TAPPAN ZEE BRIDGE/I-287
ENVIRONMENTAL REVIEW

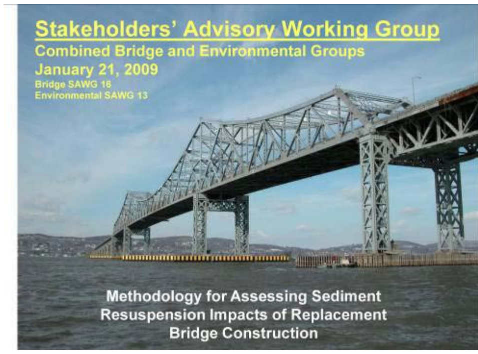
New York State Department of Transportation
Metropolitan Transportation Authority Metro-North Railroad
New York State Thruway Authority

Presentation

Stakeholders' Advisory Working Group
Joint Meeting of the
Bridge and Environmental SAWGs
Bridge SAWG 16
Environmental SAWG 14

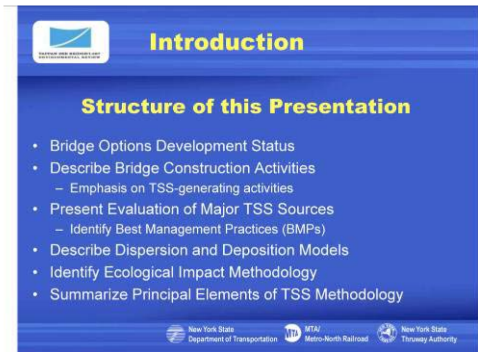
Tappan Zee Bridge/I-287 Corridor
Environmental Review

January 21, 2010



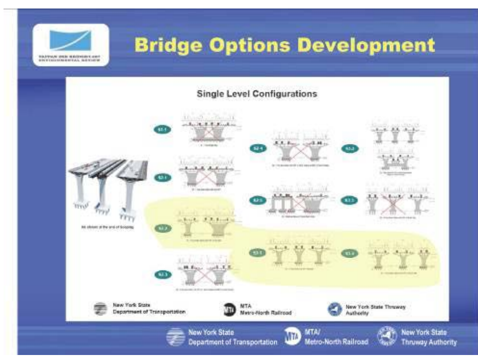
Slide 1

Robert Laravie welcomed attendees and explained the structure of the presentation. This presentation is a synopsis of what was presented to the Cooperating Agencies in November and December of 2009.



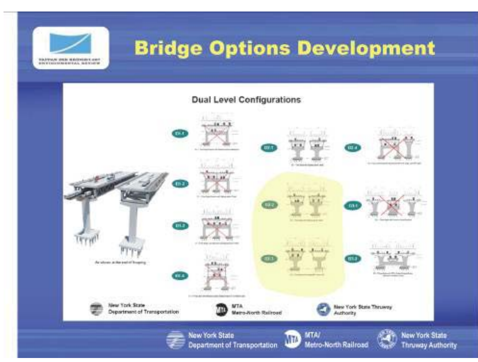
Slide 2 –

This slide identifies the topics that will be covered this evening.



Slide 3 – Bridge Options Development

We are continuing to evaluate a variety of single level configurations for the replacement Tappan Zee Bridge (TZB). This slide shows configurations similar to those shown in earlier SAWGs. The options highlighted in yellow represent similar lane arrangements or configurations. Those without red "x's" are some of the options that are being developed for a single level scenario. The other ones have issues with constructability, commuter rail transit (CRT) operations, and fit at the landings.



Slide 4 – Bridge Options Development

This slide shows the dual level options that you have seen in an earlier SAWG. The options highlighted in yellow represent similar configurations. Those without red "x's" are the remaining options that are being developed for a dual level scenario. The others have issues similar to the single level, including constructability, CRT and vehicular operations, and ability to fit at the landings.

The ongoing development and screening of options is in preparation for the DEIS.

