

NEW YORK CITY



# RANKING NEW YORK CITY'S BRIDGES BY BENEFIT COST RATIO

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New York City Department of Transportation

11<sup>th</sup> Annual International Bridge and Structure  
Management Conference

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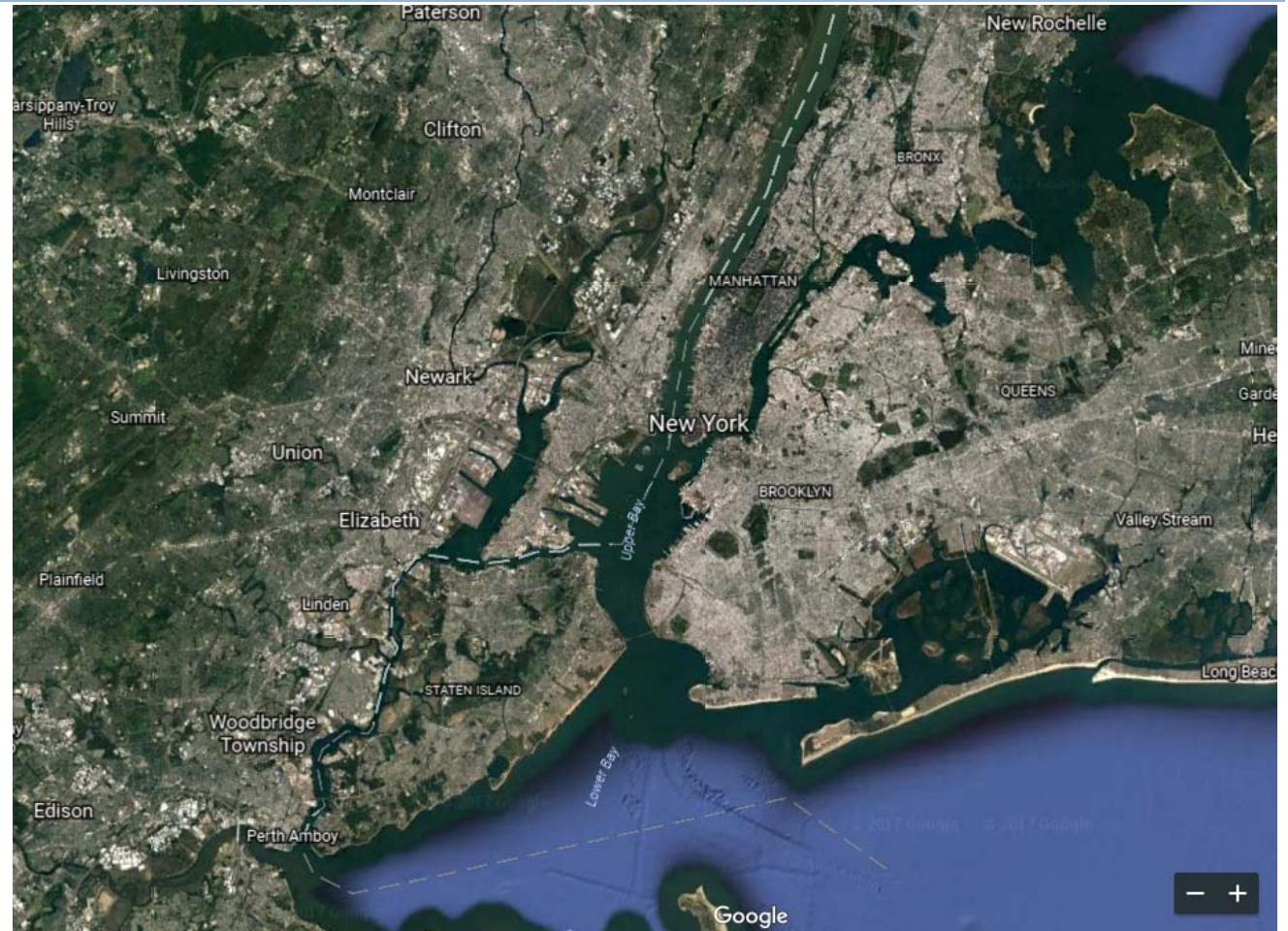
- New York City Overview
- Bridge Budget Needs
- Benefit Cost Analysis Methodology
- Results



# New York City

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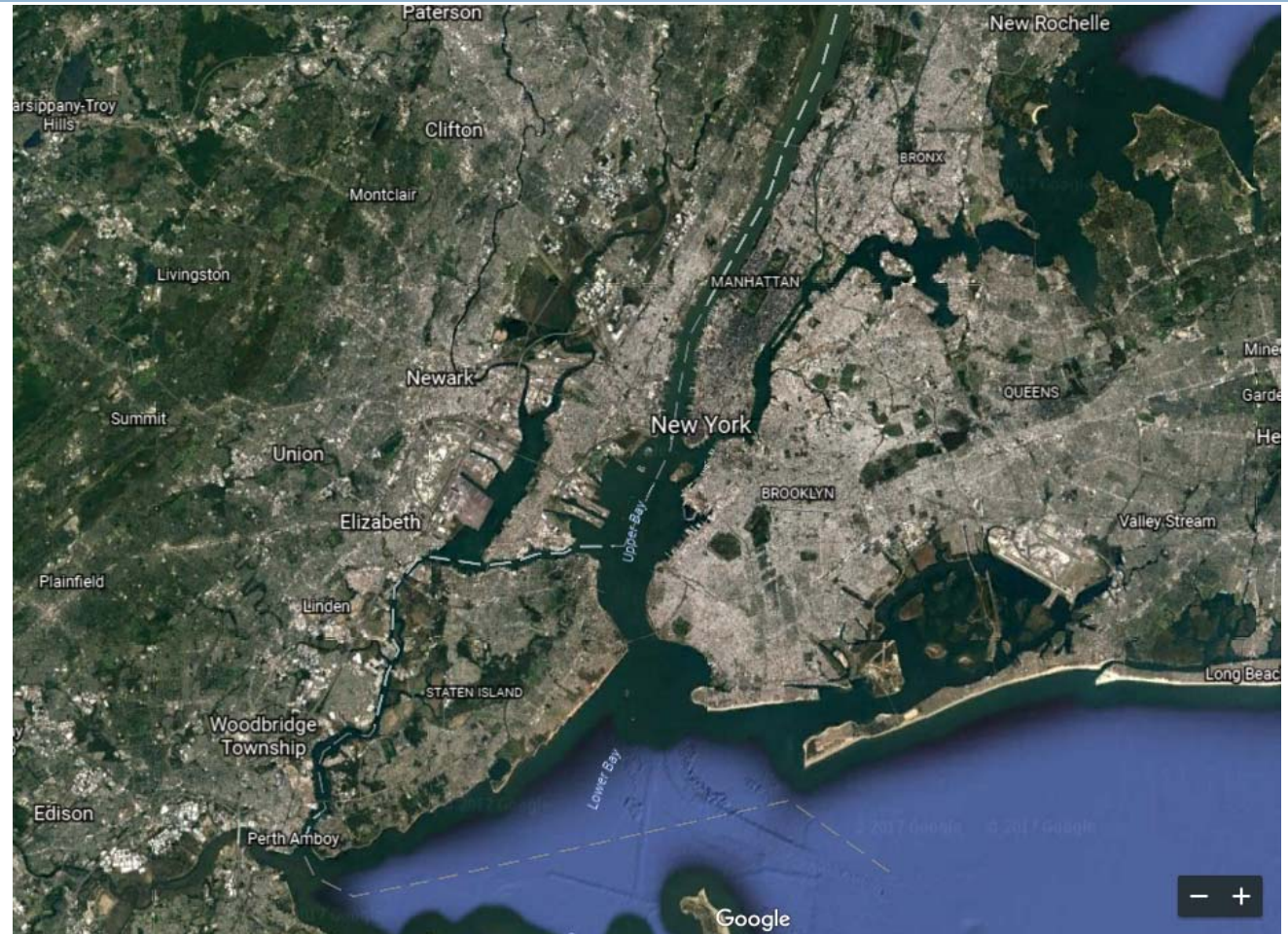
- Population: 8,537,673 (July 2016)
- 3 islands, mainland, 5 boroughs
- Increase of 362,500 since 2010
- 55% commute by mass transit
- 2/3 of all rail trips nationally
- 789 NYC Bridges



# New York City: Bridges

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- 789 NYC Bridges
- \$8.8B for Bridges in 10 Year Plan.
- Reconstruction of 121 bridges, bridge painting, component rehabilitation, and Sandy damage recovery.
- \$7.27B needed for the reconstruction of 221 unfunded bridges that are projected to fall to 3.5 by FY27
- “The Wave”



# Funding Question

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- Can we afford all of these bridges given current levels of funding? No
- Can we develop a systematic, data driven methodology to explore which bridges can eventually be taken out of commission (demolished)?
- Can we compare them according to uniform standards?
- Can we rank them in order to inform decision makers about the relative importance (utility) of each bridge?

