require us to carefully consider whether we will grant any real estate access to our facility for this hydroelectric project. If you have any questions on this matter, please have your staff contact Mr. Jeffrey Benedict, the Pittsburgh District Hydropower Coordinator, at 412-395-7202.

Sincerely,

Michael P. Crall
Colonel, Corps of Engineers
District Engineer

Enclosures

WOULD LOVE TO DISCUSS IN A CONF CALL

Corps of Engineers Pittsburgh District Comments on Mahoning Creek Hydroelectric Project 12555-004 Environmental Assessment April 23, 2010.

Corps of Engineers comments on the Environmental Assessment are presented below. The attached spreadsheet is provided to summarize Corps comments on prior documents and license application drafts.

1) Executive Summary and Section 3.3.1. Under Geology and Soils Resources it is mentioned that an erosion and sedimentation plan will "minimize hazardous materials from entering the creek." It is suggested that "hazardous materials" be defined. If there is the potential that any hazardous, toxic or radioactive materials are within the project area, then a Phase I investigation will be necessary.

2) Executive Summary and Section 3.3.2. The Corps is highly concerned that the EA does not adequately consider various alternatives available to the proposed development of hydropower at Mahoning Creek Lake. In addition, the Corps believes that alternatives discussed do not have an accurate factual basis, especially in regard to minimum flowage as proposed in the EA. Finally, the EA inappropriately attempts to put the burden of proof on the Corps with respect to adequate minimum flows.

In Section 5.2 at page 56 the EA states that the Corps of Engineers has not provided a specific recommendation or a justification for a bypass flow of greater than 30cfs, except for the need for a greater flow in winter to prevent freezing. To the contrary the Corps has provided information that the needed flows at the project are much greater than proposed by the MCHC. Moreover, it is not incumbent upon the Corps analyze the impacts of hydropower on the lake and river. The sole purpose of the EA is to gauge the impacts to the environment, therefore, it is incumbent upon FERC and MCHC to demonstrate that there would be no adverse impact on the fishery. The Corps has repeatedly requested that proper water quality monitoring be put in place to prior to project development and that an in-stream environmental flow study be conducted so the impacts to the environment could be adequately addressed.

In Section 5.2 at page 56, the EA incorrectly asserts that the stilling basin below the dam is "suboptimal, yet adequate to support a fish community favoring warm water species that prefer pool habitat." The stilling basin and the Mahoning River below the dam supports cold water, cool water and warm water fisheries. To support our position, we would point to the actions of the Pennsylvania Fish and Boat Commission (PF&BC), who regularly stock the stilling basin with cold and cool water fish. For example, on April 21, 2010 the PF&BC stocked the basin with 1200 trout (Brooke, Brown and Rainbow.) The EA does not address f the likely effects of the proposed hydropower project on the cold and cool water fisheries. For example the potential for 1) higher water temperatures with longer stilling basin retention times 2) raising the intake for hydropower plant i.e. warmer water released downstream of the hydropower outfall; and 3) the effects on the fishery in general of limiting the bypass flow to 30 cfs for approximately 230 days per year during normal flow conditions (Over the past 30 years, the dam only reached such a low flow 3 days per year on average, during drought conditions, which is reflective of natural flows.)

No where in the EA are the potential impacts to the cold and cool water fishery discussed. No where in the EA are the potential impacts of low flow on the spawning activity of the fishery addressed. As stated above the Corps is highly concerned that the assumptions underlying the EA are not accurate and that the alternative analysis is incomplete.

The EA identifies only three alternatives – the "No Action" alternative, MCHC's proposed alternative and MCHC's alternative with FERC staff revisions. The alternative formulation is not complete since alternatives that would have less environmental impact were not considered, including: 1) use of the existing stilling basin or the pool below the stilling weir for the hydropower outflow, which would significantly reduce impacts to aquatic life (fish & macroinvertebrates), water quality (reduced metal & nutrient laden bypass flow, low dissolved oxygen, supersaturation), aquatic habitat (scouring in the reach of the river at the new outfall and increased bank protection), and angler access and fishing success (this was proposed as an option early in the process but was withdrawn from consideration); 2) consideration of a range of seasonal bypass flows with the preferred alternative (hydro outfall downstream of the stilling basin), to protect water quality and aquatic life (in the lake and downstream); and 3) As much as 100% bypass flow when lake and/or downstream water quality problems develop.

As we are sure you are aware, if an EA is challenged, the most likely target will be to the adequacy of the alternatives analysis. Therefore, the Corps highly recommends that the EA be revised to address the Corps comments as provided prior to the comment period and throughout the comment period.

3) Executive Summary and Section 3.3.2. The EA does not adequately address anticipated substantial environmental impacts to water quality, aquatic life, and aquatic habitat in the dam tailwaters and, especially, in the stilling basin and the lake. Take, for example, the fact that basic limnology defines impacts expected with the proposed higher intake elevation, which will increase lake bottom retention times and lake stratification patterns. In addition, not all alternatives were considered: i.e. using the existing stilling basin (no bypass needed), or alternative bypass flows, as we recommended in previous comments. In order to protect existing aquatic resources and project benefits, we will utilize current and historical pre-hydropower data to develop non- degradation criteria for hydropower generation, and will require the licensee to conduct intense, real-time continuously recording water quality monitoring.

We are increasing water quality monitoring at Mahoning Lake as a direct result to better define pre-hydropower conditions. We began monitoring real-time, continuously recorded lake (vertical profiles) and outflow water temperature data in 2007; we installed a real-time, continuously recording monitor downstream of the dam in late 2008 which measures dissolved oxygen (DO), water temperature, pH, conductivity, and total dissolved gas concentrations (TDG); and began monitoring real-time lake dissolved oxygen levels in April 2010. We have also conducted annual lake limnological surveys since 2006. An initial review of historical data for the development of non-degradation

dissolved oxygen and water temperature criteria for the lake, the stilling basin and Mahoning Creek downstream of the stilling basin, follows.

Dissolved oxygen vertical profile data for Mahoning Lake at the deepest location just upstream of the dam for our period of record are presented in Figure 1, and the same data sorted by depth are presented in Figure 2. Outflow dissolved oxygen and water temperature data (sorted by water temperature) are presented in Exhibits 3 and 4, respectively.

As can be seen in Figures 1 and 2, lake dissolved oxygen levels are generally > 5 mg/l at depths < 25 feet although there is a general trend towards decreasing DO levels in the lake hypolimnion (30 - 50 ft) over the period of record. The average lake surface DO (0 to 5 ft) is 8.9 mg/l, the average mid-depth DO (10 to 25 ft) is 7.0 mg/l, and the average lake bottom DO (30 to 100 ft) is 5.7 mg/l. As can be seen in Figure 3, the lowest outflow DO reading for the entire period of record was 7.2 mg/l in 1979, and these data show a general increasing trend. Figure 4 demonstrates that outflow water temperatures do not exceed 80 Degrees F.

Figure 1

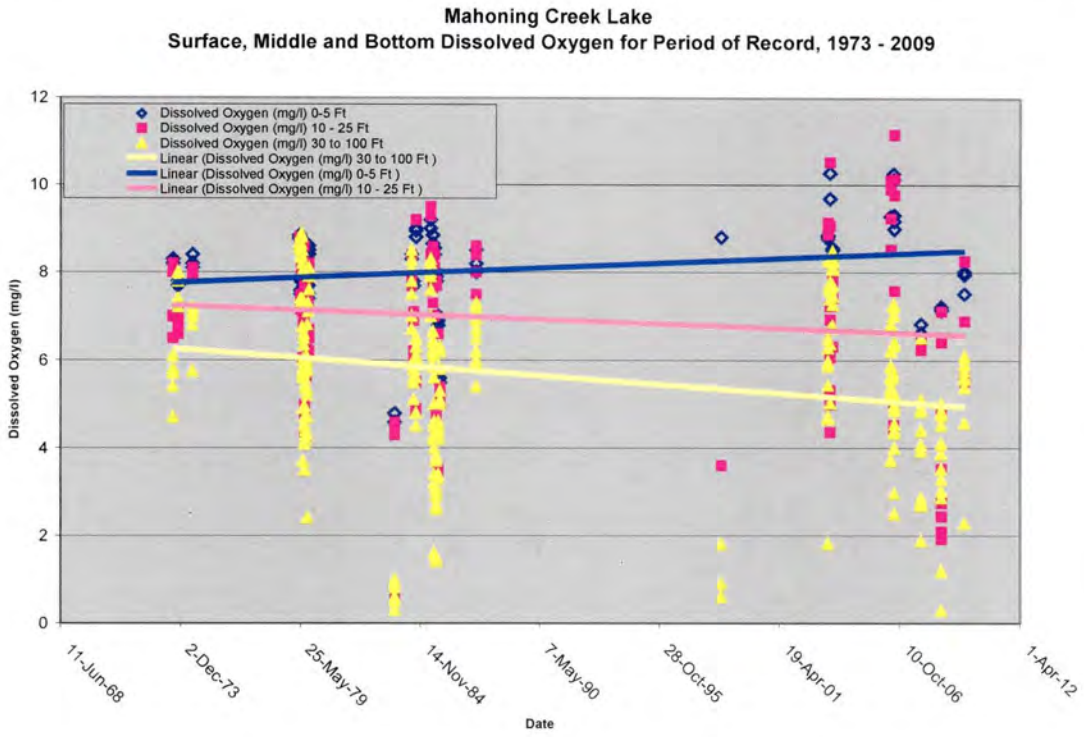


Figure 2

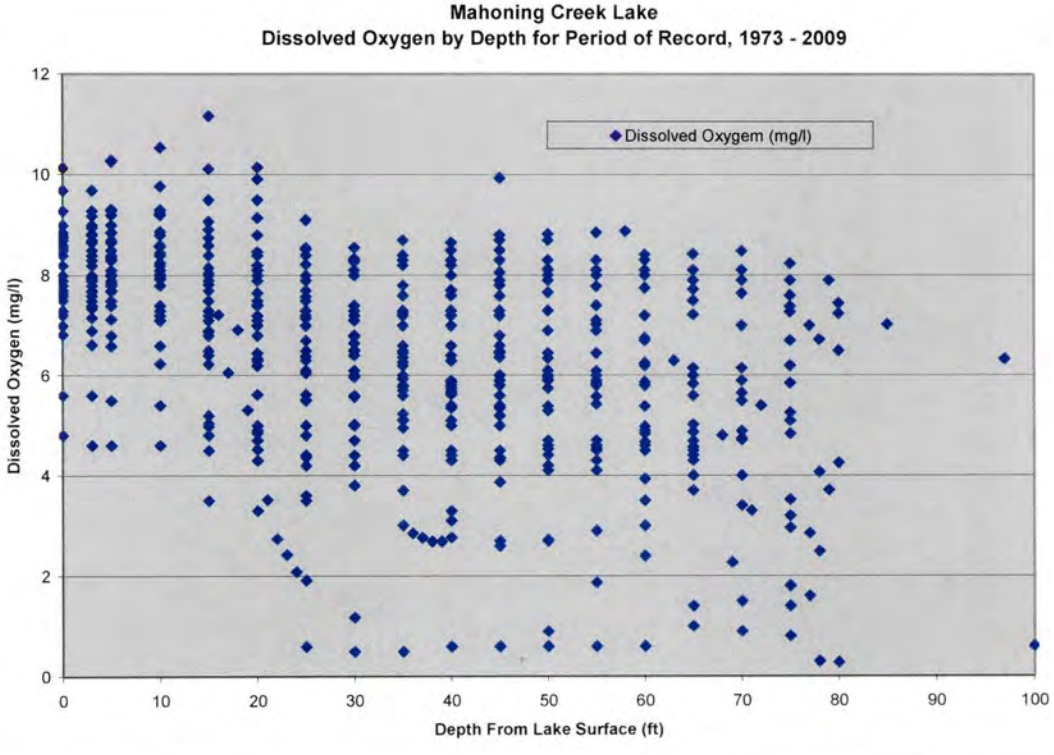


Figure 3

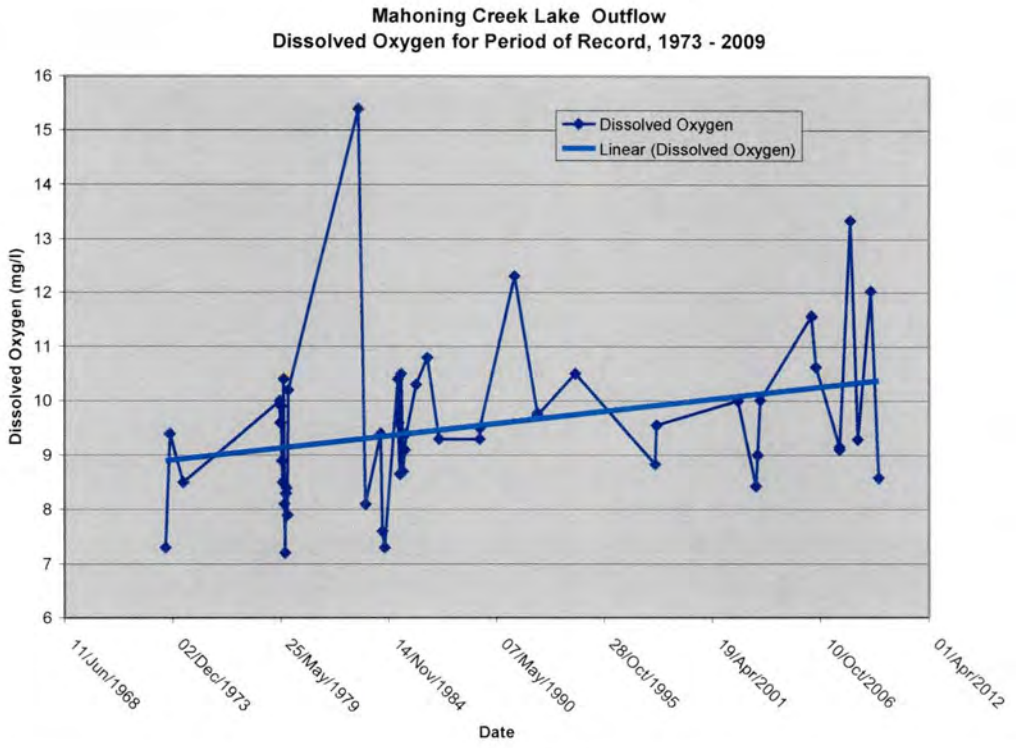
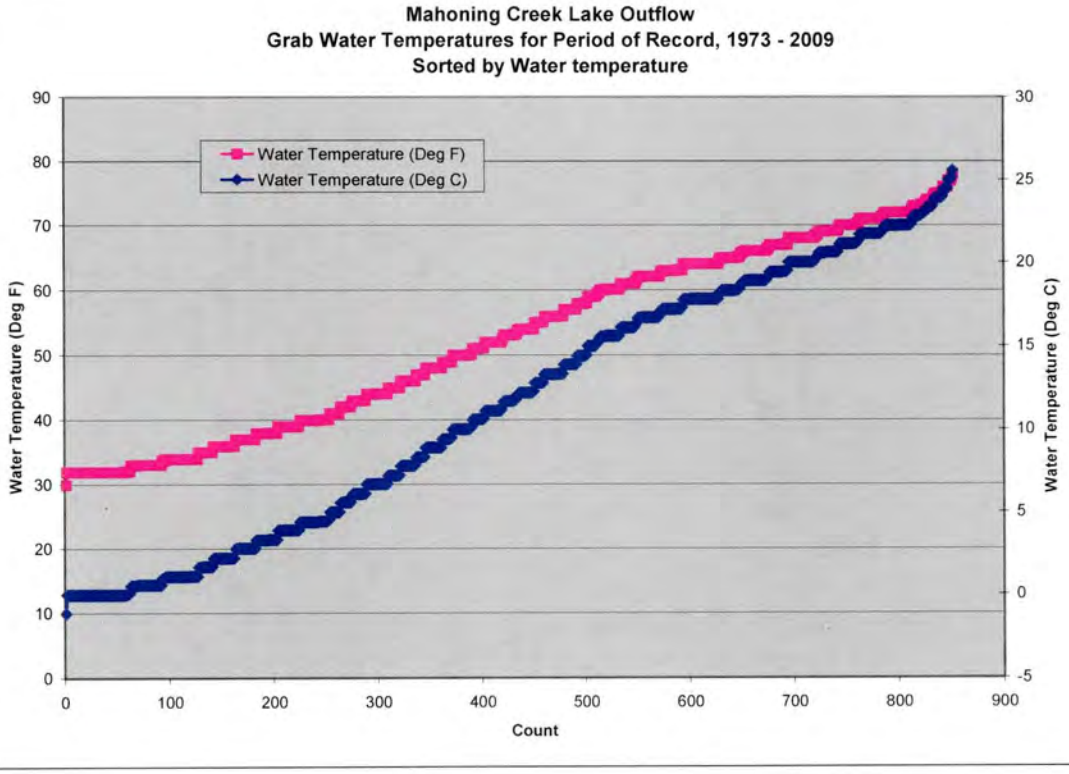


Figure 4



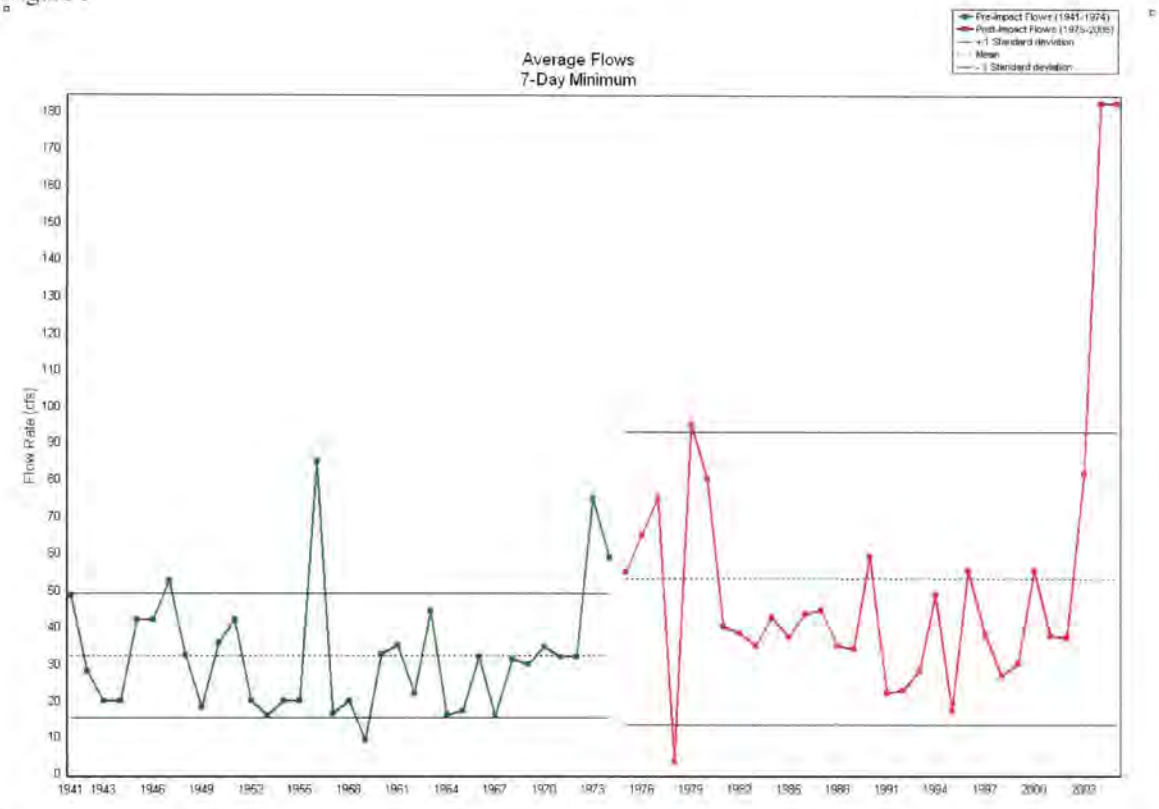
4) Executive Summary and Section 3.3.2. We strongly object to the proposed 30 cfs by pass flow because of impacts to water quality and aquatic life in the stilling basin (including its high quality and extremely popular fishery). Our 3 June 1986 fish survey of the Mahoning Dam stilling basin, which verifies the viability of the fishery, is presented below (Appendix A). During this survey, a total of 94 fish weighing 1.6 kilograms were collected, representing 12 fish species. Four species of sport fish were collected including yellow perch (10), smallmouth bass (3), rock bass (1) and white crappie (1). An additional boat electrofishing survey of the stilling basin pool will be conducted in May 2010. For this survey, at least during part of the sampling period, flow through the dam will be stopped in order to enable the entire stilling basin to be sampled. We expect fish diversity to increase since our 1986 survey due to reservoir and outflow stocking efforts by the PFBC, improved access to the entire basin compared to our 1986 survey, and improving water quality.

5) Executive Summary and Section 3.3.2. There is little discussion and/or dismissal of the anticipated impacts of hydropower generation on water quality and aquatic life in the lake, the stilling basin, and the downstream regulated reach, and the mitigation measures necessary to address these issues. Lake stratification and retention times will become more severe if the intake elevation is raised, increasing the volume of anoxic, metal laden hypolymnetic waters in the lake and bypass flow so therefore stilling basin water quality will likely be degraded. With a higher intake elevation, outflow water temperatures will increase, possibly impacting the downstream cool/cold water fishery which is dependent on cold, lake bottom releases. Mitigation measures for impacts to lake and downstream water quality (elevated dissolved metal & nutrient concentrations, depressed dissolved oxygen levels, higher outflow water temperatures especially in the stilling basin, elevated total dissolved gas levels, etc.) could include construction of a lake bottom hydropower intake, higher & seasonal bypass flows, no hydropower generation during late summer months when lake stratification is severe, and/or downstream O2 injection.

6) Executive Summary and Section 3.3.2. Executive Summary and Section 3.3.2. Based on the current analyses presented in the EA, the Corps can not and agree to a minimum flow of 30 cfs by pass flow at any time of year. As we stated in our comment on the Draft License Application in June 09, our analysis of releases from the dam during the past 30 years shows the average 7-day minimum is greater than 50 cfs (red line in Figure 5). Based on our assessment, the proposed minimum flow corresponds to severe drought conditions that would be imposed by hydropower operations over half of each and every year. This is totally unacceptable. Currently, the stilling basin supports coldwater, coolwater and warmwater fish. The proposed minimum flow will drastically change this to only support of certain warmwater fish and may imperil other fish that are passed through the sluice gates. Without additional modeling, we fully expect the net effect of this new flow condition to be negative in an area that is very popular for anglers. What makes this even more crucial is the proposed fixed-in-place fishing pier to take advantage of this very fishery. Further, reliance on use of Q7-10 to determine a minimum flow through the dam continues to be a problem for the Corps. One issue is

interpretation of the meaning of Q7-10; it appears that this concept is being interpreted differently by MCHC and the Corps. Page 19 of the EA includes a footnote defining Q7-10 as "the lowest flow which has occurred on a given stream reach for seven consecutive days over the previous 10-year period of record"; the USGS defines it as "the average minimum streamflow expected for seven consecutive days once every ten years"; and the EPA defines it as "the seven-day, consecutive low flow with a ten-year return frequency; the lowest stream flow for seven consecutive days that would be expected to occur once in ten years". The differences in wording may be small, but we would like to stress that Q7-10 is not the 7-day low flow from the previous ten years and MCHC's reference to a ten-year period ending on September 30, 2008 is in error since the Q7-10 is not based on a specific ten-year period.

Figure 5



The use of the calculated Q7-10 as a bypass flow is not appropriate because it does not address seasonal requirements or impacts of a permanent low flow on water quality and aquatic life in the stilling basin. As we commented in our review of the Application for New License, the proposed 30 cfs bypass flow will not adequately protect stilling basin water quality and aquatic life; will increase lake sedimentation since hypolymnetic releases will be reduced; will increase sedimentation in the stilling basin and degrade stony bottom habitat; and is too low to minimize impacts of a higher intake elevation on lake and downstream water temperatures. Therefore, we will require that the Operations

MOA required by Draft License Article 011 identify appropriate bypass flows for at least 2 seasons (and possibly a 3rd). An instream flow study will likely reveal that at least a 150 cfs bypass flow will be necessary for the spring spawning season (March - June); and at least 50 cfs will be necessary for remainder of the year (July - Feb.

7) Executive Summary and Section 3.3.2. The use of forced air will cause additional impacts not addressed in the EA. Using forced air to meet the non-degradation DO criteria of 7.2 mg/l will supersaturate tailwaters, causing popeye or nitrogen narcosis in tailwater fish during late summer and early fall (mid July through early October) when water temperatures are high. Another alternative to meet the non-degradation DO criteria other than higher bypass flow would be oxygen injection.

8) Executive Summary and Section 3.3.2. No mitigation measures were suggested for impacts of the proposed 30 cfs bypass flow on water quality and the fishery in the stilling basin or the impacts of a higher intake elevation on lake water quality. Therefore, in addition to monitoring the hydropower outfall, real-time, continuously recording water quality monitoring will be necessary in the stilling basin and also at three depths in the lake. The statement, "install a continuous DO sensor, water quality monitoring, and data collection system on the intake structure and downstream of the powerhouse to monitor and report DO, temperature and total dissolved gas", can be interpreted in many ways. Since negative environmental impacts in the lake, the stilling basin, and the regulated reach are likely, a strong real-time, continuous monitoring network, with data continuously available on line, is critical to insure optimum operation of the Corps' gates to mitigate water quality problems. Sampling locations will include the lake metalimnion, epilimnion, & hypolimnion, the stilling basin, and downstream of the hydropower outfall. Parameters measured should include DO, water temperature, and TDG in the hydropower outfall, and DO, water temperature, and conductivity in the lake and the stilling basin.

9) Executive Summary, Section 3.3.2 and Section 5.2. Since the proposed bypass flow is too low to protect the stilling basin fishery, construction of a fishing pier over the basin will not mitigate the loss of the fishery or the fishing access.

10) Executive Summary and Section 3.3.2. Monitoring is not mitigation but it is necessary to determine if the proposed mitigation measures are effective or if Corps control / reservoir releases (bottom withdrawal) are necessary. Therefore, as mentioned above, a strong real-time, continuous monitoring network, with data always available on line throughout the duration of the license, is critical to insure optimum operation to mitigate hydropower related water quality problems.

11) Executive Summary and Section 3.3.3. A planting plan and an exotic species control plan, using regionally native, mature woody riparian and wetland plant species must be developed and implemented.

12) Section 1.3. The reference for the FWS email dated July 20, 2009 is unclear, we could not find it in Exhibit E of the Final License Application.

13) Section 1.3.3, Endangered Species Act. The EA states that "FWS concluded that the project is not likely to adversely affect listed species". This correspondence should be included as part of the EA.

14) Section 1.3.5, National Historic Preservation Act. SHPO letters and coordination should be included as an appendix to the Environmental Assessment. Also, the Corps should cited as a consulting party on the historic preservation management plan.

15) Section 3.3.2, Aquatic Biota. The low macroinvertebrate diversity recorded by MCHC in 2007 is inconsistent with the high diversity recorded in the outflow area by the Corps in 1987. Seven light trap samples collected by the Corps between 6 May and 26 September 1987 contained a total of 43 taxa of adult aquatic insects, including 39 taxa of caddisflies (Trichoptera) and four taxa of mayflies (Ephemeroptera). The caddisflies collected included five species that were new records for Pennsylvania. Based on the number of caddisfly species collected during the 1987 study (the highest number collected in the Pittsburgh District), the Mahoning Dam tailrace would have the highest water quality in the Pittsburgh District.

16) Section 3.3.2, Water Quality. Water release from (over) the spillway and through a deep ring jet is cited and that "By using the two release locations in combination, the Corps can mix water as necessary to protect water quality downstream of the dam." Water has only been released as a flood operation from the spillway one time. Currently water mixing occurs between the three gate controlled sluices, the ring jet valve and the ball valve for an approximate range of about 10 feet elevation difference in withdrawals.

17) Section 3.3.2, Fish Protection. The EA states that "the only way for fish to move from the impoundment into Mahoning Creek downstream is over the spillway." Since water in a flood operation has gone over the spillway only once, it is more correct to state that fish movement occurs through the dam by way of the gate controlled sluices.

18) Section 3.3.2 and Section 5.2. The EA implies that fish passage between the lake and the stilling basin occurs by way of spillage over the dam. Flow over the dam's center spillway is extremely rare and fish passage through the dam generally takes place by way of the sluice gates.

APPENDIX A

Mahoning Creek Lake Stilling Basin Boat Electrofishing Survey, 3 June 1986. Prepared by Bob Hoskin, USACE Fishery Biologist

A boat electroshocking fish survey was conducted in the Mahoning Creek Lake Dam stilling basin on 3 June 1986 (Table 1). The effort for this stilling basin survey was 1.58 hours (1110-1245 hours). A total of 94 fish weighing 1.6 kilograms were collected, representing 12 fish species. Four species of sport fish were collected including yellow perch (10), smallmouth bass (3), rock bass (1) and white crappie (1). The fifteen fish weighed a total of 0.6 kilograms. As far as quality sport fish (angler speaking) the largest rock bass collected was nine-inches long, all yellow perch were five to six-inches long. White sucker (30) and river chub (20) ranked number 1 and 2 by total number. Over two-thirds of the fish by number were suckers and minnows combined, representing 60% of the total weight of all fish collected. These along with the other five species of suckers and minnows collected would provide excellent forage for game fish. The remaining fish observed were all logperch (darters).

The electrofishing boat utilized for the survey works best in water less than 4-feet deep. Much of the water in the Mahoning Dam stilling basin pool is deeper than four-feet and therefore provides avenues for fish to escape the electrofishing field and capture. As with most fish communities smaller fish are more abundant. With the presence of larger predator fish, the smaller fish tend to take refuge near shallow water habitat. During the day the larger predator fish generally find refuge and ambush habitat in the deeper and darker waters generally out of range of the electrofishing boat. It was for these reasons that majority of the fish collected during the June 1986 survey were small size.

Even though the number of harvestable size fish observed in the stilling basin pool was low, several well utilized angler paths from the outflow public parking lots to the shore were observed. It is therefore likely that the number of quality size fish in these waters is greater than observed. The stilling basin bottom structure is composed of large rocks, stone and/or bedrock, which provides good habitat for fish and macroinvertebrates. Fish inhabiting the stilling basin pool most likely have passed through the dam during normal discharge since there is no chance for upstream migration due to the high stilling basin weir. A reduction in flow into the stilling basin pool will significantly reduce its productivity and drastically reduce the reservoirs stocking potential to this site.

Since 2003, the Pennsylvania Fish & Boat Commission has stocked harvestable size trout in the stilling basin pool as a put-and-take fishery. This site was chosen by the PFBC because of the excellent recreational amenities found at the outflow of Mahoning Creek Lake. Eliminating this popular spring and fall program is not advised.

An additional boat electrofishing survey of the stilling basin pool will be conducted in May 2010. For this survey, at least during part of the sampling period, flow through the dam will be stopped. This should lower the stilling basin pool water level and also enable the entire stilling basin to be sampled. It is likely that fish diversity will increase

in 2010 with improved access in the stilling basin, the reservoir and outflow stocking efforts by the PFBC, and improving water quality. A night electrofishing survey of the stilling basin may also be conducted in 2010 to capture larger game fish.

Table 1

FISH DATA SUMMARY, **Mahoning Creek Lake Stilling Basin**, 3 JUNE 1986.

SPECIES	TOTAL NO.	CATCH PER HOUR	% BY NO.	RANGE (mm)	TOTAL WEIGHT (grams)	% OF TOTAL WEIGHT	NUMBER Stock Size	PSD
SPORT FISH								
PANFISH								
Yellow perch	10	6.33	10.64%	124-161	290	17.97%	8	0
Rock bass	1	0.63	1.06%	226	250	15.49%	1	100
White crappie	1	0.63	1.06%	94	15	0.93%	0	0
GAME FISH								
Smallmouth bass	3	1.90	3.19%	88-117	42	2.60%	0	0
SUCKERS								
White sucker	30	18.99	31.91%	71-150	528	32.71%		
Hog sucker	5	3.16	5.32%	60-110	33	2.04%		
MINNOWS								
River chub	20	12.66	21.28%	67-220	351	21.75%		
Bigeye chub	4	2.53	4.26%	61-87	11	0.68%		
Golden shiner	3	1.90	3.19%	88-97	20	1.24%		
Bluntnose minnow	1	0.63	1.06%	98	12	0.74%		
Creek chub	1	0.63	1.06%	114	18	1.12%		
DARTERS								
Logperch	15	9.49	15.96%	63-101	44	2.73%		
TOTALS	**94**	**59.49**			**1,614**			
SPORT FISH	15	9.49	15.96%		597	36.99%		
PANFISH	12	7.59	12.77%		555	34.39%		
GAME FISH	3	1.90	3.19%		42	2.60%		
SUCKERS	35	22.15	37.23%		561	34.76%		
MINNOWS	29	18.35	30.85%		412	25.53%		
DARTERS	15	9.49	15.96%		44	2.73%		

SURVEY PARAMETERS

Date 3 June 1986	Effort - 1.58	Time: 1110-1245	
Method: Boat electrofishing AC ? Volts ? Amps			
Survey Participants: Fowles, Koryak, Montgomery, Hoskin, Murray			
River flow: No. 1 Gate valve closed to 6" or 40 cfs			
Secchi: > 10'	pH: 7.37	Stream temp: 12.8 C	
Dissoved Oxygen: 10.23 mg/L	Conductivity: 114 umhos/cm	Air temp: 60 F	
NOTES: Weights of fish estimated from previously collected fish or The Fishes of Ohio by Trautman.			

