Appendix F: Ecology

F-7 NMFS Essential Fish Habitat Determination and FHWA Response

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
NORTHEAST REGION
55 Great Republic Drive
Gloucester, MA 01930-2276

JUN 22 2012

Jonathan McDade, Administrator
U.S. Department of Transportation
New York Division, Federal Highway Administration
Leo W. O Brien Federal Building
11A Clinton Avenue, Suite 719
Albany, NY 12207

Re: Essential Fish Habitat [EFH] Assessment for the Tappan Zee Bridge Hudson River Crossing Project; Rockland and Westchester Counties, New York and the Historic Area Remediation Site [HARS], New York Bight Apex

Dear Mr. McDade:

We have reviewed your essential fish habitat (EFH) assessment for the Tappan Zee Bridge Hudson River Crossing Project, prepared in April 2012. As described in that document, the proposed project entails replacement of the existing Tappan Zee Bridge with a new, two span crossing immediately north of the current bridge. Upon completion of these structures, the existing bridge would be demolished. Since this project is progressing under a design-build scenario, a final design has not been established and the EFH assessment considers several generic alternatives. Each of these alternatives has implications for the nature and duration of project impacts incurred during construction and for the life of the project. We have determined that impacts associated with bridge construction and removal may adversely affect living aquatic resources and their habitats, and we offer the following comments for your consideration.

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) and the Fish and Wildlife Coordination Act (FWCA) require federal agencies to consult with one another on projects such as this. Insofar as a project involves EFH, as this project does, this process is guided by the requirements of our EFH regulation at 50 CFR 600.905, which mandates the preparation of EFH assessments and generally outlines each agency's obligations in this consultation procedure. Included in this consultation process is the preparation of a complete and appropriate EFH assessment to provide necessary information on which to consult. Based on this EFH assessment, we have provided EFH conservation recommendations to avoid and minimize impacts to our resources.

General Comments

The proposed action is to replace the 3.1 mile long Tappan Zee Bridge with two new structures aligned immediately to the north of the existing bridge. The Tappan Zee Bridge replacement entails activities in two distinct areas: estuarine portions of the Hudson River in the vicinity of Nyack and Tarrytown, New York, and also a portion of the Atlantic Ocean known as the Historic Area Remediation Site (HARS). The Hudson River estuary extends more than 240 kilometers between The Battery in southernmost Manhattan and the federal lock and dam at Troy, New

York (Cooper et al. 1988). This region is fully tidal and supports a wide variety of living aquatic resources including resident and migratory fishes, crustaceans, and benthic invertebrates. Some of these species are federally managed, and essential fish habitat has been designated for multiple species and life stages in and immediately surrounding the Tappan Zee crossing. Beebe and Savidge (1988) noted that 140 fishes are known to occur somewhere in the estuary, and tend to be distributed along the prevailing salinity gradient. Everly and Boreman (1999) further characterized fish distribution in terms of the preferred life history strategies of species present including fishes that are resident in particular salinity zones, appear as seasonal transients, etc.

Your EFH assessment updates these works through a review of selected literature and field studies specifically undertaken for the Tappan Zee Crossing project in 2007-2008. This effort indicates that 25 species, predominantly diadromous fishes and those capable of tolerating a wide range of salinities, occur in the Tappan Zee reach of the Hudson. Water depth and seasonal considerations appeared to influence the presence or absence of some species significantly. These results appear consistent with local hydrological conditions and the life histories of species that dominated the catch during the project sampling. While there is some overlap in species that may be encountered at both the construction and proposed dredged material placement sites, the local ecological communities differ between the Tappan Zee reach and the HARS largely due to local salinity regimes. While the HARS has comparatively higher salinity levels than at the Tappan Zee reach at any given time, the area is susceptible to reduced salinity when engulfed by the Hudson River plume during periods of high flow. This hydrological cycle has a seasonal component. Depending on the time of year, it is possible that a variety of resident and diadromous fishes, crustaceans, bivalve mollusks, and benthic invertebrates may be encountered in either location as they feed, rest, spawn, complete nursery life stages, or take refuge in the winter. Life stage, species, and a host of other considerations must be taken into account for how the final project design, installation plan and use would affect living aquatic resources.

The New York State Thruway Authority maintains rights-of-way on both sides of the river that would accommodate the construction activities. Two spans are proposed to allow for service redundancy. These structures would include landings on each shore of the Hudson, as well as approach and main spans. Based on the design alternative chosen, impacts to fish habitat will vary based on the amount of structure that would be constructed in and over the waterway, and how long it would take to complete the work. As disclosed in your analysis, the short span approach would result in more structure and permanent loss of water column and benthic surface than the long span approach, and would require approximately a year longer to build. Similarly, the arch style main span would entail a larger superstructure over the waterway than would a cable stay design. We anticipate that the new spans would potentially cast a greater shadow than the existing structure and that the shading from an arched span would likely be wider than from a cable-stayed span. Reducing the number of support piers by implementing the long span option also has the advantage of avoiding and minimizing acoustic impacts to fishes that could alter their essential behaviors, lead to temporary or permanent physical damage, or result in mortality.

The proposed project also includes dredging for the purpose of creating construction access in the extensive shallows for the bridge span approaches. Dredging would resuspend the finer sediment fractions, release pore water, and create a plume near the sediment surface and up into the water column. The amount and extent of distribution can be managed through appropriate

equipment selection. Dredging does not simply extract the local substrate and enhance navigation access, but also removes, injures or destroys any organisms that are present within or in close association with the sediment. This is a significant consideration for the Tappan Zee Bridge replacement project. Approximately 165 to 175 acres of bottom habitat—including about 5.3 acres of state-regulated littoral zone tidal wetland and 160-170 acres of open water benthic habitat—would be removed to accommodate work barges, support vessels, and other equipment. The EFH assessment describes a generic dredging plan in which material would be removed during three 3-month phases, from August 1 through November 1, over a four year period. The defined work window was negotiated with the state and federal resource agencies to avoid periods of diadromous fish spawning migrations and peak biological activity. This window does not eliminate impacts to fishes, but is intended to reduce direct dredging impacts.

In addition to these predominantly acute impacts, the resulting trench would be armored with stone or gravel following dredging. This relatively coarse material is intended to reduce the amount of substrate that would be disturbed by vessels during construction. Assuming that gravel would be placed up to 20 feet of the side slope, approximately 155 to 165 acres of bottom would be converted from fine sediment components to gravel. This change has implications for what kinds of benthic invertebrates could use the acres of affected habitat and the amount and kind of prey that are present in the interim until the area returns to soft bottom. These impacts most likely would have mid- to long-term consequences depending on the individual species that are displaced or otherwise affected by this conversion of bottom type. Similarly, the deepened areas would be expected to support a different species or life state assemblage of fishes, depending upon their preference for littoral or pelagic waters. Species or life stages that prefer deeper water would benefit from the deepening at the cost of those which prefer or require shallow water habitat.

Construction of new structure in the waterway will eliminate areas that are currently open water column or soft bottom. Bridge piers and protection would interrupt local flow and change local erosion and accretion patterns from current ambient conditions. Depending on how these members are installed, the materials from which they are constructed, and what is necessary to maintain them, all have potential to affect aquatic life both during and after construction. For example, installation of pilings using impact hammers would create acoustic signals that could adversely affect a variety of fishes if the sound meets or exceeds thresholds that could create injuries. If the pilings are composed of, or coated with, concrete, eventual cracks and spalling would have to be repaired. Some of the materials used to exact these repairs could be injurious to aquatic life. Until a more well-defined project design is produced, it is not possible to provide a comprehensive discussion of the nature and extent that these impacts might create in the Tappan Zee crossing.

It is important to highlight that the proposed construction footprint would impact intertidal and subtidal areas including relict or active American oyster beds. Oyster beds, whether relict or active, are valuable as cover or feeding habitat for a variety of aquatic organisms including juvenile fishes and crustaceans. Hard bottom of this nature also may serve as spawning habitat for certain species that place demersal eggs. Active oysters have ecological and cultural value for this region and should be preserved. We consider any live oysters that are present to be particularly important aquatic resources because they are remnants of what was an important

regional source of seed oysters prior to being nearly extirpated by hurricane damage in 1955 (Stanne et al, 2007). Because these remaining oysters are uniquely adapted to the ecological conditions in this river reach, we consider them important potential founding stock for future restoration or enhancement activities should they be contemplated. For oyster mitigation, it may be desirable to hold adequate broodstock in reserve to culture spat adapted to local conditions that could be deployed after all the construction is completed over a greater series of strata to increase the likelihood of restoring or enhancing these important filter feeders.

Preliminary sediment testing results reported in your EFH assessment indicate that certain contaminants (e.g., heavy metals, pesticides, polychlorinated biphenyls, polycyclic aromatic hydrocarbons, and dioxins) are present in what the State of New York considers moderate to high concentrations capable of incurring chronic or acute toxicity responses in aquatic life. Further testing is ongoing to determine whether all or a portion of the sediment that must be dredged to accommodate construction and support vessels will be eligible for ocean placement at the HARS and what measures must be observed to adequately protect aquatic habitats in the Hudson River. The preliminary sediment testing results underscore the need for controlling the amount of re-suspension and dispersal of fine sediment fractions in the waterway and also may suggest that at least a portion of the material may require special management.

With regards to ocean disposal of dredged material, only sediments which have been tested for potential ocean placement and have been determined to have no unacceptable toxicity or bioaccumulation in test systems may be placed at the HARS. Such materials are used to cap areas where more contaminated materials were placed historically in an effort to restore the habitat at HARS. The HARS region has been designated as EFH for multiple species and life stages of federally managed fishery resources. Remediation of the HARS would benefit these resources by capping historically placed material that exceeds current action levels and effectively isolating them from bioturbation. However, we recommend that the contractor or project proponents develop an alternate sediment placement plan to cover the eventuality that all, or a portion of the dredged material fails to meet HARS criteria or to address other contingencies that may arise during construction. We do not object to upland placement; however, any proposed placement in aquatic habitats other than HARS will require re-initiation of our consultation.

