Independent Science Advisory Panel Evaluation of
Fort Peck Adaptive Management Framework for Upper Missouri River Pallid Sturgeon
14 August 2019

Introduction

This report from the Independent Scientific Advisory Panel (ISAP[1]) reviews the *Fort Peck Adaptive Management Framework for Upper Missouri River Pallid Sturgeon* (dated 12 December 2018), a planning document in service to the Missouri River Recovery Program authored by the U.S. Army Corps of Engineers (USACE) and U.S. Fish and Wildlife Service (FWS). The Fort Peck Framework and accompanying supplementary material (*Supplement to the Draft Fort Peck Adaptive Management Framework for Upper Missouri River Pallid Sturgeon – Draft Effects Pathway Diagrams*) describes "a potential approach that was developed by the Missouri River Recovery Program Technical Team to formulate and evaluate test flow releases from Fort Peck Dam for pallid sturgeon…" The document offers "an adaptive management framework for their implementation based on the best available scientific information about the species and current knowledge of potential management actions." In doing so "two conceptual hydrographs are presented, along with a set of studies gleaned from a review of existing information and an expert elicitation process." The supplement to the *Fort Peck Adaptive Management Framework* presents Draft Effects Pathway Diagrams (detailing material information in Section 1.5.2 and Appendix A1 of the Framework) that are "illustrative in nature" and are "intended to inform and facilitate scientific discussion and communicate with stakeholders." The ISAP was provided the supplement so that it could better evaluate analyses referenced in the Framework document; the supplement itself was not the subject of ISAP review.

The recent USFWS 2018 Biological Opinion pertaining to operations of the six dams on the Missouri River concludes that actions incidental to normal operations by the USACE cause

[1] ISAP members contributing to this review include Steve Bartell, Christopher Guy, Dennis Murphy, John Loomis, and Melinda Daniels.

negative impacts to recruitment of the endangered pallid sturgeon due to alterations of the natural hydrograph, water temperatures, and turbidity. In response to that finding, the agencies developed the Fort Peck Adaptive Management Framework, which includes Level 1 and Level 2 studies (as described in the *Science and Adaptive Management Plan* – SAMP) that are intended help resource managers better understand ways to alter discharge conditions that encourage pallid sturgeon to move upstream to spawn near the Milk River, which in turn may allow adequate drift distance of embryos to benefit pallid sturgeon recruitment in the upper Missouri River.

At the time of the drafting of the Framework, there was a legal constraint on the implementation of a fish passage structure in the Yellowstone River near Intake, Montana, making that adaptive-management action, as described in the SAMP, not operational. A Fort Peck management action proposed in the Framework then was viewed as a reasonable conservation-action alternative targeting pallid sturgeon in the upper Missouri River system. As described in the Framework, the legal challenge to the fish-passage structure has been lifted and fish passage construction will proceed. Therefore, "no special considerations have been incorporated to address decisions regarding operations of Fort Peck Dam due to uncertainty about the existence of a passage structure in the Yellowstone River near Intake, Montana." Nonetheless, "the Fort Peck AM Framework presented in this report was developed to assess critical uncertainties regarding recruitment of pallid sturgeon in the upper Missouri River while maintaining opportunities for recruitment in the Yellowstone River" (Framework page 2).

The ISAP acknowledges that the Framework document was a response to a commitment stated in a January 19, 2018 letter from David Ponganis (USACE) to Michael Thibault (USFWS). The letter formally amended a proposed action described in the 2017 Biological Assessment (BA), when developing the Fort Peck Adaptive Management Framework.

The Framework was produced by extra-agency efforts under the Missouri River Recovery Program (MRRP), including consultation with and input from the program's Adaptive Management Technical Team between December 2017 and November 2018, interaction with MRRIC's working groups, and "technical perspectives" from outside pallid sturgeon experts. The Framework is represented as "a new component of the MRRP Science and Adaptive

Management Plan for the Missouri River Basin… providing a structured process through which substantive decisions regarding the appropriate role of Fort Peck Dam operations and other management actions to support Upper Missouri River pallid sturgeon can be made and would be adjusted over time as new information is obtained" (Framework page 1). The Framework emphasizes that it is a starting point for further engagements between "the federal agencies, MRRIC, Tribes and other stakeholders." Important regarding this review, the Framework states that final project designs or actions for implementation have not been developed and that "Actions in the proposed framework are a starting point for consideration and discussion. Some proposed actions may require further analysis and adjustment to this proposed framework in the future."

The Framework is based on, guided by, and references the SAMP as providing the template for its supporting analytical approach. It is unclear whether the standing Framework and supplement document(s) will be amended, added to, or formally completed. Accordingly, rather than offering discrete recommendations for adjustments to the Framework, the ISAP offers in this review observations on the approach and the available technical information, and observes whether both are exercised consistent with protocols and directions in the SAMP. That noted, the overarching observation that can be made by the ISAP is that the Framework in approach, direction, and process steps hews closely to the SAMP. The Framework uses relevant material information from the pallid sturgeon effects analysis, new information from research and monitoring accrued since completion of the effects analysis, and the outcomes from an expert elicitation carried out specifically to address prospective consequences of alternative pallid sturgeon adaptive management actions in the upper Missouri River. The effects analysis and SAMP, upon which the Framework is based and linked, have been subject to previous review by the ISAP and have been judged to constitute the "best available scientific information" as required under the federal Endangered Species Act and intended in the Biological Opinion. The Framework, as well, can be reasonably characterized as meeting programmatic intent under the MRRP.

The ISAP was guided in its review by three compound "questions" — better described as task statements — that were provided it by the federal agencies after consideration and amendment by the Fish and HC Work Groups (Attachment 1). The ISAP was compelled to adjust the three task statements to make them more tractable to technical assessment and to answer; the amended

task statements head the individual response sections below. The full intent of the original "questions" was retained in the refined task statements.

Stimulated by the Fort Peck Framework document and the supplement, the ISAP considered worthy of comment three additional issues that affect the implementation of management actions in an adaptive framework under the MRRP: (1) the absence of a well-developed population model for pallid sturgeon that can contribute to the selection of management actions from among alternatives; (2) the apparent slow progress in producing monitoring tools that allow the size and trajectories of the Missouri River pallid sturgeon populations to be estimated and the performance of management actions to be evaluated; and (3) the challenge of making progress in better understanding the ecology of pallid sturgeon and managing for its future in an experimental "decision-space" that is narrowly defined by stakeholder prerogatives and concerns. These three issues are addressed near the end of this report. The ISAP anticipates that the brief discussion herein may stimulate focused discussion of the issues by the Adaptive Management Team and relevant work groups operating in support of the MRRP.

