



TAPPAN ZEE BRIDGE/I-287
ENVIRONMENTAL REVIEW

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



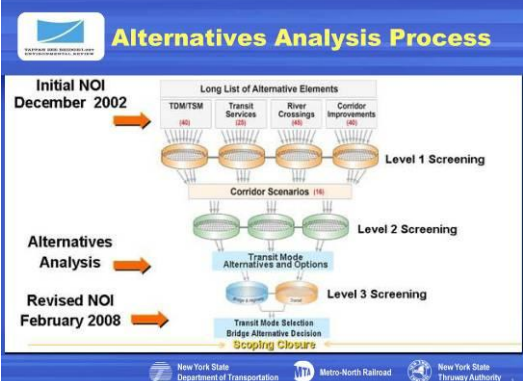
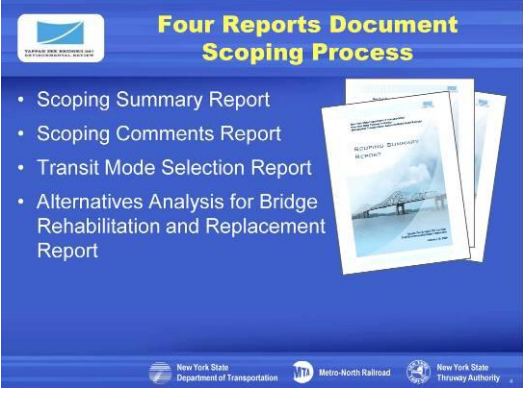
Presentation






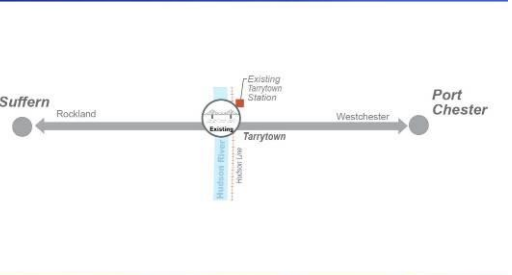
***Stakeholders' Advisory Working Group
Bridge and Environmental SAWG 11***


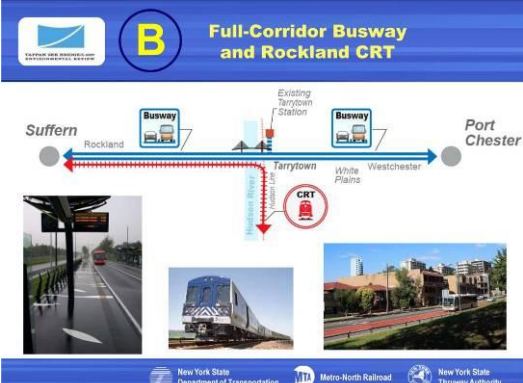
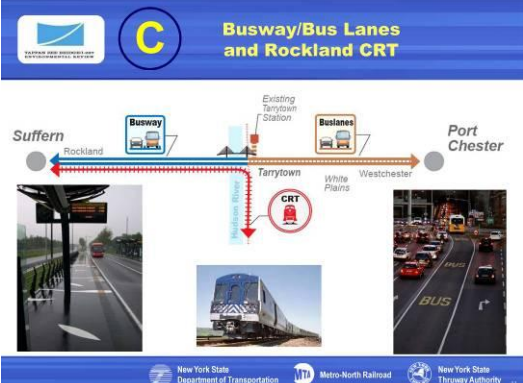
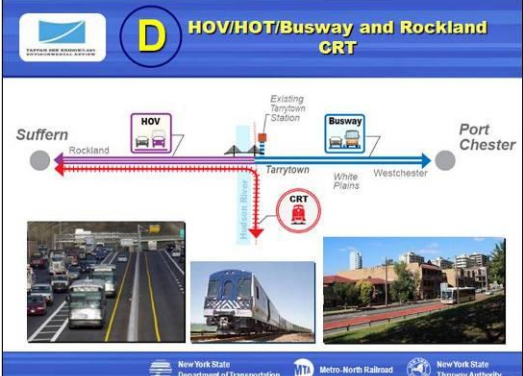
***Tappan Zee Bridge/I-287 Corridor
Environmental Review***

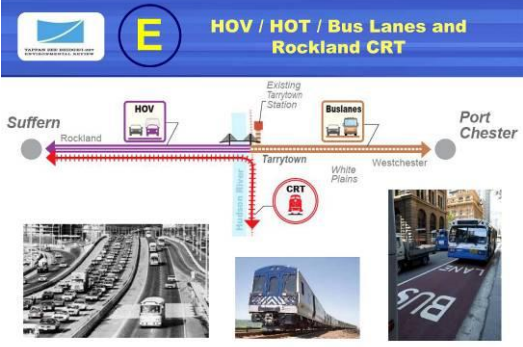
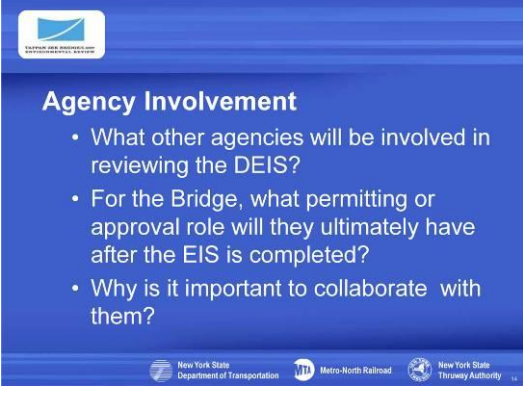
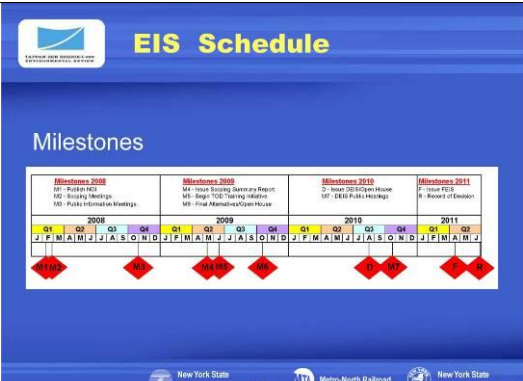


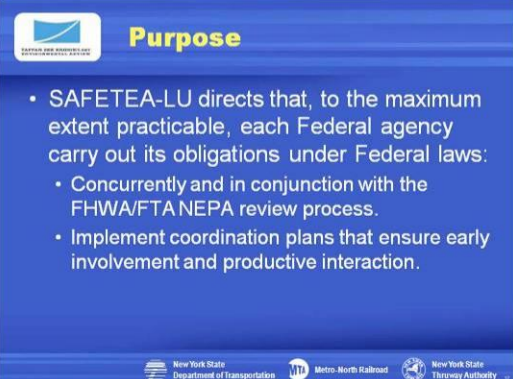
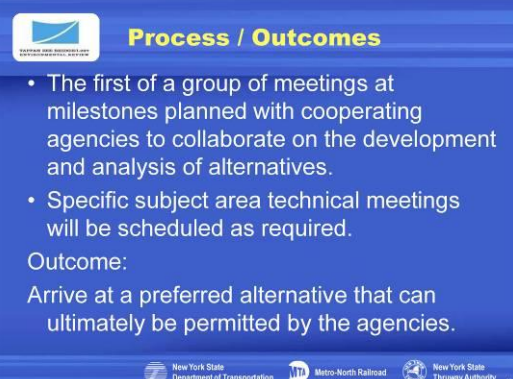
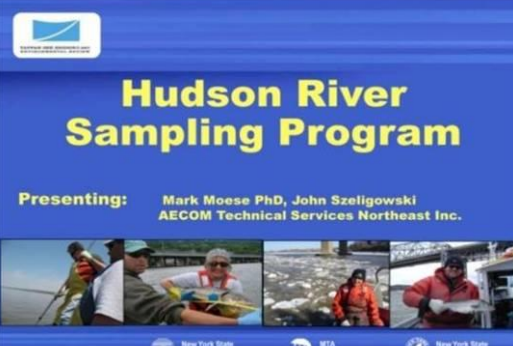
June 25, 2009