Finally, it is important to consider what impacts would accrue from removal of the existing Tappan Zee Bridge once the replacement spans are in operation. Removal of the old structure would reduce the amount of shading over the waterway, offset the amount of water column and benthos that are occupied by pilings, and reduce the thermal and other impacts associated with stormwater washing off the old structure. Care must be taken to consider how the bridge may be removed while inflicting the least possible impacts to aquatic resources. For instance, proposals to use explosive charges would require substantial technical planning and review and should not be presumed to be available. It would be desirable to remove as much of the above-water superstructure as possible working progressively across the river and removing portions section – by section as this would eliminate the need to perform additional dredging for permitting barge access that would be required if the work was done from the water. Some of these materials may be suitable for placement at an existing artificial reef(s) in New York, New Jersey or Delaware.

We are receptive to appropriate volumes and materials being placed in this manner provided that they can be accommodated at the existing sites and cannot be recycled or otherwise repurposed.

EFH Conservation Recommendations
In order to avoid, minimize and mitigate for project impacts, it is important to utilize appropriate design selection, sequencing of key activities, and continued cooperation among the project proponents and involved state and federal resource agencies as the project proceeds.

We recommend pursuant to Section 305(b)(4)(A) of the MSA that you adopt the following EFH conservation recommendations:

1) The long span, cable-stayed design should be implemented because it would introduce the least amount of structure in and over the waterway and would take approximately 20% less time to build.

2) Prior to any construction activities, the project proponents must develop a project schedule and activity plan that includes appropriate staging of the work (such as seasonal windows and timing of extractions in deep versus shallow water habitats), and reasonable approaches to avoiding and minimizing disturbances to fishery populations that are appropriate for the project setting. This may include (but not limited to) sequencing particular activities away from portions of the river when particularly sensitive life stages may be present

3) All appropriate, practicable management practices should be observed for limiting the amount of re-suspension and dispersal of fine sediment fractions in the waterway. This includes requiring the use of environmental or closed bucket dredges, prohibiting side-casting or temporary storage of dredged material in the waterway, prohibiting unfiltered or unprocessed overflows from barges into the river, and ensuring that any transfers from local work barges to ocean disposal barges is accomplished without generating measurable plumes in the waterway.

4) Wet pours of concrete proposed in the waterway must be confined within sealed forms until cured or pre-cast members installed.

5) All paints and other substances/materials used for this project should be appropriate for use in or adjacent to aquatic habitats.

6) Demolition of the existing bridge should be conducted in the most environmentally sensitive manner practicable. Any use of explosive charges would require re-initiation of consultation and is generally discouraged. Fixed structures should be removed at the mudline, or in a manner that requires the least possible sediment disturbance. All such material should be removed from the waterway.

7) The existing bridge should be removed and properly disposed promptly after it is decommissioned and the new spans are in service.

8) A mitigation plan should be developed to compensate for permanent loss of habitat associated with all structures that are maintained after the bridge installation is completed.

9) Monitoring of the dredged areas that have been partially backfilled with stone "matting" should be required. In the event that the areas do not backfill on their own in a reasonable period of time, the contractor should be required to bring them to their original elevation by placing clean material of a suitable grain size.

10) A mitigation and restoration plan for restoring oyster reef habitat that lies in or adjacent to the construction area should be required. This plan should include provisions for relocating and maintaining any live oysters in an appropriate area during construction, and the reefs restored as soon as possible after construction is completed, and should be acceptable to the involved state and federal resource agencies, including the National Marine Fisheries Service.

We recognize that your ability to respond to our conservation recommendations for this project is complicated by the design-build scenario and our mutual reliance on adaptive management to address issues that arise when more definitive design and construction specifications are developed. Please note that Section 305(b)(4)(B) of the MSA requires you to provide us with a detailed written response to these EFH conservation recommendations, including a description of measures you adopt for avoiding, mitigating or offsetting the impact of the project on EFH. In the case of a response that is inconsistent with our recommendations, Section 305(b)(4)(B) of the MSA also indicates that you must explain your reasons for not following the recommendations. Included in such reasoning would be the scientific justification for any disagreements with us over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate or offset such effects pursuant to 50 CFR 600.920(k).

Please also note that a distinct and further EFH consultation must be reinitiated pursuant to 50 CFR 600.920(l) if new information becomes available or the project is revised in such a manner that affects the basis for the above EFH conservation recommendations.

Conclusion

Thank you for the opportunity to review and comment on the Tappan Zee Bridge Hudson River Crossing project. We look forward to continued work with you and your staff through adaptive management and future coordination events as the project design is further developed. If you have any questions concerning these comments, please contact Diane Rusanowsky at (203) 882-6504 or Diane.Rusanowsky@noaa.gov.

Sincerely,

for Louis A. Chiarella
Acting Assistant Regional Administrator
For Habitat Conservation

cc: NMFS – Boelke, Milford
USEPA – Region 2
USFWS – Cortland
USACE – NAN
USCG – Kassof
NYSDEC – New Paltz

References:

Beebe, C.A.; Savidge I.R. 1988. Historical Perspective on Fish Species Composition and Distribution in the Hudson River Estuary. In: Barnthouse, L.W.; Klauda, R.J.; Vaughan, D.S.; Kendall, R.L., eds. Science, Law, and Hudson River Power Plants: A Case Study in Environmental Impact Assessment. Am. Fish. Soc. Monogr. 4:25-35.

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July 16, 2012

In Reply Refer To:
HDA-NY

Mr. Louis A. Chiarella
Acting Assistant Regional Administrator
For Habitat Conservation
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United States Department of Commerce
55 Great Republic Drive
Gloucester, MA 01930

Dear Mr. Chiarella:

We have received your June 22 response to the Essential Fish Habitat (EFH) Assessment Report for the Tappan Zee Hudson River Crossing Project. We have reviewed the Conservation Recommendations together with the Project Team which consists of the State sponsors: the New York State Department of Transportation and the New York State Thruway Authority.

The Project Team has prepared the enclosed Technical Response to Conservation Recommendations and General Comments, in the order in which they were provided (Enclosure 1). Also enclosed with this letter are a Mitigation Proposal and the New York State Department of Environmental Conservation's response to the Mitigation Proposal, memorializing the conceptual mitigation measures (Enclosure 2).

We will continue to consult with your office throughout the project development process. If there are material changes to the project as identified in the April Tappan Zee Essential Fish Habitat Assessment Report and your June 22 Conservation Recommendations, this office will coordinate with you.

Thank you for your assistance, and please call Melissa Toni (518-431-8867) with any questions.

Sincerely,

Michael Davies, P.E.
Assistant Division Administrator

Enclosures

Enclosure 1

Technical Response to Conservation Recommendations and General Comments

July 12, 2012

NMFS Conservation Recommendations, as stated in June 22, 2012, EFH Assessment Response, and the Project Team's responses:

1. The long span, cable-stayed design should be implemented because it would introduce the least amount of structure in and over the waterway and would take approximately 20% less time to build.

Response 1:

The evaluation performed was for two specific alternatives. The January 2012 Draft Environmental Impact Statement (DEIS), and the soon to be published Final Environmental Impact Statement (FEIS) consider both a Replacement Bridge Alternative and a No Build Alternative.

For purposes of the NEPA environmental review, two options for the approach spans of the Replacement Bridge Alternative were considered—Short Span and Long Span—which differ in terms of the type of structure as well as the number of and distance between bridge piers. Both approach span options include eight travel lanes (four eastbound and four westbound) with inside and outside shoulders on both structures. The January 2012 DEIS, the January and April 2012 Biological Assessments (BAs), the January and April 2012 EFH Assessments, the June 2012 Biological Opinion (BO) and the FEIS evaluate these options and consider a range of potential environmental impacts that would be expected to occur under the Replacement Bridge Alternative, many of which go beyond those considered by NMFS in an assessment of EFH. The potential impacts of the two approach span options to aquatic resources are summarized in Table 1 and are discussed in greater detail in the DEIS, EFH assessment, soon to be published FEIS, and in the Responses to General Comments # 5 and 7. Similarly, the NEPA environmental review considered two options for the bridge's main spans over the navigable channel—Cable-stayed and Arch.

NEPA calls for an examination and consideration of impacts of the proposed action on a broad spectrum of resources. These resources include the human and natural environment but are not limited to: Essential Fish Habitat, floodplains, wetlands, community character, endangered species, historic and archeological sites, parklands, air

Table 1

Effects of Construction and Operation of the Replacement Bridge on Natural and Visual Resources

Resource Affected	Construction		Operation	
	Short Span	Long Span	Short Span	Long Span
Water quality (stormwater runoff)	-	-	Net decrease of TSS; Net increase of total phosphorus by 4.8 pounds per year (10% increase). No resulting adverse impacts to water quality or Class SB water quality standards.	Same as Short Span
USACE freshwater wetlands	Possibly up to 2 acres disturbed	Same as Short Span	Either no permanent loss of freshwater wetlands, or offset by mitigation.	Same as Short Span
NYSDEC littoral zone tidal wetlands	0.11 acres disturbed	Same as Short Span	No permanent loss of littoral zone tidal wetlands.	Same as Short Span
NYSDEC tidal wetland adjacent areas	0.01 acres disturbed	Same as Short Span	No permanent loss of tidal wetland adjacent areas.	Same as Short Span
Stream and forested wetland corridor, Westchester County	0.26 acres disturbed – upland construction of temporary access road.	Same as Short Span	No permanent adverse impact.	Same as Short Span
Open water benthic habitat	Approximately 165 acres dredged Approximately 160 acres of armoring of the dredged channel	Approximately 173 acres dredged Approximately 167 acres armoring of the dredged channel	Net loss of 0.92 acres	Net gain of 0.58 acres
Oyster habitat	13 acres removed due to dredging and armoring of the bottom. Unavoidable adverse impact.	Same as Short Span	13 acres lost due to dredging and armoring. Unavoidable adverse impact.	Same as Short Span
Benthic macroinvertebrates (suspended sediment from construction activities)	Increase in suspended sediment expected to be within tolerance levels; Minimal impacts to organisms, no adverse impacts to benthic communities in the region.	Same as Short Span	-	-

