorado Railcar), which can be built in both single-level and bi-level configurations. Bi-level cars currently operate for a demonstration program on the Tri-Rail system in the Miami, Florida area, while single-level cars operate on the Portland, Oregon area Westside Express service. Both car types are shown in Figure 3.7.

**Service and Operations**

Freight-compatible SPRs are planned to serve longer, more regional trips than BRT, LRT and LRT-compatible SPRs. Freight-compatible SPRs stop less frequently, but run at higher speeds on dedicated ROW. Although capable of speeds nearing 80 miles per hour, speeds are limited in sections of the Harbor Subdivision by constraints such as frequent grade crossings and proximity to adjacent sensitive land uses. The service characteristics of freight-compatible SPRs can best be compared to a typical Commuter Rail (Metrolink) train, but with all cars providing power rather than one or two locomotives pushing / pulling unpowered coaches. Headways for the alternatives using freight-compatible SPRs will be approximately 15 to 30 minutes at a minimum, with longer headways in the off-peak periods.
Freight-compatible SPRs meet the FRA’s crashworthiness standards for operation on tracks shared with freight and conventional passenger trains. This mode can run on the same tracks at the same time as freight or conventional passenger trains.

Physical Characteristics

The freight-compatible SPR configuration varies throughout the Study Area and is based on the physical constraints of the Corridor. See Figure 3.4 for a map of the Corridor segments described below. The configuration is as follows:

- **Northern Terminus Connections – Redondo Junction** – Freight-compatible SPRs are not suitable to operate on-street like the LRT-compatible modal options described previously. Instead, they generally operate on existing railroad corridors in mixed passenger and freight rail traffic. While they can operate on new grade-separated guideways, the structures needed to carry freight-compatible SPRs vehicles are generally large and costly, and only justified by very large ridership opportunities. Given the existing railroad corridor along the Los Angeles River, the freight-compatible SPR option would follow the river corridor (and not the many on-street options) into downtown Los Angeles. The existing tracks along the Los Angeles River used by Metrolink and Amtrak are near capacity and therefore one or two more freight tracks may need to be added in the available ROW. Section 3.2.4.1 describes northern routing / terminus options in more detail.
• **Redondo Junction – Crenshaw Corridor** – Because the ROW in this portion of the Corridor is only 30 feet wide, the freight-compatible SPR option would share one track with freight operations. Passing sidings may be necessary in some locations. Also, a potential spur from the ROW into Huntington Park is not a feasible route for this modal option due to the on-street configuration.

• **Crenshaw Corridor – Imperial Highway** – Regardless of whether BRT or LRT is chosen as the LPA and constructed along the Crenshaw Corridor, the freight-compatible SPR option would utilize the freight track adjacent to the BRT busway or LRT infrastructure. In terms of a potential spur from Century Boulevard to the LAX terminals, the freight-compatible SPR option could operate on an elevated guideway. LAX area routing / terminus options are discussed in more detail in Section 3.2.4.2.

• **Imperial Highway – Redondo Beach** – In this section of the Corridor, the freight-compatible SPR option would utilize the freight track that runs adjacent to Aviation Boulevard. Freight-compatible SPRs would not be able to use the existing Metro Green Line infrastructure.

• **Redondo Beach – Watson Yard** – In this portion of the Corridor, the freight-compatible SPR option would operate on the existing freight track. Passing sidings may be necessary in some locations. A potential spur from the ROW to Del Amo Fashion Center is not a feasible route for this mode because it cannot operate on-street, and the massive structure needed to carry freight-compatible SPRs above grade would be very difficult to construct in the Hawthorne Boulevard median without serious impacts to the street below. Section 3.2.4.3 describes central routing / terminus options in more detail.

• **Watson Yard – Southern Terminus Connections**: Of the southern routing / terminus options, freight-compatible SPR would only be able to operate on the alignments that utilize existing railroad tracks or do not follow streets, because the freight-compatible SPR option is not suitable for on-street operation. Section 3.2.4.4 describes southern routing / terminus options in more detail.

**Vehicles and Facilities**

Freight-compatible SPR vehicles are very similar to the existing Metrolink Commuter Rail system with the exception that all cars are powered rather than only the locomotive. If capacity is available, maintenance can be carried out at Taylor Yard, or a new facility will likely be needed along the Harbor Subdivision Corridor as described in Sections 3.2.3.3 and 3.2.3.4.
3.2.3.6. Electric Multiple Unit (EMU)

Electric Multiple Unit (EMU) technology is one of two freight-compatible SPR technologies being considered for passenger service along the Harbor Subdivision. EMUs are multiple carriage cars powered by overhead electric wires or an electrified third rail. LRT-compatible EMUs are basically light rail-type vehicles like those discussed in Section 3.2.3.3. Freight-compatible EMUs, which generally operate like electrified commuter rail trains, currently operate throughout the eastern United States, Europe, Asia and Australia. An example of an Australian EMU can be observed in Figure 3.8.

![Figure 3.8. Freight-Compatible EMU Example – Transperth, Perth Australia](image)


Service and Operations

Freight-compatible EMUs are generally intended to serve longer, more regional trips than BRT, LRT and LRT-compatible SPR vehicles. Freight-compatible EMUs run at higher speeds on dedicated ROW with top speeds between 80 and 100 miles per hour and stop less frequently. Headways for the EMU option will be approximately 15 to 30 minutes at a minimum, with longer headways in the off-peak periods. Freight-compatible EMUs meet the FRA’s crashworthiness standards for operation on tracks shared with freight and conventional passenger trains. This mode can run at the same time on the same tracks as freight or conventional passenger trains.
Physical Characteristics

The freight-compatible EMU’s configuration is much like that of the freight-compatible SPR option. The most significant difference is that the configuration for the EMU includes the OCS poles as well as electrical substations located approximately every mile along the Corridor. See Section 3.2.3.5 for further detail on the physical characteristics of the freight-compatible SPR (and EMU) option.

Vehicles and Facilities

Freight-compatible EMUs are larger and heavier than light rail vehicles, enabling them to carry more passengers and operate at higher speeds. Maintenance facility requirements for freight-compatible EMUs are similar to those of the LRT option, which are described in more detail in Section 3.2.3.3.; however EMU and LRT vehicles cannot share maintenance facilities given the many different physical and propulsion characteristics of the two types of vehicles.

3.2.3.7. Commuter Rail Transit (CRT)

Commuter rail transit (CRT) service is already provided throughout the Los Angeles metropolitan area by the Metrolink system, which serves Los Angeles, Orange, Riverside, San Bernardino, and Ventura Counties. Commuter rail trains consist of diesel-powered locomotives pushing or pulling un-powered, passenger-carrying coaches. Commuter rail generally serves longer, home to work trips from suburbs to central city areas during peak rush hour periods. Much of the Metrolink service is from suburbs into the Los Angeles Central Business District in the morning, and returning to the suburbs in the evening. Recently, Metrolink has focused on adding additional midday and reverse commute service, such as the all-day, 30-minute headway service currently planned for Orange County. A typical Metrolink commuter rail train is shown in Figure 3.9.

Service and Operations

Commuter rail serves longer regional trips as compared to the other modes previously described. Commuter rail operates at higher speeds (up to 80 mph) and lower frequency – following a schedule rather than operating at fixed intervals. Some commuter rail services only operate at peak hours. Because commuter rail typically operates between central cities and suburbs along existing railroad corridors, the mode often serves lower density areas and shares ROW with intercity or freight trains.
Physical Characteristics

The Commuter Rail alternative’s configuration is much like that of the freight-compatible SPR and EMU options. The most significant difference is that the configuration for the Commuter Rail will likely include locomotives instead of SPR technology. See Section 3.2.3.5 for further detail.

Vehicles and Facilities

Commuter trains in Southern California are powered by locomotives in the push-pull configuration, where a locomotive either pushes from the rear or pulls from the front. Commuter trains are large and designed to maximize passenger volume. Cars may be single or double-level. Because commuter rail is a regional service, stations are located far apart and not everyone is able to live within walking distance. For this reason, commuter rail stations are generally connected to large park and ride lots and feeder bus services.

Maintenance functions for commuter rail trains can be carried out at the existing (possibly expanded) Metrolink maintenance facilities, if capacity allows. Otherwise, a new facility can be built along the Harbor Subdivision Corridor.
3.2.3.8. Other Modes (Eliminated from Further Consideration)

Additional modes like streetcar, heavy rail (such as subway) and monorail were excluded from initial consideration because they are unlikely to serve the Corridor in an efficient and cost effective manner. The basis for not carrying these modes forward is detailed below.

Streetcar

Streetcars have recently been revived throughout the country to stimulate development and serve short trips in urban areas. The best example is the Portland Streetcar, which serves the western downtown area of the city and is shown in Figure 3.10.

Figure 3.10. Streetcar Example – Portland Streetcar, Portland, OR

Streetcars are best suited for on-street operation in downtown areas. As a form of local transit, street cars stop frequently and operate on tracks primarily running on city streets. Like local buses, Streetcars are subject to traffic congestion and subsequent delays as they often lack continuous dedicated ROW. Consequently, Streetcar speeds are generally low. Because Streetcars are smaller and lighter than LRT vehicles, they also do not have the capacity to carry as many passengers and it is very difficult for Streetcars to interline with other transit modes (operate on the tracks of other transit services). For these reasons, Streetcars are not suitable to serve the 26-mile Harbor Subdivision Corridor. The Harbor
Subdivision requires more intensive transit service that can operate over a much longer distance at higher speeds and carry significantly more passengers.

Streetcars may be best suited for connections to the Harbor Subdivision Corridor. The Waterfront Red Car Line on the San Pedro waterfront is a historic streetcar line, and may be able to provide local connections to the Harbor Subdivision. In addition, a streetcar is under preliminary study in the downtown Los Angeles area and could provide connections from LAUS into the heart of downtown.

**Heavy Rail**

Heavy rail transit (HRT) vehicles are electrically powered (generally by third rails), completely grade separated (underground, on elevated structures, or on separated at-grade ROWs), and are the highest capacity form of transit possible for an urban area. Examples of heavy rail in Los Angeles include Metro’s Red and Purple subway lines. The Red Line is shown in Figure 3.11.

![Figure 3.11. Heavy Rail Example – Metro Red Line](Image)

HRT lines are generally located along the very busiest transit corridors. The Metro Red and Purple Lines serve some of Los Angeles’ densest areas including downtown Los Angeles, the
Wilshire Corridor, and the Hollywood area. The Harbor Subdivision, however, is not located in a particularly dense urban area. Instead, the Corridor stretches for a considerable distance - approximately 26 miles - throughout a combination of relatively low-density residential and industrial land uses. Projected ridership would not justify the extremely high costs to build heavy rail along the Corridor, and it will not be carried forward for further analysis.

**Monorail**

Monorails are electric railways which carry trains on aerial guideways formed by a single beam or rail. Several systems were built in the 1960s and 1970s at theme parks and exhibitions including Disneyland in Anaheim, Disney World in Orlando, Florida, and the Seattle Monorail in Seattle, Washington (shown in Figure 3.12).

![Figure 3.12. Monorail Example – Seattle Monorail, Seattle, WA](source: Wilshire Center)

While monorail service is effective under certain circumstances, it is not a suitable mode for passenger service along the Harbor Subdivision. Most monorail systems are a type of heavy rail best suited to serve frequent and relatively short trips, and must be fully grade separated from other transportation facilities. Monorail vehicles are not compatible with any other type of rail infrastructure in the Metro system, which makes through services onto existing tracks impossible. Furthermore, monorails require large straddle bent beams to support tracks and
stations. Columns supporting these straddle beams would have a negative impact on visibility throughout the Corridor and could be considered a visual blight for residences near the ROW. Given its high cost and lack of interoperability with the region’s existing rail infrastructure, a monorail will not be examined further for the Harbor Subdivision project.

### 3.2.3.9. Modal Summary

A summary of the various characteristics of each mode discussed in this section is given in Table 3.2 through Table 3.4.

