



**New York State Department of Transportation  
Metropolitan Transportation Authority Metro-North Railroad  
New York State Thruway Authority**

**Presentation**

***Stakeholders' Advisory Working Groups (SAWGs)  
Traffic and Transit SAWG Meeting #7***

***Tappan Zee Bridge/I-287 Corridor  
Environmental Review***

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December 4, 2008



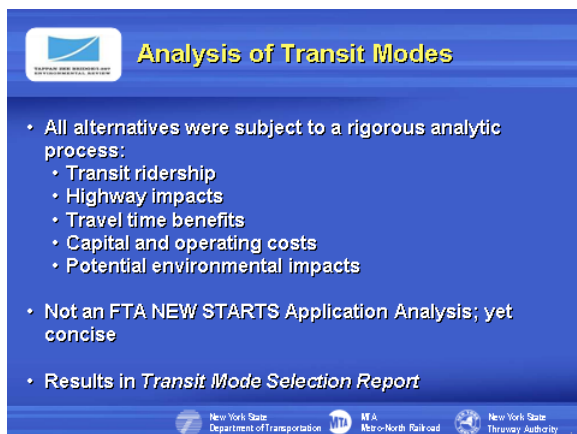
## Slide 1

Title Slide



## Slide 2

This presentation discusses the contents of the Transit Mode Selection Report.



## Slide 3

The report was completed to reduce the number of modes being considered so as to permit focusing on the recommended mode and its options in greater detail, while permitting the bridge reconstruction to proceed more expediently.

Inventory of Transit Alternatives			
Alternative/ Options	Rockland	Hudson Line Connection	Westchester
3A Full Corridor Bus Rapid Transit Westchester Local			
3B Full Corridor Bus Rapid Transit Westchester Express			
4A Full Corridor Commuter Rail Transit			
4B Rockland Commuter Rail Transit Westchester Light Rail Transit			
4C Rockland Commuter Rail Transit Westchester Bus Rapid Transit			
4D Rockland Commuter Rail Transit Full Corridor Bus Rapid Transit			

#### Slide 4

These are the transit alternatives/options currently under evaluation. Each includes consideration of replacement or rehabilitation of the Tappan Zee Bridge.

The top two are based on Bus Rapid Transit service and each labeled with a 3. The other four alternatives are all labeled with a 4 and all feature commuter rail service:

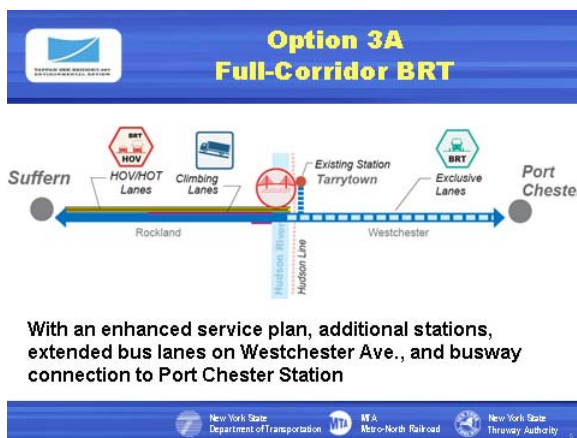
4A: Full corridor Commuter Rail Transit (or CRT)

4B: CRT in Rockland, LRT in Westchester

4C: CRT in Rockland, BRT in Westchester

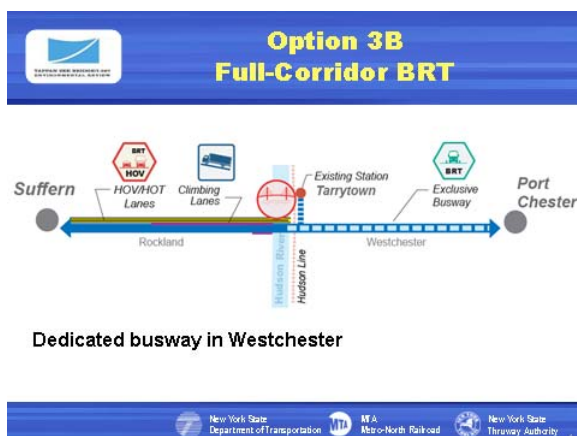
4D: CRT in Rockland with full corridor BRT

All of the CRT alternatives/options include a direct connection to the Hudson Line.



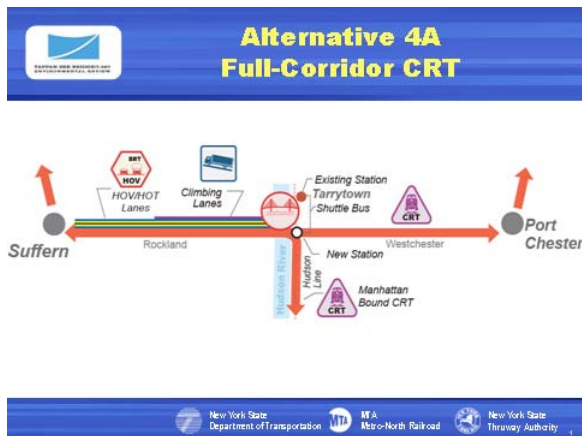
#### Slide 5

Full corridor BRT includes HOT lanes in Rockland County and BRT on exclusive lanes in Westchester County.



