Final

NEW HAVEN PORT AUTHORITY TRAFFIC STUDY

October 2019

Port Authority
City of New Haven

CDM Smith®

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Section 1
Introduction

The New Haven Port Authority (NHPA) proposes to conduct a traffic study of the Port District within the City of New Haven to understand traffic impacts associated with the vehicular movements serving the various port facilities.

1.1 Study Background

The Port of New Haven is the most active port between Boston and New York and ranks fifth in the Nation of ports handling liquid cargo. It serves a good portion of New England and is part of Connecticut's critical port facilities. The Port District consists of 366 acres, not all of which are occupied by maritime-related businesses and public roads service the entire district. There are maritime terminals, maritime-related businesses and storage lay down areas within the port district as well as several lay down areas outside the port district that support the terminal functions. Most of the waterborne cargo is trucked out of the port at this time. However, rail service has been recently installed on Waterfront Street and spurs have been provided to five major terminals. Rail access is expected to be used for selective transportation needs to and from the Port in the future.

A 2007 Strategic Land Use Plan of the port of New Haven estimated truck volumes for three major liquid terminals at 600 per day, however truck moves to and from dry cargo terminals were not quantified. With the completion of I-95 over the Quinnipiac River and reconfiguration of the highway access as well as the reconstruction of Waterfront Street, traffic patterns and volumes need to be evaluated to best determine the optimum use of port access.

At the time the NHPA was created (2003), the City of New Haven requested that consideration be made to accommodate a bike trail within the port area that would facilitate access to the East Shore Park located just south of the Port District. Although the Land Use Plan does identify a location for the bike trail, no specific plans have been developed and this issue should be considered as part of this study.

1.2 Study Purpose

The purpose of the study is to develop a set of recommendations that will consider the following:

- Analysis of vehicular movements within the Port District
- Determination of inbound and outbound truck impacts and destination
- Projection of traffic volumes and type of vehicles
- Identify Impacts of freight rail on vehicular moves and volume
- Evaluate appropriate truck staging and queuing areas
- Evaluate Road conditions as it relates to supporting Port operations
- Develop appropriate traffic circulation plans that considers vehicles, rail, and cycle movements
- Develop signage plans that help in identifying the traffic, port usage and safety concerns

1.3 Study Area

Figure 1-1 shows the study area within the Port District. The Port District is depicted by a red boundary. The main roadways serving the port are I-95, Forbes Avenue (U.S. Route 1), Waterfront Street, Stiles Street, Connecticut Avenue, and Alabama Street. These roadways are described later in the report. The figure also shows the port facilities within the study area.

1.4 Study Process

The study process involved meeting with key stakeholders including the owners/operators. An owner/operator user survey was conducted to determine specific needs and determine existing concerns and future needs. Based on the survey, data collection was performed to gain an understanding of the vehicular flows specifically truck movements within the Port District. The data collection and evaluation process led to specific recommendations to help traffic flow and circulation within the Port District.

The following sections discuss the various steps of the study process – Data Collection, Existing Conditions, Future Conditions, and List of Recommendations.

Figure 1-1 – Study Area Map

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Section 2
Data Collection

This section discusses the data collection process i.e. gathering available data and reports, owner/operator feedback, traffic counts, and existing inventory of roadway and parking conditions.

2.1 Available Data and Reports

In consultation with NHPA, the following reports were reviewed and considered for this study.

2.1.1 Port of New Haven Strategic Land Use Plan

This study discusses the current conditions of the port relative to land use and operations and the future development strategies for port development in land use and infrastructure. The study presents specific implementation strategies for three to five-year and five to ten-year timeframes. The study identified five key action items within the implementation framework to enhance the economic competitiveness of the port.

2.1.2 New Haven Truck Route Study

This study was proposed to develop a strategy for directing truck traffic to use appropriate routes while traveling through or within the city. Truck routes were evaluated in various sections of the city to identify the impact on residential streets and direct access to the interstate system. A truck routing plan and implementation schedule was developed to assist the city in preparing action items to address truck movements, signage, and an enforcement plan.

2.1.3 Connecticut Maritime Coalition

The Connecticut Maritime Coalition developed a report to discuss the future growth of Connecticut ports relative to maritime and freight movement. Recommendations in this study included a market study of existing good movements, identify freight flow in the state, study of an in-depth ferry system, is study was proposed to develop a strategy for directing truck traffic to use appropriate routes while traveling through or within the city. Truck routes were evaluated in various sections of the city to identify the impact on residential streets and direct access to the interstate system. A truck routing plan and implementation schedule was developed to assist the city in preparing action items to address truck movements, signage, and an enforcement plan.

2.1.4 Connecticut Deep Water Port Strategy Study

The Connecticut Deep Water Port Strategy Study was commissioned to develop an independent marking strategy for the three ports in Connecticut – New Haven, Bridgeport, and New London. Specifically, for the New Haven port, the market strategy included retention and expansion of existing business such as liquid bulk and related energy uses, shipyard and ship repair services, and dry bulk. The market strategy also discussed opportunities for scrap metal exports; break bulk lumber, copper, and steel imports; and fresh food imports to New Haven. The above strategy identified the need for supporting investment in transportation infrastructure i.e. rail and truck.

2.2 Owner/Operator User Group Survey

An owner/operator user group survey was conducted at study initiation to identify the specific concerns/needs of stakeholders relative to the flow of goods and commodities through the port and surrounding transportation network. The following stakeholders took part in the owner/operator surveys:

- Port Security Services and Sea Support, Inc.
- Motiva Enterprises
- Blakeslee Arpaia Chapman
- Greater New Haven Water Pollution Control Authority (GNHWPCA)
- New Haven Transport
- Magellan
- Gateway Terminal

Specific issues/concerns that were brought up relative to this study are:

1. **Port Access – I-95/I-91/Route 1** – The respondents stated that the port access both externally (I-95/I-91/Route 1) and internally is challenging due to poor infrastructure, and lack of internodal connectivity.

2. **Truck flows and circulation** – The respondents stated that the truck movements in and out of the port area are impacted during peak times of truck activity. It was indicated that in many cases due to lack of truck staging areas, trucks block internal roadways creating a disruption in traffic flow.

3. **Depth of Channel/basin** – The respondents stated that the depth of the channel/basin limits the ability of marine vessels to traverse into the North Yard and create redevelopment opportunities.

4. **Parking** – The respondents stated the imminent need for identification of the truck staging and parking areas. It was suggested that the current truck idling area on Alabama Street should be reconstructed for an improved truck parking area.

5. **Roadway condition** – The respondents expressed concern over the poor condition of the roadways within the port area specifically Connecticut Avenue.

6. **Railroad movements** – The respondents indicated that rail access to the port was limited and should be expanded in the future into North Yard.

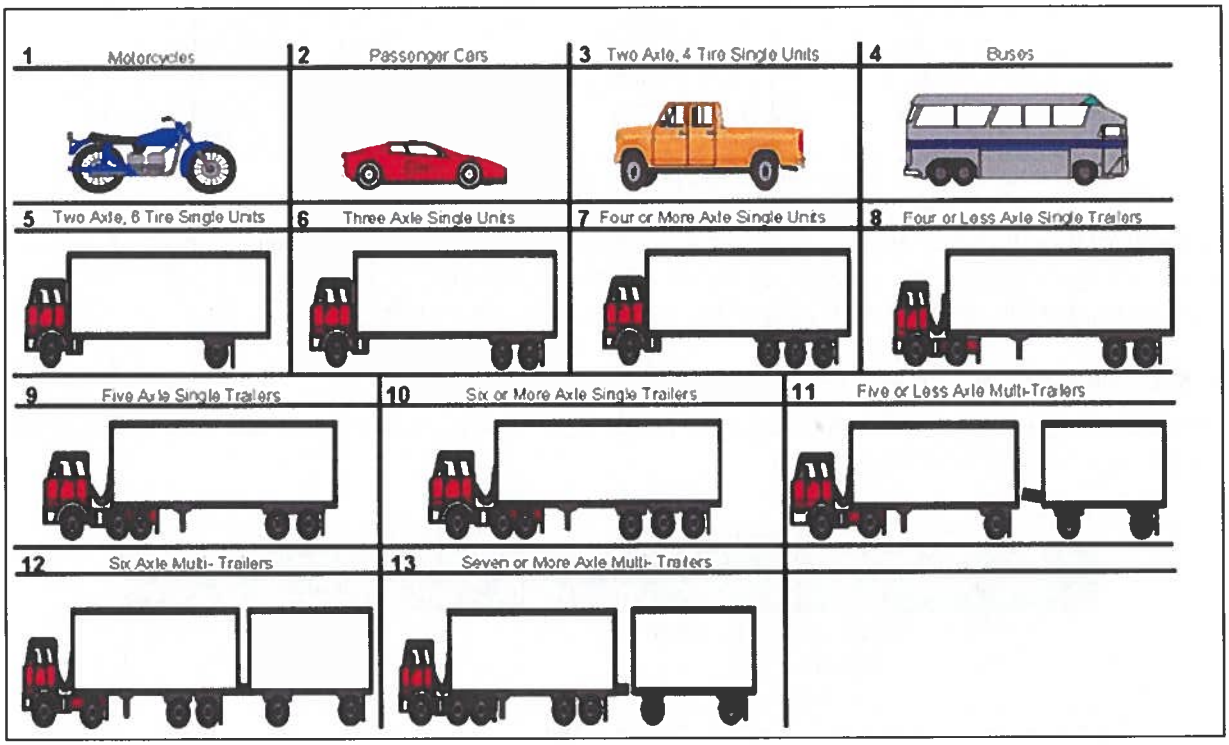
2.3 Traffic Data Collection

Traffic data collection activity involved obtaining existing traffic counts at key roadways in the Port Area. Automatic traffic recorder (ATR) counts were conducted along Waterfront Street, Connecticut Avenue, and the Waterfront Connector. These traffic counts were supplemented with manual counts at key intersections in the Port Area. The following sections describe the type of data collected and the findings.

2.3.1 Automatic Traffic Recorder Counts

This section describes the ATR counts which consisted of installing a tube across key roadways leading into the Port Area. These roadways are Waterfront Street, Connecticut Avenue, and the Waterfront Connector. The traffic counts were conducted from Thursday, November 19 through Monday, November 23, 2015. The traffic counts included a vehicle classification count based on the Federal Highway classification system shown in **Figure 2-1**.

Figure 2-1 Federal Highway Vehicle Classification System



As shown above, Classification 5 and higher are considered trucks. Therefore, the traffic data was evaluated to identify typical truck flows in the Port Area.

