## 4.6 Climate Change

This section summarizes the existing climate and greenhouse gas (GHG) conditions in the project area, and the potential impacts of the proposed alternatives, including the Locally Preferred Alternative (LPA), on these conditions. The information in this section is based on the Climate Change Technical Memorandum, which is incorporated into this EIS/EIR as Appendix R.

This section has been updated since publication of the Draft EIS/EIR based on refinements to the LPA. A vertical line in the margin is used to show where revisions have occurred to this section since publication of the Draft EIS/EIR, excluding minor edits for consistency and correction of formatting and minor typographical errors.

Minor changes were made to the numerical values stated in this section since publication of the Draft EIS/EIR. Average weekday values were calculated in the Draft EIS/EIR for vehicle miles traveled (VMT) and other measures based on VMT. In order to report annual values for VMT in the Draft EIS/EIR, a multiplier (annualization factor) was used to convert the daily values. This annualization factor has been updated for this Final EIS/EIR to maintain consistency with other Metro projects, and has caused annual VMT and other annualized measures based on VMT to change slightly. No changes to the NEPA impact findings or CEQA impact determinations were identified as a result of these minor revisions.

The analysis of climate change impacts associated with the LPA is discussed in Section 4.6.3.

### 4.6.1 Regulatory Framework

NEPA does not include specific requirements for analysis of potential impacts related to global climate change (GCC), and a specific quantitative threshold of significance was not established for this project. Incremental project emissions were determined for motor vehicles and project electricity use based on the change in VMT between each build alternative and the No Build Alternative. A year 2035 scenario is analyzed in this section, and a year 2010 scenario is analyzed in Chapter 10 of this Final EIS/EIR. Changes in motor vehicle VMT were determined by the project traffic analysis for each alternative and include the potential project impacts for automobile and bus transit VMT and operation of light rail trains and new stations.

CEQA guidance provided by the South Coast Air Quality Management District (SCAQMD) and the California Natural Resources Agency requires examination of direct, indirect, and life-cycle emissions that would occur during project construction and operation. Significant impacts would occur if a project would exceed emissions thresholds determined by the lead agency or other applicable adopted state, regional, or local plan for the reduction or mitigation of GHG emissions. CEQA guidelines require quantification of GHG emissions over time in a specified geographic area, establishment of a significance threshold for cumulative contributions to climate change, analysis of GHG emissions as they pertain to specific project actions, and specification and monitoring of any mitigation measures needed to achieve specified emissions levels.

In addition, the following regulations and standards apply to the climate change analysis for the Regional Connector project:

- Federal
  - Massachusetts et al. v. Environmental Protection Agency et al.
  - Mandatory GHG Reporting Rule (U.S. Environmental Protection Agency (USEPA))
  - Endangerment Finding (USEPA)
  - American Clean Energy and Security Act of 2009
  - Clean Energy Jobs and American Power Act
- State
  - California Assembly Bill 1493
  - California Executive Order S-3-05
  - Global Warming Solutions Act of 2006 (Assembly Bill 32)
  - Senate Bill 97
  - California Air Resources Board (CARB) Interim Significance Thresholds
  - Senate Bill 375
- Local
  - SCAQMD Guidelines and Regulations

### 4.6.2 Affected Environment

As required by CEQA, existing (2009) emissions from regional traffic were estimated in the analysis to compare against future build alternatives, including the LPA. Data on VMT in the region and emission factors from the EMFAC2007 model were used to estimate emissions of GHG. The emissions calculations were based on the total VMT in the region and the average speed on the highway network. Since the EMFAC model only generates emissions of carbon dioxide ($CO_2$) and methane ($CH_4$), the California Climate Action Registry (CCAR) General Reporting Protocol was used to estimate emissions of nitrous oxide ($N_2O$). Table 4.6-1 summarizes the results of the baseline GHG emissions.

Table 4.6-1. Existing Conditions: 2009 Annual Highway Traffic GHG Emissions

| | $CO_2$ | $CH_4$ | $N_2O$ | Total[2] |
|---|---|---|---|---|
| Annual Vehicle Miles Traveled (VMT) | N/A | N/A | N/A | 96,739,543,200 |
| Emission Factor (grams per mile) | 365.210 | 0.028 | 0.173 | N/A |
| Emissions (metric tons per year) | 35,330,200 | 2,700 | 16,700 | N/A |
| GWP | 1 | 21 | 310 | N/A |
| $CO_2e$ Emissions[1] (metric tons per year) | 35,330,200 | 56,700 | 5,177,000 | 40,563,900 |

*Key:*
*$CO_2$ = carbon dioxide*
*$CO_2e$ = carbon dioxide equivalent*
*$CH_4$ = methane*
*GWP = Global Warming Potential*
*N/A = not applicable*
*$N_2O$ = nitrous oxide*
*Notes:*
[1] *$CO_2e$ emissions are weighted by the global warming potential (GWP) for each non-$CO_2$ pollutant (i.e., $CO_2e$ equals emissions of non-$CO_2$ pollutant x GWP)*
[2] *Totals may vary due to rounding*

