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

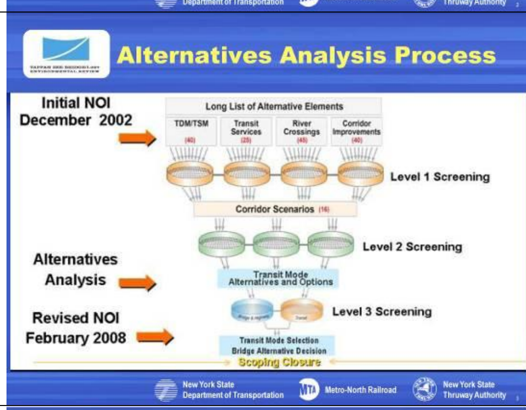
Slide 1:

Part 1: Project status and purpose (Slides 1-18)

Slide 2:

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 Coorperating Agencies focused only on the potential in-river impacts from a replacement bridge.

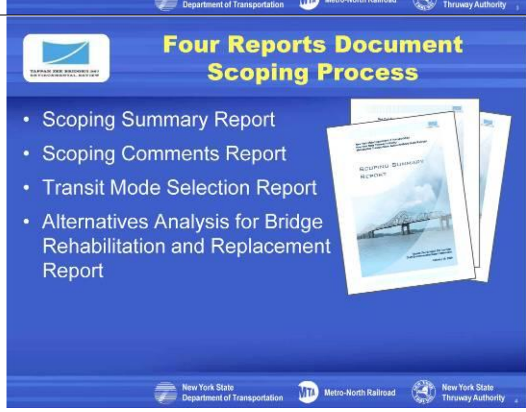
This slide outlines the structure of the presentation.



Slide 3:

This slide shows a summary overview of our scoping process.

Scoping was completed early this year.

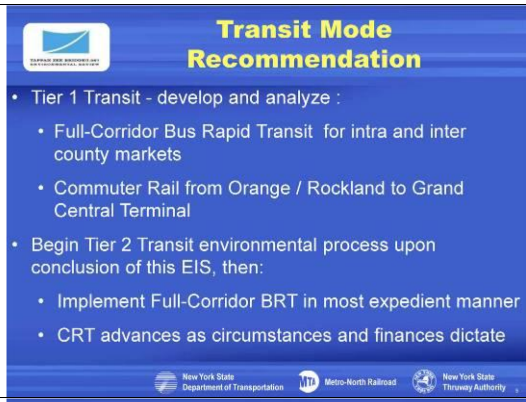


Slide 4:

This slides lists the four major documents completed at the end of scoping.

- 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 *Transit Mode Selection Report* and *Alternatives Analysis for the Rehabilitation and Replacement of the Tappan Zee Bridge* contain the respective transit mode and bridge analysis and recommendations.

These documents are now available on our website www.tzbsite.com.



Slide 5:

This slide summarizes the overall tiering process as presented in the spring of 2008 for transit.

- 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.

Slide 6:

This slide summarizes the main reasons for the bridge replacement recommendation as presented in the spring of 2008..

- 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 sited. 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.

Slide 7:

This slide summarizes the results presented in the *Alternatives Analysis for the Rehabilitation and Replacement of the Tappan Zee Bridge*:

- 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.

Slide 8:

This and the following five slides outline the five overall corridor alternatives to be evaluated in the DEIS.

Alterantive A: The DEIS alternatives include the required NEPA no build which for the existing bridge includes:

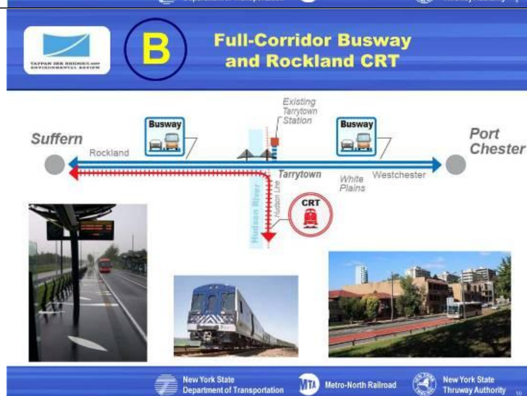
- continued maintenance
- repair of the bridge by contracts
- continued operation of the movable barrier system to provide 4 general use lanes in the peak direction, 3 in the off peak direction

Slide 9:

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.

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.

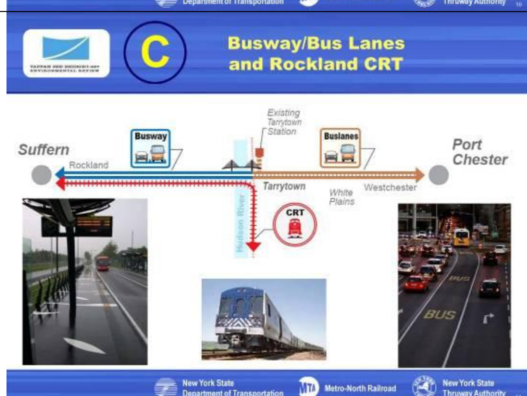
The other four alternatives have BRT across the full 30 miles of corridor.



Slide 10:

Alternative B:

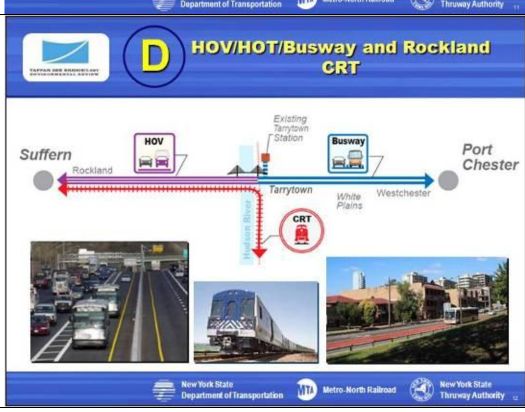
- Replacement TZB
- CRT across Rockland to Hudson Line
- Rockland BRT in busway
- Westchester BRT in busway



Slide 11:

Alternative C:

