Los Angeles County
Metropolitan Transportation Authority

West Santa Ana Branch Transit Corridor

Draft EIS/EIR Appendix C: System Components and Ancillary Facilities

Metro®

WEST SANTA ANA BRANCH TRANSIT CORRIDOR PROJECT

Draft EIS/EIR Appendix C: System Components and Ancillary Facilities

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Draft Environmental Impact Statement/ Environmental Impact Report

LEAD AGENCIES: Federal Transit Administration of the U.S. Department of Transportation; Los Angeles County Metropolitan Transportation Authority

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ACRONYMS AND ABBREVIATIONS

Acronyms	Definitions
CPUC	California Public Utilities Commission
I-	Interstate
LA	Los Angeles
LAUS	Los Angeles Union Station
LRT	light rail transit
OCS	overhead catenary system
PEROW	Pacific Electric Right-of-Way
ROW	right-of-way
TPSS	traction power substation
UPRR	Union Pacific Railroad
WSAB	West Santa Ana Branch

1 SYSTEM COMPONENTS AND ANCILLARY FACILITIES

This Appendix describes the required system components and ancillary facilities for the Project and supplements the narrative provided in Chapter 2, Project Description/Alternatives Considered, of the *West Santa Ana Branch Transit Corridor Project Draft Environmental Impact Statement/Environmental Impact Report*. The following sections describe the light rail transit (LRT) system operation configurations, system components, and ancillary facilities that provide power and operate the LRT. The LRT system components would adhere to the Metro Rail Design Criteria and would have a similar Metro LRT system as existing lines, such as the Metro E (Expo) Line. See Appendix B, *Final Advanced Conceptual Alignment Design*, for more detail on the system components along the project alignment.

1.1 Light Rail Transit Guideways

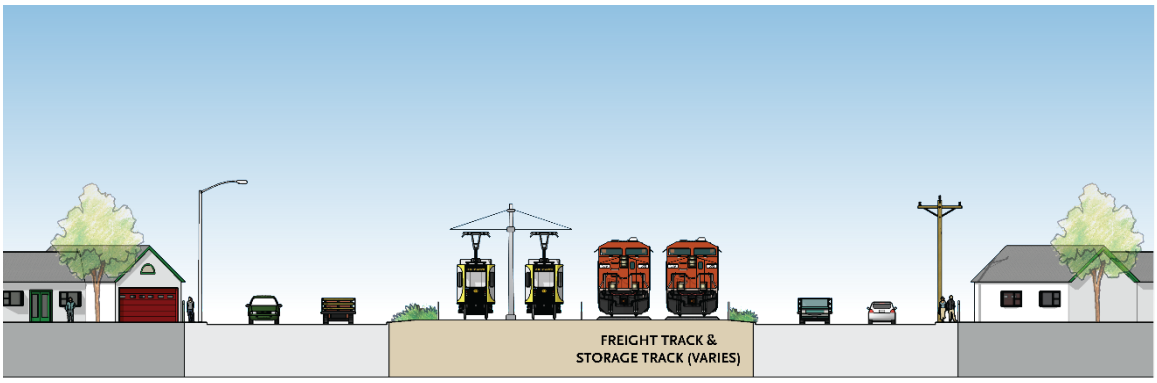
The Build Alternatives would consist of a dual-track LRT system and would operate at-grade, aerial, or underground. The guideway is comprised of the light rail tracks, the sub-structure that supports it, and an overhead catenary system (OCS) to electrically power the light rail cars.

1.1.1 At-Grade LRT Guideway

At-grade segments of the alignment would be located in dedicated rail right-of-way (ROW) that is independent of the street network. The clearances needed for an at-grade LRT configuration are approximately 35 feet for ROW clearance and a minimum vertical clearance of 15 feet above top of rail. Where the Build Alternatives shares ROW with existing freight tracks, at-grade guideways would consist of two LRT tracks along the east side of the corridor and relocated freight track and sidings along the west in the San Pedro Subdivision, and the two LRT tracks along the north side of the corridor and relocated freight track along the south in the La Habra Branch. Along the corridor, current freight track and sidings would be relocated so that clearances would be met. The distance between the LRT track centerlines would be a minimum of 14 feet, and the distance between the nearest realigned freight track centerline and LRT track centerline would be a minimum of 20 feet. At several locations along the Pacific Electric Right-of-Way (PEROW), existing bike paths would require realignment, and consideration given to future bike paths planned within the corridor.

Figure 1-1 illustrates a typical cross section of an at-grade guideway with adjacent freight tracks. Figure 1-2 shows an example of a typical center of street at-grade configuration on the existing Metro E (Expo) Line.

Figure 1-1. Typical At-Grade LRT Guideway with Freight Service



Source: Cityworks Design 2020
Note: Landscape features would be dependent on available ROW, maintenance budget, and capital costs.