# Benefit Cost Analysis

## Benefits

### **Economic Benefits** (Travel Time Savings)

- Measured:
  - Bike/Ped/Vehicles using bridge
  - Time to travel alternate routes
  - Each user at a different speed

### **Environmental Benefits** (GHGs avoided)

- Measured:
  - Using Federal TIGER methodology

### **Safety Benefits**

(Actual crash rates on No Build route)

- Measured:
  - Using 5 year average derived from latest NYC DOT crash data

### **Livability Benefits** (Access to Amenities)

- Measured using FHWA definition

## Costs

### **Cost of Construction**

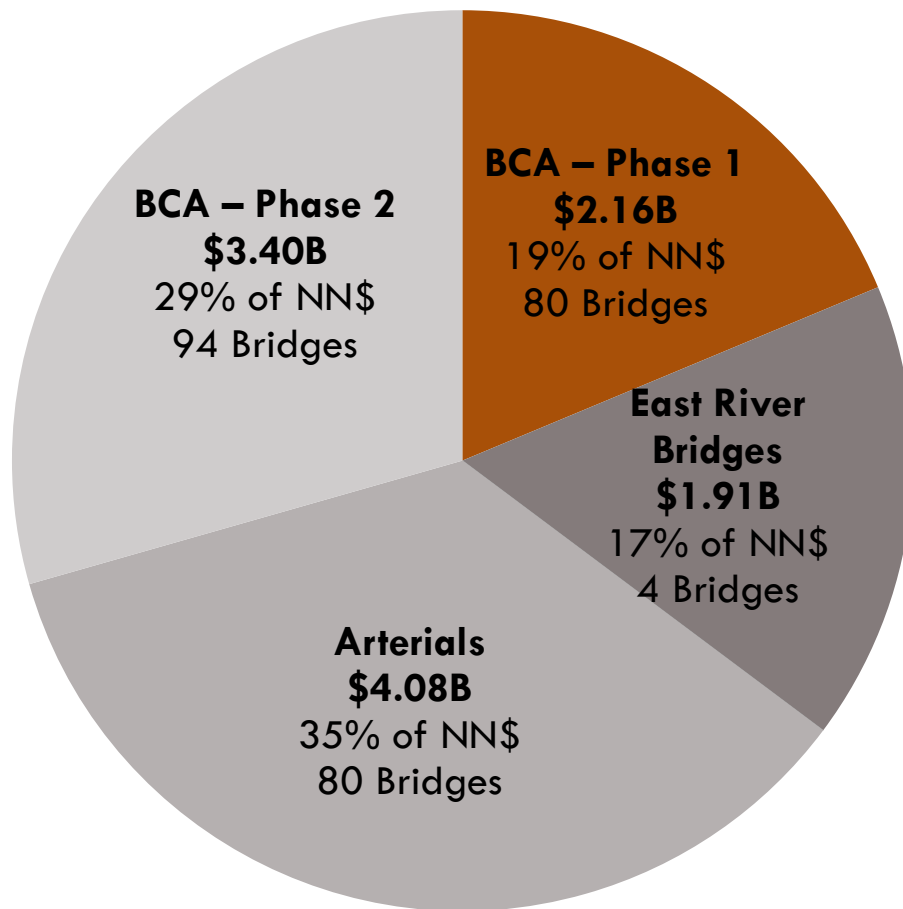
### **Cost of Maintenance** (40 years)

### **Cost of Demolition** (used in the “No Build” scenario)

# Which Bridges are Expendable?

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## FY18 -- FY27 New Needs by BCA Status as of 9/27/16 (\$ in Billions)



Status:

Phase 1 – Completed

Phase 2 – In Process

153 of 174 Bridges  
analyzed thus far

**Total NN: \$11.545B**

# Bridge Types in Benefit Cost Analysis

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## ■ Bridges to Analyze

- Small Bridges
- Non-Arterials
- Non-East River Crossings
- Potentially Expendable

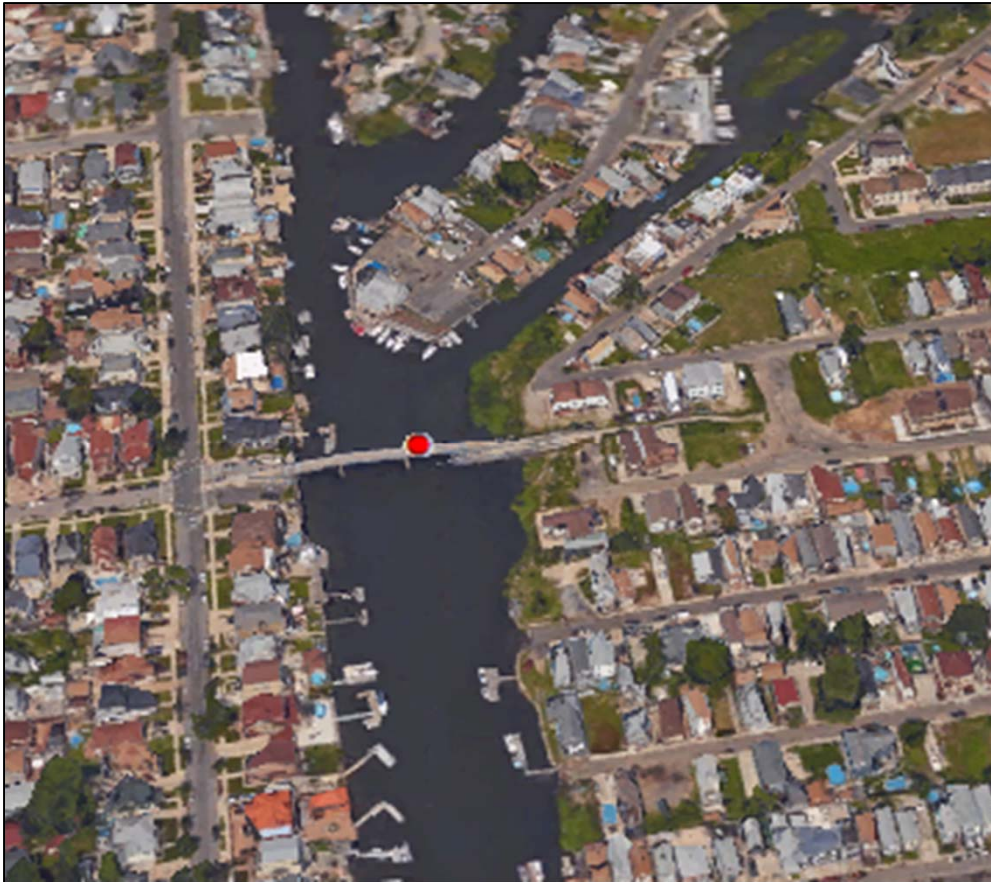




# 163<sup>rd</sup> AVE PED BRIDGE

*over Hawtree Basin (BIN: 2240650)*

BCR: ?



- Built: 1962
- Total Reconstruction Cost: \$16.12M (FY17\$)
- AADT Volumes:
  - Pedestrians: ?
  - Bikes: ?
- Alternate Route: ?

