

West Santa Ana Branch Transit Corridor

Draft EIS/EIR Appendix P
Final Advanced Conceptual Engineering Capital Cost Report



Metro®

WEST SANTA ANA BRANCH TRANSIT CORRIDOR PROJECT

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Final Advanced Conceptual
Engineering Capital Cost Report

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ACRONYMS AND ABBREVIATIONS

AA	Alternatives Analysis
AACE	AACE International (American Association of Cost Engineers)
BRT	Bus Rapid Transit
Caltrans	California Department of Transportation
CEQA	California Environmental Quality Act
CHSRA	California High-Speed Rail Authority
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
FTA	Federal Transit Administration
GCCOG	Gateway Cities Council Governments
LPA	Locally Preferred Alternative
LRT	Light Rail Transit
LRTP	Long Range Transportation Plan
Metro	Los Angeles County Metropolitan Transportation Authority
MRDC	Metro Rail Design Criteria
NEPA	National Environmental Policy Act
OCTA	Orange County Transportation Authority
PEROW/WSAB	Pacific Electric Right-of-Way/West Santa Ana Branch
ROD	Record of Decision
ROW	Right-of-Way
SCAG	Southern California Association of Governments
TPSS	Traction Power Substation
TRS	Technical Refinement Study
UPRR	Union Pacific Railroad
WSAB	West Santa Ana Branch

1 INTRODUCTION

1.1 Study Background

The West Santa Ana Branch (WSAB), Transit Corridor Project (Project), extends up to 19.3 miles through southeast Los Angeles County, traversing densely populated, low-income and heavily transit dependent communities. The WSAB Transit Corridor Study Area begins at the Los Angeles Union Station on the north and terminates at the Los Angeles/Orange County line on the south. The Study Area is approximately 98 square miles and incorporates 20 individual cities – the Cities of Los Angeles, Vernon, Maywood, Huntington Park, Commerce, Bell, Cudahy, Bell Gardens, South Gate Lynwood, Compton, Downey, Paramount, Bellflower, Long Beach, Lakewood, Norwalk, Artesia, Cerritos and Hawaiian Gardens – as well as portions of unincorporated LA County.

The WSAB Transit Corridor is one of 17 transit projects funded by Measure R, a one-half cent sales tax approved by LA County voters in November 2008, and Measure M, an extension of Measure R and an additional one-half cent sales tax approved by voters in November 2016. The project is identified in the Los Angeles County Metropolitan Transportation Authority’s (Metro) 2009 Long Range Transportation Plan (LRTP) with an anticipated revenue service date of 2027.

In September 2016, Metro initiated the WSAB Transit Corridor Environmental Study (Environmental Study). The Environmental Study builds on the recent analysis completed by Metro in West Santa Ana Branch Technical Refinement Study (TRS) and the Pacific Electric Right-of-Way/West Santa Ana Branch Corridor Alternatives Analysis Report (AA Study) completed by SCAG.

2 COST ESTIMATES AND ESTIMATING METHODOLOGY

The cost estimates submitted within this report have been developed for alternatives under consideration in accordance with Federal Transit Administration (FTA) guidelines, using the latest revision of FTA's Standard Cost Categories (SCC). These estimates were prepared in a standard estimating format, appropriate for this stage of project development.

The following elements are included in this report:

- Estimate Criteria
- Estimate Summary by SCC Category
- Estimate Detail Worksheets (as appropriate)
- Unit Pricing
- Quantities

2.1 Cost Estimates by LRT Alternative - FTA SCC Format

The Project includes four Build Alternatives:

2.1.1 Alternative 1A: Los Angeles Union Station Forecourt to Pioneer (previously Alternative E1 Alameda Underground)

- Three underground stations (Arts/Industrial District, Little Tokyo (added with Design Option 2), LAUS (Forecourt))
- Three aerial stations (Slauson/A Line, Firestone, Paramount/Rosecrans)
- Seven at-grade stations (Pacific/Randolph, Florence/Salt Lake, Gardendale, WSAB I-105, I-105/C Line, Bellflower, Pioneer)
- 19.30 miles

2.1.2 Alternative 1B: Los Angeles Union Station MWD to Pioneer (previously Alternative E2 Alameda Underground)

- Three underground stations (Arts/Industrial District, Little Tokyo (added with Design Option 2), LAUS (MWD as Design Option 1))
- Three aerial stations (Slauson/A Line, Firestone, Paramount/Rosecrans)
- Seven at-grade stations (Pacific/Randolph, Florence/Salt Lake, Gardendale, WSAB I-105, I-105/C Line, Bellflower, Pioneer)
- 19.30 miles

2.1.3 Alternative 2: 7th St/Metro Center to Pioneer (previously Alternative G Downtown Transit Core Underground)

- Three underground stations (Arts/Industrial District, South Park/Fashion District, 7th St/Metro Center)
- Three aerial stations (Slauson/A Line, Firestone, Paramount/Rosecrans)
- Seven at-grade stations (Pacific/Randolph, Florence/Salt Lake, Gardendale, WSAB I-105, I-105/C Line, Bellflower, Pioneer)
- 19.30 miles

2.1.4 Alternative 3: Slauson/A Line to Pioneer (previously IOS 2)

- Three aerial stations (Slauson/A Line, Firestone, Paramount/Rosecrans)
- Seven at-grade stations (Pacific/Randolph, Florence/Salt Lake, Gardendale, WSAB I-105, I-105/C Line, Bellflower, Pioneer)
- 14.75 miles

2.1.5 Alternative 4: I-105/C Line to Pioneer (previously IOS 1)

- One aerial station (Paramount/Rosecrans)
- Four at-grade stations (WSAB I-105, I-105/C Line, Bellflower, Pioneer)
- 6.62 miles

Figure 2-1. WSAB Alternatives



Source: Metro, 2020

Figure 2-2. WSAB Northern Section



Source: Metro, 2020

Figure 2-3. WSAB Southern Section



Source: Metro, 2020

2.2 Cost Estimates Comparison

2.2.1 LRT Alternatives - Cost Estimate Comparison

Table 2-1 presents and compares the costs associated with each of the alternatives in 2020 dollars. The cost estimates include cost contingency to cover unexpected cost increases, which is consistent with FTA recommendations for transit projects at the current level of Advance Conceptual Engineering completion. The contingency consists of amounts allocated in varying amounts to each cost category based on “known unknowns such as design changes, historical perspective related to construction, cost growth, etc.” Furthermore, an additional amount of unallocated contingency has been added to address “unknown unknowns” such as unanticipated events, including political events, widespread economy downturns, labor strife, weather, differing site conditions, mercurial commodity pricing, unfavorable market conditions, bid risk, change orders, etc. Together, allocated and unallocated amounts make up the total contingency. Table 2-2 identifies the total amount of contingency that is included in the cost estimate for each alternative. Table 2-3 presents and compares the costs associated with each of the Maintenance Facility alternatives. Bellflower

and Paramount Yard Options are included in the Southern Section Estimates for Alternative 4 as the most suitable configuration for the required quantity of vehicles.

Alternative 2 operates between the Slauson/A Line Station and a terminus in the Downtown Transit core. It is somewhat redundant of the existing A Line service, but because it is grade-separated it provides quicker service than the A Line. Therefore, Alternative 2 induces a large number of transfers from the A Line, leading to over-crowding and the need for a short-line service. Therefore, this report utilizes 62 cars for Alternatives 1A and 1B, and 80 cars for Alternative 2.

Table 2-1. Capital Cost Estimates Comparison by Alternatives/Options and Standardized Cost Category in 2020 Dollars (x000)

Cost Categories	West Santa Ana Branch Transit Corridor - Alternatives				
	Alternative "1A" LAUS Forecourt To Pioneer & 62LRV's (1)	Alternative "1B" LAUS MWD To Pioneer & 62LRV's (2)	Alternative "2" 7th/Metro Center To Pioneer & 80LRV's (3)	Alternative "3" Slauson/A Line To Pioneer & 47LRV's (4)	Alternative "4" I-105/C Line To Pioneer & 29LRV's (5)
Guideway and Track Elements	1,743,145	1,714,566	1,754,314	842,939	319,425
Stations, Stops, Terminals, Intermodal	990,619	990,619	1,213,606	225,265	132,931
Support Facilities	See Table 2-3	See Table 2-3	See Table 2-3	See Table 2-3	See Table 2-3
Sitework And Special Conditions	583,983	588,722	655,912	373,910	192,086
Systems	970,437	970,600	989,157	717,006	337,575
Right-Of-Way, Land, Existing Improvements	1,147,592	1,150,661	1,213,844	808,445	197,109
Vehicles	401,016	401,016	517,440	303,996	187,572
Professional services	1,526,592	1,518,163	1,642,222	768,646	349,598
Unallocated contingency	736,338	733,435	798,649	404,021	171,630
Finance charges	—	—	—	—	—
Subtotal cost (2020 dollars)	8,099,722	8,067,782	8,785,144	4,444,228	1,887,926

For Grand Totals see continuation of Table 2-1 on next page

Table 2-1. Capital Cost Estimates Comparison by Alternatives/Options and Standardized Cost Category in 2020 Dollars (x000) (continued)

GRAND TOTALS (See Note)	West Santa Ana Branch Transit Corridor - Alternatives				
	Alternative "1A" LAUS Forecourt To Pioneer & 62LRV's (1)	Alternative "1B" LAUS MWD To Pioneer & 62LRV's (2)	Alternative "2" 7th/Metro Center To Pioneer & 80LRV's (3)	Alternative "3" Slauson/A Line To Pioneer & 47LRV's (4)	Alternative "4" I-105/C Line To Pioneer & 29LRV's (5)
Alternatives with Bellflower MSF, wo/Option 2 (Little Tokyo Station)	8,557,687	8,525,747	9,243,109	4,902,193	2,345,891
Alternatives with Paramount MSF, wo/Option 2 (Little Tokyo Station)	8,780,955	8,749,015	9,466,377	5,125,461	2,569,159
Alternatives with Bellflower MSF, plus Option 2 (Little Tokyo Station)	9,090,204	9,058,264	Not Applicable	Not Applicable	Not Applicable
Alternatives with Paramount MSF, plus Option 2 (Little Tokyo Station)	9,313,472	9,281,532	Not Applicable	Not Applicable	Not Applicable

Source: Lenax, 2020

Notes: The capital cost estimates will be further refined as the project advances through the project development process and more detailed engineering is undertaken.

See Appendix A for sources of the combined alignment alternatives. Appendix combinations provided below.