Slide 5 – Potential Ecological Impacts on the Hudson River of the Proposed Replacement Bridge

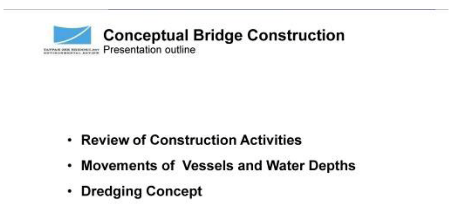
The range of potential construction phase and operational impacts of replacing the Tappan Zee Bridge is identified on this slide.

The topic of this presentation is the methodology that will be used to evaluate the potential of resuspended sediments due to the construction of the proposed replacement Tappan Zee Bridge.

Slide 6 – Implications of Resuspended Sediment

This slide identifies the principal impacts that resuspended sediments can have on the aquatic environment.

When the sediments are suspended (the "suspended phase"), sunlight is prevented from passing through the water ("attenuated"), migratory patterns may be disrupted, and there are physical stresses on the fish: gills are abraded, dissolved oxygen (DO) is reduced, and fish have trouble seeing.



Slide 7 – Conceptual Bridge Construction

Construction activities will be reviewed from the perspective of how those activities will affect the resuspenson of sediment. The analysis will take into account the movements of vessels, water depths, and a concept for dredging.

Slide 8 – Replacement TZB Alternatives

This slide illustrates the representative configurations that were developed and analyzed in the *Alternatives Analysis for the Rehabilitation and Replacement of the Tappan Zee Bridge*. They were recommended to be further developed for evaluation in the DEIS as documented in the project's *Scoping Summary Report*.

The construction activities and sequences that are presented are based on these representative configurations.

Slide 9 – Construction Activities

This slide shows the kinds of activities that occur during construction of the bridge foundations that may cause the resuspension of sediments in the river Activities include construction of cofferdams, installation of piles, vessels in the river, and so on.

Slide 10 – Construction Activities

We anticipate two different sets of activities to construct the proposed replacement bridge: on the substructure, or foundations, and on the superstructure.

In the case of the superstructure, the bigger the piece of structure, the bigger the crane and the bigger the barge required to build it.

Slide 11– Construction Activities

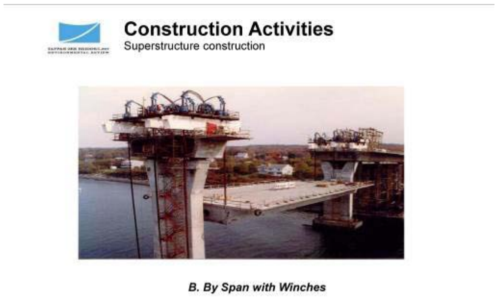
This slide shows photos of the construction of the foundations on other projects. Note that many of the piers are set up for construction activities to be active at the same time. Many vessels will be moving about the river at the same time. There will be a need to create channels.

Slide 12– Construction Activities – Superstructure Construction Using Gantry

The superstructure could be constructed in three different ways.

The first would be to transport and install segments of the superstructure. At its smallest, a superstructure segment could be a 10' wide concrete segment that can be transported on a barge in fairly shallow water.

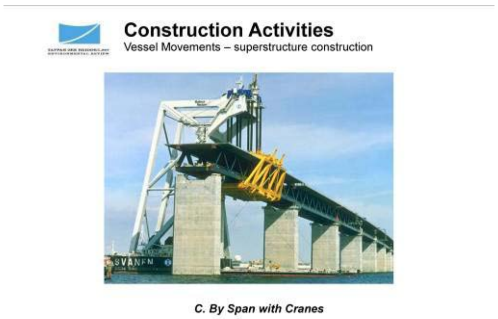
The segment would be lifted and then "launched" along a gantry as shown in the photograph.



Slide 13– Construction Activities – Superstructure Construction Using Winches

Another option would be to bring in a whole span, weighing about 30,000 to 40,000 tons, on a barge. This whole span would then be lifted into place using winches.

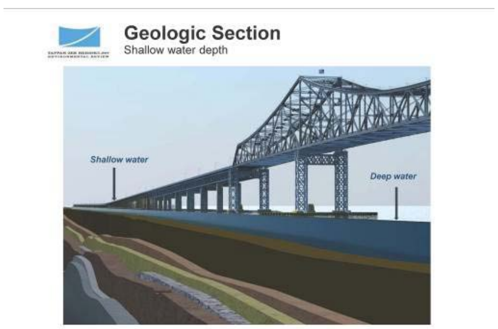
The project team will analyze construction activities to determine which ones are most suitable.



