Cross Harbor Freight EIS

Technical Advisory Committee Modeling Workshop

December 17, 2009

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Goals from the NOI

- **Improve the movement of freight across New York Harbor between the east-of-Hudson and west-of-Hudson regions**
  - Reduction in congestion on the Verrazano Narrows and George Washington Bridges
  - Congestion relief on the major freight corridors
  - Reduction in travel time for bi-state freight movements
  - Increase in cross-harbor freight movement capacity.

Cross Harbor Tier I EIS

Focus on general transportation modes and alignments, including logical termini, and regional economic and transportation effects.

Tier I of the EIS will include:

- a logistics and market demand analysis;
- a network analysis;
- an economic and financial analysis;
- Alternatives development and analysis;
- general environmental impact assessments
- data needs list for the preparation of Tier II

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Goals for Today's Workshop

Set stage to complete the Tier I Analysis

Discuss the modeling methods

Present interim work in progress

Obtain TAC feedback

Identify any technical issues to be addressed

Agenda and Suggested Schedule

1. Welcome and Introductions (1:00)
2. Overview of Modeling Approaches and Alternatives (1:05)
3. Freight Flow Modeling / Q&A (1:15)
4. Mode Choice Modeling / Q&A (1:30)
5. Break (2:00)
6. Rail Network Modeling / Q & A (2:10)
7. Highway Network Modeling / Q & A (2:40)
8. Wrap-up (2:55)

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1.3 - Welcome

Types of Models in the Tier I EIS

Freight flow models

- Estimate current baseline and future “no action” freight activity

Mode choice and demand models

- Estimate potential shifts to Cross Harbor alternatives

Transportation network models

- Determine effects on local and regional highway and rail networks

Economic and fiscal impact models

- Estimate public and private benefits, costs, and impacts

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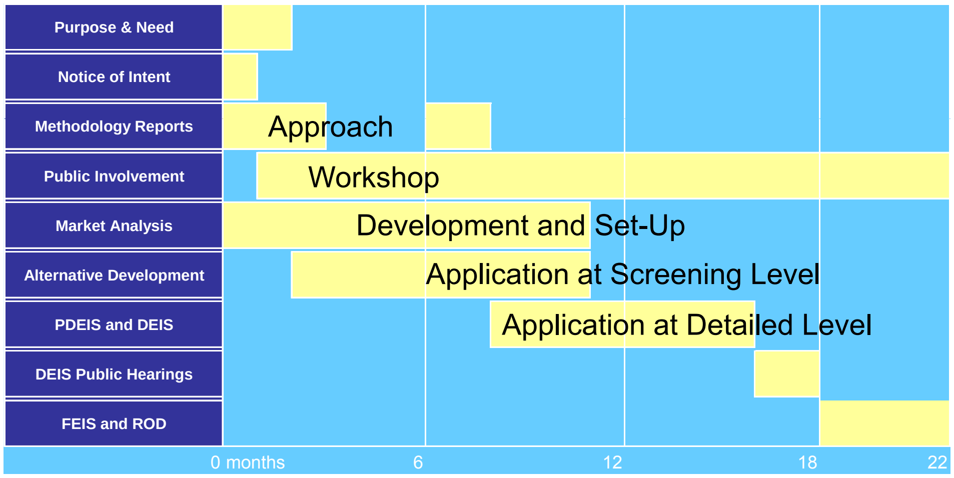
2.1 - Overview

Model Development and Application in Tier I



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2.2 - Overview

Models Must Address All Market Opportunities

Grow direct rail service to/from customers East of Hudson, focusing on proven rail commodities

For rail traffic terminating West of Hudson and trucked East of Hudson, move the rail trip end East of Hudson

Shift the ‘middle’ segment of long-haul East of Hudson truck trips to rail, and terminate East of Hudson

Provide an alternative crossing for shorter-haul truck trips

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2.3 - Overview

Models Must Address All Potential Alternatives

No Action

TSM (physical/operational upgrades) and TDM (pricing)

Float
(railcar, trailer, container) and Ferry (truck and driver)

Rail Tunnel
(single/double track, single/double stack, conventional/open technology)

Multimodal Tunnel
(rail plus emergency vehicles, scheduled trucks, roll-on/roll-off “chunnel” shuttle, automated guided vehicle)

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2.4 - Overview

Models Must Address All Potential Facility Locations and their Connecting Transportation Networks

West of Hudson

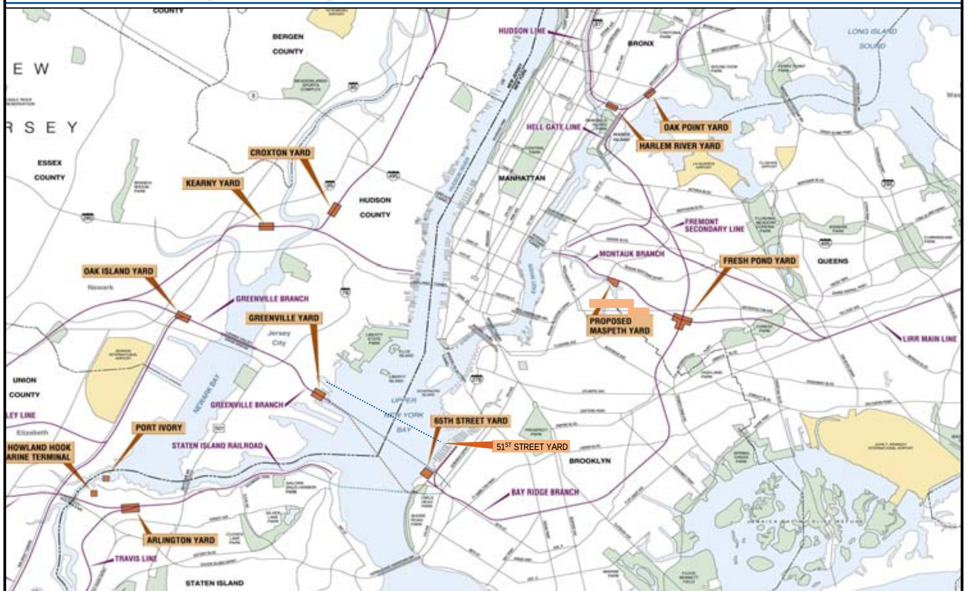
- **Facilities**
  - Greenville (float hub, ferry hub, tunnel portal)
  - Other rail yards
- **Connections**
  - Rail network/Highway network