- (1) Alternative "1A" – A-1, A-4, A-5, A-6, (A-7, 8, 9 as indicated)
- (2) Alternative "1B" – A-2, A-4, A-5, A-6, (A-7, 8, 9 as indicated)
- (3) Alternative "2" – A-3, A-4, A-5, A-6, (A-7, 8, 9 as indicated)
- (4) Alternative "3" – A-5, A-6, (A-7, 8 as indicated)
- (5) Alternative "4" – A-6, (A-7, 8 as indicated)

Table 2-2. Total Allocated and Unallocated Contingency for Alternatives in 2020 Dollars (x000)

Cost Categories	West Santa Ana Branch Transit Corridor - Alternatives				
	Alternative "1A" LAUS Forecourt To Pioneer & 62LRV's	Alternative "1B" LAUS MWD To Pioneer & 62LRV's	Alternative "2" 7th/Metro Center To Pioneer & 80LRV's	Alternative "3" Slauson/A Line To Pioneer & 37LRV's	Alternative "4" I-105/C Line To Pioneer & 29LRV's
Allocated Contingency	1,139,407	1,139,224	1,225,201	626,262	250,822
Unallocated Contingency	736,338	733,435	798,649	404,021	171,630
Total Contingency	1,875,745	1,872,659	2,023,850	1,030,283	422,452
Contingency as Percent of Capital Cost	30.14%	30.23%	29.93%	30.18%	28.83%

Source: Lenax, 2020

Note: The capital cost estimates will be further refined as the project advances through the project development process and more detailed engineering is undertaken.

Table 2-3. Capital Cost Estimates Comparison by Options by Standardized Cost Category in 2020 Dollars (x000)

Cost Categories	WSAB Transit Corridor – Options		
	Little Tokyo Station Design Option 2	Bellflower MSF & Lead Tracks	Paramount & Lead Tracks
Guideway and track elements or MSF Lead Tracks	0	1,595	55,976
Stations, stops, terminals, intermodal	255,296	0	0
Support facilities — Administration buildings	0	34,175	34,176
Support facilities — Maintenance Facility	0	106,826	104,896
Support facilities — Storage or MOW buildings	0	32,961	32,676
Support facilities — Yards and Yard Tracks, Incl. Systems	0	78,114	78,581
Sitework and special conditions	60,525	0	10,759
Systems (If Applicable)	16,839	0	25,469
Right-Of-Way, Land, Existing Improvements	33,019	72,353	154,827
Professional services	118,427	90,308	121,943
Unallocated contingency	48,411	41,633	61,930
Finance charges	—	—	—
Total cost (2020 dollars)	532,517	457,965	681,233

Source: Lenax, 2020

Notes: 1 Paramount MSF lead track parcels in the San Pedro Subdivision are not included in the current Freight ROW cost estimate, as additional coordination will be done after the first submittal of the Admin Draft.

2 The capital cost estimates will be further refined as the project advances through the project development process and more detailed engineering is undertaken.

Table 2-4. Total Allocated and Unallocated Contingency for Alternatives/Options For Southern Alignment in 2020 Dollars (x000)

Cost Categories	WSAB Transit Corridor – Options		
	Little Tokyo Station Design Option 2	Bellflower MSF & Lead Tracks	Paramount MSF & Lead Tracks
Allocated Contingency	74,152	67,431	104,478
Unallocated Contingency	48,411	41,633	61,930
Total Contingency	122,563	109,064	166,408
Contingency as Percent of Capital Cost	29.90%	31.26%	32.32%

Source: Lenax, 2020

The estimates produced during this Environmental Study consists of estimates compatible with the level of design. At the conclusion of this study, the design will not have progressed beyond the 15 percent level. As a result, there are parametric cost elements within the estimate. These parametric cost elements will be based on previously bid LA Metro projects including, Crenshaw/LAX Light Rail Transit (LRT), Regional Connector, Exposition Line LRT, and Purple Line Segments One- and Two-unit price contracts that are escalated to present day costs. This methodology forms a sound basis and high level of confidence in the project estimate.

3 FTA STANDARD COST CATEGORY

The methodology that is used for generating capital cost estimates is consistent with FTA guidelines for estimating capital costs. The FTA guidelines are based on the Standard Cost Categories (SCC), which enables projects to develop budget baselines that summarize to the SCC. This cost structure will be used for the capital cost detail and summary sheets and is described below. Where the level of design does not support quantity measurements, parametric estimating techniques are utilized. These parametric cost elements shall be based upon previously bid Crenshaw/LAX Light Rail Transit (LRT), Exposition Line LRT, LA Regional Connector, and Purple Line Segments One and Two unit price contracts escalated to the January of 2020. The methodology also utilizes AACE International Class 4 estimate approach identifying Typical Purpose of Estimate (END USAGE) as Concept Study or Feasibility (from 1% to 15%). The Class 4 estimate has Expected Accuracy Range as follows: a low range of -15% to -30% and a high range of +20% to +50%.

3.1 Capital Cost Categories

The following summarizes the SCC codification structure:

10	Guideway and Track Elements
20	Station, Stops, Terminals, Inter-modal
30	Support Facilities – Yards, Shops, Administration Buildings
40	Sitework and Special Conditions
50	Systems
60	Right-of-Way, Land, Existing Improvement
70	Vehicles
80	Professional Services
90	Unallocated Contingency
100	Finance Charges

3.1.1 SCC 10 - Guideway and Track Elements

This section includes guideway and track elements for a light rail project. The unit of measure is route miles of guideway, regardless of the width. As associated with the guideway, included are costs for rough grading, excavation, and concrete base for guideway where applicable. All construction materials and labor are included regardless of who is performing the work.

10.01 Guideway: At-Grade

This section contains costs for exclusive at-grade guideways and at-grade crossings.

10.04 Guideway: Aerial

This section includes costs for aerial guideway structures. The aerial guideway includes foundation excavation and guideway structures such as caissons, columns, bridges, viaducts, cross-overs, and fly-overs.

10.06 Guideway: Underground Cut & Cover

This section includes costs for cut and cover of U-section structures. The underground cut and cover includes excavation, retaining walls, backfill, underground guideway structure, and finishes.

10.07 Guideway: Underground Bored Tunnel

This section includes the double-bored tunnel, assumed to be bored with a tunnel boring machine (TBM), tunnel structures, pedestrian and vehicular tunnels, and finishes.

10.08 Guideway: Retained Cut or Fill

This section includes excavation, retaining walls, backfill, underground guideway structures, and finishes. This section also includes costs for retained fill and retained cut.

10.09 10.13 Track: Direct Fixation, Ballasted, Special and Vibration and Noise Dampening

This section includes the construction of trackwork (including rail, ties, ballast, second pour, concrete panels, and attachments) and special trackwork (including turnouts, crossovers, etc.).

3.1.2 SCC 20 - Stations, Stops, Terminals, Intermodal

This section is associated with stations and includes costs for rough grading, excavation, retaining walls, station structures, enclosures, finishes, equipment, mechanical and electrical components including HVAC, ventilation shafts and equipment, station power, lighting, public address/customer information system, safety systems such as fire detection and prevention, security surveillance, access control, fire/life safety systems, etc. It includes all construction materials and labor regardless of who is performing the work.

20.01 At-Grade Stations

This section includes costs for at-grade stations based on the selected Alternative.

20.02 Aerial Station

This section includes station structures including caissons, columns, platforms, superstructure, etc. This section includes four to eight aerial stations based on the selected Alternative.

20.03 Underground Stations

This section includes underground stations based on the selected Alternative.

20.07 Elevators & Escalators

The quantity of escalators and elevators pertaining to each specific station listed is included in the estimate worksheet for each Alternative.

The estimate assumes geared-traction elevators with cabs that contain stainless steel finishes and laminated glass walls, and are constructed for high durability/high traffic.

Escalators are assumed to be constructed for high durability/high traffic with stainless steel finishes.

3.1.3 SCC 30 - Support Facilities: Yards, Shops, Administration Buildings

30.01, 30.03, 30.04 & 30.05 Administrative Building, Heavy Maintenance Facility, Yard and Yard Track

This section includes an allowance for a complete rail yard and multiple shops that are capable of serving up to 80 light rail vehicles located on more than 22 acres. These yard and shops will have capabilities similar to Metro Blue Line's light rail yard and shops.

Items in this category include site demolition and preparation, traction power, office support areas, maintenance of way facilities, trackwork for vehicle storage, cleaning and maintenance facilities, and storage/maintenance buildings. Quantity takeoff as applicable to 15% ACE level of engineering will be provided and priced with developed and historical unit cost data as applicable to each yard option and will be included in this estimate.

3.1.4 SCC 40 - Sitework and Special Conditions

This cost category includes the sitework and special conditions that may be in addition to scope covered under standard profiles for guideway and station construction. Sub-categories include:

- 40.01 Demolition, Clearing, Earthwork
- 40.02 Site Utilities, Utility Relocation
- 40.03 Hazardous Materials, Contaminated Soil Removal and Mitigation, Groundwater Treatment
- 40.04 Environmental Mitigation, etc. Wetland, Historic/Archeologic, parks.
- 40.05 Site Structures including Retaining Walls, Sound Walls
- 40.06 Pedestrian/Bike Access and Accommodation, Landscaping
- 40.07 Automobile, Bus, and Van Access ways, including Roads, Parking Lots
- 40.08 Temporary Facilities and Other Indirect Costs during Construction

40.01 Demolition, Clearing, Earthwork

This cost category includes costs associated with building and other demolition and can also include existing rail structures.

40.02 Site Utilities, Utility Relocation

This cost category includes relocation of both public and private utilities and specifically excludes betterments.

40.03 Hazardous Material, Contaminated Soil Removal/Mitigation, Ground Water Treatments.

No particular hazardous material or environmental mitigation information will be available during of this study. Therefore a "plug" number based on the overall alignment length will be utilized.

40.04 Environmental Mitigation

No specific hazardous material or environmental mitigation information will be available during of this study. Therefore a “plug” number based on the overall alignment length will be utilized.

40.05 Site Structures Including Retaining Walls, Sound Walls

Work items in this category include retaining walls, sound walls, shared lots, structures where there might be retail/economic/community activities on the ground floor, and other work that is adjacent to the actual alignment. For purposes of this study, parametric cost elements will be used for these unit costs.

40.06 Pedestrian / Bike Access and Accommodation, Landscaping

Work items in this category include sidewalks, paths, plazas, landscape, site and station furniture, sight lighting, signage, public artwork, bike facilities and fencing. This category also will include the Stations Public Artwork allowance in the amount of 0.5% of the project construction cost. For purposes of this study, parametric cost elements were used for these unit costs.

40.07 Automobile, Bus, Van Accessways Including Roads, Parking Lots

This cost category includes roadways, streets, surface parking areas, sidewalks, curbs, and gutters. Additionally, this cost category if applicable may include shared-lots or structures where there might be retail/economic or community activities on the ground floor. For purposes of this study, parametric cost elements were used for these unit costs.