2.3.1.1 Waterfront Street

Table 2-1 shows the daily traffic volumes based on the traffic count data on Waterfront Street, south of Forbes Avenue (U.S. Route 1).

Table 2-1 – Daily Traffic Volumes – Waterfront Street

Day	Average Daily Traffic (vehicles per day)
Weekday (Monday through Friday)	1,290
Saturday	1,190
Sunday	490

Source: Based on traffic counts conducted by CDM Smith

As indicated in the table, the average daily traffic volume on a typical weekday on Waterfront Street is approximately **1,290** vehicles per day. The Saturday daily traffic volume is comparable

to the weekday daily volume at about **1,190** vehicles per day. The Sunday daily traffic volume is about a third of the weekday daily traffic volume at about **490** vehicles per day.

Table 2-2 shows the percentage of trucks recorded on Waterfront Street on a daily and the highest hour basis.

Table 2-2 – Truck Percentages – Waterfront Street

Day	Percentage of Trucks in Total Traffic	
	Daily	Highest Hour
Monday	56%	78% (7:00-8:00 AM)
Thursday	51%	73% (9:00-10:00 PM)
Friday	50%	74% (7:00-8:00 AM)
Saturday	58%	81% (7:00-8:00 AM)
Sunday	42%	75% (8:00-9:00 AM)

Source: Based on traffic counts conducted by CDM Smith

As indicated in the table, truck percentages are greater than 50 percent on weekdays and Saturday. The highest truck proportion is seen typically during the morning time period on Waterfront Street. About 43 percent of the trucks are 5 axle double.

2.3.1.2 Waterfront Street Connector

Table 2-3 shows the daily traffic volumes based on the traffic count data on the Waterfront Street Connector, east of Waterfront Street.

Table 2-3 – Daily Traffic Volumes – Waterfront Street Connector

Day	Average Daily Traffic (vehicles per day)
Weekday (Monday through Friday)	1,630
Saturday	820
Sunday	540

Source: Based on traffic counts conducted by CDM Smith

As indicated in the table, the average daily traffic volume on a typical weekday on Waterfront Street Connector is approximately **1,630** vehicles per day. The Saturday daily traffic volume is about half of the weekday daily volume at about **820** vehicles per day. The Sunday daily traffic volume is about a third of the weekday daily traffic volume at about **540** vehicles per day.

Table 2-4 shows the percentage of trucks recorded on Waterfront Street on a daily and the highest hour basis.

Table 2-4 – Truck Percentages – Waterfront Street Connector

Day	Percentage of Trucks in Total Traffic	
	Daily	Highest Hour
Monday	54%	72% (12:00-1:00 PM)
Thursday	55%	72% (9:00-10:00 PM)
Friday	51%	69% (11:00 PM -12:00 AM)
Saturday	51%	71% (2:00-3:00 AM)
Sunday	50%	70% (1:00-2:00 AM)

Source: Based on traffic counts conducted by CDM Smith

As indicated in the table, truck percentages are greater than 50 percent on weekdays and Saturday. The hour representing the highest truck proportion seems to vary during the week. About 40 percent of the trucks are 5-axle double.

2.3.1.3 Connecticut Avenue

Table 2-5 shows the daily traffic volumes based on the traffic count data on Connecticut Avenue, south of the Waterfront Street Connector.

Table 2-5 – Daily Traffic Volumes – Connecticut Avenue

Day	Average Daily Traffic (vehicles per day)
Weekday (Monday through Friday)	2,140
Saturday	1,140
Sunday	920

Source: Based on traffic counts conducted by CDM Smith

As indicated in the table, the average daily traffic volume on a typical weekday on Connecticut Avenue is approximately **2,140** vehicles per day. The Saturday daily traffic volume is about half of the weekday daily volume at about **1,140** vehicles per day. The Sunday daily traffic is about **920** vehicles per day.

Table 2-6 shows the percentage of trucks recorded on Connecticut Avenue on a daily and the highest hour basis.

Table 2-6 – Truck Percentages – Connecticut Avenue

Day	Percentage of Trucks in Total Traffic	
	Daily	Highest Hour
Monday	51%	82% (9:00-10:00 PM)
Thursday	50%	74% (2:00-3:00 AM)
Friday	48%	78% (10:00 -11:00 PM)
Saturday	58%	82% (2:00-3:00 AM)
Sunday	57%	80% (3:00-4:00 AM)

Source: Based on traffic counts conducted by CDM Smith

As indicated in the table, truck percentages are at or greater than 50 percent during a typical week. About 22 percent of the trucks are 5-axle double. The hour representing the highest truck proportion seems to vary during the week.

2.3.2 Intersection Traffic Counts

Intersection traffic counts were collected in the Port Area at the following locations:

- Forbes Avenue and Waterfront Street
- Forbes Avenue and Stiles Street
- Forbes Avenue and Fulton Terrace
- Waterfront St. Connector and I-95 Ramps
- Waterfront St. Connector and Fulton St./Connecticut Avenue
- Waterfront Street and Alabama Street
- Connecticut Avenue and Alabama Street

The traffic counts were collected on Wednesday, May 17, 2017 during the weekday morning (7:00 to 9:00 A.M.), weekday mid-day (11:00 A.M. to 1:00 P.M.), and weekday afternoon (4:00 to 6:00 P.M.) time periods.

2.4 Roadway Inventory

Roadway inventory was collected in the field on study area roadways to document geometry, width, and condition. Below is a description of the key study area roadways within the Port Area.

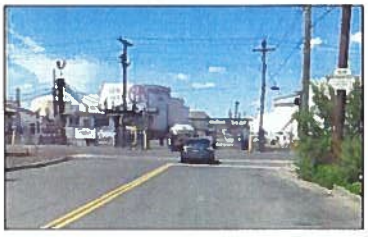
2.4.1 Waterfront Street

Waterfront Street is a two-lane two-way roadway oriented in a north-south direction within the Port Area. The roadway is about 38 feet in width. Land use along Waterfront Street consists of port related uses such as Gateway Terminal, Gulf Terminal, Magellan Terminal, and New Haven Terminal. Roadway condition is good in the project area.

2.4.2 Connecticut Avenue

Connecticut Avenue is a two-lane two-way roadway oriented in a north-south direction within the Port Area. The roadway is about 35 feet in width. Land use along Connecticut Avenue is a mix of uses such as the Motiva Terminal (port related) and the Greater New Haven Water Pollution Control Authority. Roadway condition is poor and needs immediate repair.

2.4.3 Alabama Street



Alabama Street is a two-lane two-way roadway oriented in an east-west direction between Waterfront Street and Connecticut Avenue. A truck parking area is located on Alabama Street between Waterfront Street and Connecticut Avenue. The roadway is about 37 feet in width. Roadway condition is fair and needs minor pavement repair.

2.4.4 Waterfront Street Connector

Waterfront Street Connector is a two-lane two-way roadway oriented in an east-west direction between Waterfront Street and Connecticut Avenue. This provides a connection to Waterfront Street from the I-95 northbound off-ramp and to the I-95 Southbound on-ramp. The roadway is about 39 feet in width. Roadway condition is good.

2.5 Truck Circulation

Truck movements in and out of the Port Area impact traffic flow and circulation to port facilities. The user group survey stated that truck flow and circulation is critical in efficient operations within the Port Area. Trucks are primary carriers of freight out of the Port and during ferry arrivals create disruption on the roadways. This section discusses the truck movements in and out of the Port and existing truck parking/staging areas within the Port.

2.5.1 Truck Movements

Truck movements primarily come via I-95 and U.S. Route 1(Forbes Avenue). **Table 2-7** shows the arrival and departure patterns for trucks in and out of the Port Area.

Table 2-7 - Truck Movements

Roadway	Arrivals	Departures
North		
- Fulton Street/Wheeler St.	15%	10%
West		
- I-95	60%	50%
- U.S. Route 1	20%	25%
East		
- I-95/U.S. Route 1	5%	15%
Total	**100%**	**100%**

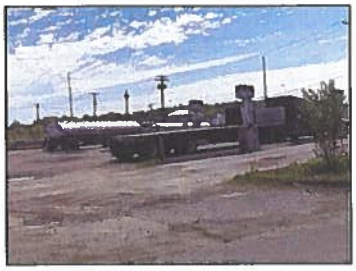
As indicated in the above table, about 50-60 percent of the truck traffic is oriented towards points west/south of the Port Area i.e. Stamford and arrives/departs using I-95. About 20-25 percent of the truck traffic is oriented towards point south of the Port Area i.e. New Haven and arrives/departs using U.S. Route 1. About 5-15 percent of the truck traffic is oriented towards east/north of the Port Area i.e. New London and arrives/departs using I-95 or U.S. Route 1. The rest 10-15 percent is local truck traffic using Fulton St. and Wheeler Street to enter/exit the Port Area.

A more detailed truck routing study was conducted for the Gateway Terminal in February 2018 which indicated that majority of the trucks (about 70 percent) entering Gateway arrive via U.S. Route 1 North. About 20 percent of the trucks arrive via I-95 North and the remaining 10 percent are anticipated to arrive via I-95 South. About 90 percent of the trucks use the Waterfront Street connector and Waterfront Street to the Gateway Terminal driveway. The remaining 10 percent of the trucks use Waterfront Street.

When trucks depart the Gateway Terminal, about 75 percent of the trucks use Waterfront Street and U.S. Route 1 (Forbes Avenue). The remaining 25 percent of the trucks use I-95 South.

2.5.2 Truck Parking

A truck parking area is located at the corner of Alabama Street and Stiles Street and provides amenities for truckers and allows for staging. The parking area has six (6) bays for trucks. Truck are not allowed to park or idle along any of the Port Area roadways specifically Waterfront Street. Signs are installed along Waterfront Street to prohibit such activity.



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Section 3
Existing Conditions

This section discusses the existing traffic conditions on the study roadways, the crash data, and the existing roadway signage in the Port Area.

3.1 Existing Traffic Conditions

The existing traffic conditions was based on a detailed traffic study of the intersections within the Port Area.

3.1.1 Existing (2017) Traffic Volumes

The intersection traffic count data was used to develop an existing (2017) traffic volume condition for the Port Area. **Figures 3-1**, **3-2**, and **3-3** represent existing (2017) traffic volumes for the weekday A.M., mid-day, and P.M. peak hour conditions respectively.

