

EXHIBIT 1

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Alternative Descriptions	The No Build Alternative does not include any improvements included in the SR 710 North Study Build Alternatives.	The TSM/TDM Alternative would provide strategies and improvements to increase efficiency and capacity for all modes in the transportation system with lower capital cost investments and/or lower potential impacts including Intelligent Transportation Systems, local street and intersection improvements, Active Traffic Management, expanded bus service and bus service improvements, and pedestrian and bicycle facility improvements. This Alternative is designed to maximize the efficiency of the existing transportation system by improving capacity and reducing the effects of bottlenecks and chokepoints. The TSM/TDM Alternative includes: • Widening of the Garfield Avenue Bridge • Construction of a new bridge for the SR 710 connector road to Mission Road underpass crossing under the UPRR with retaining walls • Retaining Walls • Noise Barriers	The BRT Alternative would provide high-speed, high-frequency bus service through a combination of new, and dedicated and mixed-flow traffic lanes to key destinations between East Los Angeles and Pasadena. The proposed route is approximately 12 mi long. The BRT Alternative includes: • BRT trunk line arterial street and station improvements • Frequent bus service • New bus feeder services • Enhanced connecting bus services • BRT service would use 60 ft articulated buses with three doors • Latest fare collection technology such as on-board smart card (TAP card) readers • Two bus feeder routes that would connect additional destinations with the BRT mainline • 17 BRT stations • Minor Street Widening • Retaining Walls • Noise Barriers	The LRT Alternative would provide an approximately 7.5 mi long passenger rail line operated on a dedicated guideway, with 3 mi of aerial segments and 4.5 mi of bored tunnel segments. The LRT Alternative includes: • Seven LRT stations • New bus feeder services • Enhanced existing bus services • New aerial bridges along the entire elevated alignment • Realignment of the SR 710 NB off-ramp to be adjacent to the SB on-ramp • Restriping of Mednick Avenue between First Street and Floral Drive to provide a new Class II bicycle lane • Retaining walls Noise barriers	The alignment for the Freeway Tunnel Alternative will start at the existing southern stub of SR 710 in Alhambra, north of I-10, and connect to the existing northern stub of SR 710, south of the I-210/SR 134 interchange in Pasadena with either a single-bore or dual-bore tunnel configuration. The dual-bore and single-bore design variations are each approximately 6.3 mi long, with 4.2 mi of bored tunnel, 0.7 mi of cut-and-cover tunnel, and 1.4 mi of at-grade freeway segments. The single-bore and dual-bore design variations include: • Extension of St. John Avenue from Del Mar Boulevard to California Boulevard • Widening of Pasadena Avenue to include a new lane from the proposed NB SR 710 off-ramp at Pasadena Avenue to Colorado Boulevard • Replacement of the Helman Avenue and Green Street overcrossing bridges • Demolition and replacement with an at-grade road of the Del Mar Boulevard overcrossing • A new bridge at the Laguna Regulating Basin and a new overpass bridge at Valley Boulevard • Emergency, communication, and ventilation systems • Pedestrian and bicycle facility improvements • Retaining walls • Noise Barriers The dual-bore design variation would also include widening of the Ramona Boulevard undercrossing and SR 710/-10 bridges.	--
Alternative Costs	--	\$105 million	\$139 million (BRT improvements) plus \$102 million for the TSM/TDM improvements \$241 million total	\$2,368 million (LRT Alternative improvements) plus \$52 million for the TSM/TDM Alternative improvements \$2,420 million total	\$3,100 million (single-bore design variation) and \$5,600 million (dual-bore design variation) plus \$50 million for the TSM/TDM improvements Single-Bore Total: \$3,150 million Dual-Bore Total: \$5,650 million	--
Property Acquisition						
Full parcel acquisition	--	Approximately 1 parcel	0 parcels	Approximately 58 parcels	Single-Bore: Approximately 1 parcel Dual-Bore: Approximately 1 parcel	--
Partial parcel acquisition	--	Approximately 31 parcels	Approximately 45 parcels	Approximately 11 parcels	Single-Bore: Approximately 2 parcels Dual-Bore: Approximately 3 parcels	--
Aerial easement	--	Approximately 2 parcels	0	Approximately 12 parcels	Single-Bore: 0 Dual-Bore: 0	--
Subsurface easement	--	0	0	1 parcel	Single Bore: Approximately 32 parcels Dual Bore: Approximately 41 parcels	--

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Permanent tunnel easement	--	0	0	Approximately 183 parcels	Single Bore: Approximately 324 parcels Dual-Bore: Approximately 563 parcels	--
Permanent footing easement	--	0	0	0	Single-Bore: Approximately 3 parcels Dual-Bore: Approximately 3 parcels	--
Temporary construction easements	--	Approximately 16 parcels	Approximately 36 parcels	Approximately 13 parcels	Single-Bore: Approximately 52 parcels Dual-Bore: Approximately 47 parcels	--
Construction period	--	Approximately 2 years	Approximately 2 years	Approximately 6 years	Single-Bore: Approximately 4 to 5 years Dual-Bore: Approximately 5 years	--
Land Use	No temporary land use effects would occur. • Direct, construction-related effects on existing land uses • TCEs on approximately 16 parcels • Air quality, noise, traffic/access, and/or parking effects on community facilities, parks, recreation resources, and bikeways within 500 ft of the physical improvements					
	Potential Environmental Impacts • Direct, construction-related effects on existing land uses • TCEs on approximately 36 parcels • Air quality, noise, traffic/access, and/or parking effects on community facilities, parks, recreation resources, and bikeways within 500 ft of the physical improvements • Temporary occupancy of approximately 0.02 ac of land in Cascades Park and permanent incorporation of approximately 0.011 ac of land from Cascades Park • The TSM/TDM Alternative improvements included in the BRT Alternative would also result in additional temporary land use impacts					
	• Direct, construction-related effects on existing land uses • Air quality, noise, traffic/access, and/or parking effects on community facilities, parks, recreation resources, and bikeways within 500 ft of the physical improvements • TCEs: – Single-Bore: TCEs on approximately 52 parcels – Dual-Bore: TCEs on approximately 47 parcels • Temporary loss of approximately 17 parking spaces					
	• Parks-1: Compliance with the Public Park Preservation Act (applies to the BRT Alternative): As part of the right of way acquisition process for the BRT Alternative, the Los Angeles County Metropolitan Transportation Authority (Metro) Division of Right of Way personnel will coordinate with the City of Monterey Park to provide compensation for the acquisition of land from Cascades Park as required under the Public Park Preservation Act. • Cascades-1: Temporary Construction Easements (applies to the BRT Alternative): The Resident Engineer will require the Construction Contractor to return land in Cascades Park that would be occupied for temporary construction easements (TCEs) to a condition that is at least as good as that which existed prior to the project at the completion of the construction of the BRT Alternative in this area. The Los Angeles County Metropolitan Transportation Authority (Metro) will require the Construction Contractor to fence and properly secure all active construction areas in and adjacent to Cascades Park within the limits of construction to protect the safety of park patrons during construction. When the sidewalks in Cascades Park at Atlantic Boulevard are temporarily closed during construction, Metro will require the Construction Contractor to develop and clearly sign pedestrian detours prior to the intersections of Atlantic Boulevard and El Portal Place to avoid making pedestrians backtrack to get to a safe crossing. • Cascades-2: Permanent Incorporation of Land (applies to the BRT Alternative): Metro will include the replacement of the sidewalks affected by the permanent incorporation of land					

