For Discussion Purposes Only – Subject to Change

DRAFT – September 19, 2018 – DRAFT

Comments on the Final Environmental Impact Statement for the Northern Integrated Supply Project

Dated: October 4, 2018

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INTRODUCTION AND EXECUTIVE SUMMARY

The City of Fort Collins ("Fort Collins") respectfully submits to the United States Army Corps of Engineers ("Corps") these comments on Final Environmental Impact Statement, dated July 2018 and issued on July 20, 2018 ("FEIS"), and its associated technical reports and related documents, regarding the Northern Integrated Supply Project ("NISP" or "Project") proposed by the applicant, the Northern Colorado Water Conservancy District ("Northern" or "District"). Reference materials are identified in the comments and the majority of such reference materials are being provided to the Corps in electronic format. These reference materials constitute part of these comments. Fort Collins reserves all rights to supplement these comments on the FEIS and/or NISP, as may be appropriate.

To the extent permitted by the short comment period, Fort Collins has completed a thorough, scientific review of the FEIS under the Clean Water Act, 33 U.S.C. § 1251 *et seq*. ("CWA"), the National Environmental Policy Act, 42 U.S.C. § 4321 *et seq*. ("NEPA"), and other relevant authority. Fort Collins completed this review through expert Fort Collins staff and consultants listed in Appendix A.

Fort Collins was founded and is located along the Cache la Poudre River ("Poudre River"). The Poudre River is a significant amenity and resource for Fort Collins in numerous respects and is cherished as a defining element of the city and community. As described below, Fort Collins has invested significant resources into the Poudre River, including through the use of two wastewater treatment plants, by purchasing land along its banks, improved flood conveyance to protect and enhance public safety, and using it for recreation and economic enhancement. It is hard to overstate the meaning and significance of the Poudre River to Fort Collins and its community.

Fort Collins is located downstream of the Project's primary points of diversion on the Poudre River, and thus stands to bear the brunt of NISP's impacts. While Fort Collins understands and appreciates the needs of other communities to develop their water supplies in environmentally-responsible ways, Fort Collins must take reasonable actions to protect its assets and investments. Fort Collins has thus sought through these comments a pragmatic approach of focusing on Alternative 2M (also, "Proposed Alternative"), direct impacts to Fort Collins, and ways to improve mitigation of the Project's impacts. *See* 40 C.F.R. § 230.93(a)(1) (regarding compensation for all "aquatic resource functions that will be lost as a result of the permitted activity.").

Fort Collins' comments are organized by general topic area. The following is a brief summary.

SECTION 1: Incorporation of Fort Collins' Previous Comments to DEIS and SDEIS.

SECTION 2: Water Quality-Related Comments.

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SECTION 4: Riparian-Related Comments.

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SECTION 1: INCORPORATION OF FORT COLLINS' PREVIOUS COMMENTS TO DEIS AND SDEIS

Fort Collins hereby incorporates by reference its comments on the original DEIS for NISP, including comments on the regulatory framework, which Fort Collins provided on September 10, 2008, and its comments on the SDEIS for NISP, including comments on the regulatory framework, which Fort Collins provided on September 2, 2015. The original DEIS and SDEIS contained flaws that rendered it insufficient under NEPA and the rules and regulations and guidelines thereunder, the Clean Water Act, and the rules and regulations and guidelines thereunder, and other relevant legal requirements. The Corps has addressed some of the comments made by Fort Collins and other stakeholders. However, the FEIS remains inadequate for the Corps to adequately discharge its obligations under these requirements and, as discussed herein, underestimates various impacts.

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SECTION 2: WATER QUALITY-RELATED COMMENTS

2.1 GLADE RESERVOIR (AND FOREBAY) WATER QUALITY COMMENTS

2.1.1 The Initial Fill of Glade Reservoir Must Be Addressed

FEIS Section 4.3.2.2.1

"Glade Reservoir would likely experience a trophic upsurge and trophic depression in the initial decade following the first filling of the reservoir (Hydros 2018f). Water quality in the reservoir during this period is uncertain and would likely differ from the long-term results simulated with Glade Reservoir water quality model. Since there is no reliable, well-tested method for predicting the magnitude and duration of the tropic upsurge period, and because no data during the trophic upsurge is available for a similar reservoir, the analysis for Glade Reservoir is limited to a qualitative discussion with a high degree of uncertainty.

"Assuming nutrient concentrations are approximately twice as high in the period following initial fill than those simulated in the water quality model suggests that the TN and TP concentrations could range from 500 to 800 ug/L and 24 to 30 ug/L. TN and TP concentration in Glade Reservoir could therefore potentially exceed the applicable in-reservoir interim numeric values of 426 ug/L and 25 ug/L during the reservoir transition period. Additionally, internal loading of NH3 and ortho-P could likely be relatively high as well, due to decomposition of organic material in the existing soil and vegetation at the Glade Reservoir site. Elevated nutrient concentrations… could increase the impact of Glade Reservoir releases on water quality in the Poudre River.

"Depending on the timing and relative magnitude of releases from Glade Reservoir, the elevated nutrient concentration could increase nutrient concentrations in the Poudre River and potentially increase algae and periphyton growth downstream of the release point to the river."

Comment: The Glade Reservoir water quality model predicts water quality during the post-filling phase of reservoir operations. Due to data and modeling constraints acknowledged in the FEIS, a simulation of water quality during the filling period was not conducted, nor is feasible. As a result, there is a great deal of uncertainty around water quality of releases during the first decade of operations. At this time, it is unclear if the water quality certification under Section 401 of the Clean Water Act ("401 Certification") will consider the two distinct operational phases for the Project, and as such, it is unclear how the risks to downstream Poudre River water quality will be managed.

Furthermore, it is unknown to what extent the expected increases in nutrient levels will impact water quality in Segment 11, within which Fort Collins has two permitted wastewater discharge points for Fort Collins' Mulberry and Drake Facilities. The effluent discharge limits that are calculated as part of the respective permits are based on a 5-year records of historical water quality

of the receiving water, in this case, Segment 11 of the Poudre River. As such, future discharge permits for the Mulberry and Drake Facilities will convey the financial and operational burden of water quality impacts caused by NISP during the filling phase onto Fort Collins' wastewater operations through stricter permit conditions, which translate to additional operational and technological control measures.

Recommendation: If the 401 Certification process does not include specific conditions for the filling phase of Glade Reservoir, Northern should be required to expressly include in its proposed adaptive management plan, specific water quality targets for the filling phase that minimize impacts to downstream water quality to the same extent that the 401 Certification requires for the post-fill, full reservoir operations.

2.1.2 Degraded Forebay Water Quality Is a Concern and Must Be Monitored

Glade Reservoir Water-Quality Model Report Section 5.7.8

"As previously described, water diverted to Glade Reservoir would flow into a forebay before being pumped into the reservoir. The forebay would store approximately 2,500 AF (including ~500 AF of dead pool) with a surface area of approximately 100 acres (0.4 km2). Given the size of the forebay, there is potential for changes in water quality, particularly temperature, during temporary storage in the forebay… The impact of temporary storage in the forebay on temperature and water quality depends on several factors, including meteorology, inflowing temperature and water quality, and flow rates. The changes in water quality and temperature are typically greatest at low inflow rates, due to the longer residence time in the forebay under these conditions (1 week or more). Changes also tend to be large when diversions begin, since diverted Poudre River water mixes with water that has been stored in the forebay. When inflow rates are high, the forebay has less of an impact on water quality, since the residence time in the forebay is relatively short under these conditions, on the order of 2–3 days. Generally speaking, temporary storage in the forebay results in increases in water temperatures of ~1.7 °C (3 °F) on average, though this can vary from -3.5 °C to +7.5 °C (- 6.3 °F to 13.5°F). DO decreases by ~0.5 mg/L on average and changes range from -1.5 mg/L to +1.5 mg/L. Nutrient concentrations (ortho-P, NH3, NO3) typically decrease due to algae growth in the forebay, particularly when flow through the forebay is low. TOC concentrations also decrease slightly as organic matter is mineralized in the forebay."

Comment: The forebay is small and is shallow (~8 m). It will thus not allow for significant dilution of nutrients (such as phosphorus and nitrogen, which typically are the factors limiting maximum growth potential of algae in a standing water body).

Concentrations of phosphorus and nitrogen vary seasonally in the Poudre River. When the Poudre River carries higher than normal concentrations of nutrients, the forebay could thus contain high levels of nutrients, which would not be diluted significantly and could allow for the growth of suspended algae in the forebay. This would most likely occur when low flow or no flow is entering the forebay.

Such conditions would be temporary, but algal growth response to nitrogen and phosphorus can be very rapid (doubling times of 1 day or less), which can produce an algal bloom in a matter of days. If the forebay is stagnant, which it likely will be at times under conditions that are outlined for its management as part of Alternative 2M, algal blooms in the forebay may reach nuisance proportions.

A nuisance bloom of algae would not directly cause a downstream impairment because the water will enter Glade Reservoir where it will be diluted. However, because the location where water from the forebay enters Glade Reservoir is close to the location where water is delivered out of Glade Reservoir, there is the risk that degraded water from the forebay will not be diluted in Glade Reservoir and will instead be delivered into the Poudre River. This effect would not be of long duration, but it could temporarily impair downstream waters, adversely affecting Fort Collins and others.

Algal blooms involving undesirable algal species, such as some species of blue-green algae (cyanobacteria), also could have an undesirable effect on the species composition of phytoplankton in Glade Reservoir. The forebay could seed the reservoir with undesirable species that otherwise would not persist in abundance in Glade Reservoir in the absence of a concentrated source of nuisance algal cells. The outcome of the seeding process is unpredictable, but it could adversely affect the species composition of phytoplankton in the reservoir.

The FEIS states that nutrients entering the forebay will be removed because of algal uptake, which would cause the water passing from the forebay to Glade Reservoir to have a lower nutrient content than water that entered the forebay. It is true that some of the phosphorus entering the forebay in inorganic particulate form, attached silt or clay, might settle to the bottom of the forebay and therefore not be transferred to Glade Reservoir. If this inorganic particulate phosphorus is transferred to Glade Reservoir, it would also reach the sediments of Glade Reservoir where it would not be of importance to the growth of algae. Phosphorus and nitrogen that enter the forebay in forms that could stimulate algal growth (such as dissolved inorganic, dissolved organic, or organic particulate phosphorus), will pass through the forebay into Glade Reservoir during through flow and will remain in the water column of Glade Reservoir. For these biologically-important forms of phosphorus, the forebay has no effect on Glade Reservoir as a whole. However, it is incorrect to view the forebay as a treatment facility for nutrients, as indicated in the Glade Reservoir Water-Quality Model Report. This could adversely affect Fort Collins due to the proposed use of the Pleasant Valley Pipeline, which Fort Collins uses, to transport water from Glade Reservoir to the Soldier Canyon Treatment Faculty.

Therefore, degraded water from the forebay may be flushed into the Poudre River after inadequate dilution in Glade Reservoir and may seed Glade Reservoir with the nutrients for algae blooms.

Recommendation: To avoid having degraded water from the forebay being flushed into the Poudre River and affecting the water quality of the Poudre River, Fort Collins recommends that chlorophyll *a* be monitored as part of Northern Water's long-term water quality monitoring

program, as generally described in the 2017 Fish & Wildlife Mitigation & Enhancement Plan. Triggers for management action should be identified in adaptive management plans and should support meeting the interim chlorophyll *a* cold water Lakes and Reservoir Standard for Direct Use Water Supply Reservoirs of 5 ug/L (5 CCR 1002-31), slated for adoption in 2022.