## 4.6.3 Environmental Impacts/Environmental Consequences

The impact conclusions for all of the alternatives are based on the methodologies above in Section 4.6.1, and in Appendix R, Climate Change Technical Memorandum. Although thresholds of significance for GHG emissions are not well-established, methodologies and protocols for analyzing GHG emissions have been extensively documented and were used in this analysis. The analysis used protocols established by the CCAR, namely the General Reporting Protocol (CCAR 2009) and the Local Government Operations Protocol (CCAR 2008). Generally, GHG impact analyses follow the same quantification methodologies as air quality studies for criteria pollutants.

GHG emissions were calculated for direct and indirect sources of GHG, including engine exhaust and purchased electricity. Emissions were estimated for three GHG pollutants regulated under the Kyoto Protocol: $CO_2$, $CH_4$, and $N_2O$. Although the Kyoto Protocol also regulated three other GHG pollutants (hydrofluorocarbons [HFCs], perfluorocarbons [PFCs], and sulfur hexafluoride [$SF_6$]), these pollutants are not emitted as products of engine exhaust or purchased electricity and are not analyzed further herein. Emissions were converted to carbon dioxide equivalent ($CO_2e$) using the Global Warming Potentials (GWPs) in the United Nations Intergovernmental Panel on Climate Change's (IPCC's) Second Assessment Report (SAR) and documented in the Inventory of U.S. Greenhouse Gas Emissions and Sinks (USEPA 2009b).

GWPs are defined by CARB as the radiative forcing impact (degree of warming to the atmosphere) of one mass-based unit of a given GHG relative to an equivalent unit of $CO_2$. For example, one ton of $CH_4$ is equivalent to approximately 21 tons of $CO_2$ in the atmosphere. Although the IPCC has released several updates to the SAR since its release in 1996, the

international standard is to use the original SAR to maintain consistency with GHG emission inventories already compiled.

The construction analysis followed the SCAQMD's recommendation that construction emissions be amortized over 30 years (defined as life of a project) and added to the operational emissions.

Potential emissions of $CO_2$, $CH_4$, and $N_2O$ from construction equipment (e.g., bulldozers, scrapers, graders, off-highway trucks, etc.) were calculated using the OFFROAD model, developed by CARB, for off-road engine exhaust emissions. Potential emissions of $CO_2$ and $CH_4$ were calculated using the EMission FACtors (EMFAC) model for on-road vehicles, and includes construction worker trips to the construction site, on-road haulage trucks, material delivery trucks, and equipment maintenance vehicles. The EMFAC model is used to calculate emission rates from on-road motor vehicles in California. It is similar to the USEPA's MOVES2010 model but uses a fleet mix and assumptions specific to California. Although $N_2O$ emissions would also occur from the operation of on-road vehicles, the EMFAC model does not currently estimate these emissions. Additionally, appropriate sources of GHG emissions were reviewed as part of this analysis to supplement the EMFAC model, as necessary.

The operational emissions analysis took into account engine exhaust emissions, which were calculated to quantify predicted reductions in VMT in the region; emissions resulting from the remote generation of electricity to run the light rail vehicles and to power the facilities at the new stations; and emissions generated by bus operations.

#### 4.6.3.1 No Build Alternative

The No Build Alternative would not involve any new transit infrastructure as part of the Regional Connector project. No construction emissions would occur, and operational emissions would not increase as part of the project. All of the increase in GHG emissions beyond the existing year 2009 conditions shown in Table 4.6-1 would be due to the projected growth in regional traffic between 2009 and 2035. Table 4.6-2 summarizes the year 2035 No Build Alternative highway traffic GHG emissions. More detailed data is available in Appendix R, Climate Change Technical Memorandum, and Section 4.5, Air Quality.

##### *4.6.3.1.1 NEPA Finding*

The No Build Alternative describes a future condition where none of the build alternatives are implemented. As such, there would be no adverse climate change effect associated with the No Build Alternative. However, the No Build Alternative lacks the beneficial greenhouse gas reductions that the build alternatives, including the LPA, would provide.

##### *4.6.3.1.2 CEQA Determination*

There would be no climate change impact associated with the No Build Alternative. However, the No Build Alternative lacks the beneficial greenhouse gas reductions that the build alternatives, including the LPA, would provide.

