TO: Governance Committee (GC)
FROM: Executive Director's Office (EDO)
SUBJECT: 2016 EDO Technical Series
#00 – Cover Memo
DATE: August 31, 2016
CC: Technical Advisory Committee (TAC) and Independent Scientific Advisory Committee (ISAC)

This cover memorandum provides background and context for a series of four technical memoranda developed by the EDO for the GC. These memoranda were prepared based on the discussion and GC information requests at the August 17 GC meeting and are intended to provide information that may be useful in First Increment Extension negotiations. Memoranda topics include:

01 – PRRIP Short Duration High Flow Performance Memo

This memorandum discusses First Increment learning in relation to the predicted effectiveness of Short-Duration High Flows (SDHF) in maintaining suitable target species habitat. SDHF was developed based on the hypothesis that changing the magnitude of the assumed AHR channel-forming discharge ($Q_{1.5}$) would cause the channel to adjust, producing suitable habitat for the Program's target species. This concept is generally supported by regime theory of alluvial channels. However, when SDHF was formulated, channel-forming discharge was not field-verified and the importance of event duration/volume was not considered. This appears to have led to an overestimation of the beneficial effects of SDHF in relation to the proportion of Program water it would require.

Given First Increment learning, a revised equivalent peak flow management action to create and maintain suitable least tern, piping plover, and whooping crane habitat would likely be a 12,000-15,000 cfs long duration high flow (40 days) in 30-50% of years. The magnitude of 12,000-15,000 cfs would be necessary to create sandbars meeting the minimum height suitability criterion. Maintenance of the flow for 40 days would result in an approximately 50% probability that unobstructed channel width at any given location in the AHR would be highly-suitable for whooping cranes (> 500 ft).[1] Peak flows of this magnitude and recurrence interval are consistent with 1993 USFWS pulse flow recommendations for the central Platte River valley. A 40-day duration at peak would be approximately two weeks longer than the 27-day total event duration proposed in 1993.

02 – PRRIP Target Flow Performance Memo

This memorandum discusses Program learning in relation to species target flows and how they relate to the First Increment water objective of 130,000 – 150,000 acre-ft. Species target flows can be divided into fish-related targets, least tern and piping plover targets, and whooping crane targets. Program learning during the First Increment includes:

Fish-Related Target Flows

From a Program target species perspective, the primary fish-related target flow objective would be maintenance of a diverse and abundant forage fish prey base for least terns. Analysis of Program monitoring data indicates the flow regime experienced during the period of 2001-2014 was sufficient to support an adequate forage fish population. Given that 50% of broods were exposed to flows below 200 cfs and still experienced high productivity, that discharge may be a reasonable minimum target.

[1] This assumes that no mechanical channel maintenance actions are taken.

If the original analysis methods were used to revise the target flow, the analysis would likely be updated to only include least tern prey species guilds. Removal of the non-prey guilds (catfish and carp) would produce habitat availability curves that optimize at approximately 450 – 600 cfs. Overall, updated fish-related target flows to protect the least tern prey base would be somewhat lower than the existing targets, likely in the rage of 200 – 600 cfs.

Least Tern and Piping Plover Flows

Given the Program's shift away from on-channel least tern and piping plover nesting habitat, it is unlikely a target flow update would include flows to encourage on-channel nest initiation and/or moat islands. In absence of on-channel nesting flows, targets would likely be associated with maintenance of an abundant and diverse forage base for least terns. As discussed previously, flow targets in the range of 200 – 600 cfs would likely be sufficient to achieve this objective.

Whooping Crane Target Flows

Updated whooping crane target flows would likely be developed by updating the Service's C4R model or a similar habitat availability model. Either way, the roosting depth bias present in the C4R model used to develop the original targets would need to be remedied. The resulting target flows would likely be similar to the 2005 USGS and USFWS update effort, which produced an optimized flow of 1,350 cfs.