2.2.3 Releases of Glade Reservoir Water Must Be Monitored to Address Hypoxia

Glade Reservoir Water-Quality Model Report Section 7.2.1.2
"The simulations suggest that summer algae growth may cause local DO maxima in the metalimnion (see profile on 7/21/1998), but the decomposition of these algae may also cause a metalimnetic minimum to form later in the year (see profile on 9/15/1998). Toward the end of the stratified season, hypoxic (< 2.0 mg/L) DO conditions can develop at the bottom of the reservoir. In years with higher storage volumes in Glade Reservoir, such as in 1998, the hypoxic conditions are generally limited to the bottom 10 – 20 feet of the reservoir, representing a small fraction of the overall hypolimnion volume, while DO concentrations in the rest of the hypolimnion remain higher (typically around 4 – 6 mg/L). In years with lower storage, such as 1993, the hypolimnion of Glade Reservoir is much smaller and low DO concentrations are more likely to impact a large fraction of the hypolimnion prior to fall turnover (Figure 44). Once the reservoir turns over in the fall, DO concentrations near the bottom are replenished and are relatively uniform throughout the water column."

NISP Fish and Wildlife Mitigation and Enhancement Plan 5.2.1.5
"Currently, it is expected that both the low flow pipeline release and the high flow canal release would incorporate a chute feature at their outfalls into the Poudre River that contain either baffles or steps to increase dissolved oxygen and dissipate energy to prevent channel erosion, or contain in channel rock structures that would serve the same purposes."

Comment: Modeling reported in the FEIS and supporting documents shows that hypoxia is expected in the hypolimnion of Glade Reservoir. However, the documents assert that the impacts from the degraded quality of water released to the Poudre River from Glade Reservoir will be insignificant.

The hypolimnetic releases from Glade Reservoir to the Poudre River during periods of hypoxia (oxygen depletion) could contain dissolved manganese, iron, and other metals and metalloids that are commonly released in dissolved form from hypoxic sediments of lakes. If released directly to the Poudre River, the dissolved metals could cause downstream reaches to exceed water quality standards.

The 2017 Fish and Wildlife Mitigation and Enhancement Plan specifies that Northern will construct a passive aeration pathway for water being delivered out of Glade Reservoir so that the released water will be oxygenated when it merges with the Poudre River. This design feature of the outlet will likely be successful in oxygenating hypoxic waters that are leaving Glade Reservoir,

which will promote oxidation of dissolved substances such as manganese, iron, or other metals or metalloids near the point of discharge. Oxidation of metals does not always occur quickly, however, and may not be complete in transit to the river even following successful oxygenation of outflow water. Also, oxidation of metals is not a full solution to the potential problem of excessive concentrations of metals that pass from the lake sediments to the hypolimnion because of hypoxia.

Precipitated (solid) forms of metals, in addition to dissolved forms, are subject to numeric standards promulgated by the State of Colorado (through the Colorado Water Quality Control Commission) that limit concentrations of total metals (dissolved plus particulate). Therefore, even complete elimination of metals in dissolved form would not resolve the potential water quality problem of excessive concentrations for total metals in water reaching the Poudre River.

In addition to metals, phosphorus in dissolved form is often released from hypoxic sediments and could cause exceedance of future stream standards for total phosphorus. Although not currently regulated, the Colorado Water Quality Control Commission has issued interim numerical values for total phosphorus and nitrogen, which are slated for adoption in 2027 (5 CCR 1002-31, Section 31.17). Release of fixed nitrogen (i.e., excluding N_2, which is inert) is less likely, but ammonia is frequently present in hypoxic water. Ammonia, which is strictly regulated under Regulation 31 (5 CCR 1002-31), would not be fully oxidized during aeration at the discharge site.

Recommendation: To avoid degradation of Poudre River water quality by Glade Reservoir releases, it is recommended that total and dissolved metals, ammonia, total nitrogen, and phosphorus be monitored at the reservoir outlet as part of Northern Water's long-term water quality monitoring program, as generally described in the 2017 Fish and Wildlife Mitigation and Enhancement Plan. Triggers for management action should be identified in adaptive management plans and should support meeting existing standards as well as the Interim Values for cold water Lakes and Reservoirs for Total Nitrogen and Total Phosphorus (5 CCR 1002-31). Northern must prepare a contingency plan that includes design features and costs for hypolimnetic aeration of Glade Reservoir by a process that prevents disruption of water column stratification as a means of offsetting adverse effects of deep water release from the reservoir, if such effects are documented through water quality monitoring.

2.2 POUDRE RIVER WATER QUALITY COMMENTS

2.2.1 Uncertainties Inherent in the Modeling Process Must be Addressed by Northern

Cache la Poudre River Water-Quality Analysis Effects Report Section 1.3
"In February 2009, the Corps decided that a common technical platform (CTP) would be developed for several key resources potentially affected by NISP, the proposed Halligan Water Supply Project and the Seaman Water Supply Project. The CTP was developed such that environmental effects to multiple resources—surface water, groundwater, water quality, geomorphology, aquatic habitat, riparian habitat, etc.—occurring as a result of NISP, Halligan, and Seaman projects could be compared against consistently-defined

current conditions hydrology and future conditions hydrology. With three proposed projects located primarily in a single river basin and potentially impacting some of the same reaches of that river, it is important that each EIS represent the river basin using a CTP that is based on consistent data and assumptions regarding key operational aspects. To meet this objective, a series of integrated hydrologic models known as the CTP model sequence was developed to simulate current conditions hydrology, future conditions hydrology, project alternatives scenarios, and cumulative effects of the proposed project alternatives."

Comment: There is a level of uncertainty inherent to water quality modeling that is reflected in the described Poudre River water quality impacts from Alternative 2M. This level of uncertainty is magnified by the fact that information about other future proposed reservoirs expansions was not available at the time of modeling.

Recommendation: Northern should be accountable for mitigation of water quality problems caused by Glade Reservoir, including unexpected exceedance of stream standards not predicted by current modeling. 40 C.F.R. § 230.10(d) (no CWA Section 404 permit shall be issued "unless appropriate and practicable steps have been taken which will minimize potential adverse impacts"). Moreover, Northern should work with other stakeholders to strengthen and integrate existing water quality monitoring programs on the Poudre River and use proposed adaptive management framework to mitigate the effects of changes in water quality resulting from NISP operations. The CWA and NEAP require the FEIS and Record of Decision include adequate mitigation measures. *See Robertson v. Methow Valley Citizens Council*, 490 U.S. 332, 352 (1989) (stating that mitigation measures should be "reasonably complete" and be discussed in "sufficient detail"); *Bering Strait Citizens for Responsible Res. Dev. v. United States*, 524 F.3d 938, 955 (9th Cir. 2008) (explaining that mitigation measures should be developed to a "reasonable degree"). Courts have rejected adaptive management plans where agencies have failed to use definite criteria or standards. *See, e.g., Natural Res. Def. Council v. Kempthorne*, 506 F. Supp. 2d 322, 387 (E.D. Cal. 2007) ("Adaptive management is within the agency's discretion to choose and employ, however, the absence of any definite, certain, or enforceable criteria or standards make its use arbitrary and capricious under the totality of the circumstances."); *Nat'l Wildlife Fed'n v. U.S. Army Corps of Eng'rs*, 92 F. Supp. 2d 1072, 1078 (D. Or. 2001) (explaining that the Corps' adaptive management approach provided the court with insufficient information to rule on summary judgment).

2.2.2 Northern Must Be Responsible for 303(d) Listing Issues

Cache la Poudre Water-Quality Analysis Effects Report Section 3.3

"As a basis for the qualitative analysis, five questions were addressed for each constituent. The purpose of these questions was to develop multiple lines of evidence regarding potential changes in constituent concentrations… Proxy constituents, in this context, are constituents quantitatively evaluated in the model that demonstrate similarity in sources and behavior to a constituent evaluated qualitatively. In this case, quantitative estimates of concentration changes for a proxy constituent can be used to help inform the qualitative

evaluation of a related constituent. The evaluation and interpretation of these individual lines of evidence provide an estimate of potential direction and magnitude of changes in water quality. Recognizing the inherent uncertainty of this process, the results are descriptive in nature and provide less detail than quantitative estimates."

Comment: There is a lack of regulatory context for water quality impairment predicted by the modeling underlying the FEIS. Specifically, some degradations of river water quality by Alternative 2M are identified by modeling, as given in the FEIS and supporting documentation, but are not framed in terms of 303(d) listings. *See* 33 U.S.C. 1313(d).

It is important that the Corps impose binding permit conditions on Northern to guarantee Northern's duty to assist Fort Collins or other affected parties in correcting and mitigating water quality problems resulting from the Project that either cause a new 303(d) listing that did not exist prior to implementation of the Project or exacerbate an existing 303(d) listing. The following are examples from the FEIS where 303(d) listing may occur or existing listing may be exacerbated as a result of Alternative 2M:

- Segment 12 of the Poudre River is currently on the Colorado Department of Public Health and Environment's ("CDPHE") Monitoring and Evaluation List due to elevated pH and Segment 12 regularly exceeds the State's interim nutrient criteria. Changes in peak flows during May-July in Segment 12 of the Poudre River are predicted to significantly increase temperature, nutrient concentrations, sediment aggradation and periphyton standing crop near the Fossil Creek confluence. Combined, these changes may negatively impact the aquatic life community within this reach and increase the likelihood of 303(d) listings for nutrients, pH and dissolved oxygen (with increased photosynthesis and metabolism).

- Concentrations of selenium and iron in Segment 12 near the Fossil Creek confluence are also predicted to increase during May-July. Concentrations of these constituents are already elevated as compared to aquatic life standards.

- Segment 12 of the Poudre River is currently on the 303(d) list because the recreational use is impaired due to elevated E. coli concentrations. During May-July, this segment is predicted to see large increases in E. coli concentrations; the higher end of the range of predicted increase would be above the CDPHE's standard. The timing of the loss of dilution flows will make it even more difficult to meet the standard. A total maximum daily load ("TMDL") for this segment is currently being developed by CDPHE; it is very important that the State of Colorado recognize the timing and magnitude of flow reductions when developing TMDL models and assigning load and waste load allocations.

- Water temperature near the transition between Poudre River Segments 11 and 12 (near the Boxelder Creek confluence with the Poudre River) is predicted to increase considerably under current and future conditions using Alternative 2M. It can be assumed that these temperature changes would also occur on the Poudre River at the outfall of the Drake Water Reclamation Facility ("Drake Facility") and the Poudre River below the Fossil Creek

confluence. These changes would increase the risk of exceeding CDPHE's aquatic life warm water temperature criteria in both segments and could affect Fort Collins' ability to discharge to the Poudre River.

Recommendation: Northern should commit to being involved as a stakeholder during any 303(d) listing process and/or TMDL development, and commit to adjusting Glade Reservoir operations where possible to help reduce constituent concentrations of interest. In addition, Northern Water should commit to work with other stakeholders to strengthen and integrate existing water quality monitoring programs on the Poudre River and use an adequate proposed adaptive management framework to mitigate the effects of changes in quality and reduced flows on aquatic life.