East of Hudson

- **Facilities**
  - Float/ferry terminals in Brooklyn – Queens, Bronx also possible
  - South Brooklyn tunnel portal
  - Rail yards in Brooklyn, Queens, Nassau, Suffolk, Bronx
  - 2004 DEIS relied on single yard, but network of multiple yards possible
- **Connections**
  - Rail network/Highway network

2.5 - Overview

Connecting Transportation Networks



Models Must Address Different Geographies

Local

- Freight flows over Cross Harbor alternatives
- Physical extent of Cross Harbor alternatives

Regional

- Freight flows to, from, within and through a 54-county study area spanning four states (NY / NJ / PA / CT)
- Effects of Cross Harbor alternatives on highway and rail infrastructure in this study area, and limitations this infrastructure imposes

National

- End-to-end freight flows of hundreds or thousands of miles
- Integration of Cross Harbor alternatives with national highway and rail networks

Models Must Utilize Best Available Data

Railroads
- Can provide: gate moves, rail car data (through STB), network and operations info
- Cannot provide: truck data (proprietary), long range rail forecasts, rail network models, evaluations of future services not now offered

DOTs and MPOs
- Can provide: highway models, traffic counts, Waybill approvals, economic forecast assumptions
- Cannot provide: commercially protected freight and economic data

Other sources
- Prior studies
- Commercial data providers
- Original data collection and surveys

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2.7 - Overview

Freight Flow Modeling

Need to understand freight flows to determine market demand and transportation impacts of Cross Harbor alternatives
- Volume, units, value
- Inbound, outbound, internal, through
- By mode, commodity, origin and destination
- Current estimates and future projections through 2035 with interim years

Our modeling process
- Selection of the best existing sources (most are modeled or sampled)
- Collection of new data
- Synthesis and validation across multiple sources

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3.1 – Freight Flow Modeling

Data Sources are Linked to Market Opportunities

Market Opportunity	USDOT Freight Analysis Framework	STB Waybill Data	Highway Models and Traffic Counts	Origin-Destination Surveys	PANYNJ Transearch Data, 2007 and 2035	Validation Interviews
#1 Grow Existing Rail Markets	No – too general compared to other sources	Full sample for NY, NJ Public sample for PA, CT	No	No	Yes	Yes
#2 Move Rail Trip Ends				STB O-D surveys New PANYNJ crossing surveys New gate data collection		
#3 Divert Long-Haul Trucks		No	NJTPA RTM-E NYMTC BPM DOT counts	New PANYNJ crossing surveys		
#4 Divert Shorter-Haul Trucks						

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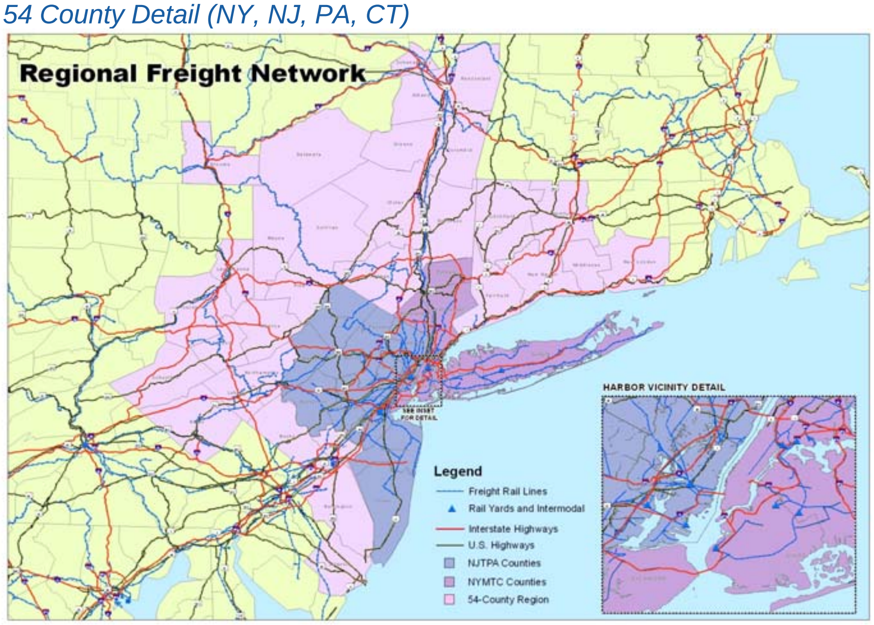
3.2 – Freight Flow Modeling

Transearch Analysis Zones

54 County Detail (NY, NJ, PA, CT)



3.3 – Freight Flow Modeling

Status of Freight Flow Modeling

Opportunity #1, Grow Existing Rail Markets

Data Type	STB Waybill Data	PANYNJ Transearch Data, 2007 and 2035	Validation Interviews
Rail volumes inbound and outbound, East of Hudson, 2007	NYSDOT permission pending	Rail data will be received following Waybill permission	Last stage
Rail volumes inbound and outbound, East of Hudson, 2035	Not applicable		

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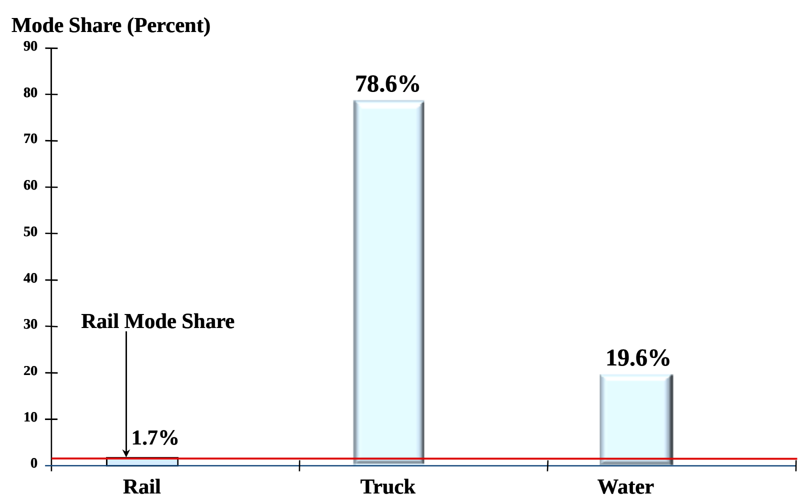
3.4 – Freight Flow Modeling