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	No permanent land use effects would occur.	- Two aerial easements related to bridge construction - Acquisition of approximately 0.6 ac and conversion of land currently planned for non-transportation uses into transportation uses, which would require amendment of General Plans - Loss of approximately 1,029 on-street parking spaces during the weekday AM and PM peak periods and the permanent loss of approximately 220 on-street parking spaces during all hours - Inconsistency with scope of the design concept for the project in the 2012 RTP/SCS and 2015 FTIP - Noise effects to approximately six parks and recreation resources - Inconsistency with individual policies, objectives, and program goals in the City of Alhambra, City of Los Angeles, City of Monterey Park, and Los Angeles County General Plans, the City of Alhambra Valley Boulevard Corridor Specific Plan, and the City of Los Angeles Northeast Los Angeles Community Plan	- Acquisition of approximately 0.3 ac and conversion of land currently planned for non-transportation uses into transportation uses, which would require amendment of General Plans - Loss of approximately 1,029 on-street parking spaces during the weekday AM and PM peak periods and the permanent loss of approximately 114 on-street parking spaces during all hours - Inconsistency with individual policies, objectives, and program goals in the City of Alhambra, City of Monterey Park, the Los Angeles County General Plans, the City of Alhambra Valley Boulevard Corridor Specific Plan, and the City of Los Angeles Northeast Los Angeles Community Plan - Inconsistency with scope of the design concept for the project in the 2012 RTP/SCS and 2015 FTIP - Noise effects on approximately four parks and recreation resources - The TSM/TDM Alternative improvements included in the BRT Alternative would also result in additional permanent land use impacts	- Tunnel easements beneath approximately 183 parcels, permanent aerial easements above approximately 12 parcels, and permanent subsurface easements beneath approximately 1 parcel - Acquisition of approximately 18.0 ac and conversion of land currently planned for non-transportation uses into transportation uses, which would require amendment of General Plans - Loss of approximately four on-street parking spaces - Inconsistent with specific individual policies, objectives, and program goals in the City of Alhambra, City of Los Angeles, City of Monterey Park, and Los Angeles County General Plans, the City of Alhambra Valley Boulevard Corridor Specific Plan, and the City of Los Angeles Northeast Los Angeles Community Plan - Inconsistency with scope of the design concept for the project in the 2012 RTP/SCS and 2015 FTIP - Noise effects to approximately one park and recreation resource - The TSM/TDM Alternative improvements included in the LRT Alternative would also result in additional permanent land use impacts	Potential permanent effects include: Easements: Single-Bore: Tunnel easements under approximately 324 parcels, footing easements on approximately 3 parcels, and subsurface easements beneath approximately 32 parcels Dual-Bore: Tunnel easements under approximately 563 parcels, subsurface easements under approximately 41 parcels and footing easements on 3 parcels and a maintenance easement on 1 parcel - Acquisition of 1.5 ac and conversion of land currently planned for non-transportation uses into transportation uses, which would require amendment of General Plans - Inconsistency with scope of the design concept for the project in the 2012 RTP/SCS and 2015 FTIP for the single-bore Freeway Tunnel design variation (the variations would not provide the capacity for four lanes of traffic in each direction) and the non-toll dual-bore Freeway Tunnel design variation - Inconsistency with specific individual policies, objectives, and program goals in the City of Alhambra and City of South Pasadena General Plans, the City of Alhambra Valley Boulevard Corridor Specific Plan, and the City of Los Angeles Northeast Los Angeles Community Plan - The TSM/TDM Alternative improvements included in the Freeway Tunnel Alternative would also result in additional permanent land use impacts	in Cascades Park in the adjacent areas of Cascades Park as part of final design. If any shrubs and/or trees are removed from the areas that will be permanently incorporated, the Construction Contractor will replace those trees elsewhere in Cascades Park after consultation with the City of Monterey Park. LU-1: General Plans: If a Build Alternative is selected for implementation, the Los Angeles County Metropolitan Transportation Authority (for the TSM/TDM, BRT, and LRT Alternatives) and the California Department of Transportation (for the Freeway Tunnel Alternative) will request the applicable local jurisdictions to amend their General Plans and/or other local land use plans after the acquisition of land for the selected alternative to reflect the improvements in that Build Alternative. LU-2: RTP/SCS and FTIP (applies to the TSM/TDM, BRT, and LRT Alternatives or any Freeway Tunnel Alternative other than the Freeway Tunnel Alternative with the dual-bore tunnel design variation with the tolled operational variation): The Los Angeles County Metropolitan Transportation Authority will coordinate with the Southern California Association of Governments on needed amendments to the next cycle of the RTP/SCS and FTIP to reflect the selected project and to delete the projects (RTP ID 18790 and FTIP ID 18790) describing a tunnel extension of SR 710 North with 4 toll lanes in each direction from those transportation plans.
Growth	The No Build Alternative does not include any of the improvements in the SR 710 North Study Build Alternatives and, therefore, would not result in impacts related to growth that could occur under the Build Alternatives.	No impact. Although the SR-710 North Study Project will improve mobility and circulation, the study area is largely built out and none of the Build Alternatives provides new access to undeveloped or underdeveloped areas; therefore, the SR-710 North Study Project is not expected to result in unplanned growth.				No avoidance, minimization, and/or mitigation measures are required.

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Community Character and Cohesion	The No Build Alternative does not have temporary effects on community character and cohesion. In addition, the No Build Alternative would not provide improvements to the transit, transportation, and circulation systems, and would not provide any transportation benefits for the traveling public. Congestion would increase, thereby exacerbating existing mobility conditions, including impacts associated with out-of-direction traffic using local arterials.	- Temporary and permanent air quality, noise, traffic/access, and/or parking effects to community facilities within 500 ft of the Build Alternatives - Minor temporary lane restrictions during construction.	- Temporary and permanent air quality, noise, traffic/access, and/or parking effects to community facilities within 500 ft of the Build Alternatives - Temporary lane restrictions during construction	- Temporary and permanent air quality, noise, traffic/access, and/or parking effects to community facilities within 500 ft of the Build Alternatives - Temporary lane restrictions during construction - Overnight closures along the elevated segments - Displacement of 15 businesses along Mednik Avenue in East Los Angeles	- Temporary and permanent air quality, noise, traffic/access, and/or parking effects to community facilities within 500 ft of the Build Alternatives - Temporary lane restrictions during construction - Temporary delays and detours for the traveling public at multiple locations in the study area during construction - Permanent 0.6 ac easement - Permanent acquisition of 1.0 ac of land	- The following measures are applicable to all of the Build Alternatives. CI-1: Property Acquisition: All acquisition of property for improvements in the Build Alternatives will be conducted in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act) of 1970 as amended. T-1: Transportation Management Plan AQ-1: Fugitive Dust AQ-2: Equipment and Vehicle Emissions AQ-3: Diesel Fuel Emissions and Sensitive Receptors N-1: Construction in State ROW N-2: Construction Outside State ROW N-3: Tunnel Boring Machine N-4: Supply and Muck Trains N-5: Ground-Borne Noise and Vibration V-1: Vibration V-2: Intactness V-3: Unity V-4: Walls with Aesthetic Treatments V-5: Built Structures V-6: Landscaping V-7: Short-Term Visual
Relocation	No temporary effects to environmental justice populations.	- The TSM/TDM Alternative would potentially result in: - TCEs on approximately 16 parcels - Creation of approximately 1,400 person-year jobs, which would generate a total of approximately \$64.7 million (in 2010 dollars) in employment earnings - Approximately one full parcel acquisition and approximately 31 partial parcel acquisitions, none of which would result in the displacement of businesses or employees - Displacement of one business from a State-owned parcel with approximately six employees at that business - Loss of approximately \$1,000 in annual property tax revenue and approximately \$1,939 in sales tax revenue - Creation of approximately 300 person-year jobs, which would generate approximately \$10.5 million per year (in 2010 dollars) in employment earnings over the long term.	- TCEs on approximately 36 parcels - Creation of approximately 3,100 person-year jobs, which would generate a total of approximately \$148.6 million (in 2010 dollars) in employment earnings	- The LRT Alternative would potentially result in: - TCEs on approximately 13 parcels - Creation of approximately 31,500 person-year jobs, which would generate a total of approximately \$1.9 billion (in 2010 dollars) in employment earnings 58 full parcel acquisitions and approximately 11 partial parcel acquisitions, requiring the relocation of approximately 73 businesses and resulting in the displacement of approximately 645 employees - Displacement of 1 business from a State-owned parcel with approximately 30 employees at that business - Loss of approximately \$50,885 in annual property tax revenue and approximately \$75,425 in sales tax revenue - Operation and maintenance is estimated to result in approximately 1,300 person-year jobs, which would generate a total of approximately \$45.4 million (in 2010 dollars) per year in employment earnings over the life of the improvements	- TCEs on approximately 52 parcels for single-bore and 47 parcels for dual-bore - Creation of approximately 41,100 person-year jobs for single-bore and 73,700 for dual-bore, which would generate a total of approximately \$1.9 billion (in 2010 dollars) in employment earnings for single-bore and approximately \$3.5 billion (in 2010 dollars) for dual-bore. - Require one full parcel acquisition, which would require the relocation of approximately 1 business and the displacement of approximately 5 employees. - Result in approximately 2 and 3 partial parcel acquisitions (single-bore and dual-bore, respectively) - Displacement of 1 business from a State-owned parcel with approximately 30 employees - Result in the loss of approximately \$1,042 in annual property tax revenue no loss of sales tax revenue (single-bore and dual-bore) Single-Bore: Operation and maintenance would result in approximately 800 to 900 person-year jobs for the operational variation that includes trucks and tolls or	No avoidance, minimization and/or mitigation measures are required.
	No permanent effects to environmental justice populations.	- Approximately one full parcel acquisition and approximately 31 partial parcel acquisitions, none of which would result in the displacement of businesses or employees - Displacement of one business from a State-owned parcel with approximately six employees at that business - Loss of approximately \$1,000 in annual property tax revenue and approximately \$1,939 in sales tax revenue - Creation of approximately 300 person-year jobs, which would generate approximately \$10.5 million per year (in 2010 dollars) in employment earnings over the long term.	- Approximately 45 partial parcel acquisitions, resulting in a loss of approximately \$2,111 in annual property tax revenue and approximately \$1,939 in sales tax revenue - Creation of approximately 600 person-year jobs, which would generate a total of approximately \$19.6 million (in 2010 dollars) per year in employment earnings over the life of the improvements.	58 full parcel acquisitions and approximately 11 partial parcel acquisitions, requiring the relocation of approximately 73 businesses and resulting in the displacement of approximately 645 employees - Displacement of 1 business from a State-owned parcel with approximately 30 employees at that business - Loss of approximately \$50,885 in annual property tax revenue and approximately \$75,425 in sales tax revenue - Operation and maintenance is estimated to result in approximately 1,300 person-year jobs, which would generate a total of approximately \$45.4 million (in 2010 dollars) per year in employment earnings over the life of the improvements	- Require one full parcel acquisition, which would require the relocation of approximately 1 business and the displacement of approximately 5 employees. - Result in approximately 2 and 3 partial parcel acquisitions (single-bore and dual-bore, respectively) - Displacement of 1 business from a State-owned parcel with approximately 30 employees - Result in the loss of approximately \$1,042 in annual property tax revenue no loss of sales tax revenue (single-bore and dual-bore) Single-Bore: Operation and maintenance would result in approximately 800 to 900 person-year jobs for the operational variation that includes trucks and tolls or	CI-1: Property Acquisition: All acquisition of property for improvements in the Build Alternatives will be conducted in compliance with the Uniform Relocation Assistance and Real Property Acquisition Policies Act (Uniform Act) of 1970 as amended.