Slide 14– Construction Activities – Superstructure Construction Using A Large, Barge Mounted Crane

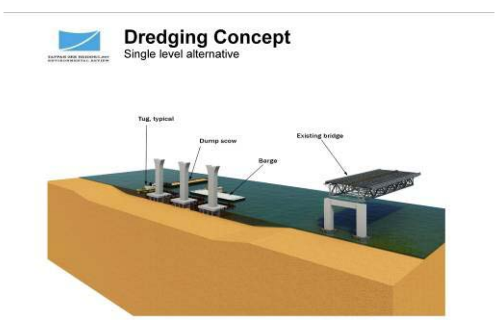
This slide shows a type of crane with an 8,000-ton capacity. Using this type of crane would require much dredging.   Single and dual level bridges may differ in the amount of dredging required.

Due to the size of this crane, it is unlikely it could pass under the existing bridge and so may not be able to be used.



Slide 15 – Geologic Section

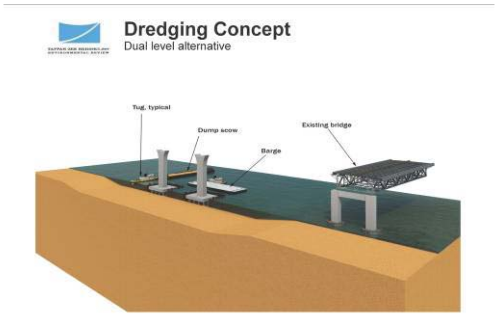
In the vicinity of the main span of the bridge, the Hudson River is about 35 to 45 feet deep, but in some of the shallow areas the depth is about 5 feet. A minimum of 9' draft (depth of vessel underneath the water) is needed. Therefore, some dredging would need to occur.



Slide 16 – Dredging Concept

This is a schematic to show the area of dredging for the single level option.

Take note of the trapezoid shape cut into the existing riverbed. To accommodate a barge 200' long, dredging would need to occur not just in the immediate area, but in the surrounding areas to allow the barge to navigate the river from the staging area to the bridge. Dredging is expected to be limited to the area where the water is shallow.



Slide 17 – Dredging Concept

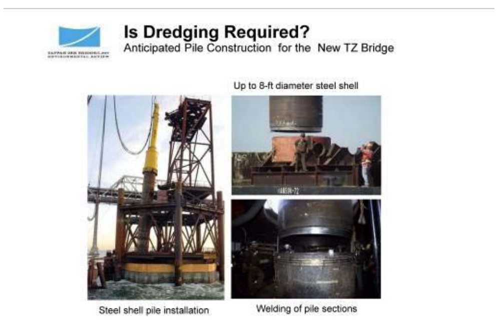
In the dual level option, the dredge channel may need to be deeper. The width would be substantially wider than that required for the single level alternative. However, the width for the vessels to move about is expected to be the same as for the single level bridge.

Slide 18 – Dredging, Is It Required?

Why dredge at all?

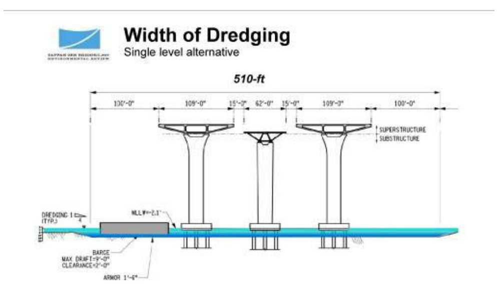
There are alternative methods for construction that don't require dredging, as shown in this slide. This is a highway bridge 50' wide and 25' off the water. Shown is the use of a gantry over water.

The size of the TZB prevents this from being a viable alternative for construction activities.



Slide 19 - Dredging, Is It Required?

This slide illustrates the size and complexity expected for the construction of the replacement Tappan Zee Bridge. Piles are expected to be 350' long and weigh 500 tons, working 30 to 50' into the water. It is expected that pile installation will need to be from a barge and therefore dredging will be necessary.