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
access road	The Dam became operational in 1941, so the vegetation on the old access road is 68 year-old woodland, not "invading brush".	Final License Application	2.2.1.6 Access Roads, Page 7 .
access road	The reference to reusing a "service road" underestimates impacts, since this road is basically a wooded trail that has not been used in more than 20 years. For use, it will need to be cleared, widened, and graded.	Water Quality Report, Mahoning Creek Hydropower Project	Section 1.1, page 6 paragraph 4.
bypass	Again, we have determined that 30 cfs is inadequate to protect downstream water quality and aquatic life in the bypass reach.	Final License Application	2.2.1.5 Bypassed Reach, Page 6.
bypass	"MCHC proposes to operate the plant without any change in the overall flow release regimen used by the USACOE and will be in compliance with the USACE's reservoir regulation guidelines. ....MCHC has proposed that a continuous discharge of 30 cfs be released at all times from the dam in order to maintain flow in the stilling basin, reduce summer stratification of the impoundment, and provide a degree of Oxygenation of the river downstream. Although there is currently no specified minimum flow released by the USACOE at the Dam, 30 cfs is consistent with the 7Q10 flow for Mahoning Creek and historical minimum releases."	Final License Application	Exhibit B, 1.0.PROPOSED OPERATION STATEMENT. Page 1. and Appendix B: 39, Page 13, and 44, page 15
bypass	The proposed operational plan may not change our existing releases schedule but bypassing flow in the tailrace and concentrating flow to one side of the river will significantly alter flow, velocity, and instream habitat in the reach of the river from the toe of the dam downstream to at least to the confluence of Pine Run (including the silling basin). Therefore, the benefits currently provided by our operational schedule will be impacted.	Final License Application	Exhibit B, 1.0.PROPOSED OPERATION STATEMENT. Page 1. and Appendix B: 39, Page 13, and 44, page 15
bypass	Since we believe the proposed 30 cfs minimum bypass flow is inadequate for the protection of water quality and aquatic life and our recommendation for an incremental instream flow survey was dismissed, determination of appropriate bypass flow will be made by the Corps. The bypass flow will likely equal approximately 10% of the Dam's normal flow, or the "drought" flow, and will be determined for at least 2 seasons (and possibly a 3rd): the spring spawning season (March - June), and the remainder of the year (July - Feb). The calculated Q7-10 is not appropriate because it does not address seasonal requirements.	Final License Application	Exhibit B, 1.0.PROPOSED OPERATION STATEMENT. Page 1. and Appendix B: 39, Page 13, and 44, page 15
bypass	As mentioned above, the Corps will determine an appropriate bypass flow to protect water quality and aquatic life.	Final License Application	Exhibit D, Sect 4.g. Bypass Release.
Bypass	States that" The site of MCHC's proposed hydroelectric development had been previously licensed in the late 1980s, resulting in a License Order issued by FERC on May 7 19901.The license application included a proposed 30 cfs minimum flow into the stilling basin, which was supported by both the Pennsylvania Fish Commission and the Department of the Interior. This minimum flow was not specifically objected to by the USACOE at that time."	Final License Application	Appendix C, Prior License Conditions, Page C-5.
Bypass	Since the 1990, new methodologies and models have been developed (Instream flow Incremental Methodology & River 2-D) which more accurately predict impacts of changing flows and velocities on aquatic life. Using the Q7-10 is no longer recommended because it does not consider seasonal or variation or species specific requirements.	Final License Application	Appendix C, Prior License Conditions, Page C-5.
bypass	States that " In this same report the USACOE evaluated a series of scenarios including a bypass flow of 60 cfs wherein the authors conclude "little additional advantage in reduction of lake anaerobic conditions appeared to be gained by increasing the bypass flow to 60 cfs in Scenario E."	Final License Application	Appendix C, Water Quality Modeling, Page C-5.
bypass	We still agree that increasing the bypass flow to 60 cfs would not be enough to reduce anerobic conditions in the lake. However, doubling the bypass flow may be enough to protect downstream aquatic life in the bypass reach of the Mahoning River. Had the licensee conducted an IFIM study, we would have been able to predict impacts of various bypass flows on downstream target species.	Final License Application	Appendix C, Water Quality Modeling, Page C-5.

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
bypass	"MCHC proposes to operate the plant without any change in the overall flow release regimen used by the USACOE and will be in compliance with the USACE's reservoir regulation guidelines. ....MCHC has proposed that a continuous discharge of 30 cfs be released at all times from the dam in order to maintain flow in the stilling basin, reduce summer stratification of the impoundment, and provide a degree of Oxygenation of the river downstream. Although there is currently no specified minimum flow released by the USACOE at the Dam, 30 cfs is consistent with the 7Q10 flow for Mahoning Creek and historical minimum releases."	Final License Application	Exhibit B, 1.0.PROPOSED OPERATION STATEMENT. Page 1. and Appendix B: 39, Page 13, and 44, page 15.
bypass	The proposed operational plan may not change our existing releases schedule but bypassing flow in the tailrace and concentrating flow to one side of the river will significantly alter flow, velocity, and instream habitat in the reach of the river from the toe of the dam downstream to at least to the confluence of Pine Run (including the silling basin). Therefore, the benefits currently provided by our operational schedule will be impacted.	Final License Application	Exhibit B, 1.0.PROPOSED OPERATION STATEMENT. Page 1. and Appendix B: 39, Page 13, and 44, page 15.
bypass	Since we believe the proposed 30 cfs minimum bypass flow is inadequate for the protection of water quality and aquatic life and our recommendation for an incremental instream flow survey was dismissed, determination of appropriate bypass flow will be made by the Corps. The bypass flow will likely equal approximately 10% of the Dam's normal flow, or the "drought" flow, and will be determined for at least 2 seasons (and possibly a 3rd): the spring spawning season (March - June), and the remainder of the year (July - Feb). The calculated Q7-10 is not appropriate because it does not address seasonal requirements.	Final License Application	Exhibit B, 1.0.PROPOSED OPERATION STATEMENT. Page 1. and Appendix B: 39, Page 13, and 44, page 15.
bypass	. Again, we have determined that 30 cfs is inadequate to protect downstream water quality and aquatic life in the bypass reach.	Final License Application	2.2.1.5 Bypassed Reach, Page 6
bypass	1. Again, much of the environmental report is based on a continuous minimum flow of 30 cfs through the dam, which the Corps has not agreed to.	Exhibit E Environmental Report	d. Exhibit E – Environmental Report.
bypass	Previous documents referred to the 30 cfs minimum flow as providing a veiling flow over the stilling weir and the Corps questioned that assertion. The "veiling flow" reference has been removed from the draft license application, but the last paragraph of this section still states that the 30 cfs minimum flow from the dam will provide a continuous flow in the stilling basin and over the weir. We continue to question whether that minimum flow will ensure a continuous flow over the stilling weir.	Exhibit E Environmental Report	d. Exhibit E – Environmental Report. 3. Section 3.8.5 – Effects of Project Construction and Operation on Visual Resources, Noise, and Air Quality in the Vicinity of the Proposed Project..
bypass	a. Paragraph 3 of this section discusses the impacts on the stilling basin that would result from diverting all but 30 cfs of flow around it for use in generating power. The statement is made that a 30 cfs flow into the stilling basin would ensure that the basin remains watered. What is not addressed is the anticipated quality of the water that would remain in the stilling basin area, particularly for periods of time when there is no additional flow through the gates and potentially no movement of water over the stilling weir.	Exhibit E Environmental Report	d. Exhibit E – Environmental Report., 4. Section 5.1.1. – Unavoidable Adverse Impacts.
bypass	The Corps' objection to a standard minimum release through the dam of 30 cfs has already been mentioned. One aspect of this is a requirement to release more than 30 cfs through the ring jet during cold temperature periods simply to keep the equipment from freezing up. It must also be stressed that the analysis in Appendix C is based on MCHC requesting to release 7Q10 flows continuously through the year, not just for an occasionally occurring 7-day period. We disagree with the use of any single year-round bypass flow, and we disagree with using the 7Q10 to select those bypass flows. The bypass flow should be selected in order to avoid degradation of existing conditions, not in order to cause continuous drought conditions between the dam and the point where the hydropower tailrace enters Mahoning Creek.	Exhibit E Environmental Report	d. Exhibit E – Environmental Report., 6. Appendix C to Exhibit E – Additional Water Quality Information.

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
bypass	The proposed 30 cfs bypass flow will not adequately protect stilling basin water quality and aquatic life; may impact the structural integrity of the weir; will increase lake sedimentation because hypolymnetic releases will be reduced; and is too low to minimize impacts of a higher intake elevation on lake and downstream water temperatures. Therefore, we will require seasonal bypass flows, 50 cfs from June – Feb. and 150 cfs from March – May (during spawning season), unless an IFIM study or another Corps approved study is conducted to demonstrate otherwise.	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	
bypass	A 30 cfs bypass flow from the dam could impact habitat, aquatic life, and water quality of the stilling basin and also the entire reach of the Mahoning Creek downstream of the dam. For example, releasing only 30 cfs from the dam during periods when hydropower generation is intentionally or unintentionally shut down would exacerbate impacts of acid mine drainage from Pine Run (a mine drainage degraded left descending Bank tributary which confluences with Mahoning Creek 2.9 miles downstream of the dam). Recommend that an incremental flow in-stream methodology (IFIM) study be conducted to determine an appropriate conservation flow (minimum release) from the dam to protect habitat & aquatic life, and a Corps approved Reservoir / riverine model be run to assess water quality impacts.	Water Quality Technical Memorandum, Mahoning Creek Hydropower Project	Operation Scenario, paragraph 1
bypass	Question supposition that "minimum flow through the stilling basin will be expected to be characteristically unchanged in each parameter...". Recommend that these alternatives be modeled using a Corps approved model.	Water Quality Technical Memorandum, Mahoning Creek Hydropower Project	Operation Scenario, page 2, paragraph 3.
bypass	We recommend that an in-stream flow study be conducted to establish the best conservation flow schedule from the dam, and also that alternatives be modeled using a USACE approved and supported, 2 dimensional model for all parameters of concern, in order to protect this excellent resource.	Water Quality Technical Memorandum, Mahoning Creek Hydropower Project	Summary, Page 6.
bypass	. While a "run-or-river" project is proposed, discharging water downstream of the stilling basin (Alternative B) will result in unnatural low flows (30 cfs by pass proposed by the licensee) in the stilling basin. The frequency of high water events will be reduced and hydraulic retention times increased. This could potentially impact aquatic life (fishery and shoreline wetlands) and water quality during periods when the lake is stratified (anoxic hypolimnetic releases with reduced metals & nutrients, turbidity, etc.).	Water Quality Report, Mahoning Creek Hydropower Project	Section 1.1, page 6 paragraph 5
bypass stilling basin	Recommend that an incremental flow instream methodology (IFIM) study be conducted to determine an appropriate conservation flow (minimum release) from the dam.	Water Quality Report, Mahoning Creek Hydropower Project	Section 3, page 17, Bullet 1.
cumulative	We believe the area impacted by the hydropower generation project is larger than MCHC describes, and includes the lake (water quality, water temperatures, lake stratification, aquatic life), and the Mahoning River from the toe of the dam downstream at least to the mouth of Pine Run (water quality, water temperature, instream habitat and flow, and riparian habitat).	Final License Application	3.2 CUMULATIVE EFFECTS, 3.2.1 Geographic Scope, Page 11.
data	The USACE Pittsburgh District conducted lake water quality surveys in 2003, 2006, and 2007, including vertical profiling at lake stations, and laboratory analyses of samples collected from the lake, the lake inflow, and the lake outflow for over 50 different parameters. In addition, we collected real-time, continuously recorded lake water temperature profile data from April through October during 2006 and 2007, and outflow water temperature data during 2007. We are considering real-time, continuous monitoring for WT, DO, TDG, and conductivity in the outflow during summer/fall 2008 to document pre hydropower conditions. In addition, the PA DEP conducted a TMDL study on Mahoning Creek and Lake in 2006, which included seasonal lake water quality surveys. These data will be submitted to FERC.	Water Quality Report, Mahoning Creek Hydropower Project	Section 2.3, Page 11, last paragraph.

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
dissolved oxygen	The Lowest dissolved oxygen concentration recorded from the Mahoning Creek Dam tailwaters by the USACE is 7.3 mg/l, not 7.0 mg/l.	Water Quality Report, Mahoning Creek Hydropower Project	Section 5.3, Page 28 Paragraph 3.
fish mortality	Fish mortality. Any loss greater than 5% can be considered degradation and will require mitigation and possibly more studies to analyze lake fish	Final License Application	Appendix B, Page 20.
fish mortality	movement, lake velocities, etc and refine Hydropower project operations. MCHC's desk study describes and considers physical characteristics of the proposed structure, but not project specific conditions such as dramatically changing lake pool elevations (reservoir operations), lake stratification patterns, seasonal variation, fish movement patterns, safe passage of lake fish downstream, measured lake velocities, etc. For example, the desk top study did not consider the fact that fish entrainment increases dramatically when the lake pool elevation is near the elevation of the hydropower intake. In addition, the desktop study provided no information on current, pre-hydropower project conditions or mortality rates or impacts on larval fish. Without a project specific fish impingement and mortality study and with no post-project fishery surveys, the onus for documenting and assessing impacts of hydropower operation on lake and downstream fisheries will fall on the Corps and/or the resource agencies.	Final License Application	
fish mortality	There has been no discussion on the management / removal of trash collected on the proposed fish screens.	Final License Application	Exhibit E, 2.1.2 Existing Project Operation, Page 5, 2.2.1.3 Trash Rack and Debris Management , Page 6.
Fish passage	We still maintain that the downstream fishery and fish passage will be impacted by hydropower development and that this loss will require mitigation. Resource agencies have conducted fish movement studies at other bottom withdrawal reservoirs in the District, and have documented that fish that move through the dam gates provide a significant component of tailwater fisheries. We suggest that MCHC may want to conduct a pre-hydropower generation fish passage study to prove otherwise.	Final License Application	Appendix B, 53, page 19.
fishery	Although no State or Federally listed fish species were identified, the high quality and diversity of the lake and tailwater fisheries should be noted. Since 1986, we have collected a total of 48 species of fish just in the Mahoning tailwaters.	Aquatic Resource Technical Memorandum	Executive Summary, Page ii, Paragraph 3.
fishing pier	The second paragraph of this section needs a minor correction. The Outflow Fishing Area does not currently feature an ADA compliant fishing pier. There had been a fishing pier in this area at one time, but it was removed a number of years ago.	Exhibit E Environmental Report	d. Exhibit E – Environmental Report., 2. Section 3.8.2.4 – Public Recreation Sites.
flow data	There were no "torrential river flows" or releases from the dam on the AHS survey dates. Mahoning Dam is operated as run of river project. Flow data for Mahoning Creek Lake inflow and outflow for the survey dates (Fish surveys conducted on August 13 and September 17, 2007 and the mussel surveys on August 21-22 and September 4-5 2007), will be provided to FERC.	Aquatic Resource Technical Memorandum	Executive Summary, Page iii, Paragraph 1.

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
instream habitat	Habitat was measured using "Physical Characterization / Water Quality Data Sheet (WQDS) "& the "Qualitative Habitat Evaluation Index" (QHEI). The QHEI is a physical habitat index developed to score lotic macro habit characteristics that are important to the fish community. For both of these indices, riparian habitat width and quality & instream conditions are critical components. All WQDS scores indicated optimal habitat except for the stilling basin, but all were higher than 90, which is sufficient to sustain fish and macroinvertebrates. QHEI scores were similar, with all sites rated as exceptional warm water WW habitat, except for the stilling basin, which was rated Modified WWH. Alternative B will depress habitat index scores because instream conditions will be modified and riffle run complexes and the natural stream bed destroyed. Also, construction of the assess road, bridges, and power house for both Alternative A & B will impact riparian habitat and depress habitat scores, which will negatively affect aquatic life. The large, exceptional quality, riparian areas with little disturbance located along Mahoning Creek downstream of the dam are noteworthy.	Aquatic Resource Technical Memorandum	Attachment A, Section 2.1.4, Pages 8 - 19.
instream habitat	. "A new tailrace will be excavated immediately downstream of the powerhouse to return the water back to the Mahoning Creek. The tailrace will be excavated in bedrock and will measure approximately 40 ft wide, 150 ft long and 10 ft deep. "	Final License Application	Exhibit A. Project Description, 2.2.4 Tailrace. Page 6
instream habitat	Construction of a new tailrace will have major impacts on dam tailwater habitat. See comments on mitigation, See comment Appendix B, 51, Page 18 below.	Final License Application	Exhibit A. Project Description, 2.2.4 Tailrace. Page 6
instream habitat	No mention is made of the likely water quality, aquatic life, and habitat impacts expected with Alternative B (locating the hydro outfall downstream of the stilling basin weir), including backwater currents; an extension of the in-river scour area; erosion or destabilization of the weir; and the loss of existing shoreline wetlands, islands, and shallow water habitat in that reach. A hydraulic model will be necessary to assess impacts of alternatives on tailwater flows.	Water Quality Report, Mahoning Creek Hydropower Project	Section 1.1.
macroincertebrate	We believe that AHS' macroinvertebrate survey underestimates the quality of tailwater macroinvertebrate community. While only 4 species of macroinvertebrates were observed during AHS' summer survey, the District has consistently identified more than 10 species during spring tailwater macroinvertebrate Surber sampling (1976 = 6 species, 1979 = 10, 1983=13, 1985 = 10, and 1991 = 18 species). During our spring 2006 kick net RBA survey of the Dam tailwaters, we identified 31 taxa. In addition, we conducted tailwater light trap surveys at all District reservoir tailwaters in 1991, and the Mahoning Dam tailwaters were the second most diverse, with 39 species identified, 5 of which were new to Pennsylvania. This difference could be explained by the fact that AHS' survey sites were located in reaches with lower habitat scores (near the scour pool and downstream of the McCrea Furnace Bridge); sampling was conducted during a summer drought period (hydrologic conditions not optimum), and samples were collected during late summer rather than early spring (time of year, seasonal interferences). Spring sampling generally allows documentation of the highest or near highest invertebrate diversity and productivity	Aquatic Resource Technical Memorandum	Executive Summary, Page iii, Paragraph 1.
macroinvertebrate	If the stilling basin is truly devoid of macroinvertebrate species, than Alternative B will create more of this unproductive habitat.	Aquatic Resource Technical Memorandum	Executive Summary, Page iii, Paragraph 1.
macroinvertebrate & fishery data	Recommend using USACE historical lake and tailwater fishery and macroinvertebrate data to establish baseline or pre-hydropower conditions, rather than just those collected for this report. USACE data will be provided to FERC.	Aquatic Resource Technical Memorandum	Executive Summary, page ii.

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
mitigation	As discussed in comments on the Final License Application above, the proposed environmental mitigation measures are inadequate: no mitigation measures were proposed for impacts to in stream and riparian habitat; the proposed by-pass flow does not consider seasonal requirements; reaeration of tailwaters using only forced air (no O2 injection) will cause downstream supersaturation; too few WQ monitors are recommended to effectively operate the project real-time; and installation of a fishing pier in the stilling basin will impact flood capacity so will not be approved..	Final License Application	2.2.3 Proposed Environmental Measures, Page 8.
mitigation	We disagree that the development of mitigation measures for the loss of instream and habitat related to construction of the new tailrace, modifying instream flows, and shoreline armoring should be differed until the operational MOA is signed (See Exhibit D, Sect 4.f. Shoreline Stabilization, Page 4.). If adequate mitigation cannot be implemented, it should be brought to light before the License is granted (See Appendix B, Comment 51). In addition, an exotic, invasive plant control will be required for all disturbed areas (including instream).	Final License Application	Appendix B, 51, Page 18.
mitigation	Mitigation measures could include re-aeration using O2 injection to avoid gas super-saturation problems; increased bypass flow; termination of generation; construction of a lake bottom hydro intake for use during summer / fall, installing baffles that intake water form a lower elevation as MCHC proposes etc. However, using blowers to reaerate tailwaters to meet downstream non-degradation DO criteria may supersaturate tailwaters and harm aquatic life. In addition, quantification of potential impacts (which would require water quality modeling) and assessment of effectiveness of baffles or other design modifications to mitigate these impacts must be determined feasible before the license is granted.	Final License Application	Appendix B, 52, page 19.
mitigation	As discussed in comments on the Final License Application above, the proposed environmental mitigation measures are inadequate: no mitigation measures were proposed for impacts to in stream and riparian habitat; the proposed by-pass flow does not consider seasonal requirements; reaeration of tailwaters using only forced air (no O2 injection), which will cause downstream supersaturation; too few WQ monitors to effectively operate the project real-time; and concerns regarding installation of the fishing pier in the stilling basin.	Final License Application	2.2.3 Proposed Environmental Measures.
mitigation	a. Loss of instream and riparian habitat related to high speed velocities, erosion, and scouring in the tailrace predicted by the hydraulic model and construction of training walls and stream bank protection. Mitigation measures could include wetland and shallow water habitat creation, riparian re-vegetation /enhancement, etc. Exotic, invasive plant control will be required in all disturbed areas.	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	
mitigation	b. Reduced lake and lake outflow DO levels. Mitigation measures could include re-aeration using O2 injection to avoid gas super-saturation problems; increased bypass flow; termination of generation; construction of a lake bottom hydro intake for use during summer / fall; etc.	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	
mitigation	c. Loss of downstream fish bypass from the lake to the tailwaters. While Mahoning Creek Dam prevents upstream fish passage, fish regularly survive passage downstream through the dam. However, fish that pass through turbines do not survive. Mitigation measures could include fish stocking, shutdowns, etc.	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	
mitigation	d. Higher outflow water temperatures. Mitigation measures could include increasing the bypass flow, discontinuing generation, construction of a lake bottom hydro intake for use during the summer / fall season, etc.	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
mitigation	e. Fish mortality. In the Application it states that it is "quite unlikely that large numbers of fish will be entrained by the proposed project" (Exhibit E p 38). Any loss greater than 5% will degrade existing conditions and will require mitigation and possibly more studies to analyze lake fish movement, lake velocities, etc for refinement of Project operations. When the lake pool elevation is near the elevation of the hydro intake, the possibility of fish entrainment will increases dramatically.	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	
mitigation	f. Mitigation plans must be submitted for all "unavoidable impacts".	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	
model	MCHC's response to Comment 48 states that "the CE-QUAL-R1 modeling performed by MCHS showed only minimal change, less than 0.5°C, in downstream water temperature, under the proposed action." However, MCHC did not recalibrate or run a 2-dimentional water quality model as we recommended, but rather reinterpreted the results of the Corp's 1993 calibration. Again, because the CE-QUAL-1 model is linear and cannot accurately predict lake stratification patterns, the model underestimated impacts to lake and outflow water temperature.	Final License Application	Exhibit D, Sect 4.c., Page 3; Appendix B 46, 47, 48, 49, and 52, pages 16 – 19.; Exhibit E. Section 3.4.3
model	Predictive modeling was not conducted, but rather, results of the District's1993 CE-QUAL-R1 run were reinterpreted for this report. Also, CE QUAL-R1 no longer a state of the art predictive model. Rather, it is a numerical, 1 dimensional, reservoir water quality model which was developed by the USACE in 1982 but has not been supported since the early 1990's. As you can see in the tables from our 1992 report that are included in this report, the calibration for the 1993 run was weak because a 1-dimentional model cannot accurately predict conditions for lakes with short hydraulic retention times and strong advective processes / riverine-like conditions like the Mahoning. A more appropriate tool would be CE-QUAL-R2, a 2 dimensional, reservoir and riverine model which has been enhanced and supported by the USACE since it was created in 1982.	Water Quality Report, Mahoning Creek Hydropower Project	Section 2.1, Page 9, Objectives Bullet 4 and Section 5.3, page 26, paragraph 3.
model	Waters with lower levels of dissolved oxygen will be released to the tailwaters with hydropower generation. Results of the CE-QUAL-R1 model simulation described above indicate that the turbine discharges of the proposed hydropower project would severely depress the dissolved oxygen concentration of the Mahoning River downstream of the power plant for most of the summer season. Also, there is no mention in this section of the increased in thermal stratification predicted for the lake.	Water Quality Report, Mahoning Creek Hydropower Project	Section 2.2, page 10, last paragraph.
model	The CE-QUAL-R1 model is not a hydraulic model, but rather, as discussed above, a 1 dimensional reservoir water quality model and the USACE 1993 run was calibrated only for dissolved oxygen and water temperature. It appears that models were not run for this study, but rather, simple concentration/flow calculations were made to predict post hydro outflow water quality conditions using existing lake conditions (MCHC's 2007 data).	Water Quality Report, Mahoning Creek Hydropower Project	Section 3, page 16, last paragraph.
model	Again the CE-QUAL-R1 model is no longer supported. Also, while our 1993 run adequately predicted water temperature and dissolved oxygen impacts for proposed hydropower alternatives, use of this run for this new license is not recommended. The calibration for the 1993 run was weak, that is, it did not accurately predict existing conditions particularly later in the summer season. This is because the model was not designed for reservoirs with riverine conditions and short hydraulic retention times and does not account for season long stratification. Therefore, impacts were underestimated. A 2 dimensional model like CE-QUAL-R2 would be more appropriate.	Water Quality Report, Mahoning Creek Hydropower Project	Section 3.3, Page 19, Paragraph 1.

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
model	Therefore, we recommend that alternatives be modeled using a USACE approved and supported, 2 dimensional model, in order to protect this excellent resource.	Water Quality Report, Mahoning Creek Hydropower Project	Section 6.0, Page 30, First paragraph.
model	This simulation is based on existing lake conditions, not those expected with summer long, lake stratification which would occur if the intake elevation is raised. Recommend that alternatives be modeled using a Corps approved, state of the art, model.	Water Quality Technical Memorandum, Mahoning Creek Hydropower Project	Dissolved Oxygen, page 2, paragraph 7.
model	Again, this effort simulates conditions for one point in time, not conditions expected with summer long lake stratification caused by a higher elevation intake.	Water Quality Technical Memorandum, Mahoning Creek Hydropower Project	Summary, Page 6.
model	To summarize, this study plan has not relieved the USACE their 1993 water quality concerns. Considering the high quality and exceptional biological diversity of the Mahoning tailwaters, reduction of outflow dissolved oxygen concentrations or water quality overall is not acceptable. Also, reinterpretation of the USACE's 1993 CE-QUAL-R1 run presented in this report underestimates impacts on now excellent lake water quality and the value of deep water habitat. Lastly, Alternative B (hydro outflow 1000 ft downstream of the dam) will reduce flows in the stilling basin, and we are not convinced this will not degrade water quality and impact aquatic life, even if flows are maintained at the Q710. An instream flow study is recommended to establish the best conservation flow schedule from the dam.	Water Quality Report, Mahoning Creek Hydropower Project	Section 6.0, Page 30, First paragraph.
monitoring	The Corps will require real-time, continuously recording water quality monitoring at the hydropower outflow; the McCrea Furnace Road Bridge; and in the lake at the surface, mid point, and bottom. Since a 2-dimentional water quality was not calibrated to assess impacts of hydropower generation on lake stratification, the proposed lake monitors are critical; they will provide the data necessary to assure optimum operation for lake and downstream water quality control. If hypolymnetic anoxia develops in the lake using the surface hydropower intakes, we can switch to the bottom gate or blend lake surface and bottom flow to mitigate problems.	Final License Application	Exhibit D, Sect 4.c., Page 3; Appendix B 46, 47, 48, 49, and 52, pages 16 – 19.; Exhibit E. Section 3.4.3
monitoring	These water quality monitors will be operational year-round (or otherwise specified by the Corps) and data will be available real-time on a public web site, throughout the duration of the license. The licensee will monitor dissolved oxygen, water temperature, % saturation (total dissolved gas and barometric pressure), specific conductance, and other parameters that may be determined to be of concern by the Corps. To assure adequate assessment of pre-hydropower seasonal and hydrologic conditions, monitoring will begin at least 2 years prior to construction of the hydropower	Final License Application	Exhibit D, Sect 4.c., Page 3; Appendix B 46, 47, 48, 49, and 52, pages 16 – 19.; Exhibit E. Section 3.4.3
monitoring	The water quality monitoring plan recommended in the Application (Exhibit E p 28) is inadequate to assure effective design & operation of the Hydro Project and mitigation of related lake and downstream water quality and aquatic life impacts. We will require continuously recording, real-time water quality monitoring, measuring at minimum, water temperature, dissolved oxygen, conductivity, total dissolved gas, and barometric pressure, hourly and/or upon request, at as many as 3 locations (in the lake, the stilling basin, and downstream of the Hydro outfall). These data will be presented real-time on a public website. Monitoring will begin at least 2 years prior to construction of the project to assess pre hydro seasonal and hydrologic conditions, and will continue during construction and throughout the duration of the license.	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	
monitoring supersaturation	We will require real-time, continuous monitoring of parameters identified by the USACE; database & website management; and use of equipment and contractors approved by the USACE. If atmospheric air is used to meet non degradation DO criteria, real-time, TDG monitored may be required.	Water Quality Technical Memorandum, Mahoning Creek Hydropower Project	Operational monitoring, page 6, paragraph 1.

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
mussels	Limiting the mussel survey to the "direct effect area" or basically the powerhouse construction site is not adequate to assess impacts related to hydropower operation. The Phase 2 mussel survey was not conducted because only a few mussels were found in the Phase 1 study area. However, habitat surveys conducted for this report (Attachment A, Page 22) demonstrated that the substrate in the scour hole downstream of the stilling basin weir (Station SA 2) was not optimum habitat for mussels. Had the survey site been located in a river reach with high quality habitat, like station SA 4, more mussels would likely have been found, especially considering the referenced report of living mussels by the PA Natural Heritage (Section 3.2, Page 5).	Aquatic Resource Technical Memorandum	Executive Summary, Page ii, Paragraph 4.
nondegredation	Consistent with our current operation and authorized purposes of Mahoning Lake, we will require non-degradation of existing resources including fish and wildlife, habitat and water quality. Since proposed mitigation measures include using forced air or bypassing the hydropower turbines when non-degradation criteria are not being met, real- time, continuously recording water quality monitoring in the lake and downstream, and routine and downstream aquatic life and fish mortality surveys will be critical for implementation. As mentioned previously, using blowers for reaeration rather than O2 injection can supersaturate tailwaters and harm aquatic life.	Final License Application	
nondegredation	Again, hydropower operations may not change reservoir elevations or total flow outflow, but will change lake stratification patterns and lake and downstream water quality.	Final License Application	2.2.2 Proposed Project Operation, Page 7.
nondegredation	Compliance with non-degradation criteria and meeting lake and downstream water temperature objectives will increase operational complexity and will require additional manpower. Dissolved oxygen, supersaturation, and water temperature problems will likely develop during the summer / fall season when seasonal water temperatures are the highest. Because of these challenges, effective remote operation of the facility during this period is questionable.	Final License Application	2.2.2 Proposed Project Operation, Page 7.
nondegredation	b. The state standards referenced in paragraph 4 of this section are significantly less than what the Corps' non-degradation standard would require.	Exhibit E Environmental Report	d. Exhibit E – Environmental Report.
nondegredation	2. NON-DEGREDATION STANDARDS. We currently require non-degradation water quality standards, which are stricter than State WQ criteria, at retrofit hydropower Projects in our District, and will require similar standards for Mahoning Lake hydro Project. Non-degradation is defined as "worse case", pre-hydro conditions. For example, the minimum DO and the maximum TDG values recorded at the dam outflow and during our entire period of record would be required with Hydro. When lake and downstream water quality does not meet non-degradation standards, the Corps will take control of the dam outflow.	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
nondegredation	We will request non-degradation standards for water quality, aquatic life, and habitat in our operational MOA, defined as quality no less than pre hydropower conditions. For example, water quality parameters of concern would include, but would not be limited to, dissolved oxygen (DO), total dissolved gas (TDG), water temperature, and reduced nutrients and metals. The non-degradation DO standard would be 7.2 mg/l, because under existing conditions, the discharge from the dam averages 7.2 mg/l, meaning that it is 100% saturated with dissolved oxygen year round, averaging 7.2 mg/l (N= 44, Standard deviation = 1.43, max = 15.4 mg/l, and min = 7.2 mg/l). Even during our 2006 and 2007 low flow, summer season lake water quality surveys, % DO saturation in the tailwater was 120 % and 114%, respectively. In 1990, both the PA F&BC and the US Fish and Wildlife Service appealed the FERC order issuing license for the Mahoning Lake hydroelectric project, and expressed support for maintenance of a minimum 7.3 mg/l DO level in the tailwaters. Note that we request that all submissions by the USACE, the PA F&BC, and the US F&WS for FERC license 3228-001 be resubmitted for this current license application.	Water Quality Report, Mahoning Creek Hydropower Project	Section 2.1, Page 9, Objectives Bullet 5.
nondegredation	One could interpret Sections 4 (e) and 10 (a) of the Federal Power Act, which states that equal consideration must be given to energy production and environmental protection, to mean that requiring hydropower generators to meet pre-project conditions in the FERC license is inconsistent with the intent of this law. However, the Federal Power Act does not apply to operational MOA's.	Water Quality Report, Mahoning Creek Hydropower Project	Section 2.3, page 12, paragraph 4.
nondegredation	We support non-degradation standards for dissolved oxygen and total dissolved gas (pre-hydropower levels).	Water Quality Technical Memorandum, Mahoning Creek Hydropower Project	Dissolved Oxygen, page 2, paragraph 4.
operation	We operate Mahoning Creek Dam in accordance with an approved regulation schedule, not in a "nominal run of river mode".	Final License Application	2.2.2 Proposed Project Operation, Page 7.
operation	We operate Mahoning Creek Dam in accordance with an approved regulation schedule, not in a "nominal run of river mode".	Final License Application	2.2.2 Proposed Project Operation, Page 7.
Sedimentation	States that " The movement of sedimentation from the lake bottom to downstream generally occurs at times of high flow conditions as only suspended solids will move during low to moderate flows. As the USACOE will be releasing flows in excess of project capacity on average 20% of the time, lake-floor deposited sedimentation will move downstream during those flood release periods. Hence little overall effect on lake sedimentation is expected."	Final License Application	Appendix C, Lake Sedimentation, Page C-7.
Sedimentation	MCHC did not conduct a sedimentation survey or run a model to determine / prove impacts. However, if the intake elevation is raised, lake bottom retention times will increase and velocities will decrease, so it is likely that sedimentation will increase.	Final License Application	Appendix C, Lake Sedimentation, Page C-7.
stilling basin	The statement "the area of habitat for fish and benthic macroinvertebrates in the stilling basin will not change under either alternative", underestimates potential impacts, since lower flows (only 30 cfs proposed in this report), longer hydraulic retention times in the stilling basin, and the release of hypolimnetic lake waters (also with increased retention times) could impact water quality, aquatic life, and in-stream habitat.	Water Quality Report, Mahoning Creek Hydropower Project	Section 2.2, Page 11, first paragraph.
stilling basin	Question the validity of predictions regarding stilling basin weir gas exchange based on a few data collected during pre hydropower conditions.	Water Quality Report, Mahoning Creek Hydropower Project	Section 5.2, Page 25, Paragraph 2.