3.1.2 Existing Levels of Service (LOS)

Level of Service (LOS) analysis provides a measurement of the delay experienced at an intersection as a result of traffic operations at that intersection. In general, there are six levels of service; Level of Service A to Level of Service F. The highest, Level of Service A, describes a condition of free flow, with low volumes and high speeds. Level of Service B represents a stable traffic flow with operating speeds beginning to be restricted somewhat by traffic conditions. Level of Service C, which is normally utilized for design purposes, describes a stable condition of traffic operation. It entails moderately restricted movements, but traffic conditions are not objectionable to motorists. Level of Service D reflects a condition of more restrictive movements for motorists and influence of congestion becomes more noticeable. Level of Service E is representative of the actual capacity of the roadway or intersection and involves delay to all motorists due to congestion. The lowest, Level of Service F, is described as force flow and is characterized by volumes greater than the theoretical roadway capacity. This is considered an unacceptable traffic operating condition.

A SYNCHRO model was built for the entire study area corridor which includes the study area intersections identified earlier. This model provides the ability to evaluate intersection operations within the Port Area. LOS was determined for signalized and un-signalized intersections during the weekday A.M. and P.M. peak hour periods.

Figure 3-1 Existing (2017) A.M. Peak Hour Traffic Volumes

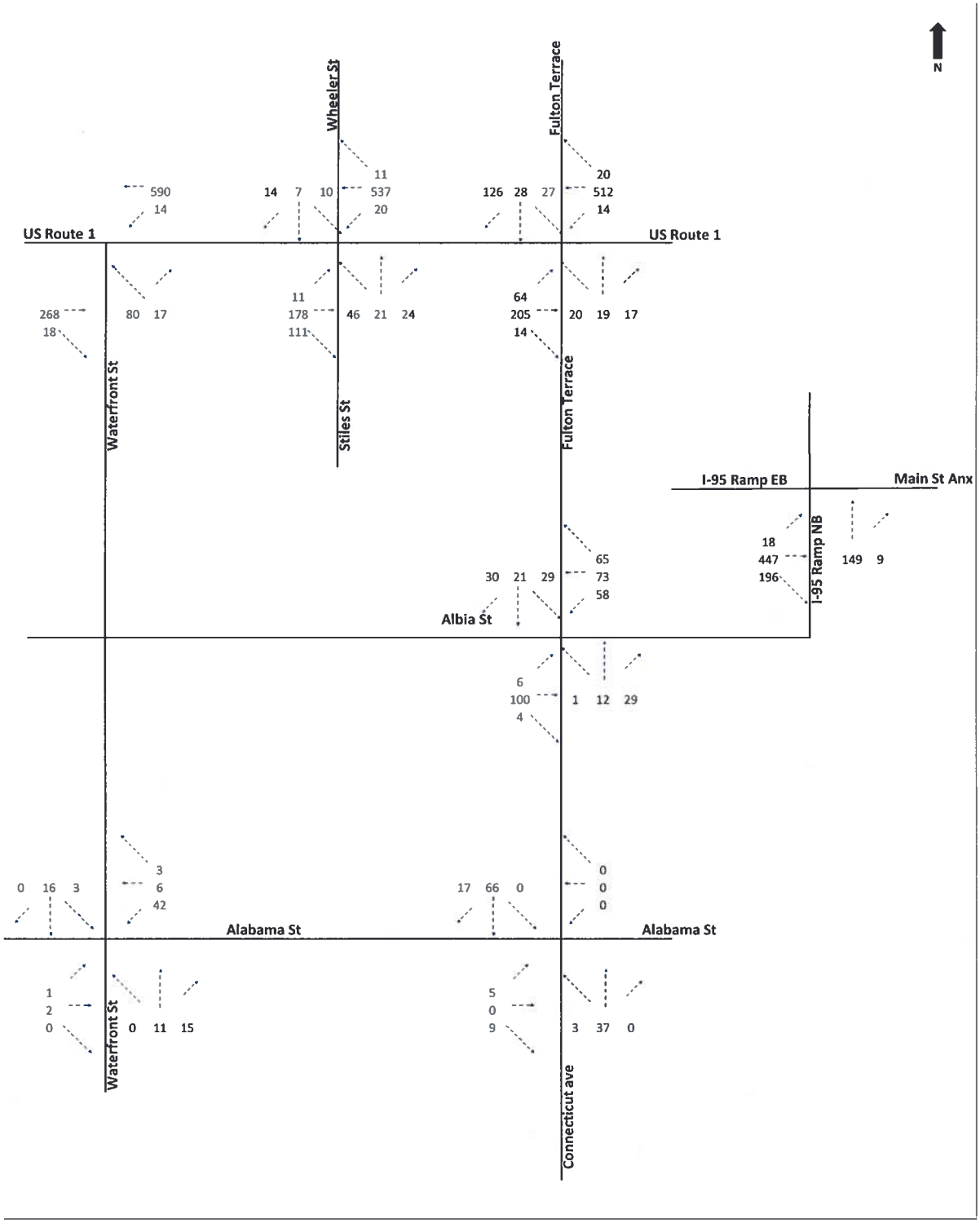


Figure 3-2 Existing (2017) Mid-day Peak Hour Traffic Volumes

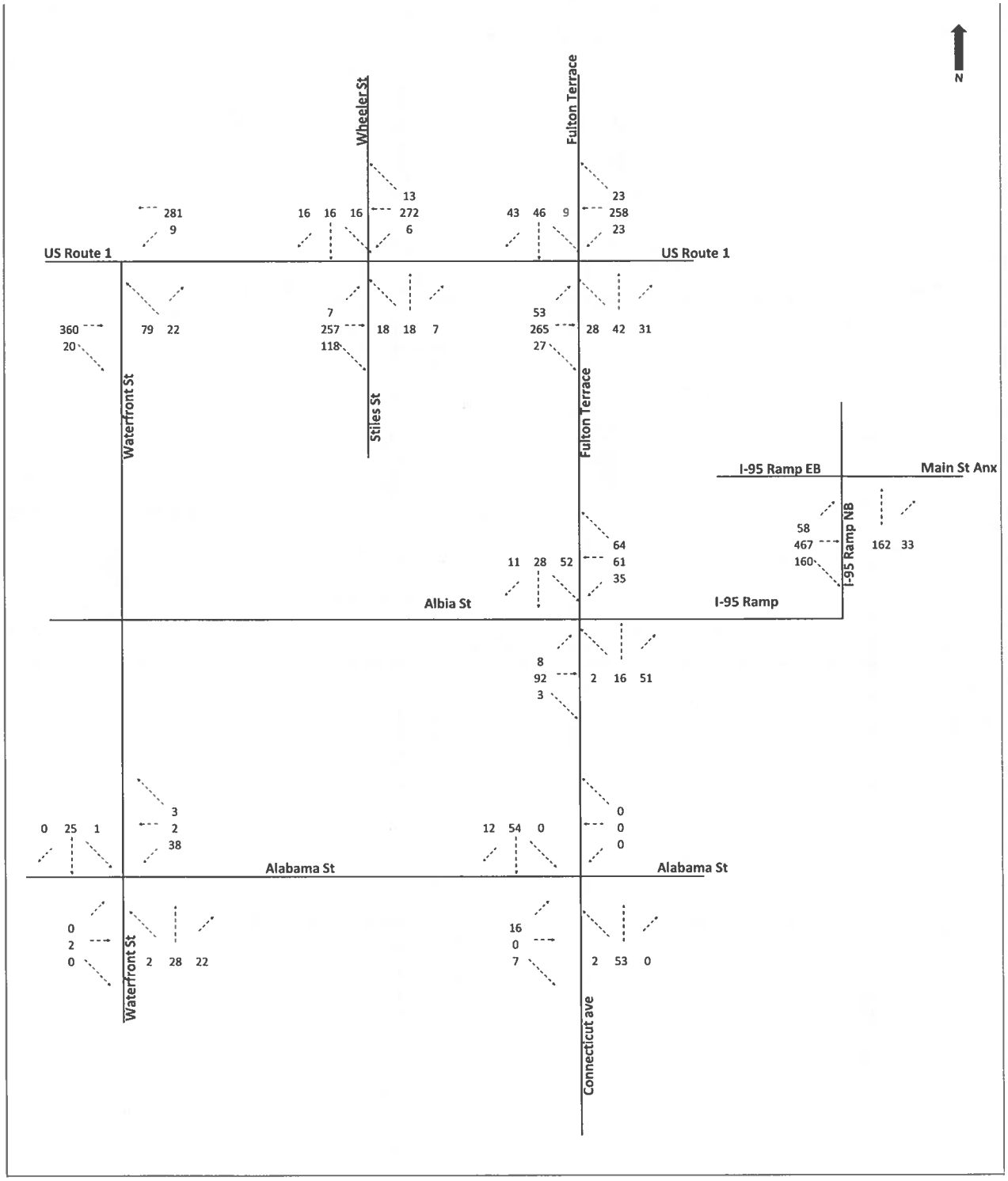


Figure 3-3 Existing (2017) P.M. Peak Hour Traffic Volumes

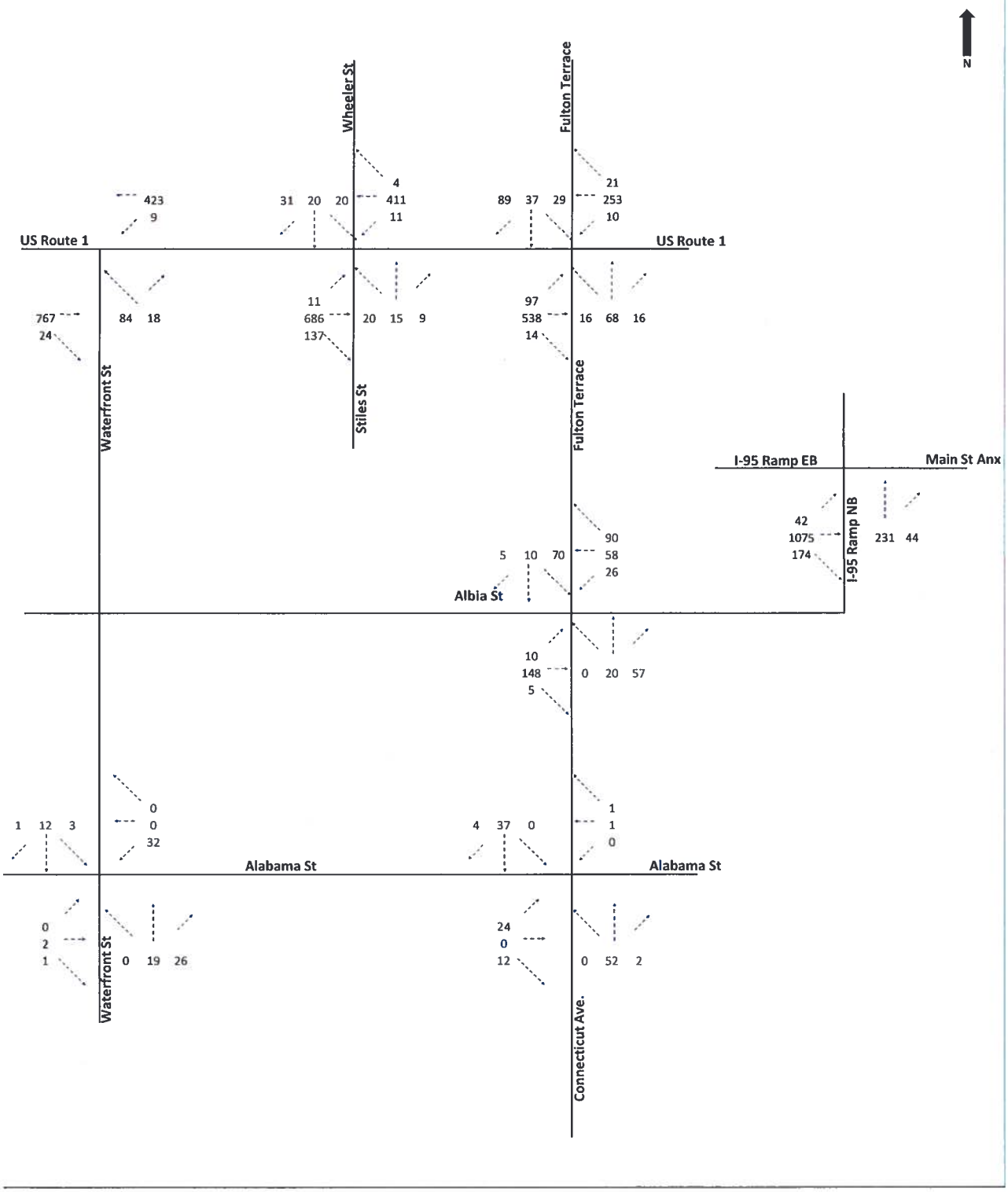


Table 3-1 highlights the level of service criteria for signalized intersections. The level of service criteria for signalized intersections is based on control delay per vehicle measured in seconds.

Table 3-1 – LOS Criteria for Signalized Intersections

Level of Service	Control Delay per Vehicle (seconds)
A	≤10
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	> 80

Source: 2010 Highway Capacity Manual

Table 3-2 highlights the level of service criteria for un-signalized intersections. The level of service criteria for un-signalized intersections is based on control delay per vehicle measured in seconds.

Table 3-2 - LOS Criteria for Un-Signalized Intersections

Level of Service	Control Delay per Vehicle (seconds)
A	≤10
B	>10 and ≤15
C	>15 and ≤25
D	>25 and ≤35
E	>35 and ≤50
F	> 50

Source: 2010 Highway Capacity Manual

Table 3-3 lists the existing (2017) levels of service for the study area intersections for overall and by approach.

Table 3-3 – Existing (2017) Levels of Service

	Time Period		
Location	Weekday A.M. Peak	Weekday Mid-day Peak	Weekday PM Peak
Signalized Intersections			
U.S. Route 1/Stiles St./ Wheeler St.	**A(6.6)**	**A(7.5)**	**A(9.4)**
U.S. Route 1 Eastbound	A(8.8)	A(8.8)	B(11.4)
U.S. Route 1 Westbound	A(3.0)	A(3.3)	A(2.3)
Stiles Street Northbound	B(18.0)	B(16.5)	C(23.9)
Wheeler St. Southbound	B(16.4)	B(14.2)	B(18.8)
U.S. Route 1/Fulton St./ Fulton Terrace	**A(6.7)**	**A(6.5)**	**A(6.7)**
U.S. Route 1 Eastbound	A(6.4)	A(6.2)	A(7.8)
U.S. Route 1 Westbound	A(6.9)	A(5.9)	A(6.9)
Fulton Street Northbound	A(8.8)	A(8.8)	B(11.8)
Fulton Terrace Southbound	A(6.2)	A(7.3)	A(8.0)

Table 3-3 – Existing (2017) Levels of Service (continued)

Location	Time Period		
	Weekday A.M. Peak	Weekday Mid-day Peak	Weekday PM Peak
Waterfront St. Connector/I-95 Ramps	**A(6.8)**	**A(7.1)**	**B(11.7)**
I-95 Ramps Eastbound	A(5.7)	A(6.0)	A(9.7)
Waterfront St. Connector Northbound	B(11.7)	B(11.0)	C(21.2)
Un-signalized Intersections			
U.S. Route 1/Waterfront Street			
U.S. Route 1 Westbound Left	A(0.1)	A(0.1)	A(0.3)
Waterfront St. Northbound	D(25.3)	C(22.6)	F(148.3)
Albia St./Waterfront Connector/Fulton Terrace			
Albia St. Eastbound	B(10.1)	A(9.9)	B(10.4)
Waterfront St. Connector Westbound	B(10.5)	A(10.0)	B(10.3)
Fulton Terrace Northbound	A(9.2)	A(8.8)	A(9.2)
Fulton Terrace Southbound	A(8.8)	A(8.9)	A(9.4)
Alabama St./Connecticut Avenue			
