

TXDOT HOUSTON DISTRICT TRUCK MOBILITY STUDY

REGIONAL GATEWAYS AND PORT HOUSTON

Executive Summary



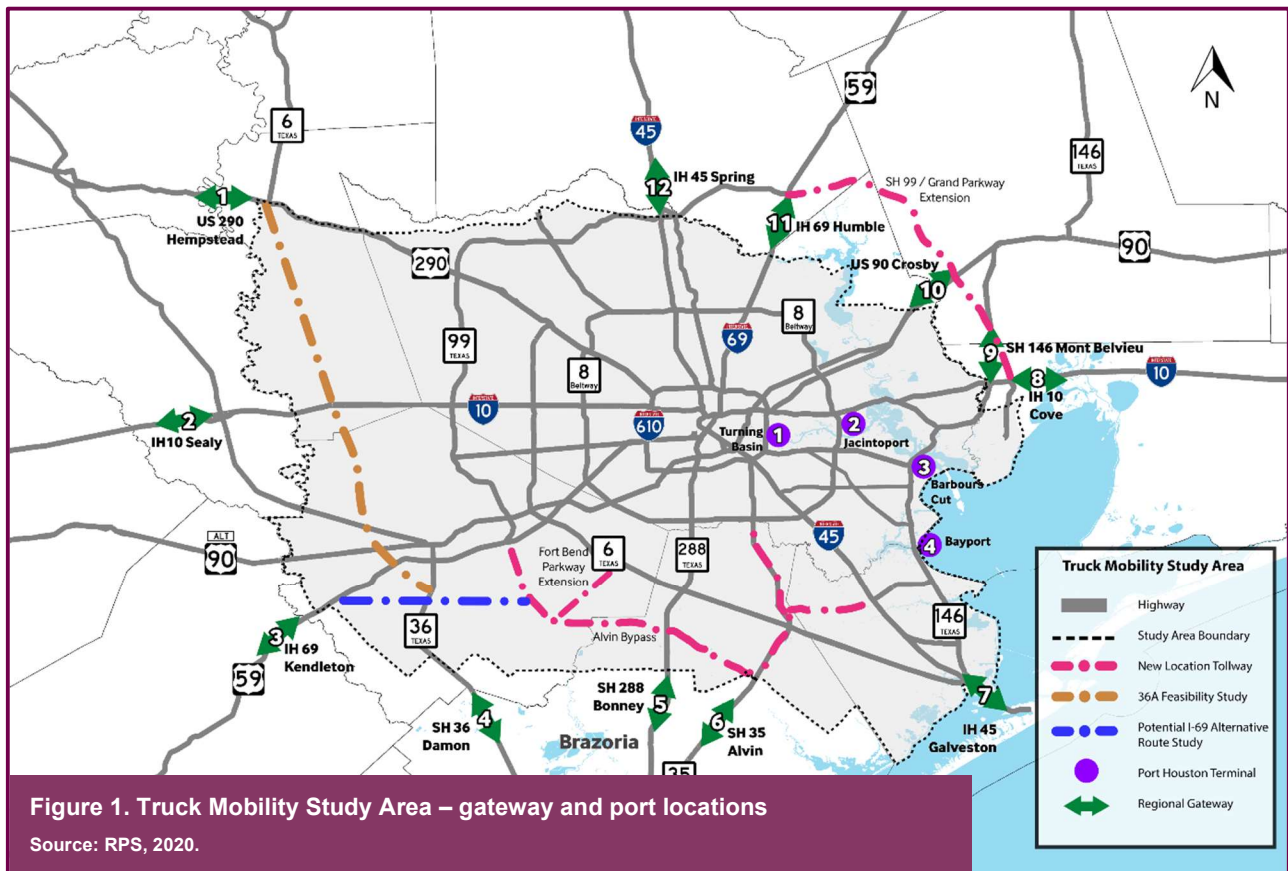
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Study Overview

While heavy truck activity levels on major highways are regularly summarized and documented by TxDOT, trucks traversal patterns in the Greater Houston region have not been studied frequently or comprehensively. The TXDOT Houston District Truck Mobility Study begins to address this gap in knowledge by compiling multiple data sources to characterize long-haul truck activity and mobility between regional gateways and major Port Houston terminals.