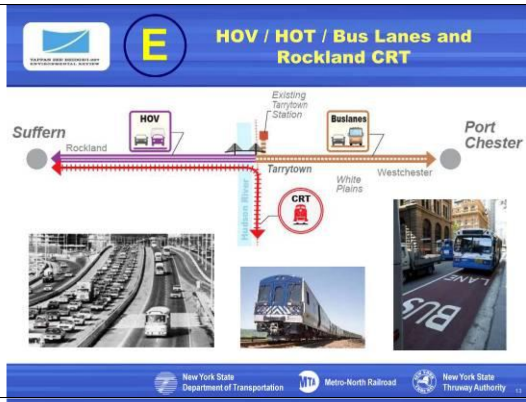
- Replacement TZB
- CRT across Rockland to Hudson Line
- Rockland BRT in busway
- Westchester BRT in buslanes



Slide 12:

Alternative D:

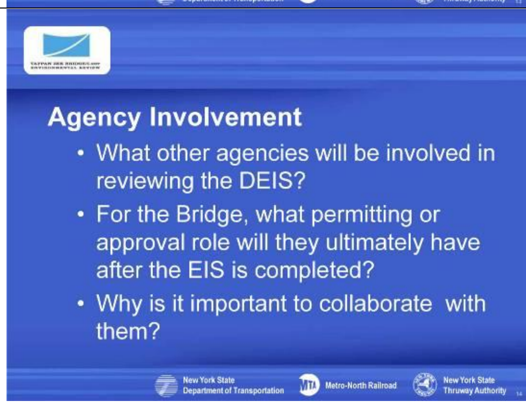
- Replacement TZB
- CRT across Rockland to Hudson Line
- Rockland BRT in HOV/HOTlanes
- Westchester BRT in busway



Slide 13:

Alternative E:

- Replacement TZB
- CRT across Rockland to Hudson Line
- Rockland BRT in HOV/HOTlanes
- Westchester BRT in buslanes

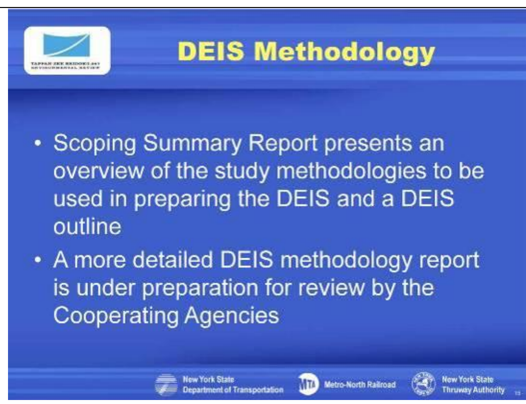


Slide 14:

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.

The preferred alternative presented in the DEIS must be permittable.

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.



Slide 15:

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.

Specific to this project the DEIS methodologies were contained in the spring 2008 scoping update packet and in the *Scoping Summary Report* that was distributed to all agencies.

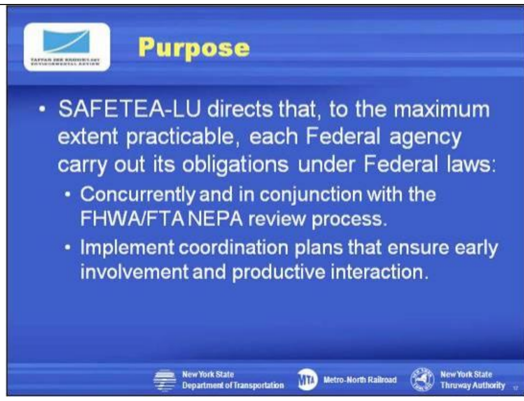
We have since been developing a more detailed DEIS methodology report that will be circulated shortly to agencies for a 30 day review.

Slide 16:

This slide presents the key milestones for the project schedule:

- DEIS issued (the D diamond) in late summer 2010
- Public hearings (the M7 diamond) in the fall of 2010

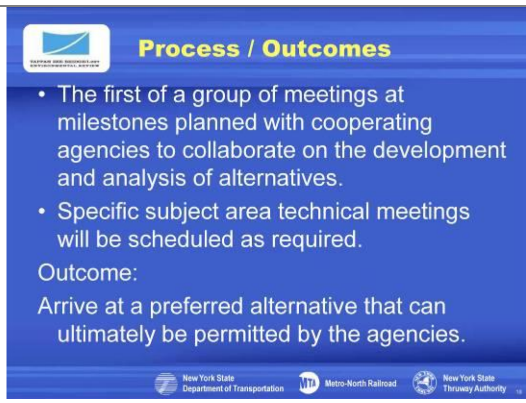
We expect to have an agency draft of the DEIS available to the cooperating agencies before the issuance of the public DEIS.



Slide 17:

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.

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.



Slide 18:

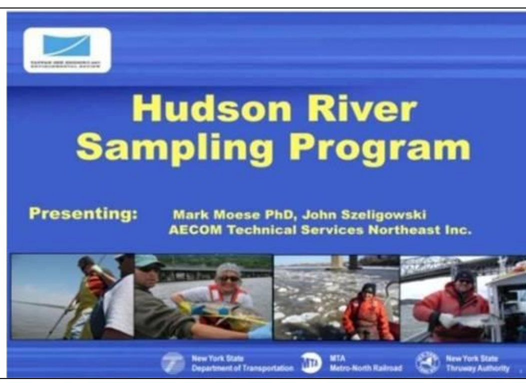
Given the complex nature of the bridge work relative to the Hudson River Ecology, we are focusing the first meeting with the cooperating agencies on the bridge. Future meetings will be scheduled once bridge options are fully defined and another meeting once a preferred alternative is identified.

Additional technical meetings will also be scheduled on specific subject areas such as sediment, acoustic analysis and dredging.

The first of these technical meetings will be scheduled once the DEIS methodology report is released.

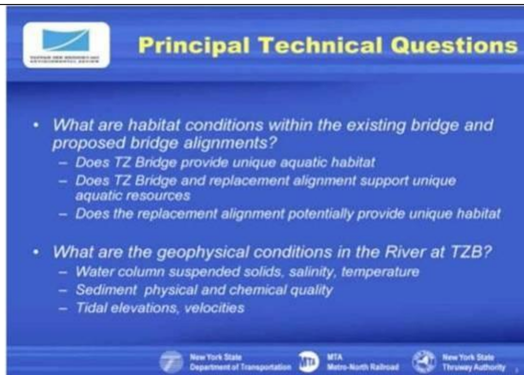
At the Cooperating Agency meetings, we are requesting that key staff from agencies be identified for these technical meetings.