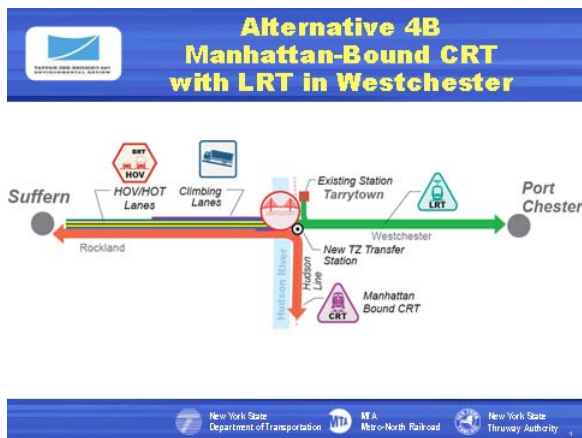
#### Slide 6

Dedicated busway in Westchester County instead of exclusive lanes.



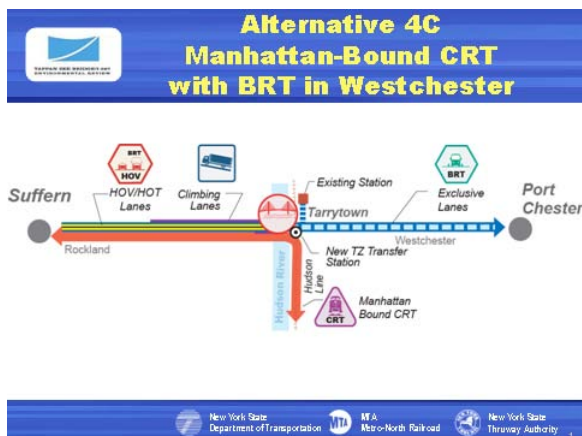
### Slide 7

Rail connecting the Port Jervis Line to the Hudson Line to Manhattan and the New Haven Line to Stamford.



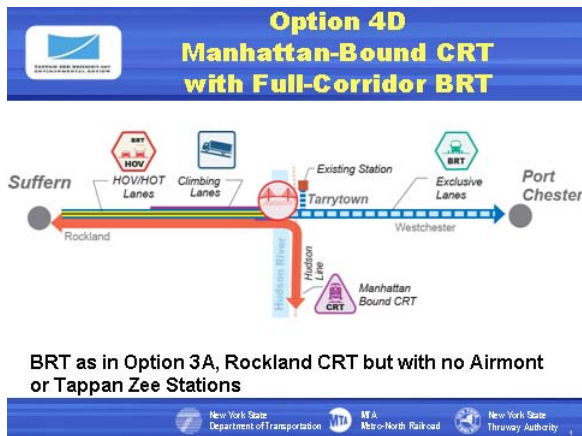
### Slide 8

Rail connecting the Port Jervis Line to the Hudson Line to Manhattan, and LRT in Westchester County from Tarrytown to Port Chester.



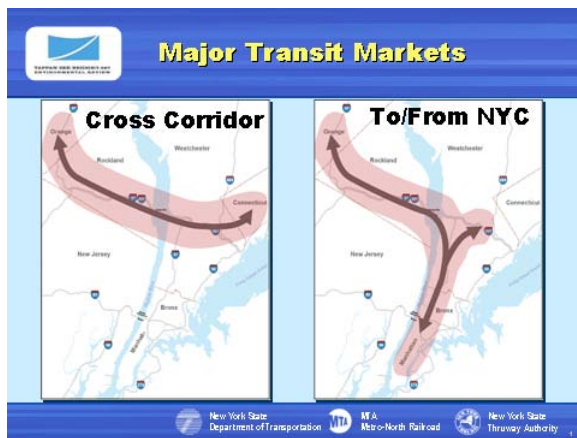
### Slide 9

Rail from the Port Jervis Line to the Hudson Line with BRT in exclusive lanes in Westchester County.



## Slide 10

BRT crossing the corridor with a full range of service, coupled with CRT connecting the Port Jervis Line to the Hudson Line.



## Slide 11

It has to be recognized that there are two distinct markets which utilize the corridor which need to be addressed.

The best transit mode has to address both markets effectively.

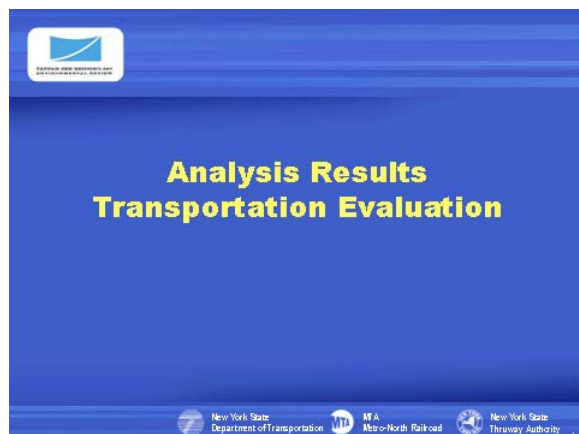
This reality is fundamental to understanding and addressing the transit solution.