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
stilling basin	Mahoning Lake and its regulated reach are congressionally authorized for Fish & Wildlife. In addition, we have a resource management responsibility for Mahoning lake and tailwaters, regardless of the fact that the stilling basin habitat is of lesser quality than the reach of the Mahoning River downstream.	Final License Application	Appendix C, Additional Water Quality Information. Stilling basin habitat, Page C-4.
studies	States that "These studies address potential impacts related to the proposed hydro project on aquatic organisms. The studies focused on potential impacts to aquatic organisms of the proposed installation of hydroelectric generation for the Mahoning Creek Dam (Site)". We feel that these surveys only demonstrate existing, summer season, low flow, pre-hydropower conditions; that they underestimate the quality and diversity of this valuable resource; and they do not address potential impacts to these resources related to hydropower generation.	Aquatic Resource Technical Memorandum	Section 1.0 Introduction, page 1, Paragraph 3.
studies	States that "The proposed project was found not likely to affect federal or state listed mussels within the area surveyed, and we considered it unlikely that listed mussels existed within the immediate area below Mahoning Dam due to the lack of suitable habitat and torrential flows". Of note is that EnviroScience does not conclude in this Attachment that there will be "no impacts" to mussels or listed mussels in areas that were not surveyed. We recommend that areas with the best mussel habitat be surveyed.	Aquatic Resource Technical Memorandum	Attachment A, Conclusions, Page 26.
study area	While there were no state or Federally listed mussel identified at station SA 2, which is located in the scour hole downstream of the stilling basin weir, we know nothing about the river reach further downstream (the reach between Stations SA3 and SA5), which would be impacted by hydropower operation.	Aquatic Resource Technical Memorandum	Executive Summary, Page iii, Paragraph 1.
summary	To summarize our comments, Mahoning Dam tailwater macroinvertebrate and fish communities are exceptionally diverse and unique resource. Even though no PA fish species of concern were identified, we identified macroinvertebrate species in the Mahoning Dam tailwaters that were new to PA. Also, we do not release "frequent torrential flows" since the dam is operated as a run-of-river project, with storage during high flow periods, and higher releases during low flow periods (peaks in the hydrograph cut off). Lastly, we question the final statement. "...the proposed project is determined to have negligible potential adverse effects on aquatic organisms within the proposed Project area". This statement is considered conjecture, since AHS' surveys only demonstrated conditions during this study period, and does not quantify likely impacts to aquatic life related to changes in habitat, in-stream flow conditions, water quality, water temperature, or total dissolved gas which could occur with hydropower generation. In addition, impacts on mussels located in the stream reaches located outside the "Project area", which will likely be impacted during hydropower operation, were not even surveyed.	Aquatic Resource Technical Memorandum	Section 4.0 Conclusions, Page 8, and Paragraph 1.
supersaturation	"MCHC will include facilities, such as natural or forced air ventilation of the turbine draft tubes to provide dissolved oxygen uptake. The plant control systems will also monitor the downstream DO level for compliance with FERC license conditions."	Final License Application	Exhibit D, Environmental Measures, Sect 4.a. Fishing Pier, Page 3.
supersaturation	Consider adding "...to meet non-degradation standards while assuring control of gas superstation ."	Water Quality Report, Mahoning Creek Hydropower Project	Section 2.1, Page 9, Objectives Bullet 7.
supersaturation	We have documented gas bubble disease (stressed, dying, and dead fish) with % saturation as low as 106% at Youghiogheny Dam, caused by using blowers for tailwater aeration. In addition, while hypolimnetic lake waters are now never totally anaerobic, they will become so if the intake elevation is raised for hydropower generation.	Water Quality Technical Memorandum, Mahoning Creek Hydropower Project	Total Dissolved Gas (TDG), Page 5, paragraph 1.
trash rack	There has been no discussion on the management / removal of trash collected on the proposed fish screens.	Final License Application	2.2.1.3 Trash Rack and Debris Management , Page 6.
water quality	Again, hydropower operations may not change reservoir elevations or total flow outflow, but will change lake stratification patterns and lake and downstream water quality.	Final License Application	2.2.2 Proposed Project Operation, Page 7.

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
water quality	3. LAKE WQ IMPACTS. Our concerns regarding the use of our 1993 the CE-QUAL-1 model run to predict impacts of this License and also AHS' interpretation of the model results were dismissed, but we still have reason to believe that the Project will adversely affect water quality and aquatic life in the lake, the stilling basin, and the river downstream.	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	
water quality	a. Lake stratification. Our 1993 model run showed that raising the intake elevation will increase lake thermal and chemical stratification and hypolymnetic anoxia during the summer and fall seasons (throughout the entire lake, and are not just limited to the area in the "impoundment near the dam". Upstream sections of the lake that are now riverine will likely become more lacustrine as lake bottom retention times increase. These predicted impacts were downplayed the Application write-up.	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	
water quality	b. Water temperature. Because the CE-QUAL-1 model is linear and cannot accurately predict lake stratification patterns, the model underestimated impacts to lake and outflow water temperature. Our model did, however, demonstrate that with a higher elevation intake, the lake hypolimnium will become cooler, more anoxic, and dissolved metal concentrations will increase as the lake stratifies, and outflow water temperatures will increase. Less cold, well aerated water in the lake will reduce cool water refuge and habitat, negatively impacting the lake fishery and water quality. In addition, even though the entire Mahoning River is designated as a warm water fishery, the dam tailwaters currently support an excellent cool water fishery because of our cold bottom releases from the dam. If the outflow water temperatures warm up even a few degrees during late summer early fall (higher maximum values), this cool water fishery could be lost.	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	
water quality	c. The water quality surveys conducted by the licensee on a few days in 2007 showed that the lake is still responsive to hydrometeriological conditions, but did not demonstrate that "hydrometerological variations during the period of summer stratification will continue to drive variations in the output model." (Exhibit E P 21). Rather, our 1993 model run showed that, with a higher elevation intake, summer/fall lake stratification will increase, and that as the bypass flow is reduced, these impacts will become more pronounced.	Comments on Mahoning Creek Hydroelectric Company LLC, Mahoning Project, Application for New License, March 200, Exhibit E	
water quality	The ability to define "baseline" lake and stilling basin water quality conditions with only 2 sampling events at 2 sites is questioned. However, historical and recent WQ data collected by the USACE and PA DEP demonstrate that the lake and tailwater water quality continues to improve and can be considered excellent, and that lake stratification patterns are generally weak. In addition, the tailwater supports an excellent and diverse coolwater fishery and macroinvertebrate populations.	Water Quality Report, Mahoning Creek Hydropower Project	Section 2.1, Objectives, bullet 1.
water quality	Raising the intake elevation for hydropower generation will impact the entire lake, not just the lake in the vicinity near the intake. In the early 1990's, the USACE ran a CE-QUAL-R1 model simulation to examine the effects of various withdrawal elevations scenarios proposed for FERC license 3228-001. Results indicated that withdrawal from 1055 ft NGVD would create relatively strong summer thermal stratification near the intake elevation, leaving anoxic, dead storage in the deeper strata of the lake below the intake elevation. Additionally, while continuous by-pass discharge from the bottom gates will evacuate a portion of this anoxic storage, it will also degrade water quality of the stilling basin when the lake is stratified, since hypolimnetic discharges of this colder\ denser storage will contain elevated	Water Quality Report, Mahoning Creek Hydropower Project	Section 2.1, Objectives, bullet 1.
water quality	The water quality sampling area does not represent the area of impact. Raising the intake elevation will impact the water quality of the entire reservoir, and possibly 23 Mahoning Creek downstream of the dam, an area that extends way beyond the FERC "project boundaries".	Water Quality Report, Mahoning Creek Hydropower Project	Section 3.2, Page 18, Paragraph 4.

USACE COMMENTS ON THE MAHONING CREEK HYDROELECTRIC COMPANY's MAHONING CREEK LAKE HYDROELECTRIC PROJECT (FERC NO. 12555)

Subject	Comment	Report	Section / page
water quality	Disagree with this attempt to underestimate value and loss of the deep water lake habitat located below the intake elevation.	Water Quality Report, Mahoning Creek Hydropower Project	Section 5.3, Page 28, Paragraph 1, Last sentence and Page 29, last paragraph.
water quality	With summer long lake stratification expected with the proposed higher intake elevation, concentrations of reduced metals & nutrients, hydrogen sulfide, conductivity, and turbidity will increase in hypolimnetic releases from the dam. Results of the 2007 simply demonstrate pre-hydropower conditions.	Water Quality Technical Memorandum, Mahoning Creek Hydropower Project	Hydrogen Sulfide, Page 5, paragraph 1.
water quality	However, hypolimnetic turbidity will increase, as will lake sedimentation rates. Also, with a higher intake elevation, higher concentrations of organic material and nutrients will be exported downstream.	Water Quality Technical Memorandum, Mahoning Creek Hydropower Project	Turbidity, Page 6, Paragraph 1.
water quality	The water quality sampling area does not represent the area of impact. Raising the intake elevation will impact the water quality of the entire reservoir, and possibly 23 Mahoning Creek miles downstream of the dam, an area that extends way beyond the FERC "project boundaries".	Water Quality Technical Memorandum, Mahoning Creek Hydropower Project	Section 3.2, Page 18, Paragraph 4.
water quality	Compliance with non-degradation criteria and meeting lake and downstream water temperature objectives will increase operational complexity and will require additional manpower. Because dissolved oxygen, supersaturation, and water temperature problems will likely develop during the summer / fall season when seasonal water temperatures are the highest, effective remote operation of the facility during this period is questionable.	Final License Application	2.2.2 Proposed Project Operation, Page 7.
water quality	As discussed above, impacts to outflow and lake water quality are still of great concern. A variable elevation intake system for both the dam and hydropower, if operated properly, could mitigate lake and tailwater water quality problems, but would the licensee consider a lower intake elevation?	Water Quality Report, Mahoning Creek Hydropower Project	Section 2.3, page 12, paragraph 3.
water temperature	If outflow water temperatures increase to levels too high to support the downstream tailwater fishery, we can increase bypass flow, blending surface and bottom lake water to meet our downstream water temperature objective or discontinue generation. If structural mitigation is preferred, a lake bottom hydro intake for use during the summer / fall season would be necessary (see response to Comment 51 above).	Final License Application	Appendix B, 54, Page 19.
water temperature	Impacts on water temperature, both in the lake and downstream were not discussed, but are also of concern. With the existing bottom withdrawal, lake outflow water temperatures stay cooler later into the spring and warmer later into the fall than inflow water temperatures. As a result, lake tailwaters support an excellent, cool water / cold water fishery, and any increase in the outflow water temperature, especially during late summer, could be detrimental to the fishery. While the Corp's 1993 CE_QUAL-R1 model run showed only a mild warming in outflow water	Water Quality Technical Memorandum, Mahoning Creek Hydropower Project	Summary, Page 6.

June 2, 2010

Re: Mahoning Hydroelectric Project (FERC No. 12555)
Applicant's Response to Comments Filed by USACE and PA Fish and Boat Commission on Environmental Assessment

United States Army Corps of Engineers – Pittsburgh District (Pittsburgh District) Letter of April 23, 2010

Comment 1: Executive Summary and Section 3.3.1 – Geology and Soils Resources

> Page 1: It is mentioned that an erosion and sedimentation plan will "minimize hazardous materials from entering the creek." It is suggested that "hazardous materials" be defined. If there is the potential that any hazardous, toxic or radioactive materials are within the project area, then a Phase I investigation will be necessary.

Response: Mahoning Creek Hydroelectric Company (MCHC) is not aware that any hazardous materials have been found or are expected to exist within the project area.

Comment 2: Executive Summary and Section 3.3.2

> Page 2: The Corps is highly concerned that the EA does not adequately consider various alternatives available to the proposed development of hydropower at Mahoning Creek Lake. In addition, the Corps believes that alternatives discussed do not have an accurate factual basis, especially in regard to minimum flowage as proposed in the EA. Finally, the EA inappropriately attempts to put the burden of proof on the Corps with respect to adequate minimum flows.

Response: Numerous opportunities were provided throughout the licensing process for stakeholders to suggest development alternatives. As a result of this input MCHC gave serious consideration to locating the powerhouse with discharge going into the stilling basin. However, MCHC determined this alternative infeasible for the following reasons:

1. Discharging into the stilling basin reduces the available static hydraulic head by 13 feet from 95/80 summer/winter to 82/67. This proportionally reduces power capacity and energy generation by 11.5%, effectively rendering the project financially not viable.
2. Locating the discharge into the stilling basin would still require a bypass flow to ensure cool downstream water temperature and releases of anoxic lake bottom water in the summer.
3. There is insufficient space on the left bank of the stilling basin for the construction of the powerhouse, particularly given the instability and erosion that has historically occurred at this location.

Comment 2 cont': Section 5.2 – Comprehensive Development and Recommended Alternative

> Page 1: [A]t page 6, the EA states that the Corps of Engineers has not provided a specific recommendation or a justification for a bypass flow of greater than 30cfs, except for the need for a greater flow in winter to prevent freezing. . . . The Corps has repeatedly requested that proper water quality monitoring be put in place prior to project development and that an in-stream

> environmental flow study be conducted so the impacts to the environment could be adequately addressed.

Response: During the licensing process an In-Stream Flow Incremental Methodology Study (IFIM) was requested by the Pittsburgh District but the FERC rejected this request based on the following points:

> Mahoning Hydro proposes a 30 cfs minimum flow through the stilling basin, which corresponds to the minimum flow required by the Commission license previously issued for this site. The approved study plan does not require a habitat based flow study of the stilling basin. The Corps recommends that an IFIM study be conducted to determine what minimum flow should be released through the stilling basin, if other than the proposed 30 cfs.
>
> The stilling basin is a man-made structure, located below the spillway and above the proposed powerhouse alternative B tailrace; it is less than 300 yards long, with marginal, mostly homogenous habitat for species which are likely common and abundant in either the lake or the creek. Therefore, we do not agree that an IFIM study of stilling basin is needed to evaluate potential effects on aquatic habitat. Existing information should be sufficient for our analysis.

While IFIMs are frequently used in licensing processes to suggest appropriate minimum flows below spillways and tailwaters, such a study is wholly inappropriate in this instance. IFIMs use water depth and velocity as key indices of habitat suitability, and must be used in stream reaches with channels that have a stable, natural geometry and slope that is in equilibrium with the streams' native hydrology (Bovee et al., 1998; Bovee 1982).

IFIMS are helpful in evaluating a natural riverine channel wherein water is partially or even completely diverted for hydroelectric generation. The stilling basin, on the other hand, is a man-made box designed with no material connection to natural stream habitat—thus it would be inappropriate to target such a structure for habitat-based flow recommendations. The study results therefore would not be relevant in suggesting an appropriate minimum flow.

In addition, as discussed below in MCHC's responses to the Pittsburgh District's comment #4, IFIM models are not designed to address fish retention, which is one of the crucial issues associated with the stilling basin. Therefore, an IFIM model would be an inappropriate tool to examine this problem with no useful predictive value.

The FERC has indicated that it could potentially require a 40 cfs bypass minimum flow in winter months to assist the Pittsburgh District in ensuring that its release valves do not freeze, as they might, at lower flows. This will cost the project 130 MWh of production. MCHC recommends that if this does become a license condition that it be linked to a specific water temperature before being effective.

Comment 2 cont': Section 5.2 – Comprehensive Development and Recommended Alternative

> Page 1-2: [A]t page 56, the EA incorrectly asserts that the stilling basin below the dam is 'suboptimal, yet adequate to support a fish community favoring warm water species that prefer pool habitat. . . . The EA does not address the likely effects of the proposed hydropower project on the cold and cool water fisheries. . . . Nowhere in the EA are the potential impacts to the cold and cool water fishery discussed. Nowhere in the EA are the potential impacts of low flow on the spawning activity of the fishery addressed.

Response: The Pittsburgh District's comments fail to place the stilling basin within an appropriate context with regards to water quality and aquatic habitat in Mahoning Creek. The stilling basin is a man-made rectangular structure created by the stilling weir, which is approximately 17.4 feet high and impounds the stilling pool, which is only approximately 4.2 acres in area. This small artificial pool is frequently scoured clear by flood releases and has been emptied from time to time by the Pittsburgh District for dam maintenance purposes. In context, the stilling basin by design is not a natural channel feature and therefore provides only marginal habitat and has little effect on the Mahoning Creek fishery.

The Pittsburgh District does not currently monitor nor has it historically monitored water quality in the stilling basin. Neither the Pittsburgh District nor PFBC appear to have any published aquatic habitat management goals for the stilling basin. The Pittsburgh District does not currently operate Mahoning Dam to specifically protect or enhance aquatic habitat in the basin. Any existing level of water quality or aquatic habitat found in the stilling basin is purely incidental and would not significantly change as a result of the proposed project.

The Pittsburgh District's characterization of the stilling appears to be based on a misinterpretation of the results of a 1986 fishery survey (Koryak and Hoskins, 1994 [1995]). Only a portion of the results of this 1986 survey was presented in Appendix A of the Pittsburgh District letter of April 23, 2010; MCHC has appended to this response a copy of the entire survey (see Attachment A).

The 1986 Mahoning Creek Dam fishery survey was actually part of a larger study of tailwater resources at Pittsburgh District projects conducted between 1986 and 1990. The results of this study were widely distributed by the Pittsburgh District in a number of presentations and publications, including the 120th Annual Meeting of the American Fisheries Society, August 26–30, 1990, Pittsburgh, Pennsylvania, and in the Proceedings of the Corps of Engineers Tenth Seminar on Water Quality, February 15–18, 1994, Savannah, Georgia; U.S. Army Corps of Engineers Committee on Water Quality and the Waterways Experiment Station.

Koryak and Hoskins 1994 provide the following characterization of the Mahoning Creek Dam stilling weir pool:

> The design of stilling weirs was another variable observed to very significantly influence the local distribution and abundance of fish in reservoir tailwaters . . . there is a profound difference in the quality and quantity of fish present in reaches upstream and downstream of the Mahoning Dam stilling weir. This weir is 5.3 meters high and impounds a 1.7 hectare stilling pool. The fish biomass CPUE was 1,900% higher in the pool downstream of this weir than in the stilling pool, and this data was collected during the spring when we were probably blowing out walleye through the dam directly into the stilling pool. However, as previously discussed, walleye are very mobile fish. They apparently don't hold there for long, and once over this high weir they can't reenter the stilling pool.
>
> During late summer the contrast can be even more extreme. In the 1970's, for instance, we [the Pittsburgh District] had to drain the Mahoning Dam stilling pool for maintenance during the summer and conducted a fish salvage operation as the pool was reduced. In this entire 1.7 hectare stilling pool, we only salvaged one walleye, one yellow bullhead, and about a hundred young of the year (>125 mm) yellow perch and bluegill. Meanwhile, anglers were successfully harvesting considerable numbers of large gamefish on the downstream side of the stilling weir during the pumpout.

> So where did the District construct its Mahoning Creek Dam tailwater wheelchair access handicapped fishing pier? Unfortunately, it was placed above rather than below the stilling weir, where dangerously steep slopes could be avoided but where fishing is generally poor. With the knowledge gained from these studies, we are now able to more effectively locate such structures. For instance, in 1993 the initially proposed site for a handicapped access fishing pier in the Mosquito Creek Dam tailwaters was tentatively relocated from above to below that project's stilling weir, to provide improved fishing opportunities in spite of some increased logistical problems.
>
> As was observed at Mahoning and Mosquito Creek Dams, Jernejcic (1982a) similarly documented a paucity of fish upstream of the high Tygart Dam stilling weir relative to the more productive fishery downstream of its weir.

This characterization of the stilling basin downstream of Mahoning Dam was definitely confirmed by the 2007 Hull and Associates survey of the project. A total of 4,068 individual fish were collected from project waters during their study, but only 26 fish (0.6%) were found in the stilling basin (Hull 2007). Hull found that "Site SA-1 (stilling basin) scored lowest of all the sites. This site scored 121 on the QWDS; categorized as suboptimal habitat."

The fish community found in the stilling basin is a transitory one, augmented by artificially stocked fish.

Comment 3: Executive Summary and Section 3.3.2

> Page 2: The EA does not adequately address anticipated substantial environmental impacts to water quality, aquatic life, and aquatic habitat in the dam tailwaters and, especially, in the stilling basin and the lake. . . . In addition, not all alternatives were considered: i.e. using the existing stilling basin (no bypass needed), or alternative bypass flows, as we recommended in previous comments. In order to protect existing aquatic resources and project benefits, we will utilize current and historical pre-hydropower data to develop non- degradation criteria for hydropower generation, and will require the licensee to conduct intense, real-time continuously recording water quality monitoring.

Response: While the Pittsburgh District characterizes the anticipated environmental impacts from the proposed project as "substantial," it is important to note that this assertion is not supported by any of the many studies conducted by MCHC during the licensing process. The threshold or definition for "substantial" is not defined and is thus an arbitrary term. Nor is the Pittsburgh District's assertion supported by any studies conducted during earlier licensing processes.

The Pittsburgh District's contention that the project will have "substantial" environmental impacts lacks any specificity or basis in study results and is not supported by the record.

Comment 4: Executive Summary and Section 3.3.2

> Page 6: We strongly object to the proposed 30 cfs bypass flow because of impacts to water quality and aquatic life in the stilling basin (including its high quality and extremely popular fishery). . . . We expect fish diversity to increase since our 1986 survey due to reservoir and outflow stocking efforts by the PFBC, improved access to the entire basin compared to our 1986 survey, and improving water quality.

Response: The Pittsburgh District's characterization of the fishery in the stilling basin is not supported by Koryak and Hoskins (1994) or Hull (2007). These studies indicate that fish

abundance and diversity in the stilling basin are inherently low due to the artificial basin's physical characteristics. Despite the Pittsburgh District's speculation, fish diversity has not increased substantially between the two surveys. Angling activity appears to be directly linked to stocking efforts; outside of stocking efforts the stilling basin does not appear to support a self-reproducing fish community.

As pointed out in Koryak and Hoskins (1994), fish are not retained within this stilling weir pool. Not surprisingly, local fishermen have figured out the patterns of fish distribution and abundance at the project. In spite of the very attractive and accessible facilities provided for them directly adjacent to the stilling weir pool, they nonetheless consistently reject this area to rough it down the hill and concentrate their efforts in the very considerably more productive waters downstream of the weir.

The Pittsburgh District provides no justification for increasing flows above 30 cfs into the stilling basin. Considering that the most pressing fisheries issue in the Mahoning Dam stilling basin is fish retention, the increased bypass flows would tend to exacerbate fish movement out of the basin.

Comment 5: Executive Summary and Section 3.3.2

> Page 6: There is little discussion and/or dismissal of the anticipated impacts of hydropower generation on water quality and aquatic life in the lake, the stilling basin, and the downstream regulated reach, and the mitigation measures necessary to address these issues. . . . Mitigation measures for impacts to lake and downstream water quality (elevated dissolved metal & nutrient concentrations, depressed dissolved oxygen levels, higher outflow water temperatures especially in the stilling basin, elevated total dissolved gas levels, etc.) could include construction of a lake bottom hydropower intake, higher & seasonal bypass flows, no hydropower generation during late summer months when lake stratification is severe, and/or downstream 02 injection.

Response: As noted above, the USACE's catalog of "anticipated impacts of hydropower generation and aquatic life" are unfounded and are not supported by the results of any studies conducted by MCHC during the licensing process. Calculations of temperature and dissolved oxygen are all contained in MCHC's Water Quality Technical Memorandum (AHS 2007).

As is described in MCHC's license application, the proposed project would not alter flows outside the stilling basin and would not alter reservoir management over existing conditions. Therefore no degradation is expected.

Comment 6: Executive Summary and Section 3.3.2

> Page 6-8: Based on the current analyses presented in the EA, the Corps cannot and agree to a minimum flow of 30 cfs by pass flow at any time of year. . . . [O]ur analysis of releases from the dam during the past 30 years shows the average 7-day minimum is greater than 50 cfs. . . . The proposed minimum flow will drastically change this to only support of certain warmwater fish and may imperil other fish that are passed through the sluice gates. . . . [R]eliance on use of Q7-1O to determine a minimum flow through the dam continues to be a problem for the Corps. One issue is interpretation of the meaning of Q7 -10; it appears that this concept is being interpreted differently by MCHC and the Corps. . . . [W]e would like to stress that Q7-10 is not the 7-day low flow from the previous ten years and MCHC's reference to a ten-year period ending on September 30, 2008 is in error since the Q7-I0 is not based on a specific ten-year period.

> The use of the calculated Q7-10 as a bypass flow is not appropriate because it does not address seasonal requirements or impacts of a permanent low flow on water quality and aquatic life in the stilling basin. . . .[T]he proposed 30 cfs bypass flow will not adequately protect stilling basin water quality and aquatic life. . . . Therefore, we will require that the Operations MOA required by Draft License Article 011 identify appropriate bypass flows for at least 2 seasons (and possibly a 3rd). An instream flow study will likely reveal that at least a 150 cfs bypass flow will be necessary for the spring spawning season (March– June); and at least 50 cfs will be necessary for remainder of the year (July– Feb.).

Response: It is unclear how the Pittsburgh District arrived at its recommended 50 cfs bypass flow in the absence of any study results. It is also unclear what need exists for a 150 cfs spawning flow in a stilling basin that lacks both spawning habitat as well as a self-reproducing fish community, and what if any specific habitat suitability criteria were employed to quantify 150 cfs as the targeted flow. The Pittsburgh District's contention that "the proposed minimum flow will drastically change this to only support of certain warmwater fish and may imperil other fish that are passed through the sluice gates" is not supported by any study results and is contradicted by studies performed by the Pittsburgh District historically and by MCHC throughout the licensing process.

The Pittsburgh District's contention that the proposed 30 cfs minimum flow "does not address seasonal requirements or impacts of a permanent low flow on water quality and aquatic life in the stilling basin," ignores the very nature of the stilling basin, which is an artificial structure not designed to offer aquatic habitat, nor support a fish community. As there is no specific fishery management objectives for this objection the need for seasonal variation in flows into the stilling basin is not supported by the record. Further, the Pittsburgh District does not currently adjust Mahoning Dam operations on a seasonal or daily basis to maintain or vary flow into the basin, and therefore the proposed operation would not alter or degrade existing habitat suitability in the basin.

While the Pittsburgh District does not—and likely cannot—attempt to quantify the environmental benefits of its suggested flow, the economic costs of such a measure are readily determined. A year-round minimum flow of 50 cfs, increased to 150 cfs for March to June, would result in a loss of approximately 1,580 MWh annually, or approximately $110,000 annually or nearly $2.2 million over a 20 year period.

MCHC evaluated the daily average flow data as recorded by the Pittsburgh District for complete years (Calendar Year 1942-2009), and assessed the low flow statistic 7Q10. (MCHC has appended this data to the response as Attachment B.)

The 7Q10 is the 10-percent lowest value of the annual 7-day moving average flows (Helsel and Hirsch 2002), and was determined using a Log-Pearson Type III distribution for the entire period of record with complete years. The lowest 7-day moving average flow is recorded for each year, resulting in single annual value for the period of record. Frequency statistics are then performed on this dataset following the Log-Pearson Type III distribution. Other parametric or non-parametric means are available to define the distribution, but the Log-Pearson approach best follows low flow records. The 10% exceedence value is then obtained from this distribution, which is the 7-day moving average low flow condition with a 10-year return frequency for a flow lower than this value.

As the project was constructed in 1941, and to present time, there are no significant changes to available storage, basin withdrawals, or upstream dam construction, the entire period of record was deemed acceptable for use in this analysis. Additionally, the project immediately upstream of the gage operates as a run-of-river facility with limited pond fluctuation, and thus storage affects during low flow periods are marginalized. **As a result of evaluating the daily flow values, the 7Q10 was determined to be 15.6 cfs, half the proposed 30 cfs minimum flow**.

Comment 7: Executive Summary and Section 3.3.2

> Page 8: The use of forced air will cause additional impacts not addressed in the EA. Using forced air to meet the non-degradation DO criteria of 7.2 mg/l will supersaturate tailwaters, causing popeye or nitrogen narcosis in tailwater fish during late summer and early fall (mid July through early October) when water temperatures are high. Another alternative to meet the non-degradation DO criteria other than higher bypass flow would be oxygen injection.

Response: Unfortunately, the Pittsburgh District's concern here is incorrectly focused on the proposed method of increasing dissolved oxygen (DO) levels, rather than on its inappropriately high DO recommendation. At several points in its comment letter the Pittsburgh District cites "non-degradation standards" as justification for various recommendations. However, the Pittsburgh District's usage of this term suggests either a fundamental misunderstanding or misapplication of federal non-degradation policy. Non-degradation does not, as seemingly implied by the Pittsburgh District, mean a simplistic "make no change to water quality," but rather "do no harm to water quality." The distinction between these two standards is critical. In 1998 FERC—with the USACE as a cooperating agency—issued a Final Environmental Impact Statement (FEIS) for hydropower development in the Upper Ohio River Basin (FERC 1988). The FEIS includes considerable discussion regarding appropriate standards for dissolved oxygen (DO) levels to meet non-degradation requirements.

The Pittsburgh District's assertion that 7.2 mg/l is the appropriate DO criteria is not consistent with federal non-degradation water quality standards, nor is it commensurate with the current classification of Mahoning Creek at the site of the proposed project. As noted in MCHC's License Application, Exhibit E, The Mahoning Creek mainstem, from its origin at the confluence of the East Branch Mahoning Creek and Stump Creek (upstream of the impounded portion of Mahoning Creek Lake) to its confluence with the Allegheny River, is classified as a Warm Water Fisheries (WWF). WWF is defined as "maintenance and propagation of fish species and additional flora and fauna which are indigenous to a warm water habitat" (25 Pa. Code §93.9s). The Pennsylvania standard for DO in WWF streams and rivers is a minimum daily average of 5.0 mg/l; minimum 4.0 mg/l.

During the licensing process for the previous hydroelectric project (FERC No. 10521), FERC staff compared the benefits of various alternatives to meet DO and fishery objectives (FERC 1989). The total project benefits were maximized with the project maintaining a DO level of 6.0 mg/l. However, the USFWS and PFBC recommended that downstream DO levels be maintained at pre-project levels to protect fishery resources in Mahoning Creek, notably cool water walleye and smallmouth bass. FERC determined that the USFWS and PFBC request to require the project proponent to maintain DO at pre-project levels was inconsistent with Sections 4(e) and 10(a) of the Federal Power Act. Accordingly, the previous FERC license required the maintenance of 6.0 mg/l DO.

MCHC is concerned by the example of the Youghigheny Project (FERC No. 3623), in which the Pittsburgh District, once more citing nondegradation criteria, has held the licensee of that project to higher DO standards (7.5 mg/l) than the FERC license condition (and state requirement) of 7.0 mg/l. One unintended result of the Pittsburgh District's high DO requirement has been total dissolved gas levels so elevated as to actually harm the fishery in the tailrace.

The Pittsburgh District's contention that 7.2 mg/L is the appropriate DO level is not consistent with federal nondegratation policy, previous determinations, or the existing fishery.

Comment 8: Executive Summary and Section 3.3.2

> Page 8: No mitigation measures were suggested for impacts of the proposed 30 cfs bypass flow on water quality and the fishery in the stilling
> basin or the impacts of a higher intake elevation on lake water quality. . . . [I]n addition to monitoring the hydropower outfall, real-time, continuously recording water quality monitoring will be necessary in the stilling basin and also at three depths in the lake. Since negative environmental impacts in the lake, the stilling basin, and the regulated reach are likely, a strong real-time, continuous monitoring network, with data continuously available on line, is critical to insure optimum operation of the Corps' gates to mitigate water quality problems. Sampling locations will include the lake metalimnion, epilimnion, & hypolimnion, the stilling basin, and downstream of the hydropower outfall. Parameters measured should include DO, water temperature, and TDG in the hydropower outfall, and DO, water temperature, and conductivity in the lake and the stilling basin.

Response: MCHC's proposals for monitoring water quality are described in its Final License Application, Exhibit E, Section 3.4.3.

Comment 9: Executive Summary, Section 3.3.2, and Section 5.2

> Page 8: "Since the proposed bypass flow is too low to protect the stilling basin fishery, construction of a fishing pier over the basin will not mitigate the loss of the fishery or the fishing access."