Interim Data

Opportunity #1, Grow Existing Rail Markets



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3.5 – Freight Flow Modeling

Status of Freight Flow Modeling

Opportunity #2, Move Rail Trip Ends

Data Type	STB Waybill Data	Origin-Destination Surveys	PANYNJ Transearch Data, 2007 and 2035	Validation Interviews
Rail volumes inbound and outbound, NNJ, 2007	NJDOT permission pending	Not applicable	Rail data will be received following Waybill permission	Last stage
Rail volumes inbound and outbound, NNJ, 2035	Not applicable			
Container units and transflow commodity trucks moving directly between NNJ rail yards and East of Hudson, without intermediate or offsite handling		STB O-D survey data obtained and analyzed New PANYNJ crossing survey data available end of January, asks about facility origin and destination type New gate data collection	Truck data for "rail drayage" of containers is available	

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3.6 – Freight Flow Modeling

Interim Data

Opportunity #2, Move Rail Trip Ends

Truck Counts, Six Non-Consecutive Days During Three-Month Periods -- NS Croxton

Period	Total Gate Units	George Washington
October through December 2001	2,419	296 (12%)
January through March 2002	2,356	294 (12%)
July through September 2002	2,422	402 (17%)

Avg 55 / day

Truck Counts, Six Non-Consecutive Days During Three-Month Periods -- CSX Kearny/Little Ferry/North Bergen

Period	Total Gate Units	George Washington
September through November 2001	3,281	386 (12%)
January through March 2002	2,913	345 (12%)
April through June 2002	3,135	322 (10%)
July through September 2002	2,423	432 (18%)

Avg 62 / day

Source: Surface Transportation Board electronic filings

In 2001-2002, between 82% and 90% of trucks moving to and from West of Hudson intermodal rail yards did not cross the GWB. PANYNJ crossing surveys will update this information and we may want to explore new gate data collection at the rail terminals.

3.7 – Freight Flow Modeling

Status of Freight Flow Modeling

Opportunity #3 (Long-Haul Trucks) and #4 (Shorter-Haul Trucks)

Data Type	Highway Models and Traffic Counts	Origin-Destination Surveys	PANYNJ Transearch Data, 2007 and 2035	Validation Interviews
Highway network counts and forecasts	NJTPA RTM-E, NYMTC BPM, DOT counts obtained	Not applicable	Not applicable	Last stage
Truck volumes by origin-destination pair and commodity, 2007	Not applicable	New PANYNJ crossing survey data available end of January – commodity info limited to truck type	All truck data (tons, units, value, commodity, O-D pair) available	
Truck volumes by origin-destination pair and commodity, 2035		Not applicable		

Interim Data

Opportunity #3, Divert Long-Haul Trucks

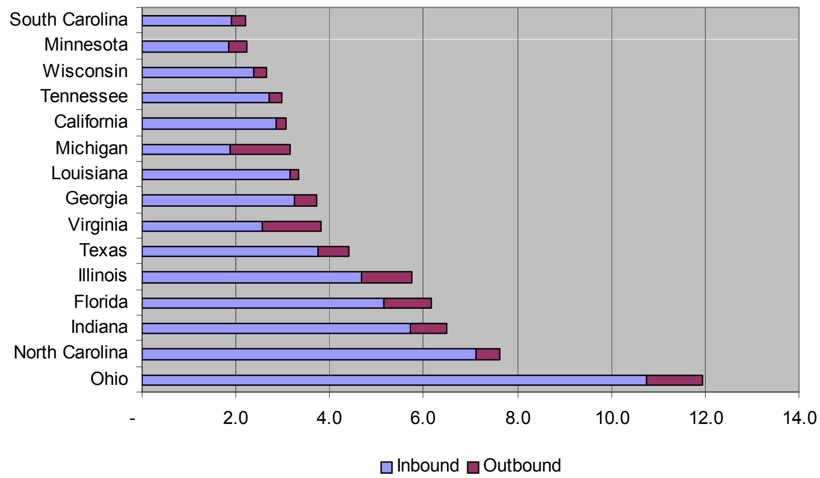
Transearch Data	2007 Tons	2035 Tons	Growth	Rate
All Truck Tonnage	1,097,721,109	1,535,076,042	140%	1.2%
Long Haul Inbound to Study Area	160,248,704	277,021,275	173%	2.0%
Long Haul Outbound from Study Area	48,224,764	75,617,511	157%	1.6%
Long Haul Inbound from WOH to Study Area EOH	78,881,196	141,883,428	180%	2.1%
Long Haul Outbound to WOH from Study Area EOH	14,142,654	19,712,048	139%	1.2%

Long-haul trips are 500 miles or more, on average. This diversion opportunity represents around 10% of all truck tonnage.

Interim Data

Opportunity #3, Divert Long-Haul Trucks

Long haul trucks to the EOH study area are mostly originating in Ohio, North Carolina, Indiana, Florida, Illinois, and Texas. Long haul trucks from the EOH study area are terminating in a variety of states.