Table 1

Effects of Construction and Operation of the Replacement Bridge on Natural and Visual Resources

Resource Affected	Construction		Operation	
	Short Span	Long Span	Short Span	Long Span
Benthic macroinvertebrates (existing bridge demolition)	Loss of bottom habitat during demolition; Rapid recolonization expected. Minimal impacts.	Same as Short Span	Removal of species attached to existing bridge would be offset by colonization of new bridge. No adverse impacts.	Same as Short Span
Aquatic habitat affected by shading (Platforms)	10.38 acres covered by platform areas, access road, access road bridge.	Same as Short Span	2.44 acres covered by permanent platform.	Same as Short Span
Aquatic habitat affected by shading: Western approach	-	-	0.34-1.07 Height-to-Width ratios, compared to 0.25-0.34 for existing bridge.	0.21-0.92 Height-to-Width ratios, compared to 0.25-0.34 for existing bridge.
Aquatic habitat affected by shading: Main span	-	-	1.15-1.47 Height-to-Width ratios, compared to 0.60-1.33 for existing bridge.	1.07-1.43 Height-to-Width ratios, compared to 0.60-1.33 for existing bridge.
Aquatic habitat affected by shading: Eastern approach	-	-	1.15-1.67 Height-to-Width ratios, compared to 1.13-1.57 for existing bridge.	0.83-1.67 Height-to-Width ratios, compared to 1.13-1.57 for existing bridge.
Fish (dredging)	Dredging of approximately 165 acres would result in temporary reduction of benthic fauna; no substantial reduction of foraging opportunities.	Dredging of approximately 173 acres would result in temporary reduction of benthic fauna; no substantial reduction of foraging opportunities.	Dredged channels restored over time to original elevations by natural sedimentation; recolonization by benthic fauna.	Same as Short Span
Fish (hydroacoustic effects, based on Peak SPL level of 206 dB re 1µPa)	0.002% to 0.004% of the estimated annual riverwide standing stock of approximately 346.3 million fish.	0.002% to 0.006% of the estimated annual riverwide standing stock of approximately 346.3 million fish.	No increase in noise levels above what is generated by the existing bridge.	Same as Short Span

Table 1

Effects of Construction and Operation of the Replacement Bridge on Natural and Visual Resources

Resource Affected	Construction		Operation	
	Short Span	Long Span	Short Span	Long Span
T&E Atlantic and shortnose sturgeon (dredging)	Estimate of 3 Atlantic and 3 shortnose sturgeon per year taken in dredge during 3 years of operation. Of the 3 fish of each species, 1 of each species may be injured or killed as a result.	Same as Short Span	Deposition processes would allow benthic habitat to return to its pre-construction state. No permanent loss of foraging habitat.	Same as Short Span
T&E Shortnose and Atlantic sturgeon (hydroacoustic effects, based on Peak SPL level of 206 dB re 1µPa)	70 fish occurring within ensonified areas above Peak SPL of 206 dB re 1µPa (same # for both species), 1 of each species may be injured or killed as a result.	43 fish occurring within ensonified areas above Peak SPL of 206 dB re 1µPa (same # for both species), 1 of each species may be injured or killed as a result.	No increase in noise levels above what is generated by the existing bridge.	Same as Short Span
Visual	-	-	With noise walls: Visual impact for residences in Grandview-on-Hudson. Without noise walls: No visual impact for residences in Grandview-on-Hudson.	With or without noise walls: Visual impact for residences in Grandview-on-Hudson.

- **Notes:** No impacts to: Suspended sediment concentration; groundwater; aquifers; floodplains; vegetated intertidal wetlands; marine mammals; threatened or endangered birds; bog turtle; New England cottontail; or Indiana bat; topography, geology and soils.

quality, wildlife habitat, etc. In accordance with the NEPA decision making process, FHWA must consider a range of factors that balance the transportation needs with the effects to the full spectrum of human and natural environmental resources. For this project FHWA has evaluated and considered the environmental effects on a broad spectrum of resources for the proposed action and, through the options presesented, assessed the worst case impacts for the Replacement Bridge Alternative.

The Documentation has also shown that each of the design options have environmental effects on a similar scale. As indicated in Table 1, the Short Span would result in a net loss of 0.92 acres of bottom habitat while the Long Span Option would result in a net gain of 0.58 acres of bottom habitat. The net loss/gain calculation takes into account the amount of bottom habitat that will be restored once the old bridge has been removed. However, the Long Span Option would require approximately 8 more acres of dredging than would the Short Span Option, of which 7 acres would be armored. The number of shortnose and Atlantic sturgeon predicted to be physiologically affected from pile driving is low for both options but slightly higher for the Short Span Option. More importantly, NMFS projected that only one shortnose and one Atlantic sturgeon would be subject to mortality for either bridge replacement option. Potential hydroacoustic effects to other fish species are approximately the same but may be slightly higher with the Long Span Option. As indicated in Table 1, for the other aquatic resources potentially affected, there is little or no difference in the projected impacts from either option. Neither option rises to the level where one is clearly different from the other in terms of population or community impacts, potential for jeopardizing a species, or temporary or permanent habitat alteration.

The Design Build process will enable the Design-Builder to use innovation to further avoid, minimize and mitigate environmental effects and promote efficiency in cost and construction duration. The design options presented in the environmental documentation provide an envelope for the possible final design of the Replacement Bridge Alternative. These options represent the extent of work that is expected to be reflected in the proposals that are received out of the design build process. The options are intended to demonstrate the possible range of impacts of the Replacement Bridge Alternative and to identify potential mitigation measures.

There are a number of EPCs (See Response to General Comment #2) that will be implemented as part of the project to minimize potential impacts to aquatic resources including EFH and EFH species. Furthermore, we have committed to mitigate for unavoidable impacts associated with either option, whether permanent or temporary, that may occur as a result of bridge construction and operation. We are committed to continued coordination and in the event new information becomes available or the project is revised in such a manner that affects the basis for these Conservation Recommendations, we will contact your office to determine the need to reinitiate consultation.

2. Prior to any construction activities, the project proponents must develop a project schedule and activity plan that includes appropriate staging of the work (such as seasonal windows and timing of extractions in deep versus shallow water habitats), and reasonable approaches to avoiding and minimizing disturbances to fishery populations that are appropriate for the project setting. This may include (but not limited to) sequencing particular activities away from portions of the river when particularly sensitive life stages may be present.

Response 2: The DEIS, BO, and soon to be submitted FEIS describe the schedule for construction activities indicating staging of the work. The project has incorporated measures into the project schedule and developed reasonable approaches in consultation with NMFS and NYSDEC to avoid and minimize disturbances to fishery populations. Several of these measures are expressed in the EPCs identified in the response to General Comment #2, and are likely to become approval conditions for the project. These measures address many of the points raised in the above comment with respect to timing of activities such as dredging and pile driving and are considerate of sensitive life stages and fish movement patterns through the Tappan Zee region. In addition, the BO listed a number of Reasonable and Prudent Measures (RPMs) which NMFS considers necessary and appropriate. The project sponsors have agreed to implement the RPMs requested by NMFS in the BO (See also Response to General Comment #2).

3. All appropriate, practicable management practices should be observed for limiting the amount of re-suspension and dispersal of fine sediment fractions in the waterway. This includes requiring the use of environmental or closed bucket dredges, prohibiting side-casting or temporary storage of dredged material in the waterway, prohibiting unfiltered or unprocessed overflows from barges into the river, and ensuring that any transfers from local work barges to ocean disposal barges is accomplished without generating measurable plumes in the waterway.

Response 3: The EPCs that are identified in General Comment #2 and the instructions included in the RFP provided to the list of potential contractors include many of the recommendations articulated in Conservation Recommendation #3. Furthermore, the FEIS will indicate that these recommendations will be met. For example, an environmental bucket is proposed for all dredging activities, there will be no side-casting or storage of dredged material in the river, any water accumulated during the dredging process will be allowed to settle for a sufficient duration prior to discharge, and measures will be incorporated to ensure that elevated sediment plumes are not introduced into the waterway. The DEIS, EFH assessment and BO all conclude that the levels of increased turbidity and suspended sediment resulting from dredging, pile driving, and bridge demolition would have little effect on water quality, or on fish and benthic resources. In referring to potential effects to sturgeon the BO states that, "it is likely that the effects of increased suspended sediment and turbidity will be insignificant."

4. Wet pours of concrete proposed in the waterway must be confined within sealed forms until cured or pre-cast members installed.

Response 4: This recommendation has been incorporated into the RFP and the amendments that have been provided to the list of potential contractors for the project.

5. All paints and other substances/materials used for this project should be appropriate for use in or adjacent to aquatic habitats.

Response 5: This recommendation has been incorporated into the RFP and the amendments that have been provided to the list of potential contractors for the project.

6. Demolition of the existing bridge should be conducted in the most environmentally sensitive manner practicable. Any use of explosive charges would require re-initiation of consultation and is generally discouraged. Fixed structures should be removed at the mudline, or in a manner that requires the least possible sediment disturbance. All such material should be removed from the waterway.

Response 6: The potential contractors have all been made aware that blasting will not be allowed under the permits that are being requested for the project. Demolition of the existing bridge will follow methods outlined in the DEIS and FEIS which are consistent with this Conservation Recommendation.

7. The existing bridge should be removed and properly disposed promptly after it is decommissioned and the new spans are in service.

Response 7: This recommendation has been incorporated into the RFP and the amendments that have been provided to the list of potential contractors for the project.

8. A mitigation plan should be developed to compensate for permanent loss of habitat associated with all structures that are maintained after the bridge installation is completed.