 <p>Bridge/ Environmental SAWG Meeting June 25, 2009</p> <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 1:</p> <p>Part 1: Project status and purpose (Slides 1-18)</p>
 <p>Agenda</p> <ul style="list-style-type: none"> • Project Status/ Purpose • Hudson River Sampling Program • Conceptual Bridge Foundation Design and Construction • Methods of Analyzing Impacts • Open Discussion <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 2:</p> <p>This is a meeting to explain our work in the DEIS with the Cooperating agencies relating to the recommendation to replace the existing TZB bridge . The meeting with the Cooperating Agencies focused only on the potential in-river impacts from a replacement bridge.</p> <p>This slide outlines the structure of the presentation.</p>
 <p>Alternatives Analysis Process</p> <p>Initial NOI December 2002 → Long List of Alternative Elements (TOM/TSM, Transit Services, River Crossings, Corridor Improvements) → Level 1 Screening → Corridor Scenarios → Level 2 Screening → Alternatives Analysis → Level 3 Screening → Transit Mode Selection, Bridge Alternative Decision, Scoping Closure → Revised NOI February 2008</p> <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 3:</p> <p>This slide shows a summary overview of our scoping process.</p> <p>Scoping was completed early this year.</p>
 <p>Four Reports Document Scoping Process</p> <ul style="list-style-type: none"> • Scoping Summary Report • Scoping Comments Report • Transit Mode Selection Report • Alternatives Analysis for Bridge Rehabilitation and Replacement Report <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 4:</p> <p>This slides lists the four major documents completed at the end of scoping.</p> <ul style="list-style-type: none"> • The two scoping documents contained all the scoping process background work, scoping comments and responses and the alternatives that will be evaluated in the DEIS. • The <i>Transit Mode Selection Report</i> and <i>Alternatives Analysis for the Rehabilitation and Replacement of the Tappan Zee Bridge</i> contain the respective transit mode and bridge analysis and recommendations. <p>These documents are now available on our website www.tzbsite.com.</p>

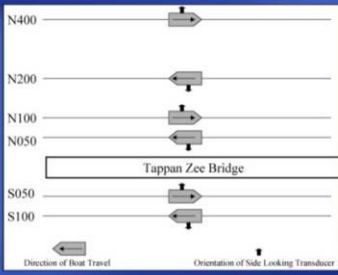
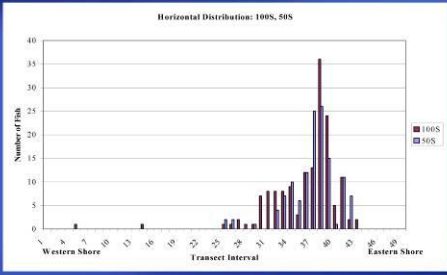
 <h3>Transit Mode Recommendation</h3> <ul style="list-style-type: none"> • Tier 1 Transit - develop and analyze : <ul style="list-style-type: none"> • Full-Corridor Bus Rapid Transit for intra and inter county markets • Commuter Rail from Orange / Rockland to Grand Central Terminal • Begin Tier 2 Transit environmental process upon conclusion of this EIS, then: <ul style="list-style-type: none"> • Implement Full-Corridor BRT in most expedient manner • CRT advances as circumstances and finances dictate <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 5:</p> <p>This slide summarizes the overall tiering process as presented in the spring of 2008 for transit.</p> <ul style="list-style-type: none"> • Tier 1 transit work will develop and analyze the best CRT and BRT alignment solutions for the selected modes • The Tier 2 transit environmental process work will commence upon completion of this EIS and record of decision.
 <h3>Bridge Recommendation</h3> <p>Tier 2 -Replacement of Tappan Zee Bridge</p> <ul style="list-style-type: none"> • Rehabilitation of existing bridge in-kind is not viable • Rehabilitation options require extensive new work • Rehabilitation options retain serious vulnerabilities • Replacement options have high life cycle (150 yrs) <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 6:</p> <p>This slide summarizes the main reasons for the bridge replacement recommendation as presented in the spring of 2008..</p> <ul style="list-style-type: none"> • The Tier 2 Bridge and Highway Analysis will be concurrent with the Tier 1 Transit Analysis. • Based upon our comparative analysis performed in the bridge report , rehabilitation was not reasonable for the reasons cited. The replacement bridge will be designed with 8 general use lanes, shoulders, and to accommodate the transit system: two lanes for a Bus Rapid Transit system and two Commuter Rail Transit tracks.
 <h3>Replacement Bridge Alternatives</h3> <p>Replacement TZB Alternatives</p>  <p>Possible Single Level Possible Dual Level</p> <p>Possible Single Level at Nyack and Westchester County</p> <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 7:</p> <p>This slide summarizes the results presented in the <i>Alternatives Analysis for the Rehabilitation and Replacement of the Tappan Zee Bridge</i>:</p> <ul style="list-style-type: none"> • The outcome of the bridge report was the need to refine and evaluate, in the DEIS, single level and dual level replacement bridge configurations that accommodate both of the selected transit modes. • Further detail of the foundation design for these two option configurations is presented later in this presentation. • All Alternatives with the exception of the No Build Alternative assume a transit ready replacement bridge.
 <h3>A DEIS Alternatives: No Build</h3>  <p>Suffern Rockland Tarrytown Westchester Port Chester</p> <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 8:</p> <p>This and the following five slides outline the five overall corridor alternatives to be evaluated in the DEIS.</p> <p>Alterative A: The DEIS alternatives include the required NEPA no build which for the existing bridge includes:</p> <ul style="list-style-type: none"> • continued maintenance • repair of the bridge by contracts • continued operation of the movable barrier system to provide 4 general use lanes in the peak direction, 3 in the off peak direction


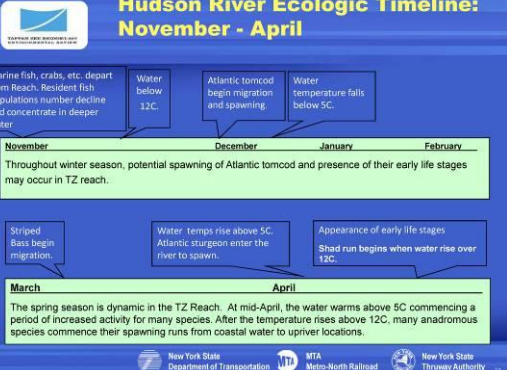
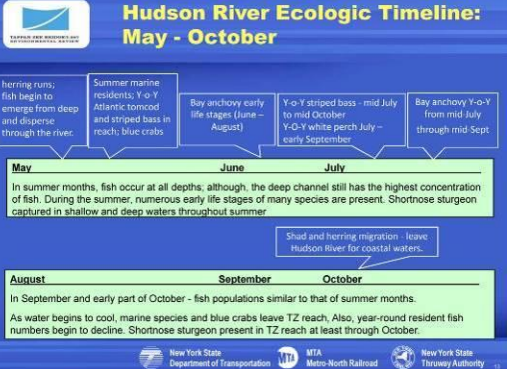
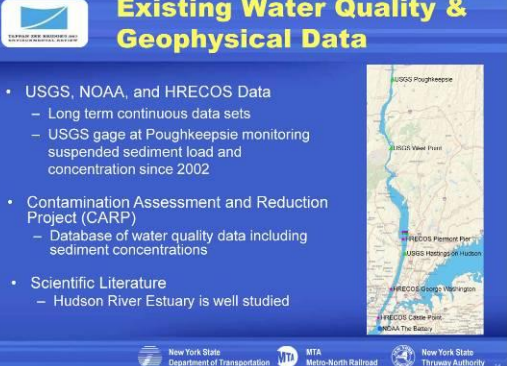

 <p>BRT Travel Ways</p> <ul style="list-style-type: none"> • Busway <ul style="list-style-type: none"> – Dedicated barrier-separated lanes – No mixed traffic • BRT/HOV/HOT Lanes <ul style="list-style-type: none"> – BRT lanes shared with HOV/HOT vehicles • Bus Lanes <ul style="list-style-type: none"> – Dedicated in-street lanes – No mixed traffic – Signal prioritization <p>New York State Department of Transportation Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 9:</p> <p>The other four alternatives all include CRT across Rockland County to the Hudson Line but differ in the type of travel ways for the Bus Rapid Transit system.</p> <p>This slide explains the three different type travel ways for the the Bus Rapid Transit system. These different travel ways vary in cost, performance and environmental impact as well as location within the corridor.</p> <p>The other four alternatives have BRT across the full 30 miles of corridor.</p>
 <p>B Full-Corridor Busway and Rockland CRT</p> <p>Suffern Rockland Tarrytown White Plains Westchester Port Chester</p> <p>New York State Department of Transportation Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 10:</p> <p>Alternative B:</p> <ul style="list-style-type: none"> • Replacement TZB • CRT across Rockland to Hudson Line • Rockland BRT in busway • Westchester BRT in busway
 <p>C Busway/Bus Lanes and Rockland CRT</p> <p>Suffern Rockland Tarrytown White Plains Westchester Port Chester</p> <p>New York State Department of Transportation Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 11:</p> <p>Alternative C:</p> <ul style="list-style-type: none"> • Replacement TZB • CRT across Rockland to Hudson Line • Rockland BRT in busway • Westchester BRT in buslanes
 <p>D HOV/HOT/Busway and Rockland CRT</p> <p>Suffern Rockland Tarrytown White Plains Westchester Port Chester</p> <p>New York State Department of Transportation Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 12:</p> <p>Alternative D:</p> <ul style="list-style-type: none"> • Replacement TZB • CRT across Rockland to Hudson Line • Rockland BRT in HOV/HOTlanes • Westchester BRT in busway







