February 26, 2020

Mr. Cody Wheeler, Halligan Project EIS Project Manager
U. S. Army Corps of Engineers, Omaha District
Denver Regulatory Office
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Littleton, Colorado 80128-6901
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Dear Mr. Wheeler:

On behalf of Trout Unlimited, Colorado Trout Unlimited and Trout Unlimited's Rocky Mountain Flycasters Chapter (collectively, "TU"), we offer these comments on the Draft Environmental Impact Statement (DEIS) published by the Army Corps of Engineers (the "Corps") relating to the Halligan Water Supply Project proposed by the City of Fort Collins.

TU is a non-profit conservation organization with approximately 150,000 members nationwide, more than 12,000 members in Colorado, and more than 1100 members in the Rocky Mountain Flycasters chapter in Larimer and Weld Counties, Colorado. Those two counties encompass the entire watershed of the Cache la Poudre River (the Poudre). For more than 50 years, TU has worked to promote conservation of fishery resources and watersheds in Colorado and the Poudre watershed specifically, through advocacy, education and on-the-ground restoration projects.

With these comments, we are also submitting technical letters that were provided to us through reviews of the DEIS by Dr. Ashley Rust (an aquatic scientist with the Colorado School of Mines) and Steven Reeves, a graduate student with the Colorado School of Mines Hydrological Sciences and Engineering program; and by Danny White (PhD student/research assistant in Civil Engineering at Colorado State University). Their technical reviews help inform the comments provided herein as well as providing additional specific comments on elements of the DEIS and associated technical reports.

Alternatives. The DEIS provides a reasonable range of alternatives. Among these far more extensive information is available on Ft. Collins' proposed action, which highlights both the impacts of Halligan enlargement as well as presenting important opportunities for streamflow enhancement on the North Fork Cache la Poudre under that alternative. We are pleased to see Ft. Collins looking at ways in which the project can be operated to provide multiple benefits, including environmental enhancements alongside water supply. That said, we also encourage the Corps to more fully develop information on alternatives beyond the proposed action, so that the public and decision-makers can weigh the relative pros and cons of those alternatives as well. This includes the "no action" alternative. While the Corps indicates that no action would not achieve the purpose and need statement, we note that the shortfall in water supply described for no action is that it would require low-level drought restrictions in only four out of 86 modeled years, and higher-level restrictions in

one out of 86 modeled years. A rare need for watering restrictions should not be relied on a basis for eliminating no action from consideration.

Hydrologic analysis. The Common Technical Platform modeling predictions used monthly stream flows and converted those to mean daily stream flows at various locations. By relying on monthly data, daily variations – including the potential for extreme high and low flow events, including zero-flow days – may be masked. Trout and other aquatic life can be profoundly impacted by those extreme events. To ensure that the analyses accurately reflect actual impacts, the Corps should use daily flow data to capture variation rather than minimizing that variation by relying on monthly mean flows in modeling hydrology under the alternatives.

Peak flow. Increased storage of runoff-period flows under the Halligan Water Supply Project will reduce the availability of high flows which provide important ecological functions including flushing of fine sediments, channel maintenance, and riparian regeneration. A river's natural geometry and therefore habitat and overall health is largely controlled by peak flows with a statistical probability of recurrence in the range of one to three years. These flows move the most sediment, clear silted pools and riffles, and contribute to a dynamic system promoting habitat complexity. The natural flow regime through Phantom Canyon as well as downstream of the NPIC diversion have been altered such that pre-development peak flows are diverted resulting in a narrower, and shallower channel. Ft. Collins has proposed that the highest three days of flow be bypassed so as to serve these functions. We appreciate this approach as it provides for a range of peak flows with different recurrence intervals (and meeting different ecological needs). However, it is unclear how this commitment will be implemented as some years may have multiple peaks and determining the actual peak flow in a given year may only be possible in retrospect. Further information on how the expected "three high days" would be determined each year should be provided. Furthermore, the basis for selecting three days – as opposed to longer duration peak flows such as five or seven days – should be clarified. A joint agreement with NPIC could further improve the peak bypass mitigation measure that aims to reach an acceptable flow rate sufficient to maintain channel form and health.

Base flow. One of the significant environmental benefits noted for the proposed action is the opportunity to provide for minimum winter and summer flow releases from an enlarged Halligan Reservoir. These target flows described in the DEIS are 3 cfs in winter and 5 cfs in summer. While any improvement in reliable base flow is appreciated, it is unclear whether these flows – in light of current channel conditions – are adequate to provide ecologically significant improvements. Ecologically-based evidence for the adequacy of the proposed flow levels should be provided. If these low flow levels are inadequate to provide habitat and connectivity in the North Fork's relatively wide channel, it may be necessary to look at channel modifications (such as establishing a smaller low-flow "channel within the channel") to focus the minimum flows being provided in order to achieve the desired habitat benefits. TU has seen this approach used successfully in other rivers – such as recent efforts on the Fraser River in Grand County, Colorado – to help ensure that flow and channel size and shape work together to provide intended aquatic habitat benefits.