## Slide 12

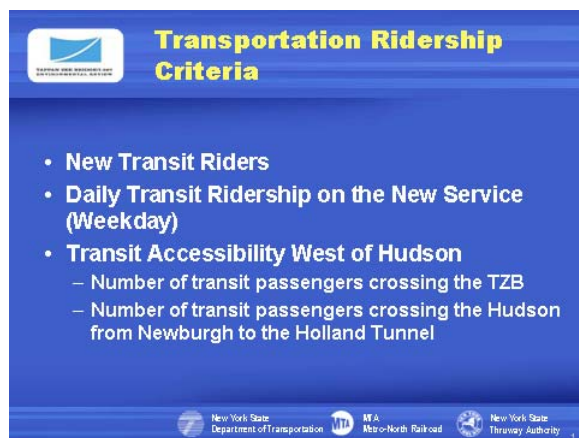
Three categories of evaluation criteria were used to evaluate the alternatives and options.





### Slide 13

Title Slide



### Slide 14

Ridership criteria include New Transit Riders (diverted from other modes), Ridership on New Services and improvements to transit for West-of-Hudson travelers crossing the river.

	Cross-Corridor	To/From NYC
No Build	66,500	94,900
3A	81,000	103,800
3B	81,100	104,100
4A	75,200	108,000
4A-X	74,200	101,000
4B	73,900	108,500
4C	74,000	108,800
4D	83,400	109,200
LRT	75,500	102,800

### Slide 15

Total transit ridership ranges from 66,000 in the No Build to 83,000 in Option 4D, cross-corridor, and 95,000 in the No Build to 109,000 in Option 4D to and from NYC.



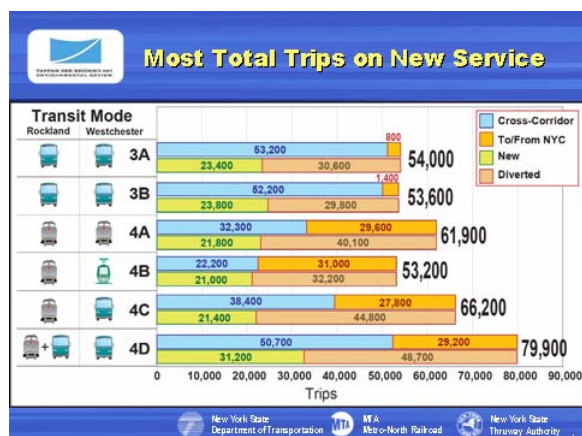
## Slide 16

New Transit Trips (diverted from other modes) range from 14,000 in Option 4A-X to 31,000 in Option 4D.



## Slide 17

Trips on New Services range from 37,000 in Option 4A-X to 80,000 in Option 4D.



## Slide 18

Looking at total daily trips on the new service (shown in black), we note that Option 4D indicates the highest number at almost 79,900.

Option 4C is next at 66,200, followed by 4A at 61,900.

The remaining options – 4B and the BRT options, all serve 53,000 to 54,000 new daily trips.

This ridership measure shows total daily transit trips on the regional transit system that would result from implementation of the alternatives/options.

These numbers are total transit trips, not just the trips on the new services. All of the build alternatives provide substantially better transit service than the no-build alternative.

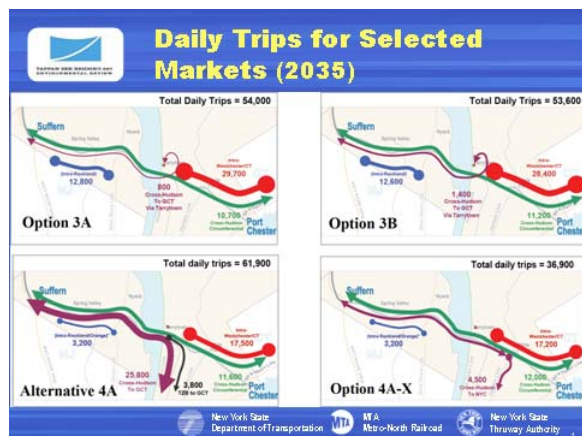
These numbers indicate that BRT alternatives (3A and 3B) or those with full corridor BRT component (Options 4D) attract higher cross-corridor riders than the CRT alternatives would.

However, to/from NYC bound riders are better served by CRT alternatives (4A, 4B and 4C) or Option 4D.

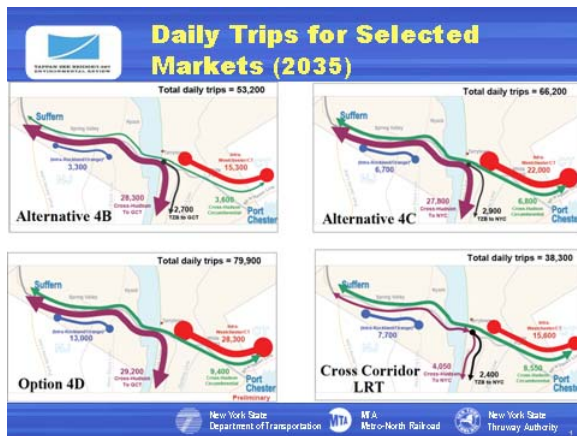
This suggests that the different transit modes have characteristics that better serve the cross corridor or the NYC market.

