# Wichita State University Environmental Finance Center Greenhouse Gas Emission Reduction Technical Analysis

**GHG Reduction Estimate Method**

Wichita State University Environmental Finance Center (EFC) staff evaluated three primary sources of data to inform the GHG Reduction Estimate Method –

* TranSystems Traffic Impact Study, developed in 2018
  + The Traffic Impact Study provided directional traffic trends including destination rate data.
* Goddard Bicycle and Pedestrian Plan
  + The Goddard Pedestrian and Bicycle Plan features two key surveys that were used to understand bicycle and pedestrian trends within the City’s current framework.
* Updated Traffic Counts at 3 major intersections, March 2024
  + Traffic counts were included in the 2018 TranSystems Traffic Study at multiple intersections. However, traffic data in 2018 is nearly obsolete as multiple development projects have been completed in Goddard in the last 5 years, increasing traffic to and from the city. City of Goddard staff updated traffic counts at three major intersections, two of which directly correlate to the proposed Bicycle and Pedestrian Bridge – 199th Street and US-54 and 183rd Street and US-54.

Additionally, EFC staff reviewed five[[1]](#footnote-2) studies evaluating the prevalence of walking and biking to assess rates of bicycling and walking based on purpose, time, and distance. This information, combined with traffic counts, destination rates, and the bicycle and pedestrian survey completed by Goddard residents, aided in determining the estimated rates of bicycling and walking in Goddard, KS. The estimated rates of bicycling and walking in Goddard were layered with mitigating factors such as weather, to ultimately determine a total number of trips reduced. The total number of trips reduced were multiplied by average travel distance and idling time at two major intersections.

To determine total vehicle miles reduced, average travel distance was established using four departure points within the Goddard community and the destinations identified in the TranSystems Traffic Impact Study. The four potential departure points are marked with a blue map flag in Figure 1. The distance between the departure points and each destination, marked with a green map flag in Figure 1 were averaged to establish an average travel distance for each destination included in the model.