We will also be scheduling specific issue meetings with those agencies that have corridor resource issues as the DEIS progresses.



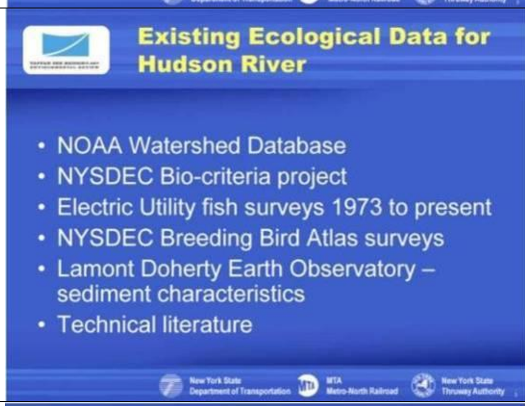
Slide 19:

Part 2: Hudson River Sampling Program (Slides 19-36)



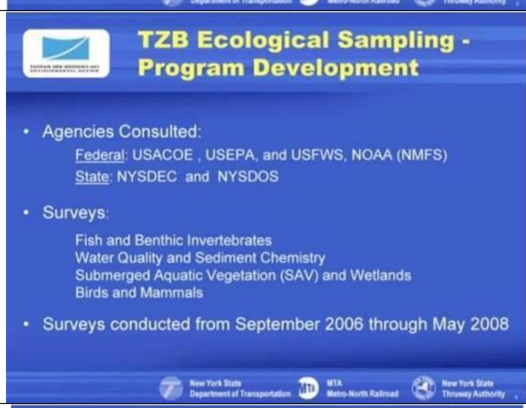
Slide 20:
Principal Technical Questions

This slide presents the goals of the Hudson River sampling program in the form of a series of technical questions.



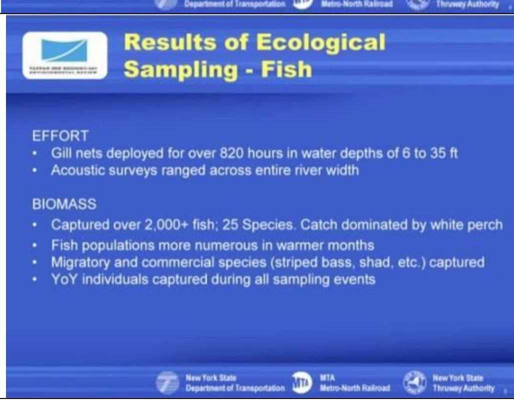
Slide 21:
Existing Ecological Data for Hudson River

Existing sources of ecological data of the Hudson River are identified here.



Slide 22:
TZB Ecological Sampling Program Development

Various state and federal agencies have significant input to the Hudson River Ecological Sampling program.



Slide 23:
Results of Ecological Sampling – Fish

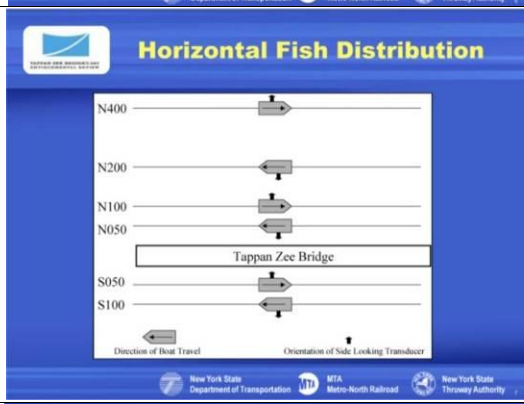
This is the summary of our fish sampling program.

Slide 24:
Results of Ecological Sampling – Fish continued

Summary continued:

Twelve short-nosed sturgeon were captured during the sampling program.

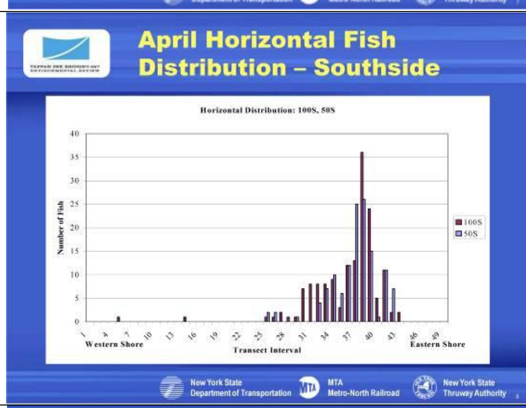
No major difference observed in fish assembleges between the existing bridge and along new bridge alignment.



Slide 25:
Horizontal Fish Distribution

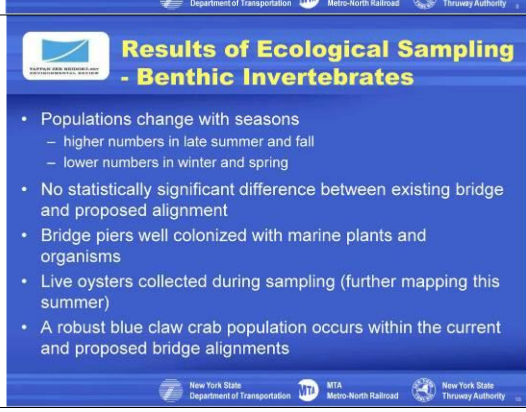
Shown here are the transects followed by the acousic survey vessel.

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 acertain the location of fish. The arrows indicate in which direction the acousic sounding was pointed.



Slide 26:
April Horizontal Fish Distribution – Southside

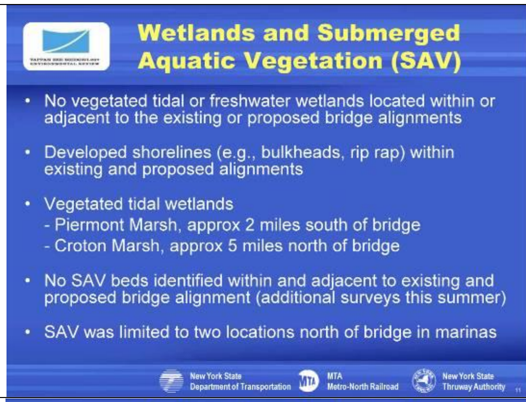
Indicated here is that more fish were found in the main channel in the early spring time shen the temperature are low and very few outside of the main channel.