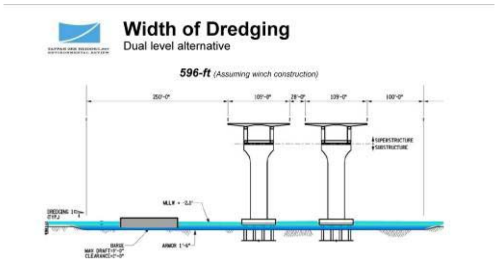


Slide 20 – Width of Dredging – Single Level Option

The width of dredging is based on anticipated barge sizes and the space required to maneuver the barges with tug boats.

It is assumed that for the construction of a single level structure, segmental construction would be used

This results in an expected channel width of 510 feet.

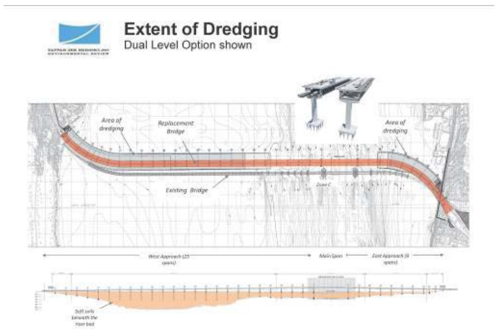


Slide 21– Width of Dredging – Dual Level Option

As shown for the single level option, the width of dredging is based on anticipated barge sizes and the space required to move them with tug boats.

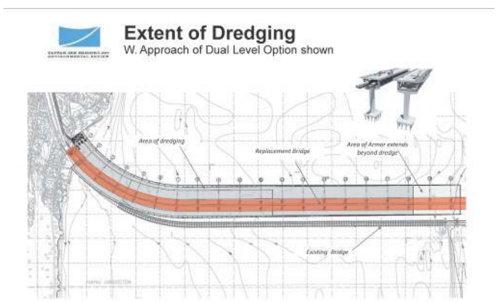
It is expected that spans will be lifted from barges using winches.

This results in an expected channel width of 596 feet.



Slide 22 – Extent of Dredging – Dual Level Option Shown

This slide represents the expected extent of dredging for a dual level option. The next slides give us a closer look.



Slide 23 – Extent of Dredging – West Approach Dual Level Option Shown.

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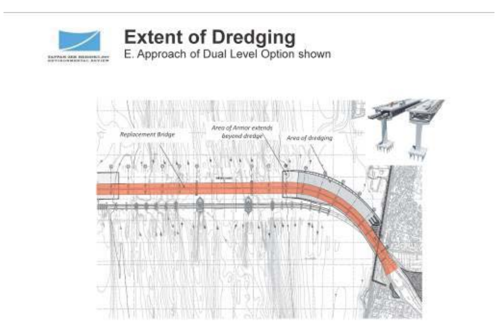
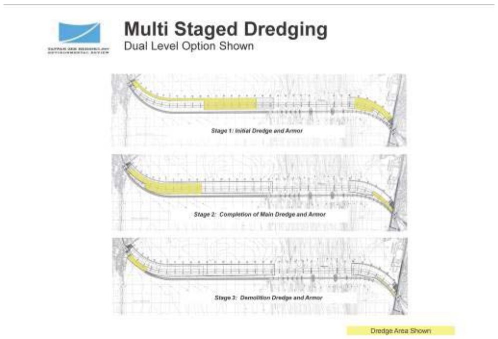
This slide represents the west approach (Rockland side) of the dual level option. The color red represents the dual level bridge. Two structures are shown. The gray, shaded area is the expected area of dredging based on the depth of water existing in the Hudson River and the required depth of water for the construction of the bridge.



Slide 24 – Extent of Dredging – East Approach of Dual Level Option Shown

Similarly, this slide shows the extent of dredging on the east approach (Westchester side) for the dual level option. Note that dredging is not shown in the area of the existing bridge. This has been modified as to not disturb the existing bridge.