Response: The Pittsburgh District's contention that the proposed bypass flow "is too low to protect the stilling basin fishery" is not supported by the record and is contradicted by the findings of studies performed by MCHC throughout the licensing process.

Comment 10: Executive Summary and Section 3.3.2

> Page 8: Monitoring is not mitigation but it is necessary to determine if the proposed mitigation measures are effective or if Corps control/reservoir releases (bottom withdrawal) are necessary. Therefore, as mentioned above, a strong real-time, continuous monitoring network, with data always available on line throughout the duration of the license, is critical to insure optimum operation to mitigate hydropower related water quality problems.

Response: MCHC's proposals for monitoring water quality are described in its Final License Application, Exhibit E, Section 3.4.3.

Comment 12: Section 1.3

> Page 8: "The reference for the FWS email dated July 20, 2009 is unclear, we could not find it in Exhibit E of the Final License Application."

Response: See MCHC's Final License Application, Exhibit E, Appendix E, Indiana Bat Protocol.

Comment 15: Section 3.3.2 – Aquatic Biota

> Page 9: The low macroinvertebrate diversity recorded by MCHC in 2007 is inconsistent with the high diversity recorded in the outflow area by the Corps in 1987. . . . Based on the number of caddisfly species collected during the 1987 study (the highest number collected in the Pittsburgh District), the Mahoning Dam tailrace would have the highest water quality in the Pittsburgh District.

Response: While the aquatic life stage macroinvertebrate data collected by MCHC in 2007 may appear inconsistent with the referenced adult flying life stage (light trap) data, it is in fact entirely consistent with similar aquatic life stage macroinvertebrate data collected over the years by the Pittsburgh District at the project—see, for example, USACE 1993. The noted inconsistency between the two sets of data is not surprisingly because they were collected by two totally different methods designed to measure different quality parameters. The aquatic life stage method data reflects quality at very specific stream locations. The light trap data, on the other hand, reflects the quality and habitat complexity of larger units that would include downstream reaches and tributaries and local spring seeps, etc. Direct comparison of the results of the two methods is entirely inappropriate.

The results of the referenced light trap study were published as a special publication of the Ohio Biological Survey (Sykora et al. 1997). A copy of this paper is appended as Attachment A. Also, according to this publication, the assertion that the Mahoning Dam outflow was the most diverse station (39 taxa) in the District is incorrect. As Sykora 1997 notes, the "Tygart River Lake's inflow had the highest diversity with 54 taxa recorded. Mahoning Creek Lake's inflow had the second highest diversity with 40 taxa. . . . . A similar pattern emerges when the outflow data are examined. Youghiogheny had the highest diversity with 49 taxa."

Pennsylvania Fish and Boat Commission (PFBC) Letter of April 22, 2010

Comment 1: Section 2.2.2 – Proposed Project Operation and Section 3.3.2, Aquatic Biota and Water Quality

> Page 1: PFBC believes that analysis of an additional alternative that releases water from the turbine to the stilling basin should be considered to support the fishery and water quality in this area. Limiting flow in the stilling basin to only 30 cfs conservation release to the basin will likely result in water quality problems, notably low dissolved oxygen and elevated temperatures. This will make this area uninhabitable at times to aquatic life. The stilling basin would also serve to dissipate velocity from the turbine release.

Response: As noted above in response to the Pittsburgh District's comment #2, during the licensing process MCHC examined discharging into the stilling basin and determined this alternative to be infeasible. PBFC's statement that the 30 cfs conservation release to the basin will likely result in water quality problems, notably low dissolved oxygen and elevated temperatures," is not supported by studies conducted as part of the licensing process (see AHS 2007). MCHC also conducted a two dimensional computer modeling of discharge patterns from

the proposed powerhouse and found that there will be little or no impact from the turbine releases.

Comment 2: Section 3.3.2 – Minimum Flow in Bypassed Reach

> Page 2: [PFBC] agree[s] with the Corps of Engineers that a moving minimum flow will help protect seasonal needs of aquatic life and water quality. Typically, PFBC recommends a conservation release of 20% average daily flow calculated on an annual basis (or all incoming flow bypassed at lower flows) to protect aquatic life downstream. Alternatively, Pennsylvania DEP Chapter 93 Water Quality Standards could be implemented as performance standards to assure water quality is supported at times of minimum flows. The Q7-10 flow advanced as sufficient is exceeded approximately 99% of the time and is insufficient support the water quality and aquatic life since it subjects this portion of the creek to severe drought flow at all times. This has proven to be limiting to aquatic life in nearly all cases unless the stream is supported by a strong base flow, which is not the case with Mahoning Creek as evidenced by the highly variable flow record in Table 1.

Response: The proposed project only affects flow into the 1.7 hectare man-made stilling basin, and a 30 cfs minimum flow would keep the stilling basin fully watered throughout the entire year. All natural riverine stretches of Mahoning Creek would receive the same flows under the proposed project as under current conditions.

Comment 3: Section 3.3.2 – Fish Protection

> Page 2: [PFBC] has recently formulated intake recommendations that water velocity is limited to no more than 0.5 feet per second. We believe intake screens of 3/8" spacing coupled with the lower velocity will be more protective of fish. The EA indicates that 90% of fish should survive entrainment, but fails to discuss the significance of loss of 10% of entrained fish. [PFBC] is responsible for managing this resource and believes that mitigation should occur by the project operator for mortality that currently does not occur.

Response: Under existing conditions, fish pass from the impoundment into Mahoning Creek downstream of the dam through the sluice gates. The PFBC has expressed concern that once the project is constructed, fish may also pass through the project's turbines potentially subjecting them to impingement and entrainment. To protect fish and minimize impingement and entrainment, MCHC has proposed to design the intake and trash rack for the power station using USFWS Region 5 standard intake and trash rack design criteria. The proposed intake and trash rack were thus designed with an intake velocity of approximately 1 foot per second (fps). To achieve this standard, the discharge of 870 cfs thereby requires the trash rack area of the intake to be approximately 870 square feet. The openings between the bars of the proposed trash rack will be spaced approximately one inch on center. The intake structure will extend between approximately 28 and 60 feet below the surface. The PFBC has requested that MCHC install a 3/8 inch spaced trashrack and target approach velocities at the intake of 0.5 fps. It is not clear from PFBC comments if this is an on-center dimension or clear spacing dimension. The following provides a discussion of the validity of FHC's original proposal for 1 inch trash rack spacing and an approach velocity of 1 fps.

The fish communities present in Mahoning Creek reservoir in the vicinity of the dam consist of open water (pelagic) species and near-shore (littoral) structure-oriented species. Based on the results of the 2007 fish community survey, the majority of fish species documented in the impoundment were not pelagic species. The majority of fishes preferred benthic and cover

habitats that is most abundant near the shoreline. Such species have a low proclivity to undergo riverine movements, and none of the species documented in the impoundment require downstream passage around the dam to complete life history requirements.

Game fish—including largemouth bass, smallmouth bass, muskellunge, white crappie, black crappie and rock bass—identified in the 2007 fish community sampling effort are primarily near-shore structure-oriented species and, as a result, entrainment of these species is expected to be minimal. Although two pelagic species, gizzard shad and yellow perch, were identified, these are abundant and highly fecund species whose populations were not likely to be adversely affected by some degree of entrainment loss, according to FERC staff (FERC 2010).

While some fish entrainment in the proposed intake is inevitable, entrainment will likely be limited to small individuals of species that are expected to be near or traveling at water depths corresponding to the depth of the intake structure (FERC 1995; EPRI 1997). Based on a review of fish swimming velocity data (Hull 2009; USFS 2008), the swimming velocities for small species including chubs, shiners and daces range from 1.1 to 3.0 fps; 1.6 to 2.1 fps for trout species, and 1.1 to 3.5 fps for bass species. As a result, small to large adult fish at the Mahoning Creek reservoir are expected to be capable of swimming out of a 1 fps intake flow, and therefore would not be involuntarily entrained. Likewise, entrainment of larger juvenile fish of other species will be minimal as they will also be capable of escaping the 1 ft/sec velocity field and swimming away from the intakes (Bell 1991).

Considering a limited amount of entrainment of small fish is likely to occur during project operation, some of the fish entrained may be injured and/or killed. Although turbine passage survival estimates vary from site to site, a number of trends have been recognized. For example, the size of a fish relative to the water passage-way within a turbine can greatly affect survival rate (EPRI 1997, FERC 1995 and Franke et al. 1997). According to FERC staff, fish survival based on studies conducted with the same and/or similar fish species at projects with Kaplan turbines operated in the 70 to 95 foot hydraulic head range, as proposed, is expected to in excess of 90 percent (Hull 2009; FERC 2010).

Reducing the average intake velocity to 0.5 fps will require a doubling in area of the intake structure at a cost of over $250,000 and will likely make the intake so heavy that its cantilevered attachment to the dam face may be unsafe. As discussed above, the existing velocity design criterion will not induce involuntary entrainment, and therefore there is no documented entrainment benefit to further reducing the velocity to 0.5 ft/sec.

REFERENCES

Advanced Hydro Solutions (AHS). 2007. Water Quality Technical Memorandum for the Mahoning Creek Hydroelectric Project (FERC No. 12555). October 2007.

M.C. Bell. 1991. Revised Compendium on the Success of Passage of Small Fish through Hydroelectric Turbines. U.S. Army Corps of Engineers, North Pacific Division, Portland, Oregon.

K.D. Bovee. 1982. A guide to stream habitat analysis using the instream flow incremental methodology. Instream Flow Information Paper 12. US Fish and Wildlife Service. FWS/OBS-82/26: 248 pp.

K.D. Bovee, B.L. Lamb, J.M. Bartholow, C.B. Stalnaker, and J. Taylor. 1998. Stream habitat analysis using the instream flow incremental methodology. Biological Resources Division Information and Technology Report USGS/BRD-1998-0004. United States Geological Survey, Fort Collins, Colorado. 131 p.

Electric Power Research Institute (EPRI). 1997. Turbine survival and entrainment database – field tests. EPRI Report No. TR-108630. Prepared by Alden Research Laboratory, Inc. Holden, MA. 13 pp + two 3.5" diskettes.

Federal Energy Regulatory Commission (FERC). 1988. Hydroelectric development in the Upper Ohio River Basin – Ohio, Pennsylvania, West Virginia: Final Environmental Impact Statement. FERC Docket No. EL85-19-114. Issued September 1988.

Federal Energy Regulatory Commission (FERC). 1989. Environmental Assessment for Mahoning Creek Dam Project (FERC No. 10521). Accession No.: 19890614-0159. Issued May 18, 1989.

Federal Energy Regulatory Commission (FERC). 1995. Preliminary assessment of fish entrainment at hydropower projects – volume 1 (Paper No. DPR-10). Office of Hydropower Licensing, FERC, Washington, DC.

Federal Energy Regulatory Commission (FERC). 2010. Environmental Assessment for the Mahoning Creek Hydroelectric Project (FERC No. 12555). Accession No.: 20100323-3051. Issued March 23, 2010.

G.F. Franke, D.R. Webb, R.K. Fisher, D.Mathur, P.N Hopping, P.A. March, M.R. Headrick, I.T. Laczo, Y. Ventikos, and F. Sotiropoulios. 1997. "Development of environmentally advanced hydropower turbine system concepts", Voith Hydro, Inc. Report No.: 2677-0141. Prepared for the USDOE (Idaho) Contract No. DE-AC07-96ID13382.

D.R. Helsel and R. M. Hirsch, 2002. Statistical methods in water resources techniques of water resources investigations, Book 4, chapter A3. U.S. Geological Survey. 522 pages.

R.H. Hoskin and M. Koryak. Tailrace Fisheries of Reservoirs in the Upper Ohio River Drainage Basin. Abstracts, 120th Annual Meeting of the American Fisheries Society, August 26-30, 1990 - Pittsburgh, Pennsylvania, American Fisheries Society.

Hull and Associates, Inc. (HA) 2007. Aquatic Resources Technical Memorandum. Prepared for Advanced Hydro Solutions. October 2007.

Hull and Associates, Inc. (HA) 2009. Fish Entrainment and Impingement Technical Memorandum. Mahoning Creek Hydroelectric Project. Prepared for Advanced Hydro Solutions. May 2008.

M. Koryak and R. H. Hoskin. 1994. "Variables influencing the productivity and diversity of reservoir tailwater fisheries in the Upper Ohio River Drainage Basin. 14th International

Symposium of the North American Lake Management Society, 31 October - 5 November 1994. Orlando, Florida. NALMS.

M. Koryak and R.H. Hoskin. 1995. “Variables influencing the productivity and diversity of reservoir tailwater fisheries in the Upper Ohio River Drainage Basin.” Proceedings of the Corps of Engineers Tenth Seminar on Water Quality, February 15-18, 1994, Savannah, Georgia. Prepared by the U.S. Army Corps of Engineers Committee on Water Quality and the Waterways Experiment Station for Headquarters, U.S. Army Corps of Engineers, Miscellaneous Paper W-95-1, February 1995.

J.L. Sykora, M. Koryak, and J.M. Fowles. 1997. "Adult Trichoptera as indicators of water quality in the Upper Ohio River Drainage Basin.” Proceedings of the 8th International Symposium on Trichoptera,1997, pages 441-414.

US Army Corps of Engineers, Pittsburgh District (USACE). 1993. Mahoning Creek Lake Reservoir limnology, aquatic life and water quality.

US Department of Agriculture, Forest Service (USFS). 2008. Stream Systems Technology Center: Fish Crossing. [Online] URL: http://www.stream.fs.fed.us/fishxing/. Accessed May 19, 2010.

USACE Comments on " Mahoning Hydroelectric Project (FERC No. 12555) Applicant's Responses to Comments Filed by USACE and PA Fish and Boat Commission on Environmental Assessment."

Comment 2: Executive Summary Section 3.3.2

Environmental, economic, and cultural impacts of all alternatives should be considered in the EA, even though opportunities were provided for Agency comment throughout the FERC process.

Comment 2 cont: Section 5.2 – Comprehensive Development and Recommends Alternative

FERC recommend a 30 cfs bypass flow for Mahoning Dam in their May 7, 1990 license to Mahoning Hydro Associates. However, what was appropriate in 1990 may not be appropriate in 2010 since both water quality and the lake and tailwater fisheries have improved over the past 20 years. The USGS' Q710 for the Mahoning River downstream of Mahoning Dam is 30 cfs. However, we believe that the Q7-10 or even the 40 cfs required to keep the valves from freezing will be too low to protect water quality and aquatic life since, as mentioned by the PA F&BC, it subjects this portion of the creek to continuous severe drought. Therefore, we will require an IFIM or similar flow study to determine an appropriate bypass flow.

We neither disagree with the conclusions of Koryak & Hoskin's presentation for the 1994 14th International Symposium of the North American Lake Management Society (based on 1989 data) nor do we question EnviroScience's 2007 gill net results. However, based on our 7 May 2010 stilling basin electrofishing survey, which was conducted by Robert Hoskin (coauthor of the referenced papers), the Mahoning basin fishery can be characterized as good and improving. The Mahoning stilling basin is not a "man-made box", but rather more like a small lake with excellent, rocky substrate (see photo 1). We have now collected a total of 17 species of fish in the stilling basin. In 2010, we collected yellow perch, smallmouth bass (> 16" inches), rock bass, smallmouth bass, yellow bullhead, carp, hog suckers, white suckers, river chubs, fathead minnow, logperch, greenside darter (see Photo 2). The stilling basin supports a cold/cool water fishery which is very different from Mahoning Lake's warmwater fishery so the basin is not just a repository for fish passing from the lake. In addition, at least six species and possibly 9 species of fish are now reproducing naturally in the stilling basin. It is true that the fishery downstream of the stilling basin dam is more productive than that in stilling basin, but that does not negate the value of the stilling basin fishery (see Attachment 1).

Regarding stilling basin water quality, our Mahoning Dam outflow semi-monthly grab water quality samples have been and continue to be collected from the stilling basin (continuous from 1974 to the present). We are also considering real-time, continuous water quality monitoring.

The Mahoning Stilling basin has only be dewatered once since it was constructed, in 1978, for debris removal. Since then, there have been a few divers' inspections and some ROV inspections in the basin.

	
Photo 1. Mahoning Stilling Basin substrate, May 7, 2010.	Photo 2. Mahoning Stilling basin Small mouth bass, May 7, 2010.

Comment 3: Executive Summary and Section 3.3.2.

MCHC did not run a current, two- dimensional model capable of predicting water quality conditions for each proposed alternative (dissolved oxygen, water temperature, lake stratification etc.). Rather, water temperature and dissolved oxygen impacts were estimated using calculations based on data from a few 2007 lake surveys. Therefore, since we are unsure of impacts, if water quality or aquatic life are negatively impacted by hydropower generation (i.e. conditions are worse than they ever were prior to hydropower generation), than we will increase by-pass flow until problems are corrected. Non-degradation criteria will be based on "worse case" pre- hydro water quality conditions (dissolved oxygen, water temperature, total dissolved gas, and other parameters that may be of issue) in the lake, the stilling basin, and the regulated reach of the Mahoning River downstream of the hydropower outfall. Requiring non-degradation criteria for hydropower development at Mahoning is not precedent setting as we have implemented non-degradation criteria at all retrofit hydropower facilities in the Pittsburgh District, including the facility at Youghiogheny Dam.

Comment 4: Executive Summary and Section 3.3.2.

As discussed, our characterization of the stilling basis fishery is based on Hoskin's 2010 stilling basin fishing survey. The stilling basin currently supports a reproducing, coldwater fishery which is not dependent on passage of fish from the lake (see Attachment 1).

Comment 5: Executive Summary and Section 3.3.2.

Again, AHS did not run a current, two- dimensional water quality modeling capable of predicting lake downstream water quality and lake stratification patterns for proposed alternatives. Therefore, if non-degradation criteria are exceeded than we will bypass more flow. Conditions will be spelled out in our operational MOA.

Comment 6: Executive Summary and Section 3.3.2

As previously discussed, our estimate of seasonal bypass flow was based on actual releases from the dam over the past 30 years. Analyses of these data show that the AVERAGE, 7-day minimum outflow, not the Q7-10, is about 150 cfs during the spring and 50 cfs for the remainder of the year. However, we have consistently recommended that an IFIM or similar in-stream flow study be conducted to determine an appropriate environmental by-pass flow to protect aquatic life and water quality in the stilling basin. The burden of proof lies with the developer since they are proposing a change in our project operations that could impact project purposes and/or benefits.

PL-85-624 authorizes our fish & wildlife responsibilities and the Corp's Environmental Operating Principles provide the basis for sustainable management of Federal resources. The Corp's non-degradation policy is described in ER 1110-2-1462, dated 20 February 1991, "Water Quality and Water Control Considerations for Non-Federal Hydropower Development at Corps of Engineers Projects" (See Attachment 2).

In the operation of Mahoning dam, we do not "adjust the outflow on a seasonal or daily basis" but rather just pass the inflow while delaying peak flows. Therefore, the outflow shows seasonal variation just as the inflow does. Natural seasonal flow variation is critical to sustain aquatic communities.

Comment 7: Executive Summary and Section 3.3.2

We are not recommending that hydropower generation "make no change to water quality". Our non-degradation criteria will be based on "worse case" pre-hydro conditions. This means that water quality can worsen but not to levels worse than the worst pre-hydro conditions. Since the quality of most of our headwater reservoirs is very high, non-degradation criteria in the Upper Ohio watershed are generally higher than State standards.

Comment 8: Executive Summary and Section 3.3.2

We increased water quality monitoring at Mahoning Lake to better define pre-hydropower conditions. Real-time, continuously recording monitors, measuring water temperature, dissolved oxygen, pH, conductivity, and TDG, have been deployed in the lake just upstream of the dam and in the Mahoning River at the McCrea Furnace Bridge (0.9 mile downstream of the dam). We are also considering real-time monitoring in the stilling basin. Data generated will be utilized to define pre-hydropower conditions.

Comment 9: Executive Summary, Section 3.3.2, and Section 5.2.

See response to Comment 2 cont above.

Comment 10: Executive Summary and Section 3.3.2

See response to Comment 8 above.

Comment 15: Section 3.2.2 – Aquatic Biota

We disagree that light trap data (macroinvertebrate adults) cannot be compared to kick net or Surber data (juvenile macroinvertebrates). Together these data provide a more complete picture of community diversity. Of the District's 16 reservoir outflows, the Youghiogheny Dam outflow did have the greatest diversity of caddisflies during Phase I of the study (49 taxa), but significantly, the Mahoning Dam outflow was second (39 taxa). During Phase II of the study, the Tygart Lake outflow caddisfly community was most diverse (54 species) and again, Mahoning was second in diversity (40 taxa). More importantly, the first state records for 5 macroinvertebrate taxa were documented at Mahoning outflow (*Stactobiella palmata, Ochrotrichia tarsalis, Hydroptila talladega, H. delineata and Oecetis nocturna*). In addition, a few very rare species were collected in the Mahoning Creek outflow (*Agapetus rossi* and *Hydroptila metoeca)*(See Attachment 3).

Mahoning Creek Lake and outflow water quality has improved dramatically since our 1985 & 1986 tailwater macroinvertebrate surveys were conducted, and results of our 2006 & 2008 kick net macroinvertebrate surveys demonstrate this. A total of 12 taxa were identified in samples collected in the Mahoning River at the Mc Crae Furnace Bridge (0.9 mile downstream of the dam) in both 1985 and 1996. Kick net sample were collected at this same location in May 2006 and in April 2008, and 31 and 26 taxa, respectively, were identified. (See Attachment 4)

Based on our current kick net macroinvertebrate data, and our 1987 – 1992 light trap data, it appears that Hull's 2007 macroinvertebrate assessment (only 4 taxa identified) underestimates Mahoning's unique, high quality tailwater macroinvertebrate community.

DEPARTMENT OF THE ARMY
PITTSBURGH DISTRICT, CORPS OF ENGINEERS
WILLIAM S. MOORHEAD FEDERAL BUILDING
1000 LIBERTY AVENUE
PITTSBURGH, PA 15222-4186

REPLY TO ATTENTION OF

November 18, 2010

Planning and Environmental Branch

Kimberly D. Bose
Secretary, Federal Energy Regulatory Commission
888 First Street, N.E., Room 1-A
Washington, DC 20426

Dear Secretary Bose:

I am writing in response to the Notice of Availability of Supplemental Environmental Assessment (EA) filed on October 20, 2010 for Mahoning Creek Project No. 12555-004. Our comments on the original EA were filed on April 23, 2010. The transmittal letter for those original comments noted three major concerns that summarized in large part the detailed comments in an enclosed memorandum. These concerns were: potential impairment of our ability to meet our water quality and environmental stewardship mission with the stipulated minimum flow of 30 cubic feet per second (cfs); lack of sufficient technical analysis of the potential impacts to water quality and aquatic resources to support the conclusion of a Finding of No Significant Impact (FONSI); and the failure to analyze a sufficient range of alternatives that would better demonstrate the tradeoffs between economic and environmental factors in support of the recommended alternative. The supplemental EA does address our concerns with the previously specified minimum flow but we will need to intensely coordinate with the developer to work out an acceptable plan for operating the proposed project. We continue to have significant concerns with respect to the other primary comments.

We are encouraged to see that the minimum flow of 30 cfs has been eliminated from the recommended project and from the draft license articles and that the need for monitoring of the stilling basin has been acknowledged. Draft License Article 18 now requires that the project be operated with flows released by the Corps or directed to be released by the Corps within constraints established by the Corps in the operating memorandum of agreement. We still consider the analyses provided in the applicant's study plans and the FERC EAs to be insufficient to determine adequate minimum flows that could vary by season. We believe that an instream flow incremental methodology (IFIM) or similar study is required to determine appropriate minimum flows. Since such a study has not been conducted, we will require constraints for hydropower production take the form of non-degradation standards for dissolved oxygen, water temperature, total dissolved gas, conductivity, and biological indices. Compliance with the historical levels of these indices will be required to protect aquatic resources. We will also require that the licensee regularly monitor fish diversity and productivity to ensure that fish resources are protected. These stipulations will be specified in agreements with the licensee as described in Draft License Articles 10 and 12, and apply to the impoundment, stilling basin, and river downstream of the power plant outlet, and will be independent of financial impact. We will

require that actions be taken whenever any non-degradation standard is violated. Such actions would include but not be limited to reducing flows through the plant and increasing flows through the dam or injecting oxygen. The corrective measures would remain in effect until all violations are corrected. The Corps understands that such actions will impact the power production or project economics. Therefore, as stated above, we highly recommend that the developer undertake an IFIM or similar study which would allow for a better estimate of power potential or the potential need for other operations that could impact project economics for any given minimum flow.

We cannot support the Supplemental EA analysis that concludes in Section 4.2 that "releasing the applicant's 30 cfs minimum flow would adequately protect water quality and habitat in the stilling basin..." The Supplemental EA fails to adequately address how the environment will be effected by the introduction of hydropower as it does not compare appropriate water quality parameters with hydropower to those without hydropower. Overall, we cannot support the Supplemental EA's determination that a FONSI is appropriate for this project, as there is a lack of analysis to support a finding of no significant impact.

We are discouraged that the economic and environmental impacts of other alternatives were not addressed in the EA, notably locating the power house upstream of the stilling basin weir, in the evaluation process. We believe that the limited evaluation of alternatives raises uncertainty that the best alternative has been recommended.

Additional detailed comments are provided in the enclosed memorandum. We are committed to working closely with Mahoning Hydro to ensure an acceptable project. If you have questions or require additional information regarding this matter, please don't hesitate to contact my FERC Hydropower Coordinator, Mr. Jeffrey Benedict, at (412) 395-7202.

Sincerely,

William H. Graham
Colonel, Corps of Engineers
District Engineer

Enclosure

1. The EA still does not address environmental impacts (water quality, aquatic life, and aquatic habitat) in the dam tailwaters and especially in the stilling basin and the lake, which we believe will be substantial. There is still little discussion and/or dismissal of likely impacts of hydropower generation on water quality and aquatic life in the lake, the stilling basin, and the downstream regulated reach, or the mitigation measures necessary to address these issues. Basic limnology defines impacts expected with the proposed use of the plugged penstock openings for a retrofit hydropower, which will influence reservoir stratification patterns and downstream water quality, increasing hypolimnetic anoxic strata and metal and reduced nutrient accumulation. While waters are currently withdrawn from anoxic strata near the bottom of the lake during the summer season, the dam is a very effective aerator and the outflow is now consistently circumsaturated with dissolved oxygen.

2. In addition, not all alternatives were considered: i.e. using the existing stilling basin (no bypass needed) was dismissed because of economics; peer reviewed studies and/or models were not utilized to determine bypass flow alternatives; and no consideration was given to the fact that we could bypass as much as 100% of flow when lake and/or downstream water quality problems develop for an undetermined amount of time. Therefore, it is likely that with an adaptive management approach, actual conditions will be much different than predicted (greater bypass flows and more days with no hydro generation).

3. Previous comments on the original EA pertaining to sections that were not revised still apply.

4. **Pages IV and V, Alternatives Considered, and PAGE 11, Section 2.4, Corps Alternative**. "The Corps recommend a flow of 50 cfs from July through February and a flow of 150 cfs from March through June" Our proposed seasonal bypass flow scenario was an estimated drought flow based on statistical analyses of historical outflow data. We guessed that at minimum, the bypass flow would equal approximately 10% of the Dam's normal flow, or the "drought" flow, and would be determined for at least 2 seasons (and possibly a 3rd): the spring spawning season (March - June), and the remainder of the year (July - Feb). Since an environmental flow study was not conducted, wee will determine appropriate bypass flow utilizing water quality an aquatic life criteria.

5. **Page vi, Paragraph 1.** "However, because the fish community inhabiting the stilling basin is primarily comprised of warm and coolwater habitat generalists such as largemouth and smallmouth bass, we would not expect these differences in velocity to significantly affect the fish community" We believe that the fishery potential in the dam stilling basin will be greatly reduced if flow in the stilling basin is reduced. Annual stilling basin fishery surveys will be necessary for effective adaptive management, and we will increase bypass flows if the fishery shows trends towards decreasing quality.

6. **Page 6, Table 1.** The following requirement should be added:

Requirement	Agency	Status
Section 404 of CWA	Corps	Issue Public Notice November 2, 2010. Section 404 Permit will be issued after Section 14 of the Rivers and Harbors Act of 1899 (33 U.S.C. 408) permission is granted thru a real estate instrument.

7. **Page 7, Section 1.3.2.** Delete "Pennsylvania DEP has not acted on the certification request." The following information should be inserted: 16 December 09 - PADEP Administrative Deficiency letter; 23 March10 - MCHC Response to Administrative Deficiency letter; 23 August 10 - PADEP Technical Deficiency letter; 15 October 10 - MCHC Response to technical deficiency letter. Add the following

sentences: Section 404 of the CWA (33 U.S.C. 1344) authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of fill material into the waters of the United States. The State issued Section 401 Water Quality Certification (WQC) will be incorporated as condition to the Section 404 permit.

8. **Page 13, Section 3.3.2, Aquatic Resources, Affected Environment, Water Quantity.** "There is currently no specified minimum flow released by the Corps at Mahoning Dam. In our comments on the application, we stated that a minimum flow between 35 and 45 cfs is required during cold periods to prevent freezing of the ring jet" . Mahoning Dam minimum flow is closer to 65 cfs, and flows are rarely this low for more than a few consecutive days.

9. **Page 14, Section 3.3.2, Aquatic Resources, Affected Environment, Water Quantity & Water Quality Standards** . There is no mention of the potential impacts of a higher intake elevation on lake stratification and lake and outflow WQ (identified in results of our 1993 WQ model) or that the Corps will require non-degradation criteria, which can be more stringent than state criteria. As discussed preciously, Corps non-degradation / anti degradation policy is described in ER 1110-2-1462. We will require compliance with anti degradation criteria, utilizing data from real-time continuously recording water quality monitors and results of fishery and macoinvertebrate studies, and will take control of the outflow when non-degradation criteria are not met (i.e. higher by-pass flows until problems are corrected). Pre-hydropower aquatic life and water quality statistics will be utilized to develop non-degradation criteria (for example, lake dissolved oxygen levels are generally > 5 mg/l at depths < 25 feet; outflow water temperatures are less than 80 Degrees F; the minimum outflow and stilling basin dissolved oxygen level for our period of record is 7.2 mg/l, etc.). Since negative environmental impacts in the lake, the stilling basin, and the regulated reach are likely, a strong real-time, continuous monitoring network, with data always available on line, is critical.

10. **Page 15, Section 3.3.2, Aquatic Resources, Affected Environment, Aquatic Biota.** "The survey documented the presence of two unlisted mussels, the flutedshell and the kidneyshell. No clubshell mussels or suitable habitat was documented". However, we questioned the appropriateness of the mussel study sampling station which was located in the scour area of the stilling basin weir, so suspect that results may underestimate existing resources and therefore potential impacts.

11. "Macroinvertebrate surveys conducted by the Corps from 1987 and 1998 documented greater numbers of caddisfly taxa than the 2007 survey, although the collection methods and target life stages were different." As mentioned previously, this assessment underestimates the existing macroinvertebrate community. We have identified over 30 species of macroinvertebrates (not just caddisfly species and including species new to the state) in the Mahoning tailwaters, utilizing a variety of sampling methods (Surber samplers, kick nets, and light traps).

12. **Pages 16-18. Section 3.3.2, Aquatic Resources, Environmental Effects, Water Quantity, Staff Analysis, Minimum flow in the stilling basin**. "Prior to issuance of the EA, the Corps stated that the flow releases need to be in the range of 35 to 45 cfs during the winter to prevent freezing of the ring jet (the valve that releases water through the dam). Additionally, the Corps stated that in order to protect aquatic habitat, the minimum flow should be higher than 30 cfs, although the Corps did not provide a specific flow recommendation. Rather, the Corps stated that the flow should be approximately 10 percent of the "dam's normal flow" or "drought flow" and should vary seasonally, including a spring spawning season flow (March – June) and another flow for the remainder of the year. No definition of the terms "dam's normal flow" or "drought flow," was given, although we assumed in the EA that this would be greater than 30 cfs, given the context of the comments" and "In its comments on the EA, the Corps recommended a stilling basin flow of 150 cfs from March through June and 50 cfs from July through February." We did not state what the bypass flow "should be" nor did we "recommend" bypass flows. Rather, we stated that 30 cfs is likely too low, that a drought flow would likely be closer to 10% of the

dam's normal flow than to the Q7-10 flow, and that an instream flow or similar study should be conducted at the licensee's expense to determine an appropriate bypass flow.

13. "Although the Corps requested a flow study using the instream flow incremental methodology (IFIM), the IFIM incorporates habitat simulation modeling appropriate for natural stream channels which exhibit more variation in stream channel width and depth, water velocity, and substrate than the stilling basin. A simpler methodology is adequate to characterize habitat conditions in the stilling basin, which has been modified from the natural stream channel to be a rectangular pool with gradually increasing depth from upstream to downstream." The proposed "simpler methodology" does not address impacts to the fishery, macroinvertebrate community, or water quality (ie. requirements of the existing reproducing trout population, dissolved oxygen and water temperature requirements, the remarkable existing crayfish population, etc.) and did not even include a comparison of existing with proposed velocities. In addition to physical features, velocities, water quality, retention times, and pool stage all impact in-stream habitat and quality. With lower flows, the stilling basin will become more lake-like and less river-like, retention times will increase, velocities decrease, water temperatures will increase, and dissolved oxygen levels will drop, exacerbated by the fact that hypolymnetic water quality will be more degraded (increased concentrations of dissolved metals & nutrients). We recommended an IFIM or similar instream flow study to determine appropriate flows to support the fishery. Results of an instream flow study may show that even 10% of the dam's normal flow (our estimated drought flow) is too low to maintain the existing fishery.