# Data Gathering

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- HDR Study
  - \$360K Pedestrian/Bicycle Count
  - Two 12 Hr video counts of each bridge
  - Provided wealth of data on bridge usage
  - Interesting Facts:
    - Highest Ped Count:
      - East 167<sup>th</sup> and Grand Concourse (37,102)
    - Lowest Ped Count:
      - Inwood Hill Park Footbridge over Amtrak (9)
    - Highest Bike Count:
      - Grand Army Plaza entrance to Prospect Park, Endale Arch (10,062)
    - Lowest Bike Count:
      - SIRT Champ Court Ped Bridge (1 – tied with 5 others)

# Methodology: 3 Benefit Cost Ratios

Bin	FEATURE_CR	FEATURE_CA	Benefit Cost Ratio	Safety Benefit	BCR + Safety Benefit	Livability Premium	BCR + Safety + Livability
2243480	LIRR BAY RIDGE	OCEAN AVE	17.42	\$ 15,376,693	18.17	\$ 1,552,534	18.25
2267860	STORAGE (SANDS ST)	BROOKLYN BR APPROACH	16.45	\$ 61,404,035	18.76	\$ 10,280,635	19.15
2243500	LIRR BAY RIDGE	NOSTRAND AVE	16.28	\$ 42,614,572	18.69	\$ 9,301,658	19.21
2243439	LIRR BAY RIDGE	OCEAN PKWY	14.71	\$ 21,064,610	15.45	\$ 5,751,505	15.65
2241509	CONRAIL (ABANDONED) PUTNAM	W 231ST ST	13.76	\$ 53,608,252	16.53	\$ 35,750,882	18.38
2268770	EQUES. PATH (ABAND.)	SPRINGFIELD BLVD	13.69	\$ 2,913,841	14.19	\$ -	14.19
2243279	FRANKLIN SHUTTLE	EASTERN PKWY	12.61	\$ 4,600,436	12.75	\$ 37,930,971	13.95
2243150	BMT SUBWAY, BRIGHTON	FOSTER AVE	12.39	\$ 3,675,241	12.68	\$ 9,801,604	13.48
2243940	NYCTA IND SBWY	9TH AVE	11.75	\$ 49,983,207	13.68	\$ 60,727,425	16.04
2241010	CSX TRANS - PT MORRIS	E 156TH STREET	11.63	\$ 18,331,013	13.44	\$ 269,329	13.46
2241790	METRO NORTH RR HAR	E 180TH ST	10.52	\$ 8,067,304	10.91	\$ 10,150,616	11.40
2243010	BMT SUBWAY, BRIGHTON	LINCOLN ROAD	10.19	\$ 63,839,390	12.67	\$ 11,861,834	13.13
2247470	CSX TRANSPORT	ELIOT AVE	10.12	\$ 1,538,819	10.25	\$ 397,396	10.28
2241800	METRO NORTH RR HAR	E 183TH ST	8.02	\$ 19,326,761	9.13	\$ 2,256,974	9.26
2245120	AMTRAK 30 ST BRANCH	W 46TH ST	7.97	\$ 11,890,320	8.68	\$ -	8.68
2243370	LIRR BAY RIDGE	17TH AVE	7.78	\$ 10,903,270	8.53	\$ -	8.53
2241409	METRO NORTH RR HUD	GRAND CONCOURSE	7.35	\$ 103,250,914	9.11	\$ 19,661,236	9.44
2243100	BMT SUBWAY, BRIGHTON	BEVERLY ROAD	7.03	\$ 3,298,546	7.23	\$ 8,880,024	7.74
2242280	E 167TH ST	GRAND CONCOURSE	6.83	\$ 39,531,058	7.06	\$ 55,355,354	7.37
2243740	BMT SEA BEACH	BAY PKWY	6.53	\$ 58,656,124	7.38	\$ 33,158,093	7.86



# Methodology: Benefits/Costs

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## Benefit Cost Ratio

- Comparing the Costs and Benefits of the Build vs the No\_Build Scenario.
- In this case, the No Build = Demolition
- Contrast to Deferred Maintenance “No Build” Scenarios

# Methodology: Benefits/Costs

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## Benefit Cost Ratio

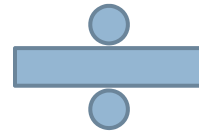
# Methodology: Benefits/Costs

14

## Benefit Cost Ratio



PV (Benefits of Reconstruction – Benefits of Demolition)



PV (Cost of Reconstruction – Cost of Demolition)

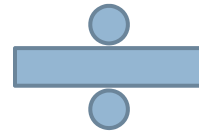
# Methodology: Benefits/Costs

15

## Benefit Cost Ratio



PV (Benefits of Reconstruction – Benefits of Demolition)



PV (Cost of Reconstruction – Cost of Demolition)

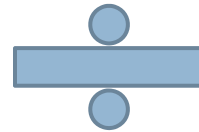
# Methodology: Benefits/Costs

16

## Benefit Cost Ratio



PV (**Benefits of Reconstruction** – Benefits of Demolition)



PV (Cost of Reconstruction – Cost of Demolition)



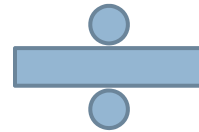
# Methodology: Benefits/Costs

17

## Benefit Cost Ratio



PV (Benefits of Reconstruction – Benefits of Demolition)



PV (Cost of Reconstruction – Cost of Demolition)

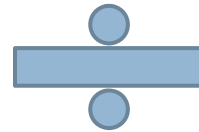
# Methodology: Benefits/Costs

18

## Benefit Cost Ratio



PV (Benefits of Reconstruction – Benefits of Demolition)



PV (Cost of Reconstruction – Cost of Demolition)

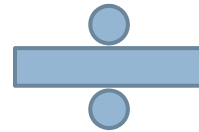
# Methodology: Benefits/Costs

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## Benefit Cost Ratio



PV (Benefits of Reconstruction – Benefits of Demolition)



PV (Cost of Reconstruction – Cost of Demolition)

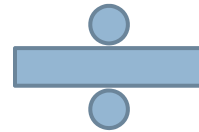
# Methodology: Benefits/Costs

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## Benefit Cost Ratio



PV (Benefits of Reconstruction – Benefits of Demolition)



PV (Cost of Reconstruction – Cost of Demolition)

# Methodology: Present Value

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## PRESENT VALUE

(Discounted Value)

Effect of a 6% discount rate

Years from Now	Amount Spend or received	Present Value (Worth Today)
0	\$ 1,000	\$ 1,000
1	\$ 1,000	943.40
2	\$ 1,000	890.00
3	\$ 1,000	839.62
4	\$ 1,000	792.09
5	\$ 1,000	747.26
6	\$ 1,000	704.96
7	\$ 1,000	665.06

$$PV = FV / (1 + \text{rate})^n$$

where

PV is present value

FV is future value

rate is the discount rate used

n is the number of periods

# Methodology: Discount Rate

22

- Cost of Capital - Minimum return on the investment required over the long run to meet expectations
- Discount Rate used is the coupon on NYC Capital Bonds = 3.6%



**FOR IMMEDIATE RELEASE**

Date: Friday, March 13, 2015

Release #031315

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**THE CITY OF NEW YORK ANNOUNCES SUCCESSFUL SALE  
OF GENERAL OBLIGATION BONDS**

The City of New York ("the City") announced the successful sale of approximately \$1 billion of General Obligation Bonds. The sale included \$800 million of tax-exempt fixed-rate refunding bonds and approximately \$203 million of taxable fixed-rate bonds consisting of \$100 million of new money bonds and a conversion of \$103 million of variable-rate demand bonds ("VRDBs") to fixed-rate.