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Environmental Justice	No temporary or permanent effects to environmental justice populations.	None of the Build Alternatives would result in disproportionate adverse impacts on environmental justice populations			approximately 900 person-year jobs for the operational variation that includes trucks, tolls, and express buses, which would generate a total of approximately \$28.6 million or approximately \$32.1 million (in 2010 dollars), respectively, per year in employment earnings. Dual-Bore: Operation and maintenance would result in approximately 1,200 person-year jobs for the operational variation that includes tolls or approximately 1,000 person-year jobs for the operational variation that excludes tolls, which would generate a total of approximately \$41.2 million or \$33.5 million (in 2010 dollars), respectively, per year in employment earnings.	Measure C1-1 is applicable.
Utilities and Emergency Services	No temporary or permanent effects to utilities and emergency services.	No impact. Although the SR-710 North Study Project will improve mobility and circulation, the study area is largely built out and none of the Build Alternatives provides new access to undeveloped or underdeveloped areas; therefore, the SR-710 North Study Project is not expected to result in unplanned growth.	Potential temporary effects include: • Lane restrictions that may impact access and circulation at approximately 24 individual locations • Lane restrictions during off-peak hours at approximately 6 locations • Loss of some on-street parking spaces during minor street work	Potential temporary effects include: • Lane restrictions that may impact access and circulation at approximately 29 locations (24 from the TSM/TDM Alternative improvements and 5 additional locations) • Lane restrictions during utility relocations and temporary road deck installation and removal • Delays from haul route disposal traffic • Loss of on-street parking spaces during minor construction • Weekend full road closures during construction	adverse transportation impacts during construction of the Build Alternatives, including potential delays for emergency service providers through preparation of a Transportation Management Plan (TMP) during final design, including coordination of the development of the TMP with emergency services providers. The TMP would be implemented during project construction	No avoidance, minimization, and/or mitigation measures are required.
Traffic and Transportation/Pedestrian and Bicycle Facilities	No temporary impacts related to traffic, transportation, pedestrian facilities, and bicycle facilities in addition, the No Build Alternative would not provide improvements to the transit, transportation, and circulation systems, and would not provide any transportation benefits for the traveling public. Congestion would increase, thereby exacerbating existing mobility conditions, including impacts associated with out-of-direction traffic using local arterials.	Potential temporary effects include: • Lane restrictions that may impact access and circulation at approximately 24 individual locations • Loss of some on-street parking spaces during minor street work • Closures of sidewalks, crosswalks, and bicycle facilities to protect the safety of pedestrians, bicyclists, and construction workers. Because ADA-compliant local streets, sidewalks, and crosswalks would be closed during construction of the Build Alternatives, ADA accessibility would also be affected during those closures.	Potential temporary effects include: • Lane restrictions that may impact access and circulation at approximately 24 individual locations • Lane restrictions during off-peak hours at approximately 6 locations • Loss of some on-street parking spaces during minor street work • Closures of sidewalks, crosswalks, and bicycle facilities, including ADA-compliant facilities, to protect the safety of pedestrians, bicyclists, and construction workers • The BRT Alternative would include most of the improvements included in the TSM/TDM Alternative; therefore, the BRT alternative would result in similar temporary lane width reductions, reductions in the number of lanes, limited temporary losses of on-street parking spaces during minor construction work, and restrictions on the number of lanes during off-peak	Potential temporary effects include: • Lane restrictions that may impact access and circulation at approximately 29 individual locations • Loss of some on-street parking spaces during minor street work • Delays and detours at several locations in the vicinity of the north and south tunnel portals: – Single-Bore: Delays and detours at 5 and 7 locations, respectively, in the vicinity of the south tunnel portal. Delays and detours at 8 and 11 locations, respectively, in the vicinity of the north tunnel portal – Dual-Bore: Delays and detours at 4 and 9 locations, respectively, in the vicinity of the south tunnel portal. Delays and detours at 8 and 11 locations, respectively, in the vicinity of the north tunnel portal • Construction-related closures of freeway on- and off-ramps • Temporary Closures: – Single-Bore: 5 on NB SR 710, 7 on SB SR 710, and 1 on WB I-210 – Dual-Bore: 5 on NB SR 710, 5 on SB SR 710, and 2 on WB I-210 • Delays from haul route disposal traffic • Closure of on-street parking on the Green Street Bridge • Closures of sidewalks, crosswalks, and bicycle facilities, including ADA-compliant facilities, to protect the safety of pedestrians, bicyclists, and construction	T-1: Transportation Management Plan: This measure addresses short-term adverse transportation impacts during construction of the Build Alternatives, including potential delays for emergency service providers through preparation of a Transportation Management Plan (TMP) during final design, including coordination of the development of the TMP with emergency services providers. The TMP would be implemented during project construction T-2: Pedestrian and Bicycle Facility Closures: When sidewalks, crosswalks, and/or bicycle facilities are temporarily closed during construction, pedestrian and bicycle detours will be developed and clearly signed prior to closing the locations.	T-1: Transportation Management Plan: This measure addresses short-term adverse transportation impacts during construction of the Build Alternatives, including potential delays for emergency service providers through preparation of a Transportation Management Plan (TMP) during final design, including coordination of the development of the TMP with emergency services providers. The TMP would be implemented during project construction T-2: Pedestrian and Bicycle Facility Closures: When sidewalks, crosswalks, and/or bicycle facilities are temporarily closed during construction, pedestrian and bicycle detours will be developed and clearly signed prior to closing the locations.

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	The No Build Alternative would not provide improvements to the transit, transportation, and circulation systems, and would not provide any transportation benefits for the traveling public. Congestion would increase, thereby exacerbating existing mobility conditions, including impacts associated with out-of-direction traffic using local arterials.	In the Horizon Year (2035), compared to the No Build Alternative, the TSM/TDM Alternative would result in: - A minor increase in combined AM and PM peak-period regional area VMT - Slight improvement in combined AM and PM peak-period regional area VHT - A minor increase in daily person throughput (trips) at the east-west screening - Moderate increase in job accessibility - Modest increase in total daily vehicle volumes crossing the east-west screening on arterials and freeways - No reduction in VMT on local arterials - Modest increase in the percent of long-distance trips using local arterials - No improvement in travel times - Third highest number of new linked transit trips - No change in transit mode split - Lowest daily transit person trips crossing the east-west screening - No change in percent of study area population and employment within 0.25 mi of high-frequency transit service - Adverse effects at 18 intersections and on 8 freeway segments - Delays at intersections for pedestrians and bicyclists - Permanent loss of approximately 26 on-street parking spaces in the AM and PM peak periods and approximately 220 on-street parking spaces during all hours of the day	In the Horizon Year (2035), compared to the No Build Alternative, the BRT Alternative would result in: - A minor increase in combined AM and PM peak-period regional area VMT - A reduction in combined AM and PM peak-period regional area VHT - A minor increase in daily person throughput (trips) at the east-west screening - Moderate increase in job accessibility - Modest increase in total daily vehicle volumes crossing the east-west screening on arterials and freeways - Minor decrease in VMT on local arterials - Modest increase in the percent of long-distance trips using local arterials - No improvement in travel times - Second highest number of new linked transit trips - Minor increase in transit mode split - Greatest daily transit person trips crossing the east-west screening - No change in percent of study area population and employment within 0.25 mi of high-frequency transit service - Adverse effects at 13 intersections and on 13 freeway segments - Delays at intersections for pedestrians and bicyclists - Permanent loss of approximately 1,055 on-street parking spaces in the AM and PM peak periods and approximately 334 on-street parking spaces during all hours of the day - The traffic modeling projections listed above include the effects of the BRT Alternative improvements in addition to the effects of the TSM/TDM Alternative improvements associated with the BRT Alternative	hours associated with the TSM/TDM Alternative improvements	The Freeway Tunnel Alternative would include most of the improvements included in the TSM/TDM Alternative, therefore, the Freeway Tunnel Alternative would result in similar temporary lane width reductions, reductions in the number of lanes, limited temporary losses of on-street parking spaces during minor construction work, and restrictions on the number of lanes during off-peak hours associated with the TSM/TDM Alternative improvements	No avoidance, minimization and/or mitigation measures are required.