Slide 25 – Multi Stage Dredging – Dual Level Option Shown

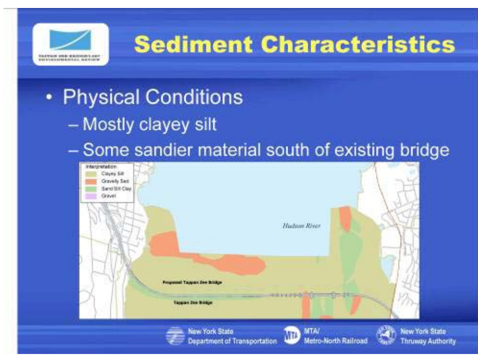
Season 1
The first stage of dredging is in the middle of the river and on the east side.

Season 2
The second stage is expected to be in the west shallows.

Season 3
The third stage is expected to be in the westernmost landing areas.

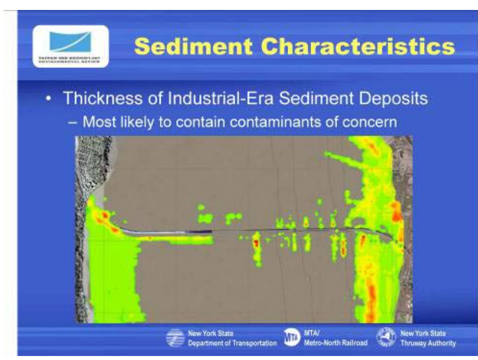
Slide 26 – Environmental Considerations

The following slides will focus on the environmental considerations with regards to resuspension of sediments during construction activities and beyond.



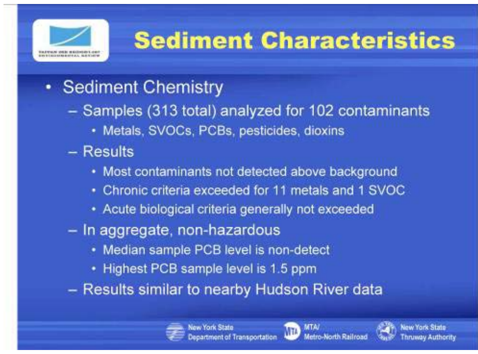
Slide 27 – Sediment Characteristics

Hudson sediments at the Tappan Zee are mostly clayey silt, which will have a tendency to resuspend easily, with some sandier material south of the existing bridge along the main channel.



Slide 28 – Sediment Characteristics

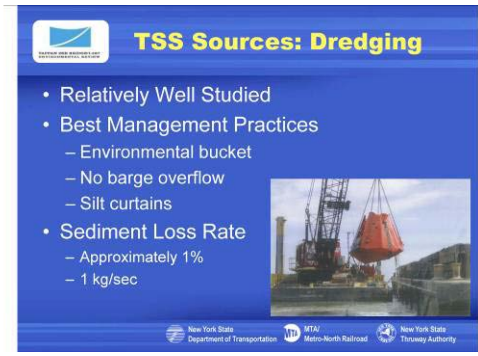
This slide is a Lamont Doherty illustration showing where recent deposits are found in relation to the bridge. Shorelines have thicker deposits of recent sediments that may have adhering containments.



Slide 29 – Sediment Characteristics

Sediment Chemistry

Over 300 sediment samples were analyzed for contamination levels. The vast majority of the samples showed very low levels of contamination.



Slide 30 – TSS Sources: Dredging

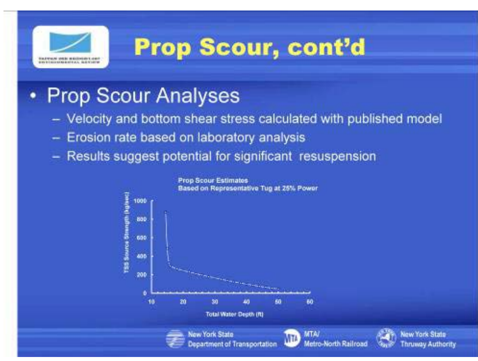
Of all construction activities, dredging is the best understood in terms of sediment resuspension.

About 1% of the material dredged could be lost during the excavation operation.