Figure 1-2. Example of At-Grade LRT Guideway and Aerial LRT Guideway

At-Grade LRT Guideway on the Metro E Line

Aerial Guideway Transition to At-Grade Level over Retaining Wall on the Metro E Line

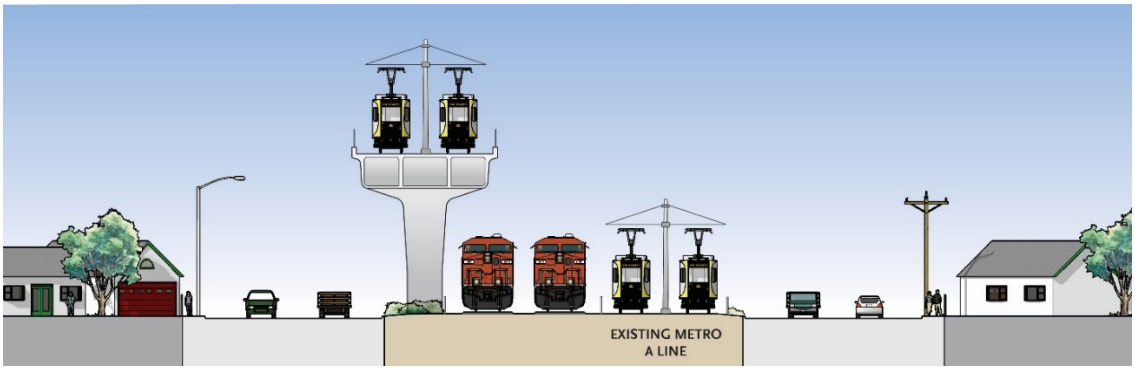
Source: Metro 2020

1.1.2 Aerial LRT Guideway

An aerial LRT guideway would be required over specific streets, street intersections, railroad crossings, and river crossings. The aerial segments of the Build Alternatives would be supported by retained fill embankments, columns, or straddle bents. Retained fill embankments would be typically constructed at the transitions between aerial structures and at-grade segments, as shown in Figure 1-2.

Figure 1-3 depicts a typical cross section for an aerial LRT guideway configuration. This type of aerial configuration may occur along the Wilmington Branch ROW and provides the option for potential variations of aerial and at-grade LRT guideways with freight service.

Figure 1-3. Typical Aerial LRT Guideway with Freight Service



Source: Cityworks Design 2020
Note: Landscape features would be dependent on available ROW, maintenance budget, and capital cost.

Typical aerial structures consist of single-pier columns that support a dual-track guideway that is approximately 35 feet wide with a minimum vertical clearance of 15 feet to the street level below. Aerial structure columns along Long Beach Avenue would typically be placed along the edge of the street ROW in approximately 120-foot intervals but would vary in some locations due to infrastructure constraints. Straddle bent columns consist of two or more columns supporting a beam and the LRT guideway. The beams would typically be located where the LRT track centerlines are widened, such as near stations, or where a single-pier structure would impact existing roadway or railroad tracks.

To meet Union Pacific Railroad (UPRR) requirements for vertical clearance, the aerial guideway spanning over the UPRR ROW would have a minimum vertical clearance of 24 feet over freight and a minimum of 15 feet over roadways. Figure 1-4 shows an example of an aerial structure straddle bent along the Metro E (Expo) Line.

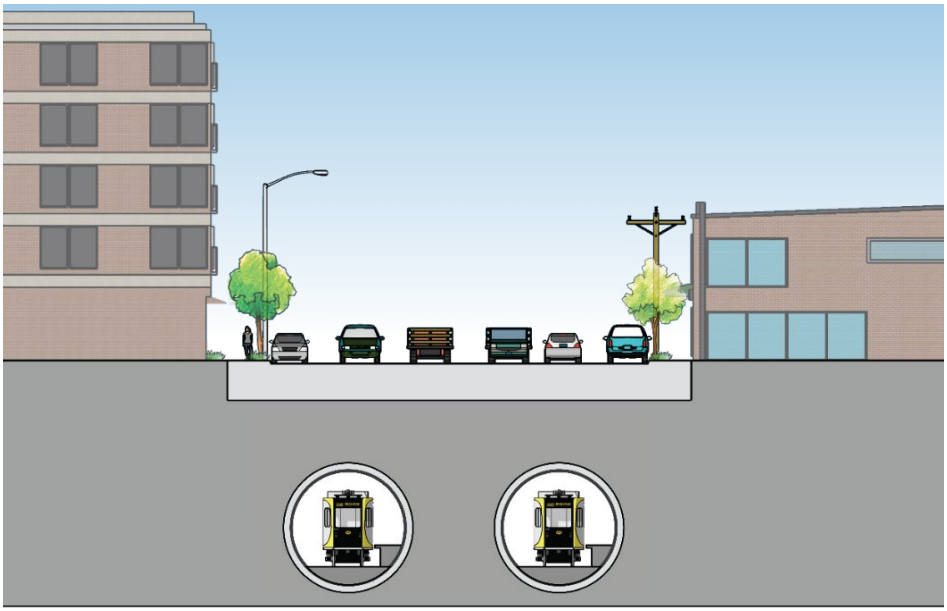
Figure 1-4. Example of Aerial Structure Straddle Bent (Metro E [Expo] Line)

Source: WSP 2020

1.1.3 Underground LRT Guideway and Stations

The underground guideway segments would consist of tracks in two side-by-side tunnels, one for each direction of travel, as shown in Figure 1-5. Tunnels would be approximately 20 feet in diameter with minimum depth of approximately 50 feet and a maximum depth of approximately 100 feet from ground elevation to the top of the tunnel. LRT tracks would transition from an underground configuration to an at-grade or aerial configuration through portals, where tracks would ascend from tunnels to the surface via a ramp structure.

Figure 1-5. Cross Section of Twin-Bored Tunnels



Source: Cityworks Design 2020
Note: Landscape features would be dependent on available ROW, maintenance budget, and capital cost.

Underground LRT guideway segments are proposed north of the I-10 freeway to Los Angeles Union Station (LAUS) for Alternative 1 and to downtown Los Angeles for Alternative 2. The twin-bored tunnels for Alternatives 1 and 2 would be constructed beneath city streets, freeways, existing Metro lines, utility lines, and various buildings.