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Visual and Aesthetics	No temporary effects to visual and aesthetics.	• Moderate to moderately high visual impacts due to construction activities	• Moderate to moderately high visual impacts due to construction activities	• Moderate to moderately high visual impacts due to construction activities	• Moderately low to moderate visual impacts due to construction activities	• V-7: Short-Term Visual Effects: During final design, Metro (TSM/TDM, BRT, and LRT Alternatives) and Caltrans (Freeway Tunnel Alternative) will identify and uses adjacent to construction areas that may be sensitive to views of construction, staging, and materials storage areas. The final design will include features to minimize views of those areas. Metro and Caltrans will require the Construction Contractor to implement and maintain these features throughout the construction period.
	• No permanent effects to visual and aesthetics.	• Minor physical changes or visible impacts to the environment • A minimal increase in lighting in existing business and residential areas • Limited changes in glare from changes in traffic control cycles and additional travel lanes • Approximately 7 noise barriers may result in a low to high visual impact	• Minor new shade and shadow effects at new bus stops and signage • Low permanent visual impacts on key views • Approximately 3 noise barriers may result in a moderate to moderately high visual impact. • In addition to the visual and aesthetic impacts associated with the BRT Alternative improvements, the visual and aesthetic impacts associated with the TSM/TDM Alternative improvements included in the BRT Alternative would also occur.	• Moderately low to moderate permanent visual impacts on key views • TSM/TDM Alternative noise barriers may result in a moderate to high visual impact • Low permanent impacts related to light, glare, and shade and shadows • In addition to the visual and aesthetic impacts associated with the LRT Alternative improvements, the visual and aesthetic impacts associated with the TSM/TDM Alternative improvements included in the LRT Alternative would also occur.	• Moderately low to moderate visual impacts on key views • Minimal vehicle headlight glare from new non-tunnel segments built below the existing grade level • Minimal shade and shadow impacts • Approximately 4 to 6 noise barriers may result in moderate to high visual impacts • In addition to the visual and aesthetic impacts associated with the Freeway Tunnel Alternative improvements, the visual and aesthetic impacts associated with the TSM/TDM Alternative improvements included in the Freeway Tunnel Alternative would also occur.	• V-1: Vividness (applies to the LRT and Freeway Tunnel Alternatives): Metro (LRT Alternative) and Caltrans (Freeway Tunnel Alternative) will address effects of the Build Alternatives related to a reduction in the vividness of views based on a number of measures in the final design. • V-2: Intactness (applies to the LRT and Freeway Tunnel Alternatives): Metro (LRT Alternative) and Caltrans (Freeway Tunnel Alternative) will address effects of the Build Alternatives related to a reduction in the intactness of views based on a number of measures in the final design. • V-3: Unity (applies to the LRT and Freeway Tunnel Alternatives): Metro (LRT Alternative) and Caltrans (Freeway Tunnel Alternative) will address effects of the Build Alternatives related to a reduction in the unity or views based on a number of measures in the final design. • V-4: Walls with Aesthetic Treatments: The final designs of sound walls and retaining walls adjacent to identified viewer groups or within sensitive key views within State-owned right of way and for the Freeway Tunnel Alternative will be based on Caltrans Highway Design Manual standards and consideration of community input. Metro design standards will be used for the TSM/TDM, BRT, and LRT Alternatives. • V-5: Built Structures (applies to the LRT Alternative): Metro (LRT Alternative) will design the project structures to blend with or enhance the surrounding areas. • V-6: Landscaping (applies to the LRT

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Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Cultural Resources	No effects to cultural resources.	The TSM/TDM Alternative would potentially result in impacts to previously undocumented cultural materials or human remains.	The BRT Alternative would potentially result in impacts to previously undocumented cultural materials or human remains.	The LRT Alternative would potentially result in impacts to previously undocumented cultural materials or human remains.	The Freeway Tunnel Alternative would potentially result in impacts to previously undocumented cultural materials or human remains.	and Freeway Tunnel Alternatives): Metro (LRT Alternative) and Caltrans (Freeway Tunnel Alternative) will address different levels of visual impacts related to walls and berms and for screening views of project features during final design. The following measures are applicable to all four Build Alternatives: • CR-1: Discovery of Cultural Resources • CR-2: Discovery of Human Remains • CR-3: Native American Monitors • CR-4: Post Review Discovery and Monitoring Plan • CR-5: Cultural Awareness Training BRT Alternative • Jardin Del Encanto and Cascades Park: ◦ Project Condition BRT-1: Incorporate existing design features in the new medians and sidewalks ◦ Project Condition BRT-2: Incorporate in-kind plant materials to replace vegetation removed during construction • Old Pasadena Historic District, Rialto Theatre, Fair Hope Building, and Oaklawn Waiting Station: ◦ Project Condition BRT-3: Equipment Use – Use of equipment other than jackhammers to break up concrete ◦ Project Condition BRT-4: Vibration Management – Preconstruction Building Survey, Vibration Monitoring During Construction, and Vibration Monitoring Plan • Glenarm Building and Electric Fountain ◦ Project Condition BRT-3: Equipment Use ◦ Project Condition BRT-5: Incorporate existing design features in the new medians and sidewalks LRT Alternative • Raymond Florist Historic District, Hospital Veterinary, Rialto Theatre, Fair Hope Building, 4777 East Cesar E. Chavez Avenue, Community Facilities Planners Building (aka Fair Oaks Professional Group), and 100 North Fremont Avenue: ◦ Project Condition LRT-1: Public outreach and community input; evaluation of existing condition of historic buildings and
	No effects on historic properties	• No Adverse Effect on the Segment of Route 66: West Huntington Drive and North Eastern Avenue, San Marino City Hall and Fire Station, Arroyo Seco Parkway Historic District (including the State-owned bridge at the Fair Oaks Avenue Overcrossing [53 0440]), Segment of Route 66: South Fair Oaks Avenue/Fair Oaks Avenue, 270 South Orange Grove Boulevard, Markham Place Historic District, Rialto Theatre, Fair Hope Building, Segment of Route 66: West Huntington Drive/ Fair Oaks Avenue, Segment of Route 66: West Huntington Drive/Fremont Avenue, Sequoyah School/Neighborhood Church (3 buildings: Children's Chapel, Nursery School, and Religious Education Building)	• No Adverse Effect based on compliance with Standard Conditions on El Jardin Del Encanto and Cascades Park, Old Pasadena Historic District, Glenarm Building and Electric Fountain, Rialto Theatre, Fair Hope Building, and Oaklawn Waiting Station • No Adverse Effect on the Golden Gate Theatre, Saint Alphonsus Church, Dr. Henry K. Kawamoto Office, Bekins Storage Co. Roof Sign, Segment of Route 66: South Fair Oaks Avenue/Fair Oaks Avenue, Segment of Route 66: East Colorado Boulevard, South Pasadena Middle School, Community Facilities Planners Building (aka Fair Oaks Professional Group), Raymond Hill Waiting Station, Segment of Route 66 (West Huntington Drive at foot of Fair Oaks Avenue), and War Memorial Building	• No Adverse Effect without Standard Conditions on 4777 East Cesar E. Chavez Avenue, Raymond Florist Historic District, Hospital Veterinary, Fair Hope Building, Rialto Theatre, and Community Facilities Planners Building (aka Fair Oaks Professional Group), and 100 North Fremont • No Adverse Effect on the Glenarm Building and Electric Fountain, Oaklawn Waiting Station, War Memorial Building, South Pasadena Middle School, Segment of Route 66 (South Fair Oaks Avenue/Fair Oaks Avenue), Arroyo Seco Parkway Historic District, 2020 Fremont Avenue, Otsungna Prehistoric Village Site, and Horatio Rust Site	• No Adverse Effect on the Norton Simon Museum, Raymond-Summit Historic District, Herkimer Arms Apartment House, 270 South Orange Grove Boulevard, Ambassador West Cultural Landscape Historic District, Markham Place Historic District, Old Pasadena Historic District, Otsungna Prehistoric Village Site, and Horatio Rust Site • No adverse effect on 42 historic properties above the tunnel segments in the Freeway Tunnel Alternative	