#### Table 3.2. Summary of Modal Characteristics – BRT Option and LRT-Compatible Options

<table>
<thead>
<tr>
<th>Mode</th>
<th>BRT</th>
<th>LRT</th>
<th>SPR – LRT Compatible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics</td>
<td>Specialized buses</td>
<td>Electric railway</td>
<td>Multiple carriages</td>
</tr>
<tr>
<td></td>
<td>On-street operation or dedicated ROW</td>
<td>Light weight rail cars</td>
<td>Powered by on-board engines</td>
</tr>
<tr>
<td></td>
<td>Customized stations</td>
<td>Electrical Substations</td>
<td></td>
</tr>
<tr>
<td>Advantages</td>
<td>Low cost</td>
<td>Can use existing Metro LRT infrastructure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Flexible routing</td>
<td>Ability to run on city streets</td>
<td></td>
</tr>
<tr>
<td></td>
<td>May be able to utilize existing Metro bus maintenance facilities</td>
<td>Can reach speeds of 55mph</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clean emissions</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Less noise</td>
<td></td>
</tr>
<tr>
<td>Issues</td>
<td>Cannot interline with most existing infrastructure in Study Area</td>
<td>Temporal separation required to preserve freight access north of LAX</td>
<td>Temporal separation required to preserve freight access north of LAX</td>
</tr>
<tr>
<td></td>
<td>Cannot easily preserve freight access north of LAX</td>
<td>Requires a large site for new / expanded maintenance facility</td>
<td>Longer acceleration and breaking distance than LRT due to heavier weight</td>
</tr>
<tr>
<td></td>
<td>Subject to congestion if operating on-street in mixed-flow traffic</td>
<td>Requires a large site for new / expanded maintenance facility</td>
<td>Requires a large site for new / expanded maintenance facility</td>
</tr>
<tr>
<td>Primary Market Served</td>
<td>Local</td>
<td>Local</td>
<td>Local</td>
</tr>
<tr>
<td>Share Infrastructure</td>
<td>Auto</td>
<td>SPR, freight-compatible options (with temporal separation)</td>
<td>LRT, freight-compatible options (with temporal separation)</td>
</tr>
<tr>
<td>Mode</td>
<td>SPR – Freight Compatible</td>
<td>EMU</td>
<td>CRT</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-------------------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------</td>
</tr>
<tr>
<td>Characteristics</td>
<td>• Multiple powered carriages&lt;br&gt;• Powered by on-board engines</td>
<td>• Electric railway&lt;br&gt;• Multiple powered carriages&lt;br&gt;• Substations</td>
<td>• Unpowered coaches&lt;br&gt;• Locomotives push / pull&lt;br&gt;• Coaches single or double level</td>
</tr>
<tr>
<td>Advantages</td>
<td>• Less vulnerable to single-point-of-failure outages&lt;br&gt;• Does not require catenary or substation infrastructure&lt;br&gt;• Can operate with freight or conventional passenger trains&lt;br&gt;• Can interline using existing Metrolink infrastructure&lt;br&gt;• Can reach speeds of 80 mph&lt;br&gt;• Could utilize Metrolink maintenance facilities if capacity available</td>
<td>• Can operate with freight or conventional passenger trains&lt;br&gt;• Can interline using existing Metrolink infrastructure&lt;br&gt;• Can reach speeds of 80-100 mph&lt;br&gt;• No emissions&lt;br&gt;• Less noise</td>
<td>• Can carry large passenger loads&lt;br&gt;• Can reach speeds of 80 mph&lt;br&gt;• Can operate with freight or conventional passenger trains&lt;br&gt;• Can interline using existing Metrolink infrastructure&lt;br&gt;• Does not require catenary or substation infrastructure&lt;br&gt;• Could utilize Metrolink maintenance facilities if capacity available</td>
</tr>
<tr>
<td>Issues</td>
<td>• Speeds limited by frequent grade crossings and proximity to adjacent land uses&lt;br&gt;• Unable to operate on-street&lt;br&gt;• Structures required are robust and costly&lt;br&gt;• Cannot interline using existing LRT infrastructure in Study Area&lt;br&gt;• Could require a large site for new / expanded maintenance facility</td>
<td>• Speeds limited by frequent grade crossings and proximity to adjacent land uses&lt;br&gt;• Unable to operate on-street&lt;br&gt;• Structures required to carry vehicles are robust and costly&lt;br&gt;• Requires a large site for new / expanded maintenance facility</td>
<td>• Speeds limited by frequent grade crossings and proximity to adjacent land uses&lt;br&gt;• Unable to operate on-street&lt;br&gt;• Structures required to carry vehicles are robust and costly</td>
</tr>
<tr>
<td>Primary Market Served</td>
<td>Regional</td>
<td>Regional</td>
<td>Regional</td>
</tr>
<tr>
<td>Share Infrastructure</td>
<td>EMU, CRT, LRT-compatible options (with temporal separation)</td>
<td>SPR, CRT, LRT-compatible options (with temporal separation)</td>
<td>SPR, EMU, LRT-compatible options (with temporal separation)</td>
</tr>
</tbody>
</table>
Table 3.4. Summary of Modal Characteristics – Modes Eliminated from Further Consideration

<table>
<thead>
<tr>
<th>Mode</th>
<th>Streetcar</th>
<th>Heavy Rail</th>
<th>Monorail</th>
</tr>
</thead>
</table>
| Characteristics | • Very light rail vehicle  
• Operates on-street without dedicated ROW  
• Could require overhead catenary system |
|           | Electric railway  
• Grade separated subways, elevated structures or separate at-grade ROWs | • Electric railway  
• Aerial guideways formed by a single beam or rail |
| Advantages | • Flexible routing  
• Highest capacity transit  
• High speed  
• Clean emissions |
|           | • Serves the densest urban areas only  
• High cost cannot be justified by ridership  
• Does not allow for at-grade intersections  
• Cannot interline with existing infrastructure along the Corridor |
| Issues    | • Subject to traffic congestion  
• Slow speeds  
• Low passenger capacity |
| Primary Market Served | Local | Local | Local |
| Share Infrastructure | None | None | None |

3.2.4. Preliminary Alternatives – Routing / Terminus Options

The Metro-owned Harbor Subdivision ROW begins several miles south of downtown Los Angeles in an industrial area and ends at the Los Angeles / Carson border in a mix of low-density residential and industrial land uses. The lack of major activity centers at either end of the ROW necessitates an examination of off-corridor routing and terminus options in the northern, central, and southern areas of the Corridor that tie into major activity centers. Many of the routing options require on-street operations, which is generally only suited for the LRT-compatible modal options. A description of the off-corridor routing and terminus options is included in the following subsections. All routing and terminus options for the Harbor Subdivision corridor are shown in Figure 3.13.

3.2.4.1. Northern Routing / Terminus Options

For the northern portion of the Study Area, activity centers and transportation hubs considered as potential off-corridor termini include LAUS, 7th Street / Metro Center, the Metro Blue Line Slauson Station and downtown Huntington Park. An overview of these options is shown in Figure 3.14.
Figure 3.13. Harbor Subdivision – All Routing / Terminus Options

Source: AE LLC, STV Incorporated
Figure 3.14. Northern Routing / Terminus Options

Source: AE LLC, STV Incorporated
Los Angeles Union Station is the major transportation hub for the Los Angeles County Transit system, with service provided by the Metro Red, Purple, and Gold Lines, Metrolink, Amtrak, and many bus operators. Five potential alignments could connect to LAUS:

- **Alameda Street** – The alignment flies over the Alameda Corridor and Washington Boulevard from the ROW terminus, continues west on Washington Boulevard and turns north on Alameda Street, connecting to the Metro Gold Line Eastside Extension at 1st Street / Alameda Street. The alignment can be at-grade or aerial, and is suitable for the LRT-compatible modal options.

- **Metro Blue Line / Alameda Street** – The alignment connects to the Metro Blue Line in the Slauson / Long Beach area, and uses existing Metro Blue Line tracks or adjacent Union Pacific (UP) tracks to head north. This option leaves the Metro Blue Line alignment just south of Washington Boulevard and then turns north on Alameda Street, connecting to the Metro Gold Line Eastside Extension at 1st Street / Alameda Street. The alignment can be at-grade or aerial, and is suitable for the LRT-compatible modal options.

- **Santa Fe Avenue** – The alignment flies over the Alameda Corridor and Washington Boulevard from the ROW terminus, and turns north on Santa Fe Avenue, connecting to the Metro Gold Line near 1st Street / Santa Fe Avenue. The alignment can be at-grade or aerial, and is suitable for the LRT-compatible modal options.

- **Los Angeles River** – The alignment flies over the Alameda Corridor and Washington Boulevard from the ROW terminus, and connects to the existing Los Angeles to San Diego (LOSSAN) / Los Angeles River Corridor (utilized by Metrolink and Amtrak) in the vicinity of the Amtrak 8th Street Yard. A connection to LAUS could follow the existing LOSSAN Corridor (which approaches LAUS from the north) or the proposed future (unfunded) LAUS Run-Through Tracks which enter LAUS from the south. The alignment is mainly at-grade and suitable for all modal options.

- **Metro Blue Line / Alameda Corridor / Los Angeles River** – The alignment leaves the ROW at the Metro Blue Line crossing and uses the existing Metro Blue Line tracks or adjacent UP tracks to head north. The alignment leaves the Metro Blue Line by using the UP tracks and connects to the Alameda Corridor to reach the Los Angeles River. This alignment is suitable for all modal options.

**7th Street / Metro Center** provides connections to the Metro Red, Purple and Blue Lines and Harbor Transitway and will serve the Metro Exposition Line in the future. The only feasible connection to Metro Center is via the existing Metro Blue Line. From the Metro Blue Line Slauson Station at Slauson Boulevard / Long Beach Avenue, the LRT modal option could follow the existing Metro Blue Line alignment to Metro Center.

The **Metro Blue Line Slauson Station** at Slauson Avenue / Long Beach Avenue is another potential terminus given the many at-grade crossings north of the Slauson Corridor through Huntington Park and Vernon, as well as the capacity and physical constraints of all routing options to LAUS and 7th Street / Metro Center. Passengers heading to downtown Los Angeles or Long Beach could transfer to Blue Line trains for continuing service.
Downtown Huntington Park is a major activity center that lies approximately one mile east of the Metro Blue Line. There are two options to connect to downtown Huntington Park:

- **Slauson Avenue / Pacific Boulevard** – The alignment leaves the Harbor Subdivision ROW where it turns north in Huntington Park and runs on-street along Slauson Boulevard for ¼ mile before turning south and following Pacific Boulevard, terminating at Pacific Boulevard / Gage Avenue. This option is mainly at-grade, and suitable for the LRT-compatible modal options.

- **Union Pacific / Randolph Avenue** – The alignment splits from the Harbor Subdivision ROW at the Metro Blue Line station and follows the UP freight line in the median of Randolph Avenue. The alignment turns south on Pacific Boulevard to reach a terminus at Pacific Boulevard / Gage Avenue. This option is mainly at-grade, and suitable for the LRT-compatible modal options.

3.2.4.2. **Los Angeles International Airport (LAX) Routing / Terminus Options**

LAX is located just west of the Harbor Subdivision ROW and is an important regional destination. An overview of the area with routing and terminus options is shown in Figure 3.15. Two terminus options could serve the airport, including a station at the potential transportation center in the Manchester Square area at Century Boulevard / Aviation Boulevard and one or more stations in the Central Terminal Area (CTA).

- **Potential Transportation Center on ROW at Century/Aviation** – A station at Century Boulevard / Aviation Boulevard would not require off-corridor operations; Metro passenger service to the airport would terminate on the Harbor Subdivision ROW at the site of a potential future intermodal transportation center / transit interface. This station would likely be elevated, and is suitable for all modal options. Connections to the airport would be provided by the planned LAX Automated People Mover (APM) (to be constructed by LAWA).

Three potential routing alignments could serve the CTA:

- **Century Boulevard** – From Century Boulevard / Aviation Boulevard, the alignment travels west into LAX where it can either circulate through the CTA or stub end. This alignment would likely be elevated and is suitable for all modal options.

- **98th Street** – From 98th Street / Aviation Boulevard, the alignment travels west into LAX where it can either circulate through the CTA or stub end. LAWA identified 98th Street as one of two planned routes for the LAX APM in the LAX Master Plan. This alignment would likely be elevated and is suitable for all modal options.