## Slide 19

The rail alternatives have about 25,000 trips to Manhattan, while the bus alternatives have about 30,000 intra-Westchester County trips.

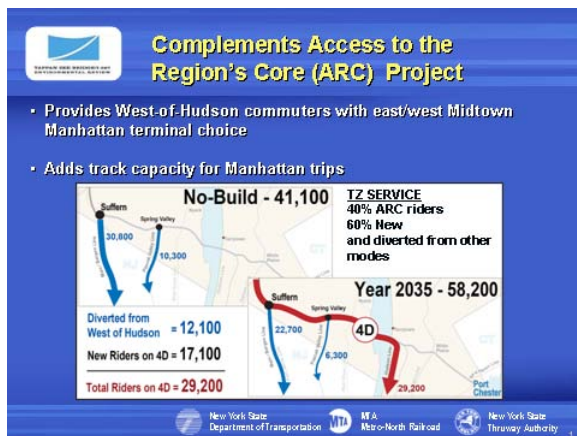






## Slide 20

Option 4D combines the best of the alternatives.



## Slide 21

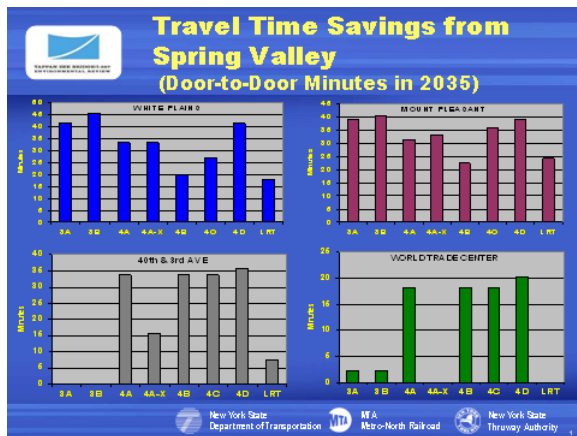
One of the questions we have addressed is the effect of the ARC project on the Tappan Zee Bridge project, and vice versa.

The overall effect differs by alternative/option, but the CRT alternatives/options 4D would result in up to 30% ARC Port Jervis riders using the TZ alternative.



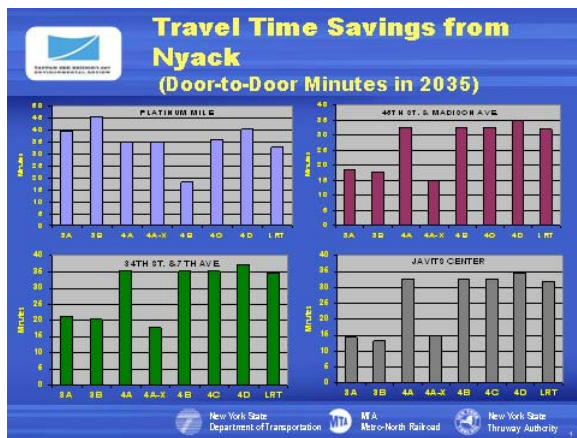
## Slide 22

Travel times are illustrated for selected origin-destination pairs, to calculate savings for those pairs. Aggregate travel time saved is also calculated.



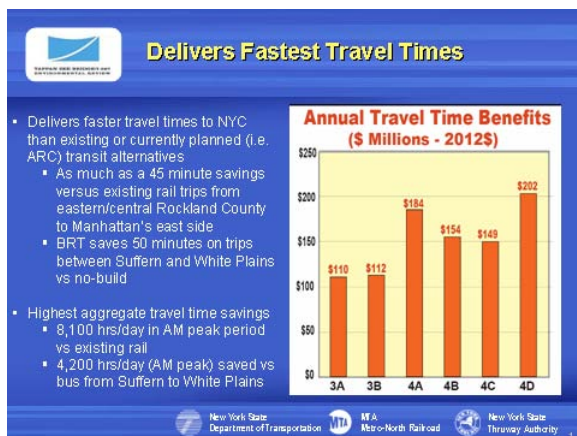
## Slide 23

All alternatives improve travel time to White Plains and other Westchester destinations from Rockland County origins. Rail alternatives improve travel time to Manhattan destinations, depending on connectivity to the subway and PATH systems.



## Slide 24

Nyack benefits from improvements to both rail and bus accessibility, as Nyack is not now well connected to existing services.



## Slide 25

Another measure is the annual travel time benefits, which monetizes the value of travel time saved for riders.

For this measure bigger is better and the best alternative/option is 4D followed by 4A.

The lowest benefit options are the BRT options.