The City received approximately \$270 million of retail orders for the \$800 million of tax-exempt fixed-rate refunding bonds during the two-day retail order period preceding yesterday's sale. Strong demand during yesterday's pricing allowed the City to reduce yields by up to 4 basis points on 11 of 18 maturities (excluding 2 maturities offered via sealed bid and 1 maturity not offered to institutions). Stated yields on the bonds ranged from 0.10% in 2015 to 3.22% in 2034 for a premium coupon bond and 3.60% in 2035 for a par bond. The refunding bonds were sold via negotiated sale through the City's syndicate, led by book-running senior manager RBC Capital Markets with BofA Merrill Lynch, Citigroup, Jefferies, J.P. Morgan, Morgan Stanley, and Siebert Brandford Shank & Co., L.L.C. serving as co-senior managers.

The City also sold \$100 million of taxable fixed-rate new money bonds via competitive bid. The winning bidder was BofA Merrill Lynch at a TIC of 2.68%.

Additionally, the City sold \$103 million of a conversion of taxable VRDBs to fixed rate bonds via competitive bid. The winning bidder was J.P. Morgan at a TIC of 3.59%.

The ratings for New York City General Obligation Bonds are Aa2 from Moody's Investors Service, AA from Standard & Poor's, and AA from Fitch Ratings.

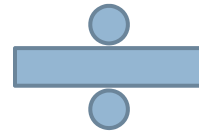
# Methodology: Benefits/Costs

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## Benefit Cost Ratio



PV (Benefits of Reconstruction – Benefits of Demolition)



PV (Cost of Reconstruction – Cost of Demolition)

# Methodology: Cost of Reconstruction

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## Example: 55<sup>th</sup> Ave Ped Bridge





# Methodology: Cost of Reconstruction

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## Example: 55<sup>th</sup> Ave Ped Bridge



Construction Cost:

Assumption:

Maintenance Cost:

Assumption:

\$5,200,000 in 2017 or  
PV \$4,676,534

\$4,000/sq ft of deck  
1,300 sq ft

\$52,000/yr for 70  
years or PV \$1,322,961

Maintenance is 1%  
70 year asset

# Methodology: Cost of Reconstruction

## Example: 55<sup>th</sup> Ave Ped Bridge



Construction Cost:

Assumption:

Maintenance Cost:

Assumption:

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# Methodology: Cost of Reconstruction

## Example: 55<sup>th</sup> Ave Ped Bridge



PV \$4,676,534

+

PV \$1,322,961

=

PV \$5,999,495

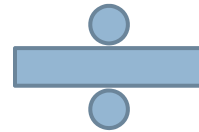
# Methodology: Benefits/Costs

28

## Benefit Cost Ratio



PV (Benefits of Reconstruction – Benefits of Demolition)



PV (\$5,999,495 – Cost of Demolition)

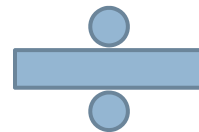
# Methodology: Benefits/Costs

29

## Benefit Cost Ratio



PV (Benefits of Reconstruction – Benefits of Demolition)



PV (\$5,999,495 – Cost of Demolition)

# Methodology: Cost of Demolition

30

Demolition Cost:

\$500,000 in 2020 or  
PV \$404,400

**Assumption:**

\$2.4M to demolish \$66M  
33<sup>rd</sup> Street Bridge (4%)

\$500,000 min

Maintenance Cost:

\$52,000/yr until 2020  
or PV \$276,177

**Assumption:**

Maintenance is 1%  
70 year asset

# Methodology: Cost of Reconstruction

## Example: 55<sup>th</sup> Ave Ped Bridge



PV \$404,400

+

PV \$276,177

=

PV \$680,577

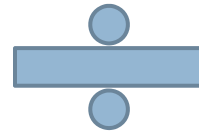
# Methodology: Benefits/Costs

32

## Benefit Cost Ratio



PV (Benefits of Reconstruction – Benefits of Demolition)



PV (\$5,999,495 – \$680,577)



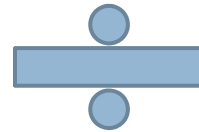
# Methodology: Benefits/Costs

33

## Benefit Cost Ratio



PV (**Benefits of Reconstruction** – Benefits of Demolition)



PV (\$5,318,917)

# Methodology: Benefits of Reconstruction

34

Reconstruction Benefit:  $\$67,179/\text{year for 70 years PV } \$1,709,129$

**Benefit = Travel Time Value**

**Length of Bridge / Walking Speed = Time to Cross Bridge**

138 Feet / 3 feet per second = 46 seconds

**Time to Cross Bridge X Value of Time = Time Value to Cross Bridge**

0.0128 HR x  $(\$33.67/2)$  =  $\$0.216$  per person

**Time Value to Cross the Bridge X Pedestrian AADT = Daily Value**

$\$0.216$  per person X 853 AADT =  $\$184$  per day

**Daily Value X Full Year = Yearly Travel Cost in Time**

$\$184$  per day X 365 =  $\$67,179$

# Methodology: Benefits of Reconstruction

The Travel Time Value is actually a Cost to Pedestrians. It is the value of the time Pedestrian lose crossing the Bridge.

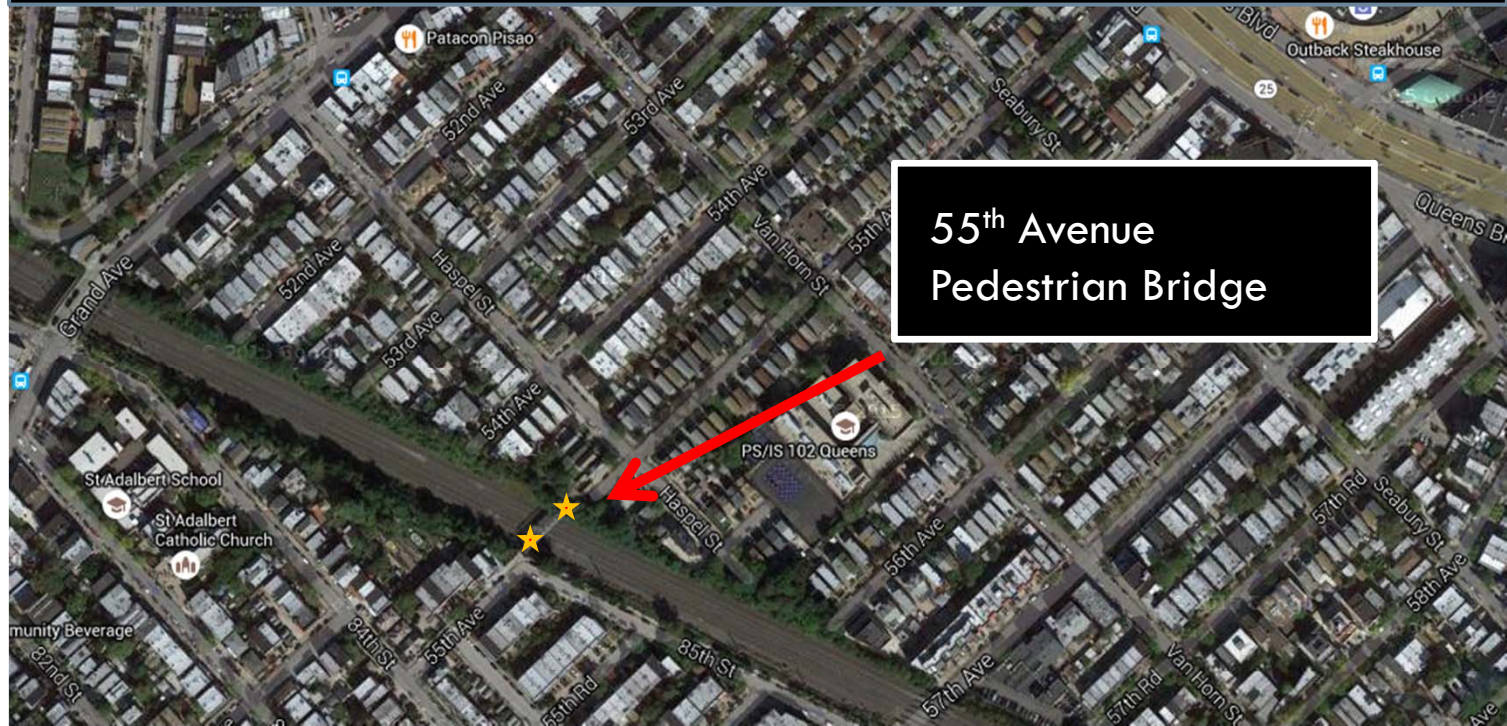
PV \$1,709,129



# Methodology: Benefits of Reconstruction

The Travel Time Value is actually a Cost to Pedestrians. It is the value of the time Pedestrian lose crossing the Bridge.