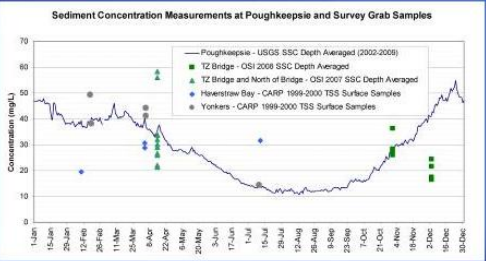




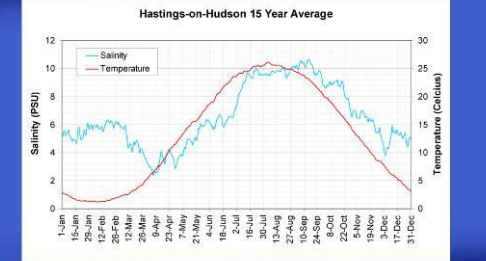







 <p>Slide 13:</p> <p>Alternative E:</p> <ul style="list-style-type: none"> • Replacement TZB • CRT across Rockland to Hudson Line • Rockland BRT in HOV/HOTlanes • Westchester BRT in buslanes 	<p>Slide 13:</p> <p>Alternative E:</p> <ul style="list-style-type: none"> • Replacement TZB • CRT across Rockland to Hudson Line • Rockland BRT in HOV/HOTlanes • Westchester BRT in buslanes
 <p>Slide 14:</p> <p>Permits will be required before the project can be constructed. While these permits are not required until after the preparation of the EIS, it is important to collaborate with the agencies responsible for issuing the permits so that their concerns can be addressed early in the environmental process.</p> <p>The preferred alternative presented in the DEIS must be permittable.</p> <p>We want to understand and be responsive in the DEIS to the issues agencies have about resources so that they are addressed in the DEIS and are carried forward integrally into the permitting process.</p>	<p>Slide 14:</p> <p>Permits will be required before the project can be constructed. While these permits are not required until after the preparation of the EIS, it is important to collaborate with the agencies responsible for issuing the permits so that their concerns can be addressed early in the environmental process.</p> <p>The preferred alternative presented in the DEIS must be permittable.</p> <p>We want to understand and be responsive in the DEIS to the issues agencies have about resources so that they are addressed in the DEIS and are carried forward integrally into the permitting process.</p>
 <p>Slide 15:</p> <p>One of the key elements of the 6002 process is collaboration on DEIS methodologies. These methodologies are the means by which potential environmental impacts will be quantified.</p> <p>Specific to this project the DEIS methodologies were contained in the spring 2008 scoping update packet and in the <i>Scoping Summary Report</i> that was distributed to all agencies.</p> <p>We have since been developing a more detailed DEIS methodology report that will be circulated shortly to agencies for a 30 day review.</p>	<p>Slide 15:</p> <p>One of the key elements of the 6002 process is collaboration on DEIS methodologies. These methodologies are the means by which potential environmental impacts will be quantified.</p> <p>Specific to this project the DEIS methodologies were contained in the spring 2008 scoping update packet and in the <i>Scoping Summary Report</i> that was distributed to all agencies.</p> <p>We have since been developing a more detailed DEIS methodology report that will be circulated shortly to agencies for a 30 day review.</p>
 <p>Slide 16:</p> <p>This slide presents the key milestones for the project schedule:</p> <ul style="list-style-type: none"> • DEIS issued (the D diamond) in late summer 2010 • Public hearings (the M7 diamond) in the fall of 2010 <p>We expect to have an agency draft of the DEIS available to the cooperating agencies before the issuance of the public DEIS.</p>	<p>Slide 16:</p> <p>This slide presents the key milestones for the project schedule:</p> <ul style="list-style-type: none"> • DEIS issued (the D diamond) in late summer 2010 • Public hearings (the M7 diamond) in the fall of 2010 <p>We expect to have an agency draft of the DEIS available to the cooperating agencies before the issuance of the public DEIS.</p>

 <p>Purpose</p> <ul style="list-style-type: none"> • SAFETEA-LU directs that, to the maximum extent practicable, each Federal agency carry out its obligations under Federal laws: <ul style="list-style-type: none"> • Concurrently and in conjunction with the FHWA/FTA NEPA review process. • Implement coordination plans that ensure early involvement and productive interaction. <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 17:</p> <p>To facilitate early involvement of the agencies and as required by SAFETEA-LU, we implemented the Hudson River sampling plan prepared a number of years ago in collaboration with the many resource agencies. We now have results from that sampling program and we believe that the data obtained from the Hudson River sampling plan and our proposed methods of analyzing impacts is sufficient to proceed with the DEIS analysis.</p> <p>We are now bringing together the design development of the replacement bridge with the Hudson River sampling data and the DEIS Analysis Methodologies. This is an important part of our collaboration efforts with the cooperating agencies.</p>
 <p>Process / Outcomes</p> <ul style="list-style-type: none"> • The first of a group of meetings at milestones planned with cooperating agencies to collaborate on the development and analysis of alternatives. • Specific subject area technical meetings will be scheduled as required. <p>Outcome: Arrive at a preferred alternative that can ultimately be permitted by the agencies.</p> <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 18:</p> <p>Given the complex nature of the bridge work relative to the Hudson River Ecology, we are focusing the first meeting with the cooperating agencies on the bridge. Future meetings will be scheduled once bridge options are fully defined and another meeting once a preferred alternative is identified.</p> <p>Additional technical meetings will also be scheduled on specific subject areas such as sediment, acoustic analysis and dredging.</p> <p>The first of these technical meetings will be scheduled once the DEIS methodology report is released.</p> <p>At the Cooperating Agency meetings, we are requesting that key staff from agencies be identified for these technical meetings.</p> <p>We will also be scheduling specific issue meetings with those agencies that have corridor resource issues as the DEIS progresses.</p>
 <p>Hudson River Sampling Program</p> <p>Presenting: Mark Moese PhD, John Szeligowski AECOM Technical Services Northeast Inc.</p> <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 19:</p> <p>Part 2: Hudson River Sampling Program (Slides 19-36)</p>

 <h3>Principal Technical Questions</h3> <ul style="list-style-type: none"> • What are habitat conditions within the existing bridge and proposed bridge alignments? <ul style="list-style-type: none"> – Does TZ Bridge provide unique aquatic habitat – Does TZ Bridge and replacement alignment support unique aquatic resources – Does the replacement alignment potentially provide unique habitat • What are the geophysical conditions in the River at TZB? <ul style="list-style-type: none"> – Water column suspended solids, salinity, temperature – Sediment physical and chemical quality – Tidal elevations, velocities <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 20: Principal Technical Questions</p> <p>This slide presents the goals of the Hudson River sampling program in the form of a series of technical questions.</p>
 <h3>Existing Ecological Data for Hudson River</h3> <ul style="list-style-type: none"> • NOAA Watershed Database • NYSDEC Bio-criteria project • Electric Utility fish surveys 1973 to present • NYSDEC Breeding Bird Atlas surveys • Lamont Doherty Earth Observatory – sediment characteristics • Technical literature <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 21: Existing Ecological Data for Hudson River</p> <p>Existing sources of ecological data of the Hudson River are identified here.</p>
 <h3>TZB Ecological Sampling - Program Development</h3> <ul style="list-style-type: none"> • Agencies Consulted: <ul style="list-style-type: none"> <u>Federal:</u> USACOE, USEPA, and USFWS, NOAA (NMFS) <u>State:</u> NYSDEC and NYSDOS • Surveys: <ul style="list-style-type: none"> Fish and Benthic Invertebrates Water Quality and Sediment Chemistry Submerged Aquatic Vegetation (SAV) and Wetlands Birds and Mammals • Surveys conducted from September 2006 through May 2008 <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 22: TZB Ecological Sampling Program Development</p> <p>Various state and federal agencies have significant input to the Hudson River Ecological Sampling program.</p>
 <h3>Results of Ecological Sampling - Fish</h3> <p>EFFORT</p> <ul style="list-style-type: none"> • Gill nets deployed for over 820 hours in water depths of 6 to 35 ft • Acoustic surveys ranged across entire river width <p>BIOMASS</p> <ul style="list-style-type: none"> • Captured over 2,000+ fish; 25 Species. Catch dominated by white perch • Fish populations more numerous in warmer months • Migratory and commercial species (striped bass, shad, etc.) captured • YoY individuals captured during all sampling events <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 23: Results of Ecological Sampling – Fish</p> <p>This is the summary of our fish sampling program.</p>