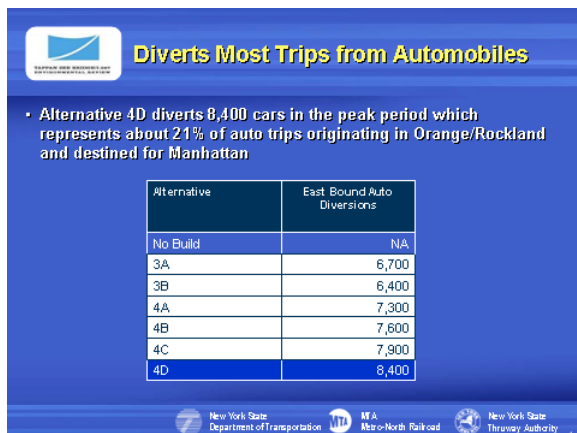
### Roadway Congestion

- **Autos Diverted**
  - Total reduction in vehicles crossing the Hudson between Newburgh and the Holland Tunnel compared to No Build – includes the HOT Lanes on the Tappan Zee Bridge
- **Vehicle Miles Traveled (VMT)**
  - Rockland, Westchester, Orange, Bergen, Bronx

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## Slide 26

Two measures of roadway congestion are used to evaluate alternatives: autos diverted and aggregate Vehicle Miles Traveled (VMT).



### Diverts Most Trips from Automobiles

- Alternative 4D diverts 8,400 cars in the peak period which represents about 21% of auto trips originating in Orange/Rockland and destined for Manhattan

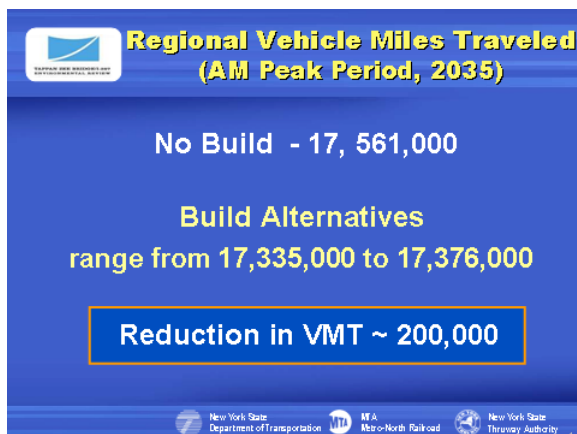
Alternative	East Bound Auto Diversions
No Build	NA
3A	6,700
3B	6,400
4A	7,300
4B	7,600
4C	7,900
4D	8,400

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## Slide 27

All of the alternatives divert drivers to transit.

4D diverts the most drivers.



### Regional Vehicle Miles Traveled (AM Peak Period, 2035)

**No Build - 17, 561,000**

**Build Alternatives**  
range from 17,335,000 to 17,376,000

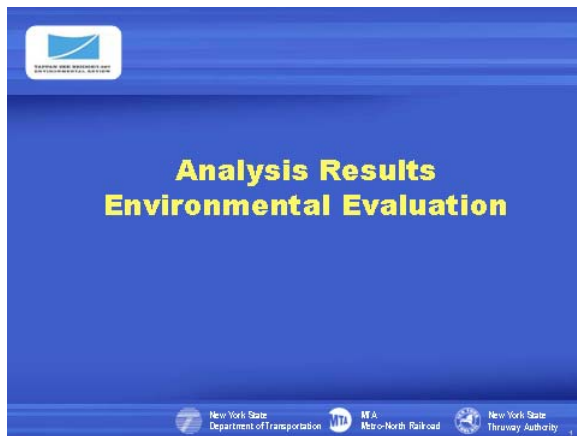
**Reduction in VMT ~ 200,000**

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## Slide 28

- The VMT (vehicle miles traveled) levels shown here are for the peak AM period and cover a five-county area (Rockland, Westchester, Orange, Bergen, and Bronx Counties).
- Across the range of alternatives and options evaluated herein it is expected that a reduction in VMT of about 200,000 will be experienced in the five-county area during the design year (2035).

These VMT reductions were then used as the basis of estimates of air emissions and energy savings.



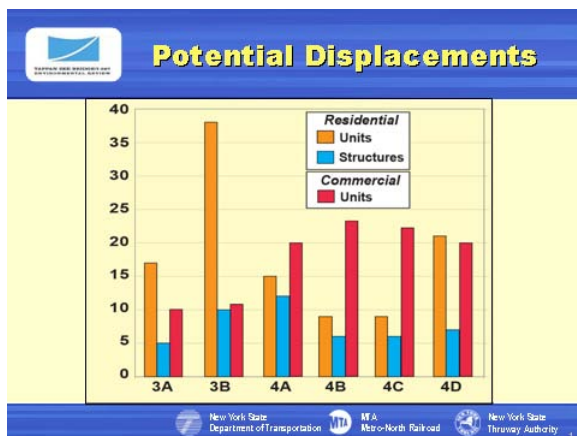
## Slide 29

Title Slide

Wetlands	8 - 14 acres
Parklands	Elizabeth Place, Tibbits Yosemite, Parkways
Historic and Archaeological Resources	2 National Historic Landmarks 3 National Register Listed 3 National Register Eligible
Hudson River Habitat Disturbance	10-15 acres - permanent 4 - 6 acres - temporary