PV  $-\$1,709,129$



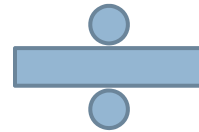
# Methodology: Benefits/Costs

37

## Benefit Cost Ratio



PV (~~-\$1,709,129~~) – Benefits of Demolition)



PV (\$5,318,917)

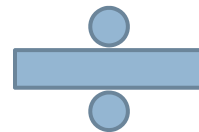
# Methodology: Benefits/Costs

38

## Benefit Cost Ratio



PV ((-\$1,709,129) – Benefits of Demolition)



PV (\$5,318,917)

# Methodology: Benefits of Demolition



# Methodology: Benefits of Demolition

40

Demolition Benefit:  $-\$1,310,513$  /year for 70 years PV  $-\$26,738,013$

**Benefit = Travel Time Value**

**Length of Alt Route / Walking Speed = Time to Walk Alt Route**  
2,700 feet / 3 feet per second = 900 seconds (15 min)

**Time to Cross Bridge X Value of Time = Time Value to Cross Bridge**  
 $0.25 \text{ HR} \times (\$33.67/2) = \$4.21$  per person

**Time Value to Cross the Bridge X Pedestrian AADT = Daily Value**  
 $\$4.21$  per person X 853 AADT =  $\$3,590$  per day

**Daily Value X Full Year = Yearly Travel Cost in Time**  
 $\$3,590$  per day X 365 =  $\$1,310,513$



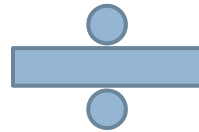
# Methodology: Benefits/Costs

41

## Benefit Cost Ratio



$$PV ((-\$1,709,129) - (- \$26,738,013 ))$$



$$PV (\$5,318,917)$$

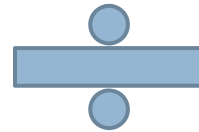
# Methodology: Benefits/Costs

42

## Benefit Cost Ratio



PV ((-\$1,709,129) + \$26,738,013 ))



PV (\$5,318,917)

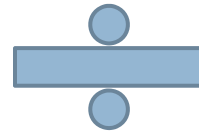
# Methodology: Benefits/Costs

43

## Benefit Cost Ratio



PV (\$25,028,884)



PV (\$5,318,917)

# Methodology: Benefits/Costs

44

## Benefit Cost Ratio



**4.71**

**55<sup>th</sup> Avenue Ped Bridge**

# Results: Pedestrian Bridges

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Bin	FEATURE_CR	FEATURE_CA	Replacement Cost	Pedestrian AADTs	Pedestrian Travel Distance No Build	Pedestrian Travel Time Savings	Benefit Cost Ratio
1247200	LIRR MAIN LINE	67 AVE PED BR (2247200)	\$ 5,200,000	2,411	2,944	\$ 96,350,805	18.22
2247020	LIRR PORT WASH BR	94TH ST PED BRDG	\$ 2,000,000	1,061	1,816	\$ 25,837,111	14.40
2243220	FRANKLIN SHUTTLE	CARROLL ST PED BRDG	\$ 2,400,000	1,040	2,143	\$ 30,713,809	13.77
2249350	SIRT SOUTH SHORE	NELSON AVE PED BRDG	\$ 1,200,000	1,033	909	\$ 12,260,825	13.40
2243910	LIRR BAY RIDGE LINE	LIVONIA AVE PED BRDG	\$ 10,000,000	3,601	2,474	\$ 110,943,814	10.47
7705510	LIRR PORT WASH BR	167TH ST PED BRDG	\$ 2,400,000	483	2,440	\$ 16,101,614	7.21
2241700	METRO NORTH RR HAR	ST PAULS PL PED BRDG	\$ 2,400,000	1,381	834	\$ 13,857,613	6.19
2247190	LIRR MAIN LINE	55TH AVE PED BRDG	\$ 5,200,000	683	2,699	\$ 25,028,884	4.71
2249210	SIRT SOUTH SHORE	MAIN ST PED BRDG	\$ 1,600,000	115	4,084	\$ 6,484,056	4.78
2249580	SIRT SOUTH SHORE	BELFIELD AVE PED BRDG	\$ 1,600,000	354	1,235	\$ 5,905,176	4.35
2245290	AMTRAK 30 ST BRANCH	W 155TH ST PED BRDG	\$ 3,200,000	188	4,222	\$ 10,983,997	3.52
7703720	LIRR PORT WASH BR	216TH ST PED BRDG	\$ 1,600,000	85	3,396	\$ 3,988,128	2.94
2241770	METRO NORTH RR HAR	E 178TH ST PED BRDG	\$ 2,800,000	651	1,133	\$ 7,657,401	2.86
2246600	APPROACH TO G.W.B.	W 176TH ST PED BRDG	\$ 4,800,000	150	5,333	\$ 11,233,265	2.36
2249390	SIRT SOUTH SHORE	CEDARVIEW AVE PED BRDG	\$ 2,500,000	391	899	\$ 4,444,493	1.89
2247650	LIRR MAIN LINE	60TH RD PED BRDG	\$ 9,172,000	730	1,517	\$ 14,282,136	1.47
2249530	SIRT SOUTH SHORE	MINTHORNE ST PED BRDG	\$ 24,000,000	1,265	1,922	\$ 28,562,837	1.11
2249280	SIRT SOUTH SHORE	CHAMP COURT PED BRDG	\$ 2,380,000	122	1,346	\$ 2,125,818	0.96
2240650	HAWTREE BASIN	163RD AVE PED BRDG	\$ 20,000,000	107	5,544	\$ 7,900,221	0.37
2249450	SIRT SOUTH SHORE	FREMONT AVE PED BRDG	\$ 3,200,000	138	714	\$ 1,240,288	0.40
2244440	NAVY ST	SOUTH OF TILLARY ST	\$ 24,800,000	445	1,255	\$ 6,368,637	0.24
2268760	TENTH AVE	PS-5 PED BRDG	\$ 5,140,000	381	188	\$ 262,689	0.05

# Benefit Cost Analysis

## Benefits

### **Economic Benefits** (Travel Time Savings)

- Measured:
  - Bike/Ped/Vehicles using bridge
  - Time to travel alternate routes
  - Each user at a different speed

### **Environmental Benefits** (GHGs avoided)

- Measured:
  - Using Federal TIGER methodology

### **Safety Benefits**

(Actual crash rates on No Build route)