Slide 31 – TSS Sources: Prop Scour – Prop Wash

The scour of the river bottom caused by action of ship propeller is referred to as "prop scour" or "prop wash."

The tug boat to be used during construction of the TZB is expected to have more than 10 feet of draft, 1800 horsepower, and a 6-foot-diameter propeller.



Slide 32- Prop Scour , cont'd

Prop scour may be a significantly greater source of suspended sediments to the water column than either dredging or any of the other construction activities.

Samples of sediments from the project area were sent to the University of Louisiana to determine the erosion rate of the soils due to prop scour. The graph on this slide indicates that the rate of erosion can be significant even when considerable water depth is available.

Slide 33– TSS Sources: Prop Scour continued

There are three options for reducing the scour of the river bottom due to the tug propeller:

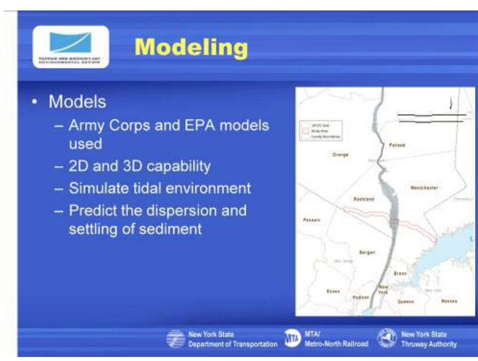
- Increase the depth of water to provide sufficient clearance between the propeller and the bottom to minimize scour. This would require an unacceptable amount of dredging when added to the amount proposed for barge clearance.
- The amount of scour due to propeller action is, in part, a function of the horsepower of the propeller motor. Therefore, a reduction in the horsepower of the tug motor would reduce the amount of scour. However, the performance of the tug would be reduced, potentially compromising construction safety and increasing the timeframe of in-river construction. The tug needs to be strong enough to maneuver the barges and other equipment effectively. Thus, this approach would not be acceptable.
- Armoring the river bottom in the vicinity of construction work appears to be the best approach to controlling resuspension form prop scour. This approach is often used at ship berths top protect pier structures.

Slide 34 – Sources Other Activities

Other construction activities are not expected to be major sources of resuspended sediments.

The project team is also looking at these other possible sources of resuspended sediments: cofferdam construction, pile driving for foundations, and existing bridge demolition.

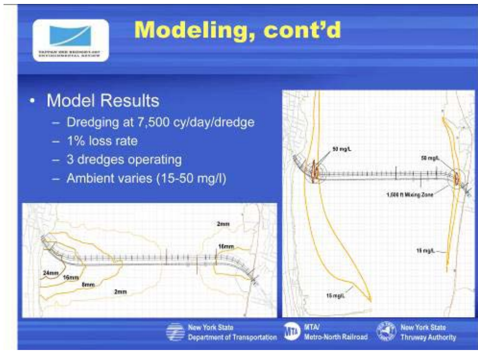
Based on monitoring conducted at Oakland Bay Bridge, initial analysis indicates these activities will not be a significant source of suspended solids.



Slide 35 – Modeling

Models approved by agencies such as USEPA and the Army Corps of Engineers will be employed to analyze the fate and transport of resuspended sediments.

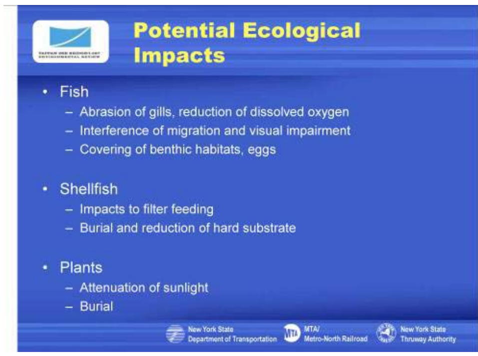
They have the following capabilities: 2D and 3D capability, ability to simulate tidal environment, and the ability to predict the dispersion and settling of sediment.



Slide 36 - – Modeling, cont'd

The output of our modeling effort will be used by project scientists to estimate the ecological implications of construction work.

Ecologists will use this information for the identification and evaluation of impacts.