Response 8: FHWA is committed to minimizing and mitigating for adverse project impacts. This commitment has been articulated in several documents including the January, 2012 DEIS, January and April 2012 BAs, the January and April 2012 EFH Assessments, the June 2012 BO and the soon to be submitted FEIS. Please refer to the Attachment 2 to the cover letter: Proposal from AKRF to NYSDEC: Rationale for Developing and Calculation of Mitigation, dated June 20, 2012 and the NYSDEC's response memorializing the mitigation proposal, dated July 3, 2012, which discusses the conceptual compensatory mitigation and net conservation benefit plan has been agreed to by the project sponsors for mitigation details.

9. Monitoring of the dredged areas that have been partially backfilled with stone "matting" should be required. In the event that the areas do not backfill on their own in

a reasonable period of time, the contractor should be required to bring them to their original elevation by placing clean material of a suitable grain size.

Response 9: The project sponsors are prepared to conduct a sediment condition and benthic study following project construction to determine sediment conditions and benthic recovery status. The project sponsors have also agreed to mitigate for the loss of habitat associated with the dredging and armoring, even though such losses are likely to be temporary.

10. A mitigation and restoration plan for restoring oyster reef habitat that lies in or adjacent to the construction area should be required. This plan should include provisions for relocating and maintaining any live oysters in an appropriate area during construction, and the reefs restored as soon as possible after construction is completed, and should be acceptable to the involved state and federal resource agencies, including the National Marine Fisheries Service.

Response 10: As indicated in the Responses to Conservation Recommendation #8 and General Comment #12, mitigation measures to offset potential permanent impacts to up to 13 acres of oyster habitat have been agreed to by the project sponsors. The oyster restoration effort calls for reintroduction of oysters in or near the construction area after construction is completed. The project sponsors will inform and coordinate with NMFS and other federal agencies as the oyster restoration plan develops.

NMFS General Comments, as stated in June 22, 2012 EFH Assessment Response, in order of appearance within the letter, and the Project Team's reponses:

Comment 1: Since this project is progressing under a design-build scenario, a final design has not been established and the EFH assessment considers several generic alternatives. Each one of these alternatives has implications for the nature and duration of project impacts incurred during construction and for the life of the project.

Response: The evaluations performed were for two specific, rather than generic, alternatives. The January, 2012 Draft Environmental Impact Statement (DEIS), and the soon to be published Final Environmental Impact Statement (FEIS) consider both a Replacement Bridge Alternative and a No Build Alternative. The January 2012 DEIS, the January and April 2012 Biological Assessments (BAs), the January and April 2012 EFH Assessments, the June 2012 Biological Opinion (BO) and the FEIS evaluate these options and consider a range of potential environmental impacts that would be expected to occur under the Replacement Bridge Alternative.

Comment 2: We have determined that impacts associated with bridge construction and removal may adversely affect living aquatic resources and their habitats.

Response: We acknowledge that there will be impacts in the January 2012 DEIS, the January and April 2012 BAs, the January and April 2012 EFH Assessments, the June 2012 BO and the soon to be submitted FEIS. Potential impacts associated with project activities that could affect living resources will be minimized by the Environmental Performance Commitments (EPCs) as described in the NEPA documentation. Many of these EPCs are expected to become approval conditions to ensure protection of aquatic resources including EFH. These EPCs include:

- Driving the largest [3 and 2.4 meters (m) (10 and 8 foot (ft))] diameter piles within the first few months of the project thereby limiting the period of greatest potential impact.
- Using cofferdams and silt curtains, where feasible, to minimize discharge of sediment into the river.
- Using a vibratory pile driver to the extent feasible (i.e., all piles will be vibrated at least to 36.6m (120ft) depth or to vibration refusal) particularly for the initial pile segment.

- Using bubble curtain, cofferdams, isolation casings, Gunderboom, or other technologies to achieve a reduction of at least 10 dB of noise attenuation.
- Using the results of the Hudson River site specific Pile Installation Demonstration Project (PIDP) to inform the project on the effectiveness of BMP technologies for reducing sound levels, and implementing BMPs to achieve maximum sound reduction.
- Limiting the periods of pile driving to no more than 12-hours/day.
- Limiting driving of 8 and 10 ft piles with an impact hammer within Zone C [water depths 5.5-13.7 m (18-45 feet)] to 5 hours per day during the period of spawning migration for shortnose and Atlantic sturgeon (April 1 to August 1).
- Maintaining an acoustic corridor where the sound level will be below an SEL_{cum} of 187 dB re 1 $\mu Pa^2 \cdot s$ totaling at least 5,000 ft at all times during impact hammer pile driving. This corridor shall be continuous to the maximum extent possible but at no point shall any contributing section be smaller than 1,500 ft.
- Pile tapping (i.e. a series of minimal energy strikes) for an initial period to cause fish to move from the immediate area.
- Development of a comprehensive monitoring plan. Elements would include:

- Monitoring water quality parameters such as temperature, salinity, and suspended sediment concentrations in the vicinity of the pile driving.
- Monitoring fish mortality and inspection of fish for types of injury, as well as a program for determining contaminant levels in dead sturgeon through tissue analysis methods.
- Monitoring the recovery of the benthic community within the dredged area at the end of the construction period.
- Supporting the Atlantic and shortnose sturgeon sonic tagging program through coordination with NMFS and NYSDEC. This may include placement of telemetry receivers in the project area.
- Monitoring predation levels by gulls and other piscivorous birds, which would indicate that they are finding an increased number of dead or dying fish at the surface.
- Preparing a Standard Operating Procedures Manual outlining the monitoring and reporting methods to be implemented during the program.

- Dredging would only be conducted during a three-month period from August 1 to November 1 for the three years of the construction period in which dredging would occur, in order to minimize the potential for

impacts to anadromous fish migration, including shortnose and Atlantic sturgeon, as well as migration by other fish species;

- Use of an environmental bucket with no barge overflow unless the contractor develops a method of treating the overflow water to ensure that any discharge does not result in a substantial visible contrast with the receiving water.
- Armoring of the channel to prevent re-suspension of sediment during the movement of construction vessels, installation and removal of cofferdams, and pile driving.

In their BO, NMFS agrees with the conclusions articulated in the DEIS and BA regarding the temporary or minimal extent of impacts due to project activities on shortnose and Atlantic sturgeon survival, movement, and their ability to forage in the Hudson River. The BO identifies additional Reasonable and Prudent Measures (RPMs) to be implemented to further ensure the protection of shortnose and Atlantic sturgeon, as well as the greater fish community. The results of these actions will improve the understanding of underwater noise and dredging impacts on fishes; specifically the extent of underwater noise and the behavioral response exhibited by sturgeon, and may allow future projects to further minimize environmental impacts due to this greater understanding of effects of underwater noise and mechanical dredging. The RPMs articulated in the BO, which NMFS considers necessary and appropriate, have been agreed to by the project sponsors, and will also be discussed in Chapter 18 of the FEIS.

As indicated above, the January, 2012 DEIS, January and April 2012 BAs, the January and April 2012 EFH Assessments, and the June 2012 BO all conclude that except for the loss of up to 13 acres of oyster habitat, impacts resulting from the project, such as those resulting from pile driving, dredging and armoring activities would largely be of a temporary nature. FHWA is committed to mitigating for adverse project impacts, and the Project Sponsors and NYSDEC have come to agreement on a conceptual compensatory mitigation and net conservation benefit plan (Attachment 2 to the cover letter).

Comment 3: Your EFH assessment updates these works through review of selected literature and field studies specifically undertaken for the Tappan Zee Crossing project in 2007-2008. This field effort indicates that 25 species, predominantly diadromous fishes and those capable of withstanding a wide tolerance of salinities, occur in the Tappan Zee reach of the Hudson.

Response: This comment refers to the number of fish species collected in the 2007/2008 aquatic sampling program, rather than the 16 EFH species designated for the Hudson River. Of the sixteen, only nine have been reported in the Tappan Zee region based on a review of ten years of Utilities fish sampling surveys. Three of these nine species were also collected in the 2007/2008 field studies.

Comment 4: Depending on the time of year, it is possible that a variety of resident and diadromous fishes, crustaceans, bivalve mollusks, and benthic invertebrates may be encountered in either location as they feed, rest, spawn, complete nursery life stages, or take refuge in the winter. Life stage, species, and a host of other considerations must be taken into account for how the final project design, installation plan and use would affect living aquatic resources.

Response: The studies that contributed to the preparation of the January, 2012 DEIS, January and April 2012 BA, the January and April 2012 EFH Assessments, the June 2012 BO and the soon to be submitted FEIS went to great lengths to consider the various biological resources including fish and benthic communities and habitats found within the study area. Results of multiple investigations including: field studies undertaken specifically for the project that collected fish, benthic, sediment, and water quality data; hydroacoustic modeling; sediment transport modeling; analysis of other data from other studies including long-term fishery monitoring data collected by the Hudson River Utilities; and a comprehensive review of the literature all contributed to thorough analyses of the effects of project construction and operational activities on the various life stages, habitat preferences such as spawning and nursery areas, and relevant life history considerations of the biological resources described in the above comment. The analyses that were performed considered a variety of potential impacts due to the Replacement Bridge Alternative including: hydroacoustic effects, dredging and armoring effects, potential for loss of forage habitat, potential for vessel strikes, effects of sediment resuspension due to dredging and pile driving and bridge demolition. The results of these efforts have been summarized in various documents including the, BA, NMFS' BO and the EFH assessment. The DEIS, FEIS, BA, EFH assessment and BO list numerous EPCs and the BO adds several RPMs which will require monitoring that the project sponsors have agreed to implement to minimize effects to aquatic resources which would include EFH and EFH species. Furthermore, the project sponsors have agreed to mitigate for permanent and temporary impacts including those from

dredging and hydroacoustic effects as indicated in other responses to comments.

Comment 5: Based on the design alternative chosen, impacts to fish habitat will vary based on the amount of structure that would be constructed in and over the waterway, and how long it would take to complete the work. As disclosed in your analysis, the short span approach would result in more structure and permanent loss of water column and benthic surface than the long span approach, and would require approximately a year longer to build.