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Hydrology and Floodplains	No temporary effects to hydrology and floodplains. No permanent effects to hydrology and floodplains.	No improvements would result in construction activities or encroachment within floodplains. No permanent effects to hydrology and floodplains	No improvements would result in any construction activities or encroachment within floodplains. No permanent effects to hydrology and floodplains	No improvements would result in any construction activities or encroachment within floodplains. No permanent effects to hydrology and floodplains	- Temporary construction impacts and potential erosion from clearing of land and vegetation. - No permanent impacts on floodplain values. - A nominal reduction of the floodplain boundaries of the Dorchester Channel and Laguna Regulating Basin, which would not result in an increase in the water surface elevation in the Laguna Regulating Basin and would result in only a minor increase in water surface elevation in Dorchester Channel (dual-bore design variation only).	preconstruction crack survey; vibration and settlement monitoring and documentation during tunneling and excavation activities; implementation of additional preventive/corrective measures as needed, and Vibration Monitoring Plan including vibration instrumentation, monitors, and exceedance notification and reporting procedures. - Project Condition LRT-2: Vibration Isolation systems –Incorporate available vibration-isolation systems that are most effective in reducing operational ground-borne noise and vibration into the final construction design. - Otsungna Prehistoric Village Site and Horatio Rust Site: - CR-4 – Post Review Discovery and Monitoring Plan Freeway Tunnel Alternative (tunnel segment) - Otsungna Prehistoric Village Site and Horatio Rust Site - CR-4 – Post Review Discovery and Monitoring Plan
Water Quality and Storm Water Runoff	No temporary water quality and storm runoff effects.	Temporary disturbance of approximately 21 ac of soil during construction	- Temporary disturbance of approximately 35 ac of soil during construction - The BRT Alternative would also include construction and operation impacts similar to the TSM/TDM Alternative.	- Temporary disturbance of approximately 33 ac of soil during construction - Construction of the TSM/TDM component of the LRT Alternative would disturb a total of approximately 11 ac of soil. Therefore, the total disturbed soil area during construction of the LRT Alternative would be approximately 44 ac. - Groundwater de-watering during construction	Temporary disturbance of approximately 81 ac and 93 ac of soil, respectively, for the single-bore and dual-bore tunnel design variations during construction component of the TSM/TDM Construction of the Freeway Tunnel Alternative would disturb a total of approximately 9 ac of soil. Therefore, the total disturbed soil area during construction of the single-bore and dual-bore design variations of the Freeway Tunnel Alternative would be approximately 90 ac and 102 ac.	WQ-1: National Pollutant Discharge Elimination: Compliance with the provisions of the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit) Order No. 2009-0009-DWQ. WQ-2: Dewatering: Compliance with the requirements of Order No. R4-2013-0095 (NPDES No. CAG994004) for construction site dewatering. WQ-3: Groundwater Monitoring (applies to the LRT and Freeway)

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Geology, Soils, Seismic, and Topography	No permanent water quality and storm runoff effects.	- A permanent increase in impervious surface area of approximately 3.8 ac - Treatment of 76% of newly created or replaced impervious surface area storm water runoff within State-owned ROW	- A permanent increase in impervious surface area of approximately 1.2 ac - Treatment of 575% and 114%, respectively, of the new impervious surface area within and outside State-owned ROW. - The total net increase in impervious surface area would be approximately 3.8 ac for the TSM/TDM component of the BRT Alternative. Therefore, the total net increase in impervious surface area for the BRT Alternative would be approximately 5 ac.	- A permanent increase in impervious surface area of approximately 16.5 ac - Treatment of 31% of the new impervious surface area within State-owned ROW and 47% of the newly created or replaced impervious surface area outside State-owned ROW. - The total net increase in impervious surface area would be approximately 2.2 ac for the TSM/TDM component of the LRT Alternative. Therefore, the total net increase in impervious surface area for the LRT Alternative would be approximately 18.7 ac.	- respectively. - Groundwater de-watering during construction	Tunnel Alternatives: A comprehensive investigation to establish a baseline for groundwater levels and quality (chemistry) in the areas in which tunneling or excavations would occur. WQ-4: Improvements in State-Owned Right of Way (applies to the Freeway Tunnel Alternative): Compliance with the provisions of the NPDES Permit, Statewide Storm Water Permit, Waste Discharge Requirements (WDRs). WQ-5: Improvements Outside State-Owned Right of Way (applies to the TSM/TDM, BRT, and LRT Alternatives): Compliance with the Standard Urban Storm Water Mitigation Plan (SUSMP) prepared for the Los Angeles Regional Water Quality Control Board WDRs for Municipal Separate Storm Sewer System Order No. R4-2012-0175 WQ-6: Improvements in State-Owned Right of Way (applies to the Freeway Tunnel Alternative): A Caltrans-approved Design Pollution Prevention BMPs will be prepared. WQ-7: Improvements in State-Owned Right of Way (applies to the Freeway Tunnel Alternative): Caltrans-approved Treatment BMPs will be prepared and implemented.
	No temporary geology and soils effects.	- Minor grading activities with no modification of existing topography - Low potential to encounter naturally occurring oil or gas during construction - Potential to experience fault rupture or seismically-induced ground motion, liquefaction, and/or landslides - Low potential for soil settlement, collapse, and expansion	- Minor grading activities with no modification of existing topography - Low potential to encounter naturally occurring oil or gas during construction - Potential to experience fault rupture or seismically-induced ground motion, liquefaction, and landslides - Low potential for soil settlement, collapse, and expansion	- Soil excavation and tunneling - Low to moderate potential to encounter naturally occurring oil or gas during construction - Potential to experience fault rupture or seismically-induced ground motion, liquefaction, and landslides - Low potential for soil settlement, collapse, expansion, and lateral spreading	- Soil excavation and tunneling - Low to moderate potential to encounter naturally occurring oil or gas during construction - Potential to experience fault rupture or seismically-induced ground motion, liquefaction, and landslides - Low potential for soil settlement, collapse, expansion, and lateral spreading	

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
	- Improvements in a Liquefaction Hazard Zone - Moderate erosion of surficial soils - Improvements that cross the active Raymond and potentially active San Rafael Faults - Improvements in a potential dam inundation area	- Improvements in a Liquefaction Hazard Zone - Moderate erosion of surficial soils - An alignment that crosses the active Raymond and potentially active San Rafael Faults - Improvements in a potential dam inundation area	- Improvements in a Landslide Hazard Zone and a Landslide Hazard Zone - Moderate erosion of surficial soils - An alignment that crosses the active Raymond and potentially active San Rafael Faults - Improvements in a potential dam inundation area - Slope instability - Potential for ground settlement and differential settlement immediately above and adjacent to the bored tunnel portion	- Improvements in a Liquefaction Hazard Zone and a Landslide Hazard Zone - Moderate erosion of surficial soils - An alignment that crosses the active Raymond and potentially active San Rafael Faults - Improvements in a potential dam inundation area - Slope instability - Potential for ground settlement and differential settlement immediately above and adjacent to the bored tunnel portion	- Improvements in a Liquefaction Hazard Zone and a Landslide Hazard Zone - Moderate erosion of surficial soils - An alignment that crosses the active Raymond and potentially active San Rafael Faults - Improvements in a potential dam inundation area - Slope instability - Potential for ground settlement and differential settlement immediately above and adjacent to the bored tunnel portion	quality control plan during construction. Comprehensive real-time monitoring with geotechnical tunnel data management software and implementation of an observational approach to construction management will be implemented during construction of the LRT or Freeway Tunnel Alternatives. GEO-3: Tunnel Design (applies to the LRT and Freeway Tunnel Alternatives): Project Engineer will make sure that measures to prevent effects from tunnel construction and operation are included in the comprehensive geologic and geotechnical investigation and the design-level geotechnical/baseline report and the project design and specifications. GEO-4: Tunnel Construction (applies to the LRT and Freeway Tunnel Alternatives): It is expected that bored tunnels for either the LRT or Freeway Tunnel Alternative would be constructed using a tunnel boring machine (TBM). During construction, the Project Engineer will select a pre-qualified contractor with experience with large, pressurized-face TBMs.
Paleontology	No temporary paleontological resource effects. All impacts are considered permanent No permanent paleontological effects	No temporary paleontological resource effects. All impacts are considered permanent - Minor ground disturbance in areas with high sensitivity for paleontological resources. - During excavation and grading, fossils would be able to be recovered	No temporary paleontological resource effects. All impacts are considered permanent - Minor ground disturbance in areas with high sensitivity for paleontological resources. - During excavation and grading, fossils would be able to be recovered	No temporary paleontological resource effects. All impacts are considered permanent - Improvements located in areas with high sensitivity for paleontological resources - The potential for fossil recovery during tunnel excavation will depend on the type of tunnel boring machine used	No temporary paleontological resource effects. All impacts are considered permanent - Located in area with high sensitivity for paleontological resources - The potential for fossil recovery during tunnel excavation will depend on the type of tunnel boring machine used	No measures required.
Hazardous Waste and Materials	No temporary or permanent hazardous waste effects	- Four properties with known hazardous waste contamination are located adjacent to or within the TSM/TDM Alternative - Widening and/or demolition of bridges may encounter asbestos-containing materials	- Three properties with known hazardous waste contamination are located adjacent to the BRT Alternative - No bridge widening/demolition proposed	- Four properties with known hazardous waste contamination are located adjacent to or within the LRT Alternative - No bridge widening/demolition proposed - Bored tunnel will be water and gas tight, and the intrusion of hazardous materials/gas into the tunnel is not expected	- Two properties with known hazardous waste contamination are located adjacent to the Freeway Tunnel Alternative - Widening and/or demolition of existing bridges may encounter asbestos-containing materials - Bored tunnel will be water and gas tight and the intrusion of hazardous materials/gas into the tunnel is not expected	PAL-1: Paleontological Mitigation Plan and Paleontological Resources Impact Mitigation Program: A PMP or PRIMP is required that addresses monitoring and treatment of fossils. HW-1: Striping and Pavement Markings: Sampling, handling, treatment and disposal of striping and pavement markings will be conducted in accordance with applicable local, State and Federal regulations. HW-2: Transformers (applies to the TSM/TDM, BRT, and LRT Alternatives): Transformer removal, required, removed and disposed of in accordance with applicable State regulations. HW-3: Lead Compliance Plan: A Lead Compliance Plan in accordance with applicable regulations that will address the presence of aerially deposited lead (ADL) in the soils within the project area and the health and safety of