Responses to the questions -

1) ***Was the best available scientific information and analysis used in formulating the Level 1 studies, conceptual hydrographs in support of Level 2 prescribed test flows, and other adaptive management actions and activities described in the Fort Peck Adaptive Management Framework? Identify and evaluate the nature of that science, which may include published information, reports and assessments, modeling efforts (both completed and ongoing), and the results of expert elicitation.***

The Fork Peck Adaptive Management Framework is based on the premise that if pallid sturgeon spawn near Fort Peck Dam (that is, near the confluence of the Milk River and the Missouri River) then there is an increased likelihood of pallid sturgeon recruiting to age 1. There are three pieces of empirical scientific evidence that support the premise. First, during the flooding of 2011, high discharge from the emergency spillway at Fort Peck Dam in combination with record high discharge from the Milk River provided conditions that were suitable for pallid sturgeon to

spawn in the Missouri River near the confluence with the Milk River. That those highly turbid conditions were suitable to attract, retain, aggregate, and trigger spawning was confirmed by tracking data on reproductively active pallid sturgeon and sampling pallid sturgeon free embryos directly downstream of the spawning location. Second, in 2018, three reproductively active female pallid sturgeon (one wild and two of hatchery origin) ascended the Missouri River in the spring during high discharge from the Milk River. Subsequently, the Milk River discharge receded, but the fish stayed in the Missouri River near Fort Peck Dam under increased discharge from the spillway at Fort Peck Dam — suggesting adequate retaining or aggregation flow despite reduced turbidity. Third, a pallid sturgeon larval drift study was conducted in 2016 where pallid sturgeon free embryos were released near Fort Peck Dam to study the drift dynamics. In the next year, one of the pallid sturgeon released in the experiment was collected during standardized sampling in the Missouri River below the confluence of the Yellowstone River upstream of Lake Sakakawea; age 1 and genetically confirmed from the family cross used in the study — family cross 1F497F1801 X 0A180E0E7E — began hatching at Garrison Dam NFH at 0200 on 26 June 2016. Those findings indicate that pallid sturgeon will spawn in the Missouri River under certain (abiotic) conditions and that there is enough drift distance for pallid sturgeon to develop beyond its free-drifting stage before encountering anoxic conditions in Lake Sakakawea. It is, however, worth noting that those findings do not confirm that pallid sturgeon spawning events in the upper Missouri River can be sufficient to produce a self-sustaining population. However, the level of recruitment necessary to maintain a self-sustaining pallid sturgeon population could be estimated using the pallid sturgeon population model.

The high flows in 2011 and 2018 were extreme events and are not readily reproducible under average discharge conditions and because of operational constraints on the system. Additionally, the Milk River is not managed by the USACE and has minimal capacity for experimental flows. Given these circumstances, two conceptual hydrographs were developed that could be implemented by managing discharges from Fort Peck Dam (Framework Figures 3 and 4). These hydrographs are experimental in the sense that they are fundamentally the “treatments” in the described Level 1 and Level 2 studies.

The Framework describes a process for developing example hydrographs as management alternatives for evaluation in compliance with the 2018 Biological Opinion. Suitable hydrologic

and hydraulic models, HEC ResSim and HEC RAS, representing the best available science, were utilized to conduct preliminary analyses of these conceptual flow regimes.

Available historical flow regime records were compared with the post-dam flow regime (Framework Figure 1) using the Indices of Hydrologic Alteration (IHA) analytical framework. The IHA approach represents a technically defensible analytical tool to compare historical and modern flow regimes. After identifying the differences in the regulated (modern) and pre-regulation (historical) flow regimes, data from a recent unregulated flow event and the current understanding of the pallid sturgeon reproductive ecology were used to develop the conceptual hydrographs. These hydrographs seek to mimic critical components of the pre-regulation flow regime that are hypothesized to be important for pallid sturgeon reproduction. The Framework provides a clear explanation of why some parameters (for example falling-limb duration) of the flow regime were set at values represented in the conceptual hydrographs that link these parameters explicitly to the pallid sturgeon ecology (for example larval drift-distance regulation) and human considerations (for example bank erosion); however, other features of the hydrographs are not discussed in detail (for example duration of the peak-flow).

The conceptual hydrographs were altered (slightly) to elicit specific behavioral responses from the reproductively active pallid sturgeon, with discharge levels intended to attract and retain the pallid sturgeon (see Figures 3 and 4). The attract, retain, aggregate, and spawn discharges outlined in the Framework are based on the current knowledge of pallid sturgeon reproductive ecology, including several years of tracking reproductively active pallid sturgeon in the Yellowstone and Missouri rivers. It is important to note that after pallid sturgeon spawn, discharge is decreased in each conceptual hydrograph to reduce free-embryo drift speed and increase development time to allow the pallid sturgeon embryos to mature and settle out of the drift before they enter anoxic conditions at Lake Sakakawea.

The Framework addresses potential irrigation intake concerns regarding the reduced summer releases designed to reduce free-embryo drift speed by acknowledging that the conceptual hydrographs contain reduced summer flows similar to current median conditions. The Framework states that “in conceptual hydrograph 1, flow is maintained at 4,200 cfs through August 20 to match median conditions,” which would result in no alteration to the current

services provided to irrigation intakes on the system. The potential impacts from conceptual hydrograph 2 are less clear, as the Framework states that flows are reduced following the flood pulse until "conventional flow operation is achieved," with some discussion of possible further reductions to limit free-embryo drift if needed. Clearly delineating summer-flow levels in conceptual hydrograph 2 would help clarify potential impacts at downstream irrigation intakes. Completion of the planned free-embryo drift dispersion modeling on the upper Missouri River (Framework, Table 5) might further inform the design of summer flows to meet requirements of pallid sturgeon while addressing stakeholder concerns regarding water intakes.

The best available science concerning the factors that influence pallid sturgeon reproductive ecology and drift dynamics were used to develop the conceptual hydrographs for the Level 1 and Level 2 studies and the Framework. The science and logic are well described using Effects Pathways Diagrams in the *Supplement to the Draft Fort Peck Adaptive Management Framework for the Upper Missouri River Pallid Sturgeon*. Additionally, ten pallid sturgeon experts were engaged to assess the evidence supporting or refuting each of the Effects Pathways (Framework page 21). The Technical Team concluded from the expert elicitation that the limiting factors for the upper Missouri River are essentially the same as described in the effects analysis, SAMP, and biological opinion, noting "In general across the range of experts, the current interpretation of the available evidence is that pallid sturgeon recruitment in the Upper River is most likely limited, in whole or in part, by flows and temperatures to attract fish to the Missouri River, and by issues related to insufficient larval development (i.e. determined by available distance, temperature and current velocities) during drift."