- Measured:
  - Using 5 year average derived from latest NYC DOT crash data

### **Livability Benefits** (Access to Amenities)

- Measured using FHWA definition

## Costs

### **Cost of Construction**

### **Cost of Maintenance** (40 years)

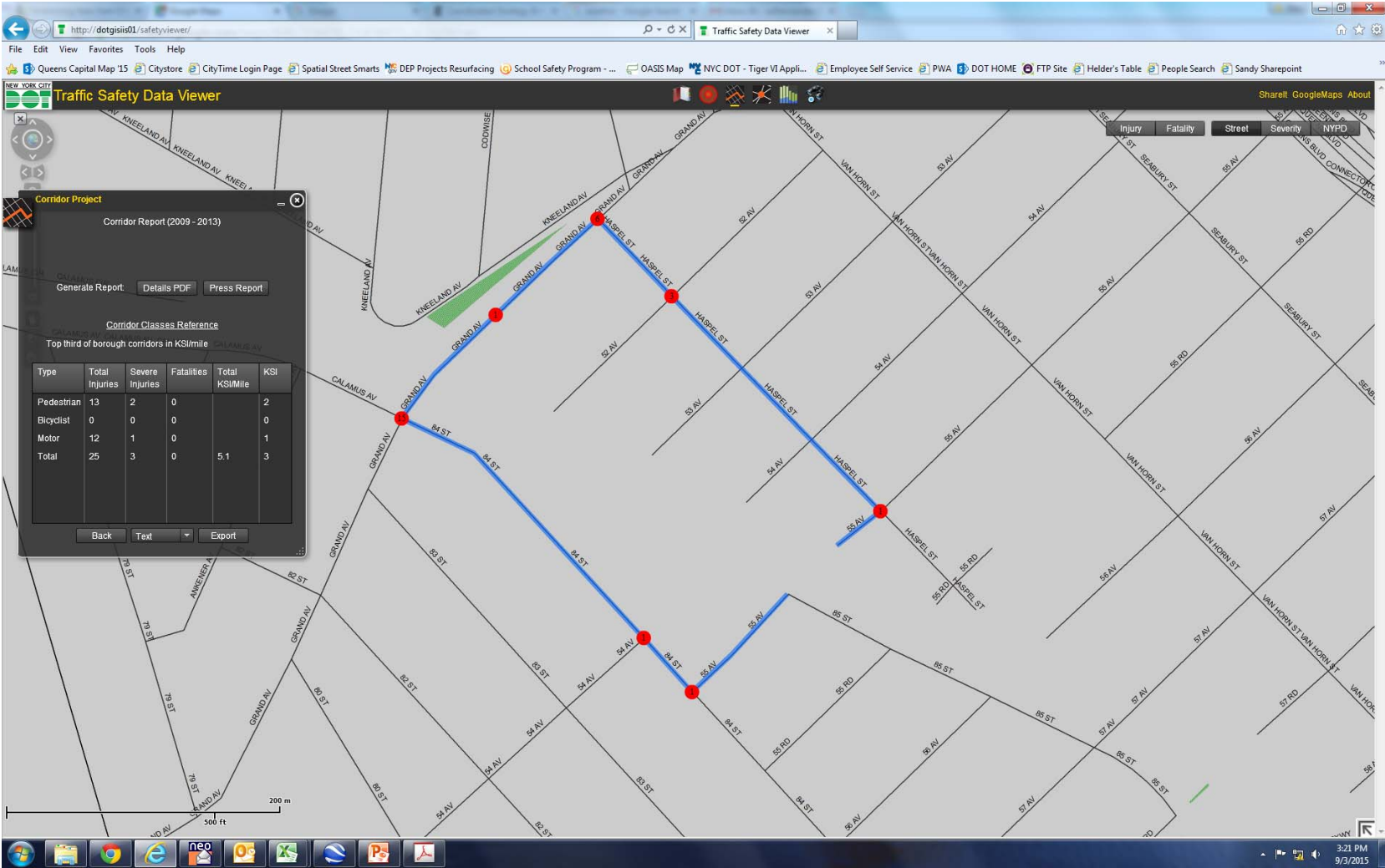
### **Cost of Demolition**

(used in the “No Build” scenario)

# Methodology: Safety Benefits



# Methodology: Safety Benefits





# Methodology: Safety Benefits

55th Avenue Ped Bridge BIN 2247190 NO BUILD 2.pdf - Adobe Acrobat Pro

File Edit View Window Help

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### Unknown - Unknown to Unknown, QN

#### Injury Summary, 2009-2013 (5 Years)

	Total Injuries	Severe Injuries	Fatalities	KSI
Pedestrian	13	2	0	2
Bicyclist	0	0	0	0
Motor Vehicle Occupant	12	1	0	1
<b>Total</b>	<b>25</b>	<b>3</b>	<b>0</b>	<b>3</b>

Fatalities, 01/01/2009-8/31/2015 : None

Source: Fatalities: NYCDOT  
Injuries: NYSDOT  
KSI: Persons Killed or Severely Injured



Route Length: 0.6 miles

**High Crash Corridor with 5.1 KSI per mile, ranking in the top third of Queens corridors (2009-2013).**

#### Non-Fatal Injuries by Severity, 2009-2013

Severity	Pedestrian	Bicyclist	Motor Vehicle	Total
A	2	0	1	3
B	3	0	4	7
C	7	0	7	14
Unknown	1	0	0	1
<b>Total</b>	<b>13</b>	<b>0</b>	<b>12</b>	<b>25</b>

Severity reported as classified by NYS Dept. of Motor Vehicles.  
A: Severe B: Moderate C: Minor  
KSI (Persons Killed or Severely Injured): NYCDOT Fatalities + NYSDOT "A" Injuries

#### Injuries by Year, 2009-2013

Year	Pedestrian	Bicyclist	Motor Vehicle	Total
2009	2	0	2	4
2010	1	0	0	1
2011	3	0	5	8
2012	5	0	3	8
2013	2	0	2	4
<b>Total</b>	<b>13</b>	<b>0</b>	<b>12</b>	<b>25</b>

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# Methodology: Safety Benefits

Non-Fatal Injuries by Severity, 2009-2013						
Severity	Build	No Build	Build Annual	No Build Annual	Monetized Build Annual	Monetized No Build Annual
A	-	3	- 0.6		\$ -	\$ 263,994.17
B	-	7	- 1.4		\$ -	\$ 167,775
C	-	14	- 2.8		\$ -	\$ 171,343
Unknown	-	-	-		\$ -	\$ -

Monetized Accident Data													
AIS Level	Unit Value	O	C	B	A	K	U						
0	\$ -	0.92534	\$ -	0.23437	\$ -	0.08347	\$ -	0.03437	\$ -	0.21538	\$ -		
1	\$ 27,600	0.07257	\$ 2,003	0.68946	\$ 19,029	0.76843	\$ 21,209	0.55449	\$ 15,304	0	\$ -	0.62728	\$ 17,313
2	\$ 432,400	0.00198	\$ 856	0.06391	\$ 27,635	0.10898	\$ 47,123	0.20908	\$ 90,406	0	\$ -	0.104	\$ 44,970
3	\$ 966,000	0.00008	\$ 77	0.01071	\$ 10,346	0.03191	\$ 30,825	0.14437	\$ 139,461	0	\$ -	0.03858	\$ 37,268
4	\$ 2,447,200	0.00000	\$ -	0.00142	\$ 3,475	0.00620	\$ 15,173	0.03986	\$ 97,545	0.00000	\$ -	0.00442	\$ 10,817
5	\$ 5,455,600	0.00003	\$ 164	0.00013	\$ 709	0.00101	\$ 5,510	0.01783	\$ 97,273	0	\$ -	0.01034	\$ 56,411
6	\$ 9,200,000	0.00000	\$ -	0.00000	\$ -	0.00000	\$ -	0.00000	\$ -	1.00000	\$ 9,200,000	0.00000	\$ -
		<b>\$3,100</b>		<b>\$61,194</b>		<b>\$119,839</b>		<b>\$439,990</b>		<b>\$9,200,000</b>		<b>\$166,778</b>	