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Air Quality	No temporary construction air quality effects	Short-term air quality impacts from construction emissions	- Short-term air quality impacts from construction emissions - Although the BRT Alternative includes some of the TSM/TSM Alternative improvements, the construction schedule for the TSM/TDM improvements would not overlap with the construction schedule for the BRT Alternative; therefore, the emissions would not be additive.	- Short-term air quality impacts from construction emissions - Although the LRT Alternative includes some of the TSM/TSM Alternative improvements, the construction schedule for the TSM/TDM improvements would not overlap with the construction schedule for the LRT Alternative; therefore, the emissions would not be additive.	- Short-term air quality impacts from construction emissions - Although the Freeway Tunnel Alternative includes some of the TSM/TSM Alternative improvements, the construction schedule for the TSM/TDM improvements would not overlap with the construction schedule for the single-bore design variation; therefore, the emissions would not be additive.	HW-4: Aerially-Deposited Lead Investigation: Sampling, handling, treatment and disposal ADL will be conducted consistent with applicable local, State and federal regulations and requirements. HW-5: Demolition of Structures and Bridges: Structures planned for demolition within the project area will be assessed for the possible presence of asbestos-containing materials (ACM), lead-based paint (LBP), and equipment containing chlorofluorocarbons (CFCs). HW-6: SCAQMD Rule 1403: Compliance with SCAQMD Rule 1403 during demolition of bridges and structures. HW-7: Phase II Site Investigations: Phase II Site Investigations will be conducted to determine if special handling, treatment, or disposal provisions associated with hazardous wastes will be required for the project. HW-8: Soils Adjacent to the Railroad ROW (applies to the TSM/TDM Alternative): Soils adjacent to railroad ROW will be sampled to determine whether they require special handling and disposal. HW-9: Tunnel Construction Activities (applies to the LRT and Freeway Tunnel Alternatives): Tunnel spoils will be tested prior to removal off-site and disposed of at an appropriate landfill or designated site. HW-10 Unknown Hazards (applies to all four Build Alternatives):Excavation and demolition activities will be monitored and if unknown hazards encountered, characterization, treatment and disposal will be consistent with federal and state regulations. WQ-2: Dewatering GEO-1: Final Geotechnical/Baseline Report AQ-1: Fugitive Dust: Compliance with South Coast Air Quality Management District Rule 403 AQ-2: Equipment and Vehicle Emissions: During all site preparation, grading, excavation, and construction, Construction Contractor required to reduce vehicle and equipment emissions through various measures. AQ-3: Diesel Fuel Emissions and

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
The 2020 and 2035 regional air quality emissions under the No Build Alternative are projected to be higher than existing emissions levels.	• The 2020 and 2035 regional air quality emissions under the No Build Alternative are projected to be higher than existing emissions levels.	• 2020 PM₁₀ emissions higher than the 2020 No Build Alternative emissions • Criteria pollutant emissions higher than the 2035 No Build Alternative emissions, with the exception of ROG • 2035 diesel PM plus diesel exhaust organic gas emissions higher than the 2035 No Build Alternative emissions • Inconsistency with the project description in the 2012 RTP, the 2015 FTIP, and the "open to traffic assumptions" in SCAG's regional emissions analysis • The operational air quality analysis for the BRT Alternative includes the effects of the TSM/TDM Alternative improvements that would be included in the BRT Alternative	• Criteria pollutant emissions higher than the 2035 No Build Alternative emissions with the exception of ROG • 2035 diesel PM plus diesel exhaust organic gas emissions higher than the 2035 No Build Alternative emissions • Inconsistency with the project description in the 2012 RTP, the 2015 FTIP, and the "open to traffic assumptions" in SCAG's regional emissions analysis • The operational air quality analysis for the LRT Alternative includes the effects of the TSM/TDM Alternative improvements that would be included in the LRT Alternative	• Criteria pollutant emissions higher than the 2035 No Build Alternative emissions with the exception of ROG • 2035 diesel PM plus diesel exhaust organic gas emissions higher than the 2035 No Build Alternative emissions • Inconsistency with the project description in the 2012 RTP, the 2015 FTIP, and the "open to traffic assumptions" in SCAG's regional emissions analysis • The operational air quality analysis for the LRT Alternative includes the effects of the TSM/TDM Alternative improvements that would be included in the LRT Alternative	Single-Bore • PM₁₀ and PM_{2.5} emissions higher than the 2025 and 2035 No Build Alternative emissions • Highest 24-hour and annual PM_{2.5} and annual PM₁₀ concentrations lower than the No Build Alternative • Diesel PM emissions greater than or equal to the 2025 and 2035 No Build Alternative emissions • Inconsistency with the project description in the 2012 Regional Transportation Plan, the 2015 Federal Transportation Improvement Program, and the "open to traffic assumptions" in the Southern California Association of Governments' regional emissions analysis Dual-Bore • 2025 criteria pollutant emissions higher than the 2025 No Build Alternative emissions, with the exception of reactive organic gases and carbon monoxide • 2035 criteria pollutant emissions higher than the 2035 No Build Alternative emissions with the exception of reactive organic gas emissions • PM₁₀ 2035 emissions higher than the existing condition emissions • Highest 24-hour and annual PM_{2.5} and annual PM₁₀ concentrations lower than the No Build Alternative • Diesel PM emissions greater than or equal to the 2025 and 2035 No Build Alternative emissions • Consistent with the project description in the 2012 Regional Transportation Plan, the 2015 Federal Transportation Improvement Program, and the "open to traffic assumptions" in the Southern California Association of Governments' regional emissions analysis	Sensitive Receptors: Construction Contractor to implement measures to reduce diesel fuel emissions near sensitive receptors. • AQ-4: Caltrans Standard Specifications for Construction (applies to the Freeway Tunnel Alternative): Comply with Caltrans Standard Specifications for Construction (Sections 14-9.03 and 18 [Dust Control] and Section 39-3.06 [Asphalt Concrete Plant Emissions]). • Measure AQ-5: Metro Green Construction Policy (applies to the TSM/TDM, BRT, and LRT Alternatives): Metro will require the Construction Contractor to comply with its "Green Construction Policy" (adopted 2011, or more current).

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Noise	No temporary noise effects	Less than perceptible temporary noise impacts from construction traffic and activity	- Less than perceptible temporary noise impacts from construction traffic and activity - Due to the distance between the TSM/TDM Alternative improvements and the other Build Alternatives, construction-related impacts are not expected to compound should they be constructed simultaneously	- Less than perceptible temporary noise impacts from construction traffic and activity - Short-term ground-borne noise and vibration effects from tunnel boring construction activity - Due to the distance between the TSM/TDM Alternative improvements and the other Build Alternatives, construction-related impacts are not expected to compound should they be constructed simultaneously	traffic assumptions" in the Southern California Association of Governments' regional emissions analysis for the tolled operational variation The operational air quality analysis for the Freeway Tunnel Alternative includes the effects of the TSM/TDM Alternative improvements that would be included in the Freeway Tunnel Alternative - Less than perceptible temporary noise impacts from construction traffic and activity - Short-term ground-borne noise and vibration effects from tunnel boring construction activity - Due to the distance between the TSM/TDM Alternative improvements and the other Build Alternatives, construction-related impacts are not expected to compound should they be constructed simultaneously	N-1: Construction in State ROW (applies to the Freeway Tunnel Alternative): Within State-owned ROWs noise will be controlled in conformance with Caltrans Standard Specifications Section 14-8.02, "Noise Control." N-2: Construction Outside State ROW (applies to the TSM/TDM, BRT, and LRT Alternatives): During construction outside State-owned ROWs, compliance with the hours of operation, the allowable noise levels at specified distances from construction activities, and other noise reduction/avoidance requirements in the applicable jurisdiction's Municipal Code and/or Noise Ordinance will be required. N-3: Tunnel Boring Machine (applies to the LRT and Freeway Tunnel Alternatives): Metro (LRT Alternative) or Caltrans (Freeway Tunnel Alternative), as appropriate, will require the Construction Contractor to maintain machinery in good working order during all tunnel boring activities. N-4: Supply and Muck Trains (applies to the LRT and Freeway Tunnel Alternatives): The Metro (LRT Alternative) or Caltrans (Freeway Tunnel Alternative) Project Engineer will include specific minimization measures in the Plans, Specifications, and Estimates (PS&E) if supply or muck trains are used to remove spoils. N-5: Ground-Borne Noise and Vibration: For the TSM/TDM and BRT Alternatives, Caltrans or Metro will not allow the Construction Contractor to use pile driving or other activities that generate high levels of vibration during the construction of the TSM/TDM or BRT Alternatives. Caltrans and Metro will require the Construction Contractor to carry out construction activities for the LRT and Freeway Tunnel Alternatives in compliance with