2.3 FORT COLLINS WASTEWATER OPERATIONS COMMENTS

2.3.1 Northern Must Not Reduce Dilution Flows at the Mulberry Water Reclamation Facility Discharge Location

Cache la Poudre River Water-Quality Analysis Effects Report Section 1.2.2
"Alternative 2M is a modified version of NISP Alternative 2 and is the Applicant's preferred alternative. As with Alternative 2, Alternative 2M would include construction of Glade Reservoir and Upper Galeton (Figure 3). Also, like Alternative 2, these new reservoirs would be filled by diversion to the Poudre Valley Canal and the SPWCP, respectively. There is, however, one key difference between Alternative 2 and Alternative 2M. Alternative 2M is designed to increase the amount of water in the river between the Poudre Valley Canal and the Mulberry Water Reclamation Facility (Mulberry WRF) outfall. This is achieved by delivering a fraction of the water to Participants via a new diversion. This new diversion would be located immediately above the Mulberry WRF outfall (RM 43, Figure 3) to maintain higher water quality for delivery to project Participants. Water is either left in the river through lower diversions at the Poudre Valley Canal (compared to Alternative 2) or added back to the river by release from Glade Reservoir for subsequent diversion at the new NISP diversion location downstream (~0.1 miles upstream of the Mulberry WRF outfall). As a result, flow rates during low flow periods tend to be higher from the Poudre Valley Canal to the Mulberry WRF outfall for Alternative 2M as compared to Alternative 2."

FEIS Section 4.3.2.6.1
"The Mulberry WRF discharges to the Poudre River downstream of the Lincoln Street Gage (Figure 4-20). Chronic annual low flow values decrease from 1.6 cfs under Current Conditions hydrology to 1.4 cfs and acute annual low values remain unchanged at 0.2 cfs. Beneficial effects can occur at times due to requirements associated with the exchange of diversions from the Larimer-Weld Canal to the Poudre Valley Canal. Chronic WQBEL values are slightly lower for all modeled water quality constituents in Alternative 2M except E. coli. Changes are typically less than 3% compared to Current Conditions hydrology. Acute WQBEL values are unchanged. Chronic ammonia WQBEL values are generally less than 2% lower than Current Condition Effects in the majority of months.

Acute ammonia WQBELs show increases and decreases of less than 2% or no change depending on the month. Chronic MWAT temperature WQBELs from April to September for Alternative 2M are less than 0.8°C higher than Current Conditions hydrology, while acute DM values range from zero to 1.1°C higher than Current Conditions hydrology."

See also FEIS Sections 4.2.5.4, 5.3.4.2.5-6, 5.3.4.4, S.6.2.1.2, 5.3.4.2.1-5.3.4.2.7, 4.3.2.5.1,4.3.2.6.1, 4.3.2.6.2, 5.3.4.5.2 regarding specific constituents.

Comment: Without a specific mitigation requirement for Alternative 2M, effluent limits established at 5-year intervals by Colorado Water Quality Control Commission permitting of treated wastewater discharge by the Mulberry Water Reclamation Facility ("Mulberry Facility") likely will become more stringent as a result of reduced dilution flow in the Poudre River near the Mulberry Facility's outfall.

The discharge permit limits for Fort Collins' Mulberry Facility are calculated based on the available dilution flows in the Poudre River at the permitted outfall. These dilutions flows allow for less stringent effluent limits than would be required without these flows. Under the Mulberry Facility's current five-year permit, the annual regulatory dilution (regulatory low flow) for Mulberry Facility is 1.6 cfs for chronic (30-day) low flow and is 0.2 cfs for the acute low flow. Because of the relatively small size of the permitted effluent discharge (6 mgd, 9.3 cfs), the small dilution flows are significant to Fort Collins in meeting effluent limits.

Flow that in the past has reached the Mulberry Facility derives from diffuse upstream sources, including ground water accretions and some small overland flow in wet weather. Most critical is ground water accretions, which persists even in dry weather. Under Alternative 2M, a new NISP diversion of flow from the Poudre River will occur 0.1 mile above the Mulberry Facility outfall. Therefore, the diversion structure will receive the diffuse flow that was received in the past by the Mulberry Facility.

In theory, strict water administration could allow the Mulberry Facility to continue to receive the dilution flow as in the past, and Northern could, at the same time, take the full amount of water from the Poudre River corresponding to its deliveries upstream (less transit and other losses). In reality, however, several complications that make this outcome very unlikely to succeed in providing dilution flows for the Mulberry Facility.

Water flows to be managed at the new Poudre River diversion by Northern will be large compared with the small amount of water that would match the flows that are now reaching the Mulberry Facility. Therefore, as a practical matter, ensuring that Northern only takes the water equal to its deliveries from Glade Reservoir (less transit and other losses) will need to occur on a day-to-day basis, and would require the installation and operation of appropriate monitoring equipment for water flow in small amounts at and below the diversion.

Northern could thus inadvertently deprive the Mulberry Facility of a portion of these flows because of estimation errors in accounting for water losses in the Poudre River that occur between the

upstream point of delivery of Glade Reservoir water into the Poudre River and the downstream point of re-diversion of such water. Although standard allowances likely will be made for these losses (e.g., 0.25% per mile), the allowances are estimates, and the needed flow for the Mulberry Facility likely falls within the margin of error for the estimated losses. Thus, the estimates will likely lead to reductions of the historical flow for the Mulberry Facility in some instances.

The Water Quality Control Division, which issues discharge permits at five-year intervals, uses an algorithm (known as "DFLOW") for quantifying the dilution flow credit for a wastewater discharge. The basis for the DFLOW calculations is a daily record of discharge. DFLOW calculates low flows for acute (1-day) and chronic (30-day) conditions; the lowest daily and monthly DFLOW values are used as annual regulatory flows. Weekly DFLOWS also are calculated. Specific water quality constituents differ in application of DFLOW values. For example, for chronic conditions, metals follow annual DFLOWs, temperature follows weekly DFLOWs, and ammonia follows monthly DFLOWs. In other words, all time intervals are significant in application of DFLOW to determination of effluent limits.

The DFLOW algorithm chooses low flows based on the daily record. The algorithm is complex; it does not identify the single lowest flow as the regulatory limit, but DFLOW values typically are close to the lowest flow. Because the computation is based on daily data, a few days per year of zero flow would reduce the acute low flow to zero, and would reduce the chronic low flow, which is calculated from running 30-day averages. Furthermore, because the calculations are made from a 10-year record of flow, even one year during which small flows were improperly managed could result in a very adverse DFLOW values for chronic and acute conditions used in permitting. Therefore, the flow management related to regulatory flows, which has not been necessary in the past because of the natural flow conditions, is quantitatively more demanding than typical water management for the amounts of water that are of interest to Northern.

Some specific consequences for the Mulberry Facility that would result from depletion or loss of low flows as calculated from the DFLOW algorithm include lower (more stringent) effluent limits for the many constituents that are subject to water quality standards. These would include heavy metals, for example or, in the future, concentrations of total nitrogen, total phosphorus, and increasingly stringent standards for ammonia. Depletion or loss of regulatory low flows also would have an adverse effect on compliance with the temperature standard. For some of these constituents, a requirement that the Mulberry Facility meet stream standards without the benefit of dilution could exceed the capabilities of the facility, which would lead to a regulatory demand for major changes in the facility.

Failure of the Mulberry Facility to meet standards could create new 303(d) listings for the Poudre River below the discharge or exacerbate recognized water quality problems that currently exist. Knowingly contributing to the increase of concentrations in a 303(d) listed segment is not allowed by the regulatory authority. *See* 40 C.F.R. 230.10(b)(1) (The Corps cannot permit a project if it contributes to a violation of water quality standards).

Recommendation: Northern should be required to guarantee a minimum flow of 2 cfs at the Mulberry Facility's point of discharge to ensure that historical low flows are maintained on a daily, monthly, and annual basis for both acute and chronic conditions at the point of discharge. This should be achieved with accurate flow monitoring of water that merges with effluent form the Mulberry Facility. Alternatively, Northern should agree to bear the cost of renovating the Mulberry Facility as needed to comply with stream standards in the absence of effluent dilution.

2.3.2 Flows for the Mulberry Water Reclamation Facility Were Calculated Incorrectly and Must Be Corrected

Cache la Poudre River Water-Quality Analysis Effects Report Section 3.4.1
"Low-flow values were calculated using the EPA software package DFLOW (v4.0; Rossman, 1990). This software allows the calculation of acute and chronic low-flow values from a series of daily flow values. The acute low flow (1e3) used to develop WQBELs for acute conditions is the one-day low flow with a three year recurrence interval. WQBELs for chronic standards use the chronic low flow (30e3), which is a 30-day average low flow with a three year recurrence interval. The WQBEL for the maximum weekly average temperature (MWAT) is based on the 7-day average low flow with a three year recurrence interval (7e3). Individual monthly low-flow values are used as input values for the ammonia and temperature WQBELs. Annual low-flow values, calculated as the minimum of the monthly low-flow values, are used for other WQBEL calculations. A 26-year period (November 1979 through October 2005) of daily flow values was used for the calculation of low-flow values. Monthly low flows from the CTP model were disaggregated to provide this 26-year period of daily flows. The methods and basis for this disaggregation are described in Hydros (2018c). In the case that the acute low flows calculated from DFLOW were higher than the corresponding chronic low flow, the acute low flow was set to the chronic low flow. This methodology is consistent with methods used by CDPHE (CDPHE, 2011)."

Cache la Poudre River Water-Quality Analysis Effects Section 4.2.4 (Table 6)
Statement: *"Table 6. Maximum WWTF Discharge Rates (cfs) for Current (Run 1) and Future (Run 2) Conditions"*

Facility Name	*Run 1*	*Run 2*
Mulberry	*3.8*	*5.7*
Boxelder	*5.5*	*8.0*
Windsor	*2.0*	*2.0*
Carestream	*2.0*	*2.0*
Front Range Energy	*0.46*	*0.46*
Greeley	*21.8*	*34.6*
Leprino	*0.99*	*0.99*

Comment: Estimates of the effects of Alternative 2M on effluent limits at the Mulberry Facility were made incorrectly with historical effluent flows rather than with design capacity effluent flows, which are higher, as required by the Colorado Water Quality Control Division for permitting purposes. Additionally, regulatory low flows for permitting of the Mulberry Facility facility were modeled on the basis of a 26-year upstream flow record, which obscures variance across individual 10-year intervals, as used in permitting.

Recommendation: The analysis must be revised based on the above comments before a CWA permit can be issued by the Corps. *See* 33 C.F.R. 325, Appendix B, Section 9.B.13 (The Corps "should consider all incoming comments and provide responses when substantive issues are raised which have not been addressed in the final EIS."); *Alliance to Save the Mattaponi v. U.S. Army Corps of Eng'rs*, 606 F. Supp. 2d 121, 132 (D.D.C. 2009) (requiring Corps to "demonstrate that it has considered significant comments and criticisms by explaining why it disagrees with them; it may not dismiss them without adequate explanation.").

2.3.3 Poudre River Water Quality Based Effluent Limits Should Be Analyzed

FEIS Section 5.3.4.5

"The constituents, temperature, and ammonia WQBEL analysis and calculation of low flows provides an approximation of values based on water quality and temperature modeling and predicted flows (Hydros 2018H). Results of the analysis for the eight WWTFs on the Poudre River for Future Conditions Effects and Cumulative Effects should be considered as the estimated direction and relative magnitude of change for comparison of alternatives, rather than absolute values."

Examples of model results of adverse stream impacts in Segment 11 are found in FEIS Section 5.3.4.2.5 (Total Nitrogen) and FEIS Section 5.3.4.2.6 (Total Phosphorus).

Examples of model results of increased WQBEL values are found in FEIS Section 5.3.4.5.1 (Mulberry Facility) and FEIS Section 5.3.4.5.2 (Drake Facility).