<div data-bbox="272 205 365 262"> </div> <h2 data-bbox="386 216 537 247">Fish, cont'd</h2> <p data-bbox="280 281 378 298">ESA SPECIES</p> <ul data-bbox="280 302 711 378" style="list-style-type: none"> • Shortnose sturgeon listed for Hudson River <ul style="list-style-type: none"> – Twelve shortnose sturgeon captured May through October in water depths ranging from 6 ft to 30 ft – Tappan Zee reach not a spawning habitat <p data-bbox="280 390 402 407">BRIDGE HABITAT</p> <ul data-bbox="280 411 748 514" style="list-style-type: none"> • Fish not observed using the existing bridge structure as a refuge or foraging area • Acoustic surveys indicate fish populations increase with distance from the bridge • No major difference in fish assemblages between bridge and new span alignment. <div data-bbox="410 552 755 577"> </div>	<p>Slide 24: Results of Ecological Sampling – Fish continued</p> <p>Summary continued:</p> <p>Twelve short-nosed sturgeon were captured during the sampling program.</p> <p>No major difference observed in fish assemblages between the existing bridge and along new bridge alignment.</p>
<div data-bbox="272 598 365 655"> </div> <h2 data-bbox="386 609 735 640">Horizontal Fish Distribution</h2>  <div data-bbox="410 940 755 966"> </div>	<p>Slide 25: Horizontal Fish Distribution</p> <p>Shown here are the transects followed by the acoustic survey vessel.</p> <p>The vessel traversed the river at intervals 50 ft, 100 ft, 200 ft and 400 ft north of the structure and 50 ft and 100 ft south of the structure to ascertain the location of fish. The arrows indicate in which direction the acoustic sounding was pointed.</p>
<div data-bbox="272 991 365 1047"> </div> <h2 data-bbox="386 987 690 1039">April Horizontal Fish Distribution – Southside</h2>  <div data-bbox="410 1333 755 1358"> </div>	<p>Slide 26: April Horizontal Fish Distribution – Southside</p> <p>Indicated here is that more fish were found in the main channel in the early spring time when the temperature are low and very few outside of the main channel.</p>
<div data-bbox="272 1383 365 1440"> </div> <h2 data-bbox="370 1383 763 1436">Results of Ecological Sampling - Benthic Invertebrates</h2> <ul data-bbox="272 1457 753 1707" style="list-style-type: none"> • Populations change with seasons <ul style="list-style-type: none"> – higher numbers in late summer and fall – lower numbers in winter and spring • No statistically significant difference between existing bridge and proposed alignment • Bridge piers well colonized with marine plants and organisms • Live oysters collected during sampling (further mapping this summer) • A robust blue claw crab population occurs within the current and proposed bridge alignments <div data-bbox="410 1724 755 1749"> </div>	<p>Slide 27: Results of Ecological Sampling – Benthic Invertebrates</p> <p>Benthic populations change with seasons. Live oysters and blue claw crabs are found at the bridge.</p> <p>More mapping of these oyster beds will be done.</p>

 <p>Wetlands and Submerged Aquatic Vegetation (SAV)</p> <ul style="list-style-type: none"> No vegetated tidal or freshwater wetlands located within or adjacent to the existing or proposed bridge alignments Developed shorelines (e.g., bulkheads, rip rap) within existing and proposed alignments Vegetated tidal wetlands <ul style="list-style-type: none"> Piermont Marsh, approx 2 miles south of bridge Croton Marsh, approx 5 miles north of bridge No SAV beds identified within and adjacent to existing and proposed bridge alignment (additional surveys this summer) SAV was limited to two locations north of bridge in marinas 	<p>Slide 28: Wetland and Submerged Aquatic Vegetation (SAV)</p> <p>Neither wetlands or SAV were found at the existing bridge or along the proposed bridge alignment.</p>
 <p>Hudson River Ecologic Timeline: November - April</p> <p>Marine fish, crabs, etc. depart from Reach. Resident fish populations number decline and concentrate in deeper water.</p> <p>Water below 12°C</p> <p>Atlantic tomcod begin migration and spawning</p> <p>Water temperature falls below 5°C</p> <p>November Throughout winter season, potential spawning of Atlantic tomcod and presence of their early life stages may occur in TZ reach.</p> <p>December</p> <p>January</p> <p>February</p> <p>Striped Bass begin migration.</p> <p>Water temps rise above 5°C. Atlantic sturgeon enter the river to spawn.</p> <p>Appearance of early life stages</p> <p>Shad run begins when water rise over 12°C</p> <p>March</p> <p>April</p> <p>The spring season is dynamic in the TZ Reach. At mid-April, the water warms above 5°C commencing a period of increased activity for many species. After the temperature rises above 12°C, many anadromous species commence their spawning runs from coastal water to upriver locations.</p>	<p>Slide 29: Hudson River Ecological Timeline: November – April</p> <p>When water temperatures fall below 12°C, fish activity is markedly reduced at the TZB, however, comcod migrate through the area during early winter.</p>
 <p>Hudson River Ecologic Timeline: May - October</p> <p>herring runs; fish begin to emerge from deep and disperse through the river.</p> <p>Summer marine residents: Y-o-Y Atlantic tomcod and striped bass in reach; blue crabs</p> <p>Bay anchovy early life stages (June – August)</p> <p>Y-o-Y striped bass - mid July to mid October</p> <p>Y-O-Y white perch July – early September</p> <p>Bay anchovy Y-o-Y from mid July through mid-Sept</p> <p>May In summer months, fish occur at all depths; although, the deep channel still has the highest concentration of fish. During the summer, numerous early life stages of many species are present. Shortnose sturgeon captured in shallow and deep waters throughout summer</p> <p>June</p> <p>July</p> <p>Shad and herring migration - leave Hudson River for coastal waters.</p> <p>August In September and early part of October - fish populations similar to that of summer months. As water begins to cool, marine species and blue crabs leave TZ reach. Also, year-round resident fish numbers begin to decline. Shortnose sturgeon present in TZ reach at least through October.</p> <p>September</p> <p>October</p>	<p>Slide 30: Hudson River Ecologic Timeline: May – October</p> <p>During summer the TZB reach experiences the movement of numerous fish populations.</p>
 <p>Existing Water Quality & Geophysical Data</p> <ul style="list-style-type: none"> USGS, NOAA, and HRECOS Data <ul style="list-style-type: none"> Long term continuous data sets USGS gage at Poughkeepsie monitoring suspended sediment load and concentration since 2002 Contamination Assessment and Reduction Project (CARP) <ul style="list-style-type: none"> Database of water quality data including sediment concentrations Scientific Literature <ul style="list-style-type: none"> Hudson River Estuary is well studied 	<p>Slide 31: Existing Water Quality & Geophysical Data</p> <p>Considerable water quality data was found from other investigations for the Hudson River.</p>

 <h3>TZB Water Quality Program</h3> <ul style="list-style-type: none"> Monitoring at the Bridge <ul style="list-style-type: none"> April 11-20, 2007 October 29 – December 4, 2008 Data <ul style="list-style-type: none"> Water column data acquisition (temp, salinity, turbidity) Grab TSS samples ADCP velocity measurements Water surface elevation gauging Dye tracer dispersion measurements  <p>    </p>	<p>Slide 32: TZB Water Quality Program</p> <p>Water quality data was obtained at the bridge as part of the Hudson River Survey program. In addition dispersion studies were conducted in the river for calibration of 2D and 3D models.</p>
 <h3>Water Quality Summary – Suspended Sediment</h3> <p>Sediment Concentration Measurements at Poughkeepsie and Survey Grab Samples</p>  <p>    </p>	<p>Slide 33: Water Quality Summary Suspended Sediment</p> <p>Suspended sediment data is available from the USGS Poughkeepsie monitoring station. Since that station is 35-40 miles north of the TZB, TSS data was collected during the water quality surveys conducted for the TZB. Typical sediment loads in the water column at TZB are in the range of 20mg/l to 40mg/l with spring peaks exceeding 100mg/l</p>
 <h3>Water Quality Summary – Temperature and Salinity</h3> <p>Hastings-on-Hudson 15 Year Average</p>  <p>    </p>	<p>Slide 34: Water Quality Summary Temperature and Salinity</p> <p>This slide shown temperature and salinity conditions monitored over a fifteen year period at Hastings on Hudson.</p>
 <h3>Sediment Sampling Program</h3> <ul style="list-style-type: none"> Objectives <ul style="list-style-type: none"> Assess sediment quality for resuspension impacts Characterization for disposal Compare project area to Hudson River averages Two rounds of sampling <ul style="list-style-type: none"> September/October 2006 <ul style="list-style-type: none"> 38 locations, 1-ft sampling intervals Metals & geotechnical parameters October/November 2008 <ul style="list-style-type: none"> 38 locations, 1-ft and 0.5-ft sampling intervals Metals, Pesticides, PCBs, BN SVOCs, Dioxins <p>    </p>	<p>Slide 35: Sediment Sampling Program</p> <p>Two rounds of sediment sampling were conducted at the bridge.</p> <p>Sediments were collected at 38 locations and at each location the samples were split at either 0.5 or 1.0 ft intervals for laboratory analysis. Laboratory analysis included tests for metals, PCBs, and dioxins among other contaminants.</p>