Despite the empirical evidence regarding movement and spawning of pallid sturgeon relating to discharge and water temperature presented above, considerable uncertainty remains. For example, not all reproductively active pallid sturgeon spawned at the confluence of the Milk River in 2011; some pallid sturgeon continued to use the Yellowstone River. Similarly, not all reproductively active pallid sturgeon ascended the Missouri River during high discharge in 2018. In the Missouri River above Fort Peck Reservoir, some hatchery-origin reproductively active pallid sturgeon spawn and others become atretic within the same spawning season when exposed to identical discharge and temperature regimes. The micro- and meso-scale conditions that elicit spawning in pallid sturgeon are not well understood; those conditions might be mutually

exclusive of the macro-scale discharge and temperature regimes that are measured and used to define the conceptual hydrographs for the Level 1 and Level 2 studies. The Framework states that Level 1 studies will be used to address key uncertainties, but understanding micro- and meso-scale metrics, such as small-scale habitat selection, mate selection, etc. could require decades of study.

Given the current degree of understanding of pallid sturgeon reproduction and recruitment, Level 1 and Level 2 studies can still be informative, but only if the performance metric benchmarks (success criteria) are relevant, that is commensurate with the understanding of abiotic factors that influence pallid sturgeon spawning. The Framework is not designed to prescribe the specific, final experimental frame, monitoring design, or performance-metric benchmarks. However, the Framework should explicitly recognize the importance of establishing and evaluating those benchmarks. For example, should a managed flow action be considered a success if one reproductively active pallid sturgeon moves up the Missouri River during the event? Or, should success be defined as all reproductively active pallid sturgeon ascending the Missouri River to Fort Peck Dam during a flow-management action? In other words, the anticipated outcomes of managed flows (or temperature or turbidity manipulations) outlined in the Framework and associated documents could be inaccurately evaluated without clearly defined metrics of success and a corresponding monitoring design necessary to sample and evaluate those metrics. Performance criteria should be identified and established prior to implementation of managed flows, a monitoring scheme needs to be designed to ensure that the data collected can be used to assess the performance metric benchmarks. The Framework addresses this topic and sets expectations commensurate with the scientific knowledge in the discussion on page 19, where it is stated "Effects on pallid sturgeon reproductive ecology will be necessarily indirect because reliable, direct models do not presently exist. For example, in the near term, success of the attractant pulse may be evaluated through estimation of the frequency, magnitude, and duration of simulated pulses relative to pulses in the unregulated flow regime. Similarly, effects of low flows intended to maximize drift time may be evaluated through estimation of relative performance calculated through simple advection-dispersion models." It is also important to recognize that the metrics for Level 1 and Level 2 studies differ from the goals and management objectives as stated in section 3.1.

Continuing to explore and develop a set of alternative release scenarios from Fort Peck Dam (managed hydrographs) as an adaptive-management option will avoid complete reliance on flows from the Yellowstone and Milk rivers. Accordingly, the ISAP supports ongoing efforts to develop "a hydrograph for testing recruitment of pallid sturgeon to age-1 on the Upper Missouri River using the best scientific understanding of biological needs of the fish, recognizing that opportunity for fish passage at Intake Dam on the Yellowstone River is imminent, and that management actions at Fort Peck should complement, but not detract from, potential for successful recruitment on the Yellowstone River." Conceptual hydrographs for the upper Missouri River can be adjusted in real time to account for local major tributary inputs from the Yellowstone and Milk rivers, consistent with the experimental nature of the Level 1 and Level 2 studies. The Framework document emphasizes the interconnections between the Missouri, Yellowstone, and Milk rivers in stimulating the Level 1 and Level 2 studies, but the Framework also offers the contradictory statement that "If pallid sturgeon use the Yellowstone River, discharge or temperature actions at Fort Peck Dam will not be relevant." Although one might expect that spawning in the Yellowstone River will be the more viable option for reproductively active pallid sturgeon following fish passage at Intake, given the natural variability in flow regimes in the upper Missouri River system, pallid sturgeon in the Yellowstone River in certain years will inevitably experience conditions that translate to lesser likelihood of reproductive success. At such times, well-considered options for strategically applied Fort Peck Dam releases to promote beneficial conditions for pallid sturgeon reproduction on the upper Missouri River could contribute directly to the fish's viability and recovery.

Several additional observations and questions emerged during the Framework review. For example, it is unclear why the peak flow is held for three days in conceptual hydrograph 1. What information and data were used to establish the three-day duration? It is perplexing that the designed peak flow magnitude in conceptual hydrograph 2 is arbitrary, given that the flow action is an experiment, one for which control of a "treatment effect" should be exercised as much as possible.

The outline on how to prioritize and sequence activities is well developed and should be followed and updated as needed. At the same time, at what point do Tables 5 and 6 get inserted into the prioritization and sequence of events schedule?

While Figure 7 clearly defines the process for implementing Level 2 flow releases from Fort Peck Dam, the difference between maximizing learning and maximizing fish benefit is unclear. These objectives appear mutually exclusive in the diagram, but it can be argued that they are not.

The section "Flow adjustments to minimize harm to the Yellowstone" (3.5.6) is confusing. Unless it is determined that pallid sturgeon spawn considerably upstream of Intake Diversion Dam, then it would appear the upper Missouri River might be the more likely contributor to pallid sturgeon recovery. At this point, proof of concept has been established for the upper Missouri River potential contributions to reproductive success by pallid sturgeon. Table 9 presents a detailed set of Level 1 and Level 2 studies aimed at increasing understanding of the potential contribution of managing temperature (Big Q3) and turbidity (Big Q4) to pallid sturgeon reproduction and recruitment. The nature of the studies and corresponding "if-then" decision points and metrics suggest that the best available science is being directed at the potential management actions. However, the absence of sufficiently robust management-response functions to anticipate the effective design and implementation of temperature or turbidity-based management actions should be noted. Level 1 and Level 2 studies might be conducted using the Fort Peck Dam infrastructure (to address temperature) or possible sediment bypass (to address turbidity). However, the current operations capabilities to actively manage temperature and/or turbidity to the benefit of pallid sturgeon remain limited to increasing temperature or turbidity downriver of Fort Peck Dam. The relations between temperature and turbidity, and pallid sturgeon recruitment are not completely understood at this point; these circumstances do not strongly support the design or implementation of temperature or turbidity manipulations until results of the proposed Level 1 and Level 2 studies are obtained to guide them.