1.2 Overhead Catenary System

The OCS electrically powers the LRT through a contact wire suspended above the track, as shown in Figure 1-6. The wires would be located approximately 20 feet above the track, supported by poles spaced at an average interval of 150 feet. The catenary poles would be generally located in the center of the project alignment or located on both sides of the tracks in some locations. In tunnel segments and underground stations, the contact wire and system would be attached to the walls or ceilings rather than supported by independent poles. Table 1-1 presents the estimated height of the OCS poles and other system components.

Figure 1-6. Example of Overhead Catenary System

Source: WSP 2020

Table 1-1. Project Component Estimated Heights

Project Component	Estimated Dimensions/Heights[1]
Station canopies	~15 feet in height
TPSS	~15 feet wide by 40 feet long by 15 feet in height, with 8-foot tall fences around the TPSS site
Ventilation structures and train control houses	Small buildings generally under 10 feet in height
Radio tower/antenna	~35 to ~60 feet in height
Radio house	~35 feet by ~15 feet
TC&C house	~12 feet by ~65 feet
At-grade-stations, OCS poles, and overhead wires	≤ ~20 feet in height

Project Component	Estimated Dimensions/Heights[1]
Aerial structures	▪ ~70 feet tall at I-10 freeway ▪ ~50 feet tall at 53rd St Pedestrian Bridge ▪ ~40 feet tall at Slauson/A Line Station (~50 feet to top of elevator shaft) ▪ ~32 feet tall at Firestone and Paramount/Rosecrans Stations (~47 feet with station canopies) ▪ ~32 feet tall in other locations (~36 feet with sound walls)
Fences (including mix of retaining walls and fences)[2]	~6 feet in height
Sound walls in areas with or near noise-sensitive uses	~8 feet in height
Sound walls placed on an aerial structure[2]	~4 feet in height

Source: Metro, 2020o
Notes: [1] Dimensions and heights are approximate; actual dimensions and heights may vary.
[2] See *West Santa Ana Branch Transit Corridor Project Noise and Vibration Impact Analysis Report* (Metro 2020j) or Section 4.7.4 Noise and Vibration for Mitigation Measure NOI-1.
[3] OCS = overhead catenary system; TPSS = traction power substations; TC&C = train control and communication

1.3 Tail Tracks

Tail tracks allow for train storage, reversing direction, and short-lining of service if a pocket track is provided along the alignment. Tail tracks can also be used during construction of future extensions without disrupting existing service. Tail tracks would be provided at both terminal stations for each Build Alternative, would extend beyond the station platforms, and would be of sufficient length to accommodate one three-car train on each track.

1.4 Crossovers and Cross Passages

A track crossover is specialized trackwork that allows a train to reverse direction and use an adjacent track to continue operation. Typically, a track crossover consists of two switches and a shorter length of connecting track that allows a train to switch to an adjacent track. Where crossovers are located underground, cut-and-cover construction methods would be required due to the size and final configuration of the opening needed to construct these crossings. The two mainline tracks excavated by tunnel boring machine that connect to the crossovers would require the removal of precast segmental tunnel lining during the cut-and-cover or sequential excavation method process. This would allow sufficient space to construct the crossover and associated rail systems equipment.

Cross passages connecting two tunnel boring machine tunnels for emergency egress and rail systems equipment would be approximately 15 feet high and 10 feet wide and would be located approximately every 800 feet along tunnel alignments. Three double crossovers are proposed along each of the tunnel segments of Alternatives 1 and 2.

1.5 Ventilation Structures

Ventilation structures allow for climate control and emergency ventilation of tunnels and underground stations. These structures would be included within the underground stations and would have ventilation gratings on sidewalks (or other public areas), typically on both

sides of all underground stations. In some instances, a small building on the surface above the station would be needed to house fans and electrical equipment. Ventilation structures can also be located along tunnel segments that are not adjacent to stations to provide additional air circulation in areas where a long stretch of tunnel is between stations.

1.6 Traction Power Substations

A traction power substation (TPSS) provides power to the OCS and is typically a metal prefabricated building approximately 15 feet wide by 40 feet long by 15 feet high. The TPSS site would include a perimeter barrier, such as a fence, and space for utility equipment, manholes, and pull boxes, and to allow for vehicle access. The entire TPSS site would require an area approximately 80 feet by 45 feet or equivalent in different configurations. The actual size of the site would also depend on ROW considerations. Figure 1-7 shows an example of a TPSS facility.

Figure 1-7. Example of a Traction Power Substation

Traction Power Substation Facility on the Metro L Line

Source: WSP 2020

Table 1-2 summarizes the proposed TPSS locations for the Build Alternatives. Up to 23 TPSS facilities are proposed for the Build Alternatives, with the number of facilities varying based on alternative and with several locations with more than one location option. Alternative 1 has 22 proposed locations; Alternative 2 has 23 proposed locations; Alternative 3 has 17 proposed locations; and Alternative 4 has 7 proposed locations. The identified TPSS sites in addition to the optional sites result in a total of 42 TPSS sites. Of the 42 TPSS sites, 35 are at-grade and 7 are proposed underground. Only one TPSS facility per proposed TPSS location would be constructed.