Response: The comment is referring to the evaluation of the bridge options rather than the alternatives which consider both the No Build and Replacement Bridge Alternatives. While it is true that the net change in structure will add marginally more water column and benthic surface under the Short Span Option (net loss of 0.9 acres of bottom habitat vs. a net gain of 0.6 acres of bottom habitat under the Long Span Option) this potential difference is likely to be offset by other environmental advantages offered by the Short Span Option (Table 1). First, it is anticipated that the Long Span Option would require about 8 acres more dredging than would the Short Span Option, and of that amount 7 acres would be armored. Second, the range of hydroacoustic effects to fish was predicted to be low for both options but the upper end of the effects range was projected to be higher under the Long Span Option (except for sturgeon). Third, for most other Replacement Bridge activities that could result in effects to fish habitat, the potential impacts of each option are equivalent (e.g. construction of the permanent platform, stormwater effects on water quality) (Table 1). Furthermore, while the BO indicates that a greater number of sturgeon could potentially be physiologically affected during pile driving under the Short Span Option, the take numbers established by NMFS in assessing projected losses to injury or mortality associated with pile driving and dredging effects were extremely low and equivalent for both options. Finally, since permanent or temporary impacts to EFH and other species associated with either option will be mitigated for, and neither option offers a clear environmental advantage over the other, it is prudent and desirable to provide the potential contractors with some latitude in their selection of the option to be constructed.

Comment 6: Similarly, the arch style main span would entail a larger superstructure over the waterway than would a cable stay design. We anticipate that the new spans would potentially cast a greater shadow than the existing structure and that the shading from an arched span would likely be wider than from a cable-stayed span.

Response: While it is true that in general an arch style span entails a larger superstructure, the deck is the primary component of the main span that affects shading of aquatic habitat. The incremental increase in shading impact associated with the superstructure is expected to be minimal for either main span option. Furthermore, shading over portions of the river cast by the superstructure would be expected to occur for only a part of the day. If the shading impact associated with the superstructure is substantially increased over the impact disclosed in the NEPA documents FHWA will discuss the issue with NMFS.

Comment 7: Reducing the number of support piers by implementing the long span option also has the advantage of avoiding and minimizing acoustic impacts to fishes that could alter their essential behaviors, lead to temporary or permanent physical damage, or result in mortality.

Response: The comment is not entirely correct. The analysis of potential impacts to fish presented in the FEIS will indicate that the hydroacoustic effects to fish (other than sturgeon) would be low and similar for each option, but a greater number of fish could be physiologically affected by pile driving with the construction of the Long Span Option. The analysis was based on the construction schedule for each option and the densities of fish that occurred in the region based on 10 years of monitoring data.

It should be noted that NMFS in their BO concluded that for both options, the total number of individual sturgeon potentially affected by elevated noise levels is projected to be much lower than was originally predicted in the DEIS and BA. Furthermore, the results of the PIDP demonstrated that the modeling used for the fish analysis in the DEIS, BA, BO, EFH assessment, and soon to be submitted FEIS is conservative because distances to the noise thresholds measured in the field are considerably less than predicted by the models used in the documents. Finally the PIDP demonstrated that vibratory hammers could be used to drive a greater portion of the piles than was previously anticipated, and the models conservatively assumed that the entire pile length would be driven using impact hammers.

While the Short Span Option will drive more piles, the same number of the largest piles (10 ft diameter) which are those with the greatest potential for hydroacoustic impacts to EFH species, would be driven for both the Short and Long Span Options. About 70% of the additional piles in the Short Span Option would be the 4 ft diameter piles. Tests conducted during the PIDP indicated that the 206 db peak SPL criterion

did not extend beyond 7.5 to 19.6 ft from the 4 ft piles. Therefore, the driving of the additional 4 ft diameter piles for the Short Span Option would not be expected to have an incremental effect beyond the immediate area where the pile driving is occurring.

In the BA we estimated that the pile driving would result in physiological effects to 796 shortnose sturgeon for the Short Span and 603 for the Long Span. The BA also estimated that the potential for onset for mortality for 89 fish for the Short Span and 67 for the Long Span. In the BO where NMFS used the 206 dB SPL peak criterion that they determined was more appropriate, they estimated that pile driving would result in physiological effects to 70 shortnose sturgeon for the Short Span and 43 for the Long Span. They also estimated that only one shortnose sturgeon would suffer from serious injury or mortality due to hydroacoustic effects for either span option.

In the BA we estimated that the pile driving would result in physiological effects to 213 to 279 Atlantic sturgeon for the Short Span and 162 to 313 for the Long Span. The BA also estimated that the potential for onset for mortality for 49-55 Atlantic sturgeon for the Short Span and 40-60 for the long Span. In the BO where NMFS used the 206 dB SPL peak criterion, they estimated that pile driving would result in physiological effects to 70 Atlantic sturgeon for the Short Span and 43 for the Long Span. They also estimated that only one Atlantic sturgeon would suffer from serious injury or mortality due to hydroacoustic effects for either span option.

For the other most abundant Hudson River species that were evaluated using the SPL peak criterion, the FEIS will report that the numbers of fish that would be affected will be low (two orders of magnitude lower than predicted in the DEIS).

Comment 8: These impacts most likely would have mid-to long-term consequences depending on the individual species that are displaced or otherwise affected by this conversion of bottom type. Similarly, the deepened areas would be expected to support a different species or life state assemblage of fishes, depending upon their preference for littoral or pelagic waters. Species or life stages that prefer deeper water would benefit from the deepening at the cost of those which prefer or require shallow water habitat.

Response: Depths greater than 16 ft would not need to be dredged. The temporary impacts associated with deepening of the access channels will be mitigated for. See Response to General Comment #2, and Responses to Conservation Recommendations #8, #9, and #10.

Comment 9: Bridge piers and protection would interrupt local flow and change local erosion and accretion patterns from current ambient conditions.

Response: Either option would result in better circulation patterns through this portion of the river as there will be greater spacing and a net reduction in the number of piles in the river after demolition of the existing bridge. Erosion and accretion at the piers will still occur but there would be fewer piers than with the existing bridge.

Comment 10: Depending on how these members are installed, the materials from which they are constructed, and what is necessary to maintain them, all have potential to affect aquatic life both during and after construction. For example, installation of pilings using impact hammers would create acoustic signals that could adversely affect a variety of fishes if the sound meets or exceeds thresholds that could create injuries.

Response: The installation methods for the piles and the materials from which they are constructed are described in the DEIS and in the EFH assessment. Since the submittal of the DEIS and the EFH assessment new information has been developed as part of the PIDP program. This information indicates that the elevated sound levels produced by both impact and vibratory hammers did not extend as far in the field testing as was predicted by the JASCO models used in the DEIS, BA, EFH assessment, BO, and soon to be submitted FEIS. Furthermore, based on observed substrate conditions, more of the pile driving will be able to be accomplished using vibratory rather than impact hammers than was originally anticipated. As vibratory hammers typically produce 15 to 20 dB less noise than impact hammers, and all of the analyses presented in the DEIS, BA, BO, and EFH assessments assumed impact hammering for 100% of the time that the piles were driven, the numbers of potentially affected fish, which would include EFH species, will be considerably less than what was predicted by those documents.

NMFS in their BO identified the Peak SPL criterion as the appropriate measure to evaluate hydroacoustic effects to fish for this project because the cumulative sound metric (SELcum) assumes that a fish would have to remain in the ensonified area for the entire duration of the pile driving, which is an unrealistic assumption. Using the Peak SPL metric, NMFS in the BO indicates that the potential risk of physiological effects to sturgeon is reduced by an order of magnitude from the estimates presented in the DEIS and the BA. Similarly, the FEIS will report that far fewer individual bay anchovy, striped bass, weakfish and other species collected in the Tappan Zee region will be subject to hydroacoustic

effects than previously calculated and reported in the DEIS, BA, and EFH assessment. See also Response to General Comment #7.

Comment 11: If the pilings are composed of, or coated with, concrete, eventual cracks and spalling would have to be repaired. Some of the materials used to exact these repairs could be injurious to aquatic life.

Response: The external material for the piles to be used for the Replacement Bridge Project will be hollow steel. The piles will be filled with concrete that will be poured in forms that are designed for a hundred year lifespan. Routine inspection and maintenance for the piles, pile caps and other bridge structures will follow standard procedures to ensure that spalling does not occur. Improvements in materials and advancements in technology over the last 60 years will greatly reduce the maintenance needs of the Replacement Bridge when compared to the current maintenance requirements of the existing bridge structure.

Comment 12: It is important to highlight that the proposed construction footprint would impact intertidal and subtidal areas including relict or active American oyster beds. Oyster beds, whether relict or active, are valuable as cover or feeding habitat for a variety of aquatic organisms including juvenile fishes and crustaceans. Hard bottom of this nature also may serve as spawning habitat for certain species that place demersal eggs. Active oysters have ecological and cultural value for this region and should be preserved. We consider any live oysters that are present to be particularly important aquatic resources because they are remnants of what was an important regional source of seed oysters prior to being nearly extirpated by hurricane damage in 1955 (Stanne et al, 2007). Because these remaining oysters are uniquely adapted to the ecological conditions in this river reach, we consider them important potential founding stock for future restoration or enhancement activities should they be contemplated. For oyster mitigation, it may be desirable to hold adequate broodstock in reserve to culture spat adapted to local conditions that could be deployed after all the construction is completed over a greater series of strata to increase the likelihood of restoring or enhancing these important filter feeders.

Response: The project sponsors and NYSDEC have reached agreement on a conceptual mitigation and net conservation benefit plan which includes restoration of 13 acres of hard bottom/shell oyster habitat to address dredging related project impacts to the benthic community.