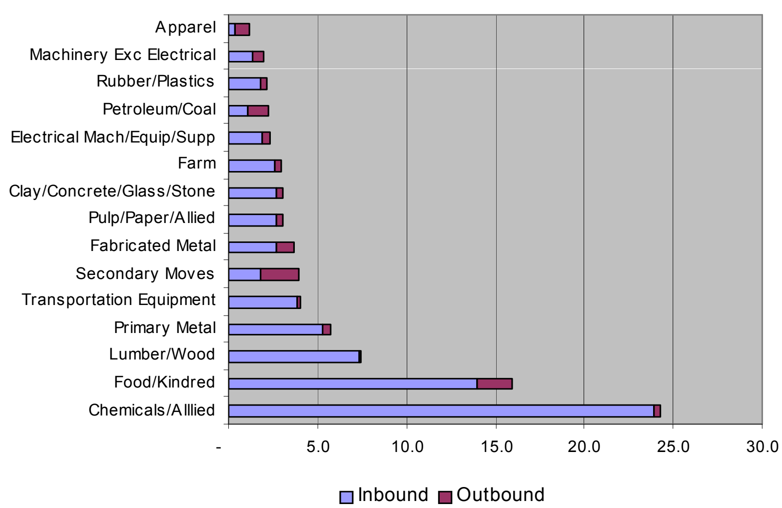


3.10 – Freight Flow Modeling

Interim Data

Opportunity #3, Divert Long-Haul Trucks

Long haul trucks to the EOH study area carry mostly chemicals and food. Long haul trucks from the EOH study area mostly carry secondary traffic, food, fuel, and other products.



3.11 – Freight Flow Modeling

Interim Data

Opportunity #4, Address Shorter-Haul Trucks

Transearch Data	2007	2035	Growth	Rate
All Truck Tonnage	1,097,721,109	1,535,076,042	140%	1.2%
Mid-Haul Inbound from WOH to Study Area EOH	63,401,213	84,107,644	133%	1.0%
Mid-Haul Outbound to WOH from Study Area EOH	21,264,190	25,148,309	118%	0.6%
Short-Haul Inbound from Study Area WOH to Study Area EOH	80,357,857	108,026,772	134%	1.1%
Short-Haul Outbound to Study Area WOH from Study Area EOH	30,884,990	38,179,755	124%	0.8%

Short-haul trips are defined as trips within the 54-county study area. Mid-haul trips are other trips of less than 500 miles, on average. This diversion opportunity represents around 17% of all truck tonnage. Transearch tends to under-represent local trucks, so this estimate will need to be adjusted.

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3.12 – Freight Flow Modeling

Freight Flow Modeling

Final Product

The product: an integrated dataset we can apply to mode choice, highway network, and rail network models

- Tons, units, values
- Mode
- Commodity
- Origin and destination pair

Dataset itself is subject to confidentiality restrictions

- Waybill
- Transearch

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3.13 – Freight Flow Modeling

Questions or Comments?

Mode Choice Modeling

The Mode Choice Model is a tool to estimate the potential demand for freight transportation services that do not yet exist

- Based on anticipated quantifiable performance measures: cost, speed, reliability, frequency, etc., compared to existing alternatives
- Allows us to test any alternative where factors can be quantified
- Can use to screen and refine different services, modes, etc. in a feedback process within the overall study
- Can develop the model based on expected ranges of alternatives – do not need to have "final" parameters for each alternative

Requirements to Develop the Mode Choice Model

The Mode Choice Model requires three main inputs

- Information on base case freight flows for analysis years
  - From Freight Flow Modeling
- Information on modal attributes (cost, speed, reliability, etc.) of mode choice alternatives
  - From regional transportation network models and national data sources (FAF, TruckLoadRate.com, ORNL Rail network, etc.)
  - From interviews with carriers and handlers (truckers, railroads, warehouse/distribution) conducted as part of the larger Tier I process
  - Interviews will be coordinated with other ongoing freight studies to minimize "interview fatigue"
- Information on the sensitivity of mode choices to different levels of cost, speed, reliability, etc.
  - Program of revealed preference and stated preference surveys, administered to logistics decision-makers

4.2 – Mode Choice Modeling

Mode Choice Modeling Steps

1. Conduct survey market research with shipping / receiving decision-makers
2. Estimate discrete choice models from survey data
3. Apply choice models to freight flows for analysis years
4. Validate choice models
5. Develop modeling tool and export results to transportation and economic impact models

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4.3 – Mode Choice Modeling

Mode Choice Modeling, Step #1
Survey Market Research

Focus Groups
- Development and pre-testing

Revealed Preference Survey
- Administer to shipping / receiving decision-makers to obtain information on current shipments

Stated Preference Survey
- Develop Stated Preference choice exercises
  - Customized to respondents based on their current shipments
  - Modal attribute levels offered (cost, speed, reliability, etc.) are realistic, <u>but varied within ranges</u> according to a pre-set experimental design
  - Process captures <u>tradeoffs between modal attributes by market segment</u>
- Administer the stated preference choice exercises
  - Target of 400 respondents, with multiple exercises per respondent

4.4 – Mode Choice Modeling

Mode Choice Modeling, Step #1
Choice Exercise Example

Suppose these were your transportation options to ship your goods from:
Las Vegas, NV to San Antonio, TX

Your choices are...	OPTION A	OPTION B	OPTION C	OPTION D
				
Method of Travel	You ship/receive your goods by truck traveling on a route which includes truck-only toll lanes	You ship/receive your goods by rail traveling on improved rail routes	You ship/receive your goods by truck traveling on existing highways	You ship/receive your goods by freight shuttle traveling on an exclusive right-of-way
Service Frequency	Every 15 minutes	Every 8 hours	Every 30 minutes	Every 60 minutes
Transit Time (hours)	34	66	30	44
Shipment Cost	$2,250	$1,553	$1,874	$2,658
On Time Delivery Reliability	85%	85%	99%	90%
Which of the four options above would you choose? (Please circle one)	OPTION A	OPTION B	OPTION C	OPTION D

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4.5 – Mode Choice Modeling

Mode Choice Modeling, Step #2
Mode Choice Model Estimation

Model Structure
- Multinomial Logit or Nested Logit formulations
- Separate models for the different freight shipment opportunities

Variables
- Policy variables
  - Attributes and attribute levels that are "traded off"
- Market segmentation variables
  - Differentiating between classes of shippers and receivers and types of commodities
- Alternative (mode) specific variables

Iterative process for finding best model specification from many different potential specifications