Ambiguity on flow commitments. Throughout the DEIS, when describing opportunities for project operations to provide benefits (notably peak flow bypass and base flow releases), they are framed as actions which "may" be conducted, and with non-specific language indicating that such efforts would not take place under drought restrictions or in the event of water supply emergency. The adverse impacts of the proposed action will exist (e.g., inundation, reduction of peak flows); however it is unclear how consistently the proposed benefits/mitigation will exist. The Corps and Ft. Collins should provide greater clarity on this point, including clear definitions of when peak or low flow commitments would and would not be met, and (based on modeling) how often such instances

could occur. If such exemptions will be frequent, then the inconsistency with which flow benefits are provided would eliminate much of the cited environmental benefit of the proposed action for the North Fork.

We would suggest that the existence of a lower-tier drought restriction should not be used as a basis to forego low flow releases; the opportunity to ensure some minimum flows during droughts would be a major part of the benefit a low flow release program offers for the North Fork. Rather, we would recommend that such exemptions be limited to severe drought conditions when Ft. Collins is prohibiting outdoor water use.

For the proposed peak flow bypass, the use of the annual peak already will lead to adjustment in this commitment in drier years (when the peak will presumably be lower than in average and wet years). We recognize that Ft. Collins may need to forego the bypass in the event of drought, but we are concerned that the most basic recurring peak flow needs for sediment flushing and riparian maintenance – with a 1.5 – 3 year recurrence interval – need to be addressed. We recommend that in providing more specificity on exemptions from the peak flow commitment, that Ft Collins be limited from using such an exemption more than two consecutive years. This would ensure that at least some flushing flows would be provided with a 3 year (at longest) recurrence.

Inundation impacts. While the proposed action offers intriguing opportunities for flow management to provide ecological benefits on the North Fork below Halligan Reservoir, it will result in the inundation of approximately 0.75 miles of the river above Halligan. We believe two aspects of this impact have not been adequately addressed. First, the expanded reservoir would impact an ecologically significant reach for macroinvertebrate populations. In comments to the Corps (attached), Dr. Boris Kondratieff, a nationally-recognized entomologist at Colorado State University, notes that:

> The North Fork of the Poudre River above Halligan Reservoir is the **last** stretch of a large, mid-altitude Front Range stream that still supports taxonomically and functionally diverse communities of aquatic insects and other macroinvertebrates anywhere from Colorado Springs to the Wyoming border.

In considering project impacts – and potential mitigation – this important ecological value warrants greater consideration.

Additionally, the reach above Halligan that would be inundated provides valuable public fishing access on the North Fork. Conceptual mitigation for the proposed action focuses on habitat benefits through primarily private water downstream of the reservoir. The value of lost public angling access should also be considered in evaluating impacts and defining appropriate mitigation.

System-wide implications of project operation. It was unclear if proposed minimum flow releases from Halligan would be recaptured downstream and exchanged back to the reservoir during higher flow periods or would be delivered for end use by Ft Collins at the time of release. Furthermore, in general, use of the expanded reservoir to help meet Ft Collins water supply may have ripple effects on how Ft Collins operates other parts of its water supply system (such as Joe Wright Reservoir). We did not see in the DEIS or associated reports analysis of how these operational changes could impact other parts of the watershed, including Joe Wright Creek and the mainstem Cache la Poudre upstream of the North Fork confluence. Of particular interest to TU is the interrelationship of proposed flow management on the North Fork with existing collaborative flow management for winter flows in the mainstem Poudre under the Joint Operating Plan. Impact analysis for the project

must characterize and take into account these potential impacts from changed operations of other existing facilities resulting from the proposed action.

Water Quality. The DEIS analysis of water quality impacts is based on limited monitoring sites, only four in the system, including tributaries and the reservoir. The downstream water quality monitoring site closest to Halligan is well down-river, below the confluence of three other tributaries. In assessing potential water quality impacts of the reservoir, monitoring should take place above the reservoir and below the reservoir (prior to other tributary influence), and data from those sites compared for key variables such as dissolved oxygen, nitrogen and phosphorus concentration, and temperature.

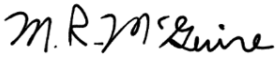
In modeling temperatures below Halligan, it is assumed that water will consist of bottom releases. However, elsewhere in the technical reports and DEIS it is stated that water is released from the top of the reservoir when Halligan is full, and that the new dam would be modified with a multi-tier outlet able to release water from top, middle, or bottom of the dam. These discrepancies must be resolved and temperature analyzed based on actual anticipated operations of the project.

Greenback restoration opportunity. TU was pleased to see consideration of the stream reach below Halligan for potential restoration of Greenback cutthroat trout. The reach would offer a rare opportunity to expand the Greenbacks' presence on the landscape into a larger, lower-elevation system, diversifying habitat that currently is limited to smaller headwater systems. Such a project would pose significant challenges. Ensuring consistent flows and adequate habitat (as noted in previous comments) would be critical. It would also be important to prevent downstream movement of non-native fish from the reservoir, especially any that could hybridize with the Greenback. This could be addressed by both designing outlet works at sufficient size to avoid water going over the spillway in all but more extreme flood events, and by managing upstream recreational fisheries using sterile hybrids (such as tiger trout) or at least species that do not pose risk of hybridizing with Greenbacks. We encourage the Corps and Ft Collins to continue exploring the possibilities for Greenback restoration below Halligan and if the obstacles can be reasonably overcome, to pursue this option as part of mitigation – maintaining downstream fish barriers to isolate the reach below Halligan, rather than reopening fish passage from further downstream reaches.