Slide 27:
Results of Ecological Sampling – Benthic Invertebrates

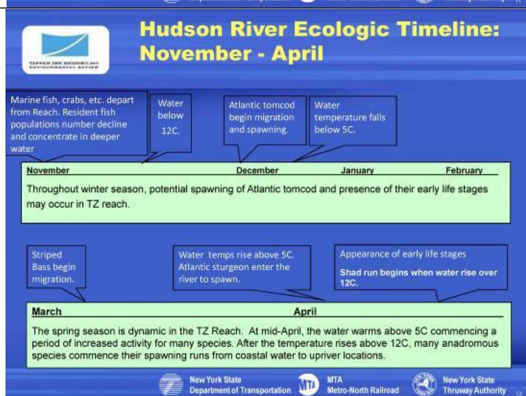
Benthic populations change with seasons. Live oysters and blue claw crabs are found at the bridge.

More mapping of these oyster beds will be done.



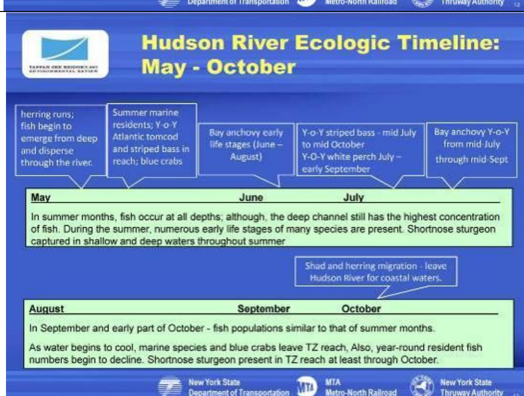
Slide 28:
Wetland and Submerged Aquatic Vegetation (SAV)

Neither wetlands or SAV were found at the existing bridge or along the proposed bridge alignment.



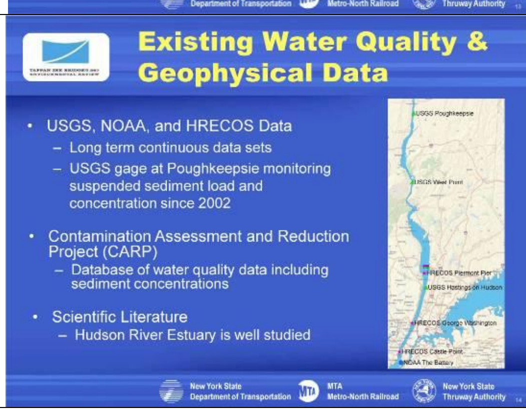
Slide 29:
Hudson River Ecological Timeline: November – April

When water temperatures fall below 12°C, fish activity is markedly reduced at the TZB, however, comcod migrate through the area during early winter.



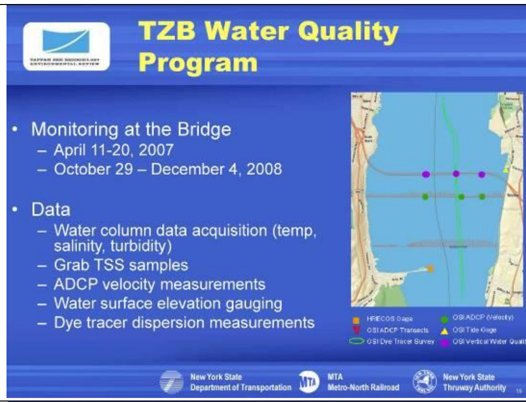
Slide 30:
Hudson River Ecologic Timeline: May – October

During summer the TZB reach experiences the movement of numerous fish populations.



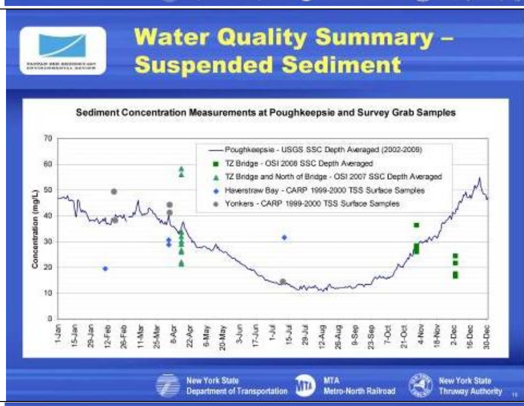
Slide 31:
Existing Water Quality & Geophysical Data

Considerable water quality data was found from other investigations for the Hudson River.



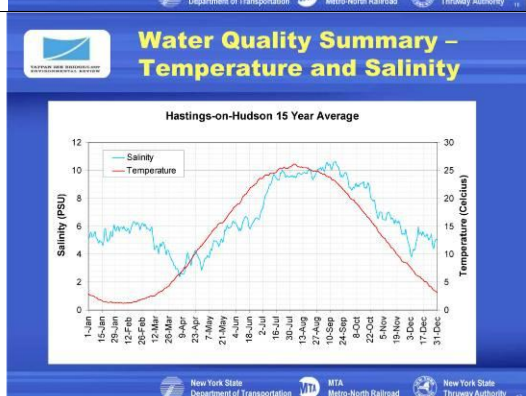
Slide 32:
TZB Water Quality Program

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.