- **Arbor Vitae Street** – From Arbor Vitae Street / Aviation Boulevard, the alignment travels southwest into LAX where it can either circulate through the CTA or stub end. This alignment would likely be underground and is suitable for all modal options.
Figure 3.15. LAX Area Routing / Terminus Options

Source: AE LLC, STV Incorporated
3.2.4.3. Central Routing / Terminus Options

The Harbor Subdivision ROW would serve the future Redondo Beach and Torrance Regional Transit Centers but would not serve the Del Amo Fashion Center, Madrona Marsh Nature Preserve and the Torrance Civic Center. These destinations could be served by two off-corridor routing alignments described below and shown in Figure 3.16:

- **Hawthorne Boulevard** – The alignment travels along Hawthorne Boulevard from Manhattan Beach Boulevard / I-405 south to Central Torrance. Shorter alignments along the northern or southern portions of Hawthorne Boulevard are also possible. These aerial alignments are only suitable for LRT-compatible modal options.

- **Madrona Avenue** – From the Harbor Subdivision ROW, the alignment runs south on Madrona Avenue and terminates at Madrona Avenue / Sepulveda Boulevard. This option is only suitable for LRT-compatible modal options.

In addition, a routing option will be studied that stays on the Harbor Subdivision throughout the South Bay. It is suitable for all modal options.
Figure 3.16. Central Area Routing / Terminus Options

Source: AE LLC, STV Incorporated
3.2.4.4. Southern Routing / Terminus Options

Several activity centers lie off the Harbor Subdivision ROW in the Harbor Gateway, Wilmington and San Pedro neighborhoods of Los Angeles as shown in Figure 3.17. Potential termini include:

- **Kaiser Hospital** – Normandie Avenue / Pacific Coast Highway (PCH)
- **Pacific Coast Highway Harbor Transitway Station / Park and Ride** – I-110 / PCH
- **Harbor College** – West of I-110 between PCH and Anaheim Street
- **Wilmington Waterfront** – Avalon Boulevard / Harry Bridges Boulevard
- **San Pedro** – Harbor Boulevard / 7th Street

These termini can be served by several corridors, including:

- **Normandie Avenue / Gaffey Street / 7th Street** – The alignment runs south on Normandie Avenue from the Harbor Subdivision ROW, continues on Gaffey Street and turns east on 7th Street to terminate at 7th Street / Harbor Boulevard. The alignment could be at-grade or aerial for LRT-compatible modal options and could provide access to Kaiser Hospital at PCH and downtown San Pedro.

- **Normandie Avenue / Gaffey Street / John Gibson Boulevard / Harbor Boulevard** – The alignment runs south on Normandie Avenue from the Harbor Subdivision ROW, continues on Gaffey Street to John Gibson Boulevard and Harbor Boulevard. Passenger service could travel in between the existing roadway and tracks for a portion of John Gibson and Harbor Boulevards. The alignment could be at-grade or aerial on Normandie Avenue and Gaffey Street and at-grade on John Gibson Boulevard and Harbor Boulevard. The alignment is appropriate for LRT-compatible modal options and could provide access to or terminate at Kaiser Hospital at PCH and/or downtown San Pedro.

- **I-110 / Harbor Transitway** – From the Harbor Subdivision ROW, the alignment travels south on I-110 and continues to John Gibson Boulevard and Harbor Boulevard. On both John Gibson and Harbor Boulevards, passenger service can operate between the existing roadway and tracks. An aerial or at-grade alignment is suitable for I-110 and an at-grade alignment is suitable for John Gibson and Harbor Boulevards. All modal options could utilize this alignment and connect to several potential termini, including the PCH Park-and-Ride, Harbor College, and downtown San Pedro.

- **Avalon Boulevard** – From the Harbor Subdivision ROW, the alignment travels south on Avalon Boulevard and turns east at Harry Bridges Boulevard and continues to John Gibson and Harbor Boulevards. Passenger service could travel in between the existing roadway and tracks for a portion of John Gibson and Harbor Boulevards. This alignment could be followed at-grade for LRT-compatible modal options, and allows for connections to the Wilmington waterfront, the proposed Red Car Line extension at Avalon Boulevard / Harry Bridges Boulevard and the Red Car Line in downtown San Pedro. It is also possible for the line to terminate at the Wilmington waterfront.

- **McFarland / BNSF** – From the Harbor Subdivision ROW, the alignment follows the BNSF freight line that continues through Watson Yard and parallels McFarland Avenue through
eastern Wilmington. The alignment then connects to Harry Bridges Boulevard, John Gibson Boulevard and Harbor Boulevard, traveling in the area between the roadways and existing tracks. This alignment could be followed at-grade for all modal options, and allows for connections to the Wilmington waterfront, the proposed Red Car Line extension at Avalon Boulevard / Harry Bridges Boulevard and the Red Car Line in downtown San Pedro. It is also possible for the line to terminate at the Wilmington waterfront.

Downtown Long Beach is a major recreational, employment and civic center and also the terminus of the Metro Blue Line. There are four potential off-corridor alignments that can serve a Long Beach terminus:

- **Sepulveda Boulevard / Willow Street / Metro Blue Line** – From the end of the Metro-owned Harbor Subdivision ROW, the alignment follows Wilmington Avenue north, turning east on Sepulveda Boulevard and continuing to Willow Street to connect to the Metro Blue Line heading south and terminating at the Long Beach Transit Mall. The alignment is suitable for LRT-compatible modal options only.

- **Pacific Coast Highway / Metro Blue Line** – The alignment follows the BNSF freight line from the end of the Metro-owned Harbor Subdivision ROW and continues east on PCH to connect to the Metro Blue Line heading south and terminating at the Long Beach Transit Mall. The alignment is suitable for LRT-compatible modal options only.

- **Anaheim Street / Pacific Avenue / Metro Blue Line** – The alignment follows the BNSF freight line and Alameda Corridor east from the end of the Metro-owned Harbor Subdivision ROW to Anaheim Street and Pacific Avenue, connecting to the existing Metro Blue Line at Pacific Avenue / 8th Street. An at-grade alignment is suitable for LRT-compatible modal options only and would likely impact traffic on these busy truck routes.

- **Alameda Corridor / Shoreline Drive / Ocean Boulevard** – The alignment follows the BNSF freight line and Alameda Corridor east from the end of the Metro-owned Harbor Subdivision ROW to Anaheim Street. The alignment continues to follow existing railroad corridors southeast, crossing the LA River and following Shoreline Drive and Ocean Boulevard to meet the Metro Blue Line at the Transit Mall station. An at-grade configuration is suitable for LRT-compatible modal options only, while an aerial or below-grade configuration along Ocean Avenue would also be able to accommodate freight-compatible modal options.
Figure 3.17. Southern Routing / Terminus Options

Source: AE LLC, STV Incorporated
3.2.5. **Build Alternatives Summary**

Modal technologies, potential routing alignments and travel markets throughout the Study Area have been combined to form an overall set of Build Alternatives. These Build Alternatives generally match the region's travel markets, but are split into distinct projects based on the location of LAX in the Harbor Subdivision Corridor. Given the central location of LAX in the study area, its presence as a large activity center, and the convergence of several existing and planned transit lines in the area, the airport area (either the Central Terminal Area or planned Transportation Center near Century and Aviation Boulevards) is a logical start or end point for three of the four Build Alternatives.

Each Build Alternative serves at least one market, with one Build Alternative serving as many as three. The Build Alternatives serve some markets well, while serving others only marginally or perhaps not at all. It should be noted that the alternatives are not exclusive, and that a combination of alternatives can be implemented for this corridor, or a selected alternative may be a blend of more than one.

Build Alternatives include:

- **Local North Alternative** – LAX to LAUS, with stations approximately every mile
- **Local South Alternative** – Harbor / South Bay to LAX, with stations approximately every mile
- **Regional Alternative** – Harbor / South Bay to LAUS, with stations approximately every four miles
- **Express Alternative** – LAX to LAUS, with no intermediate stations

3.2.5.1. **Local North Alternative**

Local service along the northern portion of the alignment encompasses routing options from the northern end of the Metro-owned Harbor Subdivision ROW into downtown Los Angeles and Huntington Park in addition to routing alignments serving the LAX CTA. This alternative is only suitable for LRT-compatible modal options because most of the potential alignments, especially in downtown Los Angeles and Huntington Park, require extensive on-street operation. The main market served by this alternative is the South Los Angeles East-West Local Corridor. The LAX travel market is served to a lesser degree. The Build Alternative does not serve the I-405 Corridor, the South Bay North-South Local Corridor or the South Bay to downtown Los Angeles regional travel market. The Local North Alternative is shown in Figure 3.18.
Figure 3.18. Local North Alternative – All Routing / Terminus Options

Source: AE LLC, STV Incorporated
3.2.5.2. **Local South Alternative**

The Local South Alternative includes various routing options from the LAX area in the north, through Lawndale and Torrance in the central South Bay, and to San Pedro, Wilmington and Long Beach in the south. These alignment options are illustrated in Figure 3.19. Like the Local North Alternative, this alternative is only suitable for LRT-compatible modal options because the potential alignments require extensive on-street operation. The main market served by this alternative is the South Bay North-South Local Corridor. The Alternative serves the I-405 Corridor to a lesser degree and does not serve the South Los Angeles East-West Local Corridor, LAX travel market or the South Bay to downtown Los Angeles regional travel market.
Figure 3.19. Local South Alternative – All Routing / Terminus Options

Source: AE LLC, STV Incorporated
3.2.5.3. Regional Alternative

The Regional Alternative spans the entire length of the Harbor Subdivision Transit Corridor Study Area. Freight-compatible modal options are best suited for this regional service because these vehicles are designed to serve longer travel distance, travel at high speeds, and stop at more widely-spaced stations. But, LRT-compatible modes will also be examined for this market to determine if their ability to interline with existing Metro services makes up for their smaller sizes and lower speed operations. The many potential alignments that include extensive on-street operations are not considered in this alternative, given their slow speeds and mixing with auto traffic. The Regional Alternative serves three major travel markets, including the I-405 Corridor, LAX and the South Bay to downtown Los Angeles markets. The Regional Alternative provides only limited utility for the South Los Angeles East-West Local and South Bay- North-South Local markets. An overview of the alternative is shown in Figure 3.20 and Figure 3.21.
Figure 3.20. Regional Alternative – All Routing / Terminus Options – Northern Section

Source: AE LLC, STV Incorporated
Figure 3.21. Regional Alternative – All Routing / Terminus Options – Southern Section

Source: AE LLC, STV Incorporated
3.2.5.4. Express Alternative

The north alignment characterized in Section 3.2.5.3 is also appropriate for a non-stop express service operating between LAUS and LAX. This alternative is suitable for all modal options and would serve well the LAX regional travel market. The Express Alternative would not serve any of the other travel markets including the I-405 Corridor, South Los Angeles East-West Local Corridor, South Bay North-South Local Corridor and the South Bay to downtown Los Angeles Regional Corridor. Figure 3.22 illustrates potential express routing alignments.

LAUS and LAX are the only activity centers within the Study Area capable of attracting the ridership necessary to make an express service cost-effective. The large number of transit lines that converge at LAUS and its close proximity to the downtown Los Angeles' employment base, make it an ideal activity center to connect directly to a major international airport. Additionally, the fact that LAX attracts millions of passengers annually, also justifies the need for a direct, one-seat connection to the central terminal area. The success of LAWA’s FlyAway service has already illustrated the strength of the LAUS-LAX travel market.
Figure 3.22. Express Alternative – All Route / Terminus Options – Overview

Source: AE LLC, STV Incorporated
3.2.6. Transportation Systems Management (TSM) / Baseline Alternative

The TSM / Baseline Alternatives consist of low cost operational improvements to current transit facilities and services that extract the greatest benefits from existing infrastructure. The development of the TSM / Baseline Alternative is based on the recommendations of Statewide and Metropolitan Planning Guidelines and the Federal Transit Administration (FTA) Major Investment Guidelines. These guidelines require the TSM / Baseline Alternatives to provide the basis of comparison to the higher capital investment Build Alternatives.