Adaptive Management. Even as improvements are made in impact analysis between this DEIS and issuance of a Final EIS, actual development of one of the action alternatives will almost certainly produce some unanticipated effects. Similarly, efforts at mitigation may require refinement to ensure that they achieve their intended results. Accordingly, we were pleased to see that Ft. Collins conceptual mitigation plan calls for adaptive management as "a key piece" of the proposal (p. 1-10). In describing a planned approach, the plan indicates that the effort will "likely involve the participation of stakeholders." We would suggest that adaptive management must include stakeholders and scientists whose interests and expertise would help inform the monitoring and adaptive management efforts. A promising model for such collaboration on adaptive management is the Learning by Doing partnership involving Denver Water, Northern Water, Grand County, Colorado Parks and Wildlife, Trout Unlimited, and other partners in addressing west-slope mitigation and enhancement efforts associated with the Windy Gap and Moffat Firming projects. Through a consensus-based process, Learning by Doing monitors environmental conditions and applies mitigation/enhancement resources in a manner responsive to those monitoring results. As the name suggests, the collective is designed to take action, learn from the observed outcomes, and make necessary adjustments to improve outcomes. We recommend a similar approach be adopted for adaptive management with the Halligan Water Supply project.

Thank you for your consideration.

Sincerely,



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January 17, 2020

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RE: Technical Review of Draft Environmental Impact Statement for Halligan Water Supply Project

Dear David,

Steven Reeves, a graduate student in the Mines Hydrological Sciences and Engineering program and I have completed our review of the current draft of the Environmental Impact Statement (dEIS) for the City of Ft. Collins' Halligan Water Supply Project. As you know, there are tradeoffs among impacts and benefits for each of the proposed alternatives.

However, not all the proposed alternatives were considered as extensively as Ft. Collins' Preferred Alternative. The expansion of Halligan Reservoir has been evaluated at length by various consultants on behalf of Ft. Collins over the last five years, as evidenced by the many appendices and technical reports. The other proposed alternatives are not given the same consideration. All the alternatives should be considered equally. The two alternatives that need much more consideration, and could be equally beneficial to aquatic ecosystems, include the Expanded Glade (NISP) Alternative and the No Action alternative. The Expanded Glade (NISP) alternative would have a smaller ecological footprint, and likely less impact than expansion of Halligan. And while the No Action alternative is said to not meet the future needs, it is still likely that if no action was taken, other alternatives and water supply solutions could emerge.

That said, the City's Preferred Alternative, the expansion of Halligan reservoir is not awful and it appears negative impacts would be minor. The Preferred Alternative has been thoroughly evaluated and I applaud the extent to which the City and the Corps have considered every negative impact from this reservoir expansion. The largest impacts include inundation of 0.75 miles of stream above the reservoir, due to expansion of the reservoir; a shorter and more muted peak runoff, as the reservoir would store water all but three days during peak runoff. The expansion of the Halligan reservoir would include some benefits, including low flow releases in the winter and summer.

Because the majority of the technical documents were about the impacts of the Preferred Alternative, we will provide a more thorough evaluation of the positive and negative consequences of expanding Halligan reservoir.

Ft. Collins' Preferred Alternative: Expansion of Halligan reservoir

Winter Release Plan

In review of the City of Ft. Collins Preferred Alternative the dEIS states that winter release of 3 cfs would eliminate zero flow days below the expanded Halligan on the North Fork of the Cache la Poudre to the confluence of Rabbit Creek. However elsewhere, in the 2017 Memo from William Miller to Ft. Collins, which was a comparison of the North Fork of the Poudre between baseline and after Ft. Collins proposed expansion of Halligan, analysis demonstrates that the Phantom Canyon segment would still be dry 7% of the time. This is a contradiction in the analysis compared to the GEI Aquatic Biological Resources Effects Technical Report (2019) and the dEIS. With information in technical Memorandums contradicting information presented in the dEIS, it is hard to tell whether the winter release plan would eliminate zero flow days in the North Fork or not. This is a major discrepancy that needs clarification.

While any amount of additional water during low flow helps aquatic ecosystems, it is hard to tell whether 3 cfs will provide any real benefit to the ecosystem. The 3 cfs to be released in the winter brings limited benefit, the habitat availability is still very low, as stated by GEI (Section 3.2.5.2.1, Aquatic Biological Resources Effects Technical Report GEI 2019). The 3 cfs released as part of the Winter Release Plan would keep portions of the channel wet, which may allow macroinvertebrates inhabiting that portion of the channel to survive, and it may provide enough water for some fish to survive in pools. However, if the channel remains as it is, wide and shallow, the 3 cfs would likely create sporadic pool habitat throughout the segment of the North Fork, and these pools would be disconnected habitat. Meaning, fish utilizing this stretch of river in the winter may be stranded in very small disconnected pools. With some amount of stream restoration work to narrow the channel and create a connected low flow channel, Ft. Collins could maximize the benefit of the 3 cfs releases. Further evaluation of flow and stream morphology would inform stakeholders as to the true benefits of these small releases. While the winter release plan would be an improvement from current conditions (where the river runs dry in that section), the benefits are often over stated in the dEIS.