Comment: The water quality modeling completed for the FEIS does not quantitatively describe the forecasted changes in water quality constituent concentrations in Segments 11 and 12 of the Poudre River. Rather, it merely describes the direction and relative magnitudes of change that the project alternatives will have on the Poudre River water quality. An EIS must properly consider the effects of a proposed action which requires "some quantified or detailed information"; general statements about possible effects "do not constitute a hard look." *Klamath-Siskiyou Wildlands Ctr. v. Bureau of Land Mgmt.*, 387 F.3d 989, 993-94 (9th Cir. 2004) (holding that while qualitative statements at times are suitable, there are "clearly variables that can be quantified").

This omission is important because water quality based effluent limits ("WQBEL") calculations are based on the water quality of the stream receiving the discharge in addition to impacts from reduced stream flows. If there is degradation from NISP activities of stream water quality at a discharge outfall, it will result in more stringent effluent limits for the discharger when the permit

is renewed. The water quality modeling results predict some adverse impacts to Segment 11 of the Poudre River, where both the Mulberry Facility and the Drake Facility have permitted discharges. The WQBEL analysis in the FEIS confirms that these reduced flows and water quality impacts from NISP will have an adverse impact on the operations of Mulberry and Drake Facilities, but do not provide a quantitative net effect. Furthermore, it clearly states that outputs should not be compared to regulatory standards and are for alternative comparisons only.

Without a quantitative description magnitude, duration and frequency of changes caused by NISP for key water quality constituents and without correcting errors in WQBEL calculations (See comment 2.3.2), it is impossible for Fort Collins to estimate the impact the of these likely changes to future wastewater discharge permit limits or to estimate the associated financial impact the Fort Collins would incur because of required upgrades to meet those new stricter limits. It is expected however, that even small negative changes in receiving water quality could translate to very large financial impacts, as a direct result of NISP.

Recommendation: Northern should be required to prepare a quantitative estimate of net impacts to Fort Collins' effluent limits for all water quality constituents included in the City's current wastewater discharge permits, including industrial pretreatment operations, to inform planning process and enable estimation of potential financial impacts to Fort Collins. Without a quantitative analysis, Northern cannot fully and adequately assess the impacts under NEPA and the CWA. *Wyoming Outdoor Council v. U.S. Army Corps of Eng'rs*, 351 F. Supp. 2d 1232, 1244 (D. Wyo. 2005) (explaining that "impacts to water quality should be considered when there is the potential that a § 404 permit will significantly affect water quality"); *see also San Juan Citizens All. V. U.S. Bureau of Land Mgmt.*, No. 16-cv-376-MCA-JHR, 2018 WL 2994406, at *18-19 (D.N.M. June 14, 2018) (holding that by failing to quantify the impacts of water quantity, BLM "failed to meet its duty to take a hard look at the environmental impacts of the proposed action").

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For Discussion Purposes Only – Subject to Change
DRAFT – September 19, 2018 -- DRAFT

SECTION 3: GEOMORPHOLOGY-RELATED COMMENTS

The Poudre River's geomorphological response to Alternative 2M is a key concern for Fort Collins because it directly affects flood risk and stream functions. The following comments describe the City's concerns over the accuracy of the predicted impacts on flood risk and Poudre River health and function that are described in the FEIS.

Fort Collins is a national leader in flood management. Decades of strategic investments in reducing flood risks have resulted in Fort Collins being one of only seven communities in the United States with a FEMA Community Rating System ("CRS") score of 2 or lower, and the only Colorado community with a CRS score under 5. The Class 2 CRS rating results in many benefits including a 40% reduction in flood insurance premiums in Fort Collins.

To ensure that Fort Collins' nationally-recognized flood management program continues to be effective, the Poudre River's capacity to carry flood flows must be sustained. The Poudre's capacity to carry flood waters fundamentally depends on: 1) maintaining the depth and width of the river channel, and 2) minimizing increases in resistance to flow. Unless capacity reductions are adequately addressed, flood risk will be increased in Fort Collins.

Aquatic and riparian functioning condition are directly reliant on geomorphic condition as well. Fish and riparian birds depend on insects that emerge from the bottom of the river as a critical food source. If the spaces between the substrate of rocks on the bottom of the river (also known as the river "bed") become clogged with sand and silt, then many of these types of river insects will be reduced in numbers and the food base will increasingly become dominated by more worm-like species that are a less preferable food source for cold water and transition zone fish.

In a healthy river, annual flows that fill or nearly fill the river channel clean and rejuvenate the river bed. The spring flows that fill or nearly fill the river channel have the power to flush away sand and silt between rocks and open up spaces in the river bed that provide safe habitats with plenty of dissolved oxygen for river insects to grow and for fish to spawn. If the power of these annual floods is reduced by the water diversions proposed for NISP, the river could cross a threshold where the spaces between the gravels in the river bed are rarely cleaned and the insect and spawning habitats are no longer maintained often enough to support the life cycle needs for various river life. The end result would be a loss of essential habitat and food sources for many animals and these effects could cascade throughout the river ecosystem

The flows that maintain the river's capacity to carry floods are the same flows that clean the river bed and maintain the food base for trout and birds. Thus, effective management and maintenance of peak river flows in terms of how often and how long they occur year by year can create a win-win situation: valuable benefits for flood management, infrastructure, recreation, and wildlife.

Fort Collins has significant concerns about the conclusions in the FEIS and these concerns are supported by internationally renowned subject matter experts and based on FEIS flow data,

fundamentals of geomorphic theory, local analysis, and other observational lines of evidence. Fort Collins' perspective, based on FEIS hydrology, is that:

- NISP will reduce the river's capacity to move sediment through the City.
- NISP will accelerate the establishment of woody vegetation along the river channel, thereby reducing the capacity of to convey flood waters in the river channel.
- NISP will reduce the flows that clean the river bed and maintain the food base for trout, birds, and other wildlife (in terms of both how often and how long the flows do the work of cleaning the river bed).

The interplay between water and physical elements (geomorphology) in a post-NISP world will determine outcomes for both flood risk and ecosystem health. For this reason, Fort Collins is relying on underlying geomorphic analyses to demonstrate logical internal connections, the use of substantiated theories, observational models that include the full suite of field evidence and consistent reporting across FEIS documents. Fort Collins remains extremely concerned that NISP FEIS and associated geomorphic analyses does not meet this criterion. Fort Collins remains concerned that NISP will cause measurable changes to channel size and the river's physical condition and that the FEIS inadequate analyses lead to underestimation of impacts and insufficient mitigation.

Fort Collins has reviewed the FEIS and related reports to understand the assumptions, methods, analyses, and conclusions reached regarding the current conditions of the Poudre River and the potential impacts of NISP operations. The Stream Morphology and Sediment Transport Technical Report presented conclusions on impacts to the Poudre River from NISP flow operations, including conclusions pertaining to potential impacts to various environmental flows, sediment transport, vegetation encroachment, and channel narrowing.

In response to deficiencies in those reports and conclusions, additional analyses were performed to garner a better understanding of how NISP might impact resiliency and flood risk in Fort Collins, as it pertains both to the Poudre River and the people affected by its flood storage benefits, recreational values, and ecological functions. These additional analyses included hydraulic modeling of a wide range of flow conditions in the river, calculations of bed mobility and sediment transport capacity, historic data review, and field observations and measurements. The results of these analyses are presented and interpreted in Appendix B (Fort Collins Geomorphology Report). From these analyses, three general comments have been identified and are discussed below.

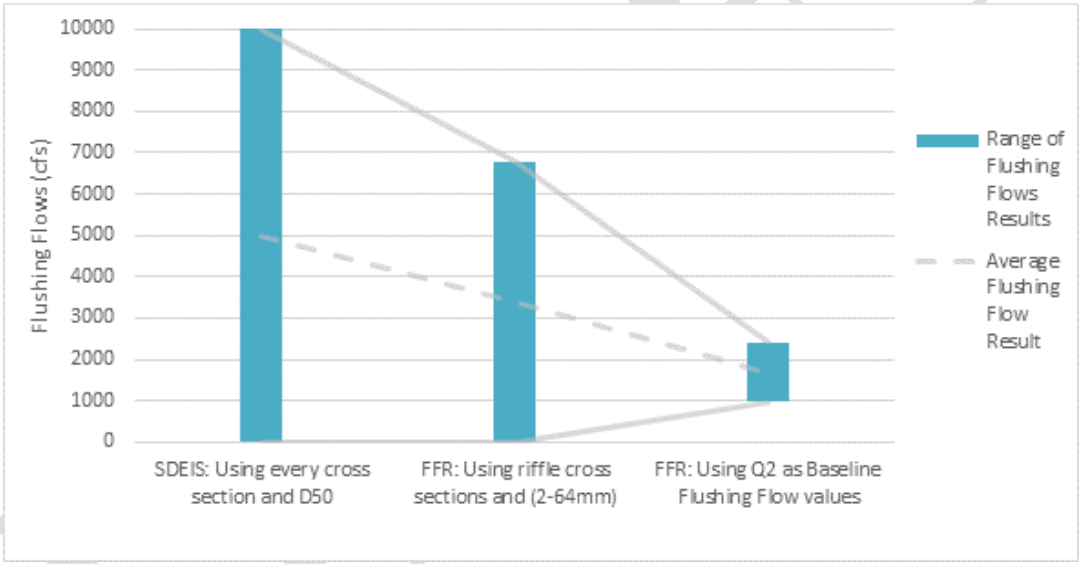
3.1 GENERAL GEOMORPHOLOGICAL COMMENTS ON THE FEIS

3.1.1 Inconsistencies and Inadequacies in Geomorphic Analysis in the FEIS Stream Morphology and Sediment Transport Technical Report Must Be Addressed

Comment: The basis for the selected geomorphology methods and conclusions are not supported by the best available science and data. *See* 40 C.F.R. § 1500.1(b) (NEPA requires "high-quality . . . accurate scientific analysis"); *New Mexico ex rel. Richardson v. Bureau of Land Mgmt.*, 565 F.3d 683, 713 (10th Cir. 2009) (explaining that an agency must consider "the relevant data and

articulate a rational connection between the facts found and the decision made"). The Corps cannot rely on inaccurate data or assumptions. *See Native Ecosystems Council v. U.S. Forest Serv.*, 418 F.3d 953, 964-65 (9th Cir. 2005) (holding that "to take the required 'hard look' at a proposed project's effects, an agency may not rely on incorrect assumptions or data in an EIS"); *see also Sierra Club v. Van Antwerp*, 526 F.3d 1353,1368 n.6 (11th Cir. 2008) (stating that the Corps "must independently evaluate the information" and "shall be responsible for its accuracy") (quoting 33 C.F.R. § 325 App. B. § 8(f)(2)). Also, the interpretation of those results is not always consistent with the results themselves.

A wide range of flow magnitudes was used during the studies leading up to the FEIS and assumed to satisfy the flushing criteria. The figure below presents a graphic illustration of how the range of flows required to meet the selected definition of flushing flows changed throughout the process leading to the FEIS. (In this figure, "FFR" refers to Flushing Flows Report, 2017.) The range is ultimately a reflection of shifting definitions, changing assumptions, and an apparently arbitrary selection key values.



The final range of flushing flow values used in the FEIS ignores the detailed sediment transport calculations presented previously in EIS documents that reflect the considerable complexity and variability of sediment transport dynamics along the Poudre River. The value used in the FEIS appears to be a value based on a flow recurrence interval, though the basis for that interval is uncertain. Given the long history of flow extraction and channelization on the Poudre River through Fort Collins, recurrence intervals are moving targets that poorly characterize the modern hydrologic and sediment regimes. Furthermore, Fort Collins is unaware of any peer-reviewed justification for the determination of a flushing flow value based on a particular recurrence interval discharge. While there is no absolute legal requirement that a methodology be peer reviewed, an agency must acknowledge and discuss any flaws in its chosen method. *All. For the Wild Rockies v. Bradford*, 720 F. Supp. 2d 1193, 1222 (D. Mont. 2010) (holding that the "Forest Service [could]

not simply rely on [a study] as the best scientific information available; it must acknowledge and discuss any flaws").