## Slide 30

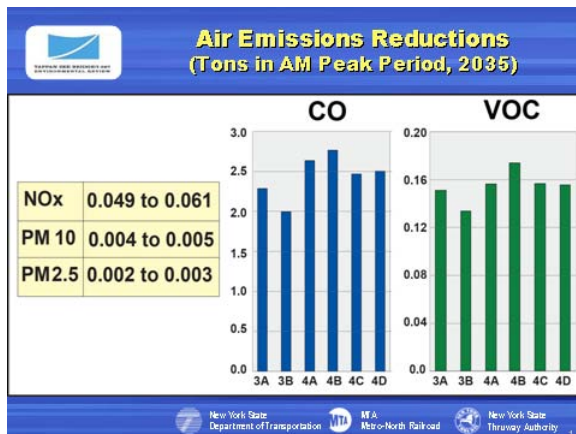
Given the fact that much of the alignments of the alternatives/options studied significantly overlap, the potential for environmental impacts falls into a narrow range as shown here. For example, wetland impacts range from 8 to 14 acres over a 30-mile corridor. There are also some qualitative considerations here. For example, the quality of impacted wetlands varies for the alternatives and options with CRT impacting higher quality wetlands in Rockland and BRT impacting higher quality wetlands in Westchester.



## Slide 31

- Over a 30-mile corridor, residential displacements are expected to range between 9 and 38 units with Option 3B having the greatest number due to potential impacts of a new busway adjacent to I-287 in White Plains. (To put it in context, there are about 84,000 residential units within project corridor).
- Most alternatives and options would result in displacement of between 10 and 23 commercial facilities with Alternative 4B showing the highest level of such displacements.

Further planning and engineering will be conducted to further reduce these impacts.



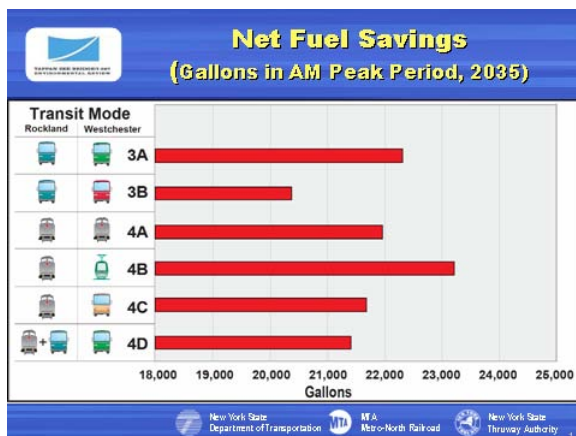
## Slide 32

Based on VMT levels, calculations were made of potential regional emission reductions of motor-vehicle-related pollutants: carbon monoxide, volatile organic compounds, nitrogen oxides, and particulate matter.

These are emission reductions compared to the no build condition, for the 6 to 10 AM peak period, for the 5-county area.

As can be seen, since there were not significant differences in VMT among the alternatives, the emission reductions are comparable among the alternatives/options on a regional basis.

It should be noted that future energy air emissions and energy consumption can be further reduced by utilizing Hybrid BRT vehicles or vehicles with improved technology such as improved hybrid or electric models.



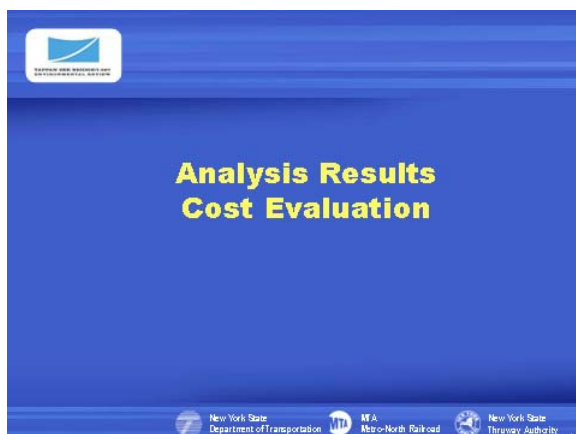
## Slide 33

An analysis was also done of the potential for fuel savings based on the VMT calculations.

This is for the AM peak period for the five-county area mentioned earlier.

Again these fuel savings are relative to the no build condition.














Basically, all alternatives/options have the potential for fuel savings, but the differences are not significant on a regional basis.



## Slide 34

Title Slide



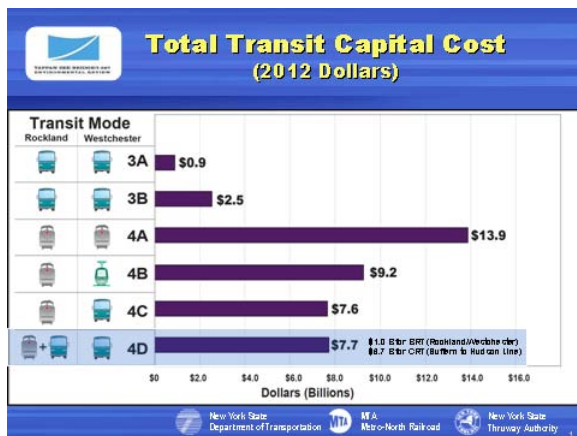
Alternative Cost Estimates (2012 Dollars)			
ALTERNATIVES / OPTIONS	ROCKLAND	WESTCHESTER	2012 COST
3A Full Corridor Bus Rapid Transit Westchester Local		 Exclusive Lanes/Buway	\$8,027
3B Full Corridor Bus Rapid Transit Westchester Express		 Exclusive Buway	\$9,678
4A Full Corridor Commuter Rail Transit			\$22,091
4B Rockland Commuter Rail Transit Westchester Light Rail Transit			\$17,352
4C Rockland Commuter Rail Transit Westchester Bus Rapid Transit		 Exclusive Lanes/Buway	\$15,755
4D Rockland Commuter Rail Transit Full Corridor Bus Rapid Transit	 + 	 Exclusive Lanes/Buway	\$15,999

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### Slide 35

Here are the updated total costs for the alternatives.