Acoustic Survey Results – Industrial Age Sediment

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Slide 36:

Acoustic Survey Results Industrial Age Sediment

This slides shows the location of industrial age sediments within the TZB vicinity.

Industrial age sediments are those that may be contaminated as a results of discharges into the Hudson River.

Sediment Chemistry – Preliminary Results

Parameter	Units	TZB Sampling Program				Hudson River Averages			
		Det. Rate	Minimum	Median	99th Percentile	Det. Rate	Minimum	Median	99th Percentile
Anthracene	ppb	27%	ND	ND	155	5%	ND	ND	34.1
Benz(a)anthracene	ppb	43%	ND	ND	418	28%	ND	ND	196.5
Fluorene	ppb	10%	ND	ND	81	2%	ND	ND	ND
Copper	ppm	100%	6.5	14	105	100%	3.1	38.9	80.4
Lead	ppm	100%	4.0	12	150	100%	6.4	38.9	80.1
Mercury	ppm	51%	ND	0.06	1.73	90%	ND	0.26	89
Silver	ppm	17%	ND	ND	2.4	97%	ND	1.15	3.98
Total PCBs	cmb	21%	ND	ND	ND	ND	ND	ND	ND

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Slide 37:

Sediment Chemistry Preliminary Results

Sediments at the TZB have either low or moderate levels of contamination are are similar in chemical composition to sediments found north and south of the bridge.

Conceptual Bridge Design and Construction Presented by Mark Roche

Slide 38:

Part 3: Conceptual Bridge Design and Construction (Slides 37-61)

Part 3 of the presentation to the Cooperating agencies included detail on the overall scale of construction as well as detail of anticipated construction sequence. The information presented was similar to that discussed at the preceding bridge working group meetings.

DEIS Alternatives





For the bridge the DEIS preferred Alternative will identify:


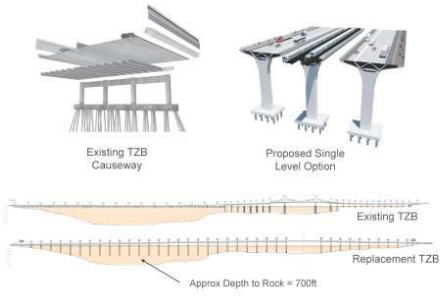

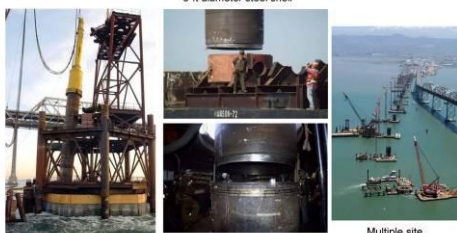
1. Single or dual level bridge
2. Bridge alignment
3. How we accommodate transit
4. Bridge types









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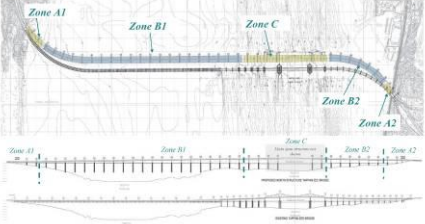
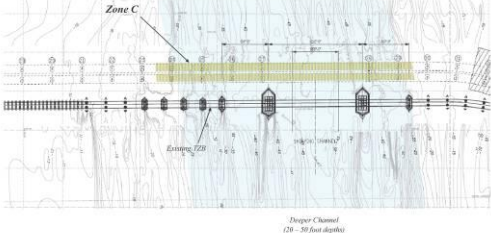
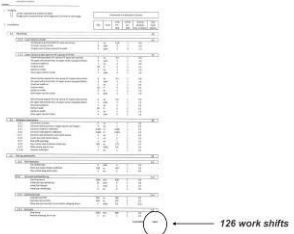
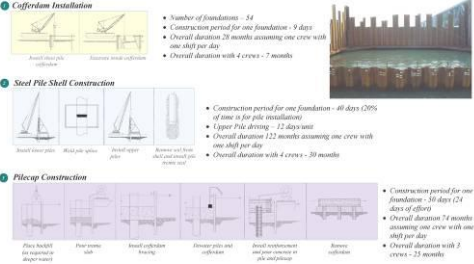
Slide 39:

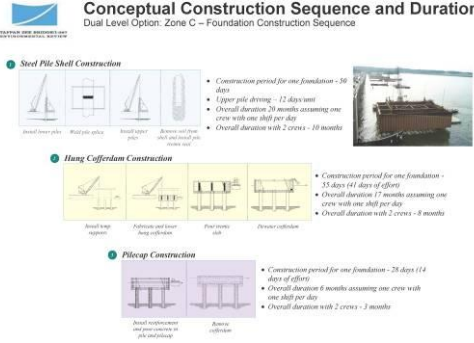
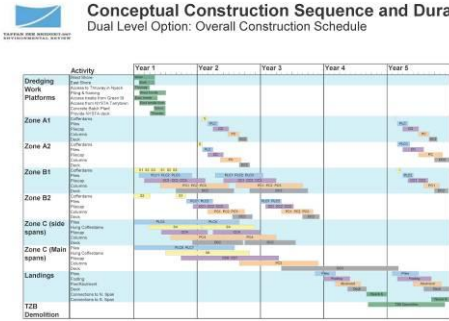
This slide lists the anticipated outcomes from the EIS for the replacement bridge. Note the outcome is not to determine the final replacement bridge form but rather to fully identify potential environmental implications for various forms, alignments and types.