Table 1-2. Proposed TPSS Locations

Build Alternatives	TPSS ID	Description (General location and parcel impact)	Underground or At-Grade	LRT Stationing
2	22c	Located underground at 8th St between Flower St and Figueroa St	Underground	410+00
1	22a	Located underground at Alameda and Los Angeles St at Union Station Square	Underground	418+00
DO 1	22b	Located underground at Union Station Square near the MWD Building	Underground	420+00
2	21a	Located underground at E 8th St and Los Angeles St	Underground	444+00
DO 2	21b	Located underground at E 3rd St and Alameda St	Underground	447+00
1	20b	Located underground south of E 6th St along Alameda St	Underground	490+00
2	20a	Located underground south of E 7th St along Alameda St	Underground	500+00
1, 2	19	North of E 14th St and west of Long Beach Ave within private property	At-Grade	528+00
1, 2	19(e)*	North of E 16th St and west of Long Beach Ave within private property	At-Grade	538+50
1, 2	19(e)*	South of E 16th St and east of Long Beach Ave within private property	At-Grade	541+00
1, 2	18	South of E Martin Luther King Jr Blvd on the east side of Long Beach Ave and within private property	At-Grade	589+50
1, 2	18(e)*	South of E Martin Luther King Jr Blvd on the west side of Long Beach Ave and within private property.	At-Grade	589+00
1, 2	17	South of E 51st St on the west side of Long Beach Ave within private property	At-Grade	638+00
1, 2	17b*	North of E 52nd St on the west side of Long Beach Ave within private property	At-Grade	640+00
1, 2	17a*	Between E 52nd and 53rd St on the west side of Long Beach Ave within private property	At-Grade	642+25
1, 2, 3	17 Slauson	South of Slauson Ave and west of Randolph Ave within Union Pacific Railroad property	At-Grade	665+25
1, 2, 3	16	West of Alameda St and south of Randolph St within private property	At-Grade	686+50
1, 2, 3	16(e)*	West of Regent St and north of Randolph St within private property	At-Grade	694+25

Build Alternatives	TPSS ID	Description (General location and parcel impact)	Underground or At-Grade	LRT Stationing
1, 2, 3	15	North of Randolph St and west of Seville Ave within private property	At-Grade	729+00
1, 2, 3	15(e)*	East of Stafford Ave and north of Randolph St within private property	At-Grade	737+75
1, 2, 3	14	West of State St and north of Randolph St within private property	At-Grade	761+75
1, 2, 3	13	North of Randolph Ave and Bissel Pl within Union Pacific Railroad property	At-Grade	787+00
1, 2, 3	13(e)*	North of Walnut St and west of Salt Lake Ave within private property	At-Grade	832+75
1, 2, 3	12	North of Walnut St and east of Salt Lake Ave within private property	At-Grade	834+75
1, 2, 3	11	Northwest of Cecelia St and east of Salt Lake Ave within private property	At-Grade	887+00
1, 2, 3	10	South of Firestone Blvd and east of Branyon Ave within private property	At-Grade	938+75
1, 2, 3	9	Between Miller Way and the Interstate 710 Freeway and north of the existing tracks within private property	At-Grade	987+75
1, 2, 3	10(e)*	Southeast of the Rio Hondo Channel and north of Meadow Rd within private property	At-Grade	998+75
1, 2, 3	8	North of Laurel St within a vacant, privately owned property	At-Grade	1044+75
1, 2, 3	9(e)*	South of Gardendale and adjacent to the west side of Dakota Ave within private property	At-Grade	1052+25
1, 2, 3, 4	7	North of Century Blvd and east of Center St within private property within the proposed parking facility	At-Grade	1080+00
1, 2, 3, 4	8(e)*	Southwest of Arthur Ave/Rose St and north of Rosecrans Ave within Metro-owned property	At-Grade	1110+50
1, 2, 3, 4	6	South of Paramount High School's tennis courts and just east of the existing pedestrian bridge within publicly owned property	At-Grade	1140+00
1, 2, 3, 4	6(e)*	North of Hegel St and south of the Bellflower Bike Trail within private property	At-Grade	1195+50
1, 2, 3, 4	5	North of Hegel St and the Bellflower Bike Trail within private property	At-Grade	1196+50

Build Alternatives	TPSS ID	Description (General location and parcel impact)	Underground or At-Grade	LRT Stationing
1, 2, 3, 4	4	East of Olive St and north of Pacific Ave within private property within the proposed parking facility	At-Grade	1243+50
1, 2, 3, 4	3	South of Flora Vista Park and just east of Beach St. within Metro-owned property	At-Grade	1301+50
1, 2, 3, 4	3(e)*	East of Studebaker Rd within Metro-owned property	At-Grade	1345+00
1, 2, 3, 4	3(e)*	Southwest of Rosewood Park within Metro-owned property	At-Grade	1350+75
1, 2, 3, 4	2	Northwest of the crossing at Gridley Rd and 183rd St within Metro-owned property	At-Grade	1372+50
1, 2, 3, 4	1	Between Corby Ave and Pioneer Blvd north of 188th St impacting a private property within the proposed parking structure	At-Grade	1405+00
1, 2, 3, 4	1(e)*	North of South St and west of Clarkdale Ave impacting a Metro-owned property	At-Grade	1416+50

Source: Metro 2020
Note: * = optional site; DO = Design Option; LRT = light rail transit; MWD = Metropolitan Water District; TPSS = traction power substation

1.7 Train Control House and Electric Power Switches

Train control houses containing signal equipment would be located periodically along the alignment within the Project's ROW. Electric power switches, contained in metal box-like enclosures, would be required at ground level for each underground station. These switches would transmit electric power from the Los Angeles Department of Water and Power electric grid to the underground traction power and other rail systems. Figure 1-8 shows an example of a typical train control house.