Alabama St. Eastbound	A(9.1)	A(9.2)	A(9.2)
Connecticut Ave. Northbound Left	A(0.6)	A(0.0)	A(0.0)
Alabama St./Waterfront St.			
Alabama St. Westbound	A(9.7)	A(9.9)	B(10.1)

Note: Delay expressed in seconds per vehicle in parenthesis.

As indicated in Table 3-3, the levels of service at the study area intersections are LOS D or better which is considered acceptable except the U.S. Route 1/Waterfront Street intersection. The Waterfront Street approach operates at LOS F during the weekday P.M. peak hour period. For this reason, we conducted a traffic signal warrant analysis at this intersection.

3.1.3 Warrant Analysis

In addition to the U.S. Route 1/Forbes Avenue and Waterfront Street intersection, the Waterfront Street/Alabama Street intersection was investigated for a multi-way or all-way stop sign based on discussions with the NHPA.

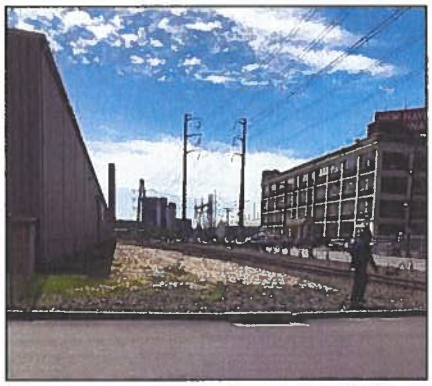
3.1.3.1 U.S. Route 1/Forbes Avenue and Waterfront Street

A traffic signal warrant analysis was conducted at the U.S. Route 1/Waterfront Street intersection. The traffic signal warrant analysis was conducted based on the Manual of Uniform Traffic Control Devices[1](MUTCD). The traffic signal warrant analysis was based on Warrants 1, 2, and 3 which

[1] Manual of Uniform Traffic Control Devices, 2009 Edition.

are traffic volume warrants. The traffic volume warrants are conducted using the major street (in this case U.S. Route 1/Forbes Avenue) volumes and the minor street (in this case Waterfront Street) volumes over a 24-hour period. For each of the three traffic volume warrants, volume thresholds should be met for any 8-hour of the 24-hour period. Based on the analysis, it was determined that for the U.S. Route 1/Waterfront Street intersection traffic signal warrants were not met under Warrants 1, 2, and 3.

3.1.3.2 Waterfront Street and Alabama Street



This intersection is currently stop-controlled on Alabama Street. Based on the MUTCD, the multi-way stop warrant was investigated from a traffic volume standpoint. Based on the minimum volume requirements on the major and minor streets, this intersection will not meet the need for a multi-way stop sign.

In addition, the crash data does not indicate this location being a concern due to the existing traffic control. The intersection sight distance on Alabama Street is not a concern looking left or right on Waterfront Street. Therefore, the existing condition at the Waterfront Street/Alabama Street intersection does not meet the need for a multi-way stop sign.

3.2 Crash Data

Crash data was obtained from the University of Connecticut's crash repository for the period between January 1, 2015 and December 31, 2017 for key study area roadways. **Table 3-4** summarizes the crash data over the three-year period.

Table 3-4 - Crash Data (2015-2017)

Description	U.S. Route 1/ Waterfront Street	Waterfront St./ Waterfront St. Connector	Alabama St./ Fulton Terrace
Year			
2015	7	1	1
2016	1	1	0
2017	1	0	0
Total	**9**	**2**	**1**
Type			
Rear-End	3	1	0
Angle	1	1	0
Sideswipe	1	0	0
Fixed Object	0	0	1
Head-on	1	0	0
Other	3	0	0
Total	**9**	**2**	**1**

Table 3-4 - Crash Data (2015-2017) (continued)

Description	U.S. Route 1/ Waterfront Street	Waterfront St./ Waterfront St. Connector	Alabama St./ Fulton Terrace
Severity			
Fatality	0	0	0
Personal Injury	4	1	1
Property Damage Only	5	1	0
Total	**9**	**2**	**1**

Source: UCONN Crash Repository

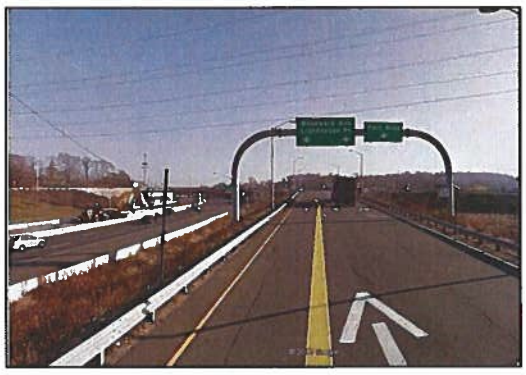
Based on the above table, the crash history within the Port Area does not indicate any significant concerns. The data also indicated three (3) crashes involving medium/heavy trucks.

3.3 Existing Highway Signage

The existing highway signage directing motorists to the Port Area is very limited from I-95 and U.S. Route 1 (Forbes Avenue).

3.3.1 I-95 Signage

In the northbound direction (towards Rhode Island), an existing "Port Area" sign is located at the exit ramp to Exit 50. Past this sign, there is no additional signage directing motorists/customers to various Port facilities.



In the southbound direction (towards New York City), an existing sign for the Port is located on the U.S. Route 1/Frontage Road ramp. Past this sign, there is no additional signage directing motorists/customers to various Port facilities.