The data collection scope for this study included summary of origin/destination (OD) activity, forecasted traffic congestion, and historical crash rates related to heavy truck travel between 12 regional freeway gateways and four Port Houston container terminal locations. Key locations are shown in **Figure 1** and listed on the following page. These gateway and port locations frame a study area containing multiple counties, including all of Harris and Fort Bend and portions of Waller, Brazoria, Galveston, and Chambers. Supplemental to the data collection, several plans and studies related to regional and statewide freight mobility were also reviewed, including the Texas Freight Mobility Plan (TxDOT, 2017), Ports Area Mobility Study (H-GAC, 2020), 2040 Regional Transportation Plan (H-GAC, 2016), Regional Goods Movement Plan (H-GAC, 2013), and the SH 36A Rail Development Corridor Business Plan (Port Freeport, 2015).



Gateways:

- US 290, near Hempstead
- IH 10, near Sealy
- IH 69 near Kendleton
- SH 35 near Damon
- SH 228 near Bonney
- SH 36 near Alvin
- IH 45 near Galveston
- IH 10 near Cove
- SH 46 near Mont Belvieu

- US 90 near Crosby
- IH 69 near Humble
- IH 45 near Spring

Port Terminals:

- Turning Basin Terminal
- Jacintoport/Care Terminal
- Barbours Cut Container Terminal
- Bayport Container Terminal

Data Collection and Analysis

Several data sources were compiled and analyzed to understand freight patterns and activity levels between the 12 regional gateways and four Port Houston container terminals; forecasted demand and congestion on major freight routes; and historical crash data, with emphasis on truck-to-automobile conflicts. Summary of the data and major findings are provided in the following sections.

Origin-Destination Analysis

Origin-destination (OD) analysis is conducted to understand the frequency and type of movements that occur between various start and end points in a region. In the past decade, large-scale empirical data sources for OD analysis have become available due to the rise in GPS navigation systems and ubiquity of smart devices. For this study, commercial truck OD data was compiled from two independent “big data” sources: (1) StreetLight Data, which provides anonymized smart device location data, and (2) truck travel logs from the American Transportation Research Institute, collected by in-vehicle fleet management software.

Using the “big data” OD patterns and existing traffic data from the TXDOT Traffic Count Database System (TCDS), daily heavy truck trips¹ to/from the 12 regional freeway gateways and four Port Houston container terminal locations were measured. Maps summarizing heavy truck OD activity levels were prepared for each gateway and terminal. As an example, **Figure 3** shows the daily OD patterns for heavy truck trips passing through the IH 45 gateway near Spring, which carries the most commercial vehicle traffic of any gateway.

The study findings indicate that most travel to/from a given gateway or port terminal starts/ends within the region, likely at warehousing/distribution centers. Though significant heavy truck activity was found to occur between IH 10 near Sealy and IH 10 near Cove and between the Turning Basin Terminal and IH 45 near Spring, trucks generally do not traverse the whole region between gateways or between port and gateway. In fact, 88% of all heavy truck trips that pass through a regional gateway have their origin or destination within the region. That is, only 12% of heavy truck trips completely traverse the study area, without stopping, in-route to another location outside the region. Additionally, 75 to 80% of all daily heavy truck trips coming in

¹ The data sources defined “heavy trucks” as class seven and above in the Federal Highway Administration vehicle classification system, which includes all articulated (tractor and trailer) trucks and single unit trucks with 4+ axels.

and out in the east Port Houston container terminals (Jacintoport/Cares, Barbour Cut, and Bayport) have their origin/destination within approximately 15 miles of those terminals. Heavy trucks are not generally traversing the region before entering or after exiting the east Port terminals.