Figure 1-8. Example of Train Control House (Metro L (Gold) Line, Monrovia Station)

Source: WSP, 2019

1.8 Radio Towers

Radio towers would be installed along the alignment to support communications between the transmitter and receiver. The primary site radio tower would be 35 to 60 feet high, measured from ground level, or alternatively two 35-foot-tall poles could be substituted. The radio tower would consist of a concrete foundation and a tapered tubular steel monopole with multiple antennas at the top, plus an adjacent cabinet for radio equipment. The standby site would have similar requirements as the primary site and would be needed to create a redundant radio transmission network. For radio towers located adjacent to alignment segments that are at-grade or in a viaduct structure, a 35-foot by 15-foot radio house would be needed at ground level to house the transmission equipment. If the radio tower is located adjacent to an underground station, the transmission equipment would be located below ground in an ancillary room and an at-grade radio house would not be required. Table 1-3 summarizes the proposed radio tower location options. Of the potential locations, only two would be constructed (one as the primary site and the other as the standby site).

Table 1-3. Proposed Radio Tower Locations

Build Alternative	Radio Tower ID	General Description	LRT Stationing
1 (DO 2)	1	East of N Alameda St between E 3rd St and E 4th St	460+50
2	2	Northeast of the intersection of E 8th St and Santee St (adjacent to South Park/Fashion District Station)	447+00
1	3a	West of Alameda St between E 6th St and E 7th St (adjacent to Arts/Industrial District Station)	485+50
1	3b	East of Alameda St between E 6th St and E 7th St (adjacent to Arts/Industrial District Station)	489+25

Build Alternative	Radio Tower ID	General Description	LRT Stationing
1	3c	West of Alameda St between E 6th St and E 7th St (adjacent to Arts/Industrial District Station)	489+75
2	4a	Southeast of the intersection of Alameda St and E 7th St (adjacent to Arts/Industrial District Station)	496+00
2	4b	East of Alameda St between E 7th St and Bay St	499+00
1, 2	5a	West of Long Beach Ave between E 16th St and E Washington Blvd	542+00
1, 2	5b	West of Long Beach Ave between E 16th St and E Washington Blvd	543+75
1, 2	6a	West of Long Beach Ave between E Washington Blvd and E 20th St	550+75
1, 2	6b	West of Long Beach Ave between E Washington Blvd and E 20th St	555+25
1, 2	7a	Southeast of the intersection of Long Beach Ave and E Martin Luther King Jr Blvd	589+00
1, 2	7b	East of Long Beach Ave between Martin Luther King Jr Blvd and E 40th Pl	590+50

Source: WSP 2020
DO = Design Option

1.9 Grade Crossings

A grade separation is a physical separation between the railroad tracks and a roadway. Grade separations for the Project consist of at-grade crossings, aerial grade crossings, and undercrossings (at freeways). A total of 65 roadway crossings, 7 freeway undercrossings, 10 railroad crossings, and 3 waterway crossings are proposed. The Build Alternatives would cross up to 31 intersections at-grade and 25 road intersections in an aerial configuration; 8 existing grade crossings or roads would be closed to through traffic. Table 1-4 lists the proposed grade crossings and configuration of each proposed grade crossing along the alignment by Build Alternatives and jurisdiction. Figure 1-9 illustrates the proposed freeway crossings for the Project.

Table 1-4. Proposed Grade Crossings and Configurations for the Build Alternatives

	Build Alternatives	Jurisdiction	Intersection Crossing	Grade Crossing Configuration
Roadway Crossings	1, 2	Los Angeles	Long Beach Ave	Closed
	1, 2	Los Angeles	14th St	Closed
	1, 2	Los Angeles	Newton St	Grade-Separated (Aerial)
	1, 2	Los Angeles	15th St	Grade-Separated (Aerial)
	1, 2	Los Angeles	16th St	Grade-Separated (Aerial)

	Build Alternatives	Jurisdiction	Intersection Crossing	Grade Crossing Configuration
	1, 2	Los Angeles	Washington Blvd	Grade-Separated (Aerial)
	1, 2	Los Angeles	20th St	Grade-Separated (Aerial)
	1, 2	Los Angeles	24th St	Grade-Separated (Aerial)
	1, 2	Los Angeles	Martin Luther King Jr. Blvd	Grade-Separated (Aerial)
	1, 2	Los Angeles	41st St	Grade-Separated (Aerial)
	1, 2	Los Angeles	Vernon Ave	Grade-Separated (Aerial)
	1, 2	Los Angeles	48th Pl	Grade-Separated (Aerial)
	1, 2, 3	Los Angeles	55th St	Grade-Separated (Aerial)
	1, 2, 3	Los Angeles	Slauson Ave	Grade-Separated (Aerial)
	1, 2, 3	Huntington Park	Holmes Ave	Grade-Separated (Aerial)
	1, 2, 3	Huntington Park	Wilmington Ave	Closed
	1, 2, 3	Huntington Park	Alameda St West	At-Grade
	1, 2, 3	Huntington Park	Alameda St East	At-Grade
	1, 2, 3	Huntington Park	Regent St	Closed
	1, 2, 3	Huntington Park	Albany St	Closed
	1, 2, 3	Huntington Park	Santa Fe Ave	At-Grade
	1, 2, 3	Huntington Park	Malabar St	At-Grade
	1, 2, 3	Huntington Park	Rugby Ave	Closed
	1, 2, 3	Huntington Park	Pacific Blvd	At-Grade
	1, 2, 3	Huntington Park	Rita Ave	Closed
	1, 2, 3	Huntington Park	Seville Ave	At-Grade
	1, 2, 3	Huntington Park	Miles Ave	At-Grade
	1, 2, 3	Huntington Park	Arbutus Ave	At-Grade
	1, 2, 3	Huntington Park; Vernon	State St	At-Grade
	1, 2, 3	Huntington Park; Vernon	Randolph St	Grade-Separated (Aerial)
	1, 2, 3	Huntington Park; Bell	Gage Ave	At-Grade
	1, 2, 3	Cudahy	Bell Ave	At-Grade
	1, 2, 3	Huntington Park; Bell	Florence Ave	At-Grade
	1, 2, 3	Huntington Park; Cudahy	Otis Ave	At-Grade