Low cost TSM Alternatives include Metro Rapid, Metro Rapid Express, and LAWA FlyAway express bus routes that correspond to the Build Alternatives proposed for operation in the Harbor Subdivision ROW. The Rapid, Rapid Express and FlyAway bus fleets would be maintained at existing Metro and LAX FlyAway maintenance facilities.

3.2.6.1. Local TSM Alternatives – Metro Rapid Bus

The Local TSM Alternatives would attempt to resemble passenger service provided by the Local North and Local South Alternatives (detailed in Sections 3.2.5.1 and 3.2.5.2) by operating a new Metro Rapid line paralleling the Harbor Subdivision Corridor. The Local TSM Alternatives would stop at similar locations as the Local Build Alternatives, providing a comparable service for shorter trip lengths. The TSM route would operate at similar headways to the existing Metro Rapid system, including headways of ten minutes or less during the peak period and frequent service during the off-peak period.

The Metro Rapid alternative would also include enhanced bus stops and traffic signal priority. Additional amenities such as bus route information and signage, benches and bus shelters would help improve the passenger experience, while traffic signal priority would decrease travel times and improve reliability for passengers navigating the most heavily-traveled corridors.

3.2.6.2. Regional TSM Alternative – Metro Rapid Express Bus

A more express-oriented service is needed for the Regional TSM Alternative to provide comparable service to the build alternative. The Regional TSM Alternative is patterned after the Metro Rapid Express service recently implemented by Metro along select routes (e.g. Line 920 - Wilshire Metro Rapid Express). The Metro Rapid Express service is similar to Metro Rapid service, but stops less frequently (approximately every four miles as opposed to every mile). Metro Rapid Express features the same signal priority and station amenities implemented by the Metro Rapid service, and would operate at headways similar to the Regional Build Alternative. The Regional TSM alternative would operate over a route similar to the Local TSM alternatives, but stop only at the major transportation centers served by the Regional Build Alternative.
3.2.6.3. Express TSM Alternative – LAWA FlyAway Bus

For point-to-point express type service, Metro Rapid and Rapid Express type services that run on city streets do not provide a comparable level of service. Therefore, a more freeway-focused bus service is needed. Such a service is already provided by LAWA’s FlyAway program, which operates nonstop between LAUS and the LAX CTA. The FlyAway utilizes the Harbor Transitway and I-105 HOV lanes for much of the trip with a travel time of approximately 30 minutes during most times of the day. The Express TSM Alternative will expand the service from its current headways (30 minutes all day, 20 minutes during peak periods, hourly in the early morning) to a more frequent schedule comparable to the Express Build Alternative.

3.3. STAGE I (INITIAL) SCREENING OF ALTERNATIVES

This section summarizes the Stage I Screening of each routing / terminus and modal option previously described using the criteria set forth in Section 3.1.2.1. Recommendations are made to either carry forward the routing / terminus or modal option or eliminate the option from further analysis. Significant and fatal flaws or reasons to carry forward the alternative are highlighted.

Full Stage I evaluation tables for each modal and routing option are contained in Appendix D.

Stakeholder input and regulatory and utilities issues were taken into account throughout this screening process. Issues pertaining to the Crenshaw Transit Corridor, BNSF operations, LAWA Master Planning activities, and LRT/freight-compatibility were incorporated into the evaluation of the various routing / terminus and modal options. The Crenshaw Transit Corridor is especially relevant in the discussions of physical fit for the northwest portion of the Harbor Subdivision Corridor and the BRT and LRT modal options. Vehicle compatibility issues are also discussed in terms of the physical fit evaluation criteria. Finally, LAWA and Federal Aviation Administration (FAA) coordination is discussed in terms of the LAX routing / terminus options, especially those that are proposed to serve the CTA.

3.3.1. Routing / Terminus Options

Many of the preliminary routing / terminus options do not withstand the Stage I evaluation criteria discussed at the beginning of this Chapter in Section 3.1.2.1. Many options are screened out on the basis of limited ridership potential, the inability to provide through service, physical fit, community impacts, and the difficulty of obtaining operating rights on select non Metro-owned ROW. The options in the four main areas of the project are evaluated in the following sections.
3.3.1.1. Northern Routing / Terminus Options

The Northern Routing and Terminus Options are shown in Figure 3.14 on Page 3-30, summarized below in Table 3.5, and evaluated in the following section.

### Table 3.5. Northern Routing / Terminus Options

<table>
<thead>
<tr>
<th>Terminus Option</th>
<th>Routing Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles Union Station</td>
<td>Alameda Street</td>
<td>Washington Boulevard &gt; Alameda Street &gt; Metro Gold Line</td>
</tr>
<tr>
<td></td>
<td>Metro Blue Line / Alameda Street</td>
<td>Metro Blue Line &gt; Union Pacific Tracks &gt; Alameda Street &gt; Metro Gold Line</td>
</tr>
<tr>
<td></td>
<td>Santa Fe Avenue</td>
<td>Washington Boulevard &gt; Santa Fe Avenue &gt; Metro Gold Line</td>
</tr>
<tr>
<td></td>
<td>Los Angeles River</td>
<td>Los Angeles River &gt; LAUS Run-Through Tracks or Existing LOSSAN Corridor</td>
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<tr>
<td></td>
<td>Metro Blue Line / Alameda Corridor / Los Angeles River</td>
<td>Metro Blue Line &gt; Alameda Corridor &gt; Los Angeles River &gt; LAUS Run Through Tracks or Existing LOSSAN Corridor</td>
</tr>
<tr>
<td>7th Street / Metro Center</td>
<td>Metro Blue Line to 7th Street / Metro Center</td>
<td>Metro Blue Line</td>
</tr>
<tr>
<td>Metro Blue Line Slauson Station</td>
<td>Terminate at Metro Blue Line Slauson Station</td>
<td>Terminate at Slauson/Long Beach</td>
</tr>
<tr>
<td>Downtown Huntington Park</td>
<td>Slauson Avenue / Pacific Boulevard</td>
<td>Slauson Boulevard &gt; Pacific Boulevard &gt;</td>
</tr>
<tr>
<td></td>
<td>Union Pacific / Randolph Avenue</td>
<td>Union Pacific Tracks / Randolph Avenue &gt; Pacific Boulevard</td>
</tr>
</tbody>
</table>

**Los Angeles Union Station Terminus Option**

- **Alameda Street Routing Option**
  - Recommended for Elimination
  - Cannot easily serve Vernon’s dispersed employment base from the ROW.
  - Use of the ROW through Vernon duplicates Metro Blue Line service between Slauson Avenue and Washington Boulevard.

- **Metro Blue Line / Alameda Street Routing Option**
  - Recommended to be Carried Forward (Local North Alternative Only)
  - Northern terminus at Little Tokyo/Arts District station at 1st/Alameda because of operational constraints closer to Los Angeles Union Station. See Section 4.1 for additional detail.
  - Utilizes the Metro Blue Line corridor and therefore does not duplicate this service by operating along the parallel portion of the Harbor Subdivision.
  - Stakeholders support the alignment because of its ample width, close proximity to growing residential neighborhoods adjacent to Alameda Street and potential TOD opportunities.
• Santa Fe Avenue Routing Option
  o **Recommended for Elimination**
  o Offers limited ridership potential because it is far from many downtown activity centers.
  o Cannot easily serve Vernon’s dispersed employment base from the ROW.
  o Use of the ROW through Vernon duplicates Metro Blue Line service between Slauson Avenue and Washington Boulevard.
  o Santa Fe Avenue is narrow and the introduction of fixed guideway service will likely cause property displacements and visual impacts, especially if an aerial structure is constructed.
  o Stakeholders do not support the Santa Fe Avenue option.

• Los Angeles River Routing Option
  o **Recommended to be Carried Forward** (Regional and Express Alternatives Only)
  o Not suitable for local service because it offers limited stop locations along the Los Angeles River.
  o Use of the Harbor Subdivision ROW through Vernon parallels but does not duplicate locally-oriented Metro Blue Line service, while providing a more direct connection to LAUS.
  o Stakeholders support the routing option because it would cause minimal property displacements, relocations and visual impacts.

• Metro Blue Line / Alameda Corridor / Los Angeles River Routing Option
  o **Recommended for Elimination**
  o Requires the use of the northern portion of the Alameda Corridor, which is used by all freight traffic to reach the Ports of Los Angeles and Long Beach, which are some of the busiest in the U.S. and major economic drivers. It is unlikely the Alameda Corridor can accommodate any passenger service in this area.

7th Street/Metro Center Terminus Option
• Metro Blue Line Routing Option
  o **Recommended for Elimination**
  o No additional capacity available for the Harbor Subdivision along Flower Street with the addition of the Metro Exposition Line service.
  o Stakeholders do not support the Metro Blue Line alignment because of capacity constraints at Washington Boulevard and Flower Street.

Metro Blue Line Slauson Station Terminus Option
• **Recommended to be Carried Forward** (potential terminus for initial phase)
• Not a major activity or transportation center and a transfer is needed to access the Metro Blue Line to continue north or south.
• Few community impacts, while opening up a potential ridership base because it is in proximity of transit-dependent residencies along the Slauson Corridor.
Downtown Huntington Park Terminus Option

- **Slauson Avenue / Pacific Boulevard Routing Option**
  - **Recommended for Elimination**
  - Portion of the alignment along Pacific Boulevard does not allow for through service to LAUS.
  - Requires significant property displacements and relocations to preserve heavily used traffic lanes and parking on Pacific Boulevard.
  - Significant visual impacts, as the alignment runs through the heart of Huntington Park.
  - Stakeholders do not support the Pacific Boulevard alignment because of community impacts.

- **Union Pacific / Randolph Avenue Routing Option**
  - **Recommended for Elimination**
  - Does not allow for through service to LAUS.
  - Requires operation on UP-owned and operated track. The routing option would require the purchase of operating rights or ROW from Union Pacific.

**Summary of Northern Routing / Terminus Options to be Carried Forward**

Two northern routing / terminus options meet the Stage I screening criteria and will be carried forward for further analysis:

- **Metro Blue Line / Alameda Street** – Suitable for LRT-compatible modal options and local service. Northern terminus at 1st/Alameda due to capacity issues between there and LAUS (See Section 4.1 for more detail)

- **Los Angeles River** – Suitable for all modal options and regional/express service. Northern terminus at LAUS.

An initial MOS to the Slauson Metro Blue Line station will also be examined. These options, which will be carried forward into Stage II Evaluation and conceptual engineering, are shown in Figure 3.23.
Figure 3.23. Northern Routing / Terminus Options Carried Forward

Source: AE LLC, STV Incorporated
3.3.1.2. LAX Routing / Terminus Options

The LAX Routing and Terminus Options are shown in Figure 3.15 on Page 3-33, summarized below in Table 3.6, and evaluated in the following section.

<table>
<thead>
<tr>
<th>Terminus Option</th>
<th>Routing Option and Description</th>
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<tr>
<td>Century/Aviation Station on ROW at Century/Aviation</td>
<td>Station on ROW at Century/Aviation</td>
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<td>LAX CTA</td>
<td>Century Boulevard</td>
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<tr>
<td></td>
<td>98th Street</td>
</tr>
<tr>
<td></td>
<td>Arbor Vitae Street</td>
</tr>
</tbody>
</table>

**Harbor Subdivision ROW with Station at Century/Aviation Terminus Option**

- **Recommended to be Carried Forward** (Local and Regional Alternatives)
- Would connect to the major transit center planned for Century Boulevard / Aviation Boulevard, providing a cost effective alternative to the routing options that run into the LAX CTA.
- Could potentially connect to the planned Crenshaw Transit Corridor, planned LAWA APM and other transit services at Century Boulevard/Aviation Boulevard.

**LAX CTA Terminus Option**

- **Century Boulevard Routing Option**
  - **Recommended to be Carried Forward** (Express Alternative only)
  - Only a premium service with the shortest possible travel time would justify the cost of a connection to the CTA.
  - Extra time needed for passengers using the local and regional services to connect to the CTA via LAWA’s APM is less significant given longer travel times.
  - Given uncertainty with LAX Master Planning activities, Century Boulevard was chosen as a representative of all the potential CTA alignments because the Corridor has been examined in previous planning studies.