The FEIS also dismisses many of the impacts on the assumption that the Poudre River is sediment supply-limited. The FEIS includes similar statements when presenting the results of technical analyses, but then disregards or downplays them in the FEIS's conclusions. The argument for minor impacts hinges on the assumption that the Poudre River through Fort Collins is "sediment supply limited." However, this assumption is unfounded because sediment supply has not been quantitatively assessed to verify the asserted supply limited classification. The CWA and NEPA require that the Corps and Northern meaningfully assess these impacts and correct errors pointed out by Fort Collins, including the flow values used in the FEIS. *See Sierra Club v. United States Army Corps of Engineers*, 701 F.2d 1011, 1029 (2d Cir. 1983) (An EIS must ensure "the integrity of the process of decision by giving assurance that stubborn problems or serious criticisms have not been 'swept under the rug.'").

The results of additional Fort Collins analyses show that the flood capacity and habitat quality of the Poudre River is susceptible to episodic inputs of sediment. Further, the reductions in sediment transport capacity produced by the selected alternative and proposed mitigation plan will exacerbate the channel narrowing and loss of flood capacity currently observed in the Fort Collins reaches of the Poudre River.

While a stronger physical signature of sediment storage may exist downstream of I-25, the Alternative 2M will reduce the transport capacity of river reaches in Fort Collins to levels below those now experienced downstream of I-25. This will exacerbate the channel narrowing and sediment storage already observed upstream through Fort Collins. The FEIS disregards this key conclusion based on an unsupported assumption that the channel is sediment supply limited. *See Or. Natural Desert Ass'n v. Jewell*, 840 F.3d 562, 570 (9th Cir. 2016) (finding a violation of NEPA because "inaccurate information and unsupported assumption materially impeded informed decisionmaking and public participation"). Risk and consequence are extremely high for Fort Collins due to broad implications for impacts to flood mitigation, infrastructure, recreation, and wildlife habitat.

3.1.2 Inadequacies in Geomorphic Analysis Must Be Addressed

Comment: The modeling methods and assumptions used in the FEIS are inadequate to predict and evaluate the impacts of NISP on sediment flushing and flood risk. The incorporation of other assessment methods that add context to and qualify the modeling calculations, lead to conclusions contrary to those presented in the FEIS. Under the CWA, when the Corps receives contradictory evidence, it must "conduct a thorough examination of the record [and] explain why it has rejected or ignored contradictory evidence." *Islander E. Pipeline Co. v. Conn. Dep't of Envtl. Prot.*, 482 F.3d 79, 99–100 (2d Cir. 2006).

Uncertainty in the shear stress calculations and comparison with the tracer rock observations suggest that capacity and competence calculations, performed with 1D model hydraulics, are alone

insufficient for the determination of flushing flows. Other evidence needs to be considered along with more rigorous analytical tools. It is apparent from field investigations (presented in the attached Fort Collins Geomorphology Report) that a biofeedback loop is occurring on the Poudre River through Fort Collins and the results presented in the EIS documents indicate that NISP will exacerbate this channel narrowing behavior and ultimately increase flood levels and risk to private property and infrastructure located in the floodplain.

3.1.3 Additional Analysis Suggest that the FEIS Substantial Underestimates Alternative 2M's Impacts

Comment: The evidence presented in the attached Fort Collins Geomorphology Report establish that the anticipated changes to Poudre River flows from Alternative 2M will reduce flood carrying capacity and simultaneously degrade riverine habitat. The expected stream response to Alternative 2M will include rapid vertical accretion of bars at the channel margin leading to a reduction in conveyance; recolonization of the newly formed bars by vegetation leading to increased roughness; and an associated reduction in channel topographic complexity, leading to a homogenous, more canal-like Poudre River. The cumulative impacts equate to increased flood risk and decreased ecologic function through Fort Collins. A discussion of the cumulative environmental impacts is an essential part of the environmental review process. *Colo. Envtl. Coal. v. Office of Legacy Mgmt.*, 819 F. Supp. 2d 1193, 1213-14 (D. Colo. 2011) (holding that the agency had failed to adequately address the cumulative impacts of its decision).

As a national leader in flood management, Fort Collins has made substantial investments in mitigation of flood hazards along the Poudre River corridor. Fort Collins has embraced the vision of a healthy and resilient Poudre River. Fort Collins has official policy to support such health and resiliency improvements. Increases in flood risk and alterations that require increased maintenance (cost and time investment) to sustain current levels of flood protection are not acceptable and impose additional risk on Fort Collins. Additionally, changes to flushing flows are unacceptable when they notably reduce the ability of the channel to maintain the current active width, as this limits in perpetuity Fort Collins' ability to achieve its vision of a healthy and resilient river

Sweeping fine particles from the surface of the river bed is not a sufficient flushing objective for Fort Collins, nor is it based in a realistic understanding of how the channel bed functions. Without effective channel maintenance flows, increases in channel roughness resulting from encroachment of woody vegetation that increases in height and stiffness over time will lead to reduced flow conveyance in the channel, channel straightening, and a reduction in habitat diversity. As predicted by Fort Collins' Ecological Response Model[1], the channel will shrink and become more limited in its capacity to absorb and convey large flood events within current floodplain extents. Fort Collins will need to invest more heavily in maintenance to avoid increased flood hazards. The proposed mitigation measures are unrealistic; conveyance will be lost in locations where adjacent land is not available to be repurposed for flood mitigation.

[1] See https://www.fcgov.com/naturalareas/eco-response.php

Overall, Fort Collins' additional analyses indicate that:

- Sediment transport processes on the Poudre River may be currently functioning more than the FEIS and associated reports indicate; and
- The Poudre River has adequate sediment supply to generate substantial accumulation along the channel margin, building new surfaces upon which vegetation can colonize and, as a consequence, triggering further sediment storage.

Field-based results have also underscored the uncertainties inherent in analyses of river bed mobilization based on one-dimensional and uncalibrated hydraulic models. The FEIS relies heavily on computer modeling alone, but the additional Fort Collins analyses (including the attached Fort Collins Geomorphology Report) show that these tools in isolation are insufficient to understand the impacted river processes and must be tempered with field evidence. *See Mountaineers v. U.S. Forest Serv.*, 445 F. Supp. 2d 1245, 1250 (W.D. Wash. 2006) (holding that an agency failed to adequately assess the cumulative impacts of a proposed action because no actual "in-the-field study" had been conducted and the agency had simply relied upon a general, hypothetical analysis). These findings suggest that the predicted impacts of Alternative 2M on current conditions presented in the FEIS may be significantly underestimated.

3.2 ADDITIONAL SPECIFIC GEOMORPHOLOGICAL COMMENTS ON THE FEIS

3.2.1 Peak Flow Operations Program Is Unclear and Its Adverse Impacts Are Not Considered

FEIS Section 4.4.3.1.2
"The Peaks Flow Operations Program would reduce the impacts of Alternative 2M on flushing flows that are ciritcal to spawning habitats for fish. […] From a hydrologic perspective, the Peak Flow Operations Program would increase the frequency of peak flows to more closely resemble the recurrence interval for historic hydrologic conditions. It would also lessen the impacts of Alternative 2M on geomorphology and sediment transport associated with reduced occurrence of peak flows (2% exceedance and 1- to 2-year floods).

[…] The Peak Flow Program does not specify what ither flow range would be reduced in order to maintain firm project yield. Without additionla detail, the overall impact of Alternative 2M with the Peak Flow Operations Program on overall stream morpholpgy and sediment transport id unknown. In the absence of more detailed informaiton, the impact of Alternative 2M with the Peak Flow Operations Program would remain minor upstream of I-15 and moderate downstream of I-25, as described in the impact summary (Table 4-50). The overall effect on flushing flows after considering the Pleak Flow Operations Plan would be minor."

FEIS Section 4.2.3.3.1
"Northern Water developed a Peak Flow Operations Program to minimize the potential effect of NISP operations on peak flows, which act to flush out course gravels and help

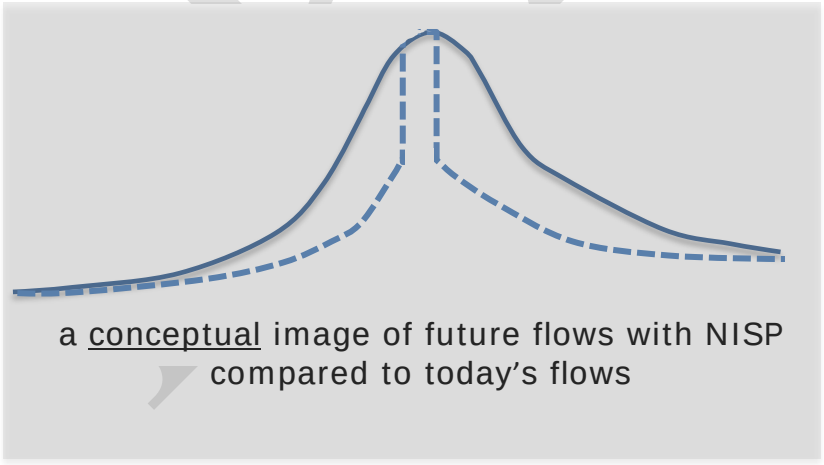
maintain spawning habitat. […] Following the peak flow event, Northern Water would attempt to increase diversions and make up a portion of the volume bypassed assuming the Grey Mountain water right remained in priority."

Comment: One of the key principles presented throughout the FEIS is that changing flows will affect Poudre River ecosystems and habitats. While Fort Collins appreciates the effort taken by Northern to develop the Peak Flow Operations Program, Fort Collins has two key concerns.

First, the Peak Flow Operations Plan is described in the 2017 Fish and Wildlife Mitigation and Enhancement Plan.[2] However, there is some uncertainty how certain aspects of the Peak Flow Operations Plan will be implemented, which results in uncertainty regarding how many peak flow bypasses will result. This leaves Fort Collins with uncertainty over the future hydrology and the degree to which flushing flows will occur. The following are examples of this uncertainty:

- Table 6 of the 2017 Fish and Wildlife Mitigation and Enhancement Plan describes that the operational tiers will be determined partially based on whether the streamflow forecast indicates if the streamflow will be greater or less than the average. However, how the streamflow will be forecasted and how the average will be calculated is not explained.
- The Peak Flow Operations Program tiers are based partially on the Glade Reservoir storage level on May 1st. However, in certain years, this could allow for Northern to manipulate the Glade Reservoir storage level to change the tier to be used that year.

Second, it appears that Project diversions following peak flow bypasses will be increased, which will likely have different impacts that do not appear to have been analyzed. This time period following peak flows ("descending limb") is ecological and recreationally significant.



[2] Under Tier 2a of Peak Flow Operations Program, bypasses will occur only to the extent that it is necessary to bring the flow at the Canyon gage up to 2,800 cfs. As indicated in previous comments, Fort Collins disagrees with the use of the 2,800 cfs value for flushing flows.