Sumer Low Flow Plan

Again, the addition of 5 cfs as part of the summer low flow plan if the expansion Halligan reservoir is completed, would help the North Fork of the Cache la Poudre below Halligan, but the benefit of 5 cfs (which is not a lot of water) is often over stated. Most importantly, the dEIS (Chapter 1) mentions that the City would curtail the summer low flow program at times. "The Summer Plan would be curtailed if Fort Collins would require any water restrictions for the coming summer or in the case of a water supply emergency." (Executive Summary, Page: ES-2, paragraph 2). The dEIS is unclear about when the City of Ft. Collins would decide to curtail the summer low flow of 5 cfs. Would this happen in drought years, when the rivers are already stressed and have low water? What would be the precise threshold that would dictate curtailing flows? What conditions would determine this? In the Miller Memorandum (2017), they state when back to back dry years occur there is a loss of stream benthos. Would the City of Ft. Collins curtail the summer low flow two years in a row? If so, this would have dramatic effects and would negate any benefit the summer low flow plan provided in prior years. The decision to curtail the summer low flow plan needs to be defined and have boundaries or be eliminated.

3 Days of Peak Flow

Reservoirs can have the greatest impact on dampening peak flows and reducing the ecological benefits of riverbed scouring that high flows provide. Allowing 3 days of peak flow would be a true benefit to the river below the reservoir and is an excellent mitigation effort. However, peak flow from snowmelt runoff is difficult to forecast; we professional hydrologists have enormous difficulty predicting when the peak days will happen, even if we analyze historic hydrographs, use models and evaluate present day snowpack. Often, we don't know the peak has occurred until we look at the hydrograph in retrospect. How would the City identify the 3 peak days of runoff? What data and tools would they use to get this right? What if there is a year where runoff has two peaks (this happened in most Colorado rivers in 2019, where snow starts to melt, then another storm comes and it gets cold and runoff is delayed and peaks again later), would they not divert water and allow releases during both hydrograph peaks? How would they know when 3 peak days are? Would this be based on snowpack in the basin? If so where, which data collection point?

There is no technical basis for choosing 3 days of peak flow to mimic natural rivers' peak runoff. Natural systems generally experience between 5-10 days of peak runoff each spring, but of course this varies each year based on meteorological conditions. Three peak days of runoff may be enough to produce the benefits of peak runoff, but it is hard to tell. It would be interesting to know why they selected three days and how they justify this. One could argue that more days (5-7 days) would be beneficial and that would give them more room for error if they missed precisely forecasting the timing of the peak.

The dEIS also states the peak flow day releases could be curtailed, again, under what circumstances and how would they make that decision? "In general, Peak Flow Bypass Program curtailment would occur if Fort Collins would require water restrictions for the coming summer or in the case of a water supply emergency." (Executive Summary, Page: ES-2, paragraph 3) The data and thresholds that would dictate this decision need to be clearly defined and stated.

Hydrologic model assumptions: Common Technical Platform (CTP)

(From Final Surface Water Resources Technical Report, by CDM Smith October 2017)

The Common Technical Platform (CTP), Reasonable Foreseeable Future Actions (RFFA's), model predictions and beneficial stream flows are all based on the same assumptions. The CTP hydrologic modeling sequence used a monthly time-step and a post-processing tool to convert monthly to mean daily stream flows at 49 locations. This is not ideal, it is a big assumption and it means there was a lot of interpolation of data, to go from a monthly mean to daily mean flow. Using mean daily flow also dampens the effect of extreme low and high flow moments. Best modeling practices use actual daily flow data to capture real conditions and the high and low flow moments.

The assumptions used in the CTP meet the RFFA criteria, yet none of them involve a hydrologic response to a varying climate. The Halligan expansion does appear, on the surface, to be a great option for both the City of Ft Collins and the North Fork of the Cache La Poudre. Yet if the future of Ft Collins arid climate, whose water is highly dependent on snowpack, may become more vulnerable than anticipated, then the benefits for both human and environment will be curtailed. The catchment area for the North Fork of the Cache La Poudre, as well as the catchment for the Wilson Ditch that supplies 2300 AF a year to the North Fork, are snow dependent high altitude water basins.

In a 2015 study where the impacts of climate, sourced from the Intergovernmental Panel on Climate Change (IPCC), were applied to a snowpack dominated region of Colorado, the hydrologic responses, "show decreases in discharge, shifts in the timing of peak runoff, and prolonged periods of soil moisture declines, all of which can have negative implications for water quality, quantity and vegetative productivity" (Pribulick et al 2015).

Yet in the DEIS, there is one sentence in the executive summary that explains that modeling is too complicated to include climate variation. "Thus, hydrologic changes in response to global climate change are not quantitatively described." (Executive Summary, Page: ES-16, Cumulative Effects, paragraph 2)

Although they have decided to not include future forecasting, they have reserved the right to curtail any mitigation or beneficial environmental impacts. The decision process on what constitutes a "water supply emergency" is not clear.