40.08 Temporary Facilities and Other Indirect Costs During Construction

This cost category includes temporary facilities and other indirect costs during construction. Such costs shall include additional temporary construction easements to facilitate construction, phasing costs, additional costs for labor and/or materials shortages (tight market). These costs were determined as a percentage of the overall capital construction cost and included in all unit prices.

3.1.5 SCC 50 - Systems

The Systems cost category includes several relevant sub-categories:

- 50.01 Train Control and Signals
- 50.02 Traffic Signals and Crossing Protection
- 50.03 Traction Power Supply: Substations
- 50.04 Traction Power Distribution: Catenary and Overhead Conductor Rail
- 50.05 Communications
- 50.06 Fare Collection System and Equipment
- 50.07 Central Control

50.01 Train Control and Signals

Work in this category includes signaling and control systems required for safe and efficient operations of the transit technology. Wayside signals, automatic train stop circuitry in the track and vehicles are included. Where appropriate for any particular alternative, Supervisory Control and Data Acquisition (SCADA) will also be assumed.

50.02 Traffic Signals and Crossing Protection

Work in this category includes signal prioritization at intersections. Crossings consist of devices that are expected to be at each crossing, including a quad gates system with traffic loop detectors. The traffic signals must be rearranged to accommodate the new crossing configuration and the crossing system pre-emption, new conduits and cables have to connect the train signals and traffic signals. The estimate for the train control systems is based on the historical data from the comparable LRT and Freight Train Crossings projects.

50.03 Traction Power Supply: Substations

A traction power substation (TPSS) converts electrical power from AC to DC. This cost category involves the cost with the station including structural, mechanical, electrical, and civil work. This work is typically estimated based on industry-standard per unit costs for each TPSS.

50.04 Traction Power Distribution: Catenary – Overhead Catenary System (OCS)

The scope covers the cost of electrical construction for an Overhead Catenary system (OCS) and Rigid Overhead Conductor Rail (OCR) system used in the Metro tunnels. It includes associated electrical site work, installation of complete catenary system inclusive of poles, feeder poles, cantilevers, pole bands, traction power feeder connections, disconnect switches, cable supports, messenger and contact wire.

50.05 Communications

The scope of this estimate covers the cost of electrical construction for a communications system. This includes associated communications/electrical site and stations work, installation of complete communications system inclusive of equipment, shelters, train communication and control buildings, systems cabling, cables connections, cable supports, and labor.

50.06 Fare Collection System and Equipment

Fare collection costs include ticket vending machines, fare gates, a cost inclusive of vendor design, manufacture, and installation. Technologies for this study were assumed to be consistent for each alternative, and ticket vending machines (TVM) pricing for estimating purposes were based on the assumed Smart Card technology planned for implementation on all Metro properties.

50.07 Central Control

At this time, the estimate includes allowance for the cost of expansion of the Central Control Facilities (ROC). Per discussions with Metro, an allowance of \$10 million was included in the South Section estimate.

3.1.6 SCC 60 - Right-of-Way (ROW), Land, Existing Improvements

This cost category includes real estate acquisition and relocation costs.

- 60.01 Purchase or Lease of Real Estate
- 60.02 Relocation of Existing Households and Businesses
- 60.03 Right of Way (ROW)

Fee acquisitions of permanent and temporary easements, relocation costs, and “loss of business” compensation are included. Real estate acquisition and relocation estimates were provided by Metro based on information provided by the Metro Real Estate Department for similar types of property. Refined real estate pricing will be produced by Del Richardson & Associates, Inc. and will be included in the final version of this report. Real Estate acquisitions/easements would primarily be associated with ROW, station entrances, construction staging, access for tunnel boring machines, and potential sub surface easements for tunneling under private property. Cost estimates will be prepared by Del Richardson & Associates, Inc. based on right-of-way drawings provided by the WSP for inclusion in the cost estimate.

Exclusions include:

- Railroad ROW owned by private railroads (Wilmington Branch and La Habra Branch). Pending final negotiations, the estimate includes 500M placeholder;
- Caltrans ROW;
- Metro owned ROW;
- Any publicly-owned ROW or real estate. Pending final negotiations, the estimate includes 150M placeholder;

3.1.7 SCC 70 - Vehicles

This cost category includes the cost of revenue and non-revenue vehicles:

Revenue vehicle pricing will be based on recent historical and industry-standard unit costs and will include design engineering, manufacture, testing, and spare parts. The estimate will assume there will be no need to retrofit any of Metro's existing fleet for consist compatibility with newer technologies.

3.1.8 SCC 80 - Professional Services (applies to SCC 10-50)

This cost category covers alternatives analysis, environmental process, engineering and design and design support during construction, construction management, Metro agency costs, professional insurance costs, surveys and testing, specialty sub-consultants, and legal expenses.

3.1.9 SCC 90 – Unallocated contingency

Unallocated contingency is intended to cover bid risk and construction risk that cannot reasonably be allocated to specific SCC codes. It is intended to cover unknowns that cannot be anticipated but is nonetheless prudent to include for planning purposes. This is calculated as a percentage add-on based on the total capital cost estimate, typically in the range of 10 to 15 percent (also Referred in Section 3.7). The Project will use 10 percent per Metro’s recommendation. Note that additionally allocated contingencies ranging from 5 to 30 percent are allocated to specific cost categories as addressed in Sections 4.6 and Table 4-1.

3.1.10 SCC 100 - Finance Charges

Finance charges are not included in the scope of the initial estimates.

4 ESTIMATING METHODOLOGY

Estimates were prepared in a standard estimating format, appropriate to the stage of project development. The following elements are comprised of the estimate deliverable under Task 26, Cost Comparison Analysis:

- Letter of Transmittal
- Basis and Assumptions Document
- Estimate Reconciliation (if the previous estimate exists)
- Estimate Summary by SCC Category
- Estimate Detail Worksheets (as appropriate)
- Unit Pricing
- Quantities

Capital cost estimates are provided for each alignment and station options. A summary table is provided with each alternative for comparison.

4.1 Estimate Assumptions - General

Estimates for the conceptual phase are based on the following assumptions:

- The estimates are prepared utilizing current year dollars.
- No premium time on labor costs are assumed.
- Adequate experience craft labor will be available.
- Compatible trade agreements exist in the region.
- No unusual labor pacts or agreements have been negotiated.
- There will be sufficient experienced contractors to complete the work.
- There will be no unusual weather conditions.

4.2 Software (MS Excel)

The estimates for this study were prepared on Microsoft Excel spreadsheets. This enables the review, edit, consolidation, and reporting of estimate components over the course of time, and provides Metro with the flexibility to easily make internal adjustments. Estimates will be transmitted in hard copy and electronic formats.

4.3 Estimate Basis and Assumptions - Detail

The Cost Comparison Analysis document is integral to providing a full understanding of the estimate submittal and an evaluation of each alternative. As each estimate was developed, the document provides specific information relating to:

- Estimate Scope: A brief explanation of each alternative and or option.
- Drawings and other technical documentation: Description of drawings, sketches and other technical documentation used, including titles and dates.
- Quantities: A description of the basis for quantity assessments for each major SCC category, including a general description of the level of design completion.
- Unit Prices: At the conclusion of this Environmental Study, the design will not have progressed beyond approximately, 10 to 15 percent. As a result, there will be parametric cost elements within the estimate. These parametric cost elements are

based upon previously bid Crenshaw/LAX Light Rail Transit (LRT), Exposition Line LRT, LA Regional Connector, and Purple Line Segments, as well as One- and Two-unit price contracts escalated to the present day.

- Exclusions: Provides identification of items that are specifically not included in the estimate, such as insurance, a contingency for construction and bid risk, escalation, etc.
- Other Information: May include a record of site visits, documents that served as the basis for certain assumptions, reference of articles from newspapers and magazines, documentation of unusual factors having an influence on the final cost, etc.

4.4 Pricing Approach

The two methodologies utilized for establishing unit rates include (1) historical information and (2) “bottom-up” pricing. Typically, estimates are developed using a combination of the two. However, in the early stages of the design and with few engineering details, the historical bid price method was used almost exclusively. The Metro Parametric Unit Cost Matrix was consulted and utilized as appropriate. As the Project evolves further beyond this Environmental Study, a mix of detailed pricing and historical information will be utilized.

It should be noted that unit pricing is not adjusted to reflect items such as market conditions and bid risk, agency reputation in the contracting community, and other considerations. These adjustments will be addressed at the appropriate time through the application of allocated and unallocated contingency as the project further evolves.

4.5 Quantities

Quantity take-offs are prepared consistent with the level of design. Quantity assessments are made based on general descriptions of horizontal and vertical alignments, standard design criteria, and order-of-magnitude assessments.

4.6 Allocated Contingencies

By FTA Standard Cost Categories, allocated contingencies are typically included in an estimate to address lack of scope and quantity definition during the in-progress design stages. Metro’s Project Contingency Policy were reviewed and addressed during this process. In the early stages, the Design Allowance represented a significant portion of the estimate for any particular SCC Category. As the design progresses and more detailed quantity takeoffs can be made, the allowance is reduced; at 100 percent design completion the Design Allowance, by definition, will be zero.

For purposes of the Environmental Study and alternative options analyses, few detailed quantity takeoffs were performed due to the early stage of engineering completion. Instead, quantities are determined consistent with the level of design at the time of estimate preparation. The amount of allocated contingency depends on the complexity of any particular SCC code as well as the stage of engineering completion. For this Environmental Study, the allocated contingency will typically be within the 5 to 30 percent range, as described in Table 4-1.

Table 4-1 Allocated Contingencies Percentages

FTA Category No.	Description	Allocated Contingency Percentage
10	Guideway and Track Elements	
	Guideway Elements (Except Underground)	25
	Guideway Elements (Underground)	25
	Track Elements	25
20	Stations, Stops, Terminals, and Intermodal	25
30	Support Facilities: Yards, Shops, and Administration Buildings	25
40	Sitework and Special Conditions	
	Demolition, Clearing, and Earthwork	25
	Site Utilities and Utility Relocation	25
	Hazardous Materials, Contaminated Soil Removal/Mitigation, and Groundwater Treatments	25
	Environmental Mitigation, e.g., Wetlands, Historic/Archaeological, and Parks	25
	Site Structures, including Retaining Walls and Sound Walls	25
	Pedestrian/Bike Access and Accommodation, including Landscaping	25
	Automobile, Bus, and Van Access, including Roads and Parking Lots	25
50	Systems	25
60	ROW, Land, Existing Improvements	
	Surface Takes	30
	Subsurface Easements	30
70	Vehicles (number)	5
	Spare Parts (10% of SCC 70 Total)	
80	Professional Services (applies to Categories 10-50)	Note 1
90	Unallocated Contingency (See 3.7)	10

Source: Crenshaw/LAX, LA Regional Connector & PLE Segment 1 & 2

Notes: SCC-80 Professional Services are calculated from SCC 10 through SCC 50 after all contingencies are applied, and therefore will include cumulative construction contingency.