Traffic Forecasts

In the next few decades, several factors will cause truck trips associated with Port Houston to more than double² – the Panama canal expansion, completed in 2016; the expansion of Port Houston, including increased gate capacity at Barbour Cut and new container yards at Bayport; growth in material imports to support of the booming Texas oil industry; and the growth of Houston as a warehousing and logistics hub for international trade. Additionally, general automobile traffic will steadily increase on regional freeways and arterials as the Houston region grows by more than 50% in the next 25 years, from 6.8 million people in 2018 to 10.7 million by 2045.³

Traffic forecasts were developed for major freight corridors within the study area using outputs from the 2040 H-GAC Regional Travel Demand model. The forecasts were used to develop roadway segment volume-to-capacity (v/c) ratios for existing (2017) and expected 2040 traffic conditions. Results indicate that, under 2040 peak hour conditions, v/c ratios would exceed 1.0 (i.e. vehicle demand would exceed capacity) on nearly all major freight routes within the SH 99 loop, excepting some segments of SH 6, BW 8, and IH 10 east, as well as local freight connectors such as Fairmont Parkway and Red Bluff Road.⁴

Crash Analysis

Crash data for the major freight corridors were extracted from the TxDOT Crash Record Information System (CRIS) for the five-year period from January 2013 to December 2017. Heat maps were used to identify locations with high concentrations of general traffic and commercial vehicle crashes. The highest crash concentrations occurred at freeway interchanges, including IH 10 / SH 99 west, IH 610 / IH 69 west, IH 610 / IH 45 south, and IH 45 / Nasa Bypass.

Segment-level crash rates were used to measure the relative safety of roadway segments using exposure data and historical crash trends. Total crash and fatal crash rates (all vehicle types) were calculated and compared to statewide averages for similar facilities. An additional measure was calculated to identify locations with a disproportionate occurrence of commercial vehicle crashes⁵. Each segment was then flagged if relevant safety improvements have been planned as part of the Regional Transportation Plan (RTP). The corridors that rank highly in one or more of the crash rate categories and are not addressed by RTP projects can be considered priorities for truck mobility and safety improvement planning.

² Ports Area Mobility Study (H-GAC, 2020), p. 4

³ 2045 Regional Transportation Plan (H-GAC, 2019), p. 4-1

⁴ A v/c ratio less than 0.85 generally indicates that adequate capacity is available and vehicles are not expected to experience significant queues and delays. Once the demand exceeds the capacity (a v/c ratio greater than 1.0), traffic flow is unstable and significant delay and queuing is expected.

⁵ Ratio of the percent of commercial vehicle crashes to the percent of commercial vehicle volume.

