Reducing Emissions and Noise at Truck Bottlenecks:
Port of Houston Barbours Cut Terminal

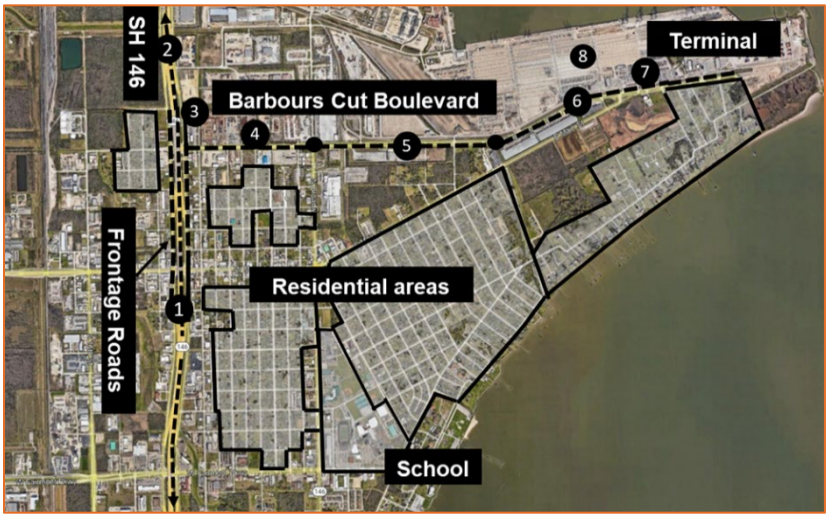
U.S. Department of Transportation
Federal Highway Administration

About the Research

The FHWA undertook research to provide information on strategies to address truck emissions and noise at truck freight bottlenecks, including major highway bottlenecks and intermodal connectors. The effects of hypothetical strategies, including infrastructure, operations, vehicle technology, and noise-specific measures, were modeled at three case study locations.

Area Overview

The Port of Houston Authority operates eight terminals along the Houston Ship Channel, including two container terminals. The Barbours Cut Container Terminal is located on Galveston Bay near the inlet to the Houston Ship Channel, approximately 30 miles east of central Houston. The terminal is accessed primarily via one local roadway (Barbours Cut Boulevard), which connects to State Highway 146.



Numbers show modeled links.
Aerial image source: Google Earth.

The terminal area is bordered by residential neighborhoods to the south, including schools and a senior living facility. Air quality has been identified as a concern locally and regionally (the Houston-Galveston-Brazoria region is in nonattainment for both 2008 and 2015 8-hour ozone standards). Noise also has been identified as a concern in some locations.

Overall Findings

Most trucks in this area serve local or regional destinations, so clean truck, drayage optimization strategies, and rail drayage could have significant emissions benefits.

Roadway infrastructure and traffic operations improvements showed little emissions benefit since local congestion was not significant.

Noise benefits of strategies affecting traffic flow were very small. Noise-specific measures can provide larger truck noise reductions.

A substantial share of emissions came from idling at gates or within-terminal operations, pointing to the benefits of terminal efficiency improvements.

Hypothetical Strategies Tested in Houston

Seven strategies were tested for emissions impacts (CO, VOC, NO_X, $PM_{2.5}$, PM_{10}, CO_2e, MSATs) and four strategies were tested for noise impacts in this case study. Note these are hypothetical strategies and results may vary by location and input assumptions.

New truck-only direct connector from route 146

Little difference in emissions or noise on 146 or local streets.

Lower route 146 speed to 55 mph

Very small impact on noise; slight increase in some emissions.

Retire and replace pre-2007 trucks

Reduces emissions of most air pollutant emissions by 20–60%, and greenhouse gas emissions by 4%, based on replacing 17% of study area trucks.

Electrify trucks

Reduces emissions up to 3% at 2030 projected market penetration levels (3–5%) and 7–21% at 2045 levels (20–45%).

Reduce idle time at terminal

Reduces study area emissions 6–9% based on 10% reduction in idling time.

Optimize port drayage

Reduces emissions of all pollutants in the range of 9–13%.

Create buffer zones or plant vegetation

Creating a 100-foot buffer zone, or planting an existing 100-foot zone with trees, reduces noise by 3–4 decibels.

Implement rail drayage between terminals

Reduces emissions of all pollutants from trucks in the range of 8–20%.

Methodology and Key Assumptions

- Emissions and noise from on-road vehicles (cars, trucks, buses) were modeled using the U.S. EPA MOVES3 model (7–8 a.m. and 4–5 p.m. weekday traffic) and FHWA Traffic Noise Model v3.0 or v3.1 (12–1 p.m. weekday traffic). Rail emissions and noise are not included.
- Baseline traffic volume and speed data were taken from the FHWA Database for Analysis of Noise and Air Quality (DANA) and Texas Department of Transportation. Changes in vehicle activity are based on a variety of assumptions documented in the project report.
- The hypothetical strategies have not been evaluated for feasibility, costs, or other benefits or impacts. Nothing in this case study should be construed as a recommendation.