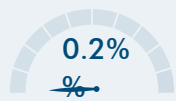


T-19-B. Construct or Improve Bike Boulevard



GHG Mitigation Potential



Up to 0.2% of GHG emissions from vehicles on roadway

Co-Benefits (icon key on pg. 34)



Climate Resilience

Constructing and improving bike boulevards can incentivize more bicycle use and decrease vehicle use, which have health benefits and can thus improve community resilience. This can also improve connectivity between residents and resources that may be needed in an extreme weather event.

Health and Equity Considerations

Prioritize low-income and underserved areas and communities with lower rates of vehicle ownership or fewer transit options. Make sure that the bicycle boulevard connects to a larger existing bikeway network that accesses destinations visited by low-income or underserved communities.

Measure Description

Construct or improve a single bicycle boulevard that connects to a larger existing bikeway network. Bicycle boulevards are a designation within Class III Bikeway that create safe, low-stress connections for people biking and walking on streets. This encourages a mode shift from vehicles to bicycles, displacing VMT and thus reducing GHG emissions. A variation of this measure is provided as T-19-A, *Construct or Improve Bike Facility*, which is for Class I, II, or IV bicycle infrastructure.

Subsector

Neighborhood Design

Locational Context

Urban, suburban

Scale of Application

Plan/Community. This measure reduces VMT on the roadway segment parallel to the bicycle facility (i.e., the corridor). An adjustment factor is included in the formula to scale the VMT reduction from the corridor level to the plan/community level.

Implementation Requirements

The following roadway conditions must be met.

- Functional classification: local and collector if there is no more than a single general-purpose travel lane in each direction.
- Design speed: ≤ 25 miles per hour.
- Design volume $\leq 5,000$ average daily traffic.
- Treatments at major intersections: both directions have traffic signals (or an effective control device that prioritizes pedestrian and bicycle access such as rapid flashing beacons, pedestrian hybrid beacons, high-intensity activated crosswalks, TOUCANs), bike route signs, "sharrowed" roadway markings, and pedestrian crosswalks.

Cost Considerations

Capital and infrastructure costs for new bike boulevards may be high, though lower than implementing the same length of protected bicycle lanes (Class IV). After the bike boulevard is complete, the local municipality may achieve cost savings from reduced infrastructure and roadway maintenance costs.

Expanded Mitigation Options

Construct boulevards with forced turns for vehicles every few blocks to minimize through traffic while ensuring that speed and volume metrics are met. Implement alongside Measures T-22-A, T-22-B, and/or T-22-C to ensure that micromobility users can ride safely along bicycle lane facilities and not pedestrian infrastructure, which is a risk to pedestrian safety.





GHG Reduction Formula

$$A = B \times \frac{D \times (F - (C \times F))}{E \times G}$$

GHG Calculation Variables

ID	Variable	Value	Unit	Source
Output				
A	Percent reduction in GHG emissions from displaced vehicles on roadway with bicycle boulevard	0–0.2	%	calculated
User Inputs				
B	Percent of plan/community VMT on roadway to have bicycle boulevard	0–100	%	user input
Constants, Assumptions, and Available Defaults				
C	Bike mode adjustment factor	1.14	unitless	Schwartz 2021
D	Existing bicycle trip length for all trips in region	Table T-10.1	miles	FHWA 2017a
E	Existing vehicle trip length for all trips in region	Table T-10.1	miles	FHWA 2017a
F	Existing bicycle mode share for work trips in region	Table T-10.2	%	FHWA 2017a
G	Existing vehicle mode share for work trips in region	Table T-10.2	%	FHWA 2017a

Further explanation of key variables:

- (C) – The bike mode adjustment factor is based on a database of before/after bicycle counts for 10 projects in four U.S. cities that invested in bicycle boulevards. Bicycle ridership increased on average by 114 percent (Schwartz 2021).
- (D and E) – Ideally, the user will calculate bicycle and vehicle trip lengths for the corridor at a scale no larger than the surrounding census tract. Potential data sources include the U.S. Census, California Household Travel Survey (preferred), or local survey efforts. If the user is not able to provide a project-specific value using one of these data sources, they have the option to input regional average one-way bicycle and vehicle trip lengths for one of the six most populated CBSAs in California provided in Table T-10.1 in Appendix C (FHWA 2017a).
- (F and G) – Ideally, the user will calculate bicycle and auto mode share for work trips for a Project/Site at a scale no larger than a census tract. Potential data sources include the U.S. Census, California Household Travel Survey (preferred), or local survey efforts. If the user is not able to provide a project-specific value using one of these data sources, they have the option to input the regional average mode shares for bicycle and vehicle work trips for one of the six most populated CBSAs in California, as presented in Table T-10.2 in Appendix C (FHWA 2017b). If the project study area is not within the listed