FTA = Federal Transit Administration; ROW = right-of-way

4.7 Unallocated Contingency

In addition to allocated contingency, project contingency addresses bid risks, construction risks, and project reserve. Contingency has been allocated in varying amounts to each SCC code based on “known unknowns” (allocated contingency). That is, historical perspectives provided insight where other projects have previously experienced cost growth. If similar conditions exist on the WSAB Transit Corridor, this risk was identified to a particular SCC code and reflected through an appropriately allocated contingency.

Unallocated contingency was also established at the total project level. Combined, the allocated and unallocated contingencies reflects the total contingency. Unallocated contingency is intended to address “unknown unknowns,” or to simply reflect a prudent amount to cover unanticipated events, including political events, labor strife, weather, differing site conditions, mercurial commodity pricing, unfavorable market conditions, bid risk, change orders, etc. The unallocated contingency is simply a percentage add-on in the range of 10 to 15 percent as indicated in Section 3.10. For this Project, 10 percent is used per Metro’s recommendation.

4.8 Escalation

The estimates developed during the Environmental Study were completed in March of 2020 dollars. As the Environmental Study effort progresses and estimates are updated, the escalation factors will be revised based upon the Quarterly Cost Indexes as published by Engineering News Record (ENR).

4.9 Estimate Review and Approval

At the completion of any given estimate deliverable, copies are reviewed internally for reasonableness and an overall quality check. The quality check includes a review for deliverable completeness, an arithmetic check, back-up documentation, and consistency with SCC coding structures. A review meeting is conducted with all participants to address and respond to any comments. All estimates will be considered drafts until approved for submittal to Metro. Record copies are provided to each participant.

4.10 Estimate Reconciliation

Over the course of the Environmental Study, estimates for each alternative and options continue to evolve. For each formal estimate submittal, a narrative is provided that explains the primary differences compared to previous submittals with regard to these factors.

5 ESTIMATE LIMITATIONS

Uncertainty exists at the early stages of engineering completion to the extent of the level that work scope has been defined. Estimates that support the Environmental Study are based on documents that are developed to an approximate 10 to 15 percent level of engineering completion. The uncertainty inherent in the project at this stage may include:

- Scope and Quantity Definition
- Commodity Pricing
- Unforeseen Problems

5.1 Project Criteria

The most recent Metro projects which have similar elements to WSAB Transit Corridor (i.e., at-grade, aerial, and underground) include the Crenshaw/LAX Line, LA Regional Connector, Purple Line Segment One and Two, and are all considered in the cost evaluation. This information is used to develop scope relative to this project.

5.2 Scope and Quantity Definition

The lack of scope definition, coupled with an inability to make precise quantity takeoffs, almost certainly results in changes to the project cost as the design evolves. Therefore, the scope cannot be completely defined in this Environmental Study. As the engineering design progresses, changes to the scope's assumptions are incorporated into the estimate and each iteration documents the updates. Although the allocated contingency is intended to mitigate some of these impacts, significant cost risk still remains.

5.3 Material Pricing

Over the past few years, the cost of commodities such as petroleum, concrete, and steel have increased and decreased dramatically. Many of these commodities continue to be unpredictable and may remain uncertain in the estimate for this project. The inclusion of a factor based on Building Construction Cost Index (BCI) values as published by ENR is used to address this risk.

5.4 Construction and Bid Risk

The risk associated with project implementation represents a significant uncertainty in the project cost. Over the past several years, many projects have seen substantial variations in bids compared to estimates as a result of unfavorable market conditions, lack of competition in the marketplace, or perceived contractor risk. These types of risk are addressed through application of contingency.

APPENDIX A – ALTERNATIVES ESTIMATES

The following pages contain estimates for each of the options described in this report as follows:

A-1: Northern Alignment Alternative 1A - Union Station Forecourt & 15 LRV's

A-2: Northern Alignment Alternative 1B - Union Station MWD & 15 LRV's

A-3: Northern Alignment Alternative 2 - 8th St & Flower St Station & 33 LRV's

A-4: Northern Alignment Alternative 1-2

A-5: Southern Alignment Alternative 3 & 18 LRV's

A-6: Southern Alignment Alternative 4 & 29 LRV's

A-7: Bellflower MSF Option

A-8: Paramount MSF Option

A-9: Little Tokyo Station Design Option

A-1: North Alignment Alternative 1A - Union Station Forecourt & 15 LRV's

MAIN WORKSHEET-BUILD ALTERNATIVE								(Rev.21, June, 2019)
West Santa Ana Branch Transit Corridor Environmental Study Northern Alignment - Alternative "1A" & 15 LRV (From 399+83.27 To 509+50.00)						Today's Date 1/14/21 Yr of Base Year \$ 2020 Yr of Revenue Ops 2028		
	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	2.08	468,128	117,032	585,160	\$281,729	36%	23%	0
10.01 Guideway: At-grade exclusive right-of-way	0.00	0	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0	0	0				0
10.04 Guideway: Aerial structure	0.00	0	0	0				0
10.05 Guideway: Built-up fill	0.00	0	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0	0	0				0
10.07 Guideway: Underground tunnel	2.08	443,218	110,805	554,023	\$266,738			0
10.08 Guideway: Retained cut or fill	0.00	0	0	0				0
10.09 Track: Direct fixation	2.08	10,638	2,660	13,298	\$6,402			0
10.10 Track: Embedded	0.00	0	0	0				0
10.11 Track: Ballasted	0.00	0	0	0				0
10.12 Track: Special (switches, turnouts)		4,950	1,238	6,188				0
10.13 Track: Vibration and noise dampening		9,322	2,331	11,653				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	2	612,283	153,071	765,354	\$382,677	47%	30%	0
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	2	578,359	144,590	722,949	\$361,474			0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development	0	0	0	0				0
20.06 Automobile parking multi-story structure	0	0	0	0				0
20.07 Elevators, escalators	28	33,924	8,481	42,405	\$1,514			0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS		0	0	0	\$0	0%	0%	0
30.01 Administration Building: Office, sales, storage, revenue counting		0	0	0				0
30.02 Light Maintenance Facility		0	0	0				0
30.03 Heavy Maintenance Facility		0	0	0				0
30.04 Storage or Maintenance of Way Building		0	0	0				0
30.05 Yard and Yard Track		0	0	0				0
40 SITEWORK & SPECIAL CONDITIONS		122,637	30,659	153,296	\$73,805	10%	6%	0
40.01 Demolition, Clearing, Earthwork		9,368	2,342	11,710				0
40.02 Site Utilities, Utility Relocation		72,922	18,231	91,153				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		8,684	2,166	10,850				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		5,100	1,275	6,375				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		10,063	2,516	12,579				0
40.07 Automobile, bus, van accessways including roads, parking lots		16,520	4,130	20,650				0
40.08 Temporary Facilities and other indirect costs during construction		0	0	0				0
50 SYSTEMS		87,101	21,775	108,876	\$52,419	7%	4%	0
50.01 Train control and signals		18,643	4,661	23,304				0
50.02 Traffic signals and crossing protection		0	0	0				0
50.03 Traction power supply: substations		22,782	5,696	28,478				0
50.04 Traction power distribution: catenary and third rail		9,980	2,495	12,475				0
50.05 Communications		32,576	8,144	40,720				0
50.06 Fare collection system and equipment		3,120	780	3,900				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)		1,290,149	322,537	1,612,686	\$776,438	100%	64%	0
60 ROW, LAND, EXISTING IMPROVEMENTS		12,008	3,602	15,610	\$7,516		1%	0
60.01 Purchase or lease of real estate		12,008	3,602	15,610				0
60.02 Relocation of existing households and businesses		0	0	0				0
70 VEHICLES (number)	15	82,400	4,620	87,020	\$6,468		4%	0
70.01 Light Rail	15	84,000	4,200	88,200	\$5,880			0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other	0	0	0	0				0
70.06 Non-revenue vehicles	0	0	0	0				0
70.07 Spare parts	15	8,400	420	8,820	\$588			0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)		574,116	0	574,116	\$276,412	36%	23%	0
80.01 Project Development		112,888	0	112,888				0
80.02 Engineering		129,015	0	129,015				0
80.03 Project Management for Design and Construction		161,269	0	161,269				0
80.04 Construction Administration & Management		80,634	0	80,634				0
80.05 Professional Liability and other Non-Construction Insurance		1,613	0	1,613				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		59,669	0	59,669				0
80.07 Surveys, Testing, Investigation, Inspection		3,225	0	3,225				0
80.08 Start up		25,803	0	25,803				0
Subtotal (10 - 80)		1,968,673	330,760	2,299,433	\$1,107,076		91%	0
90 UNALLOCATED CONTINGENCY				229,943			9%	0
Subtotal (10 - 90)				2,529,376	\$1,217,784		100%	0
100 FINANCE CHARGES				0			0%	0
Total Project Cost (10 - 100)				2,529,376	\$1,217,784		100%	0
Allocated Contingency as % of Base Yr Dollars w/o Contingency								16.80%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency								11.68%
Total Contingency as % of Base Yr Dollars w/o Contingency								28.48%
Unallocated Contingency as % of Subtotal (10 - 80)								10.00%
YOE Construction Cost per Mile (X000)								\$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								\$0
YOE Total Project Cost per Mile (X000)								\$0