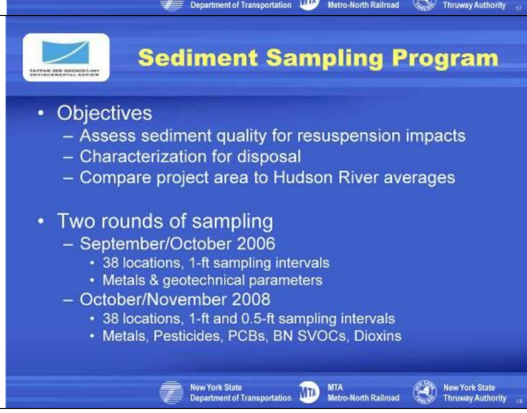
Slide 33:
Water Quality Summary Suspended Sediment

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



Slide 34:
Water Quality Summary Temperature and Salinity

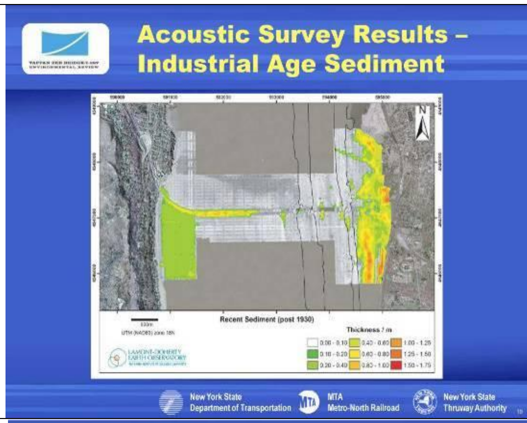
This slide shown temperature and salinity conditions monitored over a fifteen year period at Hastings on Hudson.



Slide 35:
Sediment Sampling Program

Two rounds of sediment sampling were conducted at the bridge.

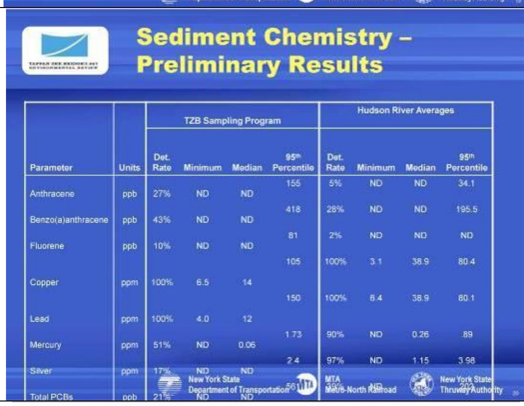
Sediments were collected at 38 locations and at each location the samples were split at either 0.5 or 1.0 ft intervals for laboratory analysis. Laboratory analysis included tests for metals, PCBs, and dioxins among other contaminents.



Slide 36:
Acoustic Survey Results Industrial Age Sediment

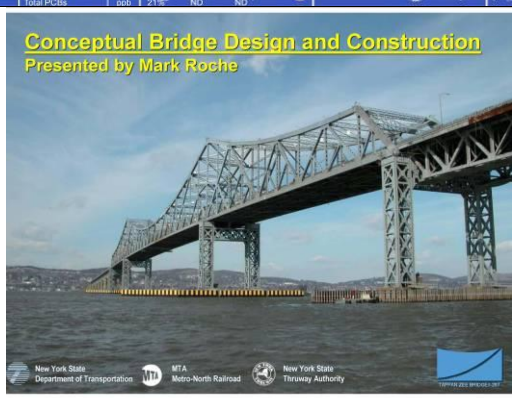
This slides shows the location of industrial age sediments within the TZB vicinity.

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



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.



Slide 38:

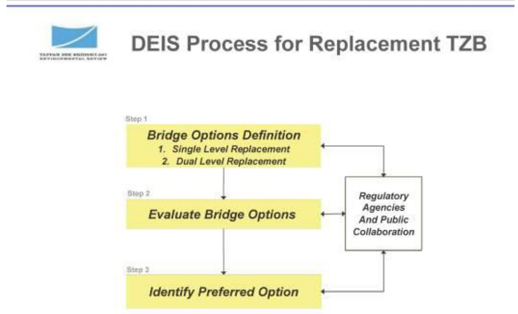
Part 3: Conceptual Bridge Design and Construction

(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.

Slide 39:

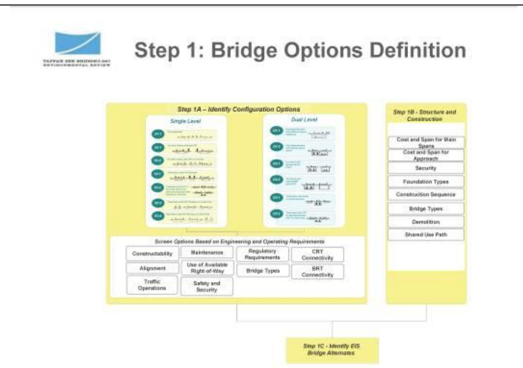
This slide lists the anticipated outcomes from the EIS for the replacement bridge. Note the outcome is not to determine the final replacement bridge form but rather to fully identify potential environmental implications for various forms, alignments and types.



Slide 40:

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.

The next slide shows Step 1 expanded to include all the items to be studied.

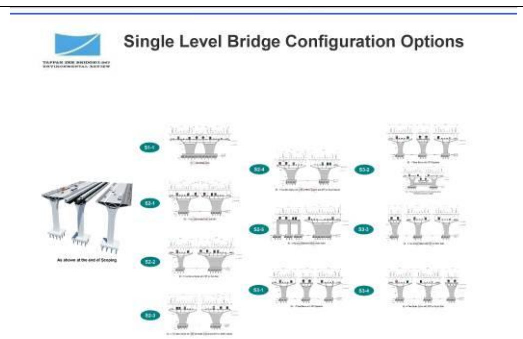


Slide 41:
This slide shows Step 1 in the EIS process for the replacement bridge.

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.

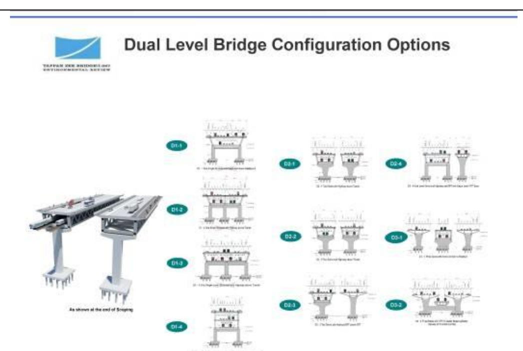
In Step 1B a series of studies common to all bridge configurations is conducted. These studies include construction staging and demolition of the existing TZB etc. for example.