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4.6 – Mode Choice Modeling

Mode Choice Modeling, Step #2
Potential Policy Variables

Policy variables in past models have included:
- Shipment cost
- Shipment travel time
- Frequency of available service
- On-time performance (based on schedule delay, delivery window adherence)
- Availability of shipment in-transit visibility technologies
- Invoice problem rate (frequency of billing and payment issues)
- Loss-and-Damage rate

Focus groups are critical to identify relevant policy variables
- Targeted to region's key industries and needs
- Targeted to local conditions

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4.7 – Mode Choice Modeling

Mode Choice Modeling, Step #2

Potential Market Segmentation Variables

Shipment characteristics
- Commodity type
- Distance
- Shipment frequency and size

Shipper characteristics
- Line of Business
- Employees
- Freight facilities and equipment

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4.8 – Mode Choice Modeling

Mode Choice Modeling, Step #3

Apply Choice Coefficients to Freight Flows for Analysis Years

Forecasting tool with spreadsheet inputs
- Coded with choice coefficients
- Inputs/links to analysis year freight flows
- Inputs/links to performance attributes of Cross Harbor alternatives

Generates quantitative estimates of demand based on inputs
- By mode
- By shipment type
- By policy variable
- By market segment

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4.9 – Mode Choice Modeling

Mode Choice Modeling, Step #4

Model Validation

Does model predict revealed preferences reasonably?

- Compare model results to revealed preference data

Are model sensitivities reasonable?

- Reality-test to ensure changes in input variables produce proportionate changes in demand
- Example of modeled tradeoffs for Canadian rail shipments at 1000-1250 kilometers
  - 1 hour reduced travel time = $1.83 per ton savings
  - 1 hour frequency improvement = $1.09 per ton
  - 1 % Improved On-time performance= $1 - $13 (commodity dependent)
  - 1 % reduction in invoice problems = $11
  - 1 % reduction in loss & damage = $5 - $22
  - Not providing visibility technologies = increase of $33

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4.10 – Mode Choice Modeling

Mode Choice Modeling, Step #5

Final Product

Final product is a model forecasting tool

- Capable of generating quantified demand estimates for each Cross Harbor alternative
- Based on underlying levels of demand, modal attributes being offered, and decision-making preferences of shippers and receivers
- Capable of testing variations in location, service, pricing, and performance of Cross Harbor alternatives throughout the study

Applications

- Developing, testing and refining alternatives
- Output to Rail Network Models (demand avoided, demand created)
- Output to Highway Network Models (demand avoided, demand created)
- Output to Economic Models

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4.11 – Mode Choice Modeling

Questions or Comments?

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Rail Network Modeling

Modeling rail capacity

- Defining rail capacity
- The AAR rail capacity study
- Modeling approaches

Cross Harbor rail capacity analysis methodology

- Establishing the volume
- Calculating the capacity
- Special considerations

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Rail Capacity and the Cross Harbor Program

Goals

- To understand the current capacity of the region's rail network
- To understand the effects of changes in rail traffic over this network
- To identify the extent and location of infrastructure and operational improvements required to support Cross Harbor alternatives

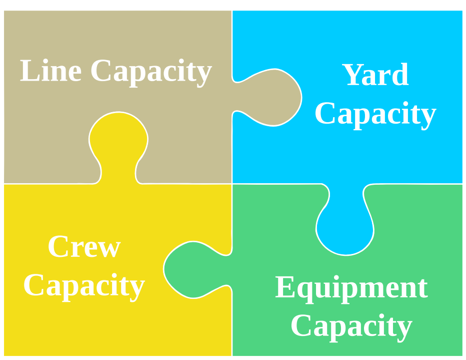
Suggested definition of capacity for the Cross Harbor Program

- "The maximum number of trains that can be moved over a rail line in a day without exceeding a predefined level of service."

Suggested geography of the analysis

- National rail network and national traffic flows to and from the region
- Capacity analysis for the multistate service region: Central and Southern New York, Northern and Central New Jersey, Western Connecticut, and Eastern Pennsylvania.

Elements in Determining Rail Capacity



For Cross Harbor modeling, line and yard capacity will be considered.

<u>Line Capacity</u>: number of tracks; type and spacing of control system; number, spacing, and length of sidings; mix of train types; operating and maintenance plans

<u>Yard Capacity</u>: total acreage; number of tracks; container storage slots

<u>Crew Capacity</u>: available crew starts; yard crews; maintenance crews

<u>Equipment Capacity</u>: locomotives; railcars; containers/trailers

Levels of Effort in Determining Rail Capacity

Initial Estimate (back of the envelope)	Planning Models (spreadsheet, parametric, AAR method)	Simulation
• Expert with basic knowledge of number of tracks, type of signals, and special conditions (e.g. mountainous terrain) • Useful for quick assessment of a single corridor or facility	• Variety of methods, requires more data than back of the envelope but less than a full simulation • Parametric (formula based) models stem from 1975 FRA work and the CN model (Krueger, 1999) • "Paper" simulations (now evolved to spreadsheets) are also used for capacity estimation	• Uses a commercial rail simulation product (RTC, RAILS, FastTrack) • Requires precise network layout (tracks, sidings, interlockings, signals, etc.) • Requires knowledge of operating plan, including approximate train schedules • Initial setup is expensive

Rail modeling for this project will be at the planning level

5.4 – Rail Network Modeling

The AAR Approach to Modeling Rail Capacity

National Rail Freight Infrastructure Capacity and Investment Study

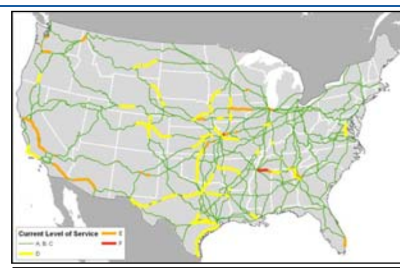
Requested by the National Surface Transportation Policy and Revenue Study Commission

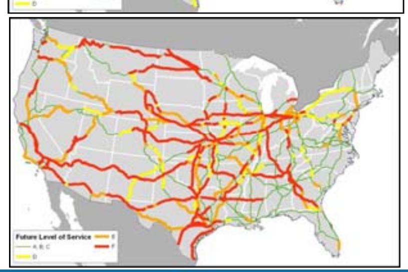
Commissioned by the Association of American Railroads

Prepared by Cambridge Systematics, Inc.