	Build Alternatives	Jurisdiction	Intersection Crossing	Grade Crossing Configuration
	1, 2, 3	Huntington Park; Cudahy; South Gate	Santa Ana St	At-Grade
	1, 2, 3	South Gate; Cudahy	Ardine St	At-Grade
	1, 2, 3	South Gate	Atlantic Ave	Grade-Separated (Aerial)[1]
	1, 2, 3	South Gate	Firestone Blvd	Grade-Separated (Aerial)[1]
	1, 2, 3	South Gate	Rayo Ave	At-Grade
	1, 2, 3	South Gate	Southern Ave	At-Grade
	1, 2, 3	N/A	Frontage Rd [1]	Closed (Private)
	1, 2, 3	N/A	Miller Way [1]	At-grade (Private)
	1, 2, 3	South Gate	Imperial Highway	Grade-Separated (Aerial)
	1, 2, 3	South Gate	Garfield Ave	Grade-Separated (Aerial)
	1, 2, 3	South Gate; Downey	Gardendale St	At-Grade
	1, 2, 3, 4	South Gate	Main St	At-Grade
	1, 2, 3, 4	South Gate	Century Blvd	At-Grade
	1, 2, 3, 4	Paramount	N. Somerset Ranch Rd	Grade-Separated (Aerial)
	1, 2, 3, 4	Paramount	S. Somerset Ranch Rd	Grade-Separated (Aerial)
	1, 2, 3, 4	Paramount	Rosecrans Ave/Paramount Blvd	Grade-Separated (Aerial)[2]
	1, 2, 3, 4	Paramount	Downey Ave	Grade-Separated (Aerial)
	1, 2, 3, 4	Paramount	Somerset Blvd	At-Grade
	1, 2, 3, 4	Paramount; Bellflower	Lakewood Blvd	At-Grade
	1, 2, 3, 4	Bellflower	Clark Ave	At-Grade
	1, 2, 3, 4	Bellflower	Alondra Blvd	At-Grade
	1, 2, 3, 4	Bellflower	Bellflower Blvd	At-Grade
	1, 2, 3, 4	Bellflower	Flower St	Grade-Separated (Aerial)
	1, 2, 3, 4	Bellflower	Woodruff Ave	Grade-Separated (Aerial)
	1, 2, 3, 4	N/A	Extra Space Storage Property [1]	At-Grade (Private)
	1, 2, 3, 4	Cerritos	Artesia Blvd	At-Grade
	1, 2, 3, 4	Cerritos	Studebaker Rd	At-Grade
	1, 2, 3, 4	Cerritos; Artesia	183rd St/Gridley Rd	Grade-Separated (Aerial)
	1, 2, 3, 4	Artesia	186th St	At-Grade
	1, 2, 3, 4	Artesia	187th St	Closed

	Build Alternatives	Jurisdiction	Intersection Crossing	Grade Crossing Configuration
	1, 2, 3, 4	Cerritos; Artesia	Pioneer Blvd	At-Grade (non-revenue)
Freeway Crossings	1	Los Angeles	I-101 Freeway	Underground
	2	Los Angeles	I-110 Freeway	Underground
	1, 2	Los Angeles	I-10 Freeway	Grade-Separated (Aerial) (new bridge construction)
	1, 2, 3	South Gate (Caltrans)	I-710 Freeway	Grade-Separated (new freeway undercrossing)
	1, 2, 3, 4	Paramount (Caltrans)	I-105 Freeway	Grade-Separated (Aerial) (new bridge construction)
	1, 2, 3, 4	Bellflower (Caltrans)	SR-91 Freeway	Grade-Separated (existing freeway undercrossing)
	1, 2, 3, 4	Cerritos (Caltrans)	I-605 Freeway	Grade-Separated (existing freeway undercrossing)
Railroad Crossings	1, 2	Los Angeles	25th St	Grade-Separated (Aerial)
	1, 2, 3	Los Angeles	51st St	Grade-Separated (Aerial)
	1, 2, 3	Los Angeles	Randolph St/Slauson Ave	Grade-Separated (Aerial)
	1, 2, 3	Los Angeles	Randolph St/Holmes Ave	Grade-Separated (Aerial)
	1, 2, 3	Huntington Park	Randolph St/Alameda St	Grade-Separated (Aerial)
	1, 2, 3	Huntington Park	Randolph St/La Habra Branch ROW	Grade-Separated (Aerial)
	1, 2, 3	Huntington Park	Randolph St/San Pedro Subdivision ROW	Grade-Separated (Aerial)
	1, 2, 3	South Gate	Atlantic Ave near Salt Lake Ave	Grade-Separated (Aerial)
	1, 2, 3, 4	Paramount	C Line in I-105 ROW	Grade-Separated (Aerial)
	1, 2, 3, 4	Paramount	San Pedro Subdivision ROW and PEROW	Grade-Separated (Aerial)
Waterway Crossings	1, 2, 3	South Gate	LA River	New Bridge
	1, 2, 3	South Gate	Rio Hondo Channel	New Bridge
	1, 2, 3, 4	Cerritos	San Gabriel River	New Bridge