The outcome from Step 1 will be the *Bridge Option Definition* Report that will present the preferred arrangement(s) for both the single and dual level bridge options.



Slide 42:
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.

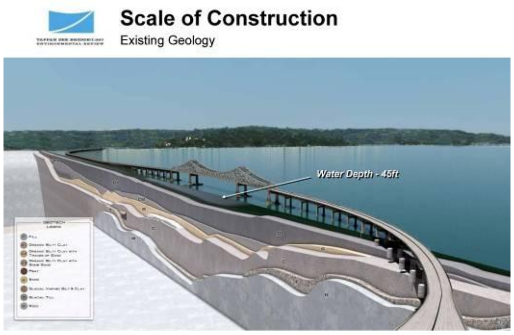
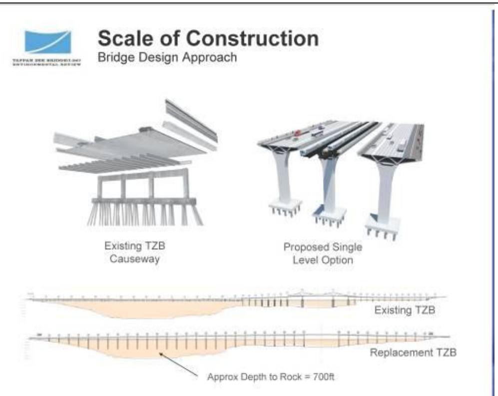
The remaining configurations are those that may be used to evaluate the bridge options in the DEIS.



Slide 43:
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.

The large image on the left is the representative dual level option used in the *Alternatives Analysis for the Rehabilitation and Replacement of the Tappan Zee Bridge Report* as part of Scoping.

The remaining configurations are those that may be used to evaluate the bridge options in the DEIS.

	**Slide 44:** 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 overerall replacement bridge.
	**Slide 45:** 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. 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.
	**Slide 46:** 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. Shown here are two different cofferdam types. Cofferdams are enclosed areas within which construction can take place. 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.
	**Slide 47:** This slide shows the equipment and techniques for installing the types of piles likely for the replacement bridge. The image on the left shows the pile driving hammer and the temporary support frame used for installation. The center images show the size of the pile and the preparation of the welded connection between two sections. 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.

Slide 48:

The image on the left shows the equipment and number of barges used in the construction of one example pilecap.

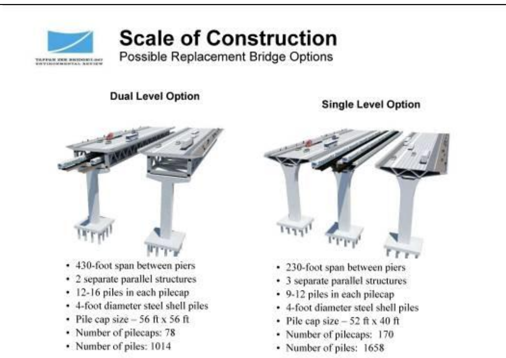
The image on the right shows concrete being placed in the pile cap and column.

Slide 49:

This slide shows the erection of the superstructure (the deck above the column).

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.

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.

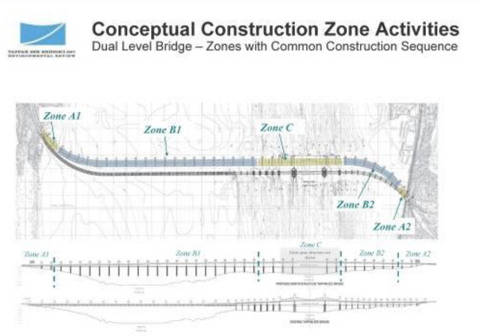


Slide 50:

This slide and those following present conceptual construction staging for both the single and dual level options.

For the purpose of this study two representative single and dual level options are used – these are the same as used in the *Alternatives Analysis for the Rehabilitation and Replacement of the Tappan Zee Bridge Report* as part of Scoping. Further development of the conceptual construction staging will be necessary once the preferred configurations are determined as part of the *Bridge Option Definition* Report.

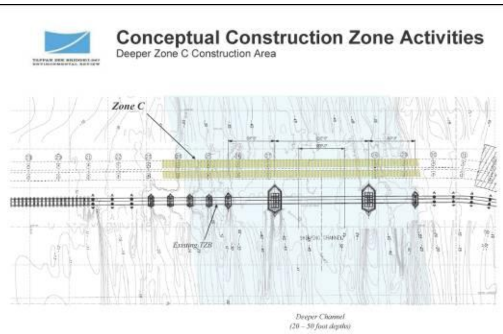
The slide presents an initial comparison of the total pilecaps and piles for each representative option. Of particular note is the difference in the number of pile caps – 78 and 170 for the dual and single level options respectively. These number of pilecaps correspond to the likely minimum spans for the types of structure shown.



Slide 51:

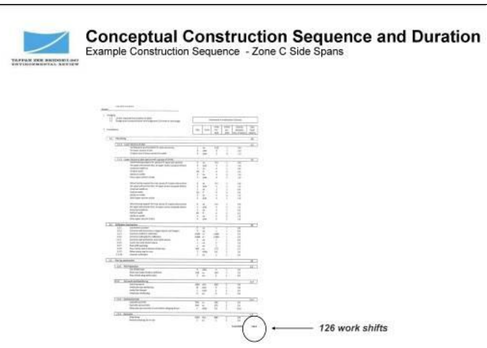
Using the representative dual level option as an example this slide identifies five different zones across the river corresponding to different foundation construction activities:

- 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 assessed from barges.



Slide 52:

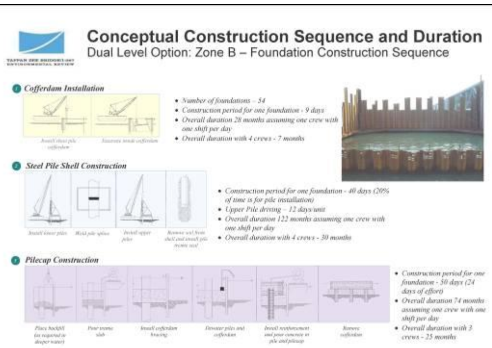
Zone C corresponds to the area of deep water around the main spans. This area has a similar extent to that of the buoyant foundations in the existing TZB.