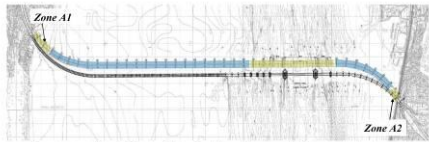

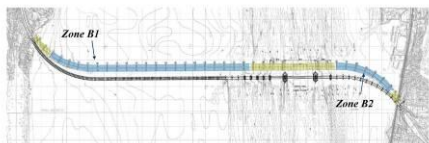

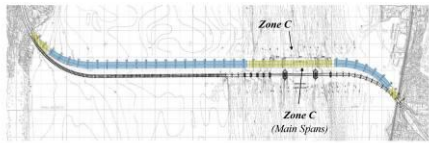

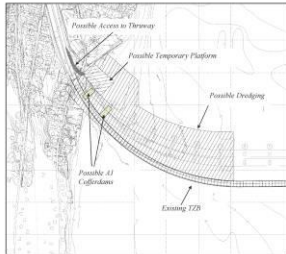
 <h3>DEIS Process for Replacement TZB</h3> <p>Step 1: Bridge Options Definition 1. Single Level Replacement 2. Dual Level Replacement</p> <p>Step 2: Evaluate Bridge Options</p> <p>Step 3: Identify Preferred Option</p> <p>Regulatory Agencies And Public Collaboration</p>	<p>Slide 40:</p> <p>This slide shows the simplified three step process to be used to define and evaluate the replacement bridge in the EIS. The initial goal is to define the physical arrangement of the single and dual level bridge options.</p> <p>The next slide shows Step 1 expanded to include all the items to be studied.</p>
 <h3>Step 1: Bridge Options Definition</h3> <p>Step 1A: Identify Configuration Options</p> <p>Step 1B: Structure and Construction</p> <p>Step 1C: Identify EIS Bridge Alternatives</p>	<p>Slide 41:</p> <p>This slide shows Step 1 in the EIS process for the replacement bridge.</p> <p>In Step 1A all possible bridge configurations are considered with respect to engineering and operational requirements leading to a reduced list of practical and feasible options.</p> <p>In Step 1B a series of studies common to all bridge configurations is conducted. These studies include construction staging and demolition of the existing TZB etc. for example.</p> <p>The outcome from Step 1 will be the <i>Bridge Option Definition</i> Report that will present the preferred arrangement(s) for both the single and dual level bridge options.</p>
 <h3>Single Level Bridge Configuration Options</h3> <p>Diagram showing various single level bridge configurations (A1, A2, A3, A4, A5, A6, A7, A8, A9, A10, A11, A12, A13, A14, A15, A16, A17, A18, A19, A20, A21, A22, A23, A24, A25, A26, A27, A28, A29, A30, A31, A32, A33, A34, A35, A36, A37, A38, A39, A40, A41, A42, A43, A44, A45, A46, A47, A48, A49, A50, A51, A52, A53, A54, A55, A56, A57, A58, A59, A60, A61, A62, A63, A64, A65, A66, A67, A68, A69, A70, A71, A72, A73, A74, A75, A76, A77, A78, A79, A80, A81, A82, A83, A84, A85, A86, A87, A88, A89, A90, A91, A92, A93, A94, A95, A96, A97, A98, A99, A100) and a large image of a bridge section.</p>	<p>Slide 42:</p> <p>This slide shows the current list of single level bridge configuration options developed as part of the outreach program, particularly at the bridge stakeholders advisory working group meetings.</p> <p>The remaining configurations are those that may be used to evaluate the bridge options in the DEIS.</p>
 <h3>Dual Level Bridge Configuration Options</h3> <p>Diagram showing various dual level bridge configurations (B1, B2, B3, B4, B5, B6, B7, B8, B9, B10, B11, B12, B13, B14, B15, B16, B17, B18, B19, B20, B21, B22, B23, B24, B25, B26, B27, B28, B29, B30, B31, B32, B33, B34, B35, B36, B37, B38, B39, B40, B41, B42, B43, B44, B45, B46, B47, B48, B49, B50, B51, B52, B53, B54, B55, B56, B57, B58, B59, B60, B61, B62, B63, B64, B65, B66, B67, B68, B69, B70, B71, B72, B73, B74, B75, B76, B77, B78, B79, B80, B81, B82, B83, B84, B85, B86, B87, B88, B89, B90, B91, B92, B93, B94, B95, B96, B97, B98, B99, B100) and a large image of a bridge section.</p>	<p>Slide 43:</p> <p>This slide shows the current list of dual level bridge configuration options developed as part of the outreach program, particularly at the bridge stakeholder advisory working group meetings.</p> <p>The large image on the left is the representative dual level option used in the <i>Alternatives Analysis for the Rehabilitation and Replacement of the Tappan Zee Bridge Report</i> as part of Scoping.</p> <p>The remaining configurations are those that may be used to evaluate the bridge options in the DEIS.</p>

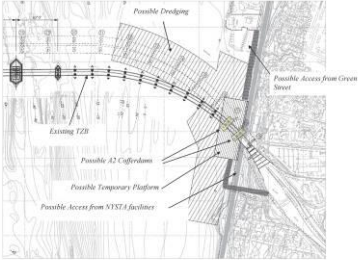
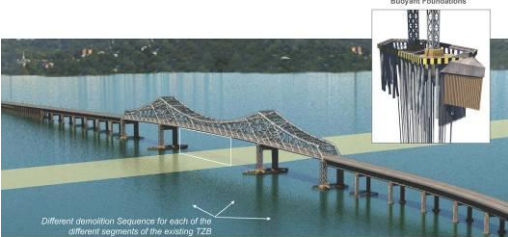
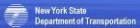





<p>Scale of Construction Existing Geology</p> 	<p>Slide 44:</p> <p>This slide shows the types and extents of the soft soils and rock deep below the Hudson River. These deep soft soils imply complex foundations, whose form and efficiency dominate the design of the overall replacement bridge.</p>
<p>Scale of Construction Bridge Design Approach</p> 	<p>Slide 45:</p> <p>On the left this slide shows the foundation solution adopted for the existing TZB over the deepest soft soils – shallow timber piles reaching only 50 feet below the river bed.</p> <p>The image on the right shows the likely foundations for a replacement bridge – deep steel and concrete foundations reaching 300-400 feet below the river bed. Installation of these piles is a major activity for a replacement bridge with the piles installed in pieces as they are too long to be brought to site in one piece. This implies splicing together pieces on site to form one pile.</p>
<p>Conceptual Construction Zone Activities Foundation Containment</p> 	<p>Slide 46:</p> <p>This slide and the next three show examples of bridge foundation and superstructure construction from other bridge sites that would be similar to that used for this replacement bridge.</p> <p>Shown here are two different cofferdam types. Cofferdams are enclosed areas within which construction can take place.</p> <p>On the left is a standard cofferdam which reaches from the above the water level all the way down to the riverbed. On the right is a hung type cofferdam that reaches only 15-20 feet into the water and has an closed base. This latter type is typically used in deeper water.</p>
<p>Conceptual Construction Zone Activities Pile Construction</p> 	<p>Slide 47:</p> <p>This slide shows the equipment and techniques for installing the types of piles likely for the replacement bridge.</p> <p>The image on the left shows the pile driving hammer and the temporary support frame used for installation.</p> <p>The center images show the size of the pile and the preparation of the welded connection between two sections.</p> <p>The right image shows the extent of the activities that occur in the river during construction – all piers are under construction at the same time.</p>

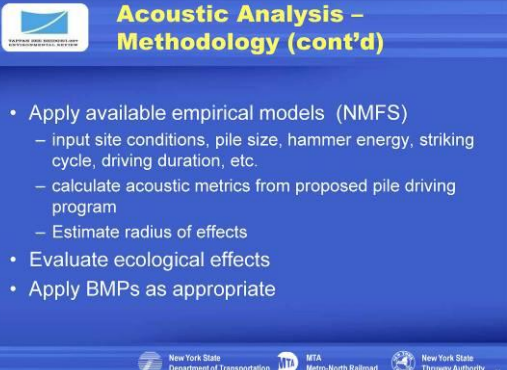
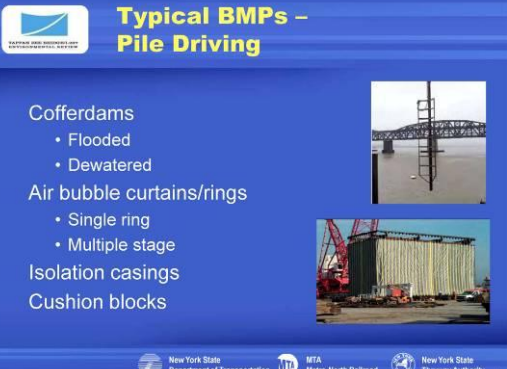
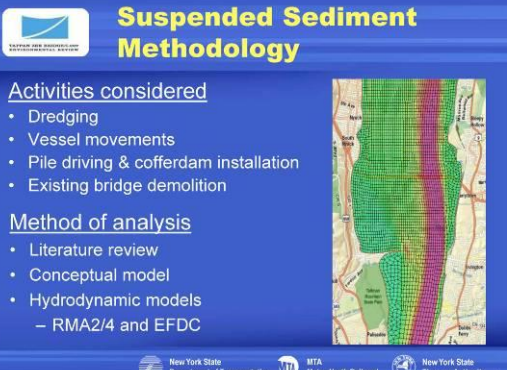
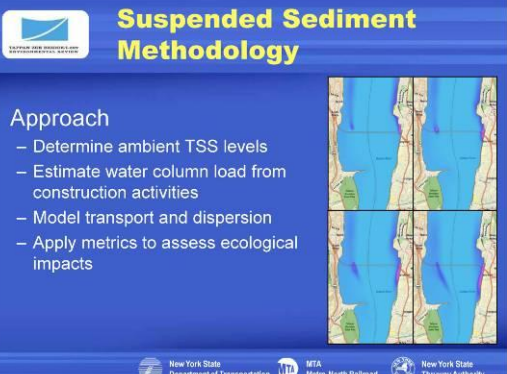
<p> Conceptual Construction Zone Activities Pilecap and Pier Construction</p>  <p>Concrete pour in progress for pilecap</p>  <p>Cast-in-place concrete pier</p>	<p>Slide 48:</p> <p>The image on the left shows the equipment and number of barges used in the construction of one example pilecap.</p> <p>The image on the right shows concrete being placed in the pile cap and column.</p>
<p> Conceptual Construction Zone Activities Superstructure (Deck) Construction with offsite prefabrication</p>  <p>Erection of precast concrete deck sections</p>	<p>Slide 49:</p> <p>This slide shows the erection of the superstructure (the deck above the column).</p> <p>In the bridge shown, the deck is precast at a location distant from the bridge and barged to site where it is lifted into position. It is anticipated that this type of prefabrication would also be used for the TZB replacement bridge.</p> <p>Also in this slide it is worth noting that the bridge was comprised of two parallel structures. For economy, the contractor effectively built one of these structures all the way across the river first and then built the second structure. Effectively the second structure was built off of the first as this provided easy access.</p>
<p> Scale of Construction Possible Replacement Bridge Options</p> <div style="display: flex; justify-content: space-around;"> <div data-bbox="316 1134 487 1396"> <p>Dual Level Option</p>  <ul style="list-style-type: none"> • 430-foot span between piers • 2 separate parallel structures • 12-16 piles in each pilecap • 4-foot diameter steel shell piles • Pile cap size – 56 ft x 56 ft • Number of pilecaps: 78 • Number of piles: 1014 </div> <div data-bbox="519 1134 706 1396"> <p>Single Level Option</p>  <ul style="list-style-type: none"> • 230-foot span between piers • 3 separate parallel structures • 9-12 piles in each pilecap • 4-foot diameter steel shell piles • Pile cap size – 52 ft x 40 ft • Number of pilecaps: 170 • Number of piles: 1658 </div> </div>	<p>Slide 50:</p> <p>This slide and those following present conceptual construction staging for both the single and dual level options.</p> <p>For the purpose of this study two representative single and dual level options are used – these are the same as used in the <i>Alternatives Analysis for the Rehabilitation and Replacement of the Tappan Zee Bridge Report</i> as part of Scoping. Further development of the conceptual construction staging will be necessary once the preferred configurations are determined as part of the <i>Bridge Option Definition Report</i>.</p> <p>The slide presents an initial comparison of the total pilecaps and piles for each representative option. Of particular note is the difference in the number of pile caps – 78 and 170 for the dual and single level options respectively. These number of pilecaps correspond to the likely minimum spans for the types of structure shown.</p>