2) ***Does the Framework reflect the intent and process for resource management under the Missouri River Recovery Program as described in the Science and Adaptive Management Plan, including a structured approach to project design that uses a clearly articulated experimental framework for implementing management actions and gathering monitoring data, that addresses the Big Questions, that develops actionable decision criteria, and that contributes to identifying next management actions and studies not yet envisioned?***

Consider those adaptive management project attributes and time frame in evaluating proposed management action scenarios offered in the Framework as they relate to 1) competing dispersion model predictions, 2) potential temperature and sediment effects on management outcomes, 3) baseline and flow-test monitoring designs that are sufficiently (statistically) robust to evaluate project performance, and 4) near-term learning regarding project benefits to pallid sturgeon that can be applied in adapting proposed management actions and identifying new actions.

As underscored in the SAMP, Level 1 and Level 2 studies are not anticipated to result in population-level impacts on pallid sturgeon (or plovers and terns). Level 1 and Level 2 studies are primarily foundational research in nature and are intended to inform Level 3 and Level 4 management actions. Therefore, Level 1 and Level 2 studies are not necessarily subject to the requirements of adaptive management as developed in the SAMP. However, the Framework demonstrates that it is possible to design Level 1 and Level 2 studies within a structured adaptive management process that tests (evaluates) management-action hypotheses and identifies potential future Level 3 and Level 4 actions that might be anticipated to have favorable population-level benefits for the sturgeon.

Project design — The Fort Peck AM Framework was developed to address key uncertainties regarding the recruitment of pallid sturgeon on the upper Missouri River. The Technical Team constructed Effects Pathway (or influence) diagrams to describe the implications of new information beyond that addressed previously in the Effects Analyses. The diagrams were constructed to be conceptually compatible with the conceptual ecological model developed previously for pallid sturgeon in the Missouri River. The diagrams effectively interrelate the complex environmental factors with known pallid sturgeon reproductive behavior toward

guiding the design of modifications to flows, temperature, and turbidity, all aimed at increasing the likelihood of pallid recruitment in the upper Missouri River. In the supplemental material, the diagrams provide active links to detailed descriptions and data supporting specific causal linkages between proposed managed flows, sediment augmentation, and pallid reproductive requirements, as well as survival of age-0 pallid sturgeon during transport down river.

The two examples of managed flows derive from knowledge of pre-construction hydrographs and apparent/hypothesized needs of pallid sturgeon to reproduce and recruit to the upper-river population (see Figure 1 in the Framework). The Framework describes hydrographs in relation to hypothesized requirements for successful reproduction and recruitment of pallid sturgeon in the upper river, including (1) an attractant high flow designed to motivate pallid sturgeon to migrate upriver, (2) subsequent high flows that will retain fish in the upriver reaches, (3) an additional pulse aimed at cuing fish to spawn, and (4) lower flows on the receding limb of the hydrograph to maximize drift durations for maturing embryos. All of these aspects related to pallid sturgeon reproduction and recruitment were addressed in developing the example hydrographs presented in the Framework. Correspondingly, separate Effects Pathway Diagrams were developed for each of the four components of the example hydrographs.

Experts were convened to identify factors that could be responsible in limiting pallid sturgeon reproduction and recruitment in the upper Missouri River. The Framework did not indicate how many of the experts had participated in previous elicitation efforts concerning possible factors that control pallid sturgeon population dynamics in the Missouri River. The expert elicitation appeared to offer little in the way of new insights or information concerning potential factors that limit pallid sturgeon reproductive success in the upper river. Rather, the results of their deliberations largely confirm previous suspicions that flows, temperature, and turbidity influence pallid sturgeon reproduction in the upper river. A possible addition to the state of understanding was recognition of the high degree of uncertainty associated with the potential importance of turbidity in affecting pallid sturgeon spawning (Figure 5). The experts also prioritized spawning habitat availability, hatchery-related effects, and mortality in the drift of embryos as important to include in the Effects Pathway diagrams. Pheromones were also suggested as an alternative to attractant flow pulses.

Two example flow manipulations (see Framework Figures 3 and 4) were developed on the basis of unregulated flow regimes [2] and unpublished observations of upriver pallid sturgeon movements. Maximum managed flows of 16,000 cfs were derived from observations of pallid sturgeon movement up the Missouri River when spring-early summer flows were roughly double that of corresponding seasonal flows in the Yellowstone River (about 8,000 cfs). The example hydrographs were similarly informed by observations that pallid sturgeon tend to spawn on the receding limb of the May-June pulse if water temperature is 16° C or higher. Yet, the Framework recognizes that there is no known relation between the unregulated-flow upper river hydrographs and pallid sturgeon reproduction. The example hydrographs might not have any impact on pallid sturgeon. That and other uncertainties will likely attend selection of a managed flow action. The "signal strength" of (permissible) managed flows in the upper river to increase pallid reproductive behavior might be insufficient to elicit a measurable response in reproduction or subsequent recruitment. A near-term challenge lies in continued evaluation of hypothesized relationships between successful pallid sturgeon reproduction and recruitment and the absolute magnitudes, timing, and durations of the four components of the managed hydrographs.

Implementation — The Framework underscores the limitations of infrastructure (the dam) and operational constraints in designing and, perhaps more importantly, implementing a managed flow. Implementation will depend on water availability in relation to authorized uses and requirements to maintain specified pool volumes and discharges at different times of the year. Managing floods in the upper Missouri River adds another constraining dimension of unknown, but likely increasing frequency with concomitant constraints on flows mobilized to benefit pallid sturgeon.