Slide 53:

This slide shows a breakdown of all the activities required for the construction of one single pilecap in Zone C.

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.

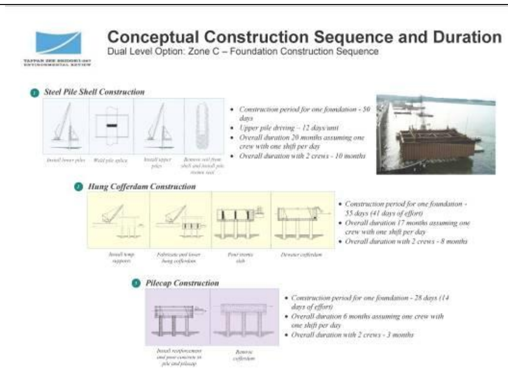
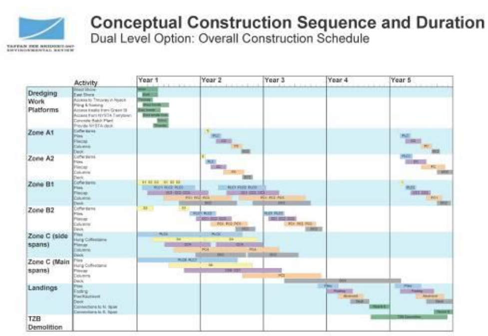


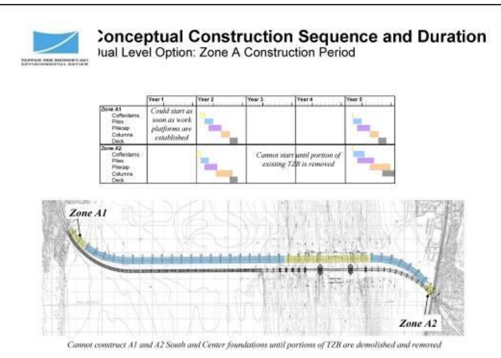
Slide 54:

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.

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 constuction duration for a single pier and all the piers in Zone B1 is shown.

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.

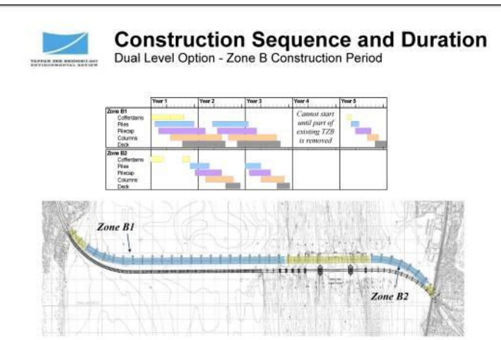
	To reduce the period of construction multiple cofferdam installation crews would be used – for example if four crews are used the construction duration would reduce to 7 months. Similarly, for the grouped activities assciated with pile and pilecap construction multiple crews would be required to reduce the overall construction duration. 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 constuction period.
	**Slide 55:** 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. 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.
	**Slide 56:** 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 an is presented in this slide for the dual level bridge. The resulting duration is just less than five years assuming no moratorium on construction. 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. 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.



Slide 57:

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.

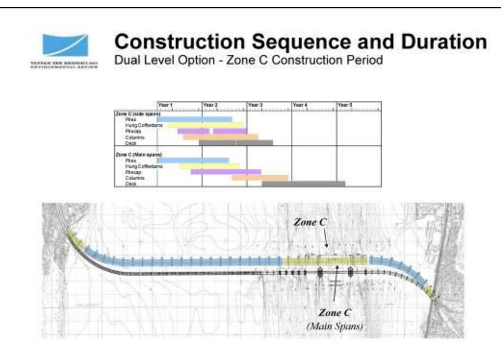
Notably, the activities in Zone A can not all occur one after the other. Rather many activities are separated by a period of two years as access to construct all the foundations in this area is not possible until the existing bridge is removed.



Slide 58:

Similarly, it is possible to extract from the overall schedule the positioning of the activities in Zone B.

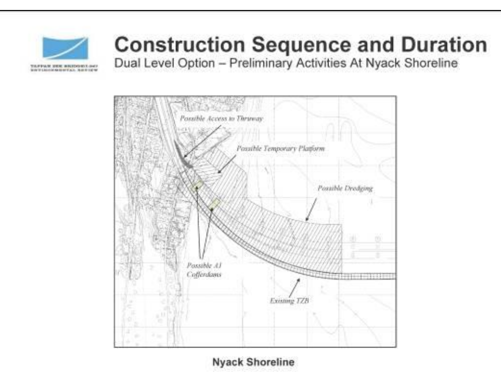
Construction in this zone occupies the first three years of construction. Similar to Zone A, activities are again separated because of conflicts with the existing TZB.



Slide 59:

This slide shows how the grouped activities in Zone C would fit within the overall interdependent construction sequence.

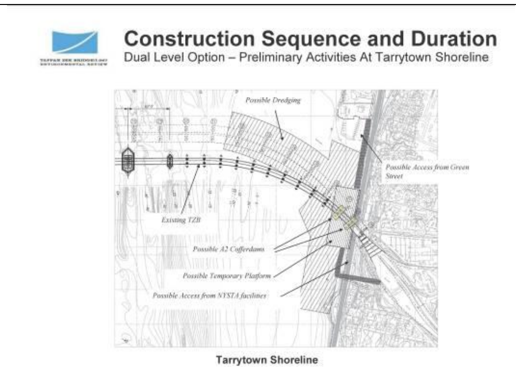
Notably this zone includes the main spans which would have the largest foundations. Construction in this zone would take just over four years to complete but would not be restricted by any conflict with the existing bridge.



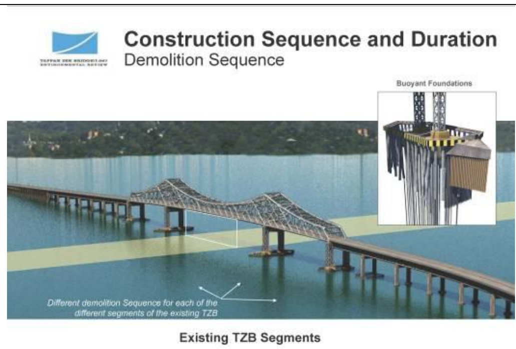
Slide 60:

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.