Comment 13: Preliminary sediment testing results reported in your EFH assessment indicate that certain contaminants (e.g., heavy metals, pesticides,

polychlorinated biphenyls, polycyclic aromatic hydrocarbons, and dioxins) are present in what the State of New York considers moderate to high concentrations capable of incurring chronic or acute toxicity responses in aquatic life. Further testing is ongoing to determine whether all or a portion of the sediment that must be dredged to accommodate construction and support vessels will be eligible for ocean placement at the HARS and what measures must be observed to adequately protect aquatic habitats in the Hudson River.

Response: The U.S. Army Corps of Engineers (USACE) and U.S. Environmental Protection Agency (USEPA) have indicated that all of the sediments to be dredged are suitable for placement at the HARS.

Comment 14: With regards to ocean disposal of dredged material, only sediments which have been tested for potential ocean placement and have been determined to have no unacceptable toxicity or bioaccumulation in test systems may be placed at the HARS. Such materials are used to cap areas where more contaminated materials were placed historically in an effort to restore the habitat at HARS. The HARS region has been designated as EFH for multiple species and life stages of federally managed fishery resources. Remediation of the HARS would benefit these resources by capping historically placed material that exceeds current action levels and effectively isolating them from bioturbation. However, we recommend that the contractor or project proponents develop an alternate sediment placement plan to cover the eventuality that all, or a portion of the dredged material fails to meet HARS criteria or to address other contingencies that may arise during construction. We do not object to upland placement; however, any proposed placement in aquatic habitats other than HARS will require re-initiation of our consultation.

Response: The USACE and USEPA have indicated that all of the sediments to be dredged are suitable for placement at the HARS.

Comment 15: Care must be taken to consider how the bridge may be removed while inflicting the least possible impacts to aquatic resources. For instance, proposals to use explosive charges would require substantial technical planning and review and should not be presumed to be available.

Response: The DEIS BA, BO, and EFH assessments all discuss the demolition methods to be used in dismantling the existing bridge and indicate that blasting will not be permitted. The FEIS will also state that no blasting of the existing structure will occur and will provide additional analyses of impacts of sediment resuspension associated with bridge demolition. The RFP issued to the potential contractors also states that explosives are not to be included in their proposals for bridge construction or demolition.

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RATIONALE FOR DEVELOPING AND CALCULATION OF MITIGATION COSTS

For the Tappan Zee Hudson River Crossing Project

6/20/2012

All of the mitigation measures indicated below are drawn from a list of potential mitigation projects identified by New York State Department of Environmental Conservation (NYSDEC).

Item I. Benthic Community

1. Loss of up to 13 acres of oyster habitat.

Rationale for Mitigation: The Draft Environmental Impact Statement (DEIS) identifies the potential loss of up to 13 acres of hard bottom/shell oyster habitat due to the dredging and armoring. NYSDEC has expressed the view that 2:1 is the appropriate level of mitigation for the potential loss of oyster habitat. We believe there is a basis for questioning the need for 2:1 mitigation in recognition of the limited value of the existing oyster habitat. For the most part these oyster habitats do not exhibit the density of organisms generally associated with fully functioning oyster bars. Nevertheless, we are prepared to provide for 26 acres of oyster habitat restoration based on the cost estimates below.

The Hudson Raritan Estuary Comprehensive Restoration Plan (2009) indicated a median estimate of about $52,500/acre (See Tables 1 and 2) for full oyster restoration. A U.S. Army Corps of Engineers document (2003) priced the cost of constructing a stocked oyster reef at $30,000/acre (Table 2). A study in Delaware Bay in 2009 estimated the cost of oyster bed restoration to be on the order of $20,000/acre. Since the Hudson Raritan Estuary Comprehensive Restoration Plan estimates are more current and targeted to local conditions, the higher $52,500 estimate is being used for mitigation purposes.

Approximate Mitigation Costs:
At 1:1 –$682,500
At 2:1 - $1,365,000

2. Approximately 157 additional acres of bottom habitat (after excluding 13 acres of oyster habitat within the 170 acre access channel) will be dredged and most of it armored. Of this amount, 0.11 acres is DEC littoral zone. Also, approximately 0.01 acres of NYSDEC wetlands adjacent area will be lost due to construction activities.[1]

Rationale for Mitigation: The DEIS identifies the impact of the dredging as temporary and it is not reasonably expected to have an adverse long-term impact upon the overall benthic community. NMFS in their Biological Opinion (BO) concurs with this view and states that, "Since much of the benthic community exists in the upper 10 cm of sediment as demonstrated from benthic samples taken throughout the Hudson River, (Versar (2003), benthic recovery should begin quickly, particularly in the soft bottom sediments." NMFS goes on to say that the temporary loss of the access channel would represent a minor fraction of similar available habitat throughout the Tappan Zee region and would not be expected to substantially reduce foraging opportunities for the river's sturgeon populations.

NYSDEC does not dispute that the DEIS supports these general conclusions, but is of the opinion that the scale and duration of these temporary impacts are sufficient to be considered as significant adverse impacts to the estuarine environment. As such, NYSDEC has indicated the need for mitigation. NYSDEC has identified certain candidate mitigation measures for the temporary loss of the bottom habitat associated with the dredging. Despite our differences of opinion with NYSDEC regarding these temporary impacts, we are nevertheless amenable to proceeding with mitigation to address them.

Discussions with NYSDEC have indicated that areas in the upper estuary may offer opportunities for secondary channel restoration. Two areas that offer these restoration opportunities are Gay's Point and Rattlesnake Island because the land is largely owned or controlled by the state. Removal of sediment that is plugging up the channel at one end of Gay's Point and removal of rocks at Rattlesnake Island to provide better flow is needed. Improving flow through channel restoration activities would greatly improve aquatic habitat for areas that are now subject to low dissolved oxygen, high water chestnut densities, and are currently poor fish habitat. These sites, if restored, can serve as a refuge for juvenile migratory fish including shad and river herring.

The initial task would be to perform a baseline study for each area to determine the existing conditions for shape and size of channel, average and low flow conditions, bottom type, and biological resources. Analyses to determine the desired flows, and the volume of dredged material to be removed to achieve desired flow conditions would need to be performed. Sediments would also need to be tested for chemical composition to determine disposal alternatives. Once the baseline study is completed, a decision can be made by NYSDEC whether to proceed with the channel improvement projects or implement other potentially more cost-effective measures, such as the introduction of fish ladders or removal of barriers to fish migration.

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[1] The mitigation being provided for the 157 acre loss of bottom also encompasses any provision for permanent gain or loss of bottom habitat associated with the change in pile footprint – Ranges from gain in habitat of 0.58 acres for Long Span Option to loss of 0.92 acres for Short Span Option due to either removal or increase in fill associated with old and new pile footprints.

Mitigation Costs:
A review of the literature has indicated a range of costs associated with the economic value of ecosystem properties and services provided by the estuarine ecosystem and bottom communities. We have determined reasonable estimates based on approaches using both estuarine ecosystem value estimates and information from natural resources damage settlements. These approaches indicated losses on the order of $1.4M to $1.8M for the affected 157 acres (excluding the 13 acre oyster habitat) of bottom resources. The methodology used for the calculations in developing these estimates is presented in Table 2 and relies on the four highlighted studies in the table. A midpoint of $1.6M between the range of $1.4M and $1.8M was established as the mitigation cost for impacts to the affected bottom habitat.

Based on the approaches suggested by NYSDEC, mitigation for the impact to the benthic community could be achieved by providing a total of $1.6 million for the Gay's Point and/or Rattlesnake Island projects. However, Phase I feasibility studies will need to be performed for these efforts and NYSDEC may conclude that that it is not cost effective to continue with the channel restoration projects. If this is the case, the funds remaining after the Phase I feasibility studies are concluded may be diverted to efforts that remove fish barriers to migration. Such barriers are located along several of the Hudson River tributaries and their removal, and/or the introduction of fish ladders could act to improve spawning success of certain anadromous fish species.

Item II. Open Water Community and Wetlands

1. Temporary Platform Overwater Coverage. Area of 10.38 acres of habitat will be shaded due to temporary platform on East and West sides of Bridge. Of that amount, 0.13 acres is located in littoral zone, balance in deeper water. Platforms are to be removed at end of construction period.

2. Permanent Platform Overwater Coverage. Area of 2.44 acres will be shaded due to permanent platform. No acreage is in littoral zone. Platform to remain but will be built on piles rather than on fill as described in the DEIS.

3. Resuspension of sediments

Rationale for Mitigation: DEC has suggested green infrastructure and wetland restoration for potential impacts to the open water community. It is our view that impacts to the open water community are of a minimal and/or temporary nature for the following reasons:
1. The temporary platforms will be removed at the conclusion of the construction period and piles cut at the mudline. Furthermore, the areas under the temporary and permanent platform would still be of considerable, albeit somewhat reduced, habitat value to fish and other resources using the area for foraging and movement during the construction period.
2. The permanent platform would now be built entirely on piles rather than partially on fill as discussed in the DEIS, thereby reducing the identified loss of habitat. Shading impacts would be inconsequential, considering the change in shading effects between the existing and new bridge.
3. The DEIS concluded that resuspension of sediments would not create an adverse impact to water quality or biological resources. This finding is strongly supported by the recent additional

analysis of suspended sediment and suspended toxic impacts (Hayes 2012), which was prepared and submitted subsequent to the preparation of the DEIS.

In the draft BO, NMFS also indicates that any effects of increased turbidity or suspended solids will be insignificant and that any shading effects to sturgeon from the permanent platform and the bridge "are extremely unlikely". Again, NYSDEC does not dispute that the DEIS supports these general conclusions, but is of the opinion that the scale and duration of these impacts are sufficient to be considered as significant adverse impacts to the estuarine environment. As such, NYSDEC has indicated the need for mitigation. Despite our differences of opinion on this point, we are nevertheless amenable to proceeding with mitigation to address these effects.

Discussions with NYSDEC have indicated that restoration efforts in Piermont Marsh and green infrastructure improvements would be desirable. Piermont Marsh is currently 90% dominated by the common reed phragmites, an undesirable invasive marsh plant. A few areas of the salt meadow with other marsh plant flora still remain. The goal of the effort would be to protect the existing marsh from being taken over by phragmites, and then in a second phase push the phragmites back to a less dominant position.