Water temperatures down river appear only in part manageable, depending on the magnitude of flows and corresponding sources of flow as defined by the structure and operation of the dam (the power house and spillway). The Framework describes water temperatures associated with

[2] The Framework and Supplement do not define unregulated flows. Are these estimates of historical pre-construction flows or simply unmanaged flows through the existing infrastructure? It appears that the unregulated flow characteristics were based on values of an Index of Hydrologic Alteration (IHA, Nature Conservancy 2005) based on output of two physical models, the Daily Routing Model (period of 1898-1997) and the ResSim (period of 1930-2012). Table 2 in the Framework summarizes the environmental flow characteristics (EFCs) based on the results of the two models.

different parts of the example hydrographs as not necessarily detrimental to pallid sturgeon, but likely not optimal for pallid sturgeon reproduction, or growth and survival of age-0 fish. Options regarding temperature modification are limited by the design of Fort Peck Dam spillway and the required pool elevation to effect top (warm) releases. The uncertain relationships between water temperature and pallid sturgeon recruitment, combined with the constrained ability to manage temperatures downriver of Fort Peck Dam only generally, suggest that Level 1 and Level 2 studies aimed at better understanding the role of temperature as it affects pallid sturgeon recruitment ought to be given high priority in the near term. If water temperature and turbidity are determined to influence pallid sturgeon reproduction and recruitment, modifications to infrastructure, for example a tower at the power house and/or a warm-water and sediment pipeline intake at the head of the reservoir, to increase capability for water temperature and turbidity modifications downriver of Fort Peck Reservoir are potentially available.

The Framework implicitly suggests that implementation of even certain components of an overall managed hydrograph might prove beneficial to pallid sturgeon recruitment in the upper Missouri River. There are no known peer-reviewed studies that explicitly address this assumption — the assumptions are based on observations from 2011, 2016, and 2018. It is similarly possible that the effectiveness of successive seasonal flow conditions is contingent on previous flows. That is, it might make little difference if low flows in late summer are successfully implemented absent a high spring pulse (managed or not). If entire managed hydrographs are required at a minimum interval, say every 2 or 3 years, to benefit measurably pallid sturgeon reproduction and recruitment, the likelihood of successful implementation decreases correspondingly, and more importantly, it could lie beyond the control of the adaptive managers.

Additionally, a piece-meal, opportunistic approach to flow management might further weaken the "signal strength" of managed hydrographs already constrained by authorized purposes, human considerations to the extent that it might become increasingly difficult to measure reliably pallid sturgeon responses and/or unequivocally attribute any measured responses to a management action.

The USACE rightly recognizes that additional NEPA analysis may be required (and in fact is currently underway) prior to implementing any proposed flow management actions. Consistent with AM as described in the SAMP, the Framework states that, during the implementation of Level 2 or Level 3 actions, it might be apparent that particular (specific) actions are not needed, actions might require modification to increase effectiveness, or novel actions not previously explored might be required.

Monitoring — The Framework rightly recognizes the importance of monitoring and assessing the results of management actions, and in evaluating Level 1 and Level 2 actions in relation to the overall management objectives. However, the document eschews detailed prescriptions for monitoring based on the assertion that an actual managed discharge remains to be defined and implemented. Perhaps the degree of monitoring described, mainly effectiveness monitoring, is appropriate for evaluating Level 1 and Level 2 studies within an AM framework consistent with the SAMP. If these studies translate into Level 3 and Level 4 management actions, it is expected that monitoring programs (plans) would correspondingly increase in dimension, detail, and quantitative rigor.

Some reference to specific monitoring activities is included in the Framework in Appendix D. The ISAP appreciates the summary of monitoring activities in Table 7 (page 46), but observe that the performance metrics listed have been subjected to little more than anecdotal validation, and several will inevitably be challenging or not functional. It is beyond the scope of the Framework to include a detailed monitoring plan at this juncture; however, the Framework needs to more clearly articulate the central role of monitoring in assessing managed flow actions to determine if Level 1 and Level 2 studies are to meet the established performance metric benchmarks. Reasonable performance metrics are listed in Table 7, such as water temperature, discharge, and river mile location, but the links to project success are absent (for example, what river-mile location would determine success?) Monitoring plans and performance-metric benchmarks need to be established now, because learning is ongoing.

Decision-making — The Framework describes how the use of monitoring results will support decision-making in relation to adaptive management. Table 6 outlines the overall methods, describes metrics, and addresses decision-making in the form of "if-then" statements that might

generally inform decisions. However, the information in the table, such as monitoring metrics, should not be interpreted as meeting the technical requirements of a rigorous monitoring program in support of adaptive management. The if-then statements do not lead to concrete decisions, rather they seem to be included to suggest support (or not) for continuing to pursue identified studies or management actions.

Several of the if-then decision statements in Table 6 include the phrase “sufficient to have a population-level effect,” yet that sufficiency is not quantified in relation to pallid sturgeon population dynamics in the upper river in either the Framework or Supplement documents. The Framework defaults to the 5,000 individual pallid sturgeon per management unit as designated in the SAMP, while understanding that this number surely will change as more information accumulates. These circumstances might be addressed through a series of sensitivity-analysis simulations using the pallid sturgeon population model. While understanding the uncertainties associated with the model, it would nevertheless seem worthwhile to explore modeled pallid sturgeon population dynamics in relation to relationships, even hypothesized relationships, between managed flow elements and pallid sturgeon responses (including spawning, recruitment).

The questions and evidentiary framework in that section of the Framework seem too vague for learning. Moving forward, the questions should be focused on the experimental design of the conceptual hydrographs, which was established as the foundation for the Framework in the beginning of the document. For example, the authors might frame a question as such "Did 25% of the reproductively active pallid sturgeon in the upper Missouri River (Missouri and Yellowstone rivers) aggregate near the Milk River when conceptual hydrograph 1 was implemented?" This establishes a benchmark that is tied to the conceptual hydrograph. There is an opportunity here to perform large-scale experimental designs, which can be quantitatively powerful if conducted correctly.

Table 8 can be extremely useful. For example, in the row 4, column 3 it states "IF Fort Peck flows are likely to have biological benefits without causing unacceptable impacts to human considerations, that THEN supports moving to BQ/L2/C5." But what is meant by biological benefits? The Framework should strive to define decision criteria within the context of what is

actually being measured or monitored, such as numbers of fish that moved, maximum upstream location, spawning location, and number of free embryos sampled.

Governance — The Framework (Pages 27 and 48) refers generally to the governance process in the SAMP. The word governance appears only three times in the Framework document.

Data Management — The Framework and supporting documentation do not address data management, which represents an essential element to adaptive management in relation to the MRRP (as per the SAMP). The words "data management" do not appear in the Framework. Given that specific management actions and corresponding monitoring programs have yet to be defined, it might be premature to consider data management in any detail; however, the Framework would benefit from strategic articulation of how data will be developed, analyzed, presented, and otherwise managed.