# Methodology: Safety Benefits

51

PV of Injuries on No Build Route

– PV of Injuries on the Build Route



Safety Benefit

# Methodology: Safety Benefits

52

PV \$12,140,928

– PV of Injuries on the Build Route



Safety Benefit

# Methodology: Safety Benefits

53

PV \$12,140,928  
– 0



Safety Benefit

# Methodology: Safety Benefits

54

Safety Benefit



PV \$12,140,928

# Methodology: Safety Benefits

55

## 55<sup>th</sup> Street Ped Bridge:

Plain BCR



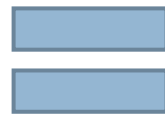
4.71

Safety Benefit



PV \$12,140,928

BCR + Safety



6.99

# Results: Pedestrian Bridges

56

Bin	FEATURE_CR	FEATURE_CA	Benefit Cost Ratio	Safety Benefit	BCR + Safety Benefit
1247200	LIRR MAIN LINE	67 AVE PED BR (2247200)	18.22	\$ 8,895,716	19.90
2247020	LIRR PORT WASH BR	94TH ST PED BRDG	14.40	\$ 8,408,769	19.08
2243220	FRANKLIN SHUTTLE	CARROLL ST PED BRDG	13.77	\$ 15,148,693	20.55
2249350	SIRT SOUTH SHORE	NELSON AVE PED BRDG	13.40	\$ 2,935,947	16.60
2243910	LIRR BAY RIDGE LINE	LIVONIA AVE PED BRDG	10.47	\$ 9,870,945	11.40
7705510	LIRR PORT WASH BR	167TH ST PED BRDG	7.21	\$ 7,967,323	10.77
2241700	METRO NORTH RR HAR	ST PAULS PL PED BRDG	6.19	\$ 1,950,458	7.07
2247190	LIRR MAIN LINE	55TH AVE PED BRDG	4.71	\$ 12,140,928	6.99
2249210	SIRT SOUTH SHORE	MAIN ST PED BRDG	4.78	\$ 41,804,528	35.60
2249580	SIRT SOUTH SHORE	BELFIELD AVE PED BRDG	4.35	\$ 739,117	4.90
2245290	AMTRAK 30 ST BRANCH	W 155TH ST PED BRDG	3.52	\$ 43,796,560	17.57
7703720	LIRR PORT WASH BR	216TH ST PED BRDG	2.94	\$ 10,846,175	10.94
2241770	METRO NORTH RR HAR	E 178TH ST PED BRDG	2.86	\$ 21,637,783	10.94
2246600	APPROACH TO G.W.B.	W 176TH ST PED BRDG	2.36	\$ 30,834,438	8.68
2249390	SIRT SOUTH SHORE	CEDARVIEW AVE PED BRDG	1.89	\$ 8,460,067	5.50
2247650	LIRR MAIN LINE	60TH RD PED BRDG	1.47	\$ 83,296,458	10.07
2249530	SIRT SOUTH SHORE	MINTHORNE ST PED BRDG	1.11	\$ 52,188,737	3.15
2249280	SIRT SOUTH SHORE	CHAMP COURT PED BRDG	0.96	\$ 4,224,904	2.87
2240650	HAWTREE BASIN	163RD AVE PED BRDG	0.37	\$ 1,714,346	0.45
2249450	SIRT SOUTH SHORE	FREMONT AVE PED BRDG	0.40	\$ 6,992,094	2.64
2244440	NAVY ST	SOUTH OF TILLARY ST	0.24	\$ 3,438,951	0.37
2268760	TENTH AVE	PS-5 PED BRDG	0.05	\$ 26,858,435	5.16



# Methodology: Vehicular Bridges

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In addition to Pedestrian Travel Time Savings, the BCR for vehicular bridges also includes:

- Bicycle Travel Time Savings
- Vehicle Travel Time Savings
- Vehicle Operating Cost Savings
- Emissions Reductions
- Pavement Maintenance Savings

# Results: Vehicular Bridges

58

Bin	FEATURE_CR	FEATURE_CA	Benefit Cost Ratio	Safety Benefit	BCR + Safety Benefit	Livability Premium	BCR + Safety + Livability
2243480	LIRR BAY RIDGE	OCEAN AVE	17.42	\$ 15,376,693	18.17	\$ 1,552,534	18.25
2267860	STORAGE (SANDS ST)	BROOKLYN BR APPROACH	16.45	\$ 61,404,035	18.76	\$ 10,280,635	19.15
2243500	LIRR BAY RIDGE	NOSTRAND AVE	16.28	\$ 42,614,572	18.69	\$ 9,301,658	19.21
2243439	LIRR BAY RIDGE	OCEAN PKWY	14.71	\$ 21,064,610	15.45	\$ 5,751,505	15.65
2241509	CONRAIL (ABANDONED) PUTNAM	W 231ST ST	13.76	\$ 53,608,252	16.53	\$ 35,750,882	18.38
2268770	EQUES. PATH (ABAND.)	SPRINGFIELD BLVD	13.69	\$ 2,913,841	14.19	\$ -	14.19
2243279	FRANKLIN SHUTTLE	EASTERN PKWY	12.61	\$ 4,600,436	12.75	\$ 37,930,971	13.95
2243150	BMT SUBWAY, BRIGHTON	FOSTER AVE	12.39	\$ 3,675,241	12.68	\$ 9,801,604	13.48
2243940	NYCTA IND SBWY	9TH AVE	11.75	\$ 49,983,207	13.68	\$ 60,727,425	16.04
2241010	CSX TRANS - PT MORRIS	E 156TH STREET	11.63	\$ 18,331,013	13.44	\$ 269,329	13.46
2241790	METRO NORTH RR HAR	E 180TH ST	10.52	\$ 8,067,304	10.91	\$ 10,150,616	11.40
2243010	BMT SUBWAY, BRIGHTON	LINCOLN ROAD	10.19	\$ 63,839,390	12.67	\$ 11,861,834	13.13
2247470	CSX TRANSPORT	ELIOT AVE	10.12	\$ 1,538,819	10.25	\$ 397,396	10.28
2241800	METRO NORTH RR HAR	E 183TH ST	8.02	\$ 19,326,761	9.13	\$ 2,256,974	9.26
2245120	AMTRAK 30 ST BRANCH	W 46TH ST	7.97	\$ 11,890,320	8.68	\$ -	8.68
2243370	LIRR BAY RIDGE	17TH AVE	7.78	\$ 10,903,270	8.53	\$ -	8.53
2241409	METRO NORTH RR HUD	GRAND CONCOURSE	7.35	\$ 103,250,914	9.11	\$ 19,661,236	9.44
2243100	BMT SUBWAY, BRIGHTON	BEVERLY ROAD	7.03	\$ 3,298,546	7.23	\$ 8,880,024	7.74
2242280	E 167TH ST	GRAND CONCOURSE	6.83	\$ 39,531,058	7.06	\$ 55,355,354	7.37
2243740	BMT SEA BEACH	BAY PKWY	6.53	\$ 58,656,124	7.38	\$ 33,158,093	7.86

Top 20

# Results: Vehicular Bridges

59

Bin	FEATURE_CR	FEATURE_CA	Benefit Cost Ratio	Safety Benefit	BCR + Safety Benefit	Livability Premium	BCR + Safety + Livability
2243040	BMT SUBWAY, BRIGHTON	CROOKE AVE	0.66	\$ 21,152,769	1.48	\$ 73,227	1.49
2246980	W 138TH ST	RIVERSIDE DRIVE	0.65	\$ -	0.65	\$ 10,456	0.65
2245190	AMTRAK 30 ST BRANCH	W 58TH ST	0.64	\$ 59,606,391	4.19	\$ 109,956	4.19
2245480	RIVERSIDE DRIVE	TO GWB OPP W 171ST ST	0.61	\$ 384,705	0.62	\$ -	0.62
2247410	CSX TRANSPORT	43RD AVE	0.58	\$ 384,705	0.60	\$ 625,291	0.63
224501F	AMTRAK 30 ST BRANCH	W 36TH ST	0.58	\$ 5,389,410	0.66	\$ -	0.66
224501E	AMTRAK 30 ST BRANCH	W 35TH ST	0.53	\$ 11,966,937	0.97	\$ -	0.97
1247560	LIRR -NY&ATL	METROPOLITAN AVE	0.41	\$ 40,351,080	0.88	\$ 8,215,284	0.98
2247090	LIRR PORT WASH BR	149TH PLACE	0.40	\$ 1,231,861	0.47	\$ 219,602	0.48
2241330	AMTRAK - CSX	UNIONPORT ROAD	0.36	\$ 20,578,216	1.01	\$ (593,438)	0.99
2247420	CSX TRANSPORT	44TH AVE	0.30	\$ 2,443,203	0.41	\$ 586,870	0.44
224501B	AMTRAK 30 ST BRANCH	W 33RD ST	0.28	\$ (14,190,538)	0.07	\$ 4,586,422	0.14
2243820	BMT SEA BEACH	21ST AVE	0.24	\$ 29,895,784	0.57	\$ -	0.57
2241460	METRO NORTH RR HUD	W TREMONT AVE	0.23	\$ 11,616,070	0.44	\$ 1,248,183	0.47
2270030	ACCESS TO HOUSING	E 156TH ST	0.20	\$ (2,710,094)	0.19	\$ 2,499,708	0.20
2246720	W 158TH ST - AMTRAK	RIVERSIDE DRIVE	0.12	\$ 17,630,824	0.14	\$ 581,396	0.14
2249320	SIRT SOUTH SHORE	ALBEE AVE	0.06	\$ 739,117	0.08	\$ 325	0.08
2247480	CSX TRANSPORT	JUNIPER BLVD SO	0.04	\$ 492,744	0.06	\$ -	0.06
2249520	SIRT SOUTH SHORE	HANNAH ST	0.03	\$ 43,036,389	1.04	\$ 30,267	1.04
2269740	SIRT	BUS STATION NORTH	0.03	\$ -	0.03	\$ (98,837)	0.03
2270180	STATEN ISLAND RAILWAY	BOROUGH PLACE - RAMP A	0.03	\$ (6,195,882)	-1.19	\$ 857,495	-1.02