However, impacts to the Poudre River from such a modified descending limb are not analyzed in the FEIS. The conceptual image above is Fort Collins' current understanding of how NISP's peak flow operations Program may affect current flows. The impacts to the descending limb will shorten duration of peak flows which will result in impacts to geomorphology, riparian and wetland habitat. It may cause more rapid declines in river flow, which could preclude successful establishment of cottonwood seedling. Rapid declines in flow could also cause stranding of fish and affect critical life cycle behaviors such as spawning and migration patterns of the small native fish. It could reduce sediment transport and increase aggradation through Fort Collins which would result in increased flood risk. Last, if flows at the tail end of the descending limb are reduced, there will be a greater impact on boatable day. This makes it difficult to understand Project impacts and the sufficiency of mitigation.

3.2.2 Reduction of Scouring Flows have Been Ignored as an Important Factor in Maintaining Channel Capacity

Stream Morphology and Sediment Transport Technical Report Section 2.7.2
"Reduced duration of flows that generate motion of bed material has implications both upstream and downstream of I-25. In both cases it implies that the river is predicted to move less sediment through the system under Alternative 2M than under current conditions hydrology. […]

As a second order effect, the truncated periods of bed material motion is predicted to decrease the opportunity for scouring of in-channel vegetation from bars, islands and channel margins. […]

Where the supply of material that makes up the bed is limited, such as in the Fort Collins and Laporte Reaches, reduced movement of bed material under Alternative 2M is likely to lead to lower rates of change of in-channel bars, islands, benches, and channel form. […]

There are very few cases where an isolated occurrence of bed material motion is predicted to be lost altogether. This leads to the general finding that while the duration and frequency of bed material motion is predicted to be less for Alternative 2M, the time between occurrences of bed material motion is not greatly impacted by Alternative 2M.

The spells analysis suggests that the time between occurrences of bed material motion is not generally increased under Alternative 2M, so to the extent that colonization of vegetation is dependent on the existence of a stable substrate, no significant change in the rate or extent of new colonization is expected."

Comment: The FEIS states that the ability of flows to scour away encroaching woody vegetation (to reduce channel narrowing and roughening) depends on the duration of scouring flows. The FEIS also states that Alternative 2M will reduce the duration and frequency of scouring flows, but not generally increase the time (spells) between occurrences of scouring flows. However, the FEIS then states that only the existence of a stable substrate affects encroaching woody vegetation. This

underlies the FEIS's conclusion that Alternative 2M will not cause significant change in the rate or extent of new vegetation encroachment, particularly in reaches that are claimed to be sediment supply limited.

These FEIS statements are contradictory and the conclusion is not supported by evidence. *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983) (holding that an agency acts arbitrarily and capriciously when its "explanation for its decision . . . runs counter to the evidence before it"). If the effectiveness of scouring flows is duration dependent and Alternative 2M will reduce duration, then it follows that Alternative 2M can lead to increased vegetation encroachment. This direct link between duration and vegetation scour has widespread concurrence in peer-reviewed scientific literature (Pasquale *et al.*, 2011; Edmaier *et al.*, 2010). The FEIS makes no link and points to no evidence in the available body of literature on time between occurrences and vegetation scour. Alternative 2M will decrease peak flow duration, magnitude, and frequency – all of which are documented in scientific literature as having the potential to increase vegetation encroachment and therefore flood risk (Poff and Zimmerman, 2009).

The assertion that upper reaches of the Poudre River are sediment supply limited is also not supported by evidence. *Utahns for Better Transp. v. U.S. Dep't of Transp.*, 305 F.3d 1152, 1187 (10th Cir. 2002) (holding that a Corps Section 404 decision was arbitrary and capricious because it was not supported by record evidence). Recent events and watershed disturbances including fires in the upstream watershed have resulted in substantial storage of sediment in the river channel and the formation and expansion of ne bars and vegetated islands (see the attached Fort Collins Geomorphology Report). In the lower Fort Collins reaches, particularly from Prospect Road to I-25, current conditions include substantial fine sediment aggradation. Furthermore, woody vegetation establishment is widely documented to occur in rivers with low sediment supplies.

Increased vegetation encroachment will increase flood risks through Fort Collins because woody vegetation increases flow resistance and causes sediment to accumulate. This increases flooding width and depth, as well as reduces the river's capacity to safely carry floods through Fort Collins unless additional capacity is provided to offset the loss.

3.2.3 Reduction of Scouring Flows Has Been Ignored as an Important Factor in Maintaining Channel Capacity

Stream Morphology and Sediment Transport Technical Report Section 2.10

Table 2-1 Overview of the Effects of Alternative 2M vs Current Conditions hydrology (continued)

Possible Impact	Laporte Reach	Fort Collins Reach (plus Timnath Reach upstream of I-25)
Loss of morphologic complexity	Bed material moves at about 28% of the cross sections under both current conditions and Alternative 2M hydrology. Average duration of bed material movement is reduced by 18% for Alternative 2M.	

	Spatial variability of biotopes is provided by existing bed forms and the proliferation of diversion structures. Spatial variability is predicted to be maintained under Alternative 2M, but temporal variability is predicted to be reduced because of reduced flow variability.	
Channel contraction	Sediment transport potential is predicted to be reduced throughout the river under Alternative 2M	
	Under Alternative 2M total transport potential is reduced by 5% to 30%. Transport potential to move sand and gravel is reduced by 3% to 305, and 8% to 31%, respectively, under Alternative 2M	
	Together with the reduced sediment transport capacity, a slight reduction in effective discharge suggests an ongoing tendency toward channel contraction in this reach as the result of Alternative 2M. But the response is predicted to be constrained by the limited supply of material available for deposition. A model based on observed historic response predicts that the reach is supply limited and that processes of channel contraction will be insensitive to the changes in sediment transport potential that are attributable to Alternative 2M. The persistence of in-channel vegetation is expected to increase and this could encourage channel contraction even without abundant sediment. However, the average time between scouring events is not greatly altered so the rate of growth of vegetated areas should not be greatly affected. The spells analysis suggests that the time between occurrences of bed material motion is not generally increased under Alternative 2M, so to the extent that colonization of vegetation is dependent on the existence of a stable substrate, no significant change in the rate or extent of new colonization is expected.	Sediment transport potential is reduced by around 40% across a broad range of flows but the effective discharge remains unchanged at about 2,000 cfs. The effective discharge suggests an ongoing trend of channel contraction, but this is the same for current conditions hydrology and Alternative 2M and channel contraction is predicted to continue to be constrained by the limited supply of material available for deposition. The reduced duration of high flows suggests an increase in vegetation persistence. Vegetation may cause channel contraction by colonizing bars and channel margins but there is little change in the average time between high (scouring) flows between current conditions and Alternative 2M, so no rapid expansion in vegetated area is expected. The spells analysis suggests that the time between occurrences of bed material motion is not generally increased under Alternative 2M, so to the extent that colonization of vegetation is dependent on the existence of a stable substrate, no significant change in the rate or extent of new colonization is expected. In the reach between Coy Ditch and Lemay Avenue, channel contraction is more likely to be temporary in response to pulses of sediment or dry periods. There will be a tendency in this reach for the river to develop a temporary smaller channel within the larger cross section.

Comment: The FEIS states that Alternative 2M would reduce the total capacity to transport sediment over a period of years by 5% to 30% in the Laporte and Fort Collins Reaches. The FEIS also states that capacity to transport sand and gravel would be reduced by 8% to 31% in the Fort Collins Reach, and that sediment transport potential in the Fort Collins Reach would be reduced by approximately 40%. Despite the results of these sediment transport calculations, the FEIS predicts that channel contraction will be lessened due to the limited supply of sediment delivered from upstream.

The assertion that upper reaches of the Poudre River are sediment supply limited is not supported by the evidence. Earlier arguments have been based on the notion that upstream of I-25 the Poudre River has a capacity to move sediment that exceeds the supply of sediment from upstream – and specifically on observations that "[i]n general, the bed is armored with cobbles and coarse gravels that only move rarely in response to high flow periods" (SDEIS 2013 pg. 9-4). Further, the FEIS states that because the coarse material on the river bed is rarely mobilized, the finer material underneath is rarely released; thus, the river is thought to generally have a lack of sediment supply upstream of I-25. This condition is coupled with observations upstream of I-25 that, "Bars, islands and marginal deposits do form, but signs of consistent, contiguous aggradation are not evident"

(SDEIS 2013 pg. 9-4). The observations that upstream of I-25 is sediment supply limited and lacks signs of large scale aggradation ultimately leads to the broad assertion that aggradation is not a current issue and will not be an issue under future NISP conditions.

In 2018, Fort Collins conducted field investigations to provide multiple lines of evidence for better understanding Poudre River sediment supply upstream of I-25. The lines of evidence confirm that the methods used in the FEIS and related reports to estimate the future risk of sediment build up are inadequate for assessing sediment dynamics on the Poudre River (see the attached Fort Collins Geomorphology Report). Analysis results show that the Poudre River is susceptible to episodic inputs of sediment and that the reductions in transport capacity that would result from NISP will exacerbate the narrowing and shrinking capacity of the river channel currently observed in the Fort Collins reaches. The FEIS documents appear to reach this same conclusion.

The results of Fort Collins tracer rock study (see the attached Fort Collins Geomorphology Report) suggest that the coarse bed material of Poudre River through Fort Collins is more mobile than depicted in the FEIS which asserts the bed is largely armored and immobile. Further, the methods used to quantify the mobility of the river bed did not adequately predict the mobility of the bed following the 2013 flood and five subsequent wet years. Due to this, high uncertainty exists in the percentages reported for which cross sections are mobile and how much the preferred alternative might reduce that number. The result is that the extent to which each of the alternatives will impact the Poudre River is still not understood. *Wild Earth Guardians v. U.S. Bureau of Reclamation*, 870 F.3d 1222, 1237 (10th Cir. 2017) (explaining that NEPA's purpose is to "prevent uninformed agency decisions").

Understanding the physics of whether a channel is sediment supply limited or capacity limited fundamentally requires a comparison between sediment supply and transport capacity over a range of flow events (Montgomery & Buffington 1997). Sediment supply has not been quantitatively assessed in the FEIS documents. Based on the definitive scientific paper on this subject (Montgomery & Buffington 1997), the Poudre River would be classified as capacity limited both above and below I-25.

Evidence from Fort Collins field investigations showing vegetation encroachment and aggradation indicate that while historic channel forms have been strongly influenced by land-use and development, the Poudre River is capacity limited above I-25 during some high flow events and upstream watershed conditions. Sediment supply, however, is now more episodic in nature (associated with moderate flows). While a stronger physical signature of sediment storage may exist downstream of I-25, the FEIS predicts preferred alternative will reduce the transport capacity of the reaches in Fort Collins to levels below those now experienced downstream of I-25, thus exacerbating the channel narrowing and sediment storage currently observed upstream in the urban reaches.

3.2.4 Bio-Geomorphic Feedback Loop Has Been Dismissed Upstream of I-25

Stream Morphology and Sediment Transport Technical Report FEIS Section 2.10
"In overview, the trajectory of the river condition is expected to continue under both current conditions and Alternative 2M hydrology.

"Based largely on an observational model of response to current conditions hydrology, the trends that were identified in the Baseline Report are expected to continue and be more severe downstream of I-25 than upstream of I-25 because:

- *sediment supply in the size fractions relevant for deposition is more limited upstream of I-25 than downstream; and*
- *bio-geomorphic processes involving vegetation establishment on benches and bars prevail more downstream of I-25 compared to upstream.*

Assessments of the effects of the Alternative 2M compared to the current conditions hydrology amplify the trajectory of the river conditions identified in the Baseline Report reflected in continuing channel contraction, fining of surficial material, and loss of channel complexity."