- **98th Street Routing Option**
  - **Recommended to be Eliminated**
  - Only carry forward the Century Boulevard option for the Express Alternative, as LAX Master Planning activities are ongoing. Reexamine 98th Street option when master planning has progressed further.

- **Arbor Vitae Street Routing Option**
  - **Recommended to be Eliminated**
  - Only carry forward the Century Boulevard option for the Express Alternative, as LAX Master Planning activities are ongoing. Reexamine Arbor Vitae Street option when master planning has progressed further.
Summary of LAX Routing / Terminus Options to be Carried Forward

None of the routing / terminus options proposed to serve the potential transportation center in the Manchester Square area and the LAX CTA can be screened from further analysis given the uncertainty presented by the LAX Master Planning process. However, only the Harbor Subdivision ROW option with a station at Century Boulevard / Aviation Boulevard and the Century Boulevard alignment into the CTA will be carried forward for the Stage II Evaluation. The Century Boulevard option will be carried forward as a representative of all the potential CTA alignments (98th Street and Arbor Vitae Street). The CTA alignments are only cost effective for the Express Alternative, as the high cost to enter the CTA is best justified by a premium, one-seat ride service. Lower-speed local and regional alternatives will serve the airport via the Century Boulevard / Aviation Boulevard station and the LAWA APM. The Harbor Subdivision option with a station at Century Boulevard / Aviation Boulevard and the Century Boulevard option are illustrated in Figure 3.24.
Figure 3.24. LAX Routing / Terminus Options Carried Forward

Source: AE LLC, STV Incorporated
3.3.1.3. Central Routing / Terminus Options

The Central Routing and Terminus Options are shown in Figure 3.16 on Page 3-35, summarized below in Table 3.7, and evaluated in the following sections.

<table>
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<tr>
<th>Terminus Option</th>
<th>Routing Option</th>
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<tr>
<td>Harbor Area</td>
<td>Harbor Subdivision ROW</td>
<td>Through service along Harbor Subdivision to Harbor area</td>
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<tr>
<td>Central Torrance</td>
<td>Hawthorne Boulevard</td>
<td>Manhattan Beach Boulevard &gt; Hawthorne Boulevard &gt; Del Amo Fashion Center</td>
</tr>
<tr>
<td></td>
<td>Madrona Avenue</td>
<td>Madrona Avenue &gt; Madrona Marsh Nature Preserve</td>
</tr>
</tbody>
</table>

**Harbor Subdivision ROW to Harbor Area Option**
- **Recommended to be Carried Forward** (Local and Regional Alternatives)
- Provides the option of through service southward and a connection to the South Bay Galleria and the planned Redondo Beach and Torrance Regional Transit Centers.
- Stakeholders support the Harbor Subdivision ROW as an alternative to off-corridor options that would have more significant community impacts.
- The Harbor Subdivision ROW also offers potential TOD opportunities around Manhattan Beach Avenue / Inglewood Avenue.

**Central Torrance Terminus Option**
- **Hawthorne Boulevard Routing Option**
  - **Recommended for Elimination**
  - Does not connect to the planned Redondo Beach or Torrance Regional Transit Centers, or possibly can connect to one if only a short section of Hawthorne Boulevard is used.
  - Dead-end terminus if utilized south of 190th Street (if routed to Del Amo Fashion Center) and does not offer through service due to large single-family residential neighborhoods and narrow existing transportation corridors to south and east of Del Amo Fashion Center.
  - Stakeholders do not support the Hawthorne Boulevard routing option because the aerial configuration is inconsistent with recently completed corridor enhancement and will cause significant property, traffic and visual impacts.
- **Madrona Avenue Routing Option**
  - **Recommended for Elimination**
  - Does not serve the proposed Torrance Regional Transit Center and is a dead-end terminus and does not offer through service south due to large single-family residential neighborhoods and narrow existing transportation corridors.
  - Stakeholders do not support the Madrona Avenue alignment because of significant property, visual, noise and vibration impacts.
Summary of Central Routing / Terminus Options to be Carried Forward

Only the Harbor Subdivision ROW option meets the Stage I Screening criteria and will be carried forward for further study. The Hawthorne Boulevard and Madrona Avenue options are screened out as they would cause significant impacts to surrounding communities, miss important planned regional transit centers, and not allow for through service to the Harbor area. The alignment along the ROW is suitable for both LRT-compatible and Freight-compatible modal options, and is illustrated in Figure 3.25.
Figure 3.25. Central Routing / Terminus Options Carried Forward

Source: AE LLC, STV Incorporated
3.3.1.4. **Southern Routing / Terminus Options**

The Southern Routing and Terminus Options are shown in Figure 3.17 on Page 3-38, summarized below in Table 3.8, and evaluated in the following sections.

<table>
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<tr>
<th>Terminus Option</th>
<th>Routing Option</th>
<th>Description</th>
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<tbody>
<tr>
<td>San Pedro</td>
<td>Gaffey St / 7th St</td>
<td>Normandie Ave &gt; Gaffey St &gt; 7th St</td>
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<tr>
<td></td>
<td>Gaffey St / Harbor Blvd</td>
<td>Normandie Ave &gt; Gaffey St &gt; Gibson Blvd &gt; Harbor Blvd</td>
</tr>
<tr>
<td></td>
<td>I-110</td>
<td>I-110 &gt; Harbor Transitway</td>
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<tr>
<td></td>
<td>Avalon Blvd</td>
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<tr>
<td></td>
<td>MacFarland Ave</td>
<td>MacFarland Ave &gt; BNSF</td>
</tr>
<tr>
<td>Long Beach</td>
<td>Sepulveda / Willow</td>
<td>Sepulveda Blvd &gt; Willow St &gt; Metro Blue Line</td>
</tr>
<tr>
<td></td>
<td>Pacific Coast Highway</td>
<td>BNSF Tracks &gt; Pacific Coast Highway &gt; Metro Blue Line</td>
</tr>
<tr>
<td></td>
<td>Anaheim Street</td>
<td>Anaheim St &gt; Metro Blue Line</td>
</tr>
<tr>
<td></td>
<td>Alameda Corridor / Shoreline</td>
<td>Alameda Corridor &gt; Shoreline Dr &gt; Ocean Blvd</td>
</tr>
</tbody>
</table>

**San Pedro Terminus Option**

- **Gaffey Street / 7th Street Routing Option**
  - Recommended for Elimination
  - 7th Street is narrow and the introduction of fixed guideway transit will cause significant property displacements and relocations.
  - Stakeholders do not support 7th Street because of these potential community impacts.

- **Gaffey Street / Harbor Boulevard Routing Option**
  - Recommended to be Carried Forward (Local Alternative Only)
  - Use of existing railroad ROW paralleling Gaffey Street and Harbor Boulevard
  - Connections to Cruise Terminal, Waterfront Red Car Line
  - The Gaffey Street / Harbor Boulevard option connects to Kaiser Hospital, downtown San Pedro, the Caltrans park-and-ride and the Ports O’ Call Village – locations with limited express transit.
  - Stakeholders support the Gaffey Street / Harbor Boulevard routing option.
  - The Southern terminus will be at Cruise Terminal station (SR-47/Harbor) because of urban design and engineering constraints. See Section 4.5 for additional detail.

- **I-110 Routing Option**
  - Recommended to be Carried Forward (Local and Regional Alternatives)
  - Use of existing railroad ROW paralleling Harbor Boulevard
  - Connections to Cruise Terminal, Waterfront Red Car Line
  - The I-110 option serves local bus lines at the PCH park-in-ride, Harbor College and the downtown San Pedro area
  - Stakeholders support the I-110 routing option because it proposes fewer community impacts.
The southern terminus will be at the Cruise Terminal station (SR-47/Harbor) because of urban design and engineering constraints. See Section 4.5 for additional detail.

- **Avalon Boulevard Routing Option**
  - **Recommended for Elimination**
  - Provides a circuitous route to downtown San Pedro but well serves Wilmington – an area without a large enough activity center to justify direct service.
  - Stakeholders do not support the Avalon Boulevard routing option because of significant community impacts resulting from the street’s narrow width.

- **McFarland Avenue Routing Option**
  - **Recommended for Elimination**
  - Provides a circuitous route to downtown San Pedro but well serves Wilmington – an area without a large enough activity center to justify direct service.
  - Requires operation on ROW owned and operated by BNSF; acquiring operating rights from BNSF could prove difficult and expensive.
  - Limited ridership potential, as it is difficult to access.
  - Stakeholders do not support McFarland Avenue because the alignment is narrow and the introduction of fixed guideway service would cause property, noise and vibration impacts.

**Long Beach Terminus Option**

- **Sepulveda Boulevard / Willow Street Routing Option**
  - **Recommended to be Carried Forward** (Local Alternative Only)
  - Stakeholders support the Sepulveda Blvd / Willow St / Metro Blue Line alignment, especially with a terminus at the existing Willow Blue Line station.
  - Southern terminus will be at the Willow Street Metro Blue Line station (Willow/Long Beach) because of operating constraints south to Long Beach. See Section 4.1 for additional detail.

- **Pacific Coast Highway Routing Option**
  - **Recommended to be Carried Forward** (Local Alternative Only)
  - Stakeholders support the PCH routing option as an alternative to off-corridor options that utilize the Alameda Corridor.
  - The on-street nature of PCH makes it unsuitable for regional service. The southern terminus will be at the PCH Metro Blue Line station (PCH/Long Beach) because of operating constraints south to Long Beach. See Section 4.1 for additional detail.

- **Anaheim Street Routing Option**
  - **Recommended for Elimination**
  - Financially and operationally infeasible to add additional track and ROW to the Alameda Corridor, which is heavily constrained with traffic to the Los Angeles and Long Beach ports.
  - Anaheim Street is narrow and a new guideway will cause significant property and visual impacts.
  - Stakeholders do not support the Anaheim Street routing option because construction along Anaheim Street will cause significant community impacts.
• Alameda Corridor / Shoreline Drive Routing Option
  o Recommended for Elimination
  o Operational investigation found that it is not feasible to use the existing Alameda Corridor tracks. Additional ROW through this area for separate tracks is not available because of dense industrial and refinery land uses. See Section 4.1 for additional detail.

Summary of Southern Routing / Terminus Options to be Carried Forward

Four routing / terminus options in the southern portion of the Corridor meet the Stage I screening criteria and will be carried forward for further analysis. These alignments are illustrated in Figure 3.26.

• San Pedro Terminus:
  o Normandie / Gaffey (also known as Gaffey Street / Harbor Boulevard) – Suitable for LRT-compatible modal options and local service. Southern terminus at Cruise Terminal station due to urban design issues between there and downtown San Pedro (See Section 4.5 for more detail)
  o I-110 – Suitable for all modal options and local and regional service. Southern terminus at Cruise Terminal station due to urban design issues between there and downtown San Pedro (See Section 4.5 for more detail)

• Long Beach Terminus:
  o Sepulveda / Willow – Suitable for LRT-compatible modal options and local service. Southern terminus at Willow Metro Blue Line station due to operational constraints between there and downtown Long Beach (See Section 4.1 for more detail).
  o Pacific Coast Highway – Suitable for LRT-compatible modal options and local service. Southern terminus at PCH Metro Blue Line station due to operational constraints between there and downtown Long Beach (See Section 4.1 for more detail).

Kaiser Hospital, the PCH Park-and-Ride / Harbor College and the Wilmington waterfront were initially considered as potential termini in the southern portion of the Corridor. Although Kaiser Hospital and the PCH Park-and-Ride / Harbor College are important activity centers, they are not appropriate locations for the termination of transit service as they would not serve the larger regional San Pedro Harbor destination. Instead, the Normandie / Gaffey and I-110 options will continue to downtown San Pedro via John Gibson Boulevard and Harbor Boulevard and Kaiser Hospital and the PCH Park-and-Ride / Harbor College will be carried forward as intermediate station locations. The Wilmington waterfront will not be carried forward as a terminus option, as both options serving Wilmington were eliminated from further analysis.
Figure 3.26. Southern Routing / Terminus Options Carried Forward

Source: AE LLC, STV Incorporated
3.3.1.5. **Summary of Routing / Terminus Options**

Table 3.9 summarizes Section 3.2.4.1 through Section 3.2.4.4 and states the routing/terminus options that will be carried forward and eliminated from further study per the Stage I Screening process.