Bottom 20

# Next Steps

60

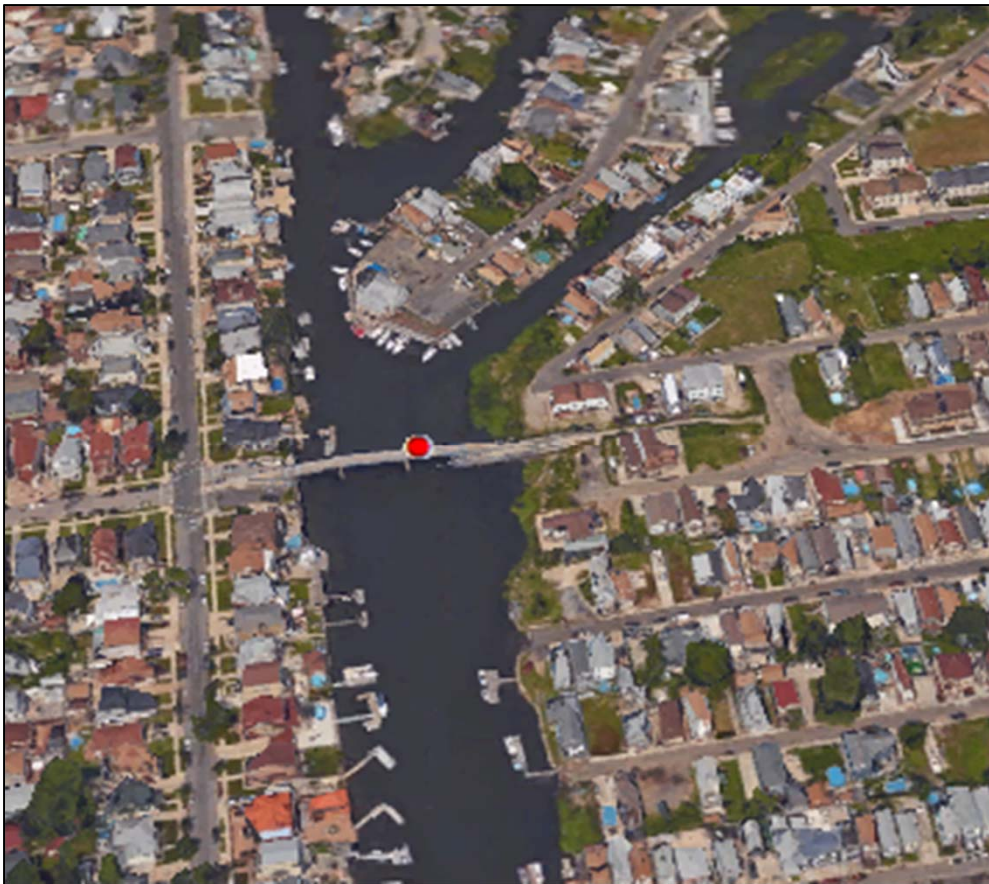
- Bridges in the lowest 10<sup>th</sup> Percentile of Rankings will undergo a deeper level of analysis before a recommendation of demolition.
  - Detailed cost estimates
  - New pedestrian/bicycle/motor vehicle counts
  - Traffic analysis
  - Detailed maintenance projections
- Results so far:
  - Confirmed existing demolition projects
  - Scope changes to funded and unfunded projects

# 163<sup>rd</sup> AVE PED BRIDGE

BCR: ?

61

over Hawtree Basin (BIN: 2240650)



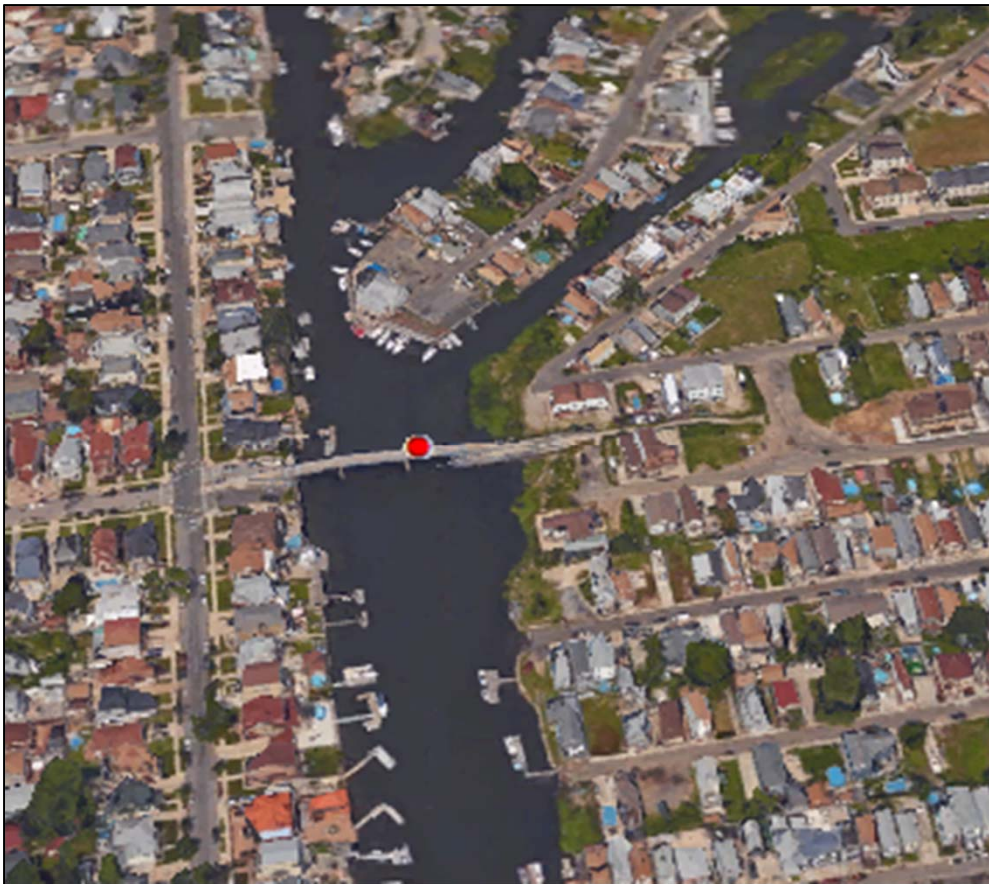
- Built: 1962
- Total Reconstruction Cost: \$16.12M (FY17\$)
- AADT Volumes:
  - ▣ Pedestrians: ?
  - ▣ Bikes: ?
- Alternate Route: ?

# 163<sup>rd</sup> AVE PED BRIDGE

**BCR: 0.58**

62

over Hawtree Basin (BIN: 2240650)



- Built: 1962
- Total Reconstruction Cost: \$16.12M (NN, in FY17\$)
- AADT Volumes:
  - ▣ Pedestrians: 107
  - ▣ Bicycles: 6
- Alternate Route: 5,544 ft.
- BCR w. Safety Benefit: 0.53

# QUESTIONS?