Slide 37 – Potential Ecological Impacts

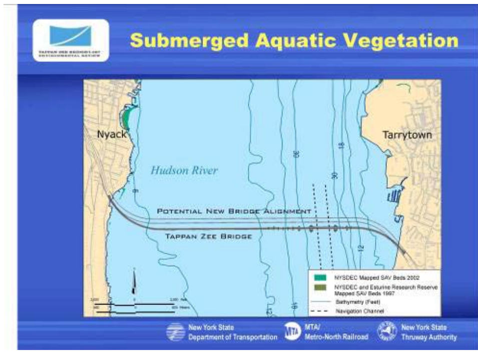
This slide expands on the potential impacts that resuspended sediments may have on aquatic ecology.

Slide 38 – Ecology – Fish Population

A simplified synopsis of the ecology of the Tappan Zee Reach is presented on this slide and the next slide. Notable points of ecologic interest are identified (e.g., biomass concentrations, spawning periods, etc.)This slide covers the winter and spring periods.

Slide 39 – Seasonal Ecology – Fish Population

This slide provides a synopsis of the ecology of the Tappan Zee Reach during summer and fall.

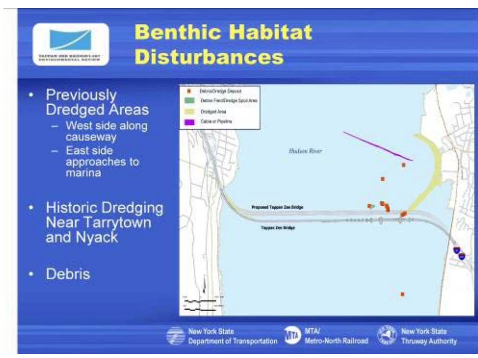


Slide 40 – Submerged Aquatic Vegetation (SAV)

In 2006, an extensive SAV survey was performed along the Hudson River shoreline out to the 6-8 ft depth contour within the project area. . In 2009, to obtain updated data on SAV within the project area, the results of NYSDEC's 1997, 2002, and 2007 SAV surveys were obtained. Using side scan sonar and physical grab samples (for ground truthing), previous NYSDEC mapped SAV beds were identified (see figure) .Most TZ Reach SAV beds are not proximate to the bridge construction area except one or two small areas.

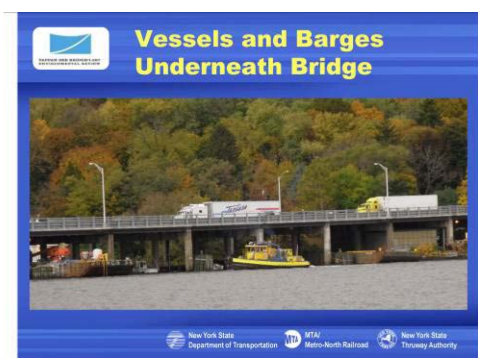
Slide 41 – Potential Oyster Beds

The general view has been that there are few live oysters near the TZB. Based on our benthic invertebrate surveys conducted in 2007-2008, live oysters were collected. In 2009, an oyster bed mapping program was performed using side-scan sonar and grab samples for ground truthing purposes. As can be seen in the figure, it now appears that oysters are re-populating the Hudson River. Near the bridge, diffuse beds were observed (i.e., scattered oysters in a generalized areas - not dense conglomerations of oysters that form reefs--were observed). Oyster beds of higher density were present in areas closer to the Piermont area. The presence of oysters is indicative of river health.



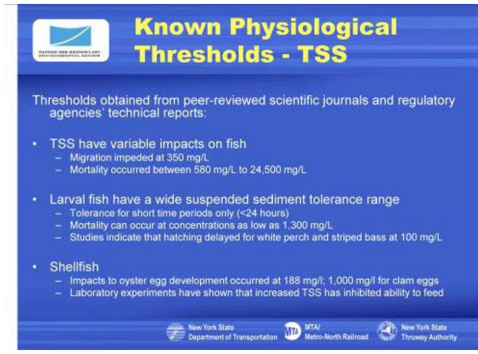
Slide 42 – Existing Benthic Habitat Disturbances

Disturbed areas near the project site include historic dredged channels for access to shore-side facilities in Tarrytown (oil terminal) and Sleepy Hollow (auto plant).