Source: WSP 2020
Notes: Table does not include underground segments north of Olympic Boulevard.
[1] Locations include existing private property grade crossings.
N/A - indicates private crossings that are not in public jurisdiction.
PEROW = Pacific Electric Right-of-Way; ROW = right-of-way

Figure 1-9. Freeway Crossings

Source: WSP 2020

The California Public Utilities Commission (CPUC) has safety and security regulatory authority over all rail transit agencies in California and works in cooperation with the Federal Transit Administration and the transit agencies to enhance public safety and security. All LRT crossings would comply with CPUC regulations to ensure they are safely designed, constructed, and maintained. Each grade crossing would require a site-specific design. Typical at-grade crossings would include the following features, as applicable: roadway crossing gates, pedestrian crossing gates, new sidewalks, Americans with Disabilities Act-compliant ramps, sidewalks, bulb-outs, raised medians, and/or other intersection amenities based on the Metro Rail Design Criteria, CPUC, and local city standards and coordination. Figure 1-10 depicts a typical at-grade vehicular crossing and typical at-grade pedestrian crossing.

Figure 1-10. Example of Typical Grade and Pedestrian Gate Crossing Equipment

Grade Crossing Equipment on the Metro E Line

Pedestrian Gate Crossing Equipment on the Metro E Line

Source: WSP 2020

1.10 Waterway Crossings

The LRT would cross the existing concrete-lined flood channels of the LA River Channel, Rio Hondo Channel, and San Gabriel Channel at existing railroad bridge crossings:

- A new LRT bridge would be constructed east of the existing LA River truss bridge to cross the LA River. The existing truss bridge would remain unaltered.
- A new LRT bridge spanning over the Rio Hondo Channel would be constructed next to the existing bridge. The existing bridge would remain unaltered and operational.
- A new LRT bridge spanning the San Gabriel River would be reconstructed in the same location at the existing abandoned freight bridge. The existing abandoned freight bridge would be demolished. Adequate clearance would be provided between the bottom of the bridges and the estimated high-water elevation. New bridge deck structures would be built above the existing river channel walls or levees, with new bridge piers or columns built within the channels.

1.11 Freight Track Realignment

The Build Alternatives would be located parallel to active freight track(s) in portions of the Wilmington Branch ROW (between approximately Martin Luther King Jr Boulevard along Long Beach Avenue to Slauson Avenue), La Habra Branch ROW (between Slauson Avenue along Randolph Street to its intersection with the San Pedro Subdivision ROW), San Pedro Subdivision ROW (between Randolph Street to approximately Paramount Boulevard), and the Metro-owned PEROW (between its intersection with the San Pedro Subdivision ROW to Somerset Street). Along the Wilmington Branch ROW, the LRT would be in an aerial viaduct that would overhang the ROW, thereby requiring an aerial easement. The Build Alternatives would require the following realignments of freight track(s) to accommodate the alignment and maintain existing freight operations:

- Relocation to the south of the project alignment within the La Habra Branch ROW
- Relocation to the west of the project alignment within the San Pedro Subdivision ROW
- Relocation to the north of the project alignment within the Metro-owned PEROW

The Project would also provide a minimum 20-foot clearance between the track centerlines of the closest LRT and freight track. Table 1-5 summarizes the length of freight relocation by Build Alternative, and Figure 1-11 identifies the proposed freight relocations.

Table 1-5. Freight Track Relocation

Rail ROW	Shared ROW with Freight (miles)	Freight Relocation by Build Alternatives (miles)			
		Alternative 1	Alternative 2	Alternative 3	Alternative 4
Wilmington Branch	1.8	0.1	0.1	0.1	—
La Habra Branch	2.3	2.0	2.0	2.0	—
San Pedro Subdivision	6.1	5.4	5.4	5.4	0.7
Metro-owned PEROW	1.2	0.6	0.6	0.6	0.6
Total	**11.4**	**8.1**	**8.1**	8.1	1.3

Source: WSP 2020
Notes: PEROW = Pacific Electric Right-of-Way; ROW = right-of-way

Figure 1-11. Existing Rail Right-of-Way Ownership

Source: WSP 2020

1.12 Pedestrian Facilities

The Build Alternatives would include pedestrian facilities, such as tunnels, bridges, and undercrossings.

1.12.1 Pedestrian Tunnels

Pedestrian tunnels would be constructed to connect the northern termini WSAB stations under Alternatives 1 and 2 to existing Metro stations. Specifically, under Alternative 1, a tunnel would be provided between the LAUS Forecourt Station and LAUS, Design Option 1 (LAUS Metropolitan Water District) to connect with Metro B (Red) and D (Purple) Lines, and Design Option 2 (Little Tokyo Station) to connect with the Regional Connector. For Alternative 2, a tunnel would be provided between the WSAB 7th St/Metro Center station and the existing 7th St/Metro Center Station.