"Planning approaches that explore multiple futures, rather than assuming a single future trajectory, are more compatible with climate projections and may improve preparedness for a changing future climate." (Lukas 2014). As Lukas demonstrated in his 2014 report for the Colorado Water Conservation Board, it is possible to build in an uncertain climate future into hydrologic models, this would be an important process for a city planning for their future water supply. Doing so may be cumbersome, tedious, annoying etc. yet very possible. Future forecasting with climate change scenarios would give a better look into future possibilities such as dry years or prolonged drought effects on supply.

It appears that all RFFA's are meeting criteria for demand, not supply conditions. The demand piece seems well adjusted, as it is suited more towards an economic and societal prediction. The supply side of the equation is simply built on historic data from 1986 to 2005 (see quote below). Which is the ideal starting point for any hydrologic investigation. Yet if predictions are being made about future demand, then future supply predictions must be made and should include climate variability.

"daily flow values for the period 1980 to 2005 on the main stem and 1986 to 2005 on the North Fork due to more limited historical data availability" (Hydrologic Modeling Technical Report for the Halligan Water Supply Project Environmental Impact Statement - CDM Smith and DiNatale Water Consultants – 2016 – Page: 1-6, section 1.2.4 Current Conditions Hydrology (CTP Run 1))

"The RFFAs, along with 2050 municipal and agricultural water demands, define the future conditions" (Hydrologic Modeling Technical Report for the Halligan Water Supply Project Environmental Impact Statement - CDM Smith and DiNatale Water Consultants – 2016 – Page: 1-7, section 1.2.6 Reasonably Foreseeable Future Actions)

All RFFA's reported in multiple locations are already based on full supply assumptions. If there is variation or shortfalls in supply, then the piggy backing of multiple assumptions can have a drastic trickledown effect to least senior water rights.

Example:

"The CTP modeling of future conditions hydrology assumes that the Windy Gap Firming Project (WGFP) is successfully completed, and the projected WGFP yield is factored into the inputs developed for the Greeley System Model (GSM) for future conditions model runs." (Hydrologic Modeling Technical Report for the Halligan Water Supply Project Environmental Impact Statement - CDM Smith and DiNatale Water Consultants – 2016 – Page: 1-8, 3rd bullet point)

“Future implementation of water-based reasonably foreseeable actions would result in changes in the amount and timing of Colorado River streamflows.” (Windy Gap Firming Project Final Environmental Impact Statement (FEIS), Executive Summary, Page: ES-23, paragraph - Cumulative Resource Effects)

This RFFA is an assumption that the WGFP is fully functioning. Yet WGFP affects the flows in the Colorado River. Most of the water rights utilized for the C-BT and transmountain diversions that affect the Cache La Poudre watershed are younger than those of the Colorado River Interstate Compacts. This essentially makes this chain of assumptions vulnerable to supply shortages and river “call-outs”.

“Future agricultural water demands will be reduced due to agricultural-to-municipal water transfers. Municipal water demands will be increased to reflect the addition of these supplies to the water providers' portfolios.” (Hydrologic Modeling Technical Report for the Halligan Water Supply Project Environmental Impact Statement - CDM Smith and DiNatale Water Consultants – 2016 – Page: 1-8, 4th bullet point) If future agricultural water demands are so likely to be reduced by a growing population, then Ft Collins should move forward with Halligan, but also pursue the Agriculture Reservoirs (from the list of alternatives), to create some resiliency and have the ability to make mandatory releases for the environmental benefits.

Although the modeling of the hydrology has adapted a Common Technical Platform (CTP) in which to conduct all modeling for the three main projects occurring in the Poudre watershed, the impacts of the combined projects is seemingly unclear.

Questions that arise are things like, will the winter, summer and peak bypass releases from Halligan simply stop at Seaman? Or are they meant for the overall health of the North Fork and main fork of the Cache La Poudre? Can these flows be sustained through a “water emergency”? There is a lot of uncertainty in the mitigation of the combined effects in this watershed. The potential impacts and the means to mitigate them is very unclear.

Water Quality Impact

(From Surface Water Quality Technical Report CDM Smith 2018b)

The water quality monitoring sites used for the analysis of potential water quality impacts are spatially far apart; there are only 4 stations in the whole system, including tributaries and the reservoir. The one water quality monitoring site closest to the North Fork of Cache la Poudre below Halligan is far down river and is below the confluence of 3 other tributaries (Figure 2-1, p 2-10). This site certainly does not capture the impact on water quality in the North Fork directly below Halligan. It is difficult to say how the Halligan reservoir expansion would impact the North Fork when there is no monitoring directly below the dam. The consultant makes the argument that it was not necessary to monitor water quality just downstream of the reservoir (2.2.1.2.1, p 2-11). This is not logical, in order to measure the effect of the reservoir, water quality should be monitored above and below the reservoir and data could be compared. They state (section 4.3.1) that the Ft. Collins Proposed Action could possibly change the water quality, but there is no monitoring conducted near the reservoir to assess this. To assess the impact of the reservoir, especially if the Preferred Action is selected, water quality, including the dissolved oxygen, concentrations of total nitrogen and total phosphorus, and temperature, should be monitored directly below the reservoir.