3) ***Is the Framework structured and presented such that the evaluation of Human Considerations (HCs) is apparent in management-action planning and decision-making, project implementation, and project assessment? Elaborate on essential framework attributes that address HC concerns.***

One of the four primary purposes of the Framework is to "Summarize monitoring and assessment activities that may be needed to evaluate the effectiveness once a test flow action has been implemented and, potentially, to assess effects on human considerations*"* (Framework page 3). One of the guiding principles in developing the Framework was to "Build an approach to integrate technical aspects of human considerations seamlessly when and if this becomes necessary" (Page 4).

As described in section 1.4 of the Framework and in supplemental information provided to the ISAP (see Attachment 2 below), the USACE met with stakeholders via MRRIC Fish and Human Considerations Work Groups regarding the development of the Framework starting in May, 2018, subsequently at the Fall Science Meeting webinar, and then at the MRRP MRRIC Plenary Meeting in November, 2018. These engagements continued into 2019, including a Fish and HC webinar, an Adaptive Management Workshop and discussion at the May 2019 MRRIC Plenary

Meeting. The Framework acknowledges "further engagement will be needed… particularly as they might pertain to impacts to Human Considerations" (Page 5). ISAP commends the USACE for those early engagements in support of transparent development of the Framework document and its potential Fort Peck test-flow cases, and for the agency's mindful recognition that continued engagement is needed. Table 1 (Framework page 6), indicates that during the first step in its development, HCs were explicitly recognized in the design and preliminary analysis of the two conceptual hydrographs. The USACE acknowledges that in the ongoing development of the Framework scope "HC monitoring may ultimately be an important factor, but specific needs for HC monitoring cannot be predicted without first specifying the precise nature of the actions to be examined" (Page 12). Accordingly, substantial reliance on MRRP vehicles for integrating stakeholder input into the Framework, with emphasis on HC issues can and should be expected.

Human Considerations are included in the discussion of the Framework's "preferred" four-step evaluation of conceptual hydrograph 2 (Page 19). Specifically, in the fourth step, HCs are included in the analysis of the flow effects associated with the conceptual hydrograph. In addition, when the USACE assesses the conditions necessary for a Level 2 experiment to be implemented, it is stated that HCs would be among the factors potentially assessed (Page 28).

The Framework includes a short section (section 3.4.3) specifically considering monitoring of salient HC factors (variables) (see Pages 31-32) and indicates that it will be necessary to assess impacts to HCs that may result from potential Level 2 actions. Importantly, the Framework does not provide any specific guidance toward HC monitoring, apparently due to uncertainty as to "…which of the possible Level 2 actions that might be of interest will actually be implemented" (Page 31). Upon identification of a Level 2 action, an updated Framework might be expected that describes an HC monitoring design that follows the sequential step-down development previously presented for piping plover.

The Framework Section 3.4.3 on HC monitoring references the SAMP Section 5.3.2. This section of the SAMP identifies physical elements of the system that are routinely monitored. Several of these may be relevant to assessing any potential impacts to HCs associated with a wide range of possible management actions related to pallid sturgeon. That section of the SAMP also refers to the Master Manual, which in turn provides a detailed list of routine targeted

monitoring elements, at least some of which have direct relevance to HCs (e.g., river flows, water temperatures). The Framework also references Section 5.4.7 of the SAMP in addressing criteria for prioritizing new monitoring requests and attending targeted environmental factors. Taken together, Section 3.4.3 of the Framework includes by reference a number of elements that could serve as indicators (factors) for an HC-focused monitoring program that is consistent with the in-preparation DEIS for Implementing Test Releases.

The listing in the Framework of Level 2 studies in Table 6 includes decision criteria and metrics that provide evidence of recognition by USACE of the importance of HCs in the selection of managed flow alternatives (HCs are also referred to as authorized purposes in Table 6). Specifically, Table 6 indicates that model-based predictions of HC responses to Level 2 flow manipulations at Fort Peck would be made during studies in years 1-5 (Page 39). Results of those studies appraising impacts associated with HC responses would be part of the determination of the feasibility of implementing low-flow measures on the upper Missouri River (Page 40). During years 6-10, studies of the observed effects on HCs of a Level 2 experimental flow release from Fort Peck would be performed (Page 41). Similarly, impacts to HCs from field experiments involving warm-water releases from Fort Peck would also be studied in years 6-10 (Page 41). Meeting those commitments to monitoring of human considerations will confirm that HC considerations are appropriately integrated into the resource-monitoring program.

Section 3.6 describes effectiveness monitoring and recognizes the need to monitor human considerations. However, Table 7 does not provide any performance metrics for HCs. Rather, that section notes that "The need for additional monitoring activities to support assessment of *effects on human considerations* could be considered in conjunction with related analyses of any alternatives developed and evaluated as part of the NEPA process." (Page 47). The USACE should plan and design monitoring for human considerations timed so that those elements can be incorporated in the NEPA assessment process for the proposed test flow.

The appendices to the Framework include a discussion of HCs. First, HCs are acknowledged in the discussion of the *Effects Pathway Diagrams* (Page 54), but at this time they are not included in Figures 8-11 (Diagrams A-D). Rather it is in Appendix A.4. *Components for Upper Missouri River AM Framework* that the USACE provides several examples of how integration of HCs into

decision criteria accompanying Level 2 flow manipulations might occur. Specifically, Table 8 in the Framework's Appendix A.4 – item BQ1/L2/C4[3] – explicitly lists "human considerations" as a Key Metric when evaluating "Level 2 flow manipulations at Fort Peck." As part of the If-Then Decision Criteria for BQ1/L2/C4[4] "without causing unacceptable impacts to human considerations" is listed as a requirement for moving from "flow manipulations" to an "experimental flow release from Fort Peck." Likewise, Decision Criteria for both BQ2/L1/C1 to move to Level 2 experiments and BQ2/L2/C5 to move forward to field experimentation of flow naturalization include statements to proceed to this next step if proceeding is not expected to cause or is without "unacceptable risks to other authorized purposes." Similarly, the Decision Criteria to move to field implementation of sediment bypass requires a determination that sediment bypass "...can be feasibly implemented without unacceptable impacts to human considerations." These examples demonstrate that the Framework explicitly incorporates the broad concept of human considerations in decision criteria.

Given that the release date of the draft Framework (12 December 2018) occurred after several USACE public engagements, some specific examples of HCs that are affected by flow experiments could have been identified in the Framework. Specifically, a listing of several of the HCs that stakeholders identified that could be affected by a few of the possible Level 2 alternatives – for example reduction in the value or quantity of hydropower resulting from potential management actions that change the timing of flows through the turbines or potentially bypassing the turbines. From knowledge of HCs that generate high stakeholder concern, corresponding representative monitoring metrics could be identified. The Framework could have identified HC monitoring metrics relevant to managed hydrographs in general and the two conceptual hydrographs in particular.