Purpose was to estimate the rail freight infrastructure improvements and investments needed to meet the U.S. DOT's projected demand for rail freight transportation in 2035

Used STB Waybill data, empty car estimates, and ORNL network attributes





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5.5 – Rail Network Modeling

Maximum Capacity vs. Effective Capacity

Transportation firms can never utilize a facility 100% of the time

- Maintenance
- Weather
- Peaking of traffic volumes
- Disruptions and recoverability
- Normal variability in operational conditions

Industry practices call for standards to maintain fluidity of operations and avoid major issues at chokepoints

- Useable (effective) capacity is 70% to 80% of the maximum (theoretical) capacity
- Utilizing the capacity buffer between effective and maximum capacity results in deferred maintenance, reduced ability to react to variability with increasing recovery time, significant reduction in reliability

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5.6 – Rail Network Modeling

Recommended Level of Service Standards for Rail Line Capacity (from AAR Study)

LOS Grade	Description		Volume/Capacity Ratio
A	Below Capacity	Low to moderate train flows with capacity to accommodate maintenance and recover from incidents	0.0 to 0.2
B			0.2 to 0.4
C			0.4 to 0.7
D	Near Capacity	Heavy train flow with moderate capacity to accommodate maintenance and recover from incidents	0.7 to 0.8
E	At Capacity	Very heavy train flow with very limited capacity to accommodate maintenance and recover from incidents	0.8 to 1.0
F	Above Capacity	Unstable flows; service break-down conditions	> 1.00

5.7 – Rail Network Modeling

Cross Harbor Rail Capacity Modeling

Step 1: Establish Current Trains/Day

- Use **current loaded railcars** from 2007 STB Waybill Sample
- Identify and adjust for **missing data** (northbound to Canada, missing commodities, significant short line volume, etc.)
- Adjust volumes for a representative **85^{th} percentile day** (similar to highway studies)
- Estimate **empty railcar movements** from empty return ratios by type
- Convert from **railcars/day to trains/day** using average train lengths
- Add **current passenger trains/day** from public timetables
- Send to railroads for **review** and corrections
- Report results at aggregates level to comply with **STB confidentiality** requirements

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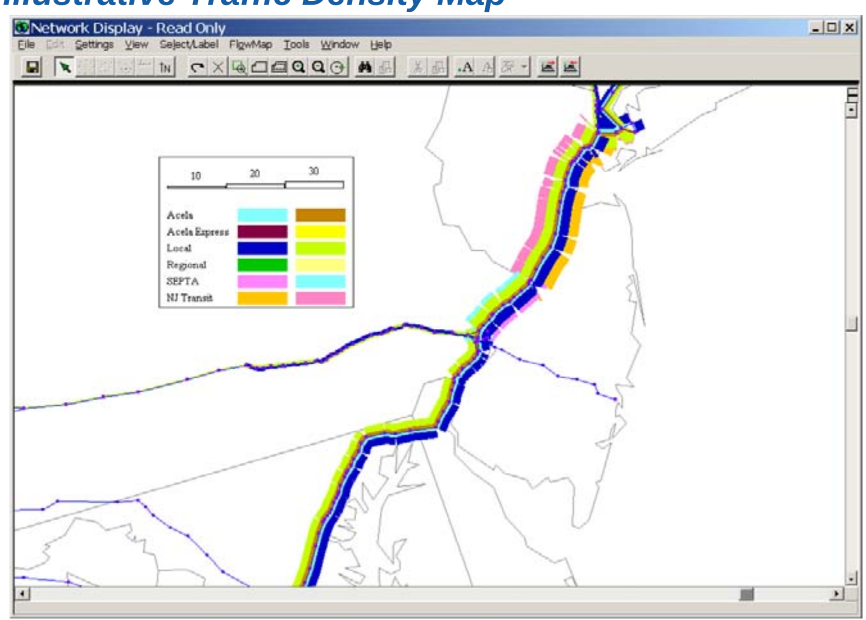
5.8 – Rail Network Modeling

Illustrative Traffic Density Map



5.9 – Rail Network Modeling

Cross Harbor Rail Capacity Modeling

Step 2: Generate Parameters for Line Capacity Analysis

Key inputs

- Obtain network attributes from the Oak Ridge National Laboratory rail network (Mileage, Owner, Subdivision, Number of Tracks, Track Class, Track Type, Control System).
- Obtain traffic attributes from the STB Waybill data. The key is whether there is a mixture of trains operating at different speeds (manifest, intermodal, bulk, passenger).
- Operating parameters (e.g., maintenance schedules) will be addressed by considering effective, rather than maximum, capacity. Specific operating plan strategies that impact capacity will not be included.

Working closely with the railroads, DOTs, and MPOs to ensure the accuracy of this information

- Team will follow up after this Workshop

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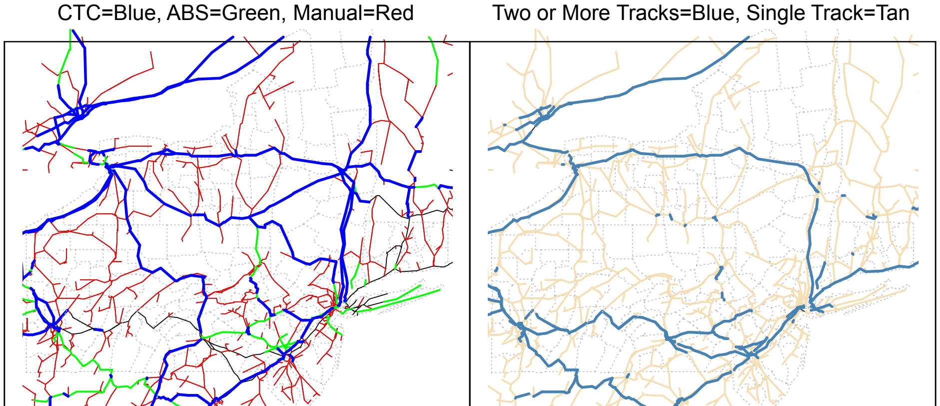
5.10 – Rail Network Modeling

Illustration of ORNL Network

Type of Control System
CTC=Blue, ABS=Green, Manual=Red

Number of Tracks
Two or More Tracks=Blue, Single Track=Tan



Preliminary data not yet verified for accuracy.