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
	No permanent noise effects	- Noise levels at approximately 27 receptor locations that would approach or exceed the NAC as applicable to the land uses at each sensitive receptor location - Seven noise barriers were found to be reasonable and feasible	- Operational long-term traffic noise impacts - Noise levels at approximately 129 receptor locations that would approach or exceed Noise Abatement Criteria - Noise levels at approximately 9 receptor locations that would approach or exceed the NAC as applicable to the land uses at each receptor location - Three modeled noise barriers were found to be reasonable and feasible - Five noise barriers in the TSM/TDM Alternative would also be included in the BRT Alternative	- Long-term ground-borne noise during operation - Noise barriers ranging in height from 4.0 to 9.5 feet will be placed at the edge of the track and a noise barrier will be placed along the perimeter of the LRT maintenance yard - Approximately 12 receptors will experience a moderate impact while approximately 5 receptors will experience a severe noise impact as defined by FTA noise criteria. - It is expected that along with the LRT Alternative, the TSM/TDM Alternative components will be constructed except improvements 1-1. Therefore, five barriers identified for the TSM/TDM improvements are recommended - Ground-borne vibration impacts to approximately 450 residential buildings and 1 commercial office building	- Operational long-term traffic noise impacts associated with traffic noise - The noise levels at approximately 66 receptor locations for the single-bore design variation and approximately 75 receptor locations for the dual-bore design variation would approach or exceed the NAC as applicable receptor location uses at each sensitive receptor location - Six modeled noise barriers were found to be reasonable and feasible - Five noise barriers in the TSM/TDM Alternative would also be included in the Freeway Tunnel Alternative	N-6: Grifols Vibration Study: For the TSM/TDM Alternative, Caltrans or Metro will not allow the Construction Contractor to use pile driving or other activities that generate high levels of vibration during the construction of the TSM/TDM Alternative. During PS&E for the Freeway Tunnel Alternative, the Caltrans Project Engineer will prepare a site-specific evaluation of potential airborne dust due to vibration associated with freeway tunnel construction at the Grifols facility. The analysis will use more detailed engineering and soil conditions developed during final design. The Caltrans Project Engineer will include the results of the evaluation, and any specific measures to ensure that vibration from the Project does not affect the clean room's compliance with the International Organization for Standardization (ISO) standards for airborne dust in clean rooms, if found to affect clean room compliance with ISO airborne dust standards, will be incorporated into the PS&E. During PS&E for the LRT Alternative, the Metro Project Engineer will prepare a site-specific evaluation of potential airborne dust due to vibration associated with the construction of the LRT Alternative at the Grifols facility. The analysis will use more detailed engineering and soil conditions. The Metro Project Engineer will include the results of the evaluation, and any specific measures to address vibration, if found to affect clean room operation, shall be incorporated into the PS&E N-7: Vibration Isolation Systems (applies to the LRT Alternative): The Metro Project Engineer, during final design of the LRT Alternative, will conduct additional field testing and analysis for the specific identification of ground-borne noise impacts and will incorporate the vibration isolation system or systems to comply with FTA ground-borne noise level criteria. The vibration isolation systems could be utilized.

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Energy	There are no temporary energy impacts.	Construction would require approximately 33,600 billion BTUs	Construction would require approximately 55,300 billion BTUs	Construction would require approximately 422,000 billion BTUs	Construction would require approximately 523,000 billion BTUs (single bore) and 926,000 billion BTUs (dual bore)	E-1: Construction Efficiency Plan: As part of the Plans, Specifications, and Estimates phase, the Project Engineer will prepare a construction efficiency plan.
	--	- Maintenance-related energy consumption would increase approximately 0.3% in the study area compared to the 2035 baseline condition (No Build Alternative) - Operational energy consumption in the study area would result in no change from the 2035 baseline condition (No Build Alternative)	- Maintenance-related energy consumption would increase approximately 0.3% in the study area compared to the 2035 baseline condition (No Build Alternative) - Operational energy consumption in the study area would result in no change from the 2035 baseline condition (No Build Alternative)	- Maintenance-related energy consumption would increase ranging from 0.6 to 1.6 percent in the study area compared to the 2035 baseline condition (No Build Alternative) - Operational energy consumption in the study area would result in an approximately 0.7 to 1.0 % decrease (single bore) and from the 2035 baseline condition (No Build Alternative)	- For the single-bore design variation: - Maintenance-related energy consumption would increase ranging from 0.6 to 1.6 percent in the study area compared to the 2035 baseline condition (No Build Alternative) - For the dual-bore design variation: - Maintenance-related energy consumption would increase ranging from 0.6 to 1.6 percent in the study area compared to the 2035 No Build Alternative. - Operational energy consumption in the study area would result in no change compared to the 2035 No Build Alternative.	No measures required.
Natural Communities	No temporary or permanent impacts to natural communities.	- No temporary or permanent impacts on sensitive natural communities - Temporary impacts to non-sensitive plant communities (0.3 acre of nonnative grassland and 0.5 acre of disturbed/developed) - Permanent impacts to non-sensitive plant communities (less than 0.1 acre of nonnative woodlands and 0.7 acre of disturbed/developed)	- No temporary or permanent impacts on sensitive natural communities - Temporary impacts to non-sensitive plant communities (0.6 acre of disturbed/developed) - Permanent impacts to non-sensitive plant communities (1.9 acres of nonnative grassland and 123.8 acres of disturbed/developed)	- No temporary or permanent impacts on sensitive natural communities - Temporary impacts to non-sensitive plant communities (2.1 acres of nonnative grassland, 8.0 acres of disturbed/developed) - Permanent impacts to non-sensitive plant communities (12.6 acres of nonnative grassland, 3.9 acres of nonnative woodland, and 93.6 acres of disturbed/developed)	- The single-bore and dual-bore design variations would each result in permanent impacts to approximately 1.09 acres of wetland complex and would potentially result in indirect temporary impacts to nearby riparian habitats. - The single-bore design variation would result in temporary impacts to non-sensitive plant communities (2.9 acres of nonnative grassland, less than 0.1 acre of nonnative woodland, and 53.4 acres of disturbed/developed) - The dual-bore design variation would result in temporary impacts to non-sensitive plant communities (2.2 acres of nonnative grassland, 1.1 acres of nonnative woodland, and 51.7 acres of disturbed/developed) - The single-bore design variation would result in permanent impacts to non-sensitive plant communities (25.2 acres of nonnative grassland, 31.6 acres of nonnative woodland, and 244.9 acres of disturbed/developed) - The dual-bore design variation would result in permanent impacts to non-sensitive plant communities (25.2 acres of nonnative grassland, 32.4 acres of nonnative woodland, and 244.9 acres of disturbed/developed)	NC-1 – Riparian/Riverine Habitat Protection (applies to the Freeway Tunnel Alternative): Environmentally Sensitive Area (ESA) fencing or other marker will be installed around any riparian or riverine habitats to be preserved. No grading or fill activities or structures will be authorized in marked areas. NC-2 – Construction Plan (applies to the Freeway Tunnel Alternative): Nonsensitive upland habitat areas will be designated for equipment maintenance, staging, fueling, and other related activities. NC-3 – Compliance Monitoring (applies to the Freeway Tunnel Alternative): The Construction Contractor will be required to have a qualified biologist monitor during construction in the vicinity of riparian and riverine areas. WQ-1 – National Pollutant Discharge Elimination: Compliance with the provisions of the NPDES General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Construction General Permit) Order No. 2009-0009-DWQ. IS-1 – Weed Abatement Program