In summary, the importance of evaluating and monitoring Human Considerations (HCs) is acknowledged throughout the Framework and in Appendix A.4. The actual section on HC monitoring primarily incorporates HCs by reference to the Science and Adaptive Management

[3] BQ is Big Question; L is Level as in Level 1, 2, 3, 4; C is component as in 1, 2, 3, 4

[4] Note that this explicit incorporation of "unacceptable impacts to human considerations" in the Decision Criteria is missing in Table 6 "If-Then Decision Criteria for BQ1/L2/C4." ISAP recommends the phrase "unacceptable impacts to human considerations" be included in Table 6 if any revisions are made to the Framework document.

Plan. Monitoring of any HC effects associated with potential flow and warm water releases from Fort Peck is implied in Level 2 studies in years 6-10 in Table 6. Appendix A.4 indicates that any decision to move forward with flow manipulations, flow naturalizations or sediment field experiments would require determining that "unacceptable impacts" to human considerations or authorized purposes are avoided. The approach taken and material presented in the Framework illustrates how HCs can be incorporated into planning, decision-making, and selection of Fort Peck management actions for implementation. Following the process guidance presented in the SAMP, the Framework provides a template and mechanisms to identify those HCs that require or could benefit from directed monitoring associated with the implementation of selected management actions.

Overall, the ISAP concludes that what is presented in the Framework provides a credible start toward an effective process to consider HCs in decision making for informing the design, implementation, monitoring, and evaluation of Fort Peck managed flows.

Additional Observations and Concerns

The pallid sturgeon population model is referred to as a potentially useful application that will be informed by the results of the Level 1 and Level 2 studies and will be implemented in the indefinite future to possibly assist in the design and exploration of future managed flows in relation to pallid population dynamics in the upper Missouri River. An alternative approach would be to focus near-term efforts on standing up the pallid sturgeon population model, recognizing remaining uncertainties, to perform simulations aimed at evaluating the likely impacts of the two example hydrographs on pallid population dynamics in the upper Missouri River. The ISAP understands that the seemingly halting development of the pallid sturgeon population model may be headed for fresh engagement. An advanced pallid sturgeon model would have substantive application in the Framework and other coming efforts elsewhere on the river. Fast-tracking its development would have estimable value in advancing the MRRP.

The Framework, while certainly consistent and compatible with the SAMP, seems unnecessarily redundant of the SAMP, despite the statement that "This Fort Peck AM Framework can be

included as a new component of the MRRP Science and Adaptive Management Plan for the Missouri River Basin." Note that the SAMP already includes actions under consideration for the upper Missouri River. Having both the Fort Peck Adaptive Management Framework and the SAMP as separate stand-alone documents sets the stage for potential confusion in moving forward under the MRRP. Do aspects of the Framework supersede the SAMP? Which adaptive management plan should be followed during implementation of Level 1 and Level 2 actions in the upper river? Is less-complementary material in the SAMP regarding Fort Peck no longer relevant? Also contributing to some confusion are the many usages of the term "framework" in the Fort Peck AM document, including AM framework, framework of four implementation levels, modeling framework, legal framework. Reserving "framework" solely for the title of the main document would help avoid confusion.

Advances on technical fronts under the MRRP are increasingly occurring ahead of the ISAP's formal assignments and ability to keep up. It might be expected that a monitoring design for pallid sturgeon is moving forward apace beyond the ISAP's recognition. But, Table 7 in the Framework suggests otherwise. The simple two-column table presents "monitoring activities" and "performance metrics" without further explanation or justification. That presentation, as noted above, is awfully thin, and is just the latest evidence that the pallid sturgeon-monitoring component of the greater conservation program is in a continuous, indefinite, and not well-defined state of development. The ISAP encourages agency staff and the technical teams to make serious real-time progress in developing monitoring tools, including identifying and validating metrics, indicators, surrogates, and proxy measures that can be applied to the MRRP's adaptive management efforts as they are implemented.

The ISAP recognizes the considerable effort devoted to constructing the Effects Pathways Diagrams and designing the example conceptual hydrographs. The Effects Pathways analysis was used to interpret the best available science in order to determine what most likely is limiting pallid sturgeon recruitment in the upper Missouri River. The results of an expert elicitation generally concluded that flows and temperature influence the attraction of pallid sturgeon. Limited drift distance influences larval development and survival. The conceptual hydrographs were correspondingly developed to evaluate the hypotheses related to discharge, temperature, and drift distance. Given conceptual hydrographs 1 and 2, it can be surmised that pallid sturgeon

migrate up the Missouri River and spawn near Fort Peck Dam and that the free-embryos have enough drift distance to develop, settle out of the drift before entering Lake Sakakawea, and recruit to age-1. In responding to Question 1, the ISAP sees the best available science supporting that reasonable logic chain and worthy of addressing with Level 1 and Level 2 studies. This is essentially where the Fort Peck Adaptive Management Framework stops. However, there remains a substantial amount of work in designing the Level 1 and Level 2 studies needed to inform Fort Peck Dam releases. The effort needed to develop Level 1 and Level 2 studies for Fort Peck releases will likely be similar in scope and intensity to that described for developing the IRCs in the SAMP's Appendix E (Attachment E.1). The Fort Peck flow manipulations represented by the example hydrographs present a valuable opportunity to implement large-scale field experiments, which have proven effective in ecological studies elsewhere.

The uncertain relationships between flow, temperature, and turbidity, and pallid sturgeon reproduction and recruitment to age-1, combined with the requirements to avoid, minimize, and mitigate the human impacts of management actions, create circumstances that challenge the fundamental practice of adaptive management of flows in the upper Missouri River. Lacking quantitative functions that project the anticipated outcomes of differently scaled management actions (managed flows), logic and expediency would recommend action(s) with sufficient "signal strength" to all but guarantee response(s) that would be (1) readily measured using realistically available monitoring resources and (2) unequivocally attributable to the management action. Implementing sufficiently scaled flows, given current HC concerns relevant to the upper Missouri River, might prove increasingly difficult: the remaining feasible "decision space" that delineates the design and implementation of managed flows could very well preclude effective management actions. The agencies and MRRIC will be challenged to identify those subunits of the permissible decision-space that could in all likelihood manifest as measurable and interpretable responses. Considerations of an HC-constrained decision-space engender additional questions and concerns, as in the following.