3.3.2 U.S. Route 1 Signage

There is no existing U.S. Route 1 signage directing motorists/customers to various Port facilities.

3.3.3 Internal Wayfinding Signage

There is no existing internal wayfinding signage directing motorists/customers to various Port facilities.

Section 4

Future Conditions

This section discusses the future conditions anticipated within the Port Area due to land use expansion. In addition, the anticipated traffic impacts associated with the proposed land use expansion is presented in this section.

4.1 Anticipated Port Expansion

Based on discussions with the Port Authority, potential future areas of expansion within the Port were identified. They are listed below:

North Portion

- North Yard – 8.6 acres

South Portion

- Parcel 1 - Old Exit 49 Property – 1.49 acres
- Parcel 4 - Albia St. Property – 0.293 acres
- Parcel 5 - WSA Property - Alabama St. – 0.992 acres
- Parcel 6 - Edgemere St. Property – 0.111 acres
- New Haven Port Authority Property (on Waterfront Street) – 4.0 acres

Figure 4-1 shows the location of these properties within the Port Area.

4.2 Anticipated Trip Generation

The anticipated port expansion information was used to develop trip generation estimates for future trips anticipated in the Port Area. The trip generation estimates were developed using Institute of Transportation Engineer's Trip Generation Manual [2] using Land Use Code 10 - Waterport/Marine Terminal.

Table 4-1 presents the trip generation estimates for the weekday daily, weekday A.M. peak hour, weekday mid-day peak hour, and weekday P.M. peak hour period. The anticipated truck trips are shown in parenthesis for the weekday daily traffic volumes.

As shown in Table 4-1, a total of **103** daily trips (52 entering/51 exiting) are anticipated in the North Yard during a typical weekday. Of the 103 daily trips, about **50** percent of the trips are anticipated to be additional truck trips. During the weekday A.M., mid-day, and P.M. peak hour periods, a total of **11**, **8**, and **6** vehicle trips are anticipated in the North Yard respectively.

In the south portion, a total of **83** daily trips (42 entering/41 exiting) are anticipated in the North Yard during a typical weekday. Of the 83 daily trips, about **50** percent of the trips are anticipated to be additional truck trips. During the weekday A.M., mid-day, and P.M. peak hour periods, a total of **9**, **7**, and **6** vehicle trips are anticipated in the south portion respectively.

[2] Trip Generation Manual, 9th Edition, Institute of Transportation Engineers, Washington, D.C.

Figure 4-1 Anticipated Port Expansion

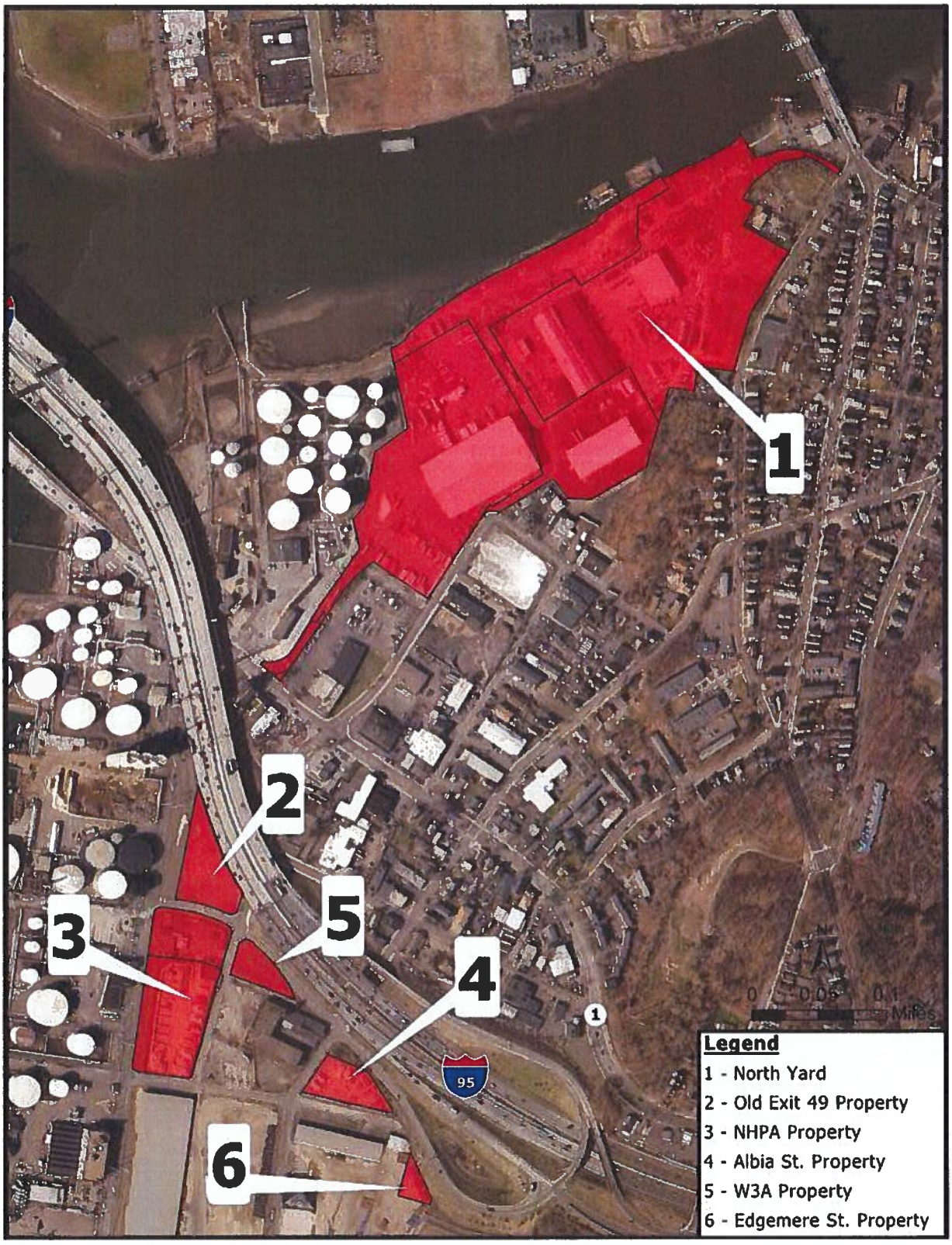


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Table 4-1 – Anticipated Trip Generation – Port Area

Name of Development	Size (Acres)	Weekday Daily			Weekday A.M. Peak Hour			Weekday Mid-day Peak Hour			Weekday P.M. Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total	Enter	Exit	Total
North Portion													
North Yard	8.6	52 (26)	51 (25)	**103 (51)**	6	5	**11**	4	4	**8**	3	3	**6**
South Portion													
Parcel 1 - Old Exit 49 Property	1.49	9 (5)	9 (4)	**18 (9)**	1	1	**2**	1	1	**2**	1	1	**2**
Parcel 4 - Albia St. Property	0.293	2 (1)	2 (1)	**4 (2)**	0	0	**0**	0	0	**0**	0	0	**0**
Parcel 5 - WSA Property - Alabama St.	0.992	6 (3)	6 (3)	**12 (6)**	1	1	**2**	1	0	**1**	1	0	**1**
Parcel 6 - Edgemere St. Property	0.111	1 (1)	1(0)	**2 (1)**	0	0	**0**	0	0	**0**	0	0	**0**
NHPA Property	4.0	24 (12)	24 (12)	**48 (24)**	3	2	**5**	2	2	**4**	2	1	**3**
	Total	42 (22)	42 (20)	**84 (42)**	5	4	**9**	4	3	**7**	4	2	**6**

Note: Numbers in parenthesis indicate truck trips based on a 50 percent composition derived from existing traffic counts.

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The anticipated future trips were distributed into the study area roadways based on existing travel patterns. No traffic growth is anticipated in the Port Area and therefore, the anticipated future trips were added to the existing (2017) traffic volumes. **Figures 4-2**, **4-3**, and **4-4** represent anticipated future traffic volumes for the weekday A.M., mid-day, and P.M. peak hour conditions respectively.

4.3 Future Conditions Analysis

Future level of service analysis was conducted using the anticipated future volumes during the weekday morning, mid-day, and evening peak hour periods. **Table 4-2** presents the results of the future levels of service at the study area intersections within the Port Area.

As indicated in Table 4-2, all signalized intersections are anticipated to operate at an overall level of service D or better. The U.S. Route 1/Forbes Avenue and Waterfront Street intersection is anticipated to remain at LOS F for the Waterfront Street approach. However, this intersection will not meet a traffic signal warrants under the future condition based on the MUTCD warrants analysis.

4.4 Needs and Deficiencies

Based on a review of existing and future conditions within the Port Area, the following is a list of needs and deficiencies:

1. The U.S. Route 1/Forbes Avenue and Waterfront Street intersection should be monitored for the need to install a traffic signal. This location may meet the warrants should the Port see an extensive amount of redevelopment in the future.

2. The pavement condition of Connecticut Avenue is in poor condition and needs reconstruction. Alabama Street and Waterfront Street seem to be in fair and good condition respectively.

3. The New Haven Port Authority requires an investment in the signage and wayfinding program to and from adjacent roadways i.e. I-95 and U.S. Route 1. This program should also enable the customers and port users to the appropriate port facilities.

4. Truck parking and staging continues to be an issue and there seems to be a shortage of vacant land to provide truckers to stage. The current truck idling area on Alabama Street/Stiles Street should be reconfigured.