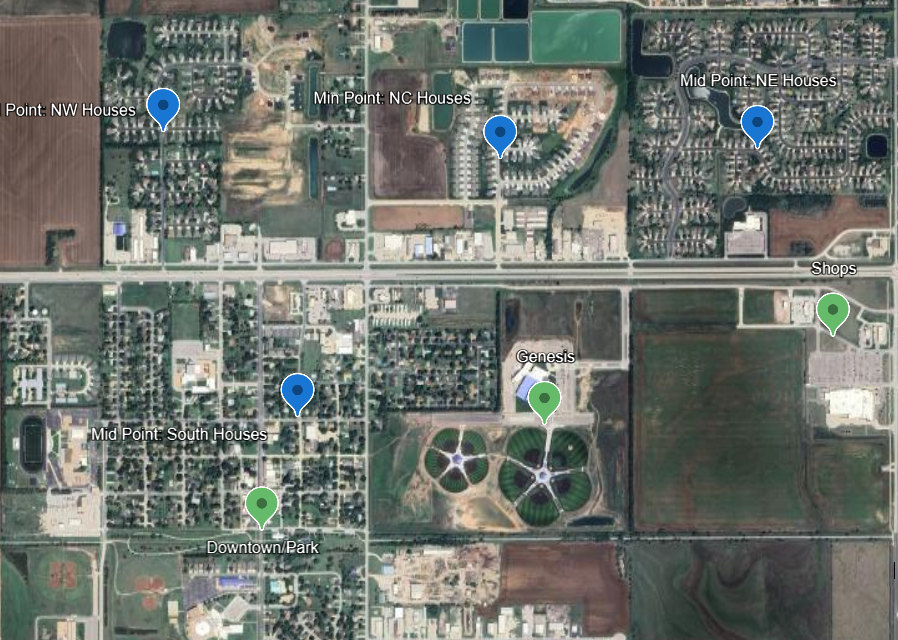
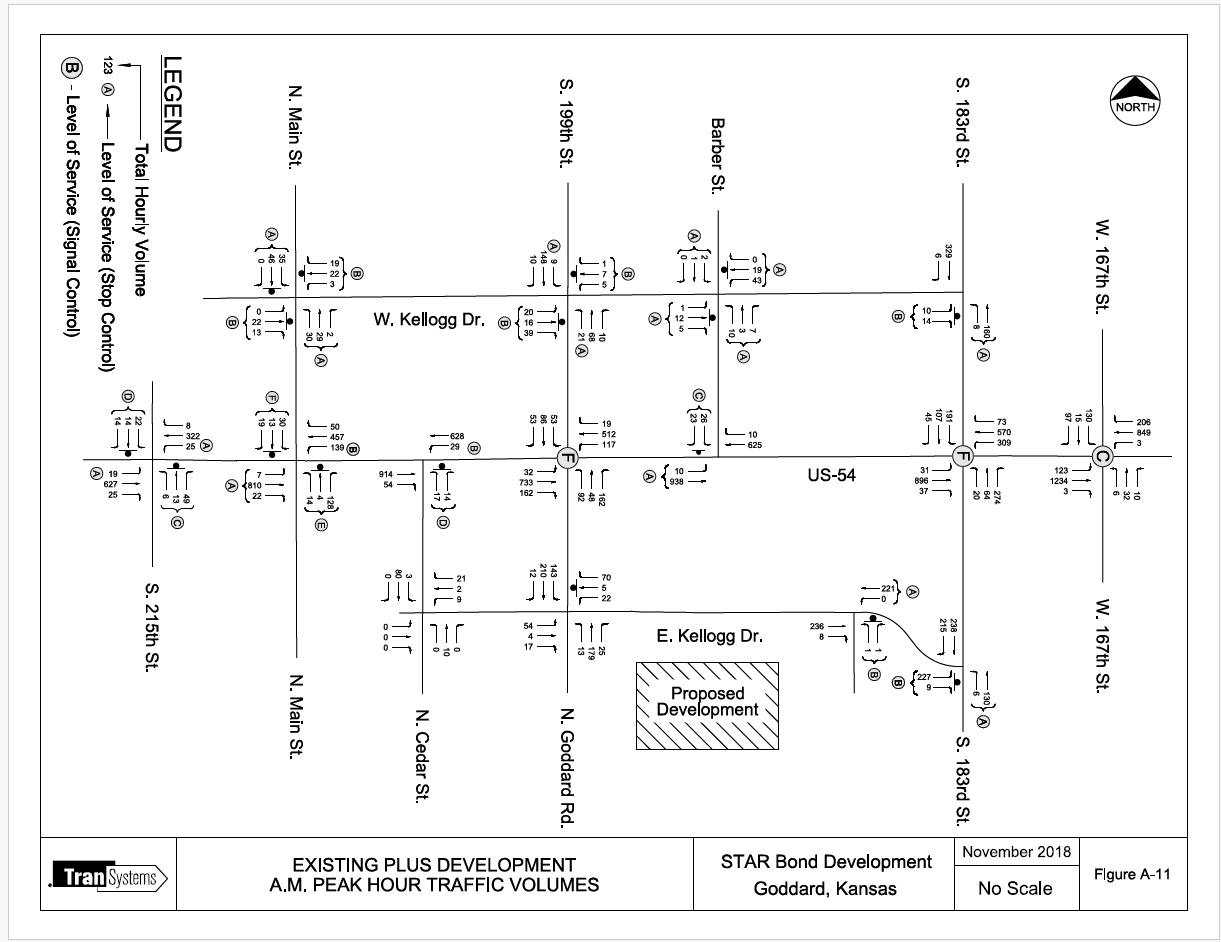