14. "Currently, water is released from the spillway sluice gates or through the deep ring jet in the dam. By using the two release locations in combination, the Corps can mix water as necessary to protect water quality downstream of the dam." It will be very challenging to blend water from the Corps gates, which spills over the weir, with the hydro outfall in order to meet downstream temperature objectives since there is little opportunity for mixing. We can bypass more flow when downstream temperature criteria are not being met, but a better option would be the construction of selective withdrawal intakes for hydro generation.

15. "Project operation would result in flows being more stable during a greater period of the year compared to current conditions. Although these stable, low flow levels may adversely affect habitat for certain species that prefer higher water velocities, such as certain darters, other species that prefer pool habitat, such as bass and sunfish, may benefit from stable, low flows. Habitat downstream of the weir would be unchanged from project operation; therefore, this reach would continue to provide habitat for species preferring the higher velocities found in riffles and runs.". Please provide references/ studies in support of this comment. If water quality, stream velocities, retention times, and water temperature in the stilling basin change, than habitat would be modified and fisheries would be impacted. In addition, if flow is concentrated along one side of the river downstream of the outfall, instream habitat and fishing opportunities downstream of the weir could also be impacted.

16. **Page 17: 3.3.2, Aquatic Resources, Environmental Effects, Staff Analysis, Minimum flow in the stilling basin.** "According to the flow duration curves, when the project is operating, 62 percent of the time the stilling basin would receive 30 cfs, leaving 38 percent of the time when the stilling basin would receive flows in excess of 30 cfs which could be released either via spillage or through the dam, as the Corps chooses based on its downstream water quality protection objectives". This is related to information found on page 15 which explains that Mahoning Hydro proposes to cease operation and release all flows into the stilling basin when available flows are less than 109 cfs (the sum of the proposed 30 cfs bypass plus the 79 cfs minimum flow needed to operate one of the turbines). It is also mentioned on page 15 that flows in excess of 905 cfs (the maximum hydraulic capacity of the two turbines plus the 30 cfs bypass) would be released through the dam.

If the 38% of the time that flows less than 109 cfs are anticipated follows a certain pattern, additional

elaboration and discussion of that issue would have been helpful. The same holds for a discussion of any discernable patterns regarding flows in excess of 905 cfs.

17. **Page19. Section 3.3.2, Aquatic Resources, Environmental Effects, Water Quantity, Staff Analysis, Water Quality.** "Mahoning Hydro proposes to install a water quality monitoring system which would include a set of sensors mounted in the forebay at the level of the penstock opening and another set of sensors approximately 200 feet downstream from the powerhouse. The penstock sensors would record temperature and DO and the downstream sensors would record temperature, DO, and total dissolved gas (TDG). Data would be collected every 5 minutes and reported every 30 minutes via a computer in the powerhouse." We will require that sampling locations include the lake (at 3 depths, surface, middle and bottom of the water column), the stilling basin, and downstream of the hydropower outfall. We expect the licensee will continue operation of our real-time, continuously recording lake and dam outflow water quality monitors, and that they will install new monitors at their outfall and in the stilling basin, as FERC recommends. Parameters measured will include dissolved oxygen (DO), water temperature, and % saturation (TDG and barometric pressure) in the hydropower outfall, and DO, water temperature, and conductivity in the lake and the stilling basin. These WQ monitors will be operational real-time, continuously on a public website (not just to the computer in the powerhouse) for the duration of the license. (Note that page V, paragraph 2 also just mentions just DO and water temperature). Water quality monitors will be operated and maintained by the USGS using Corps recommended software and equipment, and available on the Corps / USGS website, throughout the duration of the license. Monitoring should be initiated ASAP to assure adequate documentation of pre-hydro conditions.

18. "During the 2007 study report meeting, Mahoning Hydro stated that it would also reduce or curtail generation during periods when water quality monitoring indicated that other operational or structural measures could not adequately protect water quality in Mahoning Creek." No estimates were made regarding the impacts of "reduced or curtailed generation" on the economic viability of the project.

19. **Page 20: Section 3.3.2, Aquatic Resources, Environmental Effects, Water Quantity, Staff Analysis, Water Quality Monitoring. "**The Corps' recommended McCrea Furnace Bridge monitoring site would record changes in stream water quality between the project tailrace and the bridge, but would not be necessary for determining project effects because any effects of the project would already be detected at Mahoning Hydro's proposed station below the tailrace.". We suggested monitoring at both the hydro outfall and the McCrea Furnace because we are currently operating a data collection platform (DCP) there and are collecting pre-hydropower real-time water quality data. As long as the licensee collects pre-hydro data representative of seasonal and hydrologic variation at the location of their proposed outfall monitor, they do not need to monitor at the McCrea Furnace Bridge. More importantly, lake water quality must also be monitored for effective adaptive water quality management.

20. **Page 20. Section 3.3.2, Aquatic Resources, Environmental Effects, Water Quantity, Staff Analysis Water Quality Enhancement.** "Both Mahoning Hydro's 2007 water quality study and the Corps' 1993 study used the Corps' CE-QUAL-R1 model to predict the effects of installing a hydroelectric powerhouse at the Mahoning dam. Both studies concluded that the project would likely increase the temperature slightly in Mahoning Creek and, in the absence of mitigation measures, would probably cause DO to drop below state water quality standards during periods when the lake is stratified and the hypolimnion becomes oxygen depleted. Thus, both the Corps in 1993 and Mahoning Hydro in 2007 concluded that any proposed hydroelectric project at the dam would need to address this issue. The Corps has stated that Mahoning Hydro's model runs probably underestimate the potential effects on water temperature because Mahoning Hydro did not recalibrate the model but instead relied on the calibration the Corps used in 1993. Mahoning Hydro maintains that because limnological conditions are the same now as in 1993, the model is still useful for predictive purposes." Significantly, the licensee did not calibrate or run a water quality model for the Mahoning hydro project. Rather, they used results of the Corp's 1993 model, excluding conclusions that demonstrated likely environmental impacts.

21. **Page 21, Section 3.3.2, Aquatic Resources, Environmental Effects, Water Quantity, Staff Analysis, Water Quality Enhancement.**: "Because Mahoning Hydro is proposing and the Corps is recommending exactly such an approach to addressing water quality issues at the project, additional modeling would not address the variability in year-to-year conditions." Disagree. A 2-dementional water quality model would predict conditions under all scenarios, addressing seasonal and hydrologic variation for all alternative flows.

22. **Page 21: Section 3.3.2, Aquatic Resources, Environmental Effects, Water Quantity, Staff Analysis, Water Quality Enhancement.** " Mahoning Hydro has not proposed, nor has the Corps or any other agency recommended, a water quality monitoring plan." We provided recommendations for real-time monitoring, aquatic life surveys, non-degradation criteria. (see comments above), and will adaptively manage compliance with criteria (bypass flow when criteria are exceeded). The licensee will also be responsible for measuring real-time, continuously recorded, lake pool elevations and discharge, which will be operated and maintained by the USGS using Corps recommended software and equipment, and available on the Corps / USGS website, throughout the duration of the license.

23. **Page 22: Section 3.3.2, Aquatic Resources, Environmental Effects, Water Quantity, Staff Analysis, Fish Protection.** "The Corps states that "any loss [of fish] greater than 5 percent can be considered degradation and will require mitigation." The Corps also notes that the downstream fishery is at least somewhat dependent on fish movement over the dam." If fish mortality increases or the stilling basin fishery is negatively impacted with hydropower generation, we will increase bypass flows.

24. "The Corps did not provide an explanation or evidence to support its comment that loss greater than 5 percent is considered degradation and would require mitigation. It is not clear whether the Corps means 5 percent of the entire fish population or just certain species. It is also not clear how that percentage was derived or how the Corps proposes to determine what percentage of fish is being lost. " We were expecting the licensee to conduct fish entrainment and mortality studies during operation to assure that predictions of their desktop survey were accurate . If not, than we will adaptively manage the resource by bypassing flow if mortality levels exceed pre-hydro conditions.

25. "Our analysis supports the Corps' comment that the downstream fish community is likely partially dependent on recruitment of fish that move from the lake into Mahoning Creek via spillage. However, fish movement would continue to occur by means of the spillway sluice gates and turbine passage. As discussed above, over 90 percent of the fish that are entrained are expected to survive and would therefore contribute to the downstream fish community." This conclusion is questionable since turbine passage will not release fish into the stilling basin and dropping the sluce gate flows by 95% will likely drop recruitment in the stilling basin by 95%. Annual fishery surveys will be necessary to assess actual impacts.

26. **Page 27: 3.3.5, Recreational Resources , Environmental Effects, Staff Analyses.** "However, the construction activities would take place on the other side of the creek and stilling basin from the existing recreation areas, so access should not be impeded. The effects of construction would therefore be minor and temporary." Given that >70% of visits are for fishing, if the fishery in the lake, the stilling basin, or the dam tailwaters is impacted, or the best fishing opportunities for fishing will be modified (downstream of the hydro outflow along the left descending bank which is inaccessible to the public), then impacts will be significant.

As mentioned previously, the fishery potential in the dam stilling basin will be greatly reduced if flow in the stilling basin is reduced. The game fish can be found in the deeper waters of the stilling basin proper where the flow is greater. With lower bypass flows, flow and therefore productivity in the weir pool and also the section of river downstream of the weir along the right descending bank will be drastically reduced. This will impact walleye, muskellunge, channel catfish, smallmouth bass & trout. The weir pool is where the majority of the anglers fish the Mahoning Dam tailwaters. If flows are reduced, then the fishing pier may need to be located along the left descending bank.

27. **Page 28: 3.3.5, Recreational Resources , Unavoidable Adverse Effects.** "Recreation users at the project would experience negative effects (relating to noise and the physical disturbance of land, water, and materials) during project construction; however, the construction will occur on the other side of the creek and stilling basin from the existing recreation areas, so these disturbances would be temporary and minor." See previous comments.

ORIGINAL

P-12555

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHWEST REGIONAL OFFICE

Mr. M. Clifford Phillips
Mahoning Creek Hydroelectric Company, LLC
150 North Miller Road, Suite 450C
Fairlawn, OH 44333

Re: Technical Deficiency Letter
DEP File No. E03-451
Mahoning Creek Dam Hydroelectric Project
Redbank and Wayne Townships
Armstrong County

Dear Mr. Phillips:

The Department of Environmental Protection (DEP) has reviewed the above referenced permit application and has identified the following significant technical deficiencies:

1. During a recent telephone conversation with your consultant, Kleinschmidt Associates, DEP was informed that the scope of your project has changed, and that the proposed utility line upgrade is now to be included within the scope of your overall project. Accordingly, identify and quantify, individually and cumulatively, all impacts to regulated waters of the Commonwealth that will result from the proposed utility line upgrade.

2. Revise your application and drawings, to include the proposed stream bank repair below the dam.

3. Provide a table which lists each of the proposed water obstructions and encroachments, identifies the resource to be affected, and quantifies the linear feet and area of resource to be affected (e.g. in addition to the impacts referenced in the preceding items, quantify lengths and areas of impact for the proposed intake structure in Mahoning Creek Lake, the slope repair gabion wall with fence in and along the floodway fringe, the portion of fill and penstock in the floodway fringe, each of the tile drain outlets in the floodway fringe, the excavation of the floodway fringe area for the tailrace and powerhouse, the portion of the powerhouse in the floodway fringe, the temporary work pad, the ford crossings, and include in this table the impacts to Mahoning Creek from the tailrace and the wetland impact from the access road). In addition, provide a cumulative total at the end of this table.

4. You have indicated that changing the location of the discharge from the dam, from above to below the stilling basin, "...will result in localized surface velocity patterns increasing at the immediate vicinity of the discharge point of the powerhouse and conversely potentially decreasing at the weir outfall." The submitted report indicates Froude numbers greater than 1 at the tailrace. Accordingly, a) provide a detailed, written narrative and drawings, which describes and show, respectively, your proposal to armor, harden and/or modify the geometry of the proposed excavated tailrace, to reduce the potential for erosion and scour; and b) evaluate and discuss whether these increased velocities will affect fish and/or other aquatic life.

5. You have previously indicated that fish mortality through the turbines is anticipated to be approximately 10 percent. Evaluate and discuss whether the rate of mortality might be higher, given that the proposed powerhouse will have two (2) turbines, and that fish must travel through several hundred feet of penstock, before encountering the turbines.

6. To reduce fish mortality that may result from your proposed project, the Pennsylvania Fish & Boat Commission (PFBC) has previously recommended that a fish intake screen with 3/8" openings be placed over your proposed intake structure, and that the water withdrawal rate not exceed 0.5 fps. You've proposed to install an intake screen with 1" openings and a water withdrawal rate of 1 fps, in part, because you believe that the weight of an intake screen with smaller openings will be too heavy for the existing dam structure. PFBC is concerned, however, that your proposed screen design and water withdrawal rate will be inadequate to reduce mortality to fish fry and fingerlings. In light of your concern about the weight of the intake screen, PFBC has modified its recommendation such that a screen with 1" openings may be sufficiently protective, if the screen is angled; however, the withdrawal rate should still not exceed 0.5 fps. Accordingly, evaluate and discuss the feasibility of incorporating PFBC's revised recommendations into the design and operation of your proposed intake structure, or demonstrate that your proposed design will adequately protect fish fry and fingerlings.

7. One of your consultants suggested that the fish that are found in the stilling basin are transient individuals that passed down from the reservoir. If this is the case, evaluate and discuss whether many of these transient fish will now pass down through your proposed Penstock, and potentially by-pass the stilling basin. In the event that your evaluation suggests that your project will reduce the transient fish population in the stilling basin, evaluate and discuss means to mitigate for the impacts to this fisheries resource.

8. In Figure C-2, the exceedence value corresponding to 30 cfs appears to read as 3 percent, as opposed to your consultant's reading of 1 percent. Due to the scaling of this figure, it is difficult to determine the percent exceedence values within 1 percent or 2 percent accuracy. Accordingly, revise your Figure C-2, to more clearly show these values, or otherwise more clearly document your consultant's findings.

9. The cross-sectional drawing for the "Ford at Drainage Way," on Drawing C-451 shows that the "articulated block mattresses" will be installed above the streambed. Evaluate and discuss the feasibility of revising your project design and drawings, such that the ford crossing will be installed along the existing streambed, in a manner that will not obstruct the stream flow. In addition, the site plan for this ford shows a "rip-rap outfall." Evaluate and discuss the feasibility of removing this rip- rap outfall from your project design, to minimize impacts to this watercourse.

10. You did not provide the previously requested cross-sectional drawings through the tail race. Provide cross-sectional drawings at Station Nos. 13+00 and 13+50 (as located/shown on the plan view, on Drawing C-203), which show existing and proposed conditions. Extend the limits of the cross sections beyond the proposed limits of disturbance, and include the proposed slope protection along the left bank of the Mahoning Creek.

11. Related to the preceding item, describe, in detail, and show on a drawing, how you will construct and stabilize the transition from the exposed bedrock back to the existing streambed.

12. Revise your drawings to show the location, boundaries and impact area of the wetland that will be affected by your proposed access road. In addition, provide a wetland delineation report that includes data forms, and provide the identity and qualifications of the person(s) who completed the wetland delineation.

13. You have previously reported that the proposed minimum by-pass flow of 30 cfs, into the stilling basin, is based upon the 7Q10 flow for the Mahoning Creek. In another correspondence, however, you reported that the proposed minimum by-pass flow will exceed your calculated 7Q10 value. Provide a copy of your data and calculations, for determining the 7Q10 value.

14. To address potential reductions in the dissolved oxygen (DO) concentrations in Mahoning Creek, below the stilling basin and powerhouse discharge, you are proposing to "...install a natural aeration facility in the turbine draft tubes and/or turbine housings and define a flexible operational mode to maintain downstream DO concentrations." Provide specific design details about the natural aeration facility, and the continuous DO sensor and monitoring, which you will install and utilize. In addition, describe, in detail, any steps that you plan to implement in your project operations, to maintain downstream DO concentrations, including any modifications to project operations, if needed.

15. While you have indicated that "[t]he minimum flow of 30 cfs would enter the stilling basin at the foot of the dam through the low-flow sluice gates as operated by the USACE," describe, with specific details, the mechanism and/or method whereby this minimum discharge will be maintained/directed through the sluice gates of the existing dam, versus the proposed hydropower intake. In addition, discuss how the Corps' overall flow release regimen and reservoir release guidelines will be amended to maintain this divergent flow of water.

16. In a document that you provided to USACE, dated February 11, 2011, regarding downstream water quality metrics, you indicated that it is possible that the water temperature in the stilling basin could occur above the Commonwealth's water quality standards, when the minimum by-pass flow is 30cfs and the air temperature is high. In this document, you also suggested some steps that might be taken, to mitigate for these elevated temperatures. Please elaborate and more fully describe the circumstances and time periods when you anticipate that water temperatures within the stilling basin may exceed the Commonwealth's water quality standards. In addition, elaborate and more fully describe your proposed mitigation steps. Your description should include details about the monitoring equipment and procedures that will be utilized, and the mechanisms and operational procedures that will be installed and implemented, to mitigate these elevated water temperatures.

17. With further reference to the document that you provided to USACE, dated February 11, 2011, regarding downstream water quality metrics, you indicated that downstream water temperatures will occasionally be above the Commonwealth's water quality standards. In this document, you also suggested some steps that might be taken, to mitigate for these elevated temperatures. Please elaborate and more fully describe the circumstances and time periods when you anticipate that the downstream water temperatures will exceed the Commonwealth's water quality standards. In addition, elaborate and more fully describe your proposed mitigation steps. Your description should include details about the monitoring equipment and procedures that will be utilized, and the mechanisms and operational procedures that will be installed and implemented, to mitigate these elevated water temperatures.

18. As previously requested, provide evidence that your erosion and sediment control (E&SC) plan has been reviewed and considered to be adequate by the Armstrong County Conservation District. In addition, since the scope of your project has changed, provide a copy of your revised E&SC Plan to DEP and the Conservation District.

19. Your current E&SC Plan indicates that will use blasting to construct the tailrace. Since the proposed blasting activity will be conducted within close proximity to the Corps' existing dam and stilling basin weir, discuss the potential for the proposed blasting activity to affect these existing structures. In addition, please be advised that you will need to obtain blasting permits from DEP's Bureau of Mining and from the PA Fish & Boat Commission.

20. Provide specific details, regarding the armoring that will be installed along the left bank for approximately 50' to 100' downstream from the tailrace.

21. While you have reported that approx. 0.10 ac of wetted area, or approx. 590 cy of material, is to be excavated, to construct the proposed tailrace, you have not identified the area, nor quantified the amount of material, which is to be excavated, to construct the powerhouse, penstock and other water obstructions and encroachments, nor have you identified a disposal area for any excess material. Provide this information.

22. Identify all of the property owners that will be affected by the proposed project, and provide a map that shows property lines and the affected areas.

23. Your project currently proposes to directly impact 0.10 acre of Mahoning Creek, to construct the powerhouse tailrace. Accordingly, develop a mitigation plan to compensate for these impacts. If the previously proposed fishing pier is a component of your mitigation plan, your plan must include design and construction details for, along with plan view and cross-sectional drawings of, this proposed fishing pier. Since you have not yet identified and quantified all of the environmental impacts that are anticipated from your proposed project, please be aware that additional mitigation may be required, pending your response to this letter.

24. Related to the preceding item, evaluate and discuss the feasibility of providing a fishing access to Mahoning Creek, below the existing stilling basin weir. For example, would it be feasible to provide a fishing access off of the same road that you propose to use for construction access?

25. The Department has recently received water quality information in the project area, and information about the macroinvertebrate community at the Mahoning Creek Dam outflow, from USACE, which DEP is currently evaluating, to determine whether existing use protection should be provided to Mahoning Creek. Please be advised that additional comments may be forthcoming regarding your application, pending DEP's evaluation of this information.

26. In its recent order issuing an original license for this project (Project No. 12555-004), the Federal Energy Regulatory Commission (FERC) deemed water quality certification under Section 401(a)(1) of the Clean Water Act to be waived, because DEP did not act on your application for certification, within one year (refer to item #21 in FERC order). While the Department did not approve or deny your application, the Department did act on your application within 1 year. Your application for a Water Obstruction and Encroachment Permit (Application) was received on November 2, 2009. By letter dated December 16, 2009, DEP informed you that your Application was administratively incomplete, and provided you with a list of items that you would need to provide, to make your Application complete. To date, you have not provided the requested information, even though DEP reiterated some of the outstanding items, along with technical review items, in a subsequent letter, dated August 17, 2010. The Department, again, has included the outstanding administratively incomplete items in this second, technical review letter, regarding your Application. You must adequately respond to all of the preceding items, in order for DEP to determine whether your Application will comply with all of the applicable Commonwealth rules and regulations.

You must submit a response for each of the above deficiencies within 60 calendar days from the date of this letter. The requested information must be submitted in triplicate. Should you have any questions regarding the identified deficiencies, please contact Hadi Emdad and Joseph Snyder to discuss your concerns or to schedule a meeting. The meeting must be scheduled within the 60-day period allotted for your reply, unless otherwise extended by DEP.

In accordance with DEP's Money-Back Guarantee Program, the clock tracking the elapsed time for the review of your application has stopped while you prepare a response to this letter. The clock will start again when we receive the requested information.

If you believe the stated deficiencies are not significant, you have the option of asking DEP to make a decision based on the information you have already made available. If you choose this option, you should explain and justify how your current submission satisfies the deficiencies noted above. Please keep in mind that if you fail to respond within 60 calendar days, your application will be returned.

If you have any questions concerning this matter, please contact Joseph Snyder and Hadi Emdad of this office at the above telephone number, and refer to E03-451.

Sincerely,

Chris Kriley, P.E., Chief
Permitting & Technical Services Section
Watershed Management

cc: PA Fish and Boat Commission
U. S. Army Corps of Engineers, Pittsburgh District (2009-2175)
Armstrong County Conservation District
Redbank Township
Wayne Township
FERC (No. 12555)
R. Dorman, Kleinschmidt Associates

Document Content(s)

TELEPHONE DISCUSSION NOTE

DATE: April 1, 2011 **PROJECT:** **MAHONING DAM**

TIME: 1:30 PM **TALKED WITH:** MARK HARTLE

PLACED: X **RECEIVED:** **FROM: PA FISH AND BOAT COMMISSION**

BY: BRANDON KULIK

I spoke with Mark to gain an understanding of fishery resource management issues pertaining to the Mahoning Project, and to clarify items 5,6 and 7 contained in the PADEP March 29, 2011 letter that pertained to fishery issues. Mark verified that these fishery issues were expressed by PAF&BC but the actual wording was that of the PADEP staff. He noted that there is a stocked put-and-take trout fishery in the tailwater (*i.e.* from the dam approximately 3.8 miles downstream to Pine Creek) that relies on stocking in spring. These fish are presumed to have been harvested or otherwise gone from the project area by mid-June. Subsequently, the fishery reverts to a coolwater fishery which includes walleye that PAF&BC believes may have been recruited to the tailwater area from the Mahoning reservoir.

PA F&BC concerns regarding Walleye at Mahoning Dam

Two concerns regarding walleye protection that we discussed were:

1. project dissolved oxygen (DO) levels relative to walleye, and
2. potential for turbine entrainment of walleye via project turbines.

Dissolved oxygen: PAF&BC believes that adult and juvenile walleye may be present at times in the stilling basin and tailwater area. PAF&BC is concerned that water circulation in the stilling basin may be reduced if most flows are bypassed from the stilling basin to the powerhouse, to the extent that dissolved DO levels will decline to a point so that walleye would be stressed (if they are present). Mark noted that the existing DO was reported to be 8.0 ppm, and the state standard for trout was 6.0 ppm.

Entrainment - Mark noted that PAF&BC had reviewed the AHS white paper concerning fish entrainment loss and felt that intake screening may be required to reduce turbine entrainment mortality. Walleye are stocked as fry in the reservoir but some are thought to escape downstream (*i.e.* to the Pine Creek vicinity) and thus PAF&BC believes that some downstream recruitment may occur from the reservoir. For this reason PAF&BC presently thinks that fish screening may be needed to reduce entrainment mortality.

We discussed criteria, Mark felt that fry and fingerlings would refer to the small stocked fish, and thus would require screening and approach velocities less than the 1-inch clear and 1 ft/sec currently proposed. I asked what specific fish sizes were of concern; Mark needed to check with his staff, but felt it potentially would include fish less than 3 inches in length. I commented that

1. screening required for protection of fry and YOY at hydro intakes was relatively unorthodox, and that usually juvenile and adult fish were the lifestages of concern, and
2. the proposed 1" clear; 1 ft/sec velocity was generally accepted for that application

Mark said that he would consult with his department head (Leroy Young) to get input, and that we could discuss further the following week.

DISTRIBUTION:

J:\1361\004\Docs\TDN Mahoning 4-01-11PAFBC.docx

TELEPHONE DISCUSSION NOTE

DATE: April 13 and 18, 2011 **PROJECT:** **MAHONING DAM**

TIME: **TALKED WITH:** MARK HARTLE

PLACED: X **RECEIVED:** **FROM: PA FISH AND BOAT COMMISSION**

BY: **BRANDON KULIK**

This summarizes two phone calls with Mark Hartle to follow up on an earlier discussion regarding questions in the PADEP letter pertaining to fishery issues. Regarding water quality, Mark reiterated that as policy, PAFBC supports the COE anti-degradation perspective. DO standards should be adequate to support walleye and smallmouth bass during the "Coolwater" season, and re-iterated that the concern was that project operation could alter suitability of the stilling basin for the existing fish assemblage, particularly game fish.

We reviewed the three specific items in the DEP letter that pertained to PAF&BC concerns.

Item 5. Entrainment mortality. I clarified that although there were two turbines, entrained fish would only be exposed to one or the other, not both in series. Mark recommended structuring a response that addressed that, verify that the 10% mortality estimate cited in the FERC- EA was applicable to this project, and discuss penstock mortality.

Item 6. Entrainment screening criteria – Regarding target fish size for protection, Mark had checked with his staff and clarified that stocked walleye fry and young-of-year (YOY) were the critical lifestages. The goal would be to minimize the amount of walleye loss due to turbine passage. PFBC stocks fry at 1-2" lengths in June. Fry would grow to YOY; I noted that my preliminary research indicated that YOY walleye would be 3-6 inches in length. Mark commented that he had been in touch with Alex Hoar of USFWS and that he was expecting more detailed feedback from them regarding applicable screening criteria, although Alex had confirmed that 1 inch clear and 1 ft/sec. was indeed frequently the standard for adult and juvenile fish but that 0.5 ft/sec is the criterion that USFWS uses as guideline for fry lifestages where applicable Mark understood that a narrower screen spacing than 1 inch clear might create design, operation and maintenance problems, and if clogging was an issue, potentially induce higher impingement velocities. I commented in passing that it might ultimately be more cost effective to consider an alternate mitigation. Mark theorized (based on his conversation with USFWS) that at this point, a wider spacing might potentially be acceptable to PAF&BC if the screen was angled to deflect fish away from the intake. Mark agreed to forward the criteria from USFWS once he had received it.[1]

Item 7. Fish resources of the stilling basin. We discussed that there was no known population structure for any of the fish species reported to exist in the stilling basin, and that there was no specific targeted numeric abundance of resident game fish required to support fishing exploitation. Mark mentioned that Joe Snyder, of PADEP did agree with the idea that some fish were transiently (as described by AHS's consultant) occupying the reach after washing into the basin. The basin is isolated by the weir from contiguous downstream river reaches and thus does not recruit fish from the adjacent natural river

[1] these were subsequently forwarded by email dated 4/27/11 from M. Hartle to Brandon Kulik

habitats. Mark said that he was of the opinion that the rock-lined nearshore substrates do provide a degree of shelter for cover-oriented species such as bass. These refugia could to some extent enable some fish to avoid high flows, reproduce and establish resident populations. He referred to the 2010 COE survey by Bob Hoskins as a source of data, which documented the presence of some juvenile and adult fish of some species.

Mark suggested that rather than speculate on population structure and fish community structure (as in the literal wording of the DEP letter), that instead we focus our response to item 7 to discuss how project operations would potentially affect the relative numeric abundance of both "transient" fish (*i.e*. walleye), and "resident" game species that presently contribute to the fishery below the dam under existing conditions. Mark recommended referencing the COE 1986 and 2010 electrofishing surveys as the best available source of fish species presence/absence and abundance data.

DISTRIBUTION:

J:\1361\004\Docs\TDN Mahoning 4-18-11PAFBC.docx

Kelly Maloney

From: Kelly Maloney
Sent: Wednesday, May 04, 2011 3:24 PM
To: Kelly Maloney
Subject: FW: Mahoning Creek Dam Hydroelectric Project (PADEP#E03-451/USACE# 2009-2175/FERC#12555)
Attachments: DS Criteria2000.jpg; AttrQcrit..jpg; USACE.1990.Fisheries HandbookChapt6.pdf; Attachment 1-7 May 2010 boat EF Mahoning stilling basin pool.pdf

---

From: Hartle, Mark [mailto:mhartle@state.pa.us]
Sent: Wednesday, April 27, 2011 1:53 PM
To: Brandon Kulik
Cc: Snyder, Joseph (DEP); Woomer, Allen; 'Alex_Hoar@fws.gov'; Biggs, Heidi
Subject: FW: Mahoning Creek Dam Hydroelectric Project (PADEP#E03-451/USACE#2009-2175/FERC#12555)

Brandon,

I am writing to follow up our telephone conversation last week.
The key species and life stage we would like to protect is walleye fry that are stocked in the spring at 1" to 2" in length. Tiger muskellunge about 8" long are stocked in the early fall.
Also, PFBC stocks 1800 legal sized trout below Mahoning Creek Dam in May each year. Here are some points that I would like to convey associated with the 4/6/11 PA DEP letter.

Item 5.
DEP and PFBC discussion yielded a suggestion that Kleinschmidt address mortality associated with the various site specific conditions (such as travel through a long penstock, turbine mortality, and disorientation upon discharge) that an entrained fish would experience and the cumulative mortality expected.

Item 6.
PFBC indicated that we would accept a screen with one inch spacing as long as small life stages like walleye fry could be deflected with a screen angled at 45 degrees or less. I discussed our recommendation with Alex Hoar, USFWS, who provided the attached standard references used by USFWS. Regarding angled screens, most references, like the one in Chapter 4 of this link, are associated with channels.
http://www.usbr.gov/pmts/hydraulics_lab/pubs/manuals/fishprotection/
I would suggest that the short residence time of water in Mahoning Lake causes a current to be present, particularly near the tower when hydro generation would be occurring. Also, since we indicated that we would accept a screen with 1-inch spacing, the tradeoff is an angled screen to deflect fish away from the intake. We believe a 0.5 fps velocity is a valid criterion. We also note that a 0.4 fps velocity criterion is used for salmonid fry, which are stronger swimmers than walleye fry. Fish facing up lake would likely not realize they need a swimming burst to avoid drifting into the intake, so a possibility of escape with a swimming burst may not translate to avoidance. USFWS typically measures velocity one foot in front of the screen and we invite your comment on this criterion. American Society of Civil Engineers, Committee on Hydropower Intakes indicated in their 1995 book, Guidelines for Design of Intakes for Hydroelectric Plants, that resident fish exclusion usually focuses on exclusion. Our agency agrees. Please direct your comments toward how any proposed screen would protect 1 to 2 " walleye fry as a target species and life stage.

Item 7.
The term "transient" individuals was used in this paragraph because it is the term used by the project's consultant. Conversely, the U.S. Army Corps of Engineers electrofishing results attached above documented resident fish. Joe Snyder and I suggest that Kleinschmidt address projected project impacts on both resident and transient fish in the stilling basin and any suggested mitigation.

My response is not intended to be a comprehensive reevaluation of the 4/6/11 PA DEP letter, but will provide some documentation to our conversation last week.

Mark Hartle

From: Alex_Hoar@fws.gov [mailto:Alex_Hoar@fws.gov]
Sent: Friday, April 22, 2011 12:09 PM
To: Hartle, Mark
Subject: Fw: Mahoning Creek Dam Hydroelectric Project (PADEP#E03-451/USACE#2009-2175/FERC#12555)

Mark,

As promised, here is the material on fish swim speeds and approach velocities. Let me know if it works for you as soon as possible as I need to respond directly to Joe's latest email and was going to send him the documents attached here.

Alex

413-253-8631

----- Forwarded by Alex Hoar/R5/FWS/DOI on 04/22/2011 12:06 PM -----

Curtis Orvis/R5/FWS/DOI

04/19/2011 09:45 AM

To Alex Hoar/R5/FWS/DOI@FWS
cc
Subject RE: Mahoning Creek Dam Hydroelectric Project (PADEP#E03-451/USACE#2009-2175/FERC#12555)Link

Alex,
Here is the Hydro summary from our FERC course 2000.

For "game" sized or legal fish an approach velocity of 2 fps is the maximum, measured normal to the rack and 1 foot upstream.
For other species, we would recommend the Fisheries Handbook (Milo Bell) Chapter 6

For Municipal, Industrial, or Irrigation, the approach velocity of 0.5 fps is recommended with a finer mesh 3/8-inch (9 mm) maximum down to 2 mm
wedge-wire screening depending upon whether juvenile fish or larvae are present.

Hope this clarifies the discussion.