<table>
<thead>
<tr>
<th>Area</th>
<th>Options Carried Forward</th>
<th>Options Eliminated</th>
</tr>
</thead>
<tbody>
<tr>
<td>North</td>
<td>* Metro Blue Line / Alameda Street to LAUS (Local)</td>
<td>* Alameda Street to LAUS</td>
</tr>
<tr>
<td></td>
<td>* Los Angeles River to LAUS (Regional / Express)</td>
<td>* Santa Fe Avenue to LAUS</td>
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<tr>
<td></td>
<td>* Harbor Subdivision ROW with terminus at Metro Blue Line</td>
<td>* Metro Blue Line / Alameda Corridor / Los Angeles River to LAUS</td>
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<tr>
<td></td>
<td></td>
<td>* Blue Line to 7th Street/Metro Center</td>
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<td></td>
<td></td>
<td>* Slauson Avenue / Pacific Boulevard to Huntington Park</td>
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<td>* Union Pacific / Randolph Avenue to Huntington Park</td>
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<tr>
<td>LAX</td>
<td>* Harbor Subdivision ROW with station at Century Boulevard / Aviation (Local / Regional)</td>
<td>* 98th Street to CTA*</td>
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<td></td>
<td>* Century Boulevard to CTA (Express)*</td>
<td>* Arbor Vitae Street to CTA*</td>
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<tr>
<td>Central</td>
<td>* Harbor Subdivision ROW to South Bay (Local / Regional)</td>
<td>* Hawthorne Boulevard to Central Torrance</td>
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<td></td>
<td>* Madrona Avenue to Central Torrance</td>
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<tr>
<td>South</td>
<td>* Gaffey Street / Harbor Boulevard to San Pedro (Local)</td>
<td>* Gaffey Street / 7th Street to San Pedro</td>
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<td></td>
<td>* I-110 to San Pedro (Local / Regional)</td>
<td>* Avalon Boulevard to San Pedro</td>
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<tr>
<td></td>
<td>* Sepulveda Boulevard / Willow Street to Long Beach (Local)</td>
<td>* McFarland Avenue to San Pedro</td>
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<tr>
<td></td>
<td>* Pacific Coast Highway to Long Beach (Local)</td>
<td>* Anaheim Street to Long Beach</td>
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<td></td>
<td></td>
<td>* Alameda Corridor / Shoreline Drive to Long Beach</td>
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* Final alignment into LAX CTA pending until LAX Master Planning activities progress
3.3.2. Modal Options

An evaluation of the BRT mode found that BRT does not adequately meet the Stage I screening criteria specified in Section 3.1.2. Five modal alternatives consisting of two LRT-compatible options (LRT and SPR) and three freight-compatible options (SPR, EMU and CRT) will be carried forward for further analysis. Evaluations of the modal options are included in the following sections.

Bus Rapid Transit (BRT) Modal Option

- **Recommended for Elimination**
- The mode cannot interline with most existing and planned transit lines and facilitate a one-seat ride between multiple branches of the regional rapid transit system.
- A BRT running way would create safety, operational issues and conflicts with freight trains and their customers. The preliminary analysis has shown that BRT would not offer transit benefits relative to the significant investment involved due to slow “at grade” speeds when crossing a number of the Corridor’s 96 grade separations and/or the narrow segments of the Corridor that cannot accommodate the width of BRT lanes, and required clearances between BRT lanes and freight tracks.
- On-street operations are required to preserve freight rail access north of LAX where the ROW is only 30’ as temporal separation is infeasible because there are freight track maintenance issues associated with embedding tracks in a busway; extensive on-street operations make the BRT option comparable to the TSM Alternative.
- Dedicated busways will be difficult to fit in the existing street cross sections of the Harbor area, where extensive street operations are required; without a dedicated busway, BRT is comparable to the TSM Alternative.

3.3.2.1. LRT- Compatible Modal Options

- **Light Rail Transit (LRT) Modal Option**
  - **Recommended to be Carried Forward**
  - Able to connect and potentially interline with many existing and planned Metro rail lines (except the Metro Red / Purple Lines), potentially facilitating a one-seat ride between multiple branches of the regional rapid transit system.
  - Can operate on-street, if necessary, and because it is electrified, LRT will produce minimal emissions and can accelerate and decelerate more quickly than diesel engines.
  - LRT consistently emerged as one of the preferred modes throughout the public outreach process.
• **LRT-Compatible Self Propelled Railcar (SPR) Modal Option**  
  - **Recommended to be Carried Forward**  
  - Can connect to and may be able to interline with existing and planned Metro rail lines (except the Metro Red / Purple Lines), potentially facilitating a one-seat ride between multiple branches of the regional rapid transit system.  
  - Whereas there are fewer visual impacts associated with LRT-Compatible SPR compared to LRT, SPR’s diesel engines will likely produce more emissions, noise and vibration than compared to LRT.  
  - There is less community support for LRT-Compatible SPR because there is little knowledge of the technology in Southern California.

3.3.2.2. **Freight-Compatible Modal Options**

• **Freight-Compatible Self-Propelled Railcar (SPR) Modal Option**  
  - **Recommended to be Carried Forward**  
  - Can connect to (but not interline with) existing Metro transit lines via dedicated guideways and interline with (and facilitate a one-seat ride between multiple branches of) the regional Metrolink system.  
  - Preserves freight rail access in all parts of the Corridor and presents fewer safety concerns when operating with freight because the railcars are FRA compliant.  
  - Diesel engines produce more emissions, noise and vibration than electrified modes.  
  - There is less community support for Freight-Compatible SPR because there is little knowledge of the technology in Southern California.

• **Electric Multiple Unit (EMU) Modal Option**  
  - **Recommended to be Carried Forward**  
  - Can connect to (but not interline with) existing Metro transit lines via dedicated guideways and interline with (and facilitate a one-seat ride between multiple branches of) the regional Metrolink system.  
  - Preserves freight rail access in all parts of the Corridor and presents fewer safety concerns when operating with freight because the railcars are FRA-compliant.  
  - Produces minimal emissions and can accelerate and decelerate more quickly than diesel engines.  
  - Visual impacts associated with the overhead catenary system required to operate EMU.  
  - The public showed general support for the EMU during the public outreach process.

• **Commuter Rail Transit (CRT) Modal Option**  
  - **Recommended to be Carried Forward**  
  - Can connect to (but not interline with) existing Metro transit lines via dedicated guideways and interline with (and facilitate a one-seat ride between multiple branches of) the regional Metrolink system.  
  - Preserves freight rail access in all parts of the Corridor and presents fewer safety concerns when operating with freight because the vehicles are FRA-compliant.  
  - CRT emerged as a preferred modal option throughout the public outreach process.
3.3.2.3. Summary of Modal Options

Table 3.10 summarizes the modal options that will be carried forward and eliminated from further study per the Stage I Screening process.

<table>
<thead>
<tr>
<th>Weight</th>
<th>Options Carried Forward</th>
<th>Options Eliminated</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRT-Compatible</td>
<td>• Light Rail Transit</td>
<td>• Bus Rapid Transit</td>
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<tr>
<td></td>
<td>• Self-Propelled Railcar</td>
<td></td>
</tr>
<tr>
<td>Freight-Compatible</td>
<td>• Self-Propelled Railcar</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Electric Multiple Unit</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Commuter Rail Transit</td>
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</table>

The BRT option was eliminated mainly because of a lack of benefits compared to the No Build and TSM Alternatives. Constraints such as narrow ROW north of LAX and safety concerns in mixed freight / bus corridors make it difficult to operate BRT while preserving freight access. Temporal separation is not an option because there are significant freight track maintenance issues associated with embedding tracks in a busway. Therefore, BRT service would be pushed to on-street operation, where without a dedicated guideway, service and travel times would be very similar to the TSM Alternative. Because it is unlikely that dedicated guideways will fit within existing on-street cross sections, especially in the Harbor area, BRT will likely facilitate few additional improvements over the No Build and TSM Alternatives.

Two LRT-compatible options will be carried forward: LRT and LRT-compatible SPR. The physical infrastructure needed to support these two alternatives is nearly identical, with the main difference being the need for overhead catenary wires and substations to power the LRT option. The main differentiators between LRT and SPR options will be their capital and operating costs and parameters, emissions, and compatibility and interoperability with the rest of the Metro Rail system. In general, the higher capital costs for the LRT option will be compared to their lower emissions and potentially lower operating costs (depending on the future cost of electricity and fuel).

All three freight-compatible options will be carried forward: freight-compatible SPR, EMU, and CRT. As with the LRT-compatible options, these three modal options will have nearly identical infrastructure requirements with the exception of electric power substations and overhead wires for the EMU modal option. These three options will also be compared mainly using their capital and operating costs and parameters, emissions, and vehicle compatibility and interoperability.

It should be noted that it may be more difficult to acquire LRT-compatible and freight-compatible SPRs and EMU vehicles, given their relative rarity in the United States and regulatory issues. LRT and CRT vehicles will likely be easier to procure considering their extensive use throughout the existing Metro and Metrolink systems.
3.4. **Alternatives To be Carried Forward**

The No Build Alternative, a modified list of Build Alternatives and the TSM Alternatives will be carried forward for additional evaluation. The revised Build Alternatives are derived from the routing / terminus and modal options selected for further analysis in the Stage I screening process. Each alternative is described in more detail below.

3.4.1. **No Build Alternative**

As previously mentioned, the No Build Alternative represents the existing conditions in the Study Area in addition to the planned and funded improvements specified in the financially constrained portion of the 2001 Metro LRTP. Details about the No Build Alternative can be found in Section 3.2.1.

3.4.2. **Build Alternatives**

The Stage I screening process identified a number of routing / terminus and modal options potentially feasible for implementation in the Harbor Subdivision Corridor. These routing / terminus and modal options have been tailored to the travel markets within the Study Area to form a revised set of four Build Alternatives for the Harbor Subdivision Corridor: Local North Alternative (Slauson Avenue / Alameda Street Local), Local South Alternative (Metro Green Line Extension South), Regional Alternative (South Bay Commuter) and Express Alternative (LAX Express). These Build Alternatives are similar to the preliminary Build Alternatives discussed in Section 3.2.5, but include fewer potential routing / terminus and modal options. This revised set of Build Alternatives is better suited to serve the specific markets along the Corridor and will be carried forward for further evaluation in the AA Study. These alternatives are not exclusive, and one or more may be appropriate for a single portion of the Corridor or as part of a larger overall project or the preferred alternative may be a blend of more than one alternative.

This section specifies the remaining routing / terminus options suitable for each Build Alternative and breaks down these routing alignments into distinct sections, based on existing characteristics and constraints of the Corridor. This section also describes potential station locations and modal options for each Build Alternative.
3.4.2.1. Local North Alternative

Alignment

The proposed Local North Alternative is illustrated in Figure 3.27 and described below. As previously mentioned, there is only one off-corridor routing / terminus option suitable for local transit service in the northern portion of the Corridor – the Metro Blue Line / Alameda Street option.

- **Little Tokyo/Arts District – Metro Blue Line** – The alternative would start at an underground station underneath the existing at-grade Little Tokyo/Arts District Gold Line station at 1st Street and Alameda Street (operational constraints on the Metro Gold Line prevent the Local North Alternative from running at-grade into LAUS). After transitioning to above-grade running at a portal south of 3rd Street, the alignment (Metro Blue Line / Alameda Street) would continue south on an aerial structure along Alameda Street until just south of Washington Boulevard. The alignment would turn west to follow an existing Union Pacific Railroad corridor, and connect to the Metro Blue Line corridor near 24th Street. The alternative was originally proposed to terminate at LAUS, but further operational study has shown that this is not feasible (see Section 4.1 for more detail).