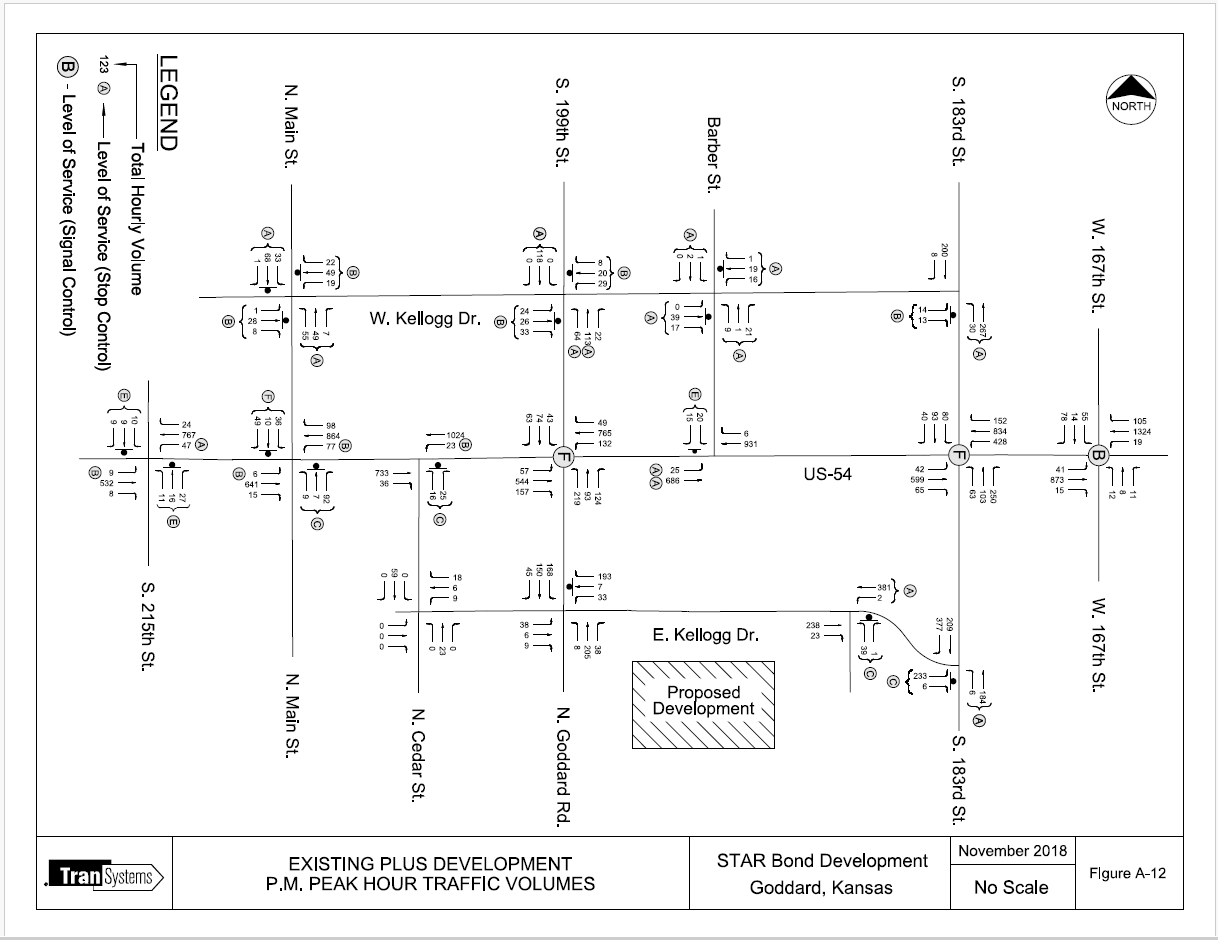
Figure 1

To determine idling emissions reduced, EFC staff used the average travel delay (in seconds) identified in the TranSystems Traffic Impact Study for each of the two major intersections which directly correlate to the proposed Bicycle and Pedestrian Bridge project and multiplied the travel delay by the total daily traffic counts based on the updated traffic counts provided by the City of Goddard.

Based on the destinations established by the TranSystems Traffic Study and the survey results in the Goddard Pedestrian and Bicycle Plan, staff determined traffic traveling south on 183rd Street across US-54, traffic traveling south on 199th across US-54, and traffic traveling north on 199th across US-54 could be reduced with the implementation of a Bicycle and Pedestrian Bridge. Current available data for traffic moving north on 183rd is not sufficient to determine potential traffic reduced by a Bicycle and Pedestrian Bridge and therefore was not included in the model. Staff determined traffic traveling south on 183rd across US-54 would be traveling to a supermarket, restaurants, a recreational facility, a hotel, and continuing south on 183rd beyond the Goddard community. It is unlikely Goddard residents would walk or bike to a hotel, therefore the rate of travel to the hotel and the rate of travel toward MacArthur were excluded from the traffic counts that could be reduced by a Bicycle and Pedestrian Bridge. The rates of travel to the supermarket, restaurants, and recreational facility were included in the potential trips reduced. Similarly, traffic traveling south on 199th Street across US-54 could also be traveling to the supermarket, restaurants, and recreational facility. Additionally, traffic traveling south on 199th across US-54 could also be traveling to the Goddard Library, Goddard Linear Park, and area neighborhoods. Lastly, staff determined traffic traveling north on 199th across US-54 could be traveling to area neighborhoods. Staff used the directional traffic volumes included in the TranSystems Traffic Impact Study to determine destination rates for all travel included in the model. Staff used the Goddard Pedestrian and Bicycle Plan to determine pedestrian and bicycle characteristics, including rates of walking and biking for enjoyment or travel, and why residents walk or bike for enjoyment or travel. Staff then applied the rate of walking and biking to appropriate traffic counts and further applied the rate of why residents walk or bike to the appropriate destination.

For example,





These factors ultimately informed the GHG Reduction Estimate.

**Models/Tools Used**

Wichita State University Environmental Finance Center staff developed a model for estimating GHG emission reductions as a result of the Bicycle and Pedestrian Bridge Project, see **GHG Emissions Reduction Spreadsheet** to review GHG Emission Reduction Calculations in a spreadsheet file. The spreadsheet includes the specific formulas, assumptions, and model inputs used to determine the estimated GHG emission reductions.