Curt Orvis
US Fish and Wildlife Service
Fisheries - Fish Passage and Water Resources
300 Westgate Center Drive
Hadley, Massachusetts 01035-9589
Tel: 413-253-8288
Fax: 413-253-8488
mailto: curtis_orvis@fws.gov

Alex Hoar/R5/FWS/DOI

04/14/2011 02:37 PM

To "Snyder, Joseph (DEP)" <jossnyder@state.pa.us>

cc "'Clint_Riley@fws.gov'" <Clint_Riley@fws.gov>, "'Curtis_Orvis@fws.gov'" <Curtis_Orvis@fws.gov>, "'Jennifer_Kagel@fws.gov'" <Jennifer_Kagel@fws.gov>, "Hartle, Mark" <mhartle@state.pa.us>

Subject RE: Mahoning Creek Dam Hydroelectric Project (PADEP#E03-451/USACE#2009-2175/FERC#12555)Link

Joe,
I will provide clarification on the approach velocity, but can't do that right now. I understand that it may vary with life stage. I will check with fish passage engineer Curt Orvis in our office and get back to you with the details.
Alex

Alex Hoar
Ecological Services
U.S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035
413-253-8631 (voice)
413-253-8482 (fax)

"Snyder, Joseph (DEP)" <jossnyder@state.pa.us>

04/13/2011 04:17 PM

To "'Alex_Hoar@fws.gov'" <Alex_Hoar@fws.gov>

cc "'Clint_Riley@fws.gov'" <Clint_Riley@fws.gov>, "'Curtis_Orvis@fws.gov'" <Curtis_Orvis@fws.gov>, "'Jennifer_Kagel@fws.gov'" <Jennifer_Kagel@fws.gov>, "Hartle, Mark" <mhartle@state.pa.us>

Subject RE: Mahoning Creek Dam Hydroelectric Project (PADEP#E03-451/USACE#2009-2175/FERC#12555)

Hi Alex,

Thank you for your message, below. I would like to confirm with you, your comments, regarding the standard downstream passage design, in your message. Is the USFWS standard flow approach velocity 0.5 fps or 1 fps? The applicant has indicated to PADEP that the USFWS guidelines are 1 fps, rather than the 0.5 fps, which is mentioned in your message below. Would you please provide further comment/clarification, regarding the standard flow approach velocity? JS
-----Original Message-----
From: Alex_Hoar@fws.gov [mailto:Alex_Hoar@fws.gov]
Sent: Wednesday, April 13, 2011 1:55 PM
To: Snyder, Joseph (DEP)
Cc: 'Clint_Riley@fws.gov'; 'Curtis_Orvis@fws.gov'; 'Jennifer_Kagel@fws.gov'; Hartle, Mark
Subject: Re: Mahoning Creek Dam Hydroelectric Project (PADEP#E03-451/USACE#2009-2175/FERC#12555)

Hi Joe,

Thank you for keeping the Fish and Wildlife Service informed about Mahoning Creek Hydro Project, for your coordination, and for copying your email to fish passage engineer Curt Orvis, biologist Jenn Kagel and Project Leader Clint Riley both of our PA Field Office. You will recall that when you called and we spoke on February 4, 2011, I mentioned that our PA Field Office has the lead for hydro projects in PA and has worked on the Mahoning Creek hydro project a number of times over the years. I also mentioned that our fish passage engineers often provide technical assistance with regard to up and downstream passage for fish at hydroelectric and other dams and obstructions. I recall recommending that you contact Jenn Kagel and Curt Orvis with regard to your questions. That said, I spend considerable time with you responding to your questions about entrainment and impingement of fish passing downstream through a hydro project, and the standard downstream passage design that involves a 45 degree angled bar rack, one inch clear spacing between bars, and a flow approach velocity of 0.5 fps. I explained the genesis of that design, which was developed by the NY DEC many years ago for (I believe, juvenile) blueback herring, and the fact that variations have been recommended from time to time depending on site specific conditions at a project and the species and life stages of fish that are of interest. We also generally discussed other possible designs, which you mentieond in your email below. I am glad the time spent was helpful to you.

If you have not already, I recommend again that you contact Jenn and Curt to discuss Mahoning Creek and PA's interests and approach If you have not sent it to them already, an electronic copy of your recent letter to the applicant requesting additonal information would likely facilitate those conversations.

If I can be of further assistance, please let me know.
Alex

Alex Hoar
Ecological Services
U.S. Fish and Wildlife Service
300 Westgate Center Drive
Hadley, MA 01035
413-253-8631 (voice)
413-253-8482 (fax)

"Snyder, Joseph (DEP)" <jossnyder@state.pa.us>

04/07/2011 08:03 AM

To "'Alex_Hoar@fws.gov'" <Alex_Hoar@fws.gov>

cc "'Jennifer_Kagel@fws.gov'" <Jennifer_Kagel@fws.gov>, "'Clint_Riley@fws.gov'" <Clint_Riley@fws.gov>, "'Curtis_Orvis@fws.gov'" <Curtis_Orvis@fws.gov>, "Hartle, Mark" <mhartle@state.pa.us>

Subject Mahoning Creek Dam Hydroelectric Project (PADEP#E03-451/USACE#2009-2175/FERC#12555)

Hello Mr. Hoar,

I am following-up on a telephone conversation that you and I had, approximately 2 months ago, in which I talked to you about USFWS recommendations for intake screen design and withdrawal rates. My phone call to you was prompted by my review of an application for a PA Water Obstruction and Encroachment Permit (DEP File No. E03-451), for the subject project. (To help you to recall our conversation, I have included a copy of my notes, below. I have also copied additional USFWS personnel on this message, per your suggestion, during our conversation.) I just wanted to give you an update,

regarding this matter. DEP recently sent a letter to the applicant, which requests that the applicant provide additional information, to address multiple technical items, regarding its proposal to retrofit the Corps' existing dam across the Mahoning Creek, in Armstrong County, PA, to generate hydroelectric power. One of the items in this letter relates to the applicant's proposed design and withdrawal rate for its proposed intake structure, within the lake/reservoir. Based on subsequent conversations with Mark Hartle, of the PA Fish & Boat Commission (PFBC), PFBC is still concerned that the proposed screen design and water withdrawal rate will be inadequate to reduce mortality to fish fry and fingerlings. In light of comments from the applicant regarding PFBC's previous recommendation that the proposed intake be designed with 3/8" openings and a withdrawal rate of 0.5 fps, PFBC has modified its recommendation such that a screen with 1" openings may be sufficiently protective, if the screen is angled; however, the withdrawal rate should still not exceed 0.5 fps. In its letter to the applicant, DEP is asking the applicant to evaluate and discuss the feasibility of incorporating PFBC's revised recommendations into the design and operation of its proposed intake structure, or to demonstrate that its proposed design will adequately protect fish fry and fingerlings. If you would like to receive a copy of DEP's letter to the applicant, please let me know, and I will forward a copy to you. I appreciate the time and information that you gave to me during our previous telephone conversation, and just wanted to let you know how the issue that we had discussed was progressing. If you have any questions regarding this message, feel free to contact me at 412-442-4308. JS

P.S. Following are my notes from our previous telephone conversation:
On 02/04/2011, in an attempt to learn more about the USFWS standard intake and design criteria, I spoke by phone, with Alex Hoar, at the USFWS Northeast (Hadley, MA) Regional Office. Mr. Hoar could not recall a specific policy document, regarding the USFWS standard intake and design criteria, but said that the standard criteria has been in use for years, and is based on research by Doug Sheppard (sp.?), in the New York area. The 1 fps intake velocity is based on the swim speed of fish; however, it is not species or life stage specific. Fry, juvenile and adult fish have different swim speeds. He said that the 1 fps rate is USFWS' starting standard, and that they can deviate from this standard, on a case-by-case basis. He asked about PFBC's specific concerns, and I read to him from the applicant's response document, dated 06/02/2010, that PFBC is concerned that "[t]he EA indicates that 90% of fish should survive entrainment, but fails to discuss the significance of loss of 10% of entrained fish." Mr. Hoar indicated that if there was a specific species of fish about which PFBC was concerned, then a deviation from the standard intake rate might be considered.
Regarding the trash rake, Mr. Hoar said that the typical trash rack consists of vertical bars with 1" clear space between the bars. If the bars are perpendicular and/or angled to the flow of water, the water pressure is changed, since the water has to speed up, to get through the space. Fish sense this pressure change in their lateral line, and stay away from the screen. He also indicated that there are other options to consider, such as a perforated plate, or an overlay. If there's a particular seasonal concern, they can use an overlay, which might have different bar spacing, to address a particular concern. Resistance to changes in the intake velocity and trash rack design comes from the hydropower industry, because of cost and reductions in the amount of power that can be produced. The standard design is probably more geared toward protecting the game fish, and there is a movement toward protecting the broader fish community. JS

Joseph Snyder | Water Pollution Biologist 3
Department of Environmental Protection
Southwest Regional Office
400 Waterfront Drive | Pittsburgh, PA 15222-4745
Phone: 412.442.4308 | Fax: 412.442.4242
www.depweb.state.pa.us

East Coast Design Criteria USFWS

- Provide fish guiding or screening facilities at powerhouse intakes to guide downstream migrants to downward opening gated surface bypasses with 3-foot minimum width.

- Attraction flow to the bypass portals should be the greater of up to 4 percent of the rated turbine capacity or 20 cubic feet per second.

- Fish screens or bar racks can include angled racks, louvers, or overlay screens with the following clear opening:

  1-inch clear opening for salmon smolts
  (5 inches (127 mm) to 8 inches (200 mm) long
  1/2-inch clear opening for salmon parr
  1/4-inch clear opening for salmon fry

- Bypass conduits shall have a minimum diameter of 24 inches, be smooth lined and have minimum 10-foot radius bends. For conduits discharging into tailraces, a discharge end that is horizontal and 6 to 10 feet above normal tailwater is recommended.

- Provide an adequate plunge pool at the discharge end of all fish bypass conduits. Plunge pool depth should be 25 percent (1/4) of the total differential head.

Attraction Flow Criteria for Upstream Facilities at Hydroprojects

- **Normally provide the greater of 3% of rated turbine capaacity or 50cfs as attraction flow at gated entrances to fish passage facilities at powerhouses and spillways.**

- **Fishway entrances should normally have downward opening slide gates with twin recessed or cable suspended gate stems. Provide 20 to 30 cfs per foot of entrance width.**

Operating Range (Northeast U.S.)

- **Normally operate upstream facililties during the upstream migration period of target species and flows up to 3 times the mean annual flow at the specific site.**

Downstream Migrant Facilities at Hydroprojects

- **Provide fish guiding or screening facilities at powerhouse intakes to guide downstream migrants to downward opening gated surface bypasses (3'minimum width), discharging the greater of up to 4% of rated turbine capacity or 20 cfs.**

- **Approach velocity at fish screens should not exceed (4 body lengths per second) as measured 12" upstream and at right angles to the screen or rack.**

- **Fish screens or bar racks can include angled racks, louvers or overlay screens with the following clear opening:**
  (1" clear opening typical for salmon smolts 5-8" long)
  (1/2" " " " parr)
  (1/4" " " " fry)

- **Bypass conduits shall have a minumum diameter of 24", be smooth**

Chapter 6

Swimming Speeds of Adult and Juvenile Fish

Importance of cruising, sustained and darting swimming speeds to fish facility structures.

Amount of energy loss in transfer of muscular energy to propulsion.

Forces working against fish movement.

Effects of exhaustive exercise.

Ratio of sustained speed to darting speed and cruising speed to darting speed.

Attractive velocities at obstructions and fishways.

Effects of velocity gradients.

Method of determining the time fish can maintain various speeds.

Velocities to be used in designing upstream facilities.

Pulsing velocities and turbulence effects.

Swimming speeds affected by oxygen and other functions of fish.

Effect of temperature on swimming effort.

Visual reference and effect of darkness and light.

Pollution effects.

A. Relative Swimming Speeds of Adult Fish.

B. Relative Swimming Speeds of Young Fish.

C. Relative Swimming Speeds (Mackenzie River and Alaska data).

D. Swimming Speed of Sockeye Fry at Chilko Lake.

E. Maximum Sustained Cruising of Sockeye and Coho Underyearlings in Relation to Temperature.

References Reviewed.

SWIMMING SPEEDS OF ADULT AND JUVENILE FISH

In the development of fish facility structures, three aspects of swimming speeds are of concern.

1. Cruising - a speed that can be maintained for long periods of time (hours).
2. Sustained - a speed that can be maintained for minutes.
3. Darting - a single effort, not sustainable.

Exhibit A and B show the relative swimming speeds of selected adult and juvenile species. Exhibit C shows swimming speeds for MacKenzie River fish. Exhibit D shows the swimming effort of sockeye salmon fry at Chilko Lake.

Fish normally employ cruising speed for movement (as in migration), sustained speed for passage through difficult areas, and darting speed for feeding or escape purposes. Each speed requires a different level of muscular energy, and it may be assumed that there is a 15 per cent loss in the transfer of muscular energy to propulsion.

The force on the fish may be considered equivalent to that associated with any object, either moving within water or stationary in moving water. Energy involved may be computed by the following equation.

$$F = C_d A W \frac{V^2}{2g}$$

where F = force (in pounds)
C_d = drag coefficient = .2 (salmon)
Area = cross sectional area in square feet
W = weight of water (62.4 pounds per cubic foot)
V = summation of velocities in feet per second
g = gravity (32.2 feet per second per second)

Thus, force through a distance gives foot-pounds and can be converted to British thermal units or calories.

As energy requirements are related to the square of the apparent velocity, the reason why fish tire rapidly as the velocity increases is evident from the above formula. The build-up of lactic acid as a result of unusual activity can be fatal. A number of investigators have indicated that fish may recuperate rapidly after exhaustive exercise. Conversely, it has been noted that up to 2 hours are required for fish to recover and assume normal movement after tiring exercise.

An early investigator (Reference No. 36) used the weight of the fish to establish a ratio of sustained speed to darting speed of approximately .5 to .7. This has been borne out by recent investigations in which lengths of fish were used as a measure.

The data indicate that a fish's cruising speed level may be 15 to 20 per cent of its darting speed level. This is further supported by data from experiments on jumping fish by computing the velocities at which the fish leave the surface by using the following formula and comparing the results with the results of the swimming tests.

$$V = \sqrt{2gh}$$

where V = initial velocity in feet per second (at water surface)
g = gravity (32.2 feet per second per second)
h = height in feet of jump above water surface

Investigations have shown that fish are able to sense low levels of velocity and may orient themselves to a velocity of 0.16 fps and may sense changes of 0.328 fps (Reference 48). They, hence, may seek and find the most favorable areas, which makes it difficult to use average velocities in determining the effects of swimming speeds. It is suggested that normal distribution curves be utilized for this purpose.

Adults frequently seek higher velocities at obstructions, which may be utilized to attract them to fishway entrances. Such velocities should be well under the darting speed of the species and sizes involved but may exceed their cruising speed.

Swimming speeds are affected by available oxygen and swimming effort may be reduced by 60 per cent at oxygen levels of one-third saturation. Oxygen levels also affect other functions of fish.

Temperatures at either end of the optimum range for any species affects swimming effort. A graphic presentation (Exhibit E) has been prepared from Reference 16 and shows that a reduction of swimming effort of 50 per cent may occur as a result of adverse temperatures.

In dealing with problems at specific sites where swimming speed is important, such as the protection of juveniles ahead of protective screening or the guidance of fish (both adult and juvenile), the effects of temperature and oxygen must be evaluated.

As fish sense changes in velocity, they may avoid moving from one gradient to another, particularly from a lower to a higher gradient. When guiding or directing fish, smooth transitions and accelerations are desirable in order to prevent them from stopping, hesitating or refusing to enter a particular area.

It is assumed that fish use visual references in their movement and, therefore, behave differently in darkness than in light. Stimuli other than velocity may guide the fish's movement within established levels of cruising and sustained speed. Downstream migrating fish may lock into a velocity and be swept along at speeds that are well in excess of their cruising speeds.

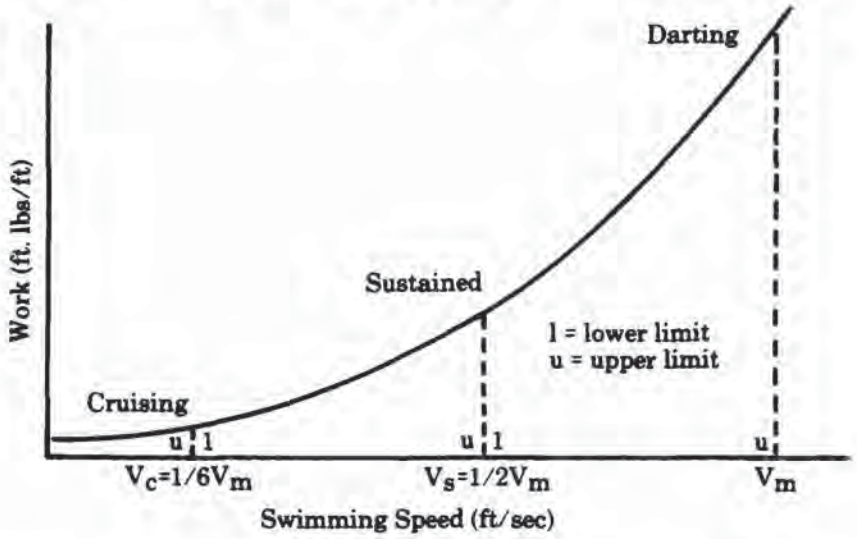
In a series of tests (Reference 49) it was shown that fish tested passed through an endless pipe system more rapidly when the system was lighted. With opposing velocities of 2 to 2.5 fps, the best swimming performance was obtained.

An increase of 23 per cent in passage time was found when the system was in darkness, and the maximum distance attained by the sockeye tested was about 1 mile under light and 0.26 mile under darkness. The ground speed of the fish was under 2 fps.

In the design of upstream facilities, velocities must be kept well below the darting speeds for general passage.

SWIMMING SPEEDS OF ADULT AND JUVENILE FISH

A means of determining the time that fish are capable of maintaining various speeds is given below:



$k = \frac{C_d \text{ A } 62.4 \text{ lbs.}}{2g}$ assuming C_d does not vary throughout the swimming ranges.

A = Cross sectional area in square feet.

V_m = Maximum swimming velocity in feet per second.

D(Swimming Distance) = VT

Work = kV^2D or kV^3T

The maximum time that darting can be maintained is estimated at 5 to 10 seconds, thus the time that maximum sustained speeds can be maintained is shown by the relationship

$$kV_s^3T_s = kV_m^3T_m$$

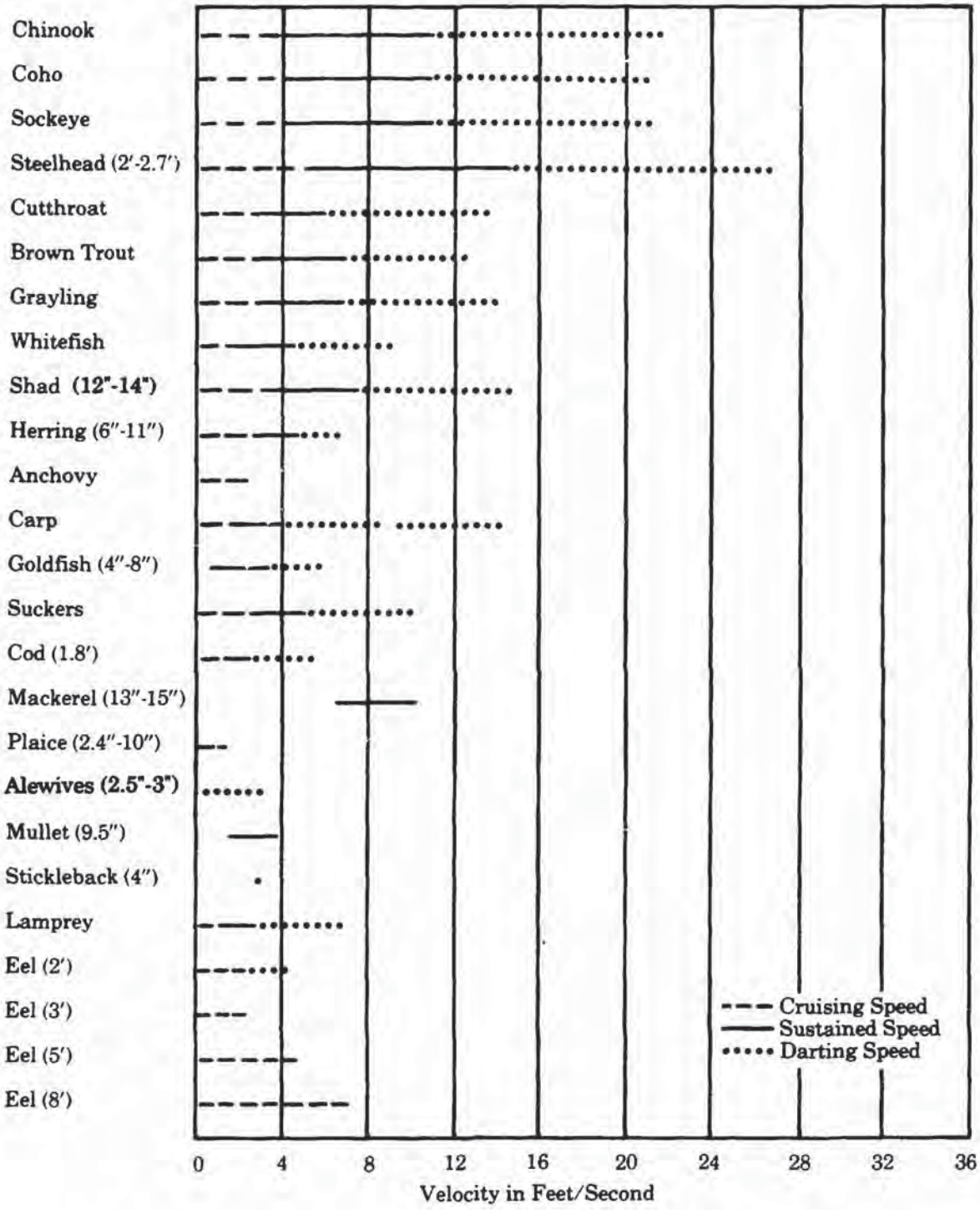
where $kV_m^3T_m$ = maximum energy factor at optimum temperature.

Velocities should not be averaged as the energy factor varies with the square of instantaneous velocity. Pulsing velocities can increase the instantaneous energy requirements by four times throughout the darting speed range. This may account for the variations in performance time found in the tests on swimming speeds. Because of turbulence and pulsing, a maximum darting time of 7-1/2 seconds is a suggested value. As fish are capable of swimming for hours at the upper ranges of their cruising speeds, it is assumed that no oxygen deficiency occurs at this level. Above this level, fish apparently are not capable of passing water over their gills at the rate necessary to obtain this increased oxygen required for the additional energy expenditure.

In addition to the effects of oxygen and temperature, swimming performance is also adversely affected by various pollutants. Selected references are included to indicate the source material for those pollutants that are of major concern.

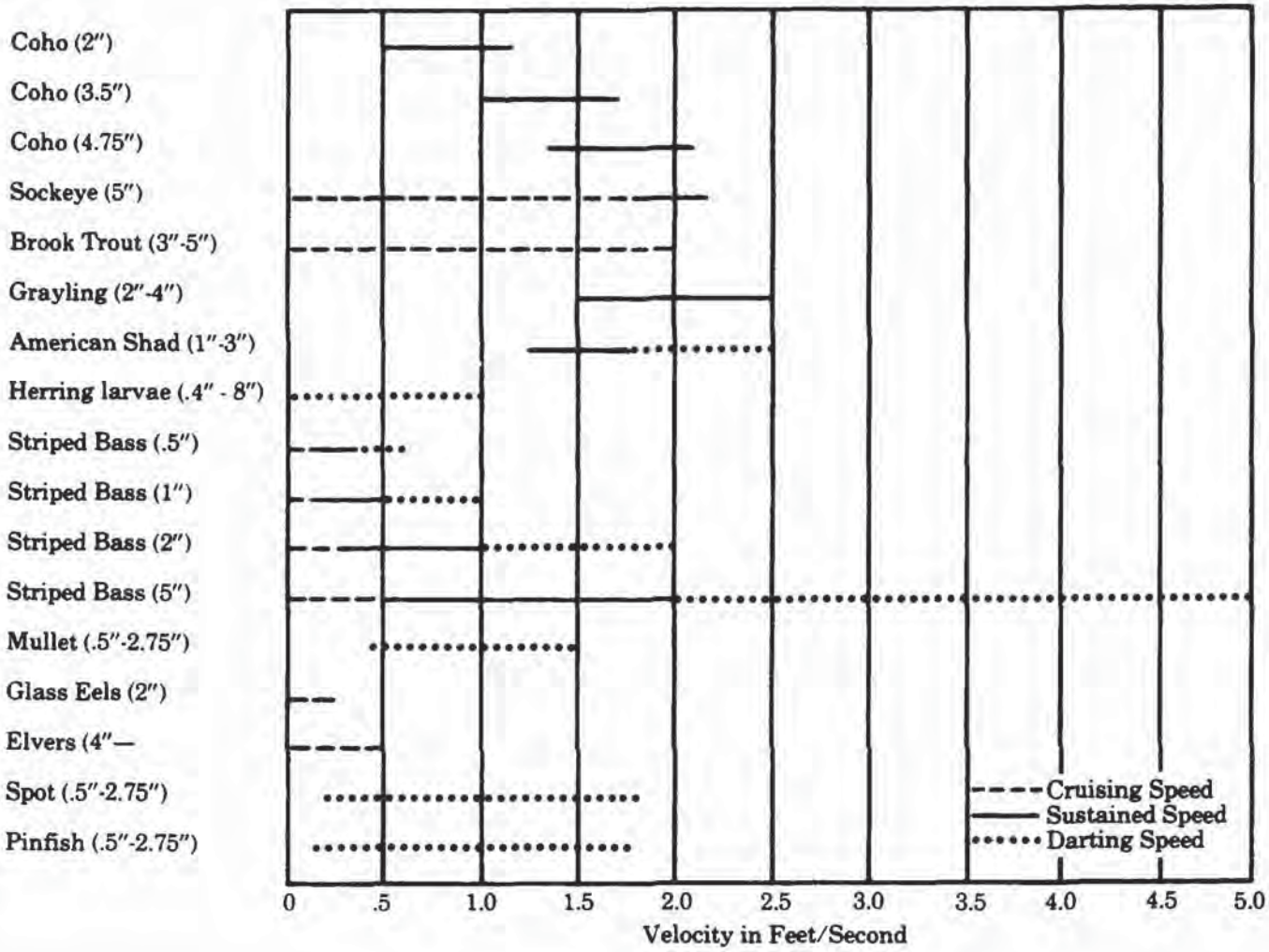
SWIMMING SPEEDS OF ADULT AND JUVENILE FISH

A
Relative Swimming Speeds of Adult Fish



SWIMMING SPEEDS OF ADULT AND JUVENILE FISH

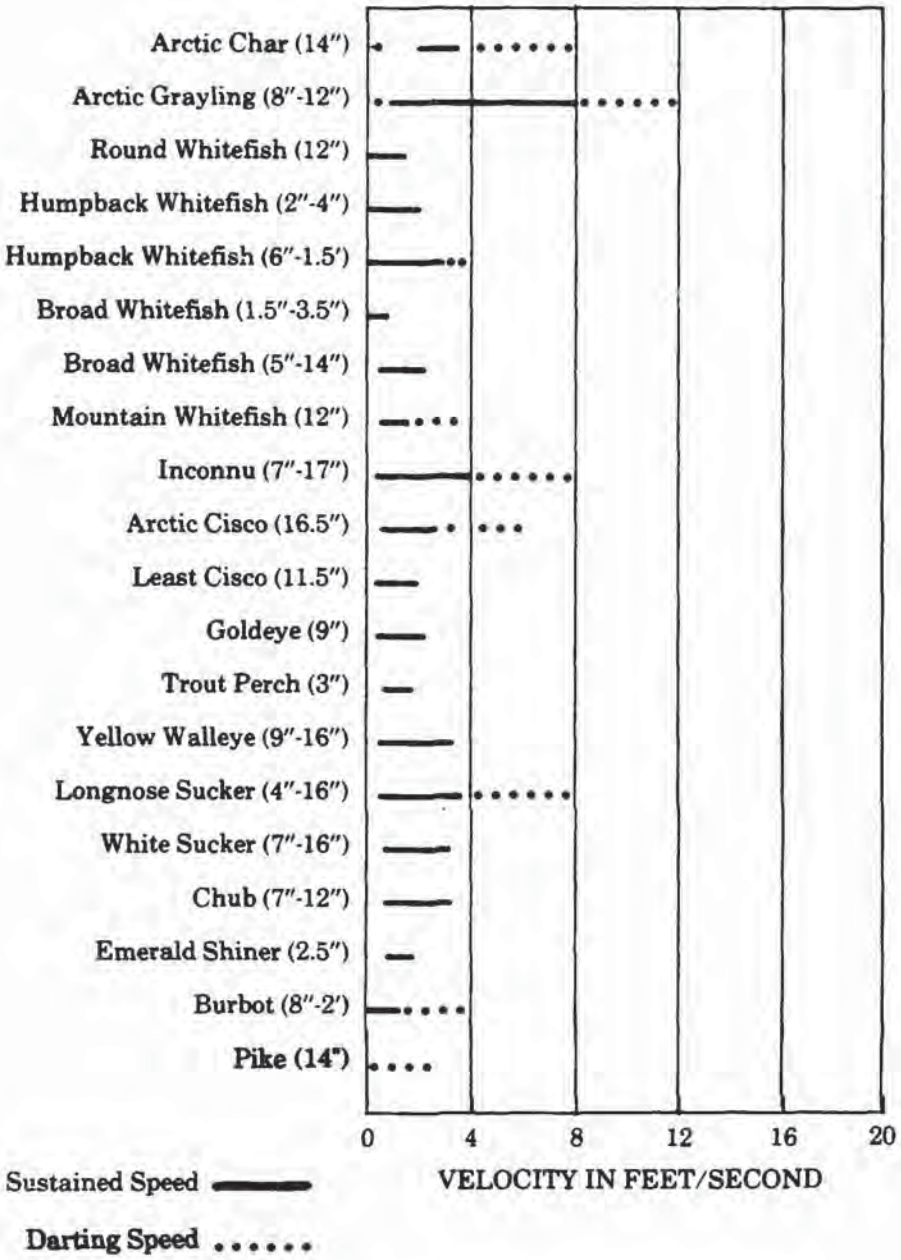
B
Relative Swimming Speeds of Young Fish



SWIMMING SPEEDS OF ADULT AND JUVENILE FISH

C

Relat ve Swimming Speeds

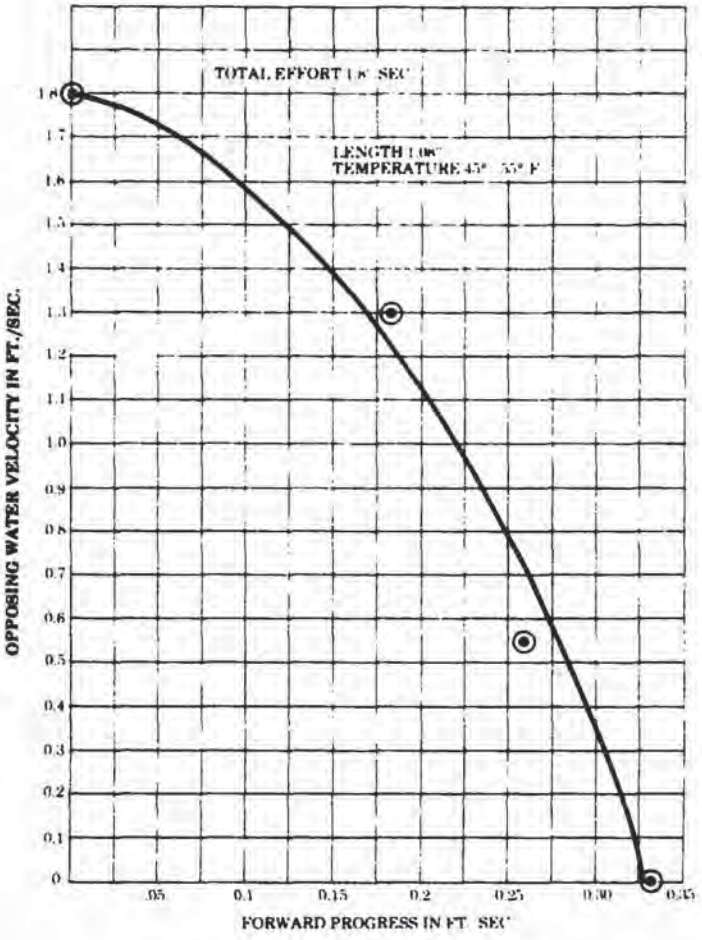


MacKenzie River data used for sustained speed.

Ala' a data used to extend swimming speed to darting level.

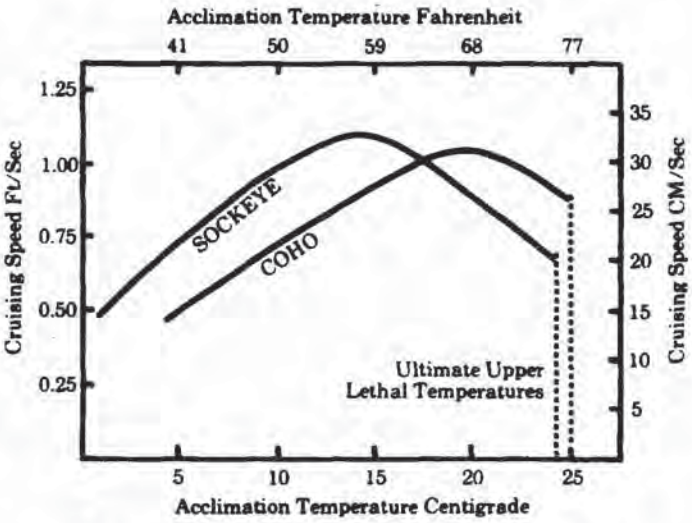
SWIMMING SPEEDS OF ADULT AND JUVENILE FISH

D
Swimming Speed of Sockeye Fry at Chilko Lake



E
Maximum Sustained Cruising of Sockeye and Coho Underyearlings in Relation to Temperature

from Brett, 1958



For 1 F. change approximately .026 fps is lost from the maximum point.