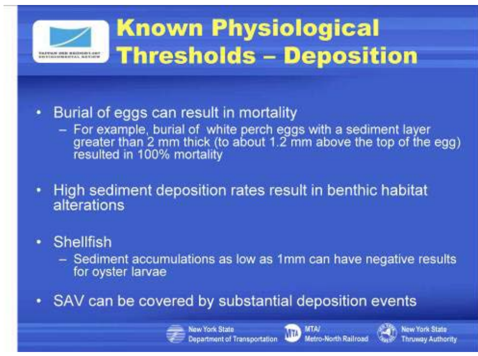
Slide 43 – Vessels and Barges Underneath Bridge

This slide shows an example of the vessels that transverse the river immediately parallel to the bridge.



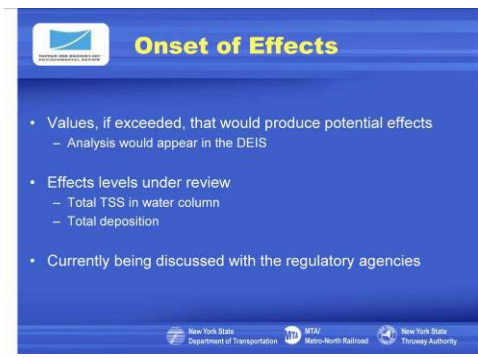
Slide 44 – Known Physiological Thresholds – TSS – Total Suspended Sediments

This slide identifies the suspended sediment levels at which impacts can occur to river biota. The information was obtained from the technical literature.



Slide 45 - Known Physiological Thresholds - Deposition

This slide identifies the depositional levels at which impacts can occur to river biota. The information for this slide was also obtained from the technical literature.



Slide 46 – Onset of Effects

This slide indicates that discussions are in progress with regulatory agencies to obtain guidance as to the levels at which there would be an onset of effects due to suspended or deposited sediments.

Slide 47 - Summary

The following slides try to summarize what has been presented. These summary items were also presented to the Cooperating Agencies at our recent meetings.

Slide 48 - Construction

• Dredging is necessary for timely and safe conduct of the project

• Dredging is on the critical path of the construction schedule

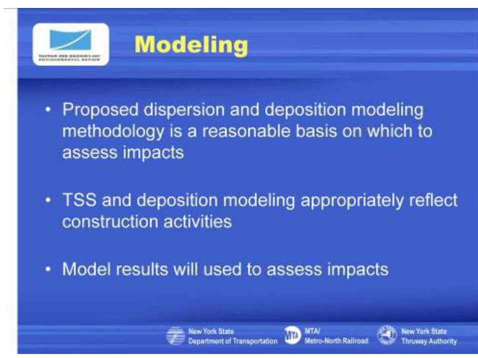
Slide 49 – TSS Source Strengths

• Dredging and prop scour are principal sources of resuspension

• Prop scour can be effectively limited by armoring

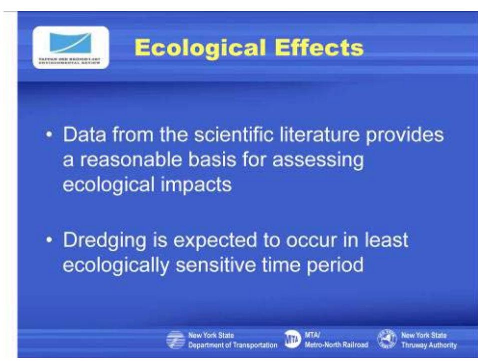
• Dredging resuspension can be controlled by BMPs, but not eliminated

• Source strength for dredging is well-defined



Slide 50 - Modeling

- Proposed dispersion and deposition modeling methodology is a reasonable basis on which to assess impacts
- TSS and deposition modeling appropriately reflect construction activities
- Model results will used to assess impacts



Slide 51 – Ecological Effects

• Data from the scientific literature provides a reasonable basis for assessing ecological impacts

• Dredging is expected to occur in least ecologically sensitive time period.