Table 4.6-2. No Build Alternative 2035 Annual Highway Traffic GHG Emissions

| | $CO_2$ | $CH_4$ | $N_2O$ | Total[2] |
|---|---|---|---|---|
| Annual Vehicle Miles Traveled (VMT) | N/A | N/A | N/A | 160,473,166,800 |
| Emission Factor (grams per mile) | 578.319 | 0.015 | 0.173 | N/A |
| Emissions (metric tons per year) | 92,804,700 | 2,400 | 27,700 | N/A |
| GWP | 1 | 21 | 310 | N/A |
| $CO_2e$ Emissions[1] (metric tons per year) | 92,804,700 | 50,400 | 8,587,000 | 101,442,100 |
| Increment (compared to Existing Conditions [2009]) (metric tons per year) | 57,474,500 | (6,300) | 3,410,000 | 60,878,200 |

*Key:*
*$CO_2$ = carbon dioxide*
*$CO_2e$ = carbon dioxide equivalent*
*$CH_4$ = methane*
*GWP = Global Warming Potential*
*N/A = not applicable*
*$N_2O$ = nitrous oxide*
*Notes:*
*[1] $CO_2e$ emissions are weighted by the global warming potential (GWP) for each non-$CO_2$ pollutant (i.e., $CO_2e$ equals emissions of non-$CO_2$ pollutant x GWP)*
*[2] Totals may vary due to rounding*

### 4.6.3.2 TSM Alternative

The TSM Alternative includes all of the provisions of the No Build Alternative, plus two new shuttle bus lines linking 7th Street/Metro Center Station and Union Station. Only minimal construction activities would be needed, such as the installation of bus stops, and no construction-related emissions are anticipated. The TSM Alternative would result in a slight increase in $CH_4$ due to the increase in compressed natural gas (CNG) bus operations. However, combined with the reduction in $CO_2$ emissions caused by the resulting decrease in regional traffic, there would be a net climate change benefit. The operational emissions benefits associated with the TSM Alternative are summarized in Table 4.6-3.

#### *4.6.3.2.1 NEPA Finding*

The TSM Alternative would result in a regional decrease in GHG emissions compared to the No Build Alternative, though not to the extent that the build alternatives would, including the LPA. This would be a beneficial effect. The TSM Alternative would not have an adverse effect on climate change.

#### *4.6.3.2.2 CEQA Determination*

The TSM Alternative would result in a regional decrease in GHG emissions compared to the No Build Alternative, though not to the extent that the build alternatives would, including the LPA. This would be a beneficial impact. The TSM Alternative would not have a significant adverse impact on climate change.

**Table 4.6-3. Summary of Incremental GHG Emissions (Operational and Construction) Compared to the No Build Alternative (2035)**

| Alternative | Annual $CO_2e$ Emissions (metric tons per year) | | |
|---|---|---|---|
| | Construction[1] | Operations[2] | Amortized Total[3] |
| TSM Alternative | NA | (51,400) | (51,400) |
| At-Grade Emphasis LRT Alternative | 2,500 | (59,400) | (56,900) |
| Underground Emphasis LRT Alternative[4] | 3,300-3,400 | (61,600) | (58,200-58,300) |
| Locally Preferred Alternative[4] | 3,800-3,900 | (63,400) | (59,500-59,600) |

*Key:*
*NA = not applicable*
*Notes:*
*[1] Construction emissions include total emissions that would occur over the life of the construction phase (2014-2017) amortized over 30 years.*
*[2] Incremental project-related operational emissions (i.e., increment between future build alternative and No Build Alternative).*
*[3] Amortized construction emissions added to incremental operational emissions. Totals may vary slightly due to rounding.*
*[4] A range of amortized construction emissions for the Underground Emphasis LRT Alternative and LPA is shown to account for slight variations due to multiple station location and construction method options.*

### 4.6.3.3 Build Alternatives (including the Locally Preferred Alternative)

The build alternatives, including the LPA, would involve construction and operation of a new light rail link between 7th Street/Metro Center Station and the Little Tokyo/Arts District area. This would entail new emissions associated with train operation, powering station facilities, and powering train and system control systems. For each alternative, the regional reduction in GHG emissions due to traffic congestion relief is greater than the new emissions associated with construction activities and operation of the LRT trains and new facilities. All of the build alternatives, including the LPA, result in an overall reduction in GHG emissions. Table 4.6-3 shows the construction, operations, and amortized total emissions for each alternative. More detailed data is available in Appendix R, Climate Change Technical Memorandum, and Section 4.5, Air Quality.

#### *4.6.3.3.1 NEPA Finding*

The At-Grade Emphasis LRT Alternative, Underground Emphasis LRT Alternative, and LPA would result in a regional decrease in GHG emissions compared to the No Build Alternative. This would be a beneficial effect. No adverse climate change effects would occur as a result of implementation of any of these alternatives.

#### *4.6.3.3.2 CEQA Determination*

The At-Grade Emphasis LRT Alternative, Underground Emphasis LRT Alternative, and LPA would result in a regional decrease in GHG emissions compared to the No Build Alternative. This would be a beneficial impact. No significant adverse climate change impacts would occur as a result of any of these alternatives.

### 4.6.4 Mitigation Measures

None of the proposed build alternatives, including the LPA, would have adverse climate change impacts. No mitigation measures are required.