A-2: North Alignment Alternative 1B - Union Station MWD & 15 LRV's

MAIN WORKSHEET-BUILD ALTERNATIVE								(Rev.21, June, 2019)	
West Santa Ana Branch Transit Corridor Environmental Study Northern Alignment - Alternative "1B" & 15 LRV (From 399+60.00 To 509+50.00)						Today's Date Yr of Base Year \$		11/17/20 2020 2028	
	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)	
10 GUIDEWAY & TRACK ELEMENTS (route miles)	2.08	445,265	111,316	556,581	\$267,402	35%	22%	0	
10.01 Guideway: At-grade exclusive right-of-way	0.00	0	0	0				0	
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0	0	0				0	
10.03 Guideway: At-grade in mixed traffic	0.00	0	0	0				0	
10.04 Guideway: Aerial structure	0.00	0	0	0				0	
10.05 Guideway: Built-up fill	0.00	0	0	0				0	
10.06 Guideway: Underground cut & cover	0.00	0	0	0				0	
10.07 Guideway: Underground tunnel	2.08	420,313	105,078	525,391	\$252,417			0	
10.08 Guideway: Retained cut or fill	0.00	0	0	0				0	
10.09 Track: Direct fixation	2.08	10,660	2,665	13,325	\$6,402			0	
10.10 Track: Embedded	0.00	0	0	0				0	
10.11 Track: Ballasted	0.00	0	0	0				0	
10.12 Track: Special (switches, turnouts)		4,950	1,238	6,188				0	
10.13 Track: Vibration and noise dampening		9,342	2,336	11,678				0	
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	2	612,283	153,071	765,354	\$382,677	48%	31%	0	
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0	
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0	
20.03 Underground station, stop, shelter, mall, terminal, platform	2	578,359	144,590	722,949	\$361,474			0	
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0	
20.05 Joint development	0	0	0	0				0	
20.06 Automobile parking multi-story structure	0	0	0	0				0	
20.07 Elevators, escalators	28	33,924	8,481	42,405	\$1,514			0	
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0	0	0	0	\$0	0%	0%	0	
30.01 Administration Building: Office, sales, storage, revenue counting	0	0	0	0				0	
30.02 Light Maintenance Facility	0	0	0	0				0	
30.03 Heavy Maintenance Facility	0	0	0	0				0	
30.04 Storage or Maintenance of Way Building	0	0	0	0				0	
30.05 Yard and Yard Track	0	0	0	0				0	
40 SITEWORK & SPECIAL CONDITIONS	2.08	122,584	35,451	158,035	\$75,926	10%	6%	0	
40.01 Demolition, Clearing, Earthwork		9,388	2,816	12,204				0	
40.02 Site Utilities, Utility Relocation		72,922	21,877	94,799				0	
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		8,682	2,605	11,287				0	
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		5,110	1,533	6,643				0	
40.05 Site structures including retaining walls, sound walls		0	0	0				0	
40.06 Pedestrian / bike access and accommodation, landscaping		9,962	2,491	12,453				0	
40.07 Automobile, bus, van accessways including roads, parking lots		16,520	4,130	20,650				0	
40.08 Temporary Facilities and other indirect costs during construction		0	0	0				0	
50 SYSTEMS	2.08	87,231	21,808	109,039	\$52,386	7%	4%	0	
50.01 Train control and signals		18,663	4,671	23,334				0	
50.02 Traffic signals and crossing protection		0	0	0				0	
50.03 Traction power supply: substations		22,782	5,696	28,478				0	
50.04 Traction power distribution: catenary and third rail		10,001	2,500	12,501				0	
50.05 Communications		32,645	8,161	40,806				0	
50.06 Fare collection system and equipment		3,120	780	3,900				0	
50.07 Central Control		0	0	0				0	
Construction Subtotal (10 - 50)	2.08	1,267,363	321,646	1,589,009	\$763,418	100%	64%	0	
60 ROW, LAND, EXISTING IMPROVEMENTS	2.08	14,369	4,311	18,680	\$8,974		1%	0	
60.01 Purchase or lease of real estate		14,369	4,311	18,680				0	
60.02 Relocation of existing households and businesses		0	0	0				0	
70 VEHICLES (number)	15	92,400	4,620	97,020	\$6,468		4%	0	
70.01 Light Rail	15	84,000	4,200	88,200	\$5,880			0	
70.02 Heavy Rail	0	0	0	0				0	
70.03 Commuter Rail	0	0	0	0				0	
70.04 Bus	0	0	0	0				0	
70.05 Other	0	0	0	0				0	
70.06 Non-revenue vehicles	0	0	0	0				0	
70.07 Spare parts	15	8,400	420	8,820	\$588			0	
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	2.08	565,687	0	565,687	\$271,777	36%	23%	0	
80.01 Project Development		111,231	0	111,231				0	
80.02 Engineering		127,121	0	127,121				0	
80.03 Project Management for Design and Construction		158,901	0	158,901				0	
80.04 Construction Administration & Management		79,450	0	79,450				0	
80.05 Professional Liability and other Non-Construction Insurance		1,589	0	1,589				0	
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		58,793	0	58,793				0	
80.07 Surveys, Testing, Investigation, Inspection		3,178	0	3,178				0	
80.08 Start up		25,424	0	25,424				0	
Subtotal (10 - 80)	2.08	1,939,819	330,577	2,270,396	\$1,090,781		91%	0	
90 UNALLOCATED CONTINGENCY				227,040			9%	0	
Subtotal (10 - 90)	2.08			2,497,435	\$1,199,860		100%	0	
100 FINANCE CHARGES				0			0%	0	
Total Project Cost (10 - 100)	2.08			2,497,435	\$1,199,860		100%	0	
Allocated Contingency as % of Base Yr Dollars w/o Contingency				17.04%					
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.70%					
Total Contingency as % of Base Yr Dollars w/o Contingency				28.75%					
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%					
YOE Construction Cost per Mile (X000)								\$0	
YOE Total Project Cost per Mile Not Including Vehicles (X000)								\$0	
YOE Total Project Cost per Mile (X000)								\$0	

A-3: Northern Alignment Alternative 2 - 7th St/Metro Center Station & 33 LRV's

MAIN WORKSHEET-BUILD ALTERNATIVE								(Rev.21, June, 2019)
West Santa Ana Branch Transit Corridor Environmental Study Northern Alignment - Alternative "2" & 33 LRV (From 399+00.00 To 509+50.00)						Today's Date 1/14/21 Yr of Base Year \$ 2020 Yr of Revenue Ops 2028		
	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	2.09	477,063	119,266	596,329	\$284,943	31%	19%	0
10.01 Guideway: At-grade exclusive right-of-way	0.00	0	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0	0	0				0
10.04 Guideway: Aerial structure	0.00	0	0	0				0
10.05 Guideway: Built-up fill	0.00	0	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0	0	0				0
10.07 Guideway: Underground tunnel	2.09	452,001	113,000	565,001	\$269,973			0
10.08 Guideway: Retained cut or fill	0.00	0	0	0				0
10.09 Track: Direct fixation	2.09	10,719	2,680	13,399	\$6,402			0
10.10 Track: Embedded	0.00	0	0	0				0
10.11 Track: Ballasted	0.00	0	0	0				0
10.12 Track: Special (switches, turnouts)		4,950	1,238	6,188				0
10.13 Track: Vibration and noise dampening		9,393	2,348	11,741				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	3	790,673	197,668	988,341	\$329,447	51%	31%	0
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	3	725,441	181,360	906,801	\$302,267			0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development	0	0	0	0				0
20.06 Automobile parking multi-story structure	0	0	0	0				0
20.07 Elevators, escalators	54	65,232	16,308	81,540	\$1,510			0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0	0	0	0	\$0	0%	0%	0
30.01 Administration Building: Office, sales, storage, revenue counting	0	0	0	0				0
30.02 Light Maintenance Facility	0	0	0	0				0
30.03 Heavy Maintenance Facility	0	0	0	0				0
30.04 Storage or Maintenance of Way Building	0	0	0	0				0
30.05 Yard and Yard Track	0	0	0	0				0
40 SITEWORK & SPECIAL CONDITIONS	1.00	180,180	45,045	225,225	\$107,619	12%	7%	0
40.01 Demolition, Clearing, Earthwork		18,946	4,737	23,683				0
40.02 Site Utilities, Utility Relocation		109,383	27,346	136,729				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		8,730	2,183	10,913				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		5,138	1,285	6,423				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		13,203	3,301	16,504				0
40.07 Automobile, bus, van accessways including roads, parking lots		24,780	6,195	30,975				0
40.08 Temporary Facilities and other indirect costs during construction		0	0	0				0
50 SYSTEMS	1.00	102,077	25,519	127,596	\$60,969	7%	4%	0
50.01 Train control and signals		18,785	4,696	23,481				0
50.02 Traffic signals and crossing protection		0	0	0				0
50.03 Traction power supply: substations		34,173	8,543	42,716				0
50.04 Traction power distribution: catenary and third rail		10,056	2,514	12,570				0
50.05 Communications		32,823	8,206	41,029				0
50.06 Fare collection system and equipment		6,240	1,560	7,800				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	1.00	1,549,993	387,498	1,937,491	\$925,786	100%	60%	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0.00	62,971	18,891	81,862	\$39,116		3%	0
60.01 Purchase or lease of real estate		62,971	18,891	81,862				0
60.02 Relocation of existing households and businesses		0	0	0				0
70 VEHICLES (number)	33	203,280	10,164	213,444	\$6,468		7%	0
70.01 Light Rail	33	184,800	9,240	194,040	\$5,880			0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other	0	0	0	0				0
70.06 Non-revenue vehicles	0	0	0	0				0
70.07 Spare parts	33	18,480	924	19,404	\$588			0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.00	689,746	0	689,746	\$329,580	36%	21%	0
80.01 Project Development		135,624	0	135,624				0
80.02 Engineering		154,999	0	154,999				0
80.03 Project Management for Design and Construction		193,749	0	193,749				0
80.04 Construction Administration & Management		96,875	0	96,875				0
80.05 Professional Liability and other Non-Construction Insurance		1,937	0	1,937				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		71,687	0	71,687				0
80.07 Surveys, Testing, Investigation, Inspection		3,875	0	3,875				0
80.08 Start up		31,000	0	31,000				0
Subtotal (10 - 80)	1.00	2,505,990	416,554	2,922,544	\$1,396,473		91%	0
90 UNALLOCATED CONTINGENCY	0.00	0	0	292,254	0		9%	0
Subtotal (10 - 90)	1.00	0	0	3,214,798	\$1,536,121		100%	0
100 FINANCE CHARGES	0.00	0	0	0	0		0%	0
Total Project Cost (10 - 100)	1.00	0	0	3,214,798	\$1,536,121		100%	0
Allocated Contingency as % of Base Yr Dollars w/o Contingency								16.62%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency								11.66%
Total Contingency as % of Base Yr Dollars w/o Contingency								28.28%
Unallocated Contingency as % of Subtotal (10 - 80)								10.00%
YOE Construction Cost per Mile (X000)								\$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								\$0
YOE Total Project Cost per Mile (X000)								\$0