FEIS Section 3.4.2.3.5
"The natural system is often able to accommodate considerable change in its controlling parameters without a consequential response, until some threshold is reached beyond which major response is initiated. […] The likelihood of such non-linear response thresholds can be elucidated by observation or space for time substitution, but accurate prediction is generally beyond current analytical techniques….in a potentially aggrading reach, progressive reductions in the frequency of moderate to large flows may initiate channel contraction until a threshold is reached where the time between flow events allows vegetation to establish to a point that is resists further removal by flow."

Comment: The statements above relies on a largely unstudied assumption that bio-geomorphic feedback loops prevail more downstream of I-25 and presumption that feedback loops upstream of I-25 are therefore un-notable. *See Or. Natural Desert Ass'n*, 840 F.3d at 570 (prohibiting "unsupported assumptions"). The term bio-geomorphic feedback loop describes the self-perpetuating process where flow reductions cause sediment build up, which creates a narrower and shallower channel and allows persistent woody vegetation to establish, which over time locks in sediment(e.g., via rooting around large rocks), which enables seedlings to become young trees and grow taller and stiffer, which increases flow resistance and causes more sediment build up among the young trees, which continues the loop via continued narrowing and vegetation encroachment.

The FEIS uses a related argument that bio-geomorphic feedback loops are less prevalent upstream of I-25 to support recommendations for mitigation downstream, but not upstream of I-25. Fort Collins disagrees with this assertion for two reasons. First, bio-geomorphic feedback loops have been documented in Fort Collins. Second, the relative argument misses the critical point that flow reduction commonly triggers these bio-geomorphic processes. This crossing of a threshold is

identified in the FEIS and has been observed on the Poudre River, as well as several other Front Range systems (e.g., Left Hand Creek, South Boulder Creek) that have experienced flow reductions.

Fort Collins has conducted initial investigations and presents two field-based lines of evidence suggesting Alternative 2M could increase bio-geomorphic processes upstream of I-25, which would exacerbate flood risk to Fort Collins via tightening, shrinking, and roughening of the channel. This impact can render current floodplain maps obsolete and unprotective. Locally, reduced flows can cause sediment buildup at bridges and culverts, increasing risk of overtopping and damage and requiring expensive preventative maintenance by Fort Collins. Although NISP operations will reduce flood peaks, the resultant flood capacity reductions (systemwide via vegetation encroachment and locally at critical infrastructure) will outweigh any benefits by increasing flood risk.

First, the Fort Collins Geomorphology Report presents an analysis of historical aerials and pre- and post-runoff photos that examine vegetation encroachment on channel bars following a large flood event in 1999 and the subsequent dry years until 2012. Additionally, the 2013 flood event was not able to remove much of the woody vegetation that had re-colonized bar surfaces since 1999. Furthermore, 2018 runoff had little effect on seedlings growing along the channel margin. These seedlings, if able to survive, then mature, trap additional sediments, and reduce channel capacity, cycling through the feedback loop. Alternative 2M would likely exacerbate this pattern.

Fort Collins Geomorphology Report presents a point bar case study documenting one known bio-geomorphic feedback loop in Fort Collins upstream of I-25. This point bar investigation showed a clear pattern of vegetation encroachment from 1999 to present and up to 4 feet of sediment deposition over that period. Significantly, this bio-geomorphic feedback loop is occurring in a reach with relatively higher transport capacity (compared to downstream), countering the FEIS assumption that the river upstream of I-25 is not at risk of increased aggradation because it is supply limited. While this bar is located within a reach of relatively higher transport capacity, it represents channel behavior at a finer scale than captured by the reach-scale capacity modeling. The dynamics of site-scale features, such as this bar, have the potential to make significant reductions in transport capacity, especially when located near critical infrastructure. Alternative 2M is likely to impact the river upstream of I-25 by creating substantially more analogous, low energy places in the river similar to the examined bar.

An important note is that the deposition seen on the bar is not the result of a singular event (i.e., the 2013 floods). The photograph in Figure 18 from the Fort Collins Geomorphology Report shows that around 1.5 feet of extra deposition occurred on the bar from the 2013 event. Therefore, up to 4 feet of deposition observed in 2018 is strong evidence that supply was available in the years following 2013 and that vegetation that had encroached on these bars is trapping sediment and reducing channel conveyance. This observation is in direct contradiction to the conclusion in the EIS documents that the reach is sediment supply limited and shows the channel to be susceptible to episodic inputs of sediment, including fine sediments which the calculations suggest

should be moved through the reach. If NISP operations increase the rate of channel contraction occurring through Fort Collins, the lost conveyance puts Fort Collins at greater risk to flooding.

3.3. RECOMMENDATIONS RELATED TO GEOMORPHOLOGICAL COMMENTS

Fort Collins make the following recommendations related to its above geomorphologic comments.

Northern should be required to provide, at minimum, a complete three-day peak flow in all years. If the Peak Flow Operations Program remains in effect, Fort Collins requests clarification on the implementation and effects of the program, including how stream flows are required to be forecast and how the averages are to be calculated. Northern should also be required to annually publish notice of how the Peak Flow Operations Program was implemented. Northern should also be required perform additional mitigation to compensate for the apparent lack of analysis of the impacts resulting from increased diversions following the peak flow bypass period (under a complete three-day peak flow or something less under the Peak Flow Operations Program) to address the apparent lack of analyses of such impacts.

Northern should be required to perform long-term monitoring of vegetation encroachment on the Poudre River, in addition to long-term monitoring of channel narrowing, sediment accumulation, and habitat degradation. If such long-term monitoring demonstrates an increase in vegetation encroachment, channel narrowing, sediment accumulation, and/or habitat degradation, Northern should be required to take steps to address the impacts, preferably through flow-based approaches.

If adequate, flow-based mitigation is not achieved, the City likely need to make expenditures of $300,000 to $400,000 annually for spring and fall river cleanups, repair of banks damage from vegetation encroachment, and removal of vegetation and sediment following flood events to remove blockages at bridges and diversion structures to mitigation the potential for flood risks to Fort Collins. Northern should mitigate such impacts.

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SECTION 4: RIPARIAN-RELATED COMMENTS

4.1 THE POUDRE RIVER IS NOT ON A TRAJECTORY OF INEVITABLE DECLINE

Comment: Fort Collins disagrees with the assumptions and statements that the Poudre River is on a trajectory of inevitable decline. In the context of mitigation and adaptive management commitments, Fort Collins emphasizes the need for a proper and integrated understanding of the systems' contemporary condition.

Although the FEIS correctly states the Poudre River is compromised by historic and current human influences, the use of this statement to propose a declining trajectory is overly simplistic, erroneous, and misleading. The FEIS concludes in many places that the Poudre River is on a well-established downward decline, and states that this downward trajectory "provides the basis for comparisons related to potential flow alterations". In the response to comment (3032), the Corps states that "the Corps did not portray the trajectories as negative or positive, but simply disclosed the projected trajectories." It is unclear how "declining trajectory" could be interpreted as something other than negative. This erroneous representation of the Poudre River serves as the basis for conclusions in various portions of the FEIS, including stream morphology and sediment transport and riparian vegetation community. The FEIS often circularly concludes that, despite potential changes, impacts are minor because the future state is assumed to be worse than current conditions.

Fort Collins contends that there are many functioning elements and/or reaches that do not match the FEIS's assumption of decline. Current scientific theory and approaches to ecosystem management utilize the widely accepted paradigm of multiple stable states, acknowledging that ecosystems can operate under different states or conditions, based on the stressors or disturbance regimes that occur. Thus, rather than being in a declining trajectory, the Poudre River would be in a different "stable state" based on the historic and current human influences that are placed on the river (gravel mining, irrigation diversions, municipal diversions, recreation, etc). However, the FEIS argues that historic disturbances have put the Poudre River on a continued downward trajectory, rather than acknowledging the potential for an alternate stable state under current conditions. The FEIS is therefore not in line with accepted scientific theories, nor is it in line with data collected by Fort Collins.

Fort Collins presents the River Health Assessment Framework ("RHAF") as an integrated assessment framework for this complex dynamic system. The RHAF is an information framework that was used to develop the first State of the Poudre Report. This framework allows for incorporation of a spectrum of data and analyses types to track river health and function depending on the scope and needs of a given program. The RHAF is a close adaptation of the FACstream method which was developed through an EPA 104(b)(3) state wetlands grant program as well as funding from Colorado Water Conservation Board. The results from the first State of the Poudre can be presented at many scales, but even at the coarsest scale (presented below) there is a strong indication this system maintains both strengths and weaknesses that should not be dismissed with the application of a declining trajectory.

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Zone	Canyon			Rural			Urban							Plains				
Reach	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Flow Regime	77	75	75	74	74	73	73	72	72	72	69	69	69	69	69	70	77	77
Sediment Regime	91	84	84	83	82	81	83	82	81	79	79	80	79	79	79	79	79	79
Water Quality	88	77	77	77	87	87	87	87	89	89	89	89	88	88	88	86	83	83
Floodplain Connectivity	78	82	85	74	65	85	62	61	87	50	67	73	70	77	50	98	82	71
Riparian Condition	85	87	85	77	73	74	64	69	76	63	65	70	71	73	70	76	71	68
River Form	82	74	72	79	68	78	67	74	76	70	78	74	75	77	67	74	75	69
Resilience	82	79	76	79	75	76	67	77	78	69	79	77	74	75	71	76	74	68
Physical Structure	76	74	71	82	72	79	66	77	79	77	81	70	77	76	63	74	74	69
Aquatic Life	80	81	78	76	76	76	77	78	72	74	79	79	85	85	85	78	78	78
River Health	82	79	78	77	74	78	70	74	78	70	74	74	75	76	70	78	76	73
	80			76			74							75				

Grading Scale		
	A	100-90
	B+	89-87
	B	86-83
	B-	82-80
	C+	79-77
	C	76-73
	C-	72-70
	D/F	69 or lower

Table z. Results of the first state of the Poudre (2017). Table reprinted from Table 4.1

Recommendation: Mitigation should demonstrably offset impacts at each level of the stream functions pyramid based on contemporary conditions, not a speculative future condition. In order to effectively implement Northern's existing commitments for mitigation and adaptive management, and to better implement the recommendations in these comments, Fort Collins recommends that the Corps imposes a mitigation objective and response mechanism for each impacted level/component of the Stream Functions Pyramid (see https://www.epa.gov/cwa-404/stream-functions-pyramid). The RHAF is based on concepts inherent in the Stream Functions Pyramid so the RHAF Indicators and Metrics closely align with concepts presented in the Stream Functions Pyramid.

Fort Collins intends to continue to use the RHAF and to place additional quantitative measures within the RHAF to monitor the ongoing health of the river under pre and post-NISP conditions This will inform the City's perspective on signals and needs for adaptive response actions. The Corps could apply the RHAF in a similar fashion to inform discussions and decisions with the adaptive management stakeholder group. This would enable the Corps to track as-built effects of NISP and more closely meet mitigation requirements and commitments as outlined in the 2017 Fish and Wildlife Mitigation and Enhancement Plan. The City would welcome the opportunity to collaborate on these parallel monitoring and management efforts.

4.2 UNMITIGATED WETLAND IMPACTS MUST BE MITIGATED

FEIS Appendix B Section 1.5.4
"Mitigation activities are intended to fully mitigate an affected resource, and in many cases, enhance environmental resources and ecological functions."

FEIS Section 4.9.4.3.5
"Alternative 2M would slightly lower the composite functional capacity index score for all riverine surface water and ground water wetlands within 100 feet of the river and most of the groundwater wetlands greater than 100 feet from the river."