The point of maximum efficiency shifts throughout the fish's temperature range, based on adjustment to latitude of residence.

SWIMMING SPEEDS OF ADULT AND JUVENILE FISH

References Reviewed

1. Black, Edgar C., "Energy stores and metabolism in relation to muscular activity in fishes." In H.R. Macmillan Lectures in Fisheries, "The Investigation of Fish-Power Problems," pp. 51-67. Symposium held at the University of British Columbia, April 29-30, 1957, edited by P.A. Larkin. University of British Columbia, Institute of Fisheries, Vancouver. 1958.

2. U.S. Army Corps of Engineers, North Pacific Division, "Progress report on fisheries-engineering research program." Portland, Oregon. November, 1956.

3. U.S. Army Corps of Engineers, North Pacific Division, "Progress report on fisheries-engineering research program." Portland, Oregon. July, 1960.

4. Weaver, Charles R., "Observations on the swimming ability of adult American shad (Alosa sapidissima)." Transactions of the American Fisheries Society, 94(4):382-385. October, 1965.

5. Williams, I.V., "Implication of water quality and salinity in the survival of Fraser River sockeye smolts." International Pacific Salmon Fisheries Commission, Progress Report No. 22. New Westminster, B.C. 1969.

6. Calkins, Thomas P., "The effect of fin revoval on the swimming ability of young silver salmon." Fisheries Research Institute, circular 109, College of Fisheries, University of Washington, Seattle. November 1959.

7. Canada Department of Fisheries and International Pacific Salmon Fisheries Commission, "A report of the fish facilities and fisheries problems related to the Fraser and Thompson River dam site investigations." Prepared in collaboration with the British Columbia Game Commission. Vancouver, B.C. November, 1955.

8. Idler, D.R., and W.A. Clemens, "The energy expenditures of Fraser River sockeye salmon during the spawning migration to Chilko and Stuart Lakes." International Pacific Salmon Fisheries Commission, Progress Report No. 6 New Westminster, B.C. 1959.

9. Dunstan, William, "Variations in the depot fats of Columbia River sockeye." In "Progress Report - Puget Sound Stream Studies," by W.E. Bostick, W.A. Dunstan, and W.H. Rees. Unpublished. Washington Department of Fisheries, Olympia. 1956.

10. Miller, Richard B., and Frances Miller, "Diet, glycogen reserves and resistance to fatigue in hatchery rainbow trout." Part II. Fisheries Research Board of Canada, Journal, 19(3):365-375. May, 1962.

11. Fields, Paul E., Ronald J. Adkins, and Gary L. Finger, "The swimming ability of immature silver salmon (Oncorhynchus kisutch) measured in an experimental flume." University of Washington, School of Fisheries, Technical Report No. 9. Seattle. 1954.

12. Wales, J.H., "Swimming speed of the western sucker (catostomus occidentalis Ayres)." California Fish and Game, 36(4):433-434. October, 1950.

13. Parson, Green "How far and fast can salmon travel?" Salmon and Trout Magazine, No. 135:146-153. May, 1952.

14. Bainbridge, Richerd, "The speed of swimming fish as related to size and to the frequency and amplitude of the tail beat." Journal of Experimental Biology, 35(1):109-133. March, 1958.

15. Paulik, Gerald J., and Allan C. DeLacy, "Changes in the swimming ability of Columbia River sockeye salmon during upstram migration." College of Fisheries, Technical Report 46, University of Washington, Seattle. 1958.

16. Brett, J.R., M. Hollands, and D.F. Alderdice, "The effect of temperature on the cruising speeed of young sockeye and coho salmon." Fisheries Research Board of Canada, Journal 15(4):587-605. July. 1958.

17. Connor, Anne R., Carl H. Elling, Edgar C. Black, Gerald B. Collins, Joseph R. Gauley, and Edward Trevor-Smith, "Changes in glycogen and lactate levels in migrating salmonid fishes ascending experimental 'endless' fishways." Fisheries Research Board of Canada, Journal 21(2):255-290. March, 1964.

18. Paulik, G.J., A.C. DeLacy, and E.F. Stacy, "The effect of rest on the swimming performance of fatigued adult silver salmon." School of Fisheries, Technical Report 31, University of Washington, Seattle. 1957.

19. Clancy, Dan W., "The effect of tagging with Petersen disc tags on the swimming ability of fingerling steelhead trout (Salmo gairdeneri)." Fisheries Research Board of Canada, Journal, 20(4):899-908. July, 1963.

20. Brett, J.R., "The relation of size to the rate of oxygen consumption and sustained swimming speed of sockeye salmon (Oncorhynchus nerka)." Fisheries Research Board of Canada, Journal, 22(6):1491-1501. November, 1965.

21. Paulik, G.J., and A.C. DeLacy, "Swimming abilities of upstream migrant silver salmon, sockeye salmon and steelhead at several water velocities." School of Fisheries, Techical Report 44, University of Washington, Seattle. 1957.

22. Thomas, Allan E., and Roger E. Burrow, "A device for stamina measurement of fingerling salmonids." U.S. Fish and Wildlife Service, Research Report, No. 67. 1964.

23. Pretious, E.S., L.R. Kersey, and G.P. Contractor, "Fish protection and power development on the Fraser River." The Fraser River Hydro and Fisheries Research Project, University of British Columbia, Vancouver. February, 1957.

24. Collins, Gerald B., "Proposed research on fishway problems." Proposal submitted to the U.S. Army Corps of Engineers by the U.S. Fish and Wildlife Service.

SWIMMING SPEEDS OF ADULT AND JUVENILE FISH

References Reviewed *(Continued)*

25. Davis, Gerald E., Jack Foster, Charles E. Warren, and Peter Doudoroff, "The influence of oxygen concentration on the swimming performance of juvenile Pacific salmon at various temperatures." Transactions of the American Fisheries Societies, 92(2):111-124. April, 1963.

26. Felton, Samuel P., "Measurement of creative and inorganic phosphate in exercised and unexercised three-year-old hatchery steelhead trout." Unpublished report. School of Fisheries, Technical Report No. 29, University of Washington, Seattle. December, 1956.

27. Haley, Richard, "Maximum swimming speeds of fishes." In "Inland Fisheries Management," edited by Alex Calhoun, pp. 150-152. California Department of Fish and Game, Sacramento. 1966.

28. MacKinnon, Dixon, and William S. Hoar, "Responses of coho and chum salmon fry to current." Fisheries Research Board of Canada, Journal, 10(8):523-538. November, 1953.

29. Kerr, James E., "Studies on fish preservation at the Contra Costa steam plant of the Pacific Gas and Electric Company." California Department of Fish and Game, Fish Bulletin, No. 92. 1953.

30. Gray, James, "How fishes swim." Scientific American, 197(2):48-65. August, 1957.

31. Nakatani, Roy E., "Changes in the inorganic phosphate and lactate levels in blood plasma and muscle tissue of adult steelhead trout after strenuous swimming." Unpublished report. School of Fisheries, Technical Report 30, University of Washington, Seattle. May, 1957.

32. Orsi, James J., "Dissolved oxygen requirements of fish and invertebrates." In California Department of Fish and Game and the Department of Water Resources, "Delta Fish and Wildlife Protection Study," Report No. 6, pp. 48-68, Chapter IV. June, 1967.

33. Nakatani, Roy E., "Changes in the inorganic phosphate levels in muscle tissue of yearling steelhead trout after exercise." Unpublished report. School of Fisheries, Technical Report 28, University of Washington, Seattle. October, 1956.

34. Black, Edgar C., Anne Robertson Connor, Kwok-Cheung Lam, and Wing-gay Chiu, "Changes in glycogen, pyruvate and lactate in rainbow trout (Salmo gairdneri) during and following muscular activity." Fisheries Research Board of Canada, Journal, 19(3):409-436. May, 1962.

35. The Progressive Fish-Culturist, 27(3):157. July, 1965. (News note on swimming speeds.)

36. Nemenyi, Paul, "An annotated bibliography of fishways: covering also related aspects of fish migration, fish protection and water utilization." University of Iowa, Studies in Engineering, Bulletin 23. 1941.

37. Blaxter, J.H.S., "Swimming speeds of fish." FAO Fish. Rep. 62, Vol. 2, pp. 69-100. 1969.

38. Brett, J.R., "Swimming performance of sockeye salmon in relation to fatique time and temperature." Fisheries Research Board of Canada, Journal, 24(8):1731-1741.1967.

39. Jones, David R., Owen S. Bamford and Joe W. Kiceniuk, "An evaluation of the swimming performance of several fish species from the Mackenzie River." Department of Zoology, University of British Columbia, Vancouver, Canada, for the Department of the Environment, Fisheries and Marine Service, Central Region, Winnepeg, Manitoba. 69 pp. 1976.

40. Jones, D.R., J.W. Kiceniuk, and O.S. Bamford, "Evaluation of the swimming performance of several fish species from the Mackenzie River." Fisheries Research Board of Canada, Journal, 31:1641-1647. 1974.

41. Glova, G.J., and J.E. McInerny, "Critical swimming speeds of coho salmon (Oncorhynchus kisutch) fry to smolt stages in relation to salinity and temperature." Fisheries Research Board of Canada, 34:151-154. 1977.

42. Kotkas, Enn, "Studies of the swimming speeds of some anadromous fishes found below Conowingo Dam, Susquehanna River, Maryland." Ichthyological Associates, Holtwood, Pa. For Conowingo Reservoir-Muddy Run Fish Studies Progress Report 6, 22 pp. 1970.

43. Fisher, Frank W., "Swimming ability of juvenile American shad (Alosa sapidissima)." California Department of Fish and Game, Anadromous Fisheries Branch, Administrative Report No. 76-9, 6p. August, 1976.

44. Ware, D.M., "Growth, metabolism, and optimal swimming speed of a pelagic fish." Fisheries Research Board of Canada, Journal, 32:33-41. 1975.

45. Howard, T.E., "Swimming performance of juvenile coho salmon (Oncorhynchus kisutch) exposed to bleached draft mill effluent." Fisheries Research Board of Canada, Journal, 32:789-793. 1975.

46. Webb. P.W., "Hydrodynamics and energetics of fish propulsion." Fisheries Research Board of Canada, Journal, 190:159, p. 1975.

47. Rulifson, Roger A., "Temperature and water velocity effects on the swimming performances of young of the year striped mullet (Mugil cephalus), spot (Leiostomus xanthurus), and pinfish (Legodon rhomboides)," Fisheries Research Board of Canada, Journal, 34:2316-2322. 1977.

48. Jones, F.R. Harden, "Fish migration." Fisheries Laboratory, Lowestoft. St. Martin's Press, New York. 1968.

References Reviewed *(Continued)*

49. Laevastu, Taivo, and Ilmo Hala, "Fisheries oceanography--New ocean environmental services." Fishing News (Books) Ltd., London, England. 1970.

50. MacPhee, Craig, and Fred J. Watts, "Swimming performance of Arctic grayling in highway culverts." University of Idaho. Progress Report for U.S. Fish and Wildlife Service. Contract No. 14-16-0001-5207. January, 1975.

51. Wagner, Charles, "Species common to the Hudson River." Personal communication.

52. Peterson, R.H., "Influence of fenitrothion on swimming velocities of brook trout (*Salvelinus fontinalis*)." Fisheries Research Board of Canada, Journal, 31:1757-1762. 1974.

53. Brett, J.R., and N.R. Glass, "Metabolic rates and critical swimming speeds of sockeye salmon (*Oncorhynchus nerka*) in relation to size and temperature." Fisheries Research Board of Canada, Journal, 30-379-387. 1973.

54. Brett, J.R., "Energy expenditure of sockeye salmon, *Oncorhynchus nerka*, during sustained performance." Fisheries Research Board of Canada, Journal, 30:1799-1809. 1973.

55. Smith, Lynwood S., and Lili T. Carpenter, "Salmonid fry swimming stamina data for diversion screen criteria." Fisheries Institute, University of Washington. Final report for Washington State Department of Fisheries and Washington State Department of Game, December, 1987.

56. Oseid, Donavon, and Lloyd L. Smith, Jr., "Swimming endurance and resistance to copper and malathion of bluegills treated by long-term expose to sublethal levels of hydrogen sulfide." Transactions of the American Fisheries Society, 4:620-625. 1972.

57. MacLeod, John Cameron, and Lloyd L. Smith, Jr., "Effect of pulpwood fiber on oxygen consumption and swimming endurance of the fathead minnow, *Pimpehales promelas*." Transactions of the American Fisheries Society, 95:711-84. 1966.

58. Webb, P.W., and J.R. Brett, "Effects of sublethal concentrations of sodium pentachlorophenate on growth rate, food conversion efficiency, and swimming performance in underyearling sockeye salmon (*Oncorhynchus nerka*)." Fisheries Research Board of Canada, Journal, 30:499-507. 1973.

59. Waiwood, K.G., and F.W.H. Beamish, "Effects of copper, pH and hardness on the critical swimming performance of rainbow trout (*Salmo gairdneri* Richardson)." Water Research 12:611-619. Pergamon Press, Ltd. 1978.

60. Kent, Joseph C., Allan DeLacy, Takao Hirota and Billy Batts, "Flow visualization and drag about a swimming fish." Fisheries Research Institute, University of Washington. U.S. Naval Ordnance Test Station, China Lake, California. Contract No. N123(60530)20579A. 1961.

61. Alexander, R. McNeill, "Animal mechanics." University of Washington Press, Seattle. 1968. 346 pp.

62. Russell, George R., "Hydraulics." Henry Holt and Company, Inc., New York. Fifth ed. 1952. 468 pp.

Mahoning Creek Lake Dam Electrofishing Survey Results, 1986 and 2010
Prepared by Bob Hoskin, Fishery Biologist
June 10, 2010

The Pittsburgh District contracted Bob Hoskin, who also conducted the Corps' June 1986 stilling basin survey, to conduct a boat electrofishing survey of the Mahoning Creek Dam stilling basin on 7 May 2010. The dam outflow was shut down during the 2010 survey and the stilling basin weir sluice gates opened to drop the pool elevation. Lowering the pool water level and reducing the flow allowed for a more representative survey and revealed excellent rock habitat along the shoreline and a good crayfish community.

Table 1 contains results of the June 1986 SB (stilling basin) survey at Mahoning Dam, **Table 2** contains the May 2010 SB survey results, **Table 3** summarizes species occurrence by survey, **Table 4** compares data from the 1986 and 1010 surveys, and **Table 5** shows length frequency distributions for various fish collected during both surveys. Results of EnviroScience's 2007 Mahoning Lake Dam electrofishing and gill net fish surveys that were conducted for the Mahoning Hydro project were also considered in this review.

The Pittsburgh District has now collected a total of 17 species of fish from the Mahoning Dam stilling basin pool, combining results from the 1998 and the 2010 surveys **(Table 3)**. For both individual surveys, a total of 12 species of fish were collected. Species added in 2010 included brown trout, carp, fathead minnow, greenside darter and yellow bullhead. Species collected during both surveys included logperch, N. hog sucker, rock bass, river chub, smallmouth bass, yellow perch and white sucker. Except for the yellow perch, these are typical cool water river species.

Dominant species in 2010 in order of abundance were N. hog sucker (35), yellow perch (28), rock bass (21), river chub (12), logperch (11), and white sucker (10). These six species represented 87% of the total number of fish collected. By weight, carp (31% - a single specimen), smallmouth bass (28%), rock bass (15%), N. hog sucker (8%) and yellow perch (7%) combined represented 89 percent of the total weight of all fish collected (**Table 2**). Again, except for yellow perch and carp these fish are typically cool water river species.

Dominant species in 1986 in order of abundance were white sucker (30), river chub (20), logperch (15), and yellow perch (10). These four species combined represented 80 percent of the total number of fish collected. By weight, white sucker (33%), river chub (22%), yellow perch (18%) and rock bass (15%) combined represented 88 percent of the total weight of all fish collected (**Table 1**).

Sampling effort for the 2010 stilling basin survey was 1.10 hours whereas in 1986 effort was 1.58 hours (**Table 4** Data Comparison). Even so, there was an increase in fish catch-per-unit-effort (CPUE) by number and by weight in 2010 versus 1986. This was very encouraging and indicates an improvement in the stilling basin fish community. These two CPUE figures are also compared in the **Table** for the various fish groups. Of significant importance was the increase in sport fish CPUE by number (from 9 to 55 fish per hour) and by weight (from 0.38 to 5.33 kilograms). Part of the increase might be explained by the lowering of the stilling basin pool to increase sampling efficiency, but not all of it.

Of note from the 2010 stilling basin survey were two sixteen-inch smallmouth bass that were collected along with several other year classes of lesser age. Also of note was the trout that was collected and another observed. These are the types of fish anglers are trying to catch, in addition to the channel catfish collected during the 2007 licensee gill net survey in the stilling basin. The Pennsylvania Fish & Boat Commission's (PFBC) reservoir channel catfish and the stilling basin trout stocking programs have been successful in expanding the sport fish fishery for the angler at the Mahoning outflow and increased facility recreational use. During the 2010 survey, Mr Hoskin observed four anglers fishing the outflow area. Considering how isolated the Mahoning facility is, he considered this was really good angler pressure.

One observation of great interest that may be unique to the Mahoning Creek Lake stilling basin was the absence of largemouth bass, bluegill, white and black crappie, channel catfish and emerald shiners in the stilling basin during both Corps electrofishing surveys. These fish dominated the reservoir fishery when sampled by the PFBC on 27-28 April 2010 (gill and trap nets) and 20 May 2010 (night electrofishing). Hoskin was also able to assist the PFBC with these surveys. While managing the Corps' routine reservoir outflow fish survey program from 1986 to 2004 (supervised and provided after-action reports), Hoskin recollects that the District tailrace fisheries generally reflected the reservoir fishery except for trout and other river species observed. However, at Mahoning Creek Lake this is not the case. He believes that the weir isolates the stilling basin fishery from the river resulting in less fish diversity. Diversity is further reduced by the coldwater discharge. The reservoir temperature regime is well suited for the absent warmwater species listed above since they survive better in the warmer waters of the reservoir. As with the other Pittsburgh District reservoir facilities, these reservoir fish (like the one listed in this paragraph above) are most likely sluiced through the dam. However, at Mahoning, after being sluiced these fish must exit the stilling basin pool in search of warmer water downstream. These species of fish are found downstream of the stilling basin weir at Mahoning, as are walleye and muskellunge which are also stocked in the reservoir. The cold water species like trout and smallmouth bass are more suited for the stilling basin pool which receives cooler water from the bottom of the lake, and tend to stay put. It is likely that the forage base in the stilling basin pool is primarily crayfish and other macroinvertebrates along with young-of-the-year fish like white and hog suckers or river chubs, or small fish sluiced through the dam.

Gill net surveys of the reservoir and stilling basin pool, and electrofishing surveys of the reservoir and waters below the stilling basin weir by the licensee contractor in 2007 confirm this theory with the exception of a fair numbers of channel catfish in the stilling basin pool. The absence of warm water species (largemouth bass, bluegill, white and black crappie, and emerald shiners) from the stilling basin was once again documented. The willingness of channel catfish to establish residence in the cool waters of the stilling basin pool must mean there is sufficient forage for them to overlook the cooler water temperatures. The collection of the reservoir warm water fish downstream of the weir was confirmed again by the licensee contractor.

Additional support for this theory exists in the length distribution data (LFD Excel sheet) for smallmouth bass, white suckers, and northern hog suckers which indicates these species are reproducing naturally in the stilling basin pool. In addition, several stream species like river chub, logperch and greenside darter must be reproducing naturally also. It is unlikely that these three latter species would move downstream through the reservoir and then the dam, or somehow swim up over the stilling basin weir. In addition, since there were individual rock bass and yellow perch captured during the 2010 survey that were less than 100 mm, there exists the possibility that these two species may be reproducing naturally in the stilling basin also, especially since these two species represented over 36% of the fish collected in 2010.

A considerable reduction in discharge from the bottom of the reservoir as proposed for retrofit hydropower development at Mahoning Dam, will increase retention time and likely increase water temperatures in the stilling basin and greatly reduce its nutrient load and therefore productivity. The popular stilling basin pool adult trout stocking program may have to be eliminated or at least greatly reduced. Because of the current cool water temperature regime in the stilling basin the trout season is greatly extended into the summer months. Pat Kline, Project Manager at Mahoning Creek Lake, indicated that anglers were catching trout from the stilling basin pool during the spring of 2010 prior to the first stocking this spring. These trout were holdovers from the 2009 stocking program and indicate that a year round trout fishery exists in the stilling basin pool.

In addition, the higher lake intake elevation proposed for hydropower development has the potential to negatively impact the very important emerald shiner forage fish community in the lake. Sport fish require forage and Mahoning Creek Lake’s minnow forage base is, for the most part, limited to this species. During PFBC’s 2010 night electrofishing surveys, Hoskin was one of the collectors. The closer the surveyors got to the dam, the more emerald shiners were observed in the electrofishing field. Emerald shiners are a warm water species which are pelagic in nature. With a high level intake during times of maximum hydropower discharge, the emerald shiner community could quickly be sent downstream. It would be impossible to re-stock this forage fish with all the disease/virus issues from various watersheds. Not all of the Corps reservoirs have such a solid shiner forage base.

The fishery in Mahoning Creek downstream of the stilling basin weir is currently more productive and contains higher diversity than the stilling basin but by no means is the stilling basin pool a marginal fishery. 1) Anglers are fishing the stilling basin for trout, smallmouth bass and channel catfish for the most part as the 2007 & 2010 surveys show. The trout especially don't seem to do as well downstream as in the stilling basin pool. 2) The establishment of a new tailrace will most likely eliminate the value of the weir pool fishery since flow through it will be substantially reduced. Therefore the fish and recreational values of the downstream fishery will significantly be reduced as a result of their proposed plant. 3) Since the weir pool is now large and deep, there is relatively quiet water except for during high reservoir discharge. This habitat is conducive especially for walleye and muskellunge. The "new" tailrace will not have these characteristics and likely will cause these two species to move

downstream. As a result, the value of the downstream pool fishery will be diminished and will likely be less fished because of a considerable change in angler access. 4) All the outflow fisheries in the District, including the Locks & Dams, are more valuable than the river fisheries downstream. Fish like the well oxygenated waters and the deep pool habitats that are created by dams. The dams stop the upstream movement of fish and therefore concentrate fish. As a result they are extremely valuable.

With the current conditions in the Mahoning outflow, we have the best of both worlds: two fisheries containing highly sought after fish of different species. With the plant discharging downstream of the stilling basin and weir pools both sport fish fisheries will have less overall value.

Table 1. FISH DATA SUMMARY, **Mahoning Creek Lake Stilling Basin**, 3 JUNE 1986.

SPECIES	TOTAL NO.	CATCH PER HOUR	% BY NO.	RANGE (mm)	TOTAL WEIGHT (grams)	% OF TOTAL WEIGHT	KILOGRAMS PER HOUR	NUMBER Stock Size	PSD
SPORT FISH									
PANFISH									
Yellow perch	10	6.33	10.64%	124-161	290	17.97%	0.18	8	0
Rock bass	1	0.63	1.06%	226	250	15.49%	0.16	1	100
White crappie	1	0.63	1.06%	94	15	0.93%	0.01	0	0
GAME FISH									
Smallmouth bass	3	1.90	3.19%	88-117	42	2.60%	0.03	0	0
SUCKERS									
White sucker	30	18.99	31.91%	71-150	528	32.71%	0.33		
N. hog sucker	5	3.16	5.32%	60-110	33	2.04%	0.02		
MINNOWS									
River chub	20	12.66	21.28%	67-220	351	21.75%	0.22		
Bigeye chub	4	2.53	4.26%	61-87	11	0.68%	0.01		
Golden shiner	3	1.90	3.19%	88-97	20	1.24%	0.01		
Bluntnose minnow	1	0.63	1.06%	98	12	0.74%	0.01		
Creek chub	1	0.63	1.06%	114	18	1.12%	0.01		
DARTERS									
Logperch	15	9.49	15.96%	63-101	44	2.73%	0.03		
TOTALS	**94**	**59.49**			**1,614**		1.02		
SPORT FISH	15	9.49	15.96%		597	36.99%	0.38		
PANFISH	12	7.59	12.77%		555	34.39%	0.35		
GAME FISH	3	1.90	3.19%		42	2.60%	0.03		
SUCKERS	35	22.15	37.23%		561	34.76%	0.36		
MINNOWS	29	18.35	30.85%		412	25.53%	0.26		
DARTERS	15	9.49	15.96%		44	2.73%	0.03		

SURVEY PARAMETERS

Date 3 June 1986	Effort - hours 1.58	Time: 1110-1245	
Method: Boat electrofishing AC ? Volts ? Amps			
Survey Participants: Fowles, Koryak, Montgomery, Hoskin, Murray			
River flow: No. 1 Gate valve closed to 6" or 40 cfs			
Secchi: None	pH: None	Stream temp: None	
Dissoved Oxygen: None	Conductivity: None		Air temp: None

NOTES: Weights of fish estimated from previously collected fish or The Fishes of Ohio by Trautman.

No water quality data collected on the day of the survey.

Attachment 1

Table 2. FISH DATA SUMMARY, **Mahoning Creek Lake Stilling Basin**, 7 May 2010.

SPECIES	TOTAL NO.	CATCH PER HOUR	% BY NO.	RANGE (mm)	TOTAL WEIGHT (grams)	% OF TOTAL WEIGHT	KILOGRAMS PER HOUR	NUMBER STOCK SIZE	Proportional Stock Density
SPORT FISH									
PANFISH									
Yellow perch	28	25.45	20.74%	80-178	718	6.57%	0.65	21	0
Rock bass	21	19.09	15.56%	97-190	1,653	15.12%	1.50	19	16
Yellow bullhead	2	1.82	1.48%	150-225	182	1.67%	0.17	2	-
GAME FISH									
Smallmouth bass	9	8.18	6.67%	85-417	3,051	27.92%	2.77	6	-
Brown trout	1	0.91	0.74%	280	263	2.41%	0.24		
SUCKERS/CARP									
N. hog sucker	35	31.82	25.93%	63-227	857	7.84%	0.78		
White sucker	10	9.09	7.41%	62-275	466	4.26%	0.42		
Carp	1	0.91	0.74%	587	3,405	31.16%	3.10		
MINNOWS									
River chub	12	10.91	8.89%	79-157	290	2.65%	0.26		
Fathead minnow	1	0.91	0.74%	67	1	0.01%	0.00		
DARTERS									
Logperch	11	10.00	8.15%	55-88	25	0.23%	0.02		
Greenside darter	4	3.64	2.96%	61-89	18	0.16%	0.02		
TOTALS	**135**	**122.73**			**10,929**		9.94		
SPORT FISH	61	55.45	45.19%		5,867	53.68%	5.33		
PANFISH	51	46.36	37.78%		2,553	23.36%	2.32		
GAME FISH	10	9.09	7.41%		3,314	30.32%	3.01		
SUCKERS/CARP	46	41.82	34.07%		4,728	43.26%	4.30		
MINNOWS	13	11.82	9.63%		291	2.66%	0.26		
DARTERS	15	13.64	11.11%		43	0.39%	0.04		

SURVEY PARAMETERS

Date 7 May 2010 — Effort - hours 1.10 — Time: 0952-1058 hrs

Method: Boat electrofishing AC 280 Volts 13 Amps

Survey Participants: Reilly, Walker, Rodden, Hoskin

River flow: Ring-jet open 50% prior to EF then shut down for survey. Pool draining during survey

Secchi: 4.0 feet — pH: 7.18 — Stream temp: 14.73°C

Dissoved Oxygen: 10.06 mg/L — Conductivity: 286 umhos/cm — Air temp: mid 50's

Reservoir Pool: 1092.89 feet and rising.

NOTES: Stilling basin pool was drained down 5-6 feet during the survey period. The stilling basin is 950 feet long and roughly 192 feet wide or 4.56 acres.

Resource Manager Pat Kline noted that several anglers had caught brown trout this spring prior to the stilling basin pool being stocked.

The survey included sampling of the entire perimeter of stilling basin & a center pool run.

Natural reproduction observed for smallmouth bass, rock bass, yellow perch, white sucker, hog sucker, and river chub with fish collected that were less than 100 millimeters in total length

Missed a number of darters/minnows along the shoreline & one large trout during the center run.

Table 3
Mahoning Creek Lake Stilling Basin
Fish Species Collected by Electrofishing
1986-2010

USACE Count	Species	03-Jun-86	07-May-10	13 Aug & 17 Sept 2007 EnviroScience	Total # of Surveys Collected
1	Bigeye chub	x			1
2	Bluntnose minnow	x			1
	Brown Bullhead			x	1
3	Brown trout		x	x	2
4	Carp		x		1
	Channel Catfish			x	1
5	Creek chub	x			1
6	Fathead minnow		x		1
7	Golden shiner	x			1
8	Greenside darter		x		1
9	Logperch	x	x		2
10	Northern Hog sucker	x	x	x	3
	Rainbow Trout			x	1
11	River chub	x	x	x	3
12	Rock bass	x	x	x	3
13	Smallmouth bass	x	x	x	3
14	White crappie	x			1
15	White sucker	x	x		2
16	Yellow bullhead		x		1
17	Yellow perch	x	x	x	3
	TOTAL Species	12	12	9	

Table 4. Mahoning Dam Stilling Basin Electrofishing Survey Data Comparison

Survey Year	Total # of Species	Total # Fish / Hour	Total Kilograms / Hour	Sports Fish CPUE	Suckers/ Carp CPUE	Minnow CPUE	Darters CPUE	Sports Fish Kg/hour	Suckers/ Carp Kg/hour	Minnow Kg/hour	Darters Kg/hour	Effort (hours)
1986	12	59	1.02	9	22	18	9	0.38	0.36	0.26	0.03	1.58
2010	12	123	9.94	55	42	12	14	5.33	4.30	0.26	0.04	1.10

Table 5

LENGTH FREQUENCY DISTRIBUTIONS, Mahoning Creek Lake Stilling Basin Pool

Corps Boat Electrofisning Surveys, 1986 & 2010

LENGTH RANGE (millimeters)	1986 White Crappie	2010 White Crappie	1986 Rock Bass	2010 Rock Bass	1986 Yellow Perch	2010 Yellow Perch	1986 White Sucker	2010 White Sucker	1986 N. Hog Sucker	2010 N. Hog Sucker	1986 Smallmouth Bass	2010 Smallmouth Bass
50							2	1	1	7		
75	1			2		1	11	6	2	7	2	1
100					1	6	14		2	5	1	1
125				10	7	12	2			6		
150				5	2	8	1	1		5		1
175				4		1				4		
200								1		1		1
225			1									1
250												1
275								1				1
300												
325												
350												
375												
400												2
425												
450												
475												
500												
525												
550												
575												
600												
625												
650												
675												
700												
725												
750												
TOTAL NUMBER	1	0	1	21	10	28	30	10	5	35	3	9

(Length frequency highlighted in yellow indicates fish suspected to be stilling basin natural reproduction.

(Sport fish below bolded line are "Quality" size)

Kelly Maloney

From: David Sinclair [david.sinclair@advancedhydrosolutions.com]
Sent: Thursday, October 13, 2011 11:12 AM
To: Kelly Maloney
Subject: FW: Mahoning Creek Dam Stilling Basin
Attachments: Pennsylvania Style Rock Rubble .pdf; PA Conifer String.pdf

---

From: Page, Benjamin [mailto:bepage@pa.gov]
Sent: Tuesday, October 11, 2011 3:50 PM
To: 'david.sinclair@advancedhydrosolutions.com'
Cc: Lutz, Karl; Hartle, Mark
Subject: RE: Mahoning Creek Dam Stilling Basin

Here are the attachments I promised.

From: Page, Benjamin
Sent: Tuesday, October 11, 2011 3:23 PM
To: 'david.sinclair@advancedhydrosolutions.com'
Cc: Lutz, Karl; Hartle, Mark
Subject: FW: Mahoning Creek Dam Stilling Basin

From: Lutz, Karl
Sent: Tuesday, October 11, 2011 8:58 AM
To: Page, Benjamin
Subject: FW: Mahoning Creek Dam Stilling Basin

Mr. Sinclair: As we discussed on the telephone today, I would suggest the possibility of placing rock rubble humps and/or conifer strings as a fish habitat device in the vicinity of your new fishing pier. Please see the attached standard drawings for materials and construction details. I would suggest using a long-reach excavator to place the rock rubble humps within casting distance of the pier. I also suggest that the conifer strings be replaced every five years to maintain their structural integrity. Typically the trees lose most of their finer branches within three to five years of placement. The above structures can be permitted through a General Permit-1 as a fish habitat device.

Please let me know if you have any questions.

Benjamin Page
Lake Habitat Manager
PA Fish & Boat Commission
Division of Habitat Management
450 Robinson Lane, Bellefonte, PA 16823
Office: (814) 359-5162
bepage@state.pa.us

From: Hartle, Mark
Sent: Thursday, October 06, 2011 10:58 AM
To: 'David Sinclair'

Cc: Lutz, Karl
Subject: RE: Mahoning Creek Dam Stilling Basin

Mr. Sinclair,

Fish habitat structure within casting distance of the floating pier would be helpful to fishermen by attracting fish. I'm not sure if such devices would simply attract fish or enhance the fish community, but the end result is that the anglers would benefit.

Our Division of Habitat Management is very familiar with our designs and other structures. The mossback rack would probably not function as well as strategically placed rock piles in the stilling basin below the dam that would be less subject to ice and variable flows associated with storm events. PFBC also places posts without cross arms in other applications. I recommend that you call Karl Lutz to get a more expert opinion. His number is 814 359-5191.