We have identified a few candidate locations within Piermont Marsh that on initial review, meet the criteria for high restoration potential in that they are:
- Isolated from adjacent monotypic stands by creeks or uplands, which can prevent phragmites rhizomes from spreading into the treated area.
- Relatively close to the mainstem Hudson as salinity can favor establishment of desirable species
- Close to hard surface roads for construction/restoration access (no boats or amphibious equipment needed)
- A possible opportunity to provide public access or educational outreach.

An initial feasibility study would need to be performed to develop the approach for restoration which could include: planting, earth moving, and/or a spray program. Surveyed spot elevations tied to a known vertical datum and accurate tidal information will be required to move the project from a planning to implementation phase. NYSDEC has indicated that some of this initial feasibility work may have already been performed.

Mitigation Costs:
The Applicant is proposing that the equivalent of 3-5 acres of tidal marsh restoration/creation/enhancement be provided as mitigation. This could be doubled if we divert some funds identified for green infrastructure to the wetland restoration effort. Estimates for this wetland effort range from $135,000 to $750,000/acre (Table 1). Assuming the cost of land procurement is $100,000/acre and that the area to be restored will not need to be purchased (e.g. Piermont Marsh), the cost of restoration ranges from $35,000 to $650,000/acre.

Using a mid-point of $342,500/acre, yields a mitigation cost of $1,027,500 for three acres. At $200,000 an acre, which may be a more realistic cost, we would be able to restore about 5 acres of marsh. NYSDEC also listed a number of green infrastructure projects whose implementation could serve as mitigation for impacts to the open water community. The costs of these infrastructure projects are estimated in Table 1 and could be substituted for, or done in

conjunction with the wetland restoration project. We have provided for an additional $1,000,000 of green infrastructure projects (or additional $1,000,000 of wetland mitigation) in our estimate.

Item III. Atlantic and Shortnose Sturgeon

Rationale for Mitigation:
The DEIS, and the Biological Assessment (BA) developed methodology to forecast the number of shortnose and Atlantic sturgeon at potential risk to hydroacoustic effects associated with pile driving. Since that time new information has been developed as part of the PIDP program. This information indicates that the elevated sound levels produced by both impact and vibratory hammers did not extend as far in the field testing as was predicted by the JASCO models. Furthermore, based on observed substrate conditions, more of the pile driving will be able to be accomplished using vibratory rather than impact hammers than was originally anticipated. As vibratory hammers typically produce 15 to 20 dB less sound than impact hammers, and all of the analyses presented in the DEIS, and the BA, assumed impact hammering for 100% of the time that the piles were driven, the numbers of potentially affected sturgeon will be considerably less than what was predicted by the modeling efforts in the documents submitted to NYSDEC.

NMFS in their draft BO has identified the Peak SPL criterion as the appropriate measure to evaluate hydroacoustic effects to fish for this project because the cumulative sound metric (SELcum) assumes that a fish have would remain in the ensonified area for the entire duration of the pile driving, which is an unrealistic assumption. Using the Peak SPL metric, NMFS has indicated that the potential risk of physiological effects is reduced by an order of magnitude compared to what was presented in the DEIS and the BA. For example, using the Peak SPL criterion rather than the cumulative sound exposure criterion (SELcum), reduces the number of shortnose sturgeon exposed to sound levels above the thresholds from 796 to 70 for the Short Span Option and 603 to 43 for the Long Span Option. In addition, based on the BO findings using the 206 dB Peak SPL criterion, the expected mortality to shortnose and Atlantic sturgeon is now predicted to be extremely low, only one individual fish of each species subject to mortality from pile driving. Finally, only one individual of each sturgeon species is projected to be subject to mortality from coming into contact with the dredge during dredging operations.

Based on the results of the PIDP and the analyses performed and articulated by NMFS in the BO, the impacts to shortnose and Atlantic sturgeon are now projected to be considerably less than those that were projected to occur in the DEIS and the BA. Nevertheless, we are amenable to proceeding with mitigation to address any potential impacts to shortnose and Atlantic sturgeon that may result from project activities.

Mitigation Costs:
Sturgeon Tracking Study – Applicant will make a contribution of $200,000/yr for 5 years to NYSDEC or other efforts for a total of a $1,000,000.
Sturgeon Gut Content Study - $200,000
Outreach Programs for Sport and Commercial Fisherman to reduce sturgeon mortality and injury during their efforts - $100,000
Mapping Shallows - $1.5M

Item IV. Impacted Resources. Other Fish Species

Rationale for Mitigation:
For the reasons articulated under Item III above, the number of fish affected by pile driving will be considerably less than those estimated in the DEIS. By using the Peak SPL criterion, the total number of all fish exposed to the ensonified area will be greatly reduced. Wetland restoration for any loss of fish habitat can be achieved through the funds appropriated under Item II above, while shad restoration efforts could be achieved by channel restoration or by removing barriers to fish migration as identified above. Channel improvement projects and green infrastructure projects would also result in improved habitat for other fish species.

Mitigation Costs:
Costs for these efforts have been identified above.

Total Mitigation Cost Summary

Oyster Habitat: $682,500 or $1,365,000
Remaining Benthic Community: $1,600,000
Wetland Restoration and Green Infrastructure $2,000,000
Atlantic and Shortnose Sturgeon: $2,800,000
Other Fish Species: Mitigation costs included under above items

TOTAL: $7,765,000

Table 1. Costing of Mitigation Options for Tappan Zee Bridge Construction

Impacted Resource	Mitigation	Unit Cost	Total Cost	Comments
I. Benthic Community	a. Oyster habitat	$52,500/acre[1]	$676,000-$1,352,000	1:1 to 2:1 mitigation, 13 acres
	b. Channel restoration	$250[a,2]–$1,000/linear foot[3]	$250,000–$1,000,000	1,000 feet
	c. Remove barrier to fish migration	$150,000/site[b,3]		
	d. Remove previously filled sites			Not evaluated[c]
II. Open-Water Community	a. Green infrastructure for stormwater control			
	1. Green roof	$1,486,000–$2,786,000/acre[4]	TBD	Costs vary widely depending on the infrastructure technology selected
	2. Planter boxes	$251,000/acre[4]		
	3. Porous pavements	$102,000–$1,019,000/acre[5]		
	4. Rain barrels	$139,000–$232,000/acre[4]		
	5. Swales	$51,000/acre[4]		
	6. Filter strips	$56,000/acre[4]		
	b. Tidal wetland restoration	$135,000[6]–$750,000/acre[d,3]	$885,000	Assume 2 acres
III. Atlantic and Shortnose Sturgeon	a. Sturgeon tracking study	TBD	$1,000,000	Assume $200,000/yr for 5 years
	b. Gut content study		$200,000	
	c. Outreach programs		$100,000	
	d. Mapping shallows		$1,200,000–$1,500,000[e,7]	
IV. Other Fish Species	a. Enhance wetlands Piermont			See II.b
	b. Shad restoration			See I.c
V. Tidal Wetlands				N/A. Elevated suspended sediment levels don't reach Piermont

Notes:

[a]Mean value

[b]Does not include costs required for land or right of way acquisition, but includes engineering and construction costs

[c]Mitigation strategy was not determined to be cost effective, due to contaminated sediments

[d]AKRF experience indicates that the unit costs range from $300,000 to $750,000/acre

[e]Includes field effort

Sources:

[1] Hudson Raritan Estuary Comprehensive Restoration Plan – median value

[2]Templeton, S., C. Dumas, W. Sessions. 2008. Estimation and Analysis of Design-Bid-Build Projects For Stream Mitigation in North Carolina. January 15, 2008.

[3]AKRF, Inc. project experience

[4]Schueler, T., D. Hirschman, M. Novotney, and J. Zielinski, P.E. 2007. Urban Stormwater Retrofit Practices Version 1.0. Urban Subwatershed Restoration Manual Series Manual 3. Center for Watershed Protection, Ellicott City, MD.

[5]UrbanDesign 2002, http://www.lid-stormwater.net/permpaver_costs.htm

[6]The Interstate Technology & Regulatory Council Mitigation Wetlands Team. 2005. Technical Guideline. Characterization, Design, Construction, and Monitoring of Mitigation Wetlands. February 2005.

[7]NYSDEC verbal estimate

Table 2. Determining Mitigation Costs for Impacts to Benthic Community

Source of information[1]	Comments	Parameter	Value	Applicable year	Extrapolated value (to 157 acres, over 6 years)	Extrapolated value (2012 dollars based on CPI, http://www.halfhill.com/inflation.html)	Adjustment	Adjusted amount
Memo from Robert Unsworth, Industrial Economics, to Edward Bolen, Massachusetts Office of Attorney General, 2002	Habitat Equivalency Analysis to estimate cost of damage to sediment. Compensation ratio 2:1. Cost of replacement wetland, times 2	$/acre	$40,000.00	2002	$6,280,000.00	$7,971,184.78		
Valuing New Jersey's Natural Capital, 2007	Economic value of total estuary/tidal bay ecosystems, including goods and services (from Table 5)	$/acre/year	$12,779.00	2004	$12,037,818.00	$14,700,824.07	The benthic component of ecosystem value is 25%; of that, the services lost are 50%	$1,837,603.01
Economic Values Associated With Construction of Oyster Reefs by the Corps of Engineers, 2003	Costs of construction of oyster reefs, $/acre stocked (from Table 4)	$/acre	$30,000.00	2003	$4,710,000.00	$5,884,240.74		
Habitat Scale Mapping of Fisheries Ecosystem Service Values in Estuaries, 2010	Recreational and Commercial Fishing Value, Yaquina Bay, subtidal habitat (from Table 4)	$/acre/year	$1,000.00	2007	$942,000.00	$1,049,721.55		

[1] Highlighted rows were used for determining mitigation cost ranges for 157 acres of benthic community.