Staff used the Department of Energy (DOE) Office of Energy Efficiency and Renewable Energy’s idle fuel consumption rate[[2]](#footnote-3), developed by Argonne National Laboratory.

To meet the requirement for absolute reduction in metric tons of CO2 equivalent, staff used the Environmental Protection Agency (EPA) Greenhouse Gases Equivalencies Calculator[[3]](#footnote-4).

**Measure Implementation Assumptions**

Bicycle and Pedestrian Bridges facilitate walking and bicycling, which are forms of active transportation that reduce reliance on carbon-emitting vehicles. By providing safe and accessible pathways for pedestrians and cyclists, bridges can encourage more people to choose these modes of travel, thereby reducing the carbon footprint associated with car travel.

By promoting walking and cycling, shared-use bridges can help decrease the number of vehicles on the road, leading to lower emissions of greenhouse gases and other pollutants associated with combustion engines. This reduction in vehicle emissions contributes to mitigating climate change and improving air quality.

Shared-use bridges often connect neighborhoods, and commercial areas, promoting compact, mixed-use development patterns.

Encouraging walking and cycling through shared-use bridges not only reduces greenhouse gas emissions but also promotes physical activity and improves public health. Active transportation can help combat sedentary lifestyles, obesity, and related health issues, resulting in a healthier population overall.

Any green infrastructure included in the design of the ped bridge?

Bicycle and Pedestrian Bridges as a climate pollution reduction measure aligns with broader efforts to create more sustainable, resilient, and equitable urban environments.

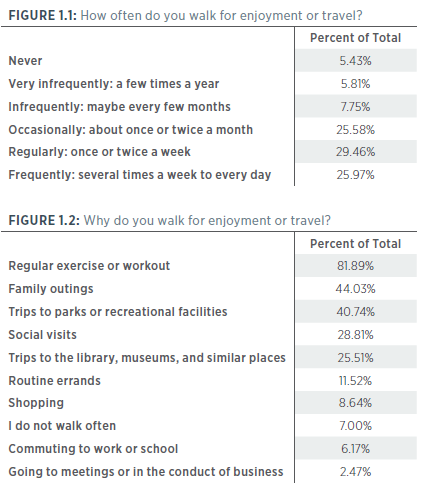
**GHG Reduction Estimate Assumptions**

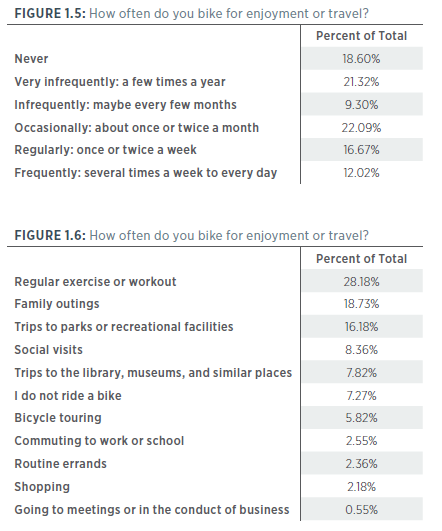
25.97% of Goddard residents frequently walk

8.6% of residents walk to go shopping

28.81% of residents walk for social visits (coffee shop/restaurants)

40.74% travel to parks or recreational facilities





**Equivalencies Calculation**

8,887 grams of CO2/gallon of gasoline = 8.887 × 10-3 metric tons CO2/gallon of gasoline

Idling Time Calculation

average consumption (Gallons/Second) x number of trips per year taken x number of cars crossing Kellogg x time

1. <https://onlinepubs.trb.org/onlinepubs/trnews/trnews280www.pdf>

   <https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burRail/bike/Documents/bikeplan1995.pdf>

   <https://data.bikeleague.org/show-your-data/national-data/rates-of-biking-and-walking/#biking-and-walking-by-trips-time-distance>

   <https://onlinepubs.trb.org/onlinepubs/trnews/trnews280www.pdf>

   <https://www.ksdot.gov/Assets/wwwksdotorg/bureaus/burRail/bike/Documents/bikeplan1995.pdf> [↑](#footnote-ref-2)
2. <https://www.energy.gov/eere/vehicles/fact-861-february-23-2015-idle-fuel-consumption-selected-gasoline-and-diesel-vehicles> [↑](#footnote-ref-3)
3. <https://www.epa.gov/energy/greenhouse-gases-equivalencies-calculator-calculations-and-references> [↑](#footnote-ref-4)