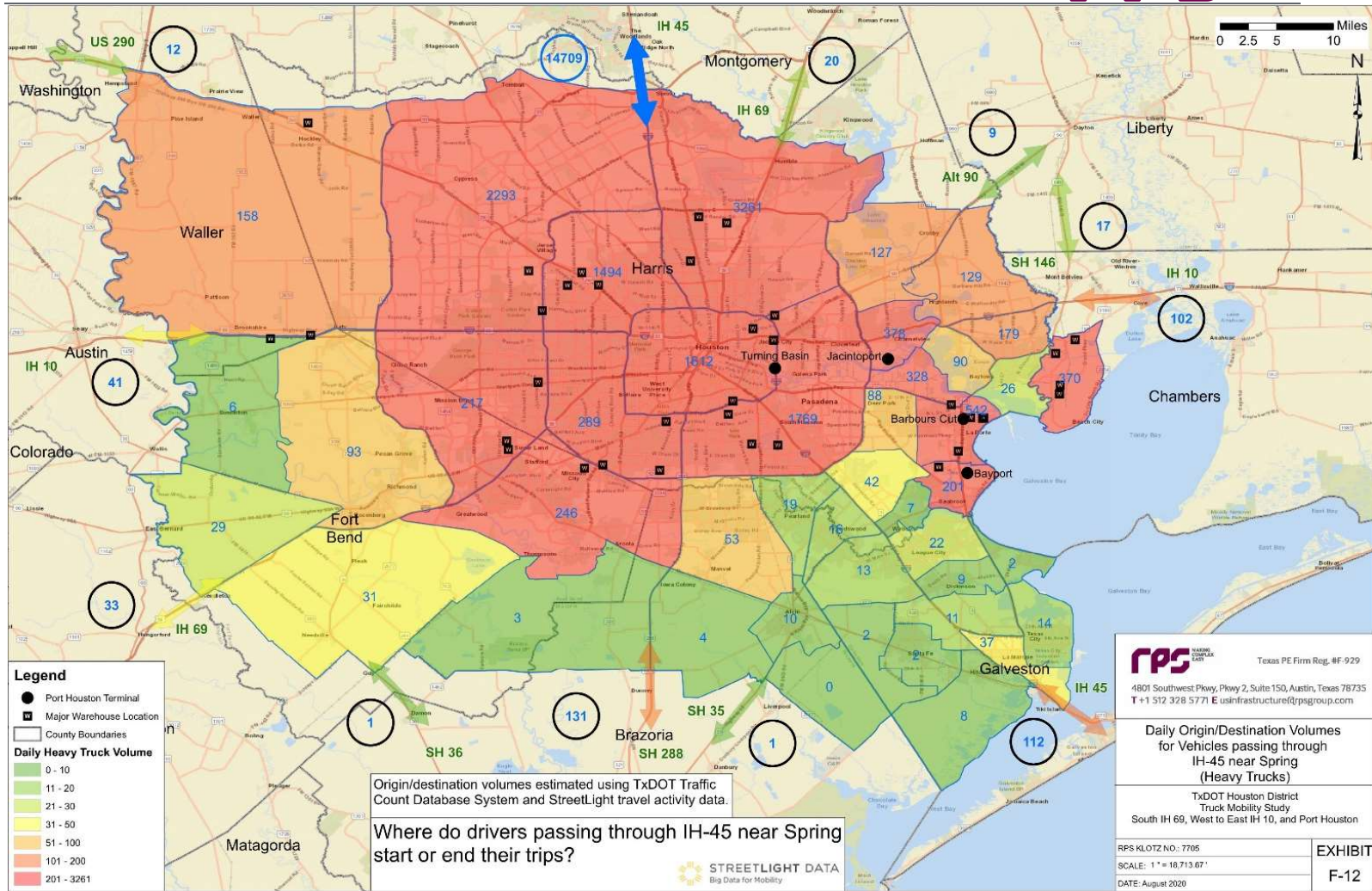


Figure 3. Daily origins and destinations for truck trips passing through IH 45 near Spring (shown in blue)

Source: StreetLight Data, 2017 weekday average

Key Data Findings

1. Approximately 88% of daily heavy truck trips that pass through regional gateways have either their origin or destination within the region. That is, only 12% of heavy truck trips completely traverse the study area, without stopping, in-route to another location outside the region.
2. 75 – 80% of all daily truck trips coming in and out in the east Port Houston container terminals (Jacintoport/cares, Barbours Cut, and Bayport) have their origin/destination within approximately 15 miles of those terminals. Trucks are not generally traversing the region before entering or after exiting the east Port terminals.
3. Under 2040 peak hour conditions, traffic demand would exceed roadway capacity on nearly all major freight routes within the SH 99 loop, excepting some segments of SH 6, BW 8, and IH 10 east, as well as local freight connectors such as Fairmont Parkway and Red Bluff Road.

Next Steps

While the findings provide insight on long-haul and port-related truck traversal patterns within the Greater Houston region, a more geographically focused analysis is required to understand what this study identified as the most common type of regional truck trip – short-haul and first/last-mile travel related to local freight nodes (warehousing, distribution, and intermodal hubs). The next steps in the analysis process should include a truck freight node study, including but not limited to the following key elements:

- Identification of regional nodes with significant truck freight activity
- Analysis of major supply chains influencing freight nodes and shifting trends due to COVID-19
- Stakeholder engagement and interviews to understand the factors that influence truck routing and access to/from the nodes
- Assessment of needs and development of potential truck mobility improvements at nodes
- Incorporation of improvements and strategies into ongoing, upcoming, and potential new projects