- **Metro Blue Line Washington Station – Metro Blue Line Slauson Station** – From Washington Station, the alignment would follow the existing Metro Blue Line at-grade in a southerly direction. The alternative would utilize the parallel tracks currently used by the UP Railroad due to operational constraints on the Metro Blue Line. Just north of the Slauson Station, a new connector would be built to transition the trains to the Harbor Subdivision ROW.

- **Metro Blue Line Slauson Station – Crenshaw Corridor** – West of the Metro Blue Line, the alignment would continue at-grade west and eventually southwest along the Harbor Subdivision ROW. In some sections along Slauson Avenue, the ROW is only 30 feet wide. LRT-compatible modal options could share two tracks with freight operations but would not be able to operate at the same time as freight service due to safety constraints. It would be necessary to move freight service to late night or early morning hours. Grade separations (aerial structures) may be necessary at Avalon Boulevard, Vermont Avenue, Slauson Avenue and Western Avenue per the initial grade crossing analysis.

- **Crenshaw Corridor – Aviation / LAX Metro Green Line Station** – The Crenshaw Transit Corridor begins to utilize the Harbor Subdivision ROW at Crenshaw Boulevard. An aerial junction could be needed with Crenshaw Transit Corridor just west of Crenshaw Boulevard. From this point, the alignment would utilize the Crenshaw Transit Corridor infrastructure if LRT is selected as the LPA for that project. In a southwest direction, two passenger rail tracks would run at-grade and parallel to one freight track, enabling passenger and freight service to operate simultaneously. If BRT is constructed along the Crenshaw Corridor, it will be very difficult for LRT-compatible modal options to operate the length of the Harbor Subdivision; Freight-compatible modal options would still be able to use the preserved freight track. A connection to LAX would be provided by a transfer to the LAX People Mover at the Century Boulevard / Aviation Boulevard station.
Figure 3.27. Local North Alternative – Overview

Source: AE LLC, STV Incorporated
The alignment would connect to the existing Metro Green Line near the Aviation / LAX Station, where trains could continue south to the existing Redondo Beach terminus or east to the existing Norwalk terminus. It is also possible for the Local North Alternative to connect to the Local South Alternative depending on how the rail system’s operations are configured.

Stations

Because this Build Alternative proposes a locally-oriented service, station locations are planned approximately every mile. There are currently 15 station locations: seven are larger and could possibly serve as intermodal centers and eight are smaller, intermediate stations. The larger stations would likely serve a greater number of passengers and include additional amenities such as signage, maps, furnishings, lighting, etc. Stations proposed along the alignment are illustrated in Figure 3.27 and listed in Table 3.11.

<table>
<thead>
<tr>
<th>Table 3.11. Local North Alternative – Stations</th>
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</thead>
<tbody>
<tr>
<td><strong>Section</strong></td>
</tr>
<tr>
<td>Little Tokyo/Arts District (1\textsuperscript{st}/Alameda) – Existing Gold Line</td>
</tr>
<tr>
<td>7\textsuperscript{th}/Alameda</td>
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<tr>
<td>Washington/Alameda</td>
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<tr>
<td>Vernon/Long Beach – Existing Metro Blue Line</td>
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<tr>
<td>Slauson/Long Beach – Existing Metro Blue Line</td>
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<tr>
<td>Slauson/Central</td>
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<tr>
<td>Slauson/110 – Existing Harbor Transitway</td>
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<tr>
<td>Slauson/Vermont</td>
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<td>Slauson/Western</td>
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<tr>
<td>Florence/West – Planned Crenshaw Corridor</td>
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<tr>
<td>Florence/La Brea – Planned Crenshaw Corridor</td>
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<tr>
<td>Florence/Manchester – Planned Crenshaw Corridor</td>
</tr>
<tr>
<td>Century/Aviation – Planned Crenshaw Corridor/LAWA APM</td>
</tr>
<tr>
<td>Aviation/LAX (Imperial/Aviation) – Existing Metro Green Line</td>
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</tbody>
</table>

Vehicles

Only LRT-compatible modal options are appropriate for the Local North Alternative. LRT-compatible modal options carried forward include LRT and SPR. Both types of vehicles would be procured to interline with those currently used on the existing Metro Blue, Green and Gold Lines. These vehicles are typically six-axle, double-ended and articulated, capable of multiple unit operation in trains up to three vehicles.
3.4.2.2. Local South Alternative

Alignment

The proposed Local South Alternative is illustrated in Figure 3.28 and described below. There are four off-corridor routing / terminus options suitable for local transit service in the southern portion of the Corridor – the Normandie / Gaffey option, the I-110 option, the Sepulveda Boulevard / Willow Street option and the PCH option.

- **Redondo Beach Metro Green Line Station – Watson Yard** – From the existing southwestern terminus of the Metro Green Line at the Redondo Beach Station, the alignment would continue at-grade southeast along the Harbor Subdivision ROW. Because the ROW south of LAX is relatively wide (approximately 100 feet), LRT-compatible modal options would run parallel to the existing freight tracks. Passenger and freight service would operate simultaneously with a physical separation between the two services. Grade separations (aerial structures) could be needed at Inglewood Avenue, Manhattan Beach Boulevard, Sepulveda Boulevard, and Western Avenue per the initial grade crossing analysis. The segment from Torrance Boulevard to Carson Street may require a trenched grade separation because physical constraints preclude an aerial structure.

- **Harbor Subdivision ROW – San Pedro** – The alignment would take one of two routes to San Pedro.
  - The **Normandie / Gaffey** routing option would turn south on Normandie Avenue before reaching the end of the Metro-owned ROW at Watson Yard. The alignment would run on-street on an aerial structure along Normandie Avenue, which continues to Gaffey Street. The alignment would continue at-grade along Gaffey Street until Front Street, using a railroad ROW located to the east of Gaffey Street from Westmont Drive to the waterfront (aerial structures would be built as needed along Normandie Avenue and Gaffey Street because of physical and traffic constraints). From Front Street, the alignment would continue at-grade in a southerly direction on Harbor Boulevard, operating in the space between the street and adjacent railroad ROW. The alignment would terminate in San Pedro near the Cruise Terminal (an alignment further south to 5th and Harbor has been screened because of urban design issues).
  - The **I-110** routing option would turn south on the I-110 / Harbor Transitway before reaching Watson Yard. The mainly aerial / fill structure would run adjacent to and east of the I-110 / Harbor Transitway ROW. The alignment would then continue at-grade to John Gibson Boulevard, Front Street and finally Harbor Boulevard, operating in between these streets and adjacent railroad ROW. The alignment would terminate in San Pedro near the Cruise Terminal (an alignment further south to 5th and Harbor has been screened because of urban design issues).
Figure 3.28. Local South Alternative – Overview

Source: AE LLC, STV Incorporated
• **Harbor Subdivision ROW – Long Beach** – The alignment would take one of two routes to downtown Long Beach.
  o From Watson Yard, the **Sepulveda / Willow** routing option would turn north and travel on-street and at-grade on Wilmington Avenue. The alignment would then turn east and continue on-street and at-grade on Sepulveda Boulevard, which turns into Willow Street in Long Beach. The alignment would terminate at the Metro Blue Line Willow Station where passengers could transfer between platforms to reach downtown Long Beach via the Metro Blue Line (an alignment further south to downtown Long Beach using the Metro Blue Line has been screened because of operational constraints).
  o The **Pacific Coast Highway** routing option would continue at-grade along the BNSF ROW from Watson Yard until PCH. The alignment would then switch to on-street operations and travel east and at-grade on PCH until terminating at the Metro Blue Line PCH station where passengers could transfer between platforms to reach downtown Long Beach via the Metro Blue Line. Aerial structures would be constructed as needed dependent upon physical and traffic constraints. An alignment further south to downtown Long Beach using the Metro Blue Line has been screened because of operational constraints.

**Stations**

Because this Build Alternative proposes a locally-oriented service, station locations are planned approximately every mile. There are 12 station locations proposed along the Harbor Subdivision ROW and 20 other station locations proposed throughout the various routing alignments suggested for the southern connections. Seven of these stations would be larger and could serve as intermodal centers while the rest would be smaller, intermediate stations. The larger station locations would likely serve a greater number of passengers and include additional amenities such as signage, maps, furnishings, lighting, etc. Stations proposed for the Local South Alternative are illustrated in Figure 3.28 and listed in Table 3.12.

<table>
<thead>
<tr>
<th>Table 3.12. Local South Alternative – Stations</th>
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<tbody>
<tr>
<td><strong>Section</strong></td>
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<tr>
<td>Harbor Subdivision ROW</td>
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<td>I-110</td>
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<td>Sepulveda/Willow</td>
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**Vehicles**

Only LRT-compatible modal options are appropriate for the Local South Alternative. LRT-compatible modal options carried forward include LRT and SPR. Both types of vehicles would be procured to interline with those currently used on the existing Metro Blue, Green and Gold Lines. These vehicles are typically six-axle, double-ended and articulated, capable of multiple unit operation in trains up to three vehicles.

**3.4.2.3. Regional Alternative**

The proposed Regional Alternative is illustrated in Figure 3.29 and is described below. As previously mentioned, there is only one off-corridor routing / terminus option suitable for regional transit service in the northern portion of the Corridor – the Los Angeles River option, and one off-corridor routing option suitable for regional transit service in the southern portion of the Corridor – the I-110 option.
Figure 3.29. Regional Alternative – Overview

Source: AE LLC, STV Incorporated
Alignment

- **LAUS – Redondo Junction** – A new aerial structure would connect LAUS to the LOSSAN Corridor. The structure would parallel US-101 and meet up with the LOSSAN Corridor between US-101 and 1st Street. It is likely that one or possibly two tracks would need to be constructed along the LA River to provide additional capacity (given the introduction of the California High Speed Train Project (CHSTP) along the LOSSAN Corridor from Redondo Junction to LAUS). LRT-compatible modal options would require one to two new tracks because of freight-compatibility issues. The freight-compatible options could utilize the two existing LOSSAN Corridor tracks along the river, but it is likely that at least one additional track will be needed due to operational constraints. Required capacity could be obtained by using BNSF tracks along the Corridor which are currently used for storing empty rail cars. At the Amtrak 8th Street Yard, the alignment would use a new single-track aerial connector to fly over Washington Boulevard and the Alameda Corridor to the Harbor Subdivision ROW.

- **Redondo Junction – Crenshaw Corridor** – From the Redondo Junction area, at the beginning of the Metro-owned Harbor Subdivision ROW, the Regional Alternative would continue at-grade in a southerly direction. The alignment would then turn east, following the ROW at-grade along Slauson Avenue to Crenshaw Boulevard. Throughout this portion of the Corridor, the ROW is only 30 feet wide. LRT-compatible modal options could share two tracks with freight operations but would not be able to operate at the same time as freight service due to safety constraints. It would be necessary to move freight service to late night or early morning hours. Freight-compatible modal options would share one or two tracks with freight operations.

- **Crenshaw Corridor – Aviation / LAX Metro Green Line Station** – The Crenshaw Transit Corridor utilizes the Harbor Subdivision ROW from Crenshaw Boulevard to the Aviation / LAX Metro Green Line station. Throughout this portion of the Corridor, LRT-compatible modal options would utilize the Crenshaw Transit Corridor infrastructure. Regardless of whether BRT or LRT is chosen as the LPA and constructed along the Crenshaw Corridor, freight-compatible modal options would utilize the freight track adjacent to the BRT busway or LRT tracks. A connection to LAX would be provided by a transfer to the planned LAX APM at the Century Boulevard / Aviation Boulevard station.

- **Aviation / LAX Metro Green Line Station – Redondo Beach Metro Green Line Station** – From the Aviation / LAX Station, LRT-compatible modal options would follow the Metro Green Line at-grade south until the line’s terminus at Redondo Beach Station. Freight-compatible modal options however, would not be able to use the existing Metro Green Line infrastructure and would travel at-grade in a southerly direction by utilizing the existing freight track that runs adjacent to Aviation Boulevard.