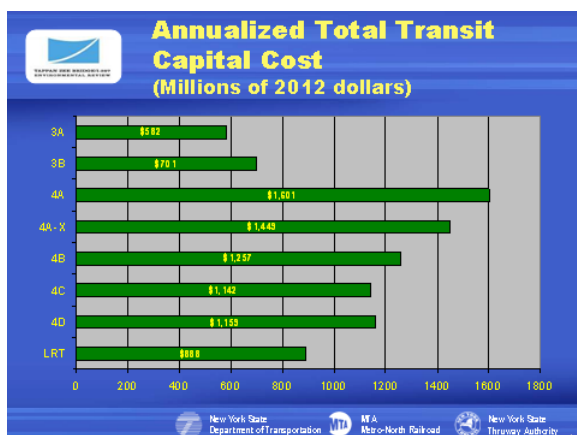
These are 2012 dollars and include all components, highway, bridge and transit.



### Slide 36

The cost criteria include not only the capital cost of the options, but the annual operating costs, fare revenue, net cost per passenger, net cost per passenger mile and total travel time benefits.

Transit options, unlike highway options, have to consider operating costs and revenues, in addition to capital cost and travel time benefits.



### Slide 37

Annualized capital costs for transit range from \$600 million for Alternative 3A to \$1.6 billion for Alternative 4A.



#### Slide 38

Annual operating costs range from \$75 million for Alternative 3A to \$294 for Alternative 4A.

### Fare Revenue

- Monthly pass costs per ride in 1996 dollars
- 2035 AM peak ridership
- Factored to daily ridership using 2.86 multiplier
- Daily ridership factored to annual ridership using 291 multiplier, reflecting weekday and weekend ridership
- Revenues in 1996 dollars were inflated to 2012

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#### Slide 39

Fare revenues were calculated in 1996 dollars, based on monthly pass costs in 2005, then inflated to 2012 dollars for compatibility.

### Net Cost per Passenger-Mile

Annualized Capital + Annual Operating Costs = Total Annual Transit Cost

$$\text{Net Cost per Passenger-Mile} = \frac{\text{Total Annual Transit Cost} - \text{Annual Fare Revenue}}{\text{Total Passenger Miles}}$$

Average  
Net Cost per Passenger-Mile = \$1.45

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#### Slide 40

The net cost per passenger mile considers capital and annual operating costs and then deducts the fare box revenues to arrive at a cost per passenger mile.

Lower is better for this measure and the BRT option 3A has the lowest net cost per passenger mile of the options. Alternative 4A would have the highest cost.



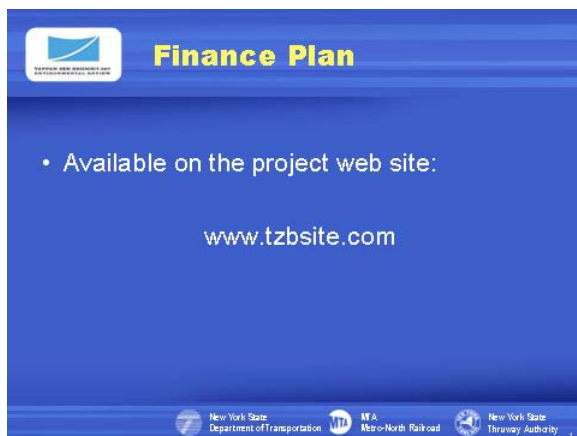
#### Slide 41

Net cost per passenger mile ranges from \$0.72 in Alternative 3A to \$5.36 in Option 4A-X.



#### Slide 42

Net cost per passenger ranges from \$6 in Alternative 3A to \$100 in Option 4A-X.



#### Slide 43

The finance plan is not presented here, but is available on the web site.



## Slide 44

Title Slide



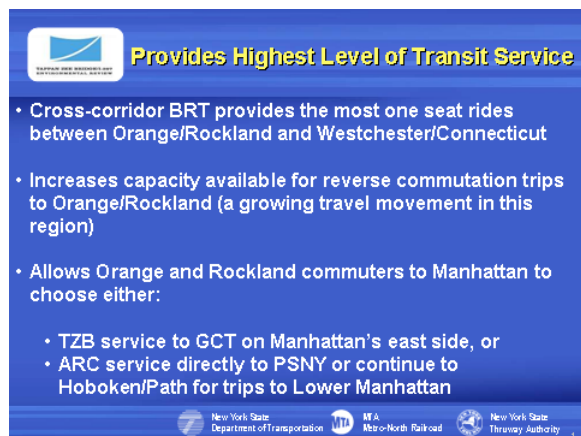
## Slide 45

Option 4D was recommended as the best for meeting the combined criteria.