FEIS Section 4.9.2.3
"The largest potential effect on functions is predicted to be to riverine surface water supported wetlands and groundwater wetlands within 100 feet of the river banks. The NISP action alternatives could change the functions of these wetlands by altering river stage, inundation, and/or water quality. Effects on riverine ground water wetlands greater than 100 feet from the river banks are also anticipated due to changes in inundation and vegetation structures and complexity."

FEIS Section 4.9.8.3
"Along the Poudre River, wetland functions would decrease for riverine surface water and riverine ground water wetlands. The greatest reductions in composite functional capacity index score are for Alternatives 2 and 3 at Martinez Park."

Comment: In the FEIS, impacts to Poudre River wetland functions are described, with the severity of impacts varying by location. For example, as noted above, the FEIS states that nearly all wetlands within 100 feet of the Poudre River will be impacted. No compensatory mitigation for these unavoidable functional impacts is provided in the Conceptual Mitigation Plan, which is required by the CWA. *See* 40 C.F.R. § 230.91(a) (purpose of mitigation is to "offset unavoidable impacts to waters of the United States"); *id.* § 230.11(h) (requiring evaluation and mitigation of "secondary effects" on aquatic ecosystem resulting from project).

Table 1 of the Poudre River Wetland and Riparian Mapping technical report, dated February 1, 2018 (with excerpts below), summarizes habitats along the Poudre River that appear to be wetlands and which would subject to functional losses.

Wetland Type	**Acres**
Riparian Herbaceous - Cattails/Sedges/Rushes	418.8
Riparian Herbaceous-Sedges/Rushes/Mesic Grasses	303.5
Riparian Shrub-Willow	216.4
Total acreage subject to impact	**938.7**

As summarized above, approximately 938.7 acres of probable wetland habitat within 100 feet of the Poudre River would be impacted.

Nearly all these wetlands will be subjected to functional impacts. Fort Collins and its properties along the Poudre River will be adversely affected by NISP and the lack of compensatory mitigation for the wetland impacts noted above. Although the predicted impacts will fall short of outright habitat destruction, Corps regulations do not distinguish between partial and total functional loss in setting mitigation requirements. *See* 40 C.F.R. § 230.93(a)(1) (stating "fundamental objective of compensatory mitigation is to offset environmental losses resulting from unavoidable impacts to waters of the United States"). Mitigation must compensate for all "aquatic resource functions that will be lost" as result of the project. *Id*.; *see also id*. § 230.92 (defining "impact" as any "adverse effect," and not a complete loss of aquatic ecosystem functions).

Recommendations: Any approval of the Project must include compensatory mitigation for Poudre River wetland functional losses as required by Corps regulations as part of offsetting losses to aquatic resource functions. *Id*. § 230.93(a)(1). Mitigation of Poudre River wetland functional losses must be sufficient to achieve the expressed goals of the Conceptual Mitigation Plan. *Id*. § 230.94(c) (setting forth criteria for mitigation plan). Compensatory mitigation should be required to offset the incremental functional impairment of these wetlands. *Id*. Such compensatory mitigation should offset temporal and spatial impacts and other risks, as well as employ a watershed approach in planning. *Id*. § 230.93(m) (requiring to the extent appropriate "additional compensatory mitigation to offset temporal losses of aquatic functions that will result from the permitted activity.").

4.3 UNMITIGATED IMPACTS TO STREAM FUNCTIONS MUST BE MITIGATED

FEIS Section 4.5.3.3
"For the four river segments that were analyzed (A, B, C, and F), the predicted reductions in maximum river stage would range from about 1.8 feet to 3.0 feet."

FEIS Section 4.4.7.3
"The occurrence of flushing flows would be reduced by a total of 1 to 2 years (out of 26 years). The average duration of flushing flows would be reduced by up to 4.9 days/year and the median duration by up to 12 days/year."

FEIS Section 4.4.7.3
"Sediment transport potential is predicted to be reduced throughout the river. The capability of the river to move bed material is predicted to be reduced between 5% and 30% upstream of I-25."

FEIS Section 4.3.6.2.1
"Adverse effects generally occur in May-August and are more pronounced below the extent of conveyance refinement flows."

FEIS Section 4.12.3.3.1
"Alternative 2M would have an overall minor adverse effect on aquatic."

Fish and Wildlife Mitigation and Enhancement Plan
"The mitigation costs are exclusive of costs for other mitigation requirements that will be developed for and required by the Final EIS, 401 certification, and 404 permit."

Comment: According to the Omaha District of the Corps (Corps 2018), stream functions are impacted when adverse changes to hydrology, hydraulics, geomorphology, physicochemistry (water quality), and/or biota occur. The FEIS predicts such impacts as noted in the example statements listed above.

The compensatory mitigation included in the 2017 Fish and Wildlife Mitigation and Enhancement Plan is exclusive of the requirements of other applicable legal requirements, including Section 404 of the Clean Water Act. Table 1 of the Compensatory Mitigation Plan indicates that no compensatory mitigation for stream functional losses is being proposed in response to Clean Water Act Requirements. Adequate compensatory mitigation of stream functional losses is critical under the Corps' regulations, which expressly recognize streams as "difficult-to-replace resources." 40 C.F.R. § 230.93(e)(3). Compensating for lost stream functions has been a long-standing Corps practice under the CWA. *See e.g.* Regulatory Guidance Letter 02-2 (December 24, 2002) (superseded by 40 C.F.R. § 230.91) ("Districts should require compensatory mitigation projects for streams to replace stream functions where sufficient functional assessment is feasible.").

The 2008 Final Rule on Compensatory Mitigation for Losses of Aquatic Resources (40 C.F.R. § 230 *et seq.*) ("Mitigation Rule") states that compensatory mitigation "involves actions taken to offset unavoidable adverse impacts to wetlands, *streams* and other aquatic resources . . . ." 73 Fed. Reg. 19,594, 19,594 (April 10, 2008) (emphasis added). Under the Mitigation Rule, stream mitigation plans must contain the same 12 fundamental standards as those applied to wetland mitigation—including adequate baseline information and ecological performance standards. 73 Fed. Reg. at 19,597. The Mitigation Rule requires replacement of stream functions lost as a result of a federally-permitted action, to the degree practicable. 40 C.F.R. § 230.93(e)(1)–(3) (discussing stream mitigation); *id*. § 230.94(c)(7) (setting forth criteria for work plans regarding "stream compensatory mitigation projects").

The 2017 Fish and Wildlife Mitigation and Enhancement Plan includes mitigation for stream-related impacts to fish and wildlife as described in the Fish and Wildlife Mitigation and Enhancement Plan. However, the Poudre River stream functions that would be adversely affected by NISP go beyond fish and wildlife impacts, and the 2017 Fish and Wildlife Mitigation and Enhancement Plan does not offset all the predicted impacts to Poudre River stream functions.

Under the Mitigation Rule, the Conceptual Mitigation Plan must adequately describe the "resource type(s) and amount(s) that will be provided," "the method of compensation," and "the manner in which the resource functions of the compensatory mitigation project will address the needs of the watershed," which include stream functions. 40 C.F.R. § 230.94(c)(2). Thus, the

Conceptual Mitigation Plan must adequately offset the adverse impacts to stream functions. Compensatory mitigation for unavoidable stream functional impacts in response to the requirements of the Mitigation Rule was not included in the Conceptual Mitigation Plan, therefore the Conceptual Mitigation Plan does not comply with the Mitigation Rule nor is it consistent with the stated goals of the Conceptual Mitigation Plan as discussed above.

Recommendation: Any approval of the Project must provide adequate compensatory mitigation for losses of stream function in and along the Poudre River, including offsets for any predicted temporal and spatial impacts or other risks, and should consider both in-stream and near-stream components of habitats.

4.4 UNMITIGATED RISKS TO AQUATIC HABITATS MUST BE MITIGATED

FEIS Section 4.4.3.1.2

Section 3.4 of the Operations Report provides a qualitative description of how NISP diversions may be operated immediately following a peak flow operational period. The Peak Flow Operations Plan does not specific what other flow range would be reduced in order to maintain firm yield. Without additional detail, the overall impact of Alternative 2M with Peak Flow Operations Program on overall stream morphology and sediment transport is unknown"

Comment: Because impacts of the Project are uncertain, there is significant risk to Fort Collins that impacts to stream and wetland resources will be greater than predicted. Uncertainties described in the FEIS include those regarding how stream flow alterations might affect the in-stream processes that drive aquatic habitat functioning (such as sediment transport), and those regarding how alterations in river flows will affect riparian habitats that support stream functioning. These uncertainties should be addressed through additional mitigation set forth in the Mitigation Plan. *See* 73 Fed. Reg. 19,594, 19,613 (April 10, 2008) (affording the Corps broad discretion in determining the amount of mitigation "sufficient to replace lost aquatic resource functions").

Fort Collins acknowledges that predictive modeling always includes inherent uncertainty and appreciates the discussion of those uncertainties included in the FEIS. Fort Collins maintains that the uncertainties expressed in the FEIS analyses and confirmed in Fort Collins own analyses constitute real risks, many of which Fort Collins will ultimately bear. Furthermore, because of extensive concerns previously expressed by Fort Collins regarding the adequacy and validity of the science underlying FEIS conclusions, Fort Collins contends this leads to exacerbated level of uncertainty and risk to the accuracy of the predicted impacts. Project risks include under estimation of impacts to stream and wetland resources in terms of severity, extent, and type of impact, as well as, spatial, temporal and watershed-based impacts.

The most substantial risk to the Poudre River aquatic system in Alternative 2M is the unknown effect of altering the descending limb of the Poudre River's hydrograph, as stated above. The risks of analytical uncertainty can be most effectively minimized by improving the flow characteristics

of the descending limb of the Poudre River hydrograph, generally by extending the descending limb to make impacts more gradual.

Recommendation: A compensatory mitigation plan for unavoidable impacts to aquatic resources, including both stream and wetland habitats, should be developed and that plan should include measures to offset the risks of the predictive uncertainties identified and acknowledged in the FEIS.

4.5 COMPARISONS TO A SPECULATIVE FUTURE CONDITIONS OF A DEGRADED POUDRE RIVER ECOSYSTEM MUST NOT BE MADE

FEIS Section 4.9.1.1
"The trajectory of the wetland and riparian resources along the Poudre River has been affected by historical and contemporary physical and hydrologic changes that have established a trajectory that is expected to continue."

Comment: Throughout the FEIS, the severity of predicted Project impacts to Poudre River stream and wetland habitats are cast in the light of an assumed on-going downward trajectory of habitat conditions. Although the FEIS suggests that this downward trajectory is well established, Fort Collins contends that it is not.

Poudre River stream, wetland, and riparian functioning will be harmed by all NISP alternatives, as noted above. That harm includes the acceleration of the assumed downward trajectory in degradation because that constitutes a temporal impact. In determining compensatory mitigation requirements under Section 404 of the Clean Water Act for unavoidable impacts to aquatic resources, solid benchmarks must be established. The Conceptual Mitigation Plan must include "baseline information" regarding the ecological characteristics of the aquatic ecosystem, including streams. 40 C.F.R. § 230.94(c)(5). A benchmark for pre-NISP functional condition of wetlands is provided in the FEIS and Poudre River Wetland and Riparian Vegetation Mapping technical report, dated February 1, 2018. No such assessment is provided for stream functional condition.

Fort Collins understands that compensatory mitigation for Poudre River wetland and stream functional impacts must be included in the NISP Conceptual Mitigation Plan. Moreover, the nature and amount of compensatory mitigation should be based on the conditions characterized at the time