Source of information[1]	Comments	Parameter	Value	Applicable year	Extrapolated value (to 157 acres, over 6 years)	Extrapolated value (2012 dollars based on CPI, http://www.halfhill.com/inflation.html)	Adjustment	Adjusted amount
Settlement Agreement for Natural Resource Damages for Releases from the Port Arthur, Texas Refinery, 2008	Habitat Equivalency Analysis to estimate cost of injury to 44.2 acres of benthic habitat, by constructing 31.67 acres of marsh at a cost of $720000	$/acre	$16,290.00	2008	$2,557,530.00	$2,772,367.72	50% of a Spill Cost	$1,386,183.86
Joint Federal / State Application for the Alteration of any Tidal Wetland in Maryland, by the Maryland DNR, for acquiring oyster shell, 2009	Net increase in value of recreational fishing activity in the Bay by creating 2000 acres of new hard bottom habitat was estimated to be $640000 per year.	$/acre/year	$320.00	2004	$301,440.00	$368,124.54		
US Fish and Wildlife Service news posted November 15, 2010, http://www.fws.gov/contaminants/DisplayNews.cfm?NewsID=50C82CC2-028E-5D94-E05E7B57996B9BF3	Trustees received $27.5 million to restore natural resources and lost recreational uses in Delaware Bay from oil spill. Resources injured included 3628 acres of shoreline, 412 acres of benthic habitat, 11,869 birds and 41,709 trips. It is assumed in this table that 15% of the funds were for the injury to benthic habitat.	$/acre	$10,012.00	2010	$1,571,884.00	$1,648,139.24		

Source of information[1]	Comments	Parameter	Value	Applicable year	Extrapolated value (to 157 acres, over 6 years)	Extrapolated value (2012 dollars based on CPI, http://www.halfhill.com/inflation.html)	Adjustment	Adjusted amount
The Value of the World's Ecosystem Services and Natural Capital, 1997	Total value of ecosystem services for coastal estuaries (from Table 2), $22832 per hectare per year, converted to $/acre/year.	$/acre/year	$9,244.00	1994	$8,707,848.00	$13,557,689.44	The benthic component of ecosystem value is 25%; of that, the services lost are 50%	$1,694,711.18
Hudson Raritan Estuary Comprehensive Restoration Plan, (2009)	Cost of oyster restoration, median value	$/acre	$52,478.00	2011	$8,239,046.00	$8,502,695.47		
Restoration Plan and Environmental Assessment for the Certus Chemical Spill, Clinch River, VA, 2004	$3.8 million settlement for spill that eliminated benthos including 3 species of endangered freshwater mussels. Restoration period 12+ years. Area impacted was 40 acres.	$/acre/year	$7,916.67	2004	$7,457,500.00	$9,107,247.80		

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Joe Martens
Commissioner

Via E-Mail and Regular Mail

David Paget, Esq.
Sive, Paget & Riesel
460 Park Avenue
New York, NY 10022

RE: Tappan Zee Hudson River Crossing – Mitigation Proposal

Dear Mr. Paget:

This letter is intended to memorialize our recent discussions concerning the environmental impact mitigation to be required in connection with construction of the Tappan Zee Hudson River Crossing.

The compensatory mitigation outlined below is in addition to: (i) any compliance monitoring or reporting which is a standard or special condition to any permits governing this project, and (ii) the mandatory Environmental Performance Commitments (EPCs) presented in the Draft Environmental Impact Statement which must be incorporated into the project's final design and contracts.

Although the EPCs minimize and/or avoid certain adverse environmental effects, to fulfill its mandate pursuant to the State Environmental Quality Review Act, and satisfy the Net Conservation Benefit requirement of 6 NYCRR Part 182, the Department has determined that mitigation is required for the impacts associated with the bridge's construction, in particular those resulting from the proposed dredging.

Based upon the information available to us, the applications submitted by your clients, and materials prepared by other resource agencies, the Department has concluded that the following conceptual mitigation plan addresses the unavoidable and significant adverse environmental impacts associated with construction of the Tappan Zee Hudson River Crossing, and achieves a net conservation benefit under Part 182.

I. Compensatory Mitigation for Dredging-Related Impacts to Benthic Community; Tidal Wetlands and Open Water Community.

A. Oyster Restoration

- Applicant must create 13 acres of hard bottom/shell oyster habitat;
- Habitat replacement shall occur as soon as possible following construction, and shall take place in the immediate vicinity of the existing bridge (at a location to be approved), and

- Reintroduce oysters to habitat. The Department presumes that utilizing live oysters from the extant reef, collected and maintained during the project's active construction phase and stored in an appropriate location in the vicinity of the project site, will provide the most appropriate brood stock for reintroduction of locally-derived juvenile oysters (spat) and the best opportunity to re-establish the oyster reef (however, the applicants may propose alternative measures).

B. Secondary Channel Restoration

- Develop a secondary channel restoration project intended to evaluate the means and methods to increase habitat diversity and function at Gay's Point (Columbia County);

- The applicant shall promptly prepare and expeditiously implement a sampling and analysis regime to assess sediment quality at Gay's Head, and determine the costs of sediment management.

- If the sediments obstructing flow at Gay's Point can be managed without incurring unreasonably excessive costs, the applicant shall design and implement a channel restoration demonstration project intended to document baseline conditions; identify target restoration conditions; design restoration activities and implement restoration;

- The secondary channel restoration plan shall include not less than three years of monitoring to compare pre and post – restoration conditions and preparation of a final report presenting an evaluation of the effectiveness of each element of the restoration program.

- If the initial assessment demonstrates that sediment management costs are likely to be excessive the applicant shall propose and implement an alternative project designed to provide equivalent habitat benefits.

C. Wetlands Enhancement – Piermont Marsh

- The applicant shall design and implement a plan to reduce invasive species (primarily *Phragmites*), restore hydrologic conditions and remove fill in the marsh, along the Sparkill Creek; and restore the hydrologic connection of an oxbow in Crumkill Creek;

- *Phragmites* control will be implemented on approximately 200 acres through application of herbicide with the goal of eliminating 90% of the *Phragmites* while avoiding impacts on native vegetation. Annual maintenance spraying will be performed for approximately five years, to prevent return of *Phragmites* and allow native plant communities to recover;

- The oxbow in Crumkill Creek in the central area will be restored along with historic flow regimes of the creek channel by placing a small amount of fill in the existing by-pass, diverting flow into the historic oxbow;

- Applicant shall design and implement a green infrastructure project(s) designed to improve the quality of stormwater entering Sparkill Creek; and

- Restoration of historic wetlands at the northern end of Piermont Marsh. Conduct baseline studies of existing plant and animal communities, study of sediments to be removed and hydrologic studies;

II. Net Conservation Benefit

- Map Hudson River shallows < 4 meters deep to document benthic habitat used by Atlantic and shortnose sturgeon;

- Study sturgeon foraging habits using gastric lavage to obtain gut contents in order to link sturgeons' diet to benthic habitats;

- Capture and tag approximately 30 adult SNS (>500 mm TL); 30 juvenile SNS (300-500 mm TL); 30 pre-migrant juvenile (450 to 1000 mm TL) ATS; and 30 Age-1 (300-450mm TL) ATS. SNS will be captured at overwintering locations near Kingston and Haverstraw Bay in early spring (late March through early April and possibly New York harbor in late fall; Attempts to collect juvenile SNS will also be made during the fall downriver of spawning area which is above Coxsackie. Juvenile ATS will be captured in late winter and early spring in Haverstraw Bay; Age-1 ATS in early fall;

- Acoustically marked fish will be tracked from the vicinity of the bridge construction site and other locations to contribute knowledge of species distribution and habitat use with the Hudson River Estuary. Two techniques will be used: Stationary Gateway receivers: Data indicate a tagged fish can be detected when it passes within 1 km of a stationary receiver. The applicants shall install receivers at intervals within a 50 kilometer (km) stretch encompassing the bridge construction site, to indicate when a fish moves between each section and the duration of time a sonic tagged fish remains within each section of river. Gateway receivers will be placed so that the entire width of the river is covered as follows:

    - G. Washington Bridge to Piermont – One (1) centrally located receiver every 5 km

    - Piermont to Stony Point – three (3) at equally spaced intervals across river every 5 km

- Mobile tracking will determine a more precise location to determine bottom/ habitat type the tagged fish utilizes. The 50 km stretch of river centered on the Tappan Zee Bridge will be monitored by mobile tracking for tagged fish two days per week on a schedule to be determined.

- Produce pamphlet or other appropriate written material to be used as part of ongoing outreach program to reduce impacts of commercial by-catch of Atlantic sturgeon in the near shore Atlantic Ocean.

III. Conditions

- The Department has no objection to use of a third-party to administer the mitigation program and will work with the applicants to identify an acceptable third-party and to develop an appropriate agreement governing this arrangement. However, costs of administrating the mitigation activities; monitoring and/or reporting on the mitigation program shall not diminish the mitigation program or otherwise delay implementation;

- Upon approval of an acceptable third-party, the Department will allow the applicants to pre-fund the mitigation program by irretrievably depositing $8 million dollars into a trust fund dedicated to these projects (or reasonable substitutes to the extent that any project are determined not to be feasible); and

- The applicants will propose a conceptual mitigation plan, including a proposed monitoring plan and schedule for each major task. The net conservation benefit projects will be addressed in a separate, stand-alone, submission. Upon review and approval by the Department, the conceptual mitigation plan and endangered species implementation plan will be incorporated into the permit(s) for this project.

All the Department's approvals for this project are subject to public review and comment. The Department will carefully consider relevant comments, the result of which may cause changes to the proposed mitigation actions described above. Accordingly, pending a final Department decision, no rights are created concerning the Department's permits and certifications as a result of this letter.

Please feel free to contact me if you wish to discuss this issue further.

Sincerely,

Edward F. McTiernan
Deputy Counsel

cc: John Ferguson, NYS DEC
Julie Crocker, NMFS