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative (disturbed/developed)	Avoidance, Minimization, and Mitigation Measures
Wetlands and Other Waters	No temporary or permanent impacts to wetlands and other resources	No temporary or permanent impacts to wetlands or other waters.	No temporary or permanent impacts to wetlands or other waters.	No temporary or permanent impacts to wetlands or other waters.	- The single-bore design variation would result in approximately 0.02 acre of temporary impacts to non-wetland waters under United States Army Corps of Engineers, California Department of Fish and Wildlife, and Regional Water Quality Control Board jurisdiction. - The dual-bore design variation would result in approximately 0.2 acre of temporary impacts to non-wetland waters under United States Army Corps of Engineers, California Department of Fish and Wildlife, and Regional Water Quality Control Board jurisdiction. - The single-bore design variation would result in approximately 0.06 acre of permanent non-wetland water impacts under United States Army Corps of Engineers, California Department of Fish and Wildlife, and Regional Water Quality Control Board jurisdiction to the Laguna Channel - The dual-bore design variation would result in approximately 0.5 acre of permanent non-wetland water impacts under United States Army Corps of Engineers, California Department of Fish and Wildlife, and Regional Water Quality Control Board jurisdiction to the Laguna Channel - The permanent impacts on the Laguna Channel would not impact the Arroyo Seco.	WET-1: Obtain United States Army Corps of Engineers Section 404 Dredge and Fill Permit WET-2: Obtain CDFW Streambed Alteration Agreement WET-3: Obtain RWQCB Section 401 Water Quality Certification WET-1 – Obtain United States Army Corps of Engineers Section 404 Dredge and Fill Permit WET-2 – Obtain CDFW Streambed Alteration Agreement (applies to the Freeway Tunnel Alternative) WET-3 – Obtain RWQCB Section 401 Water Quality Certification (applies to the Freeway Tunnel Alternative) NC-1: Riparian/Riverine Habitat Protection NC-2: Construction Plan NC-3: Compliance Monitoring WQ-1: National Pollutant Discharge Elimination WQ-2: Dewatering WQ-3: Groundwater Monitoring WQ-4: Improvements in State-Owned ROW WQ-5: Improvements Outside State-Owned ROW WQ-6: Improvements in State-Owned ROW IS-1: Weed Abatement Program
Plant Species	No temporary or permanent impacts to plant species	No temporary or permanent direct or indirect impacts to plant species (Parish's gooseberry, slender mariposa-illy, and Coulter's goldfields)	No temporary direct or indirect impacts to plant species (Parish's gooseberry, slender mariposa-illy, and Coulter's goldfields) The BRT Alternative would potentially result in removal of approximately 136 trees protected by local tree ordinances.	- No temporary or permanent direct or indirect impacts to plant species (Parish's gooseberry, slender mariposa-illy, and Coulter's goldfields) - Temporary impacts to approximately 8 trees within the State right of way not protected by a local ordinance - Temporary indirect impacts and exacerbate existing indirect permanent edge effects on a Coulter's goldfields population within approximately 250 feet of the permanent impact area for the LRT Alternative - Removal of approximately 21 trees protected by various local tree ordinances	- No temporary or permanent direct or indirect impacts to plant species (Parish's gooseberry, slender mariposa-illy, and Coulter's goldfields) - Temporary impacts to approximately 36 trees in the City of Pasadena that are protected by the City's Trees and Tree Protection Ordinance - Potential permanent impacts to the Coulter's goldfields within the permanent impact area of the single-bore and dual-bore design variations - Potential permanent impacts to a Southern California black walnut tree that is approximately 4 feet outside the permanent impact area for the Freeway	PS-1 – Coulter's Goldfields (applies to the LRT Alternative): Should the LRT Alternative be selected and documentation of the planting efforts of the population of Coulter's goldfields in the Biological Study Area (BSA) be unavailable, effects of the LRT Alternative on the Coulter's goldfields population will be addressed. PS-2 – Coulter's Goldfields (applies to the Freeway Tunnel Alternative): Should the Freeway Tunnel Alternative be selected and documentation of the planting efforts of the population of Coulter's goldfields in the BSA be unavailable, the effects of the Freeway

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Animal Species	No temporary or permanent impacts to threatened and endangered species	- Temporary and permanent adverse impacts to the disturbed/developed community, which may contain suitable habitat for the San Bernardino ring-necked snake - Indirect temporary impacts to foraging bats may occur from noise, lighting, vibration, dust, etc. if nighttime construction activities take place - Temporary indirect impacts through habitat loss if special-status bats begin using bridges (including the Garfield Avenue Bridge) proposed for demolition or widening as roosting habitat - Temporary and permanent impacts to a limited amount of nonnative grasslands that may support monarch butterfly breeding, and is suitable habitat for western spadefoot toad and San Bernardino ring-necked snake	- Temporary and permanent adverse impacts to the disturbed/developed community, which may contain suitable habitat for the San Bernardino ring-necked snake - Indirect temporary impacts to foraging bats may occur from noise, lighting, vibration, dust, etc. if nighttime construction activities take place - Permanent impacts to a limited amount of nonnative grasslands that may support monarch butterfly breeding, and is suitable habitat for western Spadefoot toad and San Bernardino ring-necked snake	- Temporary and permanent adverse impacts to the disturbed/developed community, which may contain suitable habitat for the San Bernardino ring-necked snake - Indirect temporary and permanent impacts to foraging bats may occur from noise, lighting, vibration, dust, etc. if nighttime construction activities take place - Indirect temporary impacts to riparian obligate bird species as a result of the proximity of potential nonbreeding habitat in the riparian areas due to project construction activities - Temporary impacts through habitat loss if special-status species bat populations begin using bridges proposed for removal as roosting habitat - Temporary and permanent impacts to nonnative woodlands that may contain eucalyptus trees with winter roosting aggregations of adult monarch butterflies	- Tunnel Alternative - The single-bore and dual-bore design variations would result in removal of approximately 84 trees protected by local tree ordinances	- Tunnel Alternative on the Coulter's goldfields population will be addressed. PS-3 – Southern California Black Walnut (Applies to the Freeway Tunnel Alternative): Implement measures to address the project effects on the Southern California black walnut PS-4 – Trees Protected by City and/or County Ordinances: Avoid/minimize impacts to trees where feasible. If not feasible, obtain appropriate tree removal permits. AS-1 – Bats: Due to the presence of marginally suitable roosting habitat, avoidance and minimization efforts will be implemented. AS-2 – Monarch Butterfly: Avoidance and minimization measures in areas of potentially suitable habitat for winter roosting aggregations of monarch butterfly and the species' egg, caterpillar, and pupal stages will be implemented AS-3 – Amphibians and Reptiles: Avoidance and minimization measures in areas of potentially suitable habitat for coast range newt, western spadefoot, two-striped garter snake, western pond turtle, San Bernardino ring-necked snake, and South Coast garter snake species will be implemented. AS-4 – Other Special-Status Bird Avoidance and Minimization Measures: Avoidance and minimization efforts for birds protected under California Fish and Game Code Sections 3503 and 3503.5, and the Migratory Bird Treaty Act (MBTA) will be implemented.
Threatened and Endangered Species	No temporary impacts to threatened and endangered species	Potential temporary indirect impacts through habitat loss to Townsend's big-eared bats if they are discovered using bridges proposed for widening as roosting habitat and indirect temporary impacts to foraging bats may occur from if nighttime construction activities take place.	Determined to have no direct or indirect temporary impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	Potential impacts are limited indirect temporary impacts to listed riparian obligate bird species as a result of the proximity of potential nonbreeding habitat in the riparian areas due to project construction activities	Potential impacts are limited indirect temporary impacts to listed riparian obligate bird species as a result of the proximity of potential nonbreeding habitat in the riparian areas due to project construction activities	NC-1 – Riparian/Riverine Habitat Protection NC-2 – Construction Plan NC-3 – Compliance Monitoring AS-1 – Bats
	No permanent impacts to threatened and endangered species	Determined to have no direct or indirect permanent impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	Determined to have no direct or indirect permanent impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	Determined to have no direct or indirect permanent impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	Determined to have no direct or indirect permanent impacts on federally listed threatened or endangered species, to not result in take of State-listed threatened or endangered species, and to have a preliminary no effect on threatened and endangered species.	No avoidance, minimization, and/or mitigation measures are required.

TABLE 2.15:
Summary of Alternatives and Impacts

Project Description and Environmental Topics	No Build Alternative	TSM/TDM Alternative	BRT Alternative	LRT Alternative	Freeway Tunnel Alternative	Avoidance, Minimization, and Mitigation Measures
Invasive Species	No impacts to invasive species	Potentially result in the spread of permanent invasive species through construction activities.	Potentially result in the permanent spread of invasive species through construction activities.	Potentially result in the permanent spread of invasive species through construction activities.	Potentially result in the permanent spread of invasive species through construction activities.	The following measure is applicable to all four Build Alternatives: • IS-1: Weed Abatement Program
Cumulative Impacts	The No Build Alternative does not include any of the improvements in the SR 710 North Study Build Alternatives and, therefore, would not result in the cumulative impacts related to visual/aesthetics and animal species that could occur under the Build Alternatives.	Visual/Aesthetics: No cumulative impact. Animal Species: Potential to contribute to a cumulative impact on nesting or breeding birds under the MBTA.	Visual/Aesthetics: No cumulative impact. Animal Species: Potential to contribute to a cumulative impact on nesting or breeding birds under the MBTA.	Visual/Aesthetics: Potential to contribute to an cumulative impact for the Eastside Phase II Transit Corridor Project. Animal Species: Potential to contribute to a cumulative impact on nesting or breeding birds under the MBTA.	Visual/Aesthetics: No cumulative impact. Animal Species: Potential to contribute to a cumulative impact on nesting or breeding birds under the MBTA.	No measures beyond the project-specific measures listed above.

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