## Slide 46

Option 4D can include BRT service at the time of the bridge opening, with improvements phased in over time.



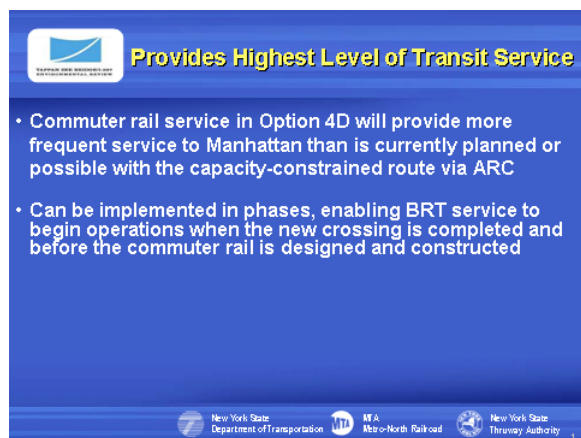
**Provides Highest Level of Transit Service**

- Cross-corridor BRT provides the most one seat rides between Orange/Rockland and Westchester/Connecticut
- Increases capacity available for reverse commutation trips to Orange/Rockland (a growing travel movement in this region)
- Allows Orange and Rockland commuters to Manhattan to choose either:
  - TZB service to GCT on Manhattan's east side, or
  - ARC service directly to PSNY or continue to Hoboken/Path for trips to Lower Manhattan

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#### Slide 47

This slide summarizes how Option 4D provides the highest levels of transit service.



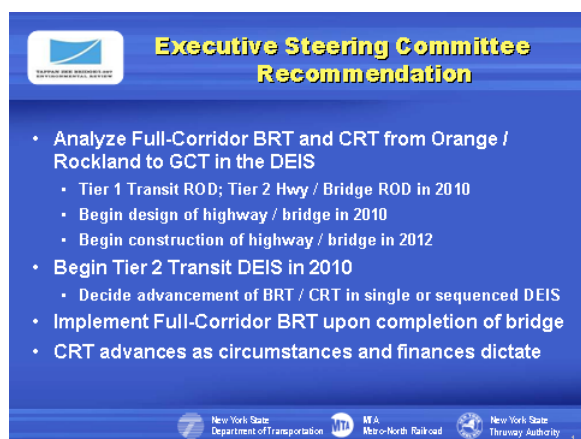
**Provides Highest Level of Transit Service**

- Commuter rail service in Option 4D will provide more frequent service to Manhattan than is currently planned or possible with the capacity-constrained route via ARC
- Can be implemented in phases, enabling BRT service to begin operations when the new crossing is completed and before the commuter rail is designed and constructed

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#### Slide 48

Continued.



**Executive Steering Committee Recommendation**


- Analyze Full-Corridor BRT and CRT from Orange / Rockland to GCT in the DEIS
  - Tier 1 Transit ROD; Tier 2 Hwy / Bridge ROD in 2010
  - Begin design of highway / bridge in 2010
  - Begin construction of highway / bridge in 2012
- Begin Tier 2 Transit DEIS in 2010
  - Decide advancement of BRT / CRT in single or sequenced DEIS
- Implement Full-Corridor BRT upon completion of bridge
- CRT advances as circumstances and finances dictate

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#### Slide 49

The Executive Steering Committee's transit mode recommendation is outlined here along with the decisions to be made in the future.



 **Transit Alternatives  
To Be Studied in DEIS**

- Full Corridor BRT (Suffern to Port Chester)
  - BRT in Median / Shared HOV Lanes in Rockland
  - BRT in Exclusive Guideway in Thruway ROW in Rockland
  - BRT in Dedicated Lanes in Local Street System in Westchester
  - BRT in Exclusive Guideway in Westchester
- West-of-Hudson CRT to East Side of Manhattan (GCT)
  - CRT in median of Thruway in Rockland
  - CRT in South Side of Thruway ROW in Rockland
  - CRT connection to Hudson Line via Shoulder Tunnel

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## Slide 50

The transit alternatives to be studied in the DEIS are described here.

 **The Bus Rapid Transit  
Experience**


- Alameda, CA
- Pittsburgh, PA
- Cleveland, OH
- Houston, TX
- Ottawa, Canada
- Mexico City
- Curitiba, Brazil
- Brisbane, Australia






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## Slide 51

BRT experience worldwide has been largely positive.

 **Bus Rapid Transit  
Rockland Alternatives**

**BRT in  
HOV Lanes**



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## Slide 52

In Rockland, BRT would operate at express speeds in HOV lanes.



### Slide 53

Alternatively, in Rockland, BRT could operate in exclusive guideways.



### Slide 54

BRT in most areas operates in exclusive lanes, which is one alternative for BRT in Westchester.



### Slide 55

BRT in Westchester could also operate in exclusive guideway.



#### Slide 56

Commuter rail can operate within freeway medians, which is one option for CRT in the I-287 right-of-way.



#### Slide 57

Alternatively, CRT could operate on the south side of I-287. There are both advantages and disadvantages to operating along the south side of I-287 in Rockland County.



#### Slide 58

These are possible discussion topics for the next scheduled SAWG in January.