Figure 4-2 Future A.M. Peak Hour Volumes

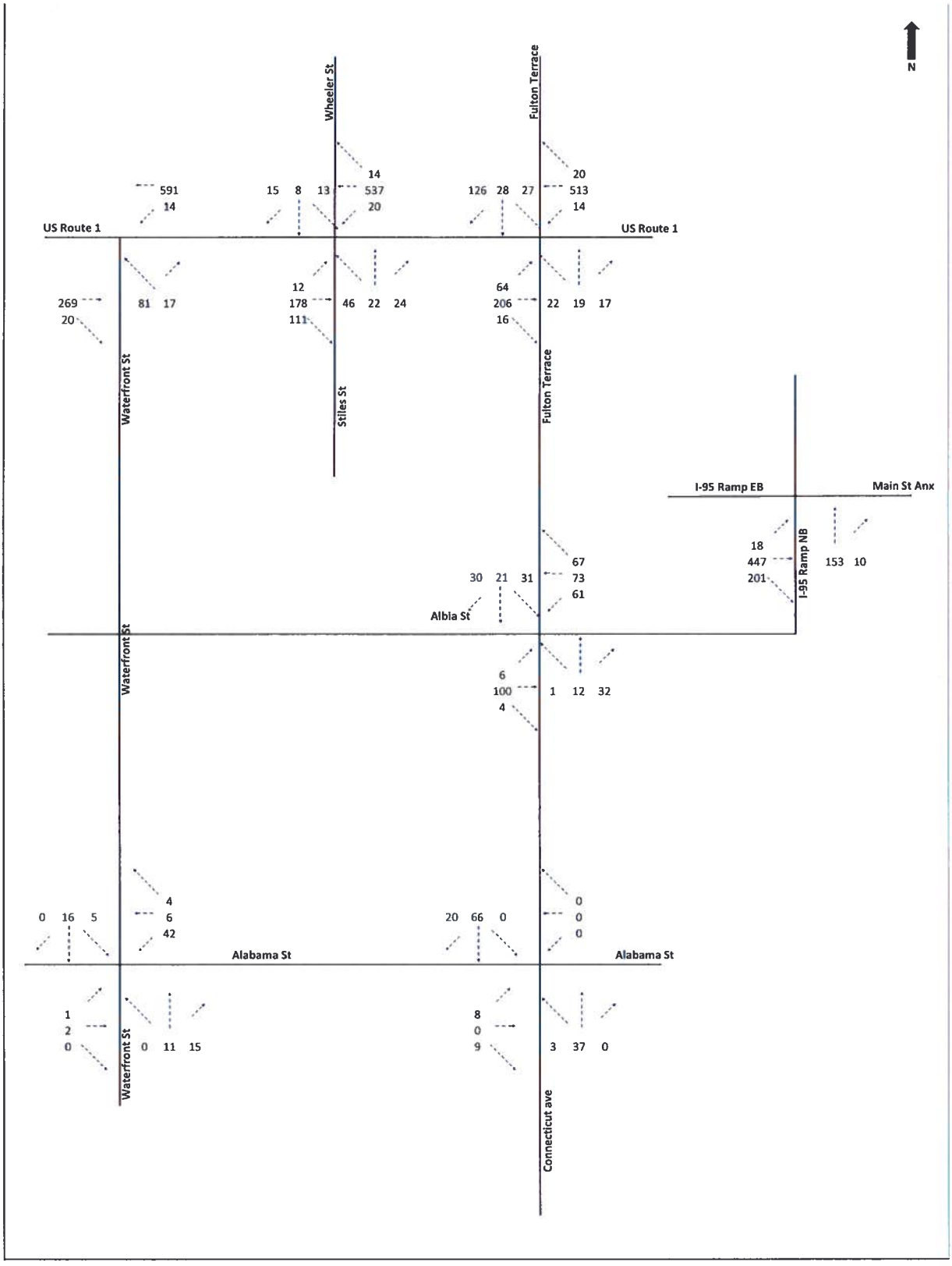

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Figure 4-3 Future Mid-day Peak Hour Volumes