Temperature Modeling

(From Surface Water Quality Technical Report, CDM Smith 2018b)

The consultant used SN Temp model (a commonly used and appropriate model) to model temperature on the North Fork. The model predicts daily mean stream temperatures and then calculates daily maximum temperatures as a function of the average – this is not ideal, and probably not a real reflection of actual maximum temperatures (Section 4.4.1.7 Water Temperature Methodology, p. 106 dEIS). They also used Halligan bottom releases to model future conditions (p. 106) but in other portions of technical reports (2017 Memo from William Miller to Ft. Collins) it is stated that Halligan releases water from the top when it is full. Top releases would be dramatically different in temperature and would change the predictions of future temperature below the reservoir. The modeling is only based on the coldest scenario (bottom releases) and the dEIS states there would be minimal effects on stream temperature. In other portions of the dEIS, it is stated that the new dam would be modified to release water from the top, middle and bottom of the dam. Each of these releases would affect the stream temperature downstream differently. For these reasons, it is hard to assess what the future impacts on stream temperature would be below the dam. If there are three different levels of water releases, how would the reservoir manager decide where to release from? What are the thresholds or temperature or water quality boundaries that would inform this? Although cold water releases may drop the temperature of the stream below, it may also be difficult for aquatic life to tolerate widely varying temperatures from different types of releases (or no releases). The temperature analysis is incomplete because it does not consider the different levels of the reservoir where water would be released from. Again, the impact on stream temperature and the way water is released needs more careful consideration.

“There was no pre-determined demand or release pattern for the enlarged Halligan Reservoir.”(Executive Summary, Page: ES-3, paragraph 2.)

Aquatic Biological Resources

Section 4.8 dEIS, p. 4-187 states changes to the macroinvertebrate biodiversity were assessed using professional judgment, which is pure guesswork and opinion

“The analyses show that implementing the mitigation and voluntary enhancement measures is anticipated to have an overall benefit to North Fork aquatic resources and geomorphology, including increased ecological function of the stream system and associated riparian zone of the North Fork.” (Halligan Water Supply Project Conceptual Mitigation Plan, Page: 2-5, paragraph 2.1.2 - Mitigation Approach for Aquatic Resources and Stream Morphology)

The mitigation efforts and benefits only come from a structured and reliable release from the reservoir. Yet built into everything is a certain uncertainty that these beneficial flows will be the first thing to go if the supply gets tight. Proper mitigation and the future health of the River will depend on continued and accountable releases. This mandatory style release would also force Ft Collins to incorporate some resiliency into their overall system

<u>References</u>

Lukas, Jeff., 2014, Climate change in Colorado a synthesis to support water resources management and adaptation : Boulder, Colo, Western Water Assessment.

MEMORANDUM

Date: 19-February-2020

To: David Nickum

From: Daniel White

Re: Halligan Reservoir Expansion DEIS Response

Introduction

It is clear that the City of Fort Collins hopes to take advantage of opportunities to mitigate impacts to the ecosystem in Northern Colorado along the North Fork of the Poudre River. The environmental flow management plan laid out in the DEIS is a step toward optimization of ecosystem and human benefits associated with the expansion of Halligan Reservoir. Further coordination with stakeholders and experts that have spent many years studying the physical and biological processes unique to the North Fork is suggested for the proposed alternative. I also suggest a deeper investigation into innovative management that can meet the water users' needs through increased water conservation efforts and science backed flow release plans.

Hydrologic modeling and release plans

There has been a lack of investigation into the varied "design" flow regimes that could be implemented upon expansion of the reservoir which would benefit the aquatic ecosystem below the dam. This is a unique opportunity, in which further developing a water resource has the potential to benefit aquatic organisms that presently see zero flow days yearly regardless of the occurrence of a wet, or dry year. As suggested by Bestgen et al., (2020) and James et al., (2009) the shape of a hydrograph affects the physical and biological processes in riparian ecosystems. Simply defining a 3 cfs winter flow plan, 5 cfs summer flow plan and passing of three days of forecasted peak flows, does improve ecosystem function downstream, however, further analysis and adaptive management should be performed to optimally achieve the project stated purpose and goal to provide drought resilience, while enhancing the natural environment. Mean monthly flow rates based on historic data were used in the hydrologic modeling (Common Technical Platform) and may give the false sense that under the proposed action, zero flow days would no longer occur except in a water shortage emergency. In technical reports presented with the DEIS, it is stated that using historic daily flow rates, under proposed conditions, it is still possible for zero flow days. This needs to be clarified in the EIS with clear plans outlined ensuring protection from zero flow days.

Peak flow bypass

The proposed three day peak flow bypass program is a good step in sustaining suitable habitat and maintaining channel form. A river's natural geometry and therefore habitat and overall health is largely controlled by peak flows with a statistical probability of recurrence in the range of one to three years. These flows move the most sediment, clear silted pools and riffles, and contribute to a dynamic system with important habitat complexity. The natural flow regime through Phantom Canyon as well as downstream of the NPIC diversion have been altered such that pre-development peak flows are diverted resulting in a narrower, and shallower channel. The expansion of the reservoir allows for the unique opportunity to improve current channel form through increased peak flow bypass, providing suitable habitat for aquatic and land based organisms. Clarification should be provided regarding the methodology and/or plan to ensure adequate peak bypass flows. A joint agreement with NPIC could further improve the peak bypass mitigation measure that aims to reach an acceptable flow rate sufficient to maintain channel form and health.