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5.11 – Rail Network Modeling

Cross Harbor Rail Capacity Modeling

Step 3: Calibrate Line Capacity Model

Develop parametric capacity model of the form:

$$C = \beta_0 \text{ x } (1 + \beta_1 N)^{\alpha 1} \text{ x } (1 + \beta_2 L)^{\alpha 2} \text{ x } (1 + \beta_3 S)^{\alpha 3} \text{ x } (1 + \beta_4 M)^{\alpha 4} \text{ x } \ldots$$

Where:

- C = maximum capacity in trains/day
- N = number of tracks
- L = type of control system (categorical variable)
- S = average spacing between sidings
- M = mix of train types
- α_i, β_j = coefficients
- … other parameters may be considered

Calibrate model using:

- Capacity information for selected lines obtained from the railroads (typically based on simulation studies)
- Capacity ranges established in the AAR study

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5.12 – Rail Network Modeling

Cross Harbor Rail Capacity Modeling

Step 4: Address Special Considerations

Tunnels can be chokepoints

- Meets and passes
- Requirements for venting fumes inside the bore between trains, means that “fleeting” of trains through the tunnel is less likely to occur
- Significant grades to/from the tunnel require slower speed operations

Tunnel approaches and connections can be chokepoints

- Nearby yard capacity and industrial switching operations can be impacted as trains wait for clearances to enter the tunnel
- Bridge capacity can be impacted due to speed restrictions, swing/lift blockage restrictions
- Slower speeds through interlockings and connections can interfere with other railroads

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5.13 – Rail Network Modeling

Cross Harbor Rail Capacity Modeling

Step 5: Identify Potential Capacity Concerns

Establish the level of service for each rail line:

$$R = V / C$$

Where:

- R = volume to capacity ratio, from which the level of service (LOS) is determined
- V = volume in trains/day
- C = maximum capacity in trains/day

Identify potential chokepoints:

- Lines with a LOS of "D", "E", or "F", using the AAR capacity scale
- Other special considerations (e.g. tunnel, bridges, yards)

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5.14 – Rail Network Modeling

Cross Harbor Rail Capacity Modeling

Step 6: Validate Current Year and Develop Future Year Model

Complete base year model with existing capacity and demand

- Prepare summary maps and documentation

Revise model to reflect future capacity and demand

- Changes in demand from Transearch forecasts
- Changes in capacity and operations from railroads
    - *Team will reach out to freight and passenger railroads following this Workshop*

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5.15 – Rail Network Modeling

Cross Harbor Rail Capacity Modeling

Final Product

Parametric model of regional highway network

- Reflecting national and regional traffic flows
- Incorporating regional network capacity estimates
- Illustrating rail links with better and worse levels of service under current and future no-build conditions

Using the model to test Cross Harbor alternatives

- Test potential growth in trains per day over existing/planned network
- Test modifications to existing/planned network
- Identify locations and extent of capacity constraints that may develop as a result of Cross Harbor alternatives
- Help test solutions to capacity constraints that may develop as a result of Cross Harbor alternatives

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5.16 – Rail Network Modeling

Questions or Comments?

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5.17 – Rail Network Modeling

Highway Network Modeling

Goal

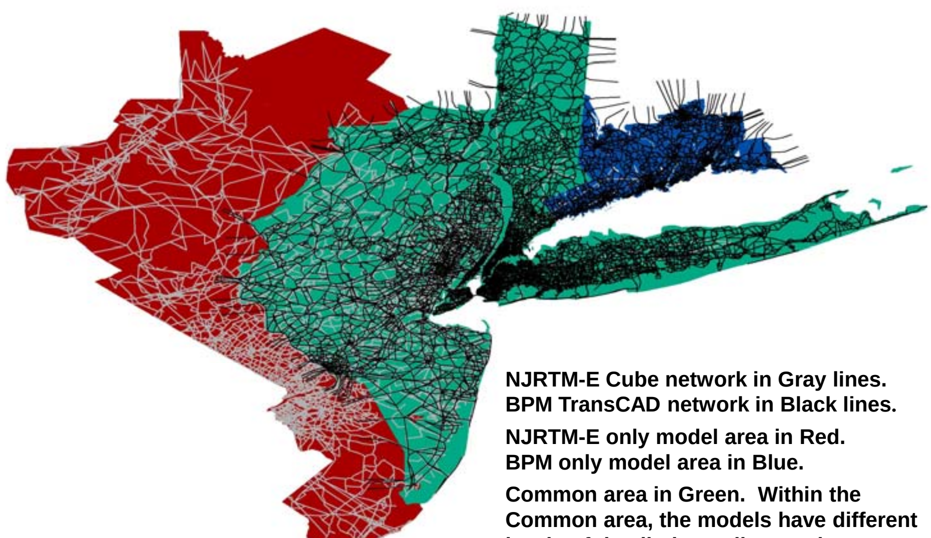
- Understand how Cross Harbor alternatives will affect local and regional highway networks
  - Reducing truck VMT on some routes, especially long-haul corridors and crossings
  - Increasing truck VMT on other routes, especially local facility access

Key analysis steps

1. Obtain and review available highway network modeling platforms
2. Perform required model modifications
3. Validate freight flow estimates
4. Apply model to test Cross Harbor alternatives

Step #1: Obtain Highway Network Model Platforms

NJTPA RTM-E and NYMTC BPM Provide Overlapping Coverage



NJRTM-E Cube network in Gray lines.
BPM TransCAD network in Black lines.

NJRTM-E only model area in Red.
BPM only model area in Blue.

Common area in Green. Within the Common area, the models have different levels of detail, depending on the zone.