Potential Updated Species Flows in relation to PRRIP Water Supply and Management

Average USFWS species target flow deficits (no pulse flows) are on the order of 180,000 acre-ft in wet years, 370,000 acre-ft in normal years, and 330,000 acre-ft in dry years. If species target flows were revised to 600 cfs for optimization of forage fish habitat across all hydrologic year types and 1,350 cfs during whooping crane migration, average deficits would be on the order of 22,000 acre-ft during wet years, 100,000 acre-ft during normal years, and 240,000 acre-ft in dry years.

Target Flows in Relation to Existing Hydrology and Channel Form

The target flows discussed in the memorandum are largely based on habitat suitability relationships which, in turn, are based on existing channel morphology. The existing flow regime is not competent to maintain suitably-wide unobstructed channel widths for whooping crane roosting in most years and Program short-duration high flow releases will likely not substantially increase channel width. As such, the Program will have to invest in mechanical channel maintenance into the foreseeable future. Further reductions in annual and/or peak flows and durations will increase the amount of mechanical intervention that is necessary.

03 – Mechanical Creation and Maintenance Strategy Performance Memo

This memorandum discusses First Increment learning in relation to the effectiveness of the Mechanical Creation and Maintenance (MCM) management strategy. Off-channel components of the MCM strategy were based on the hypothesis that least tern, piping plover, and whooping crane management objectives could be achieved in absence of riverine habitat. Tern and plover management objectives can and are being achieved via off-channel nesting habitat with the caveat that the river is necessary for foraging. The Program cannot achieve least tern and piping plover management objectives with mechanical on-channel nesting islands due to flow-induced habitat loss and associated nest/brood failure.

Whooping crane management objectives cannot be achieved with off-channel palustrine wetland habitat due to the lack of potential wetland sites in the AHR. The Program can mechanically create and maintain highly-suitable on-channel roosting habitat and has done so at the Program's habitat complexes. The major limitation of mechanical channel maintenance is the lack of a system-scale effect given that the benefits of disking and/or spraying are limited to the point of application. Accomplishing reach-scale improvements in habitat suitability requires permission to access a large number of private properties. Although

challenging, it has been accomplished in the past by coalitions of Federal and State agencies and conservation organizations.

04 – Future Mechanical Channel Maintenance Effort and Cost Memo

This memorandum discusses ongoing in-channel mechanical management efforts and cost of ongoing implementation. Given that SDHF is not anticipated to create and/or maintain suitable target species habitat, in-channel mechanical management actions are the primary tool for maintenance of the AHR channel. Primary management actions include phragmites spraying and in-channel disking. The majority of non-Program phragmites control funding has expired and new funding efforts have been largely unsuccessful. In absence of a new funding strategy, annual spraying effort may be reduced or interrupted. If that occurs, re-infestation is highly likely.

In-channel disking by conservation organizations was largely responsible for maintenance of suitable AHR species habitat during the drought of the early 2000s. Those efforts have decreased substantially during the First Increment. It is not known if similar large-scale non-Program disking efforts will be possible during the next drought cycle. In absence of such efforts, non-Program lands would likely become unsuitable target species habitat.

Overall annual cost for phragmites control from Columbus to Lake McConaughy, AHR-wide disking, and coordination of these efforts would be approximately $750,000. Of this total, expenditure of $400,000 for phragmites spraying and $90,000 for disking could be considered mandatory in order to maintain channel conveyance and suitable target species habitat on Program lands.[2] The additional $260,000 would provide for coordination and implementation of mechanical management actions throughout the remainder of the AHR. Funding of long-term mechanical maintenance could be accomplished through annual obligation of funds through the Program budget process or by establishment of a long-term conservation endowment, which would ensure sustainable implementation. Either way, there is currently no other management alternative that will create and/or maintain suitable channel conditions in the AHR, especially during drought periods.

[2] This assumes that basic coordination of phragmites spraying can occur at no cost.