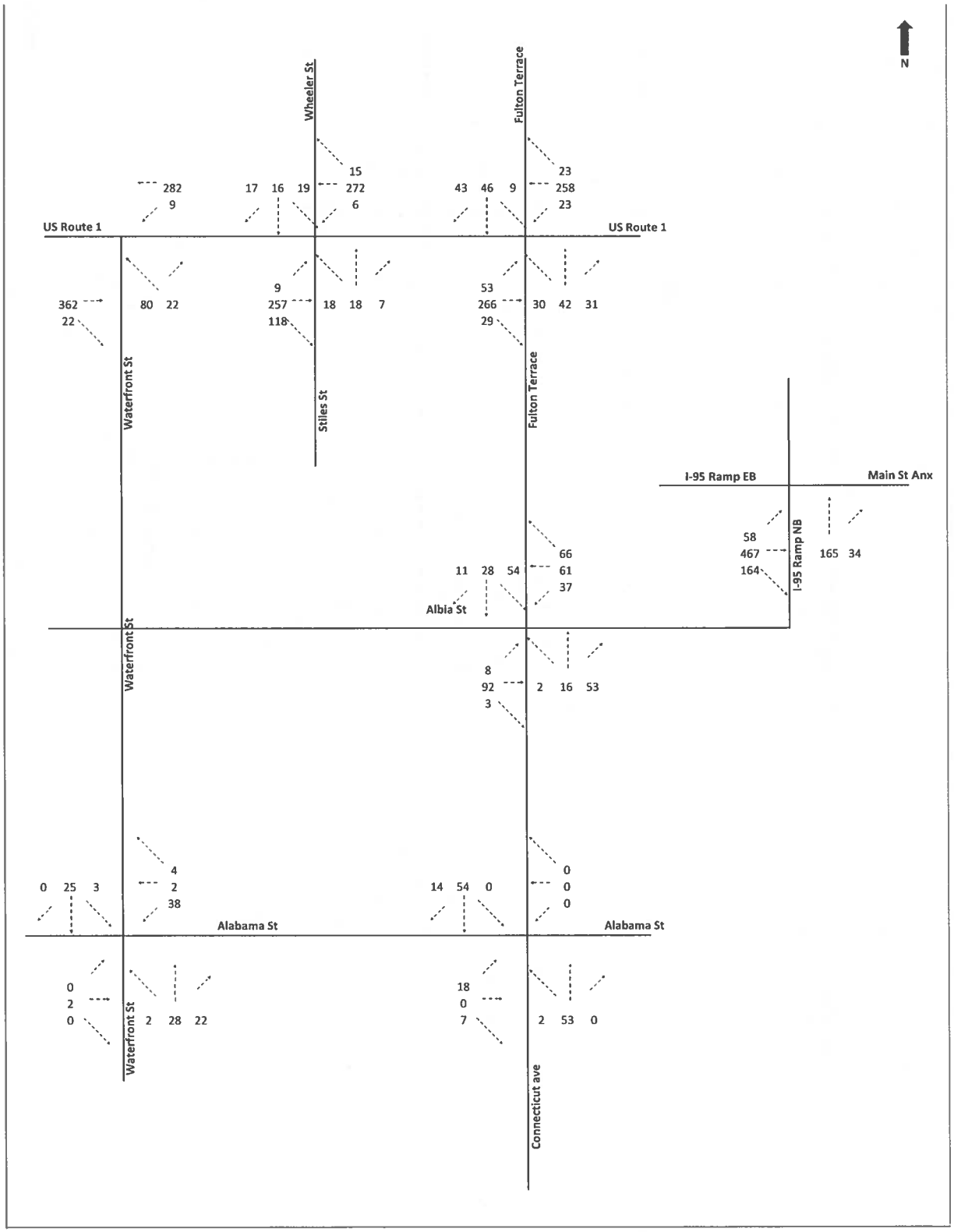

Figure 4-4 Future P.M. Peak Hour Volumes

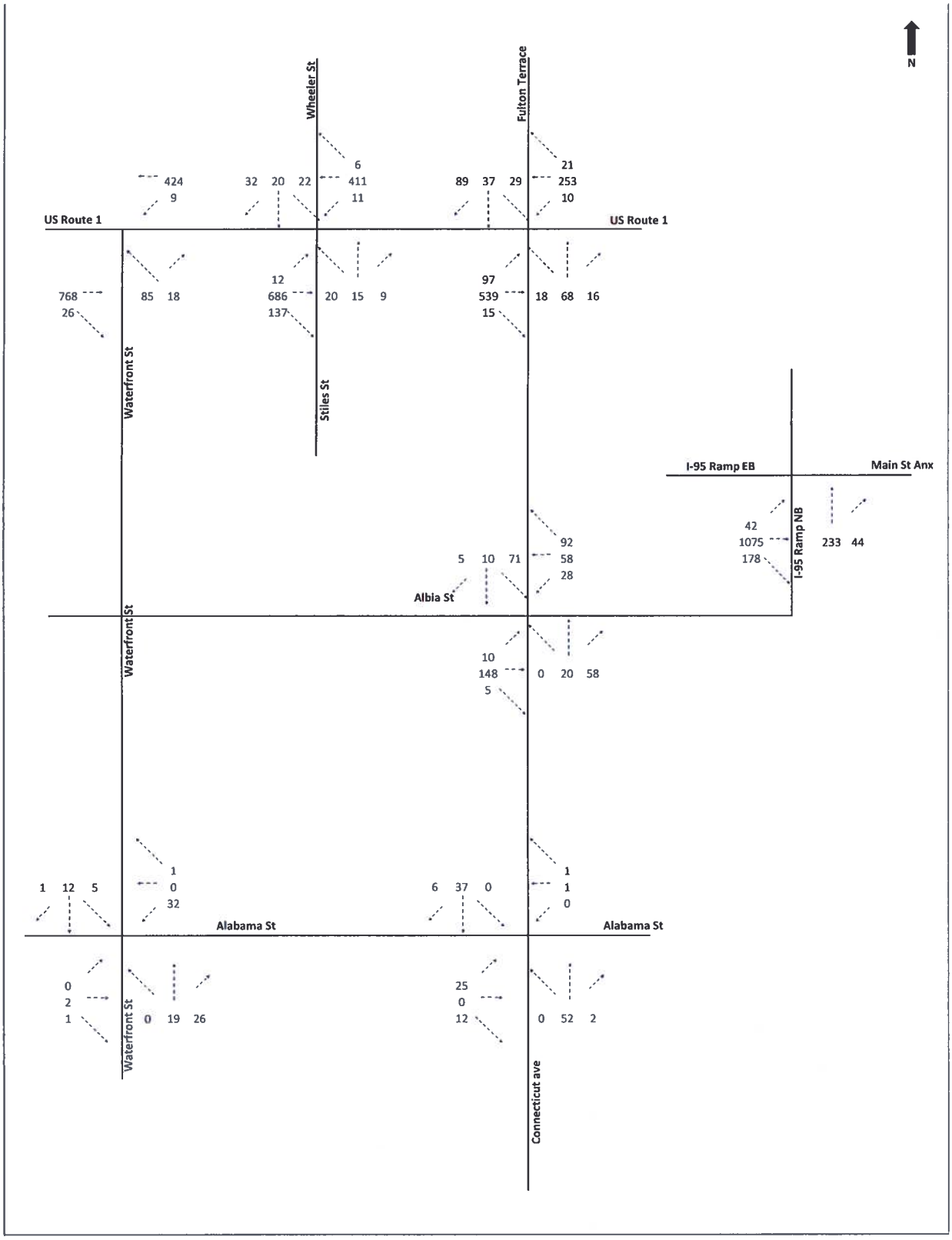

Table 4-2 – Existing and Future Levels of Service

	Weekday A.M. Peak		Weekday Mid-day Peak		Weekday P.M. Peak	
Location	**Existing**	**Future**	**Existing**	**Future**	**Existing**	**Future**
Signalized Intersections						
U.S. Route 1/Stiles St./ Wheeler St.	**A(6.6)**	**A(6.6)**	**A(7.5)**	**A(7.5)**	**A(9.4)**	**B(10.7)**
U.S. Route 1 Eastbound	A(8.8)	A(8.6)	A(8.8)	A(8.8)	B(11.4)	B(13.2)
U.S. Route 1 Westbound	A(3.0)	A(3.0)	A(3.3)	A(3.3)	A(2.3)	A(3.2)
Stiles Street Northbound	B(18.0)	B(18.2)	B(16.5)	B(16.5)	C(23.9)	C(24.1)
Wheeler St. Southbound	B(16.4)	B(16.8)	B(14.2)	B(14.4)	B(18.8)	B(19.2)
U.S. Route 1/Fulton St./ Fulton Terrace	**A(6.7)**	**A(6.7)**	**A(6.5)**	**A(6.6)**	**A(6.7)**	**A(7.8)**
U.S. Route 1 Eastbound	A(6.4)	A(6.4)	A(6.2)	A(6.2)	A(7.8)	A(7.8)
U.S. Route 1 Westbound	A(6.9)	A(6.9)	A(5.9)	A(6.0)	A(6.9)	A(6.0)
Fulton Street Northbound	A(8.8)	A(8.9)	A(8.8)	A(8.9)	B(11.8)	B(11.9)
Fulton Terrace Southbound	A(6.2)	A(6.2)	A(7.3)	A(7.3)	A(8.0)	A(8.1)
Waterfront St. Connector/I-95 Ramps	**A(6.8)**	**A(7.8)**	**A(7.1)**	**A(8.1)**	**B(11.7)**	**B(13.1)**
I-95 Ramps Eastbound	A(5.7)	A(7.1)	A(6.0)	A(7.6)	A(9.7)	B(11.8)
Waterfront St. Connector Northbound	B(11.7)	B(10.4)	B(11.0)	A(9.7)	C(21.2)	B(19.0)
Un-signalized Intersections						
U.S. Route 1/Waterfront Street						
U.S. Route 1 Westbound Left	A(0.1)	A(0.1)	A(0.1)	A(0.1)	A(0.3)	A(0.3)
Waterfront St. Northbound	D(25.3)	D(25.7)	C(22.6)	C(22.9)	F(148.3)	F(155.9)
Albia St./Waterfront Connector/Fulton Terrace						
Albia St. Eastbound	B(10.1)	B(10.1)	A(9.9)	A(9.9)	B(10.4)	B(10.4)
Waterfront St. Connector Westbound	B(10.5)	B(10.6)	A(10.0)	B(10.1)	B(10.3)	B(10.4)
Fulton Terrace Northbound	A(9.2)	A(9.2)	A(8.8)	A(8.8)	A(9.2)	A(9.2)
Fulton Terrace Southbound	A(8.8)	A(8.9)	A(8.9)	A(9.0)	A(9.4)	A(9.4)
Alabama St./Connecticut Avenue						
Alabama St. Eastbound	A(9.1)	A(9.2)	A(9.2)	A(9.3)	A(9.2)	A(9.2)
Connecticut Ave. Northbound Left	A(0.6)	A(0.6)	A(0.0)	A(0.2)	A(0.0)	A(0.0)
Alabama St./Waterfront St.						
Alabama St. Westbound	A(9.7)	A(9.7)	A(9.9)	A(9.9)	B(10.1)	B(10.1)

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Section 5
Recommendations

This section discusses the list of recommendations and future projects for the New Haven Port Authority to consider in concert with future redevelopment.

5.1 Traffic Improvements

The following is a list of traffic improvements recommended within the Port Area:

- **U.S. Route 1/Forbes Avenue and Waterfront Street** – This intersection does not meet the need for a traffic signal based on existing and future traffic volumes. However, the need should be investigated as future redevelopment occurs within the Port Area.

- **Waterfront Street and Alabama Street** – This intersection does not meet the need for a multi-way stop sign. However, if the port sees an increase in rail activity, the current traffic control would have to be further investigated.

5.2 Roadway Improvements

The following is a list of roadway improvements recommended within the Port Area:

- **Connecticut Avenue** – The entire length of Connecticut Avenue requires a full-depth reconstruction which includes full depth pavement, subbase, drainage, and curbing improvements. The cost of the proposed full depth reconstruction is estimated at $2.33 million. If a sidewalk is installed on one side, the cost is estimated at $2.54 million.

- **Alabama Street** – Alabama Street appears to be in fair condition and a mill and overlay of this roadway is required at this point. The cost of this work is estimated at $114,000.

5.3 Signage Improvements

The NHPA should undertake a detailed signage and wayfinding effort for customers and employees accessing the port form I-95 and U.S. Route 1. This program will direct motorists to specific port facilities at key decision points. A conceptual signage plan is presented in **Figure 5-1** to/from I-95 and U.S. Route 1. An internal wayfinding plan is presented in **Figure 5-2**.

5.4 Truck Circulation Improvements

As indicated in Section 3, there are very limited opportunities to provide additional truck parking and staging areas within the Port based on discussions with NHPA. However, an effort was made to reconfigure the existing truck parking/staging area on Alabama Street/Stiles Street to provide additional truck staging. **Figure 5-3** shows a concept with additional truck staging. There is an increase of about two (2) additional parking spaces for trucks to stage prior to accessing the port facilities.

Figure 5-4 shows the overall master plan for the Port Area.

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Figure 5-1 Conceptual Signage Plan