<p>Conceptual Construction Zone Activities Dual Level Bridge – Zones with Common Construction Sequence</p> 	<p>Slide 51:</p> <p>Using the representative dual level option as an example this slide identifies five different zones across the river corresponding to different foundation construction activities:</p> <ul style="list-style-type: none"> • Zone A1 and A2 foundations would be built using the standard type cofferdams accessed from temporary platforms out from each shore. • Zone B1 and B2 foundations would be built using standard type cofferdams accessed from barges. • Zone C foundations would be built using hung type cofferdams accessed from barges.
<p>Conceptual Construction Zone Activities Deeper Zone C Construction Area</p> 	<p>Slide 52:</p> <p>Zone C corresponds to the area of deep water around the main spans. This area has a similar extent to that of the buoyant foundations in the existing TZB.</p>
<p>Conceptual Construction Sequence and Duration Example Construction Sequence - Zone C Side Spans</p> 	<p>Slide 53:</p> <p>This slide shows a breakdown of all the activities required for the construction of one single pilecap in Zone C.</p> <p>Though the list of activities is too detailed to read, the final result is that 126 shifts are required for the construction of one single pilecap. Assuming one shift corresponds to one day – it takes 126 days to construct each pile cap.</p>
<p>Conceptual Construction Sequence and Duration Dual Level Option: Zone B – Foundation Construction Sequence</p> 	<p>Slide 54:</p> <p>This slide also presents a breakdown of all the activities required for the construction of one single pilecap – this time though a pilecap in Zone B is used.</p> <p>All the activities can be broken down into three prime activities: cofferdam installation, pile construction and pilecap construction. For each of these three groups of activities the construction duration for a single pier and all the piers in Zone B1 is shown.</p> <p>Considering the installation of the cofferdams only only one crew is assigned to this activity a period of 28 weeks would be required to complete all 54 units in this area. This is a very long period and would result in a very long overall duration of construction.</p>

	<p>To reduce the period of construction multiple cofferdam installation crews would be used – for example if four crews are used the construction duration would reduce to 7 months.</p> <p>Similarly, for the grouped activities associated with pile and pilecap construction multiple crews would be required to reduce the overall construction duration.</p> <p>In summary, the very long durations associated with construction indicate the need for multiple construction crews working in different locations at the same time to reduce the overall construction period.</p>
<p>Conceptual Construction Sequence and Duration Dual Level Option: Zone C – Foundation Construction Sequence</p>  <p>Steel Pile Shell Construction</p> <ul style="list-style-type: none"> Construction period for one foundation = 50 days Upper pile driving = 12 days/shift Overall duration 20 months assuming one crew with one shift per day Overall duration with 2 crews = 10 months <p>Hang Cofferdam Construction</p> <ul style="list-style-type: none"> Construction period for one foundation = 35 days (41 days of effort) Overall duration 17 months assuming one crew with one shift per day Overall duration with 2 crews = 8 months <p>Pilecap Construction</p> <ul style="list-style-type: none"> Construction period for one foundation = 28 days (14 days of effort) Overall duration 6 months assuming one crew with one shift per day Overall duration with 2 crews = 3 months 	<p>Slide 55:</p> <p>Similar to the previous slide, the construction activities in Zone C can be collected into three activity groups. Different from the previous slide however, for Zone B, the first activities in Zone C are associated with pile construction rather than cofferdam installation.</p> <p>This difference in construction sequence results in potentially different environmental impacts and is deliberately highlighted to enable further study of these impacts using methods outlined later in this presentation.</p>
<p>Conceptual Construction Sequence and Duration Dual Level Option: Overall Construction Schedule</p> 	<p>Slide 56:</p> <p>Based on the number of crews, as developed using the data in the previous slides, the overall construction duration for the replacement bridge was developed and is presented in this slide for the dual level bridge.</p> <p>The resulting duration is just less than five years assuming no moratorium on construction.</p> <p>As shown, the color coding of activities corresponds to the activity groups discussed in the previous slides. The activities shown in green are either preparatory or demolition activities.</p> <p>This overall diagram integrates all construction activities. All activities are interdependent and any change to the duration or positioning of one activity within the sequence would have an effect on all other subsequent activities.</p>

<div></div> <div>Conceptual Construction Sequence and Duration Dual Level Option: Zone A Construction Period</div> <div><table><thead><tr><th></th><th>Year 1</th><th>Year 2</th><th>Year 3</th><th>Year 4</th><th>Year 5</th></tr></thead><tbody><tr><td>Zone A1 Collectors Piers Pilecaps Caissons Deck</td><td colspan="5">Could start as soon as work platforms are established</td></tr><tr><td>Zone A2 Collectors Piers Pilecaps Caissons Deck</td><td></td><td></td><td colspan="3">Cannot start until portion of existing TZB is removed</td></tr></tbody></table><p>Cannot construct A1 and A2 South and Center foundations until portions of TZB are demolished and removed</p></div>		Year 1	Year 2	Year 3	Year 4	Year 5	Zone A1 Collectors Piers Pilecaps Caissons Deck	Could start as soon as work platforms are established					Zone A2 Collectors Piers Pilecaps Caissons Deck			Cannot start until portion of existing TZB is removed			<div>Slide 57:</div> <div>As shown in this slide, it is possible to extract the overall construction activities for the activities in Zone A and to understand how they can be accomplished within the overall interdependent sequence.</div> <div>Notably, the activities in Zone A can not all occur one after the other. Rather many activities are separated by a period of two years as access to construct all the foundations in this area is not possible until the existing bridge is removed.</div>
	Year 1	Year 2	Year 3	Year 4	Year 5														
Zone A1 Collectors Piers Pilecaps Caissons Deck	Could start as soon as work platforms are established																		
Zone A2 Collectors Piers Pilecaps Caissons Deck			Cannot start until portion of existing TZB is removed																
<div></div> <div>Construction Sequence and Duration Dual Level Option - Zone B Construction Period</div> <div><table><thead><tr><th></th><th>Year 1</th><th>Year 2</th><th>Year 3</th><th>Year 4</th><th>Year 5</th></tr></thead><tbody><tr><td>Zone B1 Collectors Piers Pilecaps Caissons Deck</td><td></td><td></td><td></td><td colspan="2">Cannot start until part of existing TZB is removed</td></tr><tr><td>Zone B2 Collectors Piers Pilecaps Caissons Deck</td><td></td><td></td><td></td><td colspan="2"></td></tr></tbody></table></div>		Year 1	Year 2	Year 3	Year 4	Year 5	Zone B1 Collectors Piers Pilecaps Caissons Deck				Cannot start until part of existing TZB is removed		Zone B2 Collectors Piers Pilecaps Caissons Deck						<div>Slide 58:</div> <div>Similarly, it is possible to extract from the overall schedule the positioning of the activities in Zone B.</div> <div>Construction in this zone occupies the first three years of construction. Similar to Zone A, activities are again separated because of conflicts with the existing TZB.</div>
	Year 1	Year 2	Year 3	Year 4	Year 5														
Zone B1 Collectors Piers Pilecaps Caissons Deck				Cannot start until part of existing TZB is removed															
Zone B2 Collectors Piers Pilecaps Caissons Deck																			
<div></div> <div>Construction Sequence and Duration Dual Level Option - Zone C Construction Period</div> <div><table><thead><tr><th></th><th>Year 1</th><th>Year 2</th><th>Year 3</th><th>Year 4</th><th>Year 5</th></tr></thead><tbody><tr><td>Zone C (Main Spans) Piers Pilecaps Caissons Deck</td><td></td><td></td><td></td><td></td><td></td></tr><tr><td>Zone C (Main Spans) Piers Pilecaps Caissons Deck</td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table></div>		Year 1	Year 2	Year 3	Year 4	Year 5	Zone C (Main Spans) Piers Pilecaps Caissons Deck						Zone C (Main Spans) Piers Pilecaps Caissons Deck						<div>Slide 59:</div> <div>This slide shows how the grouped activities in Zone C would fit within the overall interdependent construction sequence.</div> <div>Notably this zone includes the main spans which would have the largest foundations. Construction in this zone would take just over four years to complete but would not be restricted by any conflict with the existing bridge.</div>
	Year 1	Year 2	Year 3	Year 4	Year 5														
Zone C (Main Spans) Piers Pilecaps Caissons Deck																			
Zone C (Main Spans) Piers Pilecaps Caissons Deck																			
<div></div> <div>Construction Sequence and Duration Dual Level Option - Preliminary Activities At Nyack Shoreline</div> <div><p>Nyack Shoreline</p></div>	<div>Slide 60:</div> <div>Based on the knowledge of all the construction activities and the construction duration it is possible to estimate the size, type and numbers of support equipment and barges that are necessary to facilitate construction.</div> <div>This leads to the sizing of support facilities and access requirements at each end of the replacement bridge – as shown on this slide for the Nyack landing. Specifically this slide shows the extent of dredging, temporary platforms and access roads.</div>																		