CBSAs or the user is able to provide a project-specific value, the user should replace these regional defaults in the GHG reduction formula. For areas not covered by the listed CBSAs, which represent the denser areas of the state, bicycle mode share is likely to be lower and vehicle share higher than presented in Table T-10.2.

GHG Calculation Caps or Maximums

Measure Maximum

(A_{max}) For projects that use CBSA data from Tables T-10.1 and T-10.2 in Appendix C, the maximum percent reduction in GHG emissions (A) is 0.2 percent. This is based on a neighborhood project the size of a large corridor (B = 100%) within the CBSA of San Jose-Sunnyvale-Santa Clara that uses the highest values for (C, D, and E) in Tables T-19.1 through T-19.3 and annual use days for Sacramento County (F) in Table T-19.4. This maximum scenario is presented in the below example quantification.

Subsector Maximum

($\sum A_{max_{T-18 \text{ through } T-22-C}} \leq 10\%$) This measure is in the Neighborhood Design subsector. This subcategory includes Measures T-18 through T-22-C. The VMT reduction from the combined implementation of all measures within this subsector is capped at 10 percent.

Example GHG Reduction Quantification

The user reduces VMT by providing a bicycle boulevard on the targeted roadway, which encourages bicycle trips in place of vehicle trips. In this example, it is assumed this main street makes up the entire plan area, i.e., (B) is 100 percent. The project is within San Jose-Sunnyvale-Santa Clara CBSA and the user does not have project-specific values for trip lengths and mode shares for bicycles and vehicles. Per Tables T-10.1 and T-10.2, inputs for these variables are 2.8 miles, 11.5 miles, 4.1 percent, and 86.6 percent, respectively (D, E, F, and G). GHG emissions from plan/community VMT would be reduced by 0.2 percent.

$$A = 100\% \times \frac{2.8 \text{ miles} \times (4.1\% - (1.14 \times 4.1\%))}{11.5 \text{ miles} \times 86.6\%} = -0.2\%$$

Quantified Co-Benefits



Improved Local Air Quality

The percent reduction in GHG emissions (A) would be the same as the percent reduction in NO_x, CO, NO₂, SO₂, and PM. Reductions in ROG emissions can be calculated by multiplying the percent reduction in GHG emissions (A) by an adjustment factor of 87 percent. See *Adjusting VMT Reductions to Emission Reductions* above for further discussion.



Energy and Fuel Savings

The percent reduction in vehicle fuel consumption would be the same as the percent reduction in GHG emissions (A).



VMT Reductions

The percent reduction in VMT would be the same as the percent reduction in GHG emissions (A).



Improved Public Health

Users are directed to the ITHIM (CARB et al. 2020). The ITHIM can quantify the annual change in health outcomes associated with active transportation, including deaths, years of life lost, years of living with disability, and incidence of community and individual disease.

Sources

- California Air Resources Board (CARB), California Department of Public Health (CDPH), and Nicholas Linesch Legacy Fund. 2020. Integrated Transport and Health Impact Model. Available: <https://skylab.cdph.ca.gov/HealthyMobilityOptionTool-ITHIM/#Home>. Accessed: September 17, 2021.
- Federal Highway Administration (FHWA). 2017a. *National Household Travel Survey–2017 Table Designer*. Travel Day PT by TRPTRANS by HH_CBSA. Available: <https://nhts.ornl.gov/>. Accessed: January 2021.
- Federal Highway Administration (FHWA). 2017b. *National Household Travel Survey–2017 Table Designer*. Workers by WRKTRANS by HH_CBSA. Available: <https://nhts.ornl.gov/>. Accessed: January 2021.
- Schwartz, S. 2021. *Planning for Stress Free Connections: Estimating VMT Reductions*. February.