Step #1: Obtain Highway Network Modeling Platforms

Strategy for Using Both NJRTM-E and BPM

We plan to use both NJRTM-E and BPM

- NJRTM-E for trips entirely West of Hudson
  - West-of-Hudson Trip Tables
  - West-of-Hudson Highway Assignment
- BPM for trips entirely East of Hudson
  - East-of-Hudson & Trans-Hudson Trip Tables
  - East-of-Hudson Highway Assignment
- For trips between West and East of Hudson, crosswalk between the two models to ensure consistency

Coordination / Integration with Other Modeling Activities

- NYMTC GTM Truck Special Generators
- NJRTM-E Revised Jersey City Zone Forecasts
- PANYNJ Helix Trans-Hudson Modeling Effort

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6.3 – Highway Network Modeling

Step #2: Model Modifications

Travel Demand Model Trip Table Adjustments

Auto and other light vehicle trip tables from BPM and NJRTM-E

Truck trip tables modified for consistency and for cargo analyses

- Overall total truck trips from BPM and NJRTM-E
- Model trip tables modified for consistency between models
  - Separate heavy and light truck trip tables in BPM
  - Separate NJRTM-E light truck trip assignment from other light vehicles
- Heavy truck trip tables disaggregated by truck use type using TRANSEARCH data and forecasts
  - Cargo truck trips
  - Non-cargo / service truck trips

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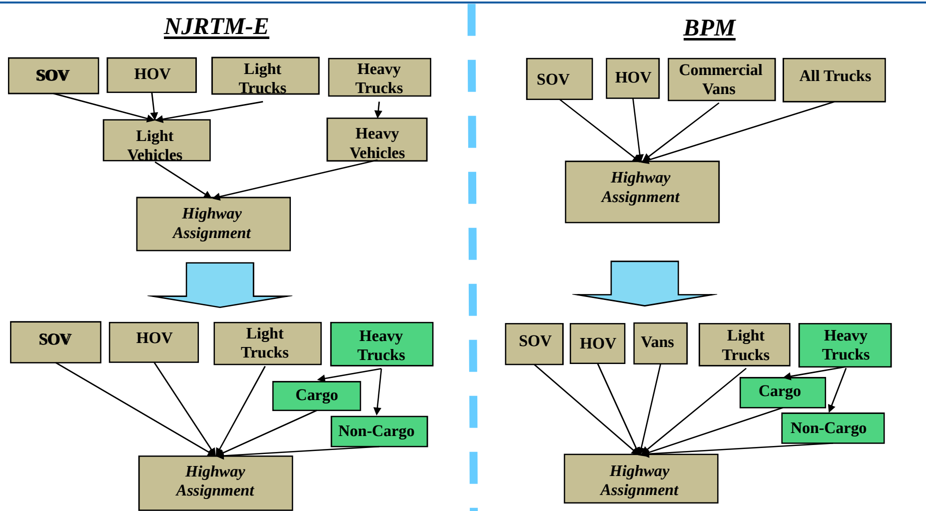
6.4 – Highway Network Modeling

Step #2: Model Modifications
Trip Table Adjustments



6.5 – Highway Network Modeling

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Step #2: Model Modifications
Creation of Cargo Truck Trip Tables

Transearch Disaggregation

- Disaggregate truck estimates (2007 and 2035) to zone level
  - Data currently provides origin-destination volumes at county level
  - Manually review for inconsistencies
- Convert annual truck tonnage to daily truck shipments
  - Payload by commodity
  - Average working days per year
- Consider rail shipments with truck drayage
  - Link Transearch annual rail tonnage to railyards (primarily West-of-Hudson) with Transearch annual truck tonnage between rail yards and East-of-Hudson shippers/receivers

Modify trip tables to reflect cargo and non-cargo trucks

6.6 – Highway Network Modeling

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Step #2: Model Modifications
Limitations

Model approach considers trip table adjustments and trip assignment changes only

Modeling approach does not consider:

- Estimation of new auto or other light vehicle trip tables as a result of changes in highway travel times (either new trip distribution or diversion from transit to auto)
- Estimation of new non-cargo truck trip table as a result of changes in highway travel times
- Changes in land use as a result of changes in highway travel times

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6.7 – Highway Network Modeling

Step #3: Model Validation

Compare cargo truck network flows against empirical data

- Traffic counts
- PANYNJ crossing surveys
- Railyard gate surveys

Modify tables as necessary to achieve good fit

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6.8 – Highway Network Modeling

Step #4: Apply Model
General Approach

Determine cargo truck changes from mode choice model

- Volumes estimated as pivot point from change in rail and truck utility in mode choice model
- Location change identified based on type of trip to be diverted.
  - If a rail dray trip, NJ zone changed to EOH zone
  - If not a dray trip, no change in either O or D

Changes in highway assignments

- Revise highway network for truck alternatives (as needed)
- Assign new and old trip tables to the highway network
- Report changes in volume, VMT and VHT by trip table and/or O-D pairs

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6.9 – Highway Network Modeling

Step #4: Apply Model
Likely Scenarios

Reduction in Trans-Hudson drayage truck trips

- Estimate reduction in Trans-Hudson drayage truck trips with shipper mode choice model
- Change NJRTM-E truck trip tables to reflect decreased truck trips on West-of-Hudson highway network
- Change BPM truck trip tables to reflect decreased truck trips on crossings and on East-of-Hudson highway network

Increase in East-of-Hudson drayage movements

- Estimate increase in drayage truck trips between East-of-Hudson rail terminals and shippers / receivers with shipper mode choice model
- Change BPM truck trip tables to reflect increases in trips between East-of-Hudson rail yards and shipper / receiver locations

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6.10 – Highway Network Modeling

Final Products

Modeling tools to estimate changes in highway network performance resulting from Cross Harbor alternatives

- Link volumes and levels of service
- Travel time and delay

Economic modeling can monetize these effects

- Highway user benefits (changes in travel time)
- Social benefits (air quality, safety, etc.)
- Business (transportation costs)

Questions or Comments?

Wrap-Up

Thank you for participating!

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7.1 – Wrap-Up