<div data-bbox="295 216 365 254" data-label="Image"></div> <p>Construction Sequence and Duration Dual Level Option – Preliminary Activities At Tarrytown Shoreline</p>  <p>Tarrytown Shoreline</p>	<p>Slide 61: This slide shows the extent of dredging, temporary platforms and access roads that would be required at the Tarrytown landing.</p>
<div data-bbox="295 606 365 644" data-label="Image"></div> <p>Construction Sequence and Duration Demolition Sequence</p>  <p>Existing TZB Segments</p>	<p>Slide 62: Finally for this part of the presentation it is necessary to consider the demolition of the existing bridge in some detail as the associated activities will have their own potential environmental impacts.</p> <p>At the present time, it is anticipated that the existing TZB would be demolished in the reverse order of its construction. The exception would be the foundations for the eight buoyant foundations around the main spans where special techniques and protection are envisaged.</p>
<div data-bbox="272 993 360 1037" data-label="Image"></div> <p>In-River Methodologies</p> <ul style="list-style-type: none"> • Estimate effects of acoustic levels <ul style="list-style-type: none"> – Pile driving • Estimate effects of suspended sediments <ul style="list-style-type: none"> – Dredging – General construction • Evaluate loss of habitat <ul style="list-style-type: none"> – Temporary – Permanent <div data-bbox="406 1333 771 1360" data-label="Page-Footer">    </div>	<p>Slide 63:</p> <p>Part 4: In-River Methodologies (Slides 62-69)</p> <p>Three principal effects of bridge construction are identified on this slide. They are underwater acoustic pressures generated by pile driving, suspended sediments from construction activities, and the loss of bottom habitat either on a temporary or permanent basis.</p>
<div data-bbox="272 1381 360 1425" data-label="Image"></div> <p>Acoustic Analysis - Methodology</p> <ul style="list-style-type: none"> • NMFS, USFWS and State agencies agreed to interim fish injury criteria for <ul style="list-style-type: none"> – Woodrow Wilson Bridge – California bridges • Typical metrics used to set criteria: <ul style="list-style-type: none"> – Peak pressure levels – Sound exposure levels (SEL) – Root mean square (RMS) <div data-bbox="406 1724 771 1751" data-label="Page-Footer">    </div>	<p>Slide 64: Federal and State agencies have identified acoustic pressures that may be injurious to fish. These injury levels were established for projects in California and the Woodrow Wilson Bridge. Metrics were established for both peak pressure levels and cumulative pressure levels.</p>

 <p>Acoustic Analysis – Methodology (cont'd)</p> <ul style="list-style-type: none"> • Apply available empirical models (NMFS) <ul style="list-style-type: none"> – input site conditions, pile size, hammer energy, striking cycle, driving duration, etc. – calculate acoustic metrics from proposed pile driving program – Estimate radius of effects • Evaluate ecological effects • Apply BMPs as appropriate <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 65: Acoustic Analysis Methodology (cont'd)</p> <p>The approach being taken for the TZB is to use the available NMFS model to estimate acoustic footprints for construction activity. Based on the acoustic footprint, ecological effects will be estimated and Best Management Practices (BMP's) applied.</p>
 <p>Typical BMPs – Pile Driving</p> <ul style="list-style-type: none"> Cofferdams <ul style="list-style-type: none"> • Flooded • Dewatered Air bubble curtains/rings <ul style="list-style-type: none"> • Single ring • Multiple stage Isolation casings Cushion blocks <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 66: Typical Best Management Practices (BMPs) for Pile Driving</p> <p>Typical BMP's that have been accepted on other projects and may have application here are presented on this slide and the photos identify various bubble curtain arrays, one of the BMP's</p>
 <p>Suspended Sediment Methodology</p> <p><u>Activities considered</u></p> <ul style="list-style-type: none"> • Dredging • Vessel movements • Pile driving & cofferdam installation • Existing bridge demolition <p><u>Method of analysis</u></p> <ul style="list-style-type: none"> • Literature review • Conceptual model • Hydrodynamic models <ul style="list-style-type: none"> – RMA2/4 and EFDC <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 67: Suspended Sediment Methodology</p> <p>Sediments may be suspended as a result of dredging and cofferdam installation among other activities.</p> <p>Once sediments are in the water column, their dispersion will be estimated using 2D and 3D models.</p>
 <p>Suspended Sediment Methodology</p> <ul style="list-style-type: none"> • Approach <ul style="list-style-type: none"> – Determine ambient TSS levels – Estimate water column load from construction activities – Model transport and dispersion – Apply metrics to assess ecological impacts <p>New York State Department of Transportation MTA Metro-North Railroad New York State Thruway Authority</p>	<p>Slide 68: Suspended Sediment Methodology</p> <p>This slide shows the output of the modeling of a suspended sediment plume.</p>

 <p>Typical BMPs – Suspended Sediment</p> <ul style="list-style-type: none"> • Environmental dredging equipment • Avoid barge overflow • Computer control of operations • Work in cofferdams • Turbidity curtains 	<p>Slide 69: Typical BMPs – Suspended Sediment</p> <p>Best Management Practices (BMPs) for suspended sediments include use of environmental dredging equipment, work in cofferdams and where applicable turbidity curtains. The slide shows an example of environmentally sensitive equipment..</p>
 <p>Typical BMPs – General Construction Activity</p> <ul style="list-style-type: none"> • Sequence work <ul style="list-style-type: none"> – Temporally – Spatially • Monitor <ul style="list-style-type: none"> – Fish – Acoustic levels – TSS and water quality 	<p>Slide 70: Typical Best Management Practice (BMPs) for General Construction Activity</p> <p>Another BMP will include the sequencing of construction work either temporarily or spatially, considering the impact to the river environment.</p> <p>It is expected that significant monitoring will occur during construction for underwater acoustic levels and suspended solids.</p>
 <p>Summary</p> <ul style="list-style-type: none"> • The project is real, now into the DEIS phase. • Resources will be required from the Agencies as we collaborate, strive for an efficient, productive process. • Need to understand and incorporate in our process the Agencies regulatory requirements and concerns. • Agency technical meetings required, particularly on emerging areas of analyzing impacts. • Time invested now will result in overall efficiencies. 	<p>Slide 71:</p> <p>Part 5: In-River Methodologies (Slides 71)</p>