A-4: Northern Alignment Alternative 1-2

MAIN WORKSHEET-BUILD ALTERNATIVE								(Rev.21, June, 2019)
West Santa Ana Branch Transit Corridor Environmental Study Northern Alignment - Alternative 1 & 2 (From 509+50.00 To 639+77.00)				Today's Date			1/14/21	
				Yr of Base Year \$			2020	
				Yr of Revenue Ops			20208	
	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	2.47	252,037	63,009	315,046	\$127,692	61%	28%	0
10.01 Guideway: At-grade exclusive right-of-way	0.00	0	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0	0	0				0
10.04 Guideway: Aerial structure	2.09	193,022	48,256	241,278	\$115,373			0
10.05 Guideway: Built-up fill	0.07	3,042	761	3,803	\$52,149			0
10.06 Guideway: Underground cut & cover	0.00	0	0	0				0
10.07 Guideway: Underground tunnel	0.20	36,809	9,202	46,011	\$234,627			0
10.08 Guideway: Retained cut or fill	0.11	4,460	1,115	5,575	\$52,139			0
10.09 Track: Direct fixation		12,263	3,066	15,329				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		296	74	370				0
10.12 Track: Special (switches, turnouts)		1,265	316	1,581				0
10.13 Track: Vibration and noise dampening		880	220	1,100				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	0	0	0	0	\$0	0%	0%	0
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development	0	0	0	0				0
20.06 Automobile parking multi-story structure	0	0	0	0				0
20.07 Elevators, escalators	0	0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0	0	0	0	\$0	0%	0%	0
30.01 Administration Building: Office, sales, storage, revenue counting	0	0	0	0				0
30.02 Light Maintenance Facility	0	0	0	0				0
30.03 Heavy Maintenance Facility	0	0	0	0				0
30.04 Storage or Maintenance of Way Building	0	0	0	0				0
30.05 Yard and Yard Track	0	0	0	0				0
40 SITEWORK & SPECIAL CONDITIONS	2.47	45,421	11,355	56,776	\$23,012	11%	5%	0
40.01 Demolition, Clearing, Earthwork	2.47	11,129	2,782	13,910	\$5,638			0
40.02 Site Utilities, Utility Relocation	2.47	8,337	2,084	10,421	\$4,224			0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	2.47	10,291	2,573	12,864	\$5,214			0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks	2.47	6,058	1,515	7,573	\$3,069			0
40.05 Site structures including retaining walls, sound walls	2.29	1,693	423	2,116	\$924			0
40.06 Pedestrian / bike access and accommodation, landscaping	2.47	7,914	1,979	9,893	\$4,010			0
40.07 Automobile, bus, van accessways including roads, parking lots		0	0	0				0
40.08 Temporary Facilities and other indirect costs during construction		0	0	0				0
50 SYSTEMS	2.47	111,196	33,359	144,555	\$58,590	28%	13%	0
50.01 Train control and signals	2.47	22,146	6,644	28,790	\$11,669			0
50.02 Traffic signals and crossing protection	9	4,326	1,298	5,624	\$625			0
50.03 Traction power supply: substations	3	34,173	10,252	44,425	\$14,808			0
50.04 Traction power distribution: catenary and third rail	2.47	11,855	3,557	15,412	\$6,246			0
50.05 Communications	2.47	38,696	11,609	50,305	\$20,389			0
50.06 Fare collection system and equipment	0	0	0	0				0
50.07 Central Control	0	0	0	0				0
Construction Subtotal (10 - 50)	2.47	408,654	107,723	516,377	\$209,294	100%	46%	0
60 ROW, LAND, EXISTING IMPROVEMENTS	2.47	248,874	74,662	323,536	\$131,133		29%	0
60.01 Purchase or lease of real estate	2.47	248,874	74,662	323,536	\$131,133			0
60.02 Relocation of existing households and businesses		0	0	0				0
70 VEHICLES (number)	0	0	0	0	\$0		0%	0
70.01 Light Rail	0	0	0	0				0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other	0	0	0	0				0
70.06 Non-revenue vehicles	0	0	0	0				0
70.07 Spare parts	0	0	0	0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	2.47	183,830	0	183,830	\$74,509	36%	16%	0
80.01 Project Development		36,146	0	36,146				0
80.02 Engineering		41,310	0	41,310				0
80.03 Project Management for Design and Construction		51,638	0	51,638				0
80.04 Construction Administration & Management		25,819	0	25,819				0
80.05 Professional Liability and other Non-Construction Insurance		516	0	516				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		19,106	0	19,106				0
80.07 Surveys, Testing, Investigation, Inspection		1,033	0	1,033				0
80.08 Start up		8,262	0	8,262				0
Subtotal (10 - 80)	2.47	841,358	182,386	1,023,744	\$414,936		91%	0
90 UNALLOCATED CONTINGENCY				102,374			9%	0
Subtotal (10 - 90)	2.47			1,126,118	\$456,429		100%	0
100 FINANCE CHARGES				0			0%	0
Total Project Cost (10 - 100)	2.47			1,126,118	\$456,429		100%	0
Allocated Contingency as % of Base Yr Dollars w/o Contingency				21.69%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.17%				
Total Contingency as % of Base Yr Dollars w/o Contingency				33.85%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								\$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								\$0
YOE Total Project Cost per Mile (X000)								\$0

A-5: Southern Alignment Alternative 3 & 18 LRV's

MAIN WORKSHEET-BUILD ALTERNATIVE								(Rev 21, June, 2019)
West Santa Ana Branch Transit Corridor Environmental Study Southern Alignment - Alternative "3" & 18 LRV's (From 639+77.00 To 1068+50.00)				Today's Date		1/14/21		
				Yr of Base Year \$		2020		
				Yr of Revenue Ops		2028		
	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	8.12	418,811	104,703	523,514	\$64,473	44%	20%	0
10.01 Guideway: At-grade exclusive right-of-way	4.40	92,976	23,244	116,220	\$26,384			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.37	9,628	2,407	12,035	\$32,840			0
10.03 Guideway: At-grade in mixed traffic	0.00	0	0	0	0			0
10.04 Guideway: Aerial structure	1.60	146,858	36,714	183,572	\$115,052			0
10.05 Guideway: Built-up fill	1.70	70,772	17,693	88,465	\$52,140			0
10.06 Guideway: Underground cut & cover	0.06	10,382	2,596	12,978	\$230,711			0
10.07 Guideway: Underground tunnel	0.00	0	0	0	0			0
10.08 Guideway: Retained cut or fill	0.00	0	0	0	0			0
10.09 Track: Direct fixation	1.65	8,460	2,115	10,575	\$6,402			0
10.10 Track: Embedded	0.88	5,151	1,288	6,439	\$7,327			0
10.11 Track: Ballasted	14.98	60,916	15,229	76,145	\$5,082			0
10.12 Track: Special (switches, turnouts)		13,669	3,417	17,086				0
10.13 Track: Vibration and noise dampening		0	0	0	0			0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	5	73,867	18,467	92,334	\$18,467	8%	4%	0
20.01 At-grade station, stop, shelter, mall, terminal, platform	3	22,425	5,606	28,031	\$9,344			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	2	34,272	8,568	42,840	\$21,420			0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0	0			0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0	0			0
20.05 Joint development	0	0	0	0	0			0
20.06 Automobile parking multi-story structure	0	2,824	706	3,530				0
20.07 Elevators, escalators	12	14,346	3,587	17,933	\$1,494			0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0	0	0	0	\$0	0%	0%	0
30.01 Administration Building: Office, sales, storage, revenue counting		0	0	0	0			0
30.02 Light Maintenance Facility		0	0	0	0			0
30.03 Heavy Maintenance Facility		0	0	0	0			0
30.04 Storage or Maintenance of Way Building		0	0	0	0			0
30.05 Yard and Yard Track		0	0	0	0			0
40 SITEWORK & SPECIAL CONDITIONS	0.13	152,062	29,762	181,824	\$22,392	15%	7%	0
40.01 Demolition, Clearing, Earthwork		60,086	15,022	75,108				0
40.02 Site Utilities, Utility Relocation		27,439	6,860	34,299				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		8,146	2,037	10,183				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		3,430	858	4,288				0
40.05 Site structures including retaining walls, sound walls		19,947	4,987	24,934				0
40.06 Pedestrian / bike access and accommodation, landscaping		33,014	0	33,014				0
40.07 Automobile, bus, van accessways including roads, parking lots		0	0	0	0			0
40.08 Temporary Facilities and other indirect costs during construction		0	0	0	0			0
50 SYSTEMS	0.13	303,545	75,886	379,431	\$46,729	32%	15%	0
50.01 Train control and signals		72,884	18,221	91,105				0
50.02 Traffic signals and crossing protection		31,285	7,821	39,106				0
50.03 Traction power supply: substations		102,519	25,630	128,149				0
50.04 Traction power distribution: catenary and third rail		36,442	9,111	45,553				0
50.05 Communications		55,735	13,934	69,669				0
50.06 Fare collection system and equipment		4,680	1,170	5,850				0
50.07 Central Control		0	0	0	0			0
Construction Subtotal (10 - 50)	0.13	948,285	228,818	1,177,103	\$144,965	100%	46%	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0.13	470,259	141,078	611,337	\$75,289		24%	0
60.01 Purchase or lease of real estate		470,259	141,078	611,337				0
60.02 Relocation of existing households and businesses		0	0	0	0			0
70 VEHICLES (number)	18	110,880	5,544	116,424	\$6,468		5%	0
70.01 Light Rail	18	100,800	5,040	105,840	\$5,880			0
70.02 Heavy Rail	0	0	0	0	0			0
70.03 Commuter Rail	0	0	0	0	0			0
70.04 Bus	0	0	0	0	0			0
70.05 Other	0	0	0	0	0			0
70.06 Non-revenue vehicles	0	0	0	0	0			0
70.07 Spare parts	18	10,080	504	10,584	\$588			0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0	419,048	0	419,048	\$51,608	36%	16%	0
80.01 Project Development		82,397	0	82,397				0
80.02 Engineering		94,168	0	94,168				0
80.03 Project Management for Design and Construction		117,710	0	117,710				0
80.04 Construction Administration & Management		58,855	0	58,855				0
80.05 Professional Liability and other Non-Construction Insurance		1,177	0	1,177				0
80.06 Legal: Permits; Review Fees by other agencies, cities, etc.		43,553	0	43,553				0
80.07 Surveys, Testing, Investigation, Inspection		2,354	0	2,354				0
80.08 Start up		18,834	0	18,834				0
Subtotal (10 - 80)	0.13	1,948,472	375,439	2,323,912	\$286,200		91%	0
90 UNALLOCATED CONTINGENCY	0	0	0	232,391	\$314,820		9%	0
Subtotal (10 - 90)	0.13	1,948,472	375,439	2,556,303	\$314,820		100%	0
100 FINANCE CHARGES	0	0	0	0	\$0		0%	0
Total Project Cost (10 - 100)	0.13	1,948,472	375,439	2,556,303	\$314,820		100%	0
Allocated Contingency as % of Base Yr Dollars w/o Contingency								19.27%
Unallocated Contingency as % of Base Yr Dollars w/o Contingency								11.93%
Total Contingency as % of Base Yr Dollars w/o Contingency								31.20%
Unallocated Contingency as % of Subtotal (10 - 80)								10.00%
YOE Construction Cost per Mile (X000)								\$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								\$0
YOE Total Project Cost per Mile (X000)								\$0