Given the number and degrees of uncertainties regarding relationships between flow, temperature, and turbidity and pallid sturgeon reproduction and recruitment to age-1, each adaptive management action should be fully capitalized upon as an opportunity to generate new knowledge and address current gaps in the best available science. When a management action is

undertaken, how will response variables be identified and monitored? Will sufficient samples be collected and analyzed to distinguish between signal and noise in biologically meaningful variables? Developing this information to establish a solid study design is not a trivial exercise; it must be accomplished or the results from Level 1 and Level 2 studies will potentially be overwhelmed with uncertainties. The management process requires difficult decisions on what to measure and what is biologically significant, because studying and sampling all environmental factors referenced in the project's "evidentiary framework" will not likely be feasible, even as prioritized in Table 8 (on page 48, labeled as Table 5). For example, given a treatment (an implemented hydrograph), a response variable may be defined as the number of reproductively active pallid sturgeon migrating up the Missouri River. Correspondingly, biological significance might require ascertaining that 50% of all the reproductively active pallid sturgeon tagged in the Missouri and Yellowstone rivers had migrated. These specific metrics permit a quantitative assessment of the "treatment" effect of the management action. The ISAP is concerned that these kinds of definitive metrics and monitoring will not be accomplishable given the history of the pallid sturgeon population-monitoring program. The ISAP advises against performing a management action under the MRRP without a robust study design and sampling design (monitoring), and with biological significance defined and quantifiable decision criteria identified.

Summary and Recommendations

The ISAP does not advocate for substantial revision to the Fort Peck Adaptive Management Framework. The development of documents of this type in the future could be greatly economized by following the overall structure of the SAMP and simply incorporating the comprehensive material in the SAMP by reference. It would be less confusing if "framework" documents were identified as project-specific implementations of the SAMP, rather than as separate adaptive-management frameworks. Only one SAMP is necessary. Corresponding adaptive management sections in "implementation" documents, such as the *Fort Peck Adaptive Management Framework*, could then provide concise statements related to specific project design, implementation, monitoring, evaluation, data management, governance, and data base management without revisiting the already-detailed conceptual context previously articulated in the SAMP. Documents such as these then could be added as appendices to the living, evergreen

SAMP to maintain programmatic organization and continuity. An abbreviated documentation of the Fort Peck management actions, with appropriate description of project-specific elements, delivered as an appendix to the SAMP, might facilitate stakeholder understanding of how Fort Peck management actions relate to other management actions in the upper Missouri River basin (see SAMP Figure 53) and the MRRP.

Attachment 1

The assigned charge statement –

Charge Questions for ISAP relating to the Draft Ft. Peck AM Framework
("*ISAP Charge Questions DFPAMF Final*," from Fish and HC Work Groups)

We have received additional input from the USACE, Third Party Science Neutral Robb Turner, and the Planning Groups to address comments received on the May 9 conference call. Based on Work Group input on the call and subsequent clarifications, the Planning Groups are proposing the following set of questions to guide the ISAP as it reviews the Draft Ft. Peck AM Framework (hereafter, 'the draft Framework').

Proposed Charge Questions

Please review the draft Framework and assess whether:

1. Best available science (e.g., a product of the scientific process; a synthesis of the most reliable knowledge available at this point in time; an expert elicitation; critical evaluation of observational data; model applications that link environmental stressor data to species and habitat responses, etc.) was used in formulating the level 1 studies and conceptual hydrographs for level 2 test flows outlined in the draft Framework;

2. The draft Framework presents an adequate approach and time frame for evaluating the efficacy of the described studies (including those assessing potential temperature and sediment effects and competing dispersion model predictions) and actions for achieving benefits to the sturgeon (i.e., testing hypotheses, answering questions regarding future management actions that may be needed);

3. The draft Framework is consistent with the SAMP, including links to the Big Questions;

4. The draft Framework provides a clear and effective process to consider HCs in decision making regarding its implementation; and

5. The draft Framework has mechanisms for identification and exploration of studies/actions not currently envisioned.

Attachment 2

Additional public engagement documentation requested by the ISAP and received from USACE (Craig Fleming) by email on 3 July 2019.

Fort Peck Engagements

USACE has coordinated with MRRIC throughout the development of the DRAFT FPDTR-EIS in addition to receiving formal consensus recommendations. Coordination has included in-person plenary meetings, webinars, in-person and virtual meetings with MRRIC work groups, and collaboration on the preparation and review of the Fort Peck AM Framework document. In addition to regularly scheduled engagements with MRRIC's Fish Work Group and Human Considerations Work Group, MRRIC members were invited to participate in the following activities:

- Joint Fish Work Group and Human Considerations Work Group Meeting, Sioux Falls, South Dakota, May 21, 2018
- Update during Fall Science Meeting webinars, October 2018
- Update during MRRIC Plenary Meeting, Kansas City, Missouri, November 2018
- Released Draft Fort Peck Adaptive Management Framework, December 21, 2018
- Joint Fish Work Group and Human Considerations Work Group webinar, February 1, 2019
- Adaptive Management Workshop, Nebraska City, Nebraska, February 25-27, 2019
- Hydropower analysis discussion with a subset of the Human Considerations Work Group, web meeting March 7, 2019
- Scoping Results Webinar, April 22, 2019
- Update and discussion during MRRIC Plenary Meeting, Sioux Falls, South Dakota, May 21-23, 2019
- ISAP review of Draft Fort Peck AM Framework document

Public and Agency Scoping:

To solicit public input in the FPDTR-EIS process, the USACE conducted public scoping meetings at the Fort Peck Interpretive Center in Fort Peck, Montana on February 19, 2019 and the Williams County Administration Building in Williston, North Dakota on February 20, 2019. The dates, times, and locations of the public scoping meetings were announced in the Notice of

Intent, published in the Federal Register on February 8, 2019; via a press release from the Omaha District Public Affairs Office on February 5, 2019; through social media, and in mass emails .

Members of the public were invited to submit questions and comments in-person at the scoping meetings, by mail, or email. The comment period was open from February 8, 2019 through March 26, 2019, during which approximately 50 correspondences were received. The content of comments received is summarized in FPDTR-EIS Scoping Summary Report (available at www.moriverrecovery.org).

Meetings with Tribes:

USACE's Omaha District sent a letter to Omaha District tribes (don't have a list of which ones) on February 6, 2019 advising basin tribes of purpose of this EIS and inviting them to attend the scoping meetings. At the request of the Fort Peck Tribe, an additional scoping meeting was held in the Tribal Chambers, on February 20, 2019.