Mitigation measure - native fish restoration

Phantom Canyon is a unique reach of the North Fork providing highly valuable habitat for conservation of Greenback Cutthroat Trout (GBCT). Unlike the ~12 current high priority restoration locations, one of which includes tributaries in the Upper Poudre, Phantom Canyon is a moderately sized tailwater on a private nature reserve owned by The Nature Conservancy (TNC). The North Fork tailwater at Halligan Reservoir is significantly larger in flow volume than all other current restoration sites. It is also situated much lower in elevation and is a highly productive river. High elevation streams often have limited gross primary productivity (GPP, a measure of stream health), due to their low winter temperatures. Although we typically associate these cold water streams (higher than 8,500 ft in elevation) as excellent cutthroat trout habitat, the low temperatures have the potential to limit the growth of cutthroat fry in their first year of life and stunt adult maximum growth. This is clearly reflected in the diversity of fish assemblages at high vs mid-elevation transitional stream ecosystems. In Phantom Canyon, besides brown and rainbow trout, small bodied fishes including Johnny darter, longnose dace, longnose sucker, and white sucker are present. In transitional riverine systems similar to this in the west, as cutthroat trout pass a size threshold, they rely on these smaller fish as a high energy food source promoting increased growth. These unique attributes set the North Fork as a GBCT restoration site apart improving the diversity of habitat types throughout the landscape. With current GBCT efforts, there is little population representation at lower elevation transitional streams. Historically, GBCT were found in transition zones where mountain streams flow into the valley of the Front Range. Restoration of GBCT to Phantom Canyon provides a unique opportunity to establish a population in a geographically diverse system.

Within the next 10 years, the Greenback will undergo a status revision under the Endangered Species Act. Currently they are listed as threatened, but the status has not been revisited since the discovery of the pure strain GBCT in Bear Creek, a small tributary near Colorado Springs. Currently, only 4 populations of GBCT exist on the landscape. The GBCT recovery team has attempted to improve the resilience of the species by identifying feasible restoration sites in geographically diverse locations. There are no lower elevation, transitional streams due to their

highly developed, high risk nature, i.e. the main stem of the Poudre in town. The opportunity to increase diversity on the landscape is unique downstream of Halligan Reservoir and will likely aid to avoid listing GBCT as endangered under the ESA.

For these reasons, The City should continue to pursue the opportunity to, where feasible, restore native fish including the GBCT below the expanded Halligan Reservoir. A restoration success of this nature will undoubtedly be heralded as a collaborative effort to meet the water demands of a growing population center in the west, and also establishing a unique population of threatened trout.

DEIS Comments

Executive Summary

ES-2

It is stated that the summer plan would be curtailed if Fort Collins would require any water restrictions for the coming summer or in the case of a water supply emergency. This is unclear. A clear definition of a water supply emergency needs to be provided.

ES-2

It is stated that the Peak Flow Bypass Program will forego all diversions to the enlarged pool at Halligan Reservoir for the three days that coincide with the forecasted peak runoff flow event for the North Fork. Accurate forecasting of the date on which peak runoff occurs is difficult. Should The City incorrectly forecast the peak flows, will the reservoir be operated to continue to forego diversions to account for the incorrect forecast? The forecasting methodology and assumed accuracy should be described and a clear plan laid out.

ES-5

Winter release plan. Here it is stated that regardless of the project selected to achieve the purpose and need, a winter release plan will be implemented at Halligan Reservoir and the dam will be rehabilitated. Although stated here, it is unclear in other chapters whether this has been accounted for in the impact analysis.

ES-8

No- action alternative. It is stated that the no-action alternative does not meet the purpose and need of the project. Although, as stated, according to Corps regulations, the No-Action Alternative need not meet the project purpose and need, The City should do its due diligence and further expand the no-action alternative to feasibly achieve their storage reserve factor in the year 2065. The hydrologic model used to assess the conditions of a no-action alternative did not use all 4 levels of described drought water-usage restrictions. Why was the strongest (level 4) drought water-usage restriction levels established but not tested. Could a level 4 restriction factor achieve the required storage factor?

ES-10

There is no discussion about the methane production due to an increased reservoir volume and anaerobic decomposition. This has been shown to contribute significantly to climate change. This should be analyzed.

ES-16

It is stated that there is no generally accepted scientific method to correlate air temperature changes with incremental changes in stream flow or reservoir levels. There are climate change models that predict decreased precipitation in the Front Range, it is negligent to decline to assess the changes in flow due to climate change. Please incorporate climate change effects into hydrologic models appropriately.

Chapter 4

Table 4-1

In the table, it states that there are no irreversible or irretrievable effects on water quantity, while the explanation states that loss of water to evaporation and consumptive use would reduce river flows and availability. These statements do not agree. Please clarify.

4.2.3.1

It is stated that if the proposed project is not constructed, ownership and operation of the dam will be turned over to NPIC and maintenance will be performed by them. Elsewhere in the DEIS, it is stated that Fort Collins will upgrade the reservoir even if the proposed project is not implemented through. This is unclear. Will Fort Collins turn the dam back over to NPIC and then upgraded? Please clarify.