This leads to the sizing of support facilites 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.



Slide 61:
This slide shows the extent of dredging, temporary platforms and access roads that would be required at the Tarrytown landing.



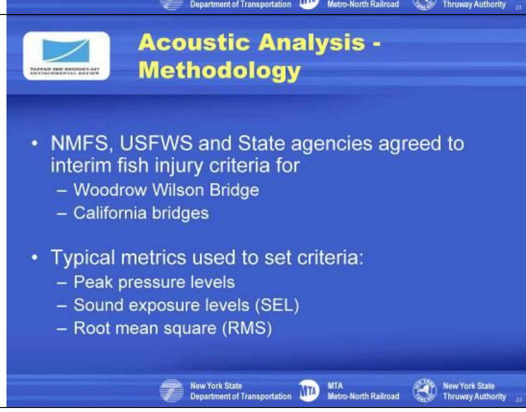
Slide 62:
Finally for this part of the presentation it is necessary to consider the demolition of the existing bridge in some detail as the assciated activities will have their own potential environmental impacts.

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.

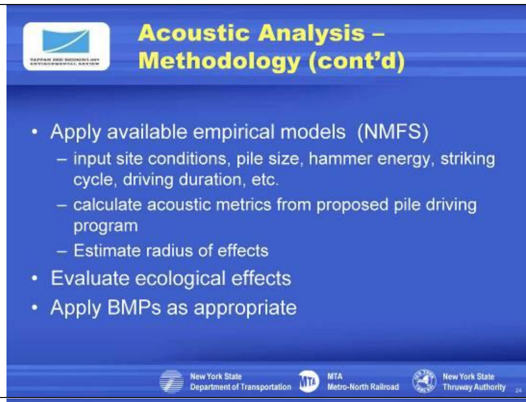
Slide 63:

Part 4: In-River Methodologies
(Slides 62-69)

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.



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.

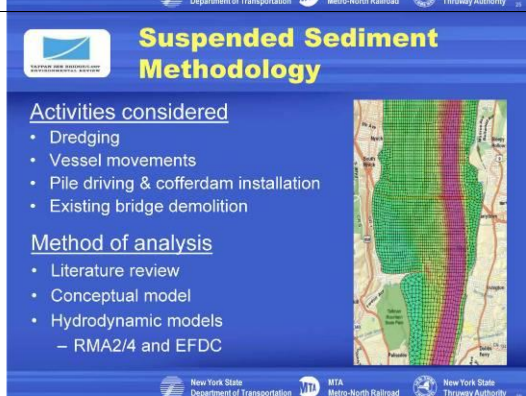


Slide 65:
Acoustic Analysis Methodology (cont'd)

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 the estimated and Best Management Practices (BMP's) applied.

Slide 66:
Typical Best Management Practices (BMPs) for Pile Driving

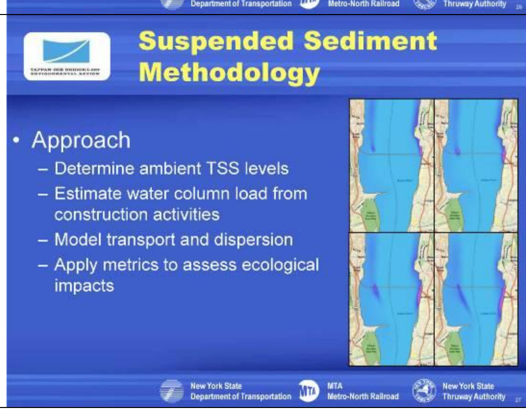
Typical BMP's that have been accepted on other projects and may have application here are presented on this slide and the photos identify various bubble curtain arrays, one of the BMP's



Slide 67:
Suspended Sediment Methodology

Sediments may be suspended as a results of dredging and cofferdam installation among other activities.

Once sediments are in the water column, their disperson will be estimated using 2D and 3D models.

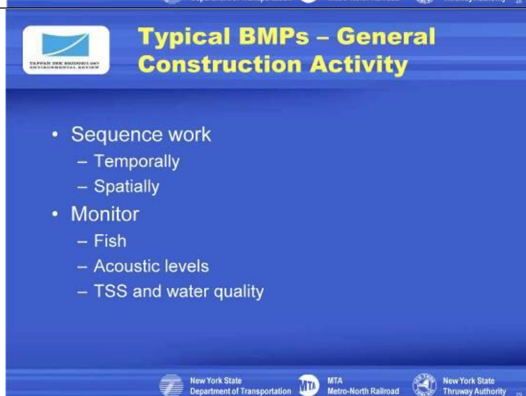


Slide 68:
Suspended Sediment Methodology

This slide show the output of the modeling of a suspended sediment plume.

Slide 69:
Typical BMPs – Suspended Sediment

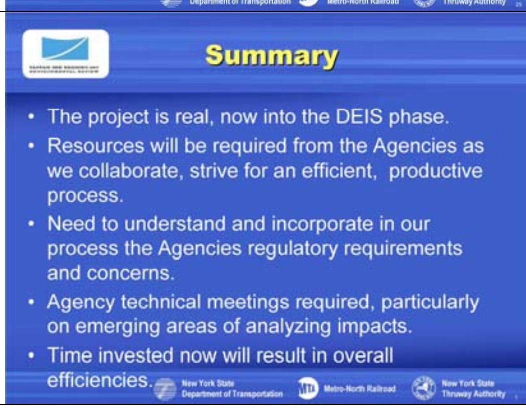
Best Management Practices (BMPs) for suspended sediments include use of environmental dredging equipment, work in cofferdams and where applicable turbidity curtains. The slide shows an example of environmentally sensitive equipment..



Slide 70:
Typical Best Management Practice (BMPs) for General Construction Activity

Another BMP will include the sequencing of construction work either temporarily or spatially, considering the impact to the river environment.

It is expected that significant monitoring will occur during construction for underwater acoustic levels and suspended solids.



Slide 71:

Part 5: In-River Methodologies
(Slides 71)