A-6: Southern Alignment Alternative 4 & 29 LRV's

MAIN WORKSHEET-BUILD ALTERNATIVE							(Rev 21, June, 2019)	
West Santa Ana Branch Transit Corridor Environmental Study							Today's Date 1/14/21	
Southern Alignment - Alternative "4" & 29 LRV's							Yr of Base Year \$ 2020	
(From 1068+50.00 To 1418+00.00)							Yr of Revenue Ops 2028	
	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	6.62	255,540	63,885	319,425	\$48,257	33%	17%	0
10.01 Guideway: At-grade exclusive right-of-way	3.68	43,590	10,898	54,488	\$14,817			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.31	3,549	887	4,436	\$14,110			0
10.03 Guideway: At-grade in mixed traffic	0.00	0	0	0				0
10.04 Guideway: Aerial structure	0.99	92,995	23,249	116,244	\$116,997			0
10.05 Guideway: Built-up fill	1.63	68,158	17,040	85,198	\$52,140			0
10.06 Guideway: Underground cut & cover	0.00	0	0	0				0
10.07 Guideway: Underground tunnel	0.00	0	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0	0	0				0
10.09 Track: Direct fixation		5,089	1,272	6,361				0
10.10 Track: Embedded		1,843	461	2,304				0
10.11 Track: Ballasted		28,392	7,098	35,490				0
10.12 Track: Special (switches, turnouts)		11,924	2,981	14,905				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	5	106,345	26,586	132,931	\$26,586	14%	7%	0
20.01 At-grade station, stop, shelter, mall, terminal, platform	4	29,900	7,475	37,375	\$9,344			0
20.02 Aerial station, stop, shelter, mall, terminal, platform	1	19,579	4,895	24,474	\$24,474			0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development	0	0	0	0				0
20.06 Automobile parking multi-story structure	0	47,752	11,938	59,690				0
20.07 Elevators, escalators	8	9,114	2,279	11,393	\$1,424			0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0	0	0	0	\$0	0%	0%	0
30.01 Administration Building: Office, sales, storage, revenue counting		0	0	0				0
30.02 Light Maintenance Facility		0	0	0				0
30.03 Heavy Maintenance Facility		0	0	0				0
30.04 Storage or Maintenance of Way Building		0	0	0				0
30.05 Yard and Yard Track		0	0	0				0
40 SITEWORK & SPECIAL CONDITIONS	6.62	153,669	38,417	192,086	\$29,019	20%	10%	0
40.01 Demolition, Clearing, Earthwork		36,577	9,144	45,721				0
40.02 Site Utilities, Utility Relocation		24,208	6,052	30,260				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		6,641	1,660	8,301				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		2,796	699	3,495				0
40.05 Site structures including retaining walls, sound walls		56,471	14,118	70,589				0
40.06 Pedestrian / bike access and accommodation, landscaping		26,976	6,744	33,720				0
40.07 Automobile, bus, van accessways including roads, parking lots		0	0	0				0
40.08 Temporary Facilities and other indirect costs during construction		0	0	0				0
50 SYSTEMS	6.62	270,060	67,515	337,575	\$50,999	34%	18%	0
50.01 Train control and signals		63,645	15,911	79,556				0
50.02 Traffic signals and crossing protection		17,615	4,379	21,894				0
50.03 Traction power supply: substations		91,128	22,782	113,910				0
50.04 Traction power distribution: catenary and third rail		31,823	7,956	39,779				0
50.05 Communications		48,669	12,167	60,836				0
50.06 Fare collection system and equipment		7,280	1,820	9,100				0
50.07 Central Control		10,000	2,500	12,500				0
Construction Subtotal (10 - 50)	16.62	785,614	196,404	982,018	\$148,357	100%	52%	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0.00	151,622	45,487	197,109	\$29,778		10%	0
60.01 Purchase or lease of real estate		151,622	45,487	197,109				0
60.02 Relocation of existing households and businesses		0	0	0				0
70 VEHICLES (number)	29	178,640	8,932	187,572	\$6,468		10%	0
70.01 Light Rail	29	162,400	8,120	170,520	\$5,880			0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other	0	0	0	0				0
70.06 Non-revenue vehicles	0	0	0	0				0
70.07 Spare parts	29	16,240	812	17,052	\$588			0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.00	349,598	0	349,598	\$52,815	36%	19%	0
80.01 Project Development		68,741	0	68,741				0
80.02 Engineering		78,561	0	78,561				0
80.03 Project Management for Design and Construction		98,202	0	98,202				0
80.04 Construction Administration & Management		49,101	0	49,101				0
80.05 Professional Liability and other Non-Construction Insurance		982	0	982				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.		36,335	0	36,335				0
80.07 Surveys, Testing, Investigation, Inspection		1,964	0	1,964				0
80.08 Start up		15,712	0	15,712				0
Subtotal (10 - 80)	6.62	1,465,474	250,822	1,716,296	\$259,288		91%	0
90 UNALLOCATED CONTINGENCY	0.00	0	0	171,630	\$0		9%	0
Subtotal (10 - 90)	6.62	1,465,474	250,822	1,887,926	\$285,217		100%	0
100 FINANCE CHARGES	0.00	0	0	0	\$0		0%	0
Total Project Cost (10 - 100)	6.62	1,465,474	250,822	1,887,926	\$285,217		100%	0
Allocated Contingency as % of Base Yr Dollars w/o Contingency				17.12%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.71%				
Total Contingency as % of Base Yr Dollars w/o Contingency				28.83%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								\$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								\$0
YOE Total Project Cost per Mile (X000)								\$0

A-7: Bellflower MSF Option

MAIN WORKSHEET-BUILD ALTERNATIVE								
West Santa Ana Branch Transit Corridor Environmental Study Southern Alignment - Bellflower MSF & Lead Tracks (From 1068+50.00 To 1418+00.00)				(Rev.21, June, 2019)		Today's Date 1/14/21		
				Yr of Base Year \$ 2020		Yr of Revenue Ops 2028		
	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	0.00	1,276	319	1,595		1%	0%	0
10.01 Guideway: At-grade exclusive right-of-way	0.00	0	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0	0	0				0
10.04 Guideway: Aerial structure	0.00	0	0	0				0
10.05 Guideway: Built-up fill	0.00	0	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0	0	0				0
10.07 Guideway: Underground tunnel	0.00	0	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0	0	0				0
10.09 Track: Direct fixation	0.00	0	0	0				0
10.10 Track: Embedded	0.00	0	0	0				0
10.11 Track: Ballasted	0.00	0	0	0				0
10.12 Track: Special (switches, turnouts)	1.276	319	1,595					0
10.13 Track: Vibration and noise dampening	0.00	0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	0	0	0	0		0%	0%	0
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development	0	0	0	0				0
20.06 Automobile parking multi-story structure	0	0	0	0				0
20.07 Elevators, escalators	0	0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0.00	201,661	50,415	252,076		99%	55%	0
30.01 Administration Building: Office, sales, storage, revenue counting	0	27,340	6,835	34,175				0
30.02 Light Maintenance Facility	0	0	0	0				0
30.03 Heavy Maintenance Facility	0	85,461	21,365	106,826				0
30.04 Storage or Maintenance of Way Building	0	26,369	6,592	32,961				0
30.05 Yard and Yard Track	0	62,491	15,623	78,114				0
40 SITEWORK & SPECIAL CONDITIONS	0.00	0	0	0		0%	0%	0
40.01 Demolition, Clearing, Earthwork	0	0	0	0				0
40.02 Site Utilities, Utility Relocation	0	0	0	0				0
40.03 Haz. mat'l, contain'd soil removal/mitigation, ground water treatments	0	0	0	0				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks	0	0	0	0				0
40.05 Site structures including retaining walls, sound walls	0	0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping	0	0	0	0				0
40.07 Automobile, bus, van accessways including roads, parking lots	0	0	0	0				0
40.08 Temporary Facilities and other indirect costs during construction	0	0	0	0				0
50 SYSTEMS	0.00	0	0	0		0%	0%	0
50.01 Train control and signals	0	0	0	0				0
50.02 Traffic signals and crossing protection	0	0	0	0				0
50.03 Traction power supply: substations	0	0	0	0				0
50.04 Traction power distribution: catenary and third rail	0	0	0	0				0
50.05 Communications	0	0	0	0				0
50.06 Fare collection system and equipment	0	0	0	0				0
50.07 Central Control	0	0	0	0				0
Construction Subtotal (10 - 50)	0.00	202,937	50,734	253,671		100%	55%	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0.00	55,656	16,697	72,353			16%	0
60.01 Purchase or lease of real estate	0	55,656	16,697	72,353				0
60.02 Relocation of existing households and businesses	0	0	0	0				0
70 VEHICLES (number)	0	0	0	0			0%	0
70.01 Light Rail	0	0	0	0				0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other	0	0	0	0				0
70.06 Non-revenue vehicles	0	0	0	0				0
70.07 Spare parts	0	0	0	0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.00	90,308	0	90,308		36%	20%	0
80.01 Project Development	0	17,757	0	17,757				0
80.02 Engineering	0	20,294	0	20,294				0
80.03 Project Management for Design and Construction	0	25,367	0	25,367				0
80.04 Construction Administration & Management	0	12,684	0	12,684				0
80.05 Professional Liability and other Non-Construction Insurance	0	254	0	254				0
80.06 Legal: Permits; Review Fees by other agencies, cities, etc.	0	9,386	0	9,386				0
80.07 Surveys, Testing, Investigation, Inspection	0	507	0	507				0
80.08 Start up	0	4,059	0	4,059				0
Subtotal (10 - 80)	0.00	348,901	67,431	416,332			91%	0
90 UNALLOCATED CONTINGENCY	0.00	0	0	41,633			9%	0
Subtotal (10 - 90)	0.00	0	0	457,965			100%	0
100 FINANCE CHARGES	0.00	0	0	0			0%	0
Total Project Cost (10 - 100)	0.00	0	0	457,965			100%	0
Allocated Contingency as % of Base Yr Dollars w/o Contingency				19.33%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.93%				
Total Contingency as % of Base Yr Dollars w/o Contingency				31.26%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								\$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								\$0
YOE Total Project Cost per Mile (X000)								\$0