Figure 4.2

The confidence interval of the proposed project average daily flows reaches to 0 cfs in March. This adds to the lack of clarity regarding the hydrologic modeling. It is repeatedly stated through the DEIS that zero flow days will be eliminated. Please clarify and implement a plan to guarantee winter and summer low flows result in no zero flow days.

4.3

For all other impact areas there are mitigation measures proposed. Why are there no mitigation measures stated for the altered hydrograph? The proposed flow regime has positive and negative impacts and could be mitigated through a further investigation into optimal design hydrograph shape.

4.4.9

It is stated that Fort Collins may design an aeration station at the outlet of the dam. The City should clearly state their intended action rather than use ambiguous language such as may.

4.6.2.1.4

In 4.6.2.1.3 it is stated that the duration of bed material movement at nearly half of cross sections would decrease on average 14 percent then stated that the proposed action will have a negligible effect on stream morphology and sediment transport. There are studies which show that the length of time where bed load is mobile is directly related to channel maintenance. With a bed material movement decreased by 14 percent at many cross sections, this likely indicates there will not be negligible but significant loss of morphologic complexity. Please clarify.

Table 4-32

The DEIS should provide enough information about the rating and observational analysis system to describe “negligible”. See previous comment.

4.6.9

Mitigation measures, the channel complexity will continue to decrease resulting in degradation of habitat. We suggest exploring the possibility of constructing low-flow channels downstream of the NPC improving channel complexity and habitat suitability that historically have seen the greatest negative impacts to channel form.

4.7.8

It is stated that Fort Collins may consider improvements to wetland function. The City should clearly state their intended action rather than use ambiguous language such as “may”.

Appendix - References

Bestgen, K. R., Poff, N. L., Baker, D. W., Bledsoe, B. P., Merritt, D. M., Lorie, M., et al.

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Haak, A. L., & Williams, J. E. (2012). Spreading the Risk: Native Trout Management in a Warmer and Less-Certain Future. *North American Journal of Fisheries Management*, *32*(2), 387–401. https://doi.org/10.1080/02755947.2012.678963

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January 31, 2020

Mr. Cody Wheeler
Halligan Water Supply Project EIS Project Manager
U.S. Army Corps of Engineers Omaha District
Denver Regulatory Office
9307 South Wadsworth Blvd
Littleton, Colorado 80128

Dear Mr. Wheeler:

The intent of this letter is to express my concerns regarding the Halligan Water Supply Project. I have studied the aquatic insects and other macroinvertebrates of Colorado for more than 34 years, especially those of the South Platte River Basin (see https://www.academia.edu/29449371/THE_MAYFLIES_STONEFLIES_AND_CADDISFLIES_THE_SOUTH_PLATTE_RIVER_BASIN_COLORADO_NEBRASKA_WYOMING.pdf). As has been indicated in our study and numerous others, all of the larger Colorado Front Range streams have a long history of negative impacts from dewatering from agricultural irrigation projects, damming, urbanization effects, and other human caused perturbations. The North Fork of the Poudre River above Halligan Reservoir is the **last** stretch of a large, mid-altitude Front Range stream that still supports taxonomically and functionally diverse communities of aquatic insects and other macroinvertebrates anywhere from Colorado Springs to the Wyoming border. Losing any length of this river to reservoir inundation by an expansion of Halligan Reservoir would be a major loss of Colorado stream biodiversity, which has been already almost completely eliminated from similar-sized streams by human alterations all along the Front Range of Colorado.

All efforts should be made to minimize flooding of the North Fork of the Poudre River above Halligan Reservoir. In the Draft EIS it is estimated that 0.75 mile of the river above the reservoir will be inundated. This is critical habitat for native stream invertebrate species. No thorough assessment of the aquatic insect and other macroinvertebrate species of the North Fork of the Poudre River above Halligan has been conducted for the EIS. This is unacceptable. Almost all the efforts to characterize the benthic communities of river has been made below Halligan Reservoir, in a river reach that has long been impacted and ecologically simplified by dam operations including periodic releases of large amounts of sediment. As our study (Zuellig, R. E., B. C. Kondratieff, and Howard A. Rhodes 2002. BENTHOS RECOVERY AFTER AN EPISODIC SEDIMENT RELEASE INTO A COLORADO ROCKY MOUNTAIN RIVER.

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Western North American Naturalist 62(1): 59–72) indicated, the community structure and function of the macroinvertebrate communities that exist between Halligan and Seaman reservoirs is composed of highly resilient and mostly common, widespread western North American aquatic insect and macroinvertebrate species that occur, disappear or recolonize as dam releases increase or decrease. Thus, the macroinvertebrate communities below Halligan are highly simplified and composed of hardy species, whereas those above Halligan retain high native diversity that will predictably be eliminated once the reservoir inundates their current habitat.

In summary it is imperative that any loss of a riverine section of the North Fork of the Poudre River be avoided or minimized, and this section be allowed to remain in perpetuity as a free-flowing river. It should be required that a more thorough biological assessment be made of the aquatic insect and macroinvertebrate communities above Halligan Reservoir to indicate the regional importance of this special aquatic biodiversity.

Sincerely,

Boris C. Kondratieff

B. C. Kondratieff, Ph.D.
Professor of Entomology
Director, C. P. Gillette Museum of Arthropod Diversity