Mark Hartle

From: David Sinclair [mailto:david.sinclair@advancedhydrosolutions.com]
Sent: Tuesday, September 27, 2011 11:23 AM
To: Hartle, Mark
Cc: 'Randy Dorman'
Subject: Mahoning Creek Dam Stilling Basin

Mark,
Thank you for your comments on our draft recreation plan for the Mahoning hydro project.
We have considered installing a couple of fish attraction devices in and around our proposed floating pier. Do you think this would be of value?
Of the different designs shown in the PaF&BC brochure on this subject, which would you suggest as being the most suitable for the stilling basin?
Do you have any experience with the Mossback tree like devices? www.**mossback**rack.com
Regards
David

David C. Sinclair
President
Advanced Hydro Solutions
150 North Miller Rd. Suite 450C
Fairlawn, Ohio 44333
Tel: (330) 869 8451
Cell: (440) 724 9900
Please visit us at our website

MAHONING CREEK HYDROELECTRIC
USACE/DEP 401-404 MEETING
November 15, 2011

USACE Pittsburgh District Office
9:00 am
Meeting Notes

Attendees:

John Coleman, USACE
Bob John, USACE
Jeffrey Benedict, USACE
Rose Reilly, USACE
Joseph Snyder, PA DEP
Ann Anderson, M&H
Greg Kulpins, M&H
Brandon Kulik, Kleinschmidt
Randy Dorman, Kleinschmidt
Kelly Maloney, Kleinschmidt
Jack Withrow, AHS

Attendees met at the USACE Pittsburgh District office to discuss the Joint 401 and 404 Application and 408 application for the Mahoning Creek Hydro Project, as well as the Recreation Plan filed with the FERC on November 4, 2011. Bulleted items as discussed at the meeting are below.

USACE Section 404 Application Discussion
9:00 am
with Jon Coleman, Kelly Maloney, Randy Dorman, Jack Withrow:

- Review of individual project structures to determine whether they are within ordinary high water line (OHW) and USACE jurisdiction
    - Intake – not in 404
    - Tile drain outlets – check on top of bank – overview drawing looks like tile drain outlets are within floodplain but not top of bank. Detail drawings show them within top of bank. Check with M&H.
    - Slope repair wall – not in 404 because it's not within the waterway even though it's below the OHW - provided that we are not grading on downstream side, check with M&H
    - Temporary tailrace work pad -- within 404
    - Tailrace excavation - -within 404
    - Powerhouse – unclear whether the encroachment below OHW is actually within the waterway. Will check as it might need to be included. Check with M&H.
    - Rip rap - -within 404 with natural plantings as mitigation.

    - Pipe outlet at interconnect? Why is that there? May have an influence on wetlands. Check with M&H.
    - Ford crossings within 404.
- Fish mitigation should be okay – will need to quantify totals.
- Public notice – might combine with 408 public notice

To do:

- Send Jon Coleman drawings with conifer string (location, quantification, etc).
- Send Jon excel spreadsheet with impacts (limited to OHW within the waterway) and mitigation. Separate from ORM worksheet.

Possible Conditions to the 404:

- Mitigation monitoring – 5 years – meet or exceed 80% performance criteria

PADEP Section 401 Application Discussion
10:00 am
with Joe Snyder, Jeff Benedict, Jon Coleman, Anne Anderson, Brandon Kulik, Greg Kulpins, Bob John, Jack Withrow, Rose Reilly

Brief Discussion of Agenda for Meeting and Key Points of Discussion

Section 401 Application Discussion/To Do List

- Provide discussion of truncation of transmission line corridor crossing – no longer affects Stream B.
- Provide clarification of 13 ft of soldier pile wall outside of floodplain elevation (page 5 says 223 ft – encroachment tables 210 ft). There is 13 ft of soldier pile wall that is above the floodplain elevation.
- Because stilling basin rip rap is no longer included in the proposal, need to provide:
    - Updated drawings to reflect removal of stilling basin rip rap (cc Jon Coleman and email 11x17)
    - Full 24x36 full set drawings (2 copies) to Joe Snyder
- Mark Hartle from PFBC couldn't join the meeting – Joe Snyder provided discussion of PFBC concerns:
    - Raised concerns about stilling basin fishery resource
    - Fish mortality through penstock and turbines – confused about mortality rate 10 or 20 %
    - Application implied the project would be better than existing conditions because of compression mortality – USACE has not observed high mortality so PFBC is not convinced this is the case
    - 2 issues that need to be resolved with PFBC:
        - Need to directly respond to question "do you think fisheries resource in stilling basin same or similar after powerhouse is constructed?"
            - BHK wrote a response to the question in latest response to technical deficiency –suspect stilling basin fishery will be roughly the same – comes from review of Hoskins fish surveys – did not find stilling basin fish were originating from reservoir – mostly

catfish and SMB that were resident –walleye and muskie were downstream of stilling basin so it doesn't appear that existing fishery is supplied by reservoir -- existing intake is sufficiently deep where fish aren't finding the outlet
        - A small number of fish through the conduit suffering from decompression so USACE wouldn't really notice
        - Catfish and SMB would continue to persist
        - BHK and Mark H met and talked through a few of these issues
    - Intake structure – Mark provided additional info regarding screening criteria, but Joe didn't bring it
        - Mark, in correspondence with Joe, tried to make argument regarding angled screen - -flow through the dam creates flow patterns that other fish will detect
        - Mark, in correspondence with Joe, stated that EPA is putting together new regulations – carry out with recommended 3/8 inch opening with 0.5 fps withdrawal rate
        - Mark is to provide supporting documentation to Joe
        - Joe Snyder stated that if AHS feels that design will adequately protect fish species, he needs documentation.
        - Mark, in correspondence with Joe, indicated that he believes USFWS guidelines protect gamefish only
        - Brandon responded that very few people would agree that USFWS recommendations are strictly based on salmonids – global to all freshwater fish. Joe stated that Alex Hoare stated that USFWS guidelines are for salmonids
        - Brandon responded that the 3/8 inch/0.5 fps guidelines pertain to cooling water intakes or 316b and are Not analogous to a hydro intake

- Joe to schedule follow up conference call with Mark Hartle for this week. Include Bob Hoskins in conference call (Bob John to send along contact info).
- Need to follow up on consultation with PFBC regarding rock or conifer string to see why the selection of conifer string was made vs. rock humps
- Need to finalize fish attraction – rock hump or conifer string in consultation with USACE.
- Recreation plan – need to send to Joe once updated – need to figure out what the fish mitigation would be first – need to include fish mitigation in design drawings
- Discussion of ford at drainage way C-301 – Joe has concern that water will be lost to rip rap protection and need to know how flowing water will be maintained. Will articulated mat have channel– slight depression on articulated concrete matting? See bigger more exaggerated channel for flow on drawings – need to maintain channel flow through crossing – concern that channel doesn't exist.
    - M&H responded that detail 4 on C-502 shows sub-base of concrete matting (section AA on C-301)

- Update drawings – keep channel low through road and change rip rap to create more of a channel – could choke rip rap with fines. Include a pipe to be sure ford continues to convey flow.
- Discussion regarding rip rap in transition from tailrace to streambed – need to know size. M&H responded that this information is shown on C-031 detail 6. Confusion regarding rip rap shown in cross sections and tailrace rip rap (one in the same)
- Discussion of minimum bypass flow in winter months - 40 cfs and status of Operations Plan. Water temperature and DO exceedances – USACE adaptive management plan (AMP) – should be part of operations plan. Kelly confirmed that it is and Plan will be updated to reflect latest AMP from USACE.
- Need to send updated Operations Plan to Joe
- E&S Control Plan doesn't include temperature mat and hydraulic buster used to break up rock – not in section 8.1.1 nor on sheet C-021 – can add both of those into sequence
    - Cc ACCD for an amendment to E&S Plan
- Obtain documentation from USACE that they are okay with the following
    - Excavation close to stilling basin weir. Jeff said no concern.
    - Penstock through abutment – Jeff has not heard any concern regarding structural integrity.
- Joe to follow up with Hadi on additional concerns
- PADEP needs to talk with attorney regarding conditional permit
- Need to submit permission from other landowners - easements or letters of consent - along the road and crossing at aerial line at Camp Run
- Discussion of First Energy's position that aerial crossing qualifies for a waiver as it is a single span. Joe clarified that PADEP doesn't separate the Camp Run aerial crossing if it's part of the larger Mahoning Creek permit.
- Discussion of placement of fishing pier – Mark wants it below the stilling basin weir but USACE doesn't want it there
- Discussion of September 23, 2011 letter – PFBC requested trail on north side be improved for fishing access. Kelly responded that it won't be ADA compliant and improvements to the trail would be costly even without ADA compliance.
- Need to follow up with Mark during conference call – Bob John believes he just wants trail improved; doesn't have to be ADA compliant
- Need supporting calculations for 100-year flood within stilling basin at soldier pile wall. Need actual table of calculations and before and after totals of floodplain elevation - - can't be more than a 1 ft increase from pre- to post-construction conditions.
- Discussion of crossing at Camp Run. Concern with concrete matting in Camp Run – USACE stated that it could be a span (would remove it from Section 404 jurisdiction) but recognize that landowners had issue with that. USACE is okay with concrete matting but it is not the preferred option. USACE prefers span because access could be maintained at high Camp Run flows.
- Discussion of approach to Camp Run crossing. Joe indicated a need to revise sheet C-301 to show how we will stabilize the approach road. Currently shows 6.22% grade approach to Camp Run crossing – could be rock so vegetation could come back – standard design road is a dirt road. M&H clarified that the approach road is compacted

aggregate roadway. Joe confirmed that 8 inches of aggregate surface should be sufficient.

- Need to Modify C-301 to refer to detail on C-502 showing road composition.
- Need to send updated PNDI for project (Phase I) when receive all responses.

Follow up discussion of scheduling meeting with PFBC.

- Joe availability week after Thanksgiving? Will send email to Kelly and Mark regarding availability.
- BHK can't do Friday December 2

Section 408 Application

- Jeff mentioned about Dr. Checks comment regarding tying off on dam. Greg commented that Lee Rutledge at Ruhlin is considered that.
- Jeff mentioned EM on flange design evaluation – comment doesn't look like it was updated. Jeff will email it and Greg will respond to it once he gets it

Recreation Plan

- Need to include section 1 comment: "The crest gates at the dam are described in the second paragraph on Page 1, but not the five low level outlets. There are three 5'8'' x 10' sluices with service and emergency gates, a 36" ring jet with a 36" ball valve emergency gate, and a 24" ball valve with a 24" ball valve emergency gate exiting through a 6' diameter penstock and surge chamber in the north training wall."
- Section 5.0: O&M Plan – seasonal removal maintenance and storage discussion needs to be updated
- Appendix B – was CEII and design drawing hadn't changed. However, drawings will change based on discussion with USACE and PFBC on fish mitigation, etc.
- Letters need to be included in Appendix C –Consultation Record
- Send Bob John drawings off conifer string and rock hump

Follow up Phone Call with Joe Snyder 11/16/11

- Notes on tables 2-1 and 2-2:
  - Discussion of how were the impacts determined?
  - Discussion of net totals – cuts are subtracted from fills for hydraulic purposes
  - Joe discussed for purposes of the permit - impacts table only do structures.
    - Length of streambank encroachment regardless of cut and fill
    - Separate cuts and fills volumes from linear feet and square feet
  - Cross sections at tailrace profile with rip-rap – Joe was confused to orientation. Discussion clarifying that.
  - Updated C-103 to add note to refer to detail for rip rap - See what size rock proposing to place there. (This note is already included actually).

Follow up Phone Call with Joe Snyder 11/18/11

- Has not gotten a hold of Bob Hoskin. Will contact USACE for alternate representative for meeting.
- Hadi is out of the office until the week after Thanksgiving.
- Kelly explained that Yiying would like to convene a conference call with Hadi to clarify his 100-year flood calculations request.
- Joe relayed that Hadi indicated that we provided only a table of results. We need to show calculations for those results. Need to have a comparison of existing and post-construction conditions relative to flood elevations in the stilling basin.
- Likely used HEC-RAS, PSO4, HYH or some other model for the calculations. Need the actual calculations from the model; not just results.

Section 401/404 Meeting
RE: PFBC Concerns
November 21, 2011
1:00 pm – 3:00 pm

Attendees:
Joe Snyder, PADEP
Jack Withrow, AHS
David Sinclair, AHS
Mark Hartle, PFBC
Randy Dorman, Kleinschmidt Associates
Brandon Kulik, Kleinschmidt Associates
Kelly Maloney, Kleinschmidt Associates
Bob John, USACE
Curt Moseley, USACE
Bob Hoskin, USACE

Notes:

Joe provided brief discussion of impetus for meeting – background on November 14 meeting, PFBC concerns, etc.

4 primary issues:

1. Proposed design for intake - Desire to have water withdrawal rate at 0.5 fps
2. Fisheries resource in stilling basin
3. Clarification of habitat improvement structures within stilling basin
4. Possibility of improving existing fishing trail below the weir

1. <u>Proposed Intake Structure</u>

The discussion about the intake structure focused on velocity and screen size, and the focus of minimizing fish entrapment, with the following key points being made:

- Mark indicated that the EPA guidelines state the rate be 0.5 fps
- Brandon provided some information having done a lot of work on cooling water intakes and indicated that for hydro, it's biologically acceptable to have a higher fps
- David made the point that when the velocity is reduced too much, the intake size must be increased which creates weight issues.

There was some additional discussion about species present, velocity, and spacing, with the following results:

- Mark will look at target species and the information that Brandon referenced to see what the reality is

- 1 fps is the goal

- Randy – agreed to resend a copy of the entrainment study as it covered some of the topics being discussed

2. Fisheries Resources in Stilling Basin

The discussion focused on whether or not the fishery resources after hydro is installed will be similar to what currently exists. Brandon and Bob made points and the general conclusion was that there would be change to the stilling basin, but not necessarily in relation to the species under discussion. David made the point that nothing can be built without making a change, but that they are trying to show that they are controlling the change and trying to mitigate the best way possible.

Joe concluded to leave it to Bob and Mark – sort of indicated that maybe there won't be much of a change. Until we had this conversation, I don't think that statement was made.

Joe also indicated that the new AMP is needed. Bob indicated that he latest is from October 5, 2011 and he can share it with whoever needs it.

Randy indicated that the AMP is near final. We don't have all the details complete but its' a 95% draft. But the key point would be the measures in that draft we have tentative agreement on. Can't promise that it won't change from where it is now but it's pretty close.

Joe and Mark would like to see the latest documents before closing the chapter on the issue. He indicated that they can special condition the permit to make us aware of any changes. May be something we can do given that it's not a final document. Typically we ask everything to be final before we make a permit decision but we'll see what we can do given the project development scheme.

3. Habitat Improvement Structures within Stilling Basin

This discussion focused on what would be an appropriate structure to improve stilling basin habitat.

USACE has concern over the conifer string that was proposed because it may be difficult to keep it in place during higher flows. The goal is to find something that can be placed without the use of a crane and also not get washed away during high flows. David indicated that he is trying to avoid construction activities where possible.

It was determined that boulders were more likely to stay put and would also improve habitat for larger fish. Mark Zaitsoff (not at the meeting) would have to concur.

David indicated that a sketch will be made and sent to everyone to determine where boulder placement makes sense. USACE will want to know how many rocks and where.

Randy indicated that FERC will need to know that the Recreation Plan may change so their review may need to be put on hold while this issue is getting wrapped up. The Plan will be re-filed once everything is straightened up.

4. Fishing Trail below the Weir

The last item discussed was the feasibility of improving the fishing trail. Joe explained that there is an existing fishing trail and the proposal was made as to whether or not there could be improved angler access below the weir since the fishing pier will be in the stilling basin.

This would be on the bank opposite of the powerhouse. Randy indicated that from an economic standpoint, additional access is not feasible.

Bob John clarified that accessibility isn't an issue. They are only looking to improve the trail to get up the slop and down on the other side of the weir to compliment the fishing pier.

David and Randy explained that there are limits to what can be done that make it unfeasible, making the following points:

- There is no ability to bring equipment up and down the hill.
- There is already access stairs that have been placed by the USACE. The pathway is already stepped so it's not clear where there is room for improvement.
- When this was discussed long ago and the fishing pier option was strongly supported by the county who wanted ADA compliant access.
- From a FERC standpoint, the trail whether ADA or not, would have to be included in the project boundary and MCHC responsible for maintaining, etc.

The general condition and safety of the trail was discussed with Bob John indicating he hadn't been there and Mark recollecting that it was treacherous. David indicated that he was there and walked the trail and it was quite comfortable.

Mark raised the question that if it is acceptable where it is, would MCHC be willing to maintain it. David responded that given that it's a USACE trail that MCHC shouldn't have to maintain it.

Randy posed the question that generally mitigation is in response to a specific effect from the project, so it's not clear what this is mitigating for. None of the studies have identified that this is a project effect.

Bob responded that the pool below the stilling weir is the number one location that people go to right now. With the reduction in flow, they are going to be in the well oxygenated water of the tailrace discharge.

David indicated that when recreational improvements were considered at the beginning, money allocated for mitigation was determined to be better used for the fishing pier, a decision with which the county agreed.

Mark indicated that they are asking for simple, low cost improvements.

The following resulted from the discussion:

- Joe suggested David put forth reasons why the improvements aren't reasonable and coordinate with Mark on the improvements while coordinating on large boulder designs.
- Mark will expand on his previous comments to make the improvement requests clearer.
- David – thank you. Appreciate you pulling everyone together to get some resolution. Are we going to take the action items and try to reconvene?

Closing items:

David suggested that in order for resolution on the issues, the group take their action items and then reconvene in about 10 working days, indicating being informal was preferred in order to come to a resolution.

In a discussion of final issues, the cables on the pier were raised as a potential restriction to angling. It was determined that Kleinschmidt is working on the range of motion and that a pier company was consulted to determine the most suitable ADA compliant design.

It was determined that MCHC would work to try to address some of these items and exchange information, convening for additional phone calls if necessary, working around the state holidays and off days.

Kelly will put together a response to the points raised during the meetings.

TELEPHONE DISCUSSION NOTE

DATE: December 8, 2011 **PROJECT:** **MAHONING DAM**

TIME: **2:30 PM** **TALKED WITH:** MARK HARTLE

PLACED: **RECEIVED:** X **FROM:** **PA FISH AND BOAT COMMISSION**

BY: **BRANDON KULIK**

Mark returned my call which was placed to follow up on the joint call with PADEP on November 21, 2011. PAFBC (Mark) had stated at the time that more time was needed to further research several issues before offering final recommendations to PADEP regarding 401 certification terms pertaining to fish passage, habitat enhancement in the tailrace and angling access.

We reviewed the three specific items that pertained to PAF&BC concerns.

Entrainment screening – Regarding target fish size for protection, Mark had checked with his staff and determined that stocked walleye fry and young-of-year (YOY) were no longer the critical species and lifestages that had been of concern earlier in the year. The objective is to screen for other warmwater indigenous species, with crappie being the most abundant. The goal is to minimize small fish loss due to turbine passage by providing a screened barrier to the intake that is adequately protective. Mark concurred that fry-sized fish that exist in the spring and early summer inhabit shallower areas of the impoundment than where the intakes are located. By the time that these fish move to deeper water potentially near the intake during the winter, they have completed growth for the year and are at age-1 lengths. His review of available site-specific PAFBC fish length data from the Mahoning reservoir indicates that such fish are long enough to be able to escape intake velocities of 1 ft/second based on the 6 body-lengths/sec criteria that characterizes fish cruising speed. For these reasons, he felt that the proposed 1 ft/sec/ 1-inch clear intake screening would be acceptable to his agency.

stilling basin habitat. We discussed this very briefly. PFBC's conclusion is that boulders or rock humps strategically placed in the tailrace area would be an acceptable alternative to the previously recommended woody materials, and would likely be much more permanent and less hazardous and labor intensive than cabled tree strings.

Tailwater angling access. We discussed the issue of improvements to the access trail very briefly as well. Mark stated that he really needed to revisit the site before making a final recommendation. He felt that based on his schedule the earliest opportunity to conduct a site visit would be December 16 or during the first week of January 2012.

DISTRIBUTION:

J:\1361\004\Docs\TDN Mahoning 4-18-11PAFBC.docx

Kelly Maloney

From: Brandon Kulik
Sent: Thursday, December 08, 2011 4:40 PM
To: Kelly Maloney; Randy Dorman
Subject: FW:
Attachments: Mahoning Lake 217D.pdf

☺

From: Hartle, Mark [mailto:mhartle@pa.gov]
Sent: Thursday, December 08, 2011 2:59 PM
To: Brandon Kulik
Cc: Snyder, Joseph (DEP); Woomer, Allen; 'Reilly, Rosemary J LRP'
Subject: FW:

Brandon,

This e-mail will confirm what we discussed today. I discussed Mahoning Creek Lake with Al Woomer, our Area Fisheries Manager today. Al indicated that our walleye culture program has uncertainty in the future. He indicated that crappie were the dominant panfish.

Based on analysis of the age – length relationships in the attached table, the Fish and Boat Commission concurs with an intake with a 1" bar screen and 1 foot per second velocity at the Mahoning Creek Lake hydro intake. The timing of smaller fish going deeper in the lake water column near the intake in fall/winter and velocity less than 6 body lengths per second for key species like crappie indicate adequate protection is likely.

Mark

Mark A. Hartle, Chief
Aquatic Resources Section
Division of Environmental Services
Pennsylvania Fish & Boat Commission
450 Robinson Lane
Bellefonte, PA 16823
(814) 359-5133

From: Hartle, Mark
Sent: Thursday, December 08, 2011 1:42 PM
To: Brandon Kulik
Subject: FW:

Brandon,

Attached from a Mahoning Creek Lake report that included sampled in 1994 sampling is Table 7 that shows age length relationships. This can help guide our discussion at 2:30.

Mark

From: Hoopsick, Susan
Sent: Thursday, December 08, 2011 1:33 PM
To: Hartle, Mark
Subject:

Susan Hoopsick, Clerical Supervisor
PA Fish and Boat Commission
450 Robinson Lane
Bellefonte, PA 16823
814-359-5180
shoopsick@pa.gov

*Notice: On **Friday, July 29th**, the Commonwealth added @pa.gov as the primary email domain for all state employees. For example: shoopsick@state.pa.us will now be shoopsick@pa.gov. The email addresses ending in @state.pa.us will continue to function so that emails will never be interrupted. We appreciate your cooperation as we take a small step to increase the usability and consistency of the commonwealth's online communications.*

This work made possible by funding from the Sport Fish Restoration Act Project F-57-R Fisheries Management.

PENNSYLVANIA FISH & BOAT COMMISSION
BUREAU OF FISHERIES
FISHERIES MANAGEMENT DIVISION

Mahoning Lake (217D)
Management Report

Prepared by:
Ronald D. Lee and Allen Woomer

Date Sampled: 1994 Date Reported: February 1997

Introduction

Mahoning Creek Lake is located in Wayne and Redbank townships, Armstrong County, Pennsylvania. The pool was filled in 1941, although construction was not completed until 1949. The most recent report preceding this one which pertained to fisheries was completed by Lee (1989), and was based on assessment work done in 1987. That report erroneously stated that shoreline development changed little as did shoreline length when summer pool increased in 1981. More recent information from the U.S. Army Corps of Engineers (USACE) indicates that while the shoreline development changed little, the actual shoreline length increased considerably from 9 to 15 miles (USACE 1993).

Fisheries management activities are fairly well documented since the late 1940s. Trembley (1948 and 1951) reported water quality parameters were well within high quality ranges for supporting fish life. Albrecht (1957) reported the evidence of acid mine drainage (AMD), but no specific numbers were given. Miller (1960) in a more comprehensive assessment reported a pH value of 7.1 on October 11, with M.O. alkalinity ranging from 31 mg/l at the surface to 34 mg/1 on bottom. Black crappie were growing at erratic rates and no game species were sampled. Ginter (1966) reported continuation of stable water quality with pH ranges of 6.9 to 7.3.

An in-depth assessment by Hollender (1974) again indicated good water quality. Gill net sampling yielded first time information on game species with good sized largemouth bass, smallmouth bass, walleye, and northern pike present. Desirable size panfish were also reported for several species. Low angler use was indicated, and poor, hazardous access and no sanitary facilities were cited as major reasons for low use.

Lee & Obert (1978) reported a low density-high quality fishery existed in Mahoning Creek Lake. Recommendations included continuation of tiger muskellunge and walleye fingerling plants and requested forage species as they became available.

Table 7. Recent, historical and state average mean length at Age, for dominant game and panfish species at MAHONING CREEK LAKE (217D), ARMSTRONG County, Pennsylvania.

BLACK CRAPPIE

Yr	Mo	No. Aged	Length at Age 1	2	3	4	5	6	7	8
74			52	139	182	266				
78		2				219				
87		24		143	180	209				
94	05	28	90	139	169	174	201			
St	Ave		86	149	192	223	249	269		

WHITE CRAPPIE

Yr	Mo	No. Aged	Length at Age 1	2	3	4	5	6	7	8
74			55	151	244	240				
78		5			242	246		254		
87		33	95	148	194	240	270	295		
94	05	38	94	157	183	189	223			
St	Ave		86	141	183	223	221	238	275	328

ROCKBASS

Yr	Mo	No. Aged	Length at Age 1	2	3	4	5	6	7	8
74		11	35	80	134	192	220	241	257	
78		7				183	174	212	210	
87		10						196	181	
94	05	7			146	158		176		
St	Ave		63	100	138	166	187			

BLUEGILL

Yr	Mo	No. Aged	Length at Age 1	2	3	4	5	6	7	8
78		7	82	125	162	178	196			
87		5					181	201		
94	05	12	72		146	158		176		
St	Ave		60	99	134	159	178	189		

YELLOW PERCH

Yr	Mo	No. Aged	Length at Age 1	2	3	4	5	6	7	8
74			48	98	139	177	199	232		
78		25		136	170	187	219	256	322	
87		6		135	176		231			
94	05	16		126	203	208		176		
St	Ave		85	125	161	187	213	237	259	268

Table 7. (cont.)

	No.	Length at Age				
78	19	103	142	164	181	
87	2			146	180	
94 05	1	119				
St Ave	56	91	118	142	157	171

LARGEMOUTH BASS

	No.	Length at Age							
Yr Mo	Aged	1	2	3	4	5	6	7	8
74		80	201	258					
78	19		152		298	344	386	418	
87	1						384		
94 05	59	145	238	275	332	376	432	387	477
St Ave		108	186	246	299	345	388	430	465

SMALLMOUTH BASS

	No.	Length at Age							
Yr Mo	Aged	1	2	3	4	5	6	7	8
94 05	86	116	148	208	260	305	318	405	405
St Ave		103	173	229	277	326	369	402	

WALLEYE

	No.	Length at Age								
Yr Mo	Aged	1	2	3	4	5	6	7	8	9
78	8		248	391	376					
87	13			373	419		535	606	623	687
94 05	5				393			601	635	
St Ave		231	324	395	461	549	579	624		

NORTHERN PIKE

	No							
74		243	477	597				
78	2			732			930	
87	2				551	715		
94 05	4				660			
St Ave		290	421	524	592	673	747	793

TIGER MUSKELLUNGE

	No.	Length at Age							
Yr Mo	Aged	1	2	3	4	5	6	7	8
78	6	310-							
87	4			573	740		925		
94 05	8	310		712			955		
St Ave		293	470	601	719	808	923		

Table 10. Fish species occurrence in MAHONING CREEK LK (217D), ARMSTRONG County, Pennsylvania.

Common Name	Scientific Name	1978	1987	1994
BLACK CRAPPIE	POMOXIS NIGROMACULATUS	✓	✓	✓
BLUEGILL	LEPOMIS MACROCHIRUS	✓	✓	✓
BROOK TROUT	SALVELINUS FONTINALIS			✓
BROWN BULLHEAD	AMEIURUS NEBULOSUS	✓	✓	✓
BROWN TROUT	SALMO TRUTTA			✓
CHANNEL CATFISH	ICTALURUS PUNCTATUS	✓	✓	✓
COMMON CARP	CYPRINUS CARPIO	✓	✓	
EMERALD SHINER	NOTROPIS ATHERINOIDES			✓
GOLDEN REDHORSE	MOXOSTOMA ERYTHRURUM		✓	✓
GOLDEN SHINER	NOTEMIGONUS CRYSOLEUCAS	✓	✓	✓
LARGEMOUTH BASS	MICROPTERUS SALMOIDES	✓	✓	✓
MUSKELLUNGE	ESOX MASQUINONGY		✓	✓
NORTHERN PIKE	ESOX LUCIUS	✓	✓	✓
PUMPKINSEED	LEPOMIS GIBBOSUS	✓	✓	✓
ROCK BASS	AMBLOPLITES RUPESTRIS	✓	✓	✓
SILVER REDHORSE	MOXOSTOMA ANISURUM			✓
SMALLMOUTH BASS	MICROPTERUS DOLOMIEUI	✓		✓
TIGER MUSKELLUNGE	TIGER MUSKELLUNGE	✓		✓
WALLEYE	S. VITREUM VITREUM	✓	✓	✓
WHITE CRAPPIE	POMOXIS ANNULARIS	✓	✓	✓
WHITE SUCKER	CATOSTOMUS COMMERSONI	✓	✓	✓
YELLOW BULLHEAD	AMEIURUS NATALIS		✓	✓
YELLOW PERCH	PERCA FLAVESCENS	✓	✓	✓
Species totals:		16	17	22

Kelly Maloney

Subject: FW: Mahoning Hydroelectric Intake Design Plan (UNCLASSIFIED)

_____

From: Benedict, Jeffrey M LRP [Jeffrey.M.Benedict@usace.army.mil]
Sent: Wednesday, October 03, 2012 2:53 PM
To: Randy Dorman; Hartle, Mark
Cc: Mark Garner; John Collins; Snyder, Joseph
Subject: RE: Mahoning Hydroelectric Intake Design Plan (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Randy, the Corps submits the following comments on your License Article 403 Submission, Intake Structure Design Plan, Kleinschmidt, August 2012.

1. Section 2.0, Intake Design, page 5, 1st paragraph - The narrative says that all sides of the intake structure will have trashracks, five high density polyethylene removable 16 ft by 16 ft trashrack/ fish screens. Drawings S1-101 and S1-103 seem to indicate that there is 3/8" steel plate on the top and bottom of the intake structure. Drawing S1-121 doesn't have trashrack details for the top or bottom.

2. Section 4.1, FISH ENTRAINMENT PROTECTION MEASURES, Background, page 7, 2nd paragraph on page
a. The velocity calculations are based on trashracks on 5 sides, if the top and bottom are covered with steel plate the flow area will be less and the velocity higher. Also, the gross area (16' x 16') is used rather than the net area (16' x 16' minus trash rack blades and spacer areas).

b. The proposed intake and trashrack were designed for a velocity of approximately 1 foot per second. We have estimated velocities through our existing trashracks. Discharges up to about 1000 CFS would produce velocities in the 1-2 FPS range through the trash racks. We believe that the overall effect on sedimentation in the reservoir would be the same since the velocities away from the dam would be the same. If we ran on the hydro outlet for a significant period of time we think there could be increased deposition in front of our intakes on the upstream face of the dam. We will consider adding a requirement for monitoring of sediment levels in front of the dam to the Operations MOA.

Any questions let me know.

Thanks

-Jeff

-----Original Message-----
From: Randy Dorman [mailto:Randy.Dorman@KleinschmidtUSA.com]
Sent: Tuesday, October 02, 2012 6:28 AM
To: Hartle, Mark; Benedict, Jeffrey M LRP
Cc: Mark Garner; John Collins; Snyder, Joseph
Subject: RE: Mahoning Hydroelectric Intake Design Plan

Gents,

I hope things are going well. We're looking to wrap up this Mahoning Intake Design plan and file with FERC as soon as possible. Do you anticipate having comments on the draft?

Best,

Ramdu

_____

From: Hartle, Mark [mhartle@pa.gov]
Sent: Monday, August 20, 2012 4:15 PM
To: Randy Dorman; Benedict, Jeffrey M LRP
Cc: Mark Garner; John Collins; Snyder, Joseph
Subject: RE: Mahoning Hydroelectric Intake Design Plan

Randy,

I'll coordinate our review with the Corps and touch base with PA DEP on the plan. Thanks for forwarding it.

Mark Hartle

From: Randy Dorman [mailto:Randy.Dorman@KleinschmidtUSA.com]
Sent: Friday, August 17, 2012 9:33 AM
To: Benedict, Jeffrey M LRP; Hartle, Mark
Cc: Mark Garner; John Collins
Subject: Mahoning Hydroelectric Intake Design Plan

Gentlemen --

Mahoning Creek Hydroelectric Company (MCHC) has prepared a draft Intake Structure Design Plan for your review and comment. This document is a requirement of Article 403 of the FERC license.

The title of the plan is something of a misnomer - it is probably more properly called the Intake Screening Design Plan, since the primary concern here is the protection of fish from potential entrainment or impingement.

Attached is the cover letter; as noted there, MCHC respectfully request all comments be provided by September 17, 2012.

Because the plan contains large design drawings, the file size is about 7MB. Rather than attaching the file, I've included this DropBox link for you to download the plan:

https://dl.dropbox.com/u/41077653/001%20DRAFT%20Intake%20Structure%20Design%20Plan%2008-16-12.pdf

If you have any problems with the link, or any questions about the plan, please feel free to call me at 207.416.2814.

Thanks and have a great weekend!

Randy

_____

Randall Dorman

Project Manager

KLEINSCHMIDT ASSOCIATES

Classification: UNCLASSIFIED
Caveats: NONE