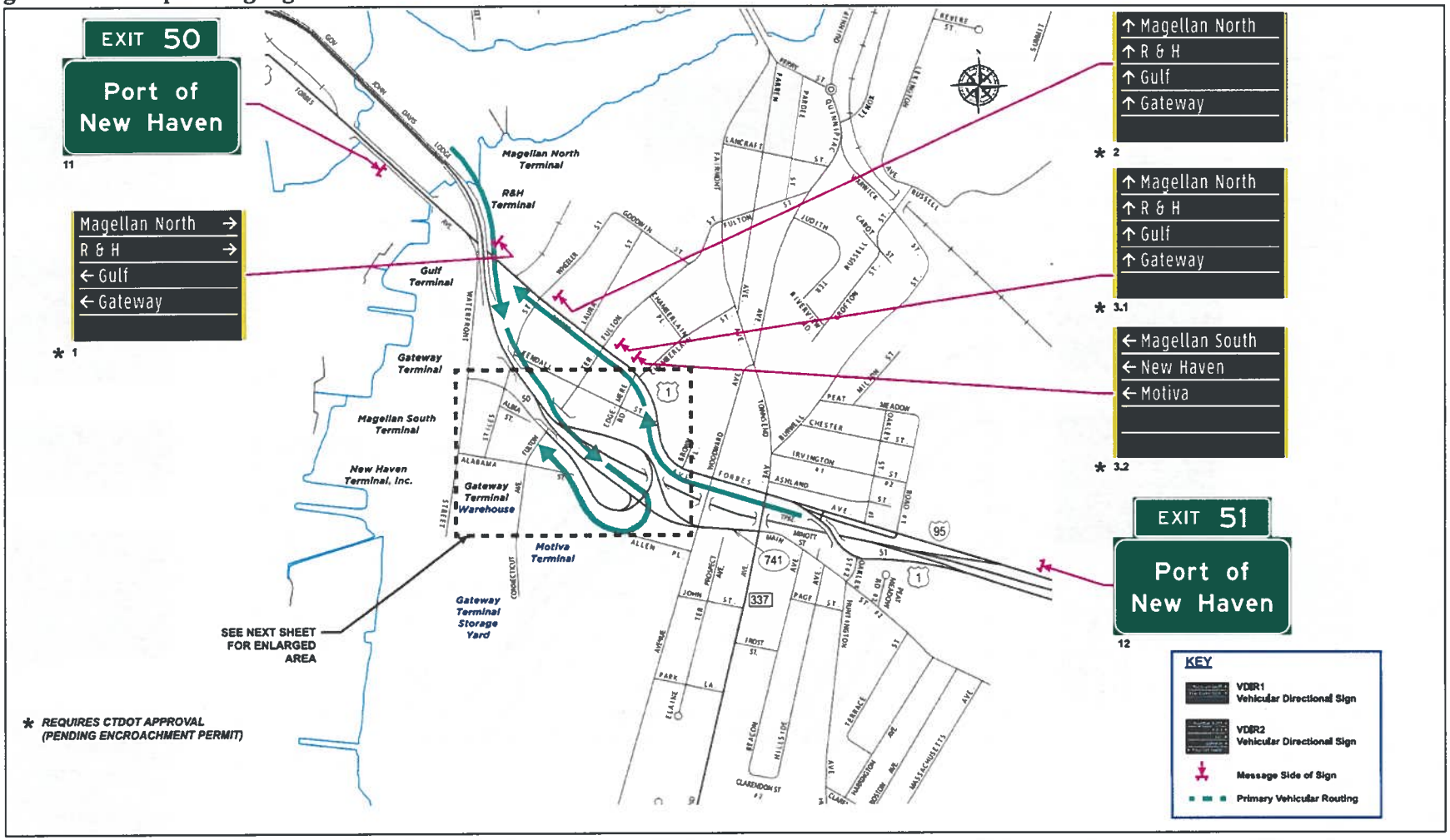

Figure 5-2 Internal Wayfinding Plan

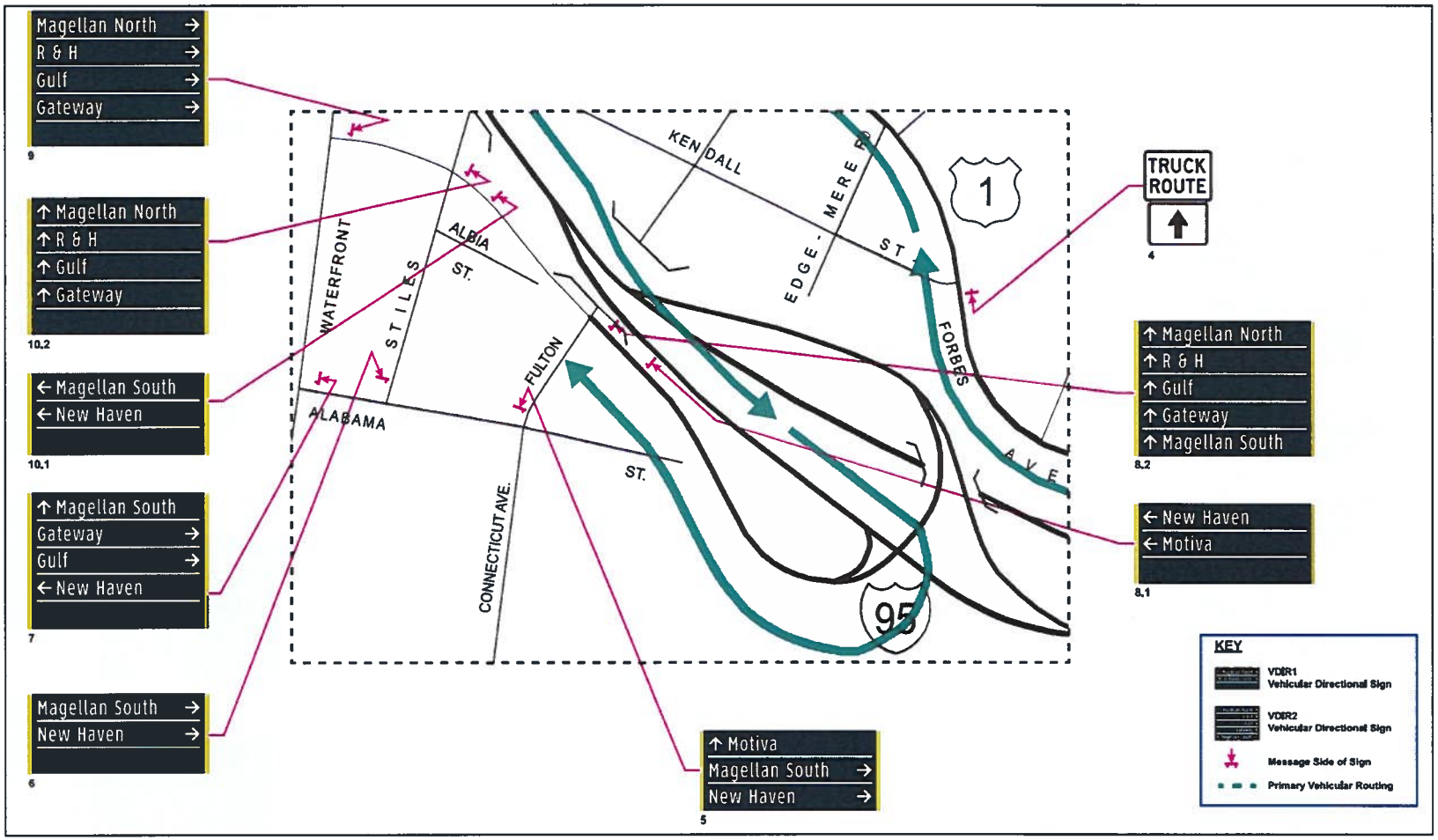

Figure 5-3 Suggested Truck Staging Plan

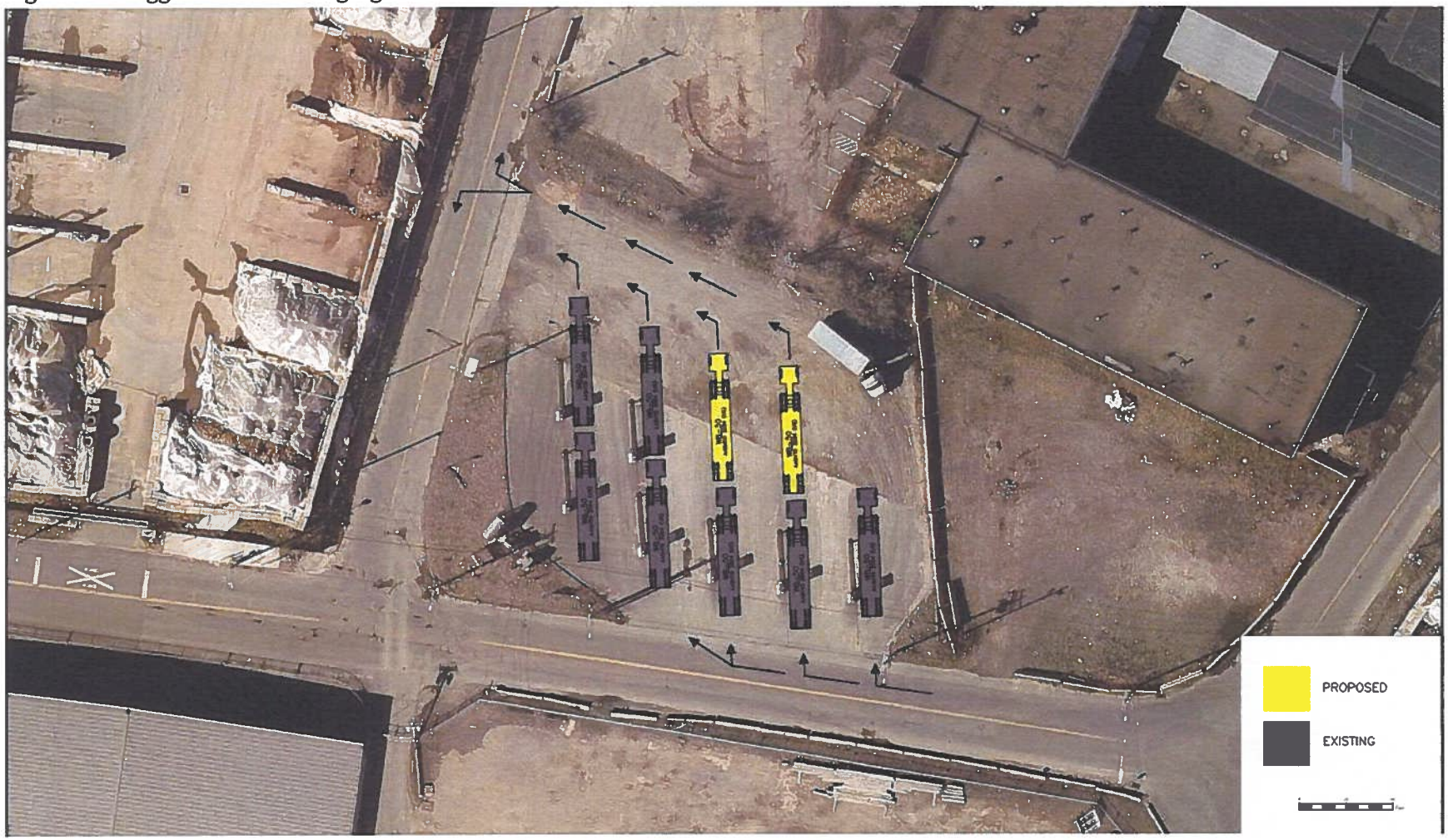

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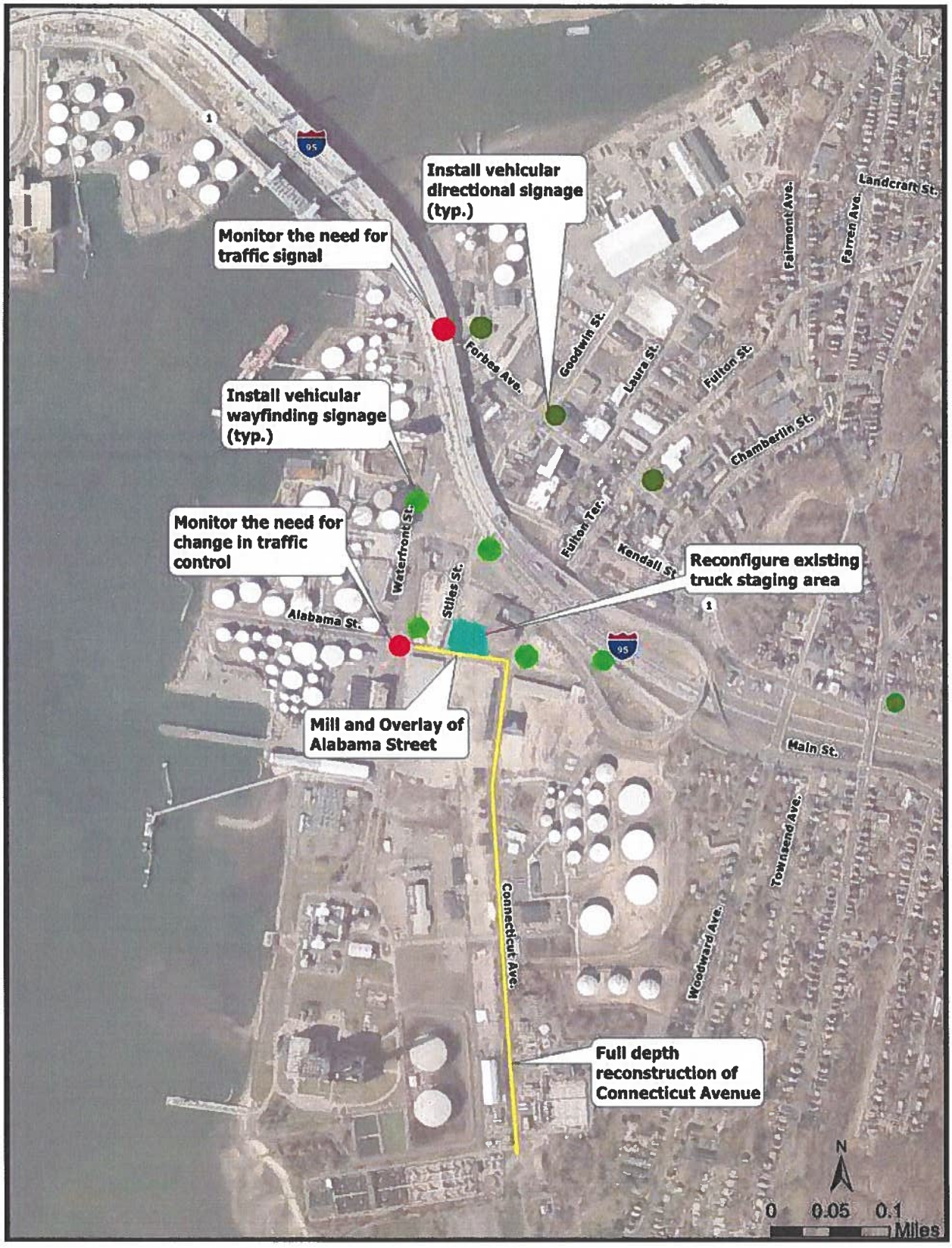
Figure 5-4 Overall Master Improvement Plan



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