- **Redondo Beach Metro Green Line Station – Watson Yard** – From the Redondo Beach Metro Green Line Station, the alignment would continue at-grade southeast along the Harbor Subdivision ROW. Because the ROW south of LAX is relatively wide (approximately 100 feet), LRT-compatible modal options would run parallel to the freight tracks. Passenger and freight service would operate simultaneously with a physical
separation between the two services. Freight-compatible modal options would operate on the existing freight track, with passing sidings necessary in some locations. New grade separations could be necessary at Torrance Boulevard / Carson Street and Sepulveda Boulevard / Western Avenue per the initial grade crossing examination. The ROW at Torrance Boulevard / Carson Street would likely be trenched while the ROW at Sepulveda Boulevard / Western Avenue would likely use an aerial structure.

• **Harbor Subdivision ROW – Downtown San Pedro** – For the I-110 Routing Option to San Pedro, the alignment would turn south on the I-110 / Harbor Transitway before reaching Watson Yard. The aerial or fill structure would run either in the I-110 / Harbor Transitway ROW or adjacent. The alignment would then continue at-grade to John Gibson Boulevard, Front Street and finally Harbor Boulevard, operating in between these streets and adjacent railroad ROW. The alignment would terminate in San Pedro at the Cruise Terminal (an alignment further south to 5th Street and Harbor Boulevard has been screened because of urban design issues). This alignment is similar to the I-110 – Local alignment, but would not have intermediate stations between the Harbor Subdivision ROW and San Pedro.

**Stations**

Because this Build Alternative proposes a regionally-oriented service, station locations are planned approximately every four miles. There are only 11 station locations proposed throughout the regional service alignment. All of these stations would be larger in size and could possibly serve as intermodal centers. These stations would include additional amenities such as signage, maps, furnishings, lighting, etc. Stations proposed for the Regional Alternative are illustrated in Figure 3.29 and listed in Table 3.13.

**Table 3.13. Regional Alternative – Stations**

<table>
<thead>
<tr>
<th>Section</th>
<th>Station Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Northern Off-Corridor Alignment Option (Los Angeles River)</strong></td>
<td>Los Angeles Union Station (Chavez/Alameda) – Existing Metro Gold Line</td>
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<td></td>
<td>Slauson/Long Beach – Existing Metro Blue Line</td>
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<td></td>
<td>Slauson/110 – Existing Harbor Transitway</td>
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<td></td>
<td>Florence/La Brea – Planned Crenshaw Transit Corridor</td>
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<td></td>
<td>Century/Airport – Planned Crenshaw Transit Corridor/LAWA APM</td>
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<td><strong>Harbor Subdivision ROW</strong></td>
<td>Douglas – Existing Metro Green Line</td>
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<td></td>
<td>Redondo Beach Regional Transit Center (Grant/Kingsdale)</td>
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<td>Torrance Regional Transit Center (ROW/Crenshaw)</td>
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<td></td>
<td>Vermont/I-110</td>
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<tr>
<td><strong>Southern Area Routing Option (I-110)</strong></td>
<td>San Pedro (6th/Harbor)</td>
</tr>
</tbody>
</table>
Vehicles

All modal options will be considered for the Regional Alternative. LRT-compatible modal options carried forward include LRT and SPR. Both types of vehicles would be procured to interline with those currently used on the existing Metro Blue, Green and Gold Lines. These vehicles are typically six-axle, double-ended and articulated, capable of multiple unit operation in trains up to three vehicles. Freight-compatible modal options carried forward include SPR, EMU and Commuter Rail. These vehicles cannot interline with existing transit within the Study Area, but may be able to operate with Metrolink services out of LAUS.

3.4.2.4. Express Alternative

The Express Alternative is similar to the Regional Alternative in the northern portion of the Corridor except that the alignment terminates in the LAX CTA and does not stop between LAUS and LAX (and does not provide service to the South Bay). The proposed Express Alternative is illustrated in Figure 3.30 and is described below starting at LAUS. There are two off-corridor routing / terminus options suitable for express transit service between LAUS and the LAX CTA: along the Los Angeles River and along Century Boulevard into LAX.
Figure 3.30. Express Alternative – Overview

Source: STV Incorporated
Alignment

- **LAUS – Redondo Junction** – A new aerial structure would connect LAUS to the LOSSAN Corridor. The structure would parallel US-101 and meet up with the LOSSAN Corridor between US-101 and 1st Street. One or possibly two new tracks may be needed along the LA River to provide additional capacity (given the introduction of the California High Speed Train Project (CHSTP) along the LOSSAN Corridor from Redondo Junction to LAUS). LRT-compatible modal options would require one to two new tracks because of freight-compatibility issues. The freight-compatible options could utilize the two existing LOSSAN Corridor tracks along the river, but it is likely that at least one additional track will be needed due to operational constraints. Required capacity could be obtained by using BNSF tracks along the Corridor which are currently used for storing empty rail cars. At the Amtrak 8th Street Yard, the alignment would use a new single-track aerial connector to fly over Washington Boulevard and the Alameda Corridor to the Harbor Subdivision ROW.

- **Redondo Junction – Crenshaw Corridor** – From the Redondo Junction area, at the beginning of the Metro-owned Harbor Subdivision ROW, the alignment would continue at-grade in a southerly direction. The alignment would then turn east, following the ROW at-grade along Slauson Avenue to Crenshaw Boulevard. In some sections along Slauson Avenue, the ROW is only 30 feet wide. LRT-compatible modal options could share two tracks with freight operations but would not be able to operate at the same time as freight service due to safety constraints. It would be necessary to move freight service to late night or early morning hours. Freight-compatible modal options would share one or two tracks with freight operations. For the section of the alignment from the Metro Blue Line to Western Avenue, there are two potential levels of investment – low and high. The low-investment option includes an at-grade configuration with numerous at-grade crossings, which would slow operations to approximately 45 miles per hour. The high-investment option includes a trench configuration along Slauson Avenue with no grade crossings, allowing for operations at 80 miles per hour or above.

- **Crenshaw Corridor – Century Boulevard / Aviation Boulevard** – The Crenshaw Transit Corridor utilizes the Harbor Subdivision ROW from Crenshaw Boulevard to Century Boulevard / Aviation Boulevard. Regardless of whether BRT or LRT is chosen as the LPA and constructed along the Crenshaw Corridor, all modal options would utilize the freight tracks adjacent to the BRT busway or LRT tracks. From this point, it is possible for the transit service to connect to LAX via the planned LAX APM at Century Boulevard / Aviation Boulevard. For this portion of the alignment, there are two potential levels of investment – low and high. The low-investment option includes an at-grade configuration with numerous at-grade crossings, which would slow operations to approximately 45 miles per hour. The high-investment option includes a trench configuration along Slauson Avenue with no grade crossings, allowing for operations at 80 miles per hour or above.

- **Century Boulevard / Aviation Boulevard – LAX CTA** – From Century Boulevard / Aviation Boulevard, the Express Alternative would travel on an aerial structure directly west along Century Boulevard. The aerial alignment would then enter the CTA and stop at two locations and stub end.
Stations

Only two general station locations are proposed for the Express Alternative – the origin and destination. The Express Alternative would operate directly between LAUS and LAX, and provide no intermediate stations along this segment at this stage. An intermediate station may be examined in the future to provide service from the Central Los Angeles area. Two stations are proposed within the LAX CTA, to better serve a variety of terminals. These stations are illustrated in Figure 3.30 and listed in Table 3.14.

<table>
<thead>
<tr>
<th>Station Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Los Angeles Union Station</td>
</tr>
<tr>
<td>LAX (Eastern CTA)</td>
</tr>
<tr>
<td>LAX (Western CTA)</td>
</tr>
</tbody>
</table>

Vehicles

All modal options will be considered for the Express Alternative. LRT-compatible modal options carried forward include LRT and SPR. Both types of vehicles would be procured to potentially interline (share track) with the existing Metro Blue, Green and Gold Lines. These vehicles are typically six-axle, double-ended and articulated, capable of multiple unit operation in trains up to three vehicles. Freight-compatible modal options carried forward include SPR, EMU and Commuter Rail. These vehicles cannot interline with most existing Metro lines, but may be able to operate with Metrolink services out of LAUS. These vehicles would likely be equipped with additional amenities to serve airport passengers.

3.4.2.5. Summary of Build Alternatives

A summary of the Build Alternatives is provided below. Table 3.15 lists the four markets that the Harbor Subdivision can serve along with the appropriate modes and routes. There are a total of 25 combinations of markets, modes and routes that fall under the four Build Alternatives previously described. An overview map showing all alternatives and stations is shown in Figure 3.31.

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Modal Options</th>
<th>Routing Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Local North</td>
<td>LRT, SPR</td>
<td>Metro Blue Line / Alameda (North)</td>
</tr>
<tr>
<td>Local South</td>
<td>LRT, SPR</td>
<td>Normandie / Gaffey (South)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1-110 (South)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sepulveda / Willow (South)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PCH / (South)</td>
</tr>
<tr>
<td>Regional</td>
<td>LRT, SPR, EMU, CRT</td>
<td>1-110 (South)</td>
</tr>
<tr>
<td>Express</td>
<td>LRT, SPR, EMU, CRT</td>
<td>Los Angeles River (North) / Century (LAX)</td>
</tr>
</tbody>
</table>
Figure 3.31. Harbor Subdivision – Alternatives Carried Forward – All

Source: AE LLC, STV Incorporated
3.4.3. Transportation Systems Management / Baseline Alternative

The TSM / Baseline Alternatives consist of low cost operational improvements to current transit facilities and services that extract the greatest benefits from existing infrastructure. The TSM / Baseline Alternatives provide a basis of comparison to the higher cost, high capital investment build alternatives.

Low cost TSM Alternatives include Rapid, Rapid Express, and FlyAway bus routes that correspond to the high-capital Build Alternatives proposed for operation in the Study Area.

3.4.3.1. Local TSM Alternatives – Metro Rapid Bus

The Local TSM Alternatives would attempt to resemble passenger service provided by the Local North and Local South Alternatives by operating a new Metro Rapid line paralleling the Harbor Subdivision Corridor on existing streets. The Local TSM Alternatives would operate at similar headways and stop at similar locations as the Local Build Alternatives, providing a comparable service for shorter trip lengths. The Local TSM Alternative will also include enhanced bus stops and traffic signal priority. Overviews of the Local North and Local South TSM Alternatives are shown in Figure 3.32 and Figure 3.33.

3.4.3.2. Regional TSM Alternative – Metro Rapid Express Bus

For the Regional Alternative, a more express-oriented service is needed for the TSM Alternative to provide comparable service. The Regional TSM Alternative is patterned after the Metro Rapid Express service recently implemented by Metro along select routes (e.g. Line 920 - Wilshire Rapid Express). The Rapid Express service is similar to Metro Rapid service, but stops less frequently (approximately every four miles as opposed to every mile) and would operate at headways similar to the Regional Alternative. The Regional TSM Alternative would operate over approximately the same route as the Local TSM Alternatives, but stop only at the major transportation centers served by the Regional Build Alternative. An overview of the Regional TSM Alternative is shown in Figure 3.34.

3.4.3.3. Express TSM Alternative – LAWA FlyAway Bus

For point-to-point service between downtown Los Angeles and LAX, Metro Rapid and Rapid Express type services cannot provide a comparable level of service because they run on city streets. A more freeway-focused bus service is needed and is already provided by LAWA’s FlyAway program, which utilizes the Harbor Transitway and I-105 high-occupancy vehicle lanes between LAUS and the LAX CTA with a travel time of approximately 30 minutes. The Express TSM Alternative will expand the service from its current headways (30 minutes all day, 15 minutes during peak periods, hourly in the early morning) to a more frequent schedule comparable to the Express Build Alternative. An overview of the Express TSM Alternative is shown in Figure 3.35.
Figure 3.32. Local North TSM Alternative (Rapid Bus) – Overview

Source: AE LLC, STV Incorporated
Figure 3.33. Local South TSM Alternative (Rapid Bus) – Overview

Source: AE LLC, STV Incorporated
Figure 3.34. Regional TSM Alternative (Rapid Express Bus) – Overview

Source: AE LLC, STV Incorporated
Figure 3.35. Express TSM Alternative (FlyAway Bus) – Overview

Source: AE LLC, STV Incorporated