1.12.2 Pedestrian Bridges

Pedestrian bridges are proposed at Slauson/A Line Station (Alternatives 1, 2, and 3) and I-105/C Line Station (Alternatives 1, 2, 3, and 4). The Slauson/A Line Station pedestrian bridge would connect travelers to the Metro A (Blue) Line Slauson Station platform via a mezzanine level to the WSAB Slauson/A Line Station platform. The Arthur Avenue pedestrian bridge crossing I-105 located east of the San Pedro Subdivision ROW would be reconstructed to accommodate changes related to adding an in-fill Metro C (Green) Line Station. Pedestrian access between the WSAB Line and the I-105/C Line Station would be provided via a pedestrian walkway on the WSAB LRT bridge over the freeway to vertical circulation elements to connect to the Metro C (Green) Line Station. The Façade Avenue bridge that includes a roadway and sidewalks over the I-105 freeway west of the San Pedro Subdivision ROW would also be reconstructed to accommodate construction of the new in-fill Metro C (Green) Line Station.

The existing E 53rd Street pedestrian bridge on Long Beach Avenue would remain, with its location above the existing freight tracks and the Metro A (Blue) Line tracks and below the WSAB aerial viaduct.

1.12.3 Pedestrian Undercrossings

A pedestrian undercrossing is also proposed at Paramount High School to connect the existing athletic fields at Paramount Park to Paramount High School.

1.13 Bicycle Facilities

1.13.1 Bike Path

A portion of the Class I bike path along the PEROW between Paramount Park and Somerset Boulevard in the City of Paramount would be altered to accommodate the Build Alternatives. The PEROW north of Somerset Boulevard would not have sufficient space to accommodate both the project alignment and a Class I bike path. The bike trail between Somerset Boulevard and Lakewood Boulevard would be relocated from the south side to the north side of the ROW to accommodate the LRT alignment.

1.13.2 Bike Hubs

The Project would provide bike hubs at several station locations near existing bikeways for convenient access to and from local destinations. The bike hubs may include bicycle racks, lockers, and secure bike parking in addition to on-call mechanics and access to on-site Metro staff. The bike hubs would offer and encourage "first mile, last mile" connections to transit. Planning and design of the bike hubs would occur during the final planning and design phase for the Project.

1.14 Metro Public Art

The Project would include the integration of public art at stations and related transit facilities. Metro would collaborate with the surrounding neighborhoods to create an aesthetic design and incorporate public art to promote a sense of place in the surrounding neighborhoods.

1.15 Maintenance and Storage Facilities

To support the Build Alternatives, a single MSF for rail cars with accommodations for maintenance and operation work staff and their equipment is required. Two sites are under consideration for this MSF: the Paramount MSF site option and the Bellflower MSF site option.

MSFs accommodate daily servicing and cleaning, inspection and repairs, and storage of light rail vehicles (LRVs). Activities may occur in the MSF throughout the day and night depending upon train schedules, work load, and the maintenance requirements. The MSF would have storage tracks, each with sufficient length to store three-car train sets (referred to as a consist) and maintenance-of-way vehicle storage. The facility would include a main shop building with administrative offices, a cleaning platform, a traction power substation (TPSS), employee parking, a vehicle wash facility, a paint and body shop, and other facilities as needed. The yard lead track (i.e., the tracks leading from the mainline to the facility) would have sufficient length for a three-car consist[1].

1.15.1 Paramount MSF Site Option

The Paramount MSF site option is a 22-acre rectangular site located in the City of Paramount. The MSF site currently consist of the Paramount Swap Meet, Paramount Drive-in Theatre and its associated parking, and industrial properties. Vehicular access to the proposed site is currently provided from All American City Way. At full capacity, the MSF would be designed to store up to 80 LRVs and provide over 200 parking spaces for MSF staff.

Lead tracks to the MSF site option would enter the site along its western edge approximately 0.3 mile south of the Project's mainline track. The lead tracks would align to the east of existing freight tracks, partially outside of the ROW. Both lead tracks would be at-grade north of the MSF site option and would cross Rosecrans Avenue through an existing at-grade crossing and then descend into a trench configuration. The northbound tracks would cross under the at-grade freight track and WSAB mainline tracks in a trench and turn to the east along the PEROW. The alignment would transition out of the trench and then ascend onto the Paramount Station elevated structure, connecting with the northbound WSAB mainline track south of the Paramount Boulevard/Rosecrans Avenue grade separation. The southbound lead track would

[1] Consist refers to multiple train units of cars which are coupled into sets. Passengers can typically move between the consist of train cars.

cross under the at-grade freight tracks in a trench and align on the west side of the San Pedro Subdivision ROW. The MSF lead track would also require realigning the existing freight tracks farther to the west. The southbound lead track would transition back to existing ground elevation and connect to the southbound mainline track south of the I-105 freeway.

1.15.2 Bellflower MSF Site Option

The Bellflower MSF site option is a 21-acre site located in the City of Bellflower. The city-owned site is currently developed with a recreational commercial business (the Hollywood Sports Paintball and Airsoft Park and Bellflower BMX). Vehicular access to the proposed site is currently provided from Somerset Boulevard. At full capacity, the MSF site option would be designed to store up to 80 LRVs and provide over 200 parking spaces.

The MSF site is adjacent to the project alignment, and lead tracks would be constructed within the Metro-owned PEROW. This segment of the project alignment would operate at-grade, thereby allowing easy access to the site for the lead track along the eastern side of the property. Lead tracks would be approximately 0.3 mile in an at-grade configuration, and no additional property impacts or grade crossings are expected as part of the MSF lead track design.