A-8: Paramount MSF Option

MAIN WORKSHEET-BUILD ALTERNATIVE							(Rev 21, June, 2019)	
West Santa Ana Branch Transit Corridor Environmental Study Southern Alignment - Paramount MSF (From 1068+50.00 To 1418+00.00)							Today's Date	1/14/21
							Yr of Base Year \$	2020
							Yr of Revenue Ops	2028
	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	1.16	44,780	11,195	55,976	\$48,395	16%	8%	0
10.01 Guideway: At-grade exclusive right-of-way	0.48	4,790	1,198	5,988	\$13,134			0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0	0	0				0
10.04 Guideway: Aerial structure	0.15	12,648	3,162	15,810	\$106,919			0
10.05 Guideway: Built-up fill	0.15	6,320	1,580	7,900	\$52,140			0
10.06 Guideway: Underground cut & cover	0.00	0	0	0				0
10.07 Guideway: Underground tunnel	0.00	0	0	0				0
10.08 Guideway: Retained cut or fill	0.40	16,742	4,186	20,928	\$52,140			0
10.09 Track: Direct fixation		2,813	703	3,516				0
10.10 Track: Embedded		0	0	0				0
10.11 Track: Ballasted		0	0	0				0
10.12 Track: Special (switches, turnouts)		1,467	367	1,834				0
10.13 Track: Vibration and noise dampening		0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	0	0	0	0		0%	0%	0
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development	0	0	0	0				0
20.06 Automobile parking multi-story structure	0	0	0	0				0
20.07 Elevators, escalators	0	0	0	0				0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS		200,264	50,066	250,330	\$216,431	73%	37%	0
30.01 Administration Building: Office, sales, storage, revenue counting		27,341	6,835	34,176				0
30.02 Light Maintenance Facility		0	0	0				0
30.03 Heavy Maintenance Facility		83,917	20,979	104,896				0
30.04 Storage or Maintenance of Way Building		26,141	6,535	32,676				0
30.05 Yard and Yard Track		62,865	15,716	78,581				0
40 SITEWORK & SPECIAL CONDITIONS		8,365	2,394	10,759	\$9,302	3%	2%	0
40.01 Demolition, Clearing, Earthwork		2,870	861	3,731				0
40.02 Site Utilities, Utility Relocation		2,240	672	2,912				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments		665	200	865				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks		280	84	364				0
40.05 Site structures including retaining walls, sound walls		0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping		2,310	578	2,888				0
40.07 Automobile, bus, van accessways including roads, parking lots		0	0	0				0
40.08 Temporary Facilities and other indirect costs during construction		0	0	0				0
50 SYSTEMS		20,375	5,094	25,469	\$22,020	7%	4%	0
50.01 Train control and signals		5,950	1,488	7,438				0
50.02 Traffic signals and crossing protection		1,296	324	1,620				0
50.03 Traction power supply: substations		0	0	0				0
50.04 Traction power distribution: catenary and third rail		5,190	1,298	6,488				0
50.05 Communications		7,939	1,985	9,924				0
50.06 Fare collection system and equipment		0	0	0				0
50.07 Central Control		0	0	0				0
Construction Subtotal (10 - 50)	1.16	273,784	68,749	342,533	\$296,148	100%	50%	0
60 ROW, LAND, EXISTING IMPROVEMENTS		119,098	35,729	154,827	\$133,861		23%	0
60.01 Purchase or lease of real estate		119,098	35,729	154,827				0
60.02 Relocation of existing households and businesses		0	0	0				0
70 VEHICLES (number)	0	0	0	0			0%	0
70.01 Light Rail	0	0	0	0				0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other	0	0	0	0				0
70.06 Non-revenue vehicles	0	0	0	0				0
70.07 Spare parts	0	0	0	0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)		121,943	0	121,943	\$105,430	36%	18%	0
80.01 Project Development		23,977	0	23,977				0
80.02 Engineering		27,403	0	27,403				0
80.03 Project Management for Design and Construction		34,253	0	34,253				0
80.04 Construction Administration & Management		17,127	0	17,127				0
80.05 Professional Liability and other Non-Construction Insurance		343	0	343				0
80.06 Legal: Permits; Review Fees by other agencies, cities, etc.		12,674	0	12,674				0
80.07 Surveys, Testing, Investigation, Inspection		685	0	685				0
80.08 Start up		5,481	0	5,481				0
Subtotal (10 - 80)	1.16	514,825	104,478	619,304	\$535,439		91%	0
90 UNALLOCATED CONTINGENCY				61,930			9%	0
Subtotal (10 - 90)				681,234	\$588,982		100%	0
100 FINANCE CHARGES				0			0%	0
Total Project Cost (10 - 100)	1.16			681,234	\$588,982		100%	0
Allocated Contingency as % of Base Yr Dollars w/o Contingency				20.20%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				12.03%				
Total Contingency as % of Base Yr Dollars w/o Contingency				32.22%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								\$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								\$0
YOE Total Project Cost per Mile (X000)								\$0

A-9: Little Tokyo Station Design Option 2

MAIN WORKSHEET-BUILD ALTERNATIVE								(Rev.21, June, 2019)
West Santa Ana Branch Transit Corridor Environmental Study Northern Alignment - Little Tokyo Station Design Option 2 (From 399+83.27 To 509+50.00)				Today's Date Yr of Base Year \$		1/14/21 2020		
				Yr of Revenue Ops		2028		
	Quantity	Base Year Dollars w/o Contingency (X000)	Base Year Dollars Allocated Contingency (X000)	Base Year Dollars TOTAL (X000)	Base Year Dollars Unit Cost (X000)	Base Year Dollars Percentage of Construction Cost	Base Year Dollars Percentage of Total Project Cost	YOE Dollars Total (X000)
10 GUIDEWAY & TRACK ELEMENTS (route miles)	0.00	0	0	0		0%	0%	0
10.01 Guideway: At-grade exclusive right-of-way	0.00	0	0	0				0
10.02 Guideway: At-grade semi-exclusive (allows cross-traffic)	0.00	0	0	0				0
10.03 Guideway: At-grade in mixed traffic	0.00	0	0	0				0
10.04 Guideway: Aerial structure	0.00	0	0	0				0
10.05 Guideway: Built-up fill	0.00	0	0	0				0
10.06 Guideway: Underground cut & cover	0.00	0	0	0				0
10.07 Guideway: Underground tunnel	0.00	0	0	0				0
10.08 Guideway: Retained cut or fill	0.00	0	0	0				0
10.09 Track: Direct fixation	0.00	0	0	0				0
10.10 Track: Embedded	0.00	0	0	0				0
10.11 Track: Ballasted	0.00	0	0	0				0
10.12 Track: Special (switches, turnouts)	0.00	0	0	0				0
10.13 Track: Vibration and noise dampening	0.00	0	0	0				0
20 STATIONS, STOPS, TERMINALS, INTERMODAL (number)	1	204,237	51,059	255,296	\$255,296	77%	48%	0
20.01 At-grade station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.02 Aerial station, stop, shelter, mall, terminal, platform	0	0	0	0				0
20.03 Underground station, stop, shelter, mall, terminal, platform	1	187,275	46,819	234,094	\$234,094			0
20.04 Other stations, landings, terminals: Intermodal, ferry, trolley, etc.	0	0	0	0				0
20.05 Joint development	0	0	0	0				0
20.06 Automobile parking multi-story structure	0	0	0	0				0
20.07 Elevators, escalators	14	16,962	4,241	21,203	\$1,514			0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	0	0	0	0		0%	0%	0
30.01 Administration Building: Office, sales, storage, revenue counting	0	0	0	0				0
30.02 Light Maintenance Facility	0	0	0	0				0
30.03 Heavy Maintenance Facility	0	0	0	0				0
30.04 Storage or Maintenance of Way Building	0	0	0	0				0
30.05 Yard and Yard Track	0	0	0	0				0
40 SITEWORK & SPECIAL CONDITIONS	0.00	48,420	12,105	60,525		18%	11%	0
40.01 Demolition, Clearing, Earthwork	0	407	102	509				0
40.02 Site Utilities, Utility Relocation	0	36,461	9,115	45,576				0
40.03 Haz. mat'l, contam'd soil removal/mitigation, ground water treatments	0	90	23	113				0
40.04 Environmental mitigation, e.g. wetlands, historic/archeologic, parks	0	38	10	48				0
40.05 Site structures including retaining walls, sound walls	0	0	0	0				0
40.06 Pedestrian / bike access and accommodation, landscaping	0	3,164	791	3,955				0
40.07 Automobile, bus, van accessways including roads, parking lots	0	8,260	2,065	10,325				0
40.08 Temporary Facilities and other indirect costs during construction	0	0	0	0				0
50 SYSTEMS	0.00	13,471	3,368	16,839		5%	3%	0
50.01 Train control and signals	0	0	0	0				0
50.02 Traffic signals and crossing protection	0	0	0	0				0
50.03 Traction power supply: substations	0	11,391	2,848	14,239				0
50.04 Traction power distribution: catenary and third rail	0	0	0	0				0
50.05 Communications	0	0	0	0				0
50.06 Fare collection system and equipment	0	2,080	520	2,600				0
50.07 Central Control	0	0	0	0				0
Construction Subtotal (10 - 50)	0.00	266,128	66,532	332,660		100%	62%	0
60 ROW, LAND, EXISTING IMPROVEMENTS	0.00	25,399	7,620	33,019			6%	0
60.01 Purchase or lease of real estate	0	25,399	7,620	33,019				0
60.02 Relocation of existing households and businesses	0	0	0	0				0
70 VEHICLES (number)	0	0	0	0			0%	0
70.01 Light Rail	0	0	0	0				0
70.02 Heavy Rail	0	0	0	0				0
70.03 Commuter Rail	0	0	0	0				0
70.04 Bus	0	0	0	0				0
70.05 Other	0	0	0	0				0
70.06 Non-revenue vehicles	0	0	0	0				0
70.07 Spare parts	0	0	0	0				0
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	0.00	118,427	0	118,427		36%	22%	0
80.01 Project Development	0	23,286	0	23,286				0
80.02 Engineering	0	26,613	0	26,613				0
80.03 Project Management for Design and Construction	0	33,266	0	33,266				0
80.04 Construction Administration & Management	0	16,633	0	16,633				0
80.05 Professional Liability and other Non-Construction Insurance	0	333	0	333				0
80.06 Legal; Permits; Review Fees by other agencies, cities, etc.	0	12,308	0	12,308				0
80.07 Surveys, Testing, Investigation, Inspection	0	665	0	665				0
80.08 Start up	0	5,323	0	5,323				0
Subtotal (10 - 80)	0.00	409,954	74,152	484,106			91%	0
90 UNALLOCATED CONTINGENCY				48,411			9%	0
Subtotal (10 - 90)	0.00			532,516			100%	0
100 FINANCE CHARGES				0			0%	0
Total Project Cost (10 - 100)	0.00			532,516			100%	0
Allocated Contingency as % of Base Yr Dollars w/o Contingency				16.09%				
Unallocated Contingency as % of Base Yr Dollars w/o Contingency				11.81%				
Total Contingency as % of Base Yr Dollars w/o Contingency				29.90%				
Unallocated Contingency as % of Subtotal (10 - 80)				10.00%				
YOE Construction Cost per Mile (X000)								\$0
YOE Total Project Cost per Mile Not Including Vehicles (X000)								\$0
YOE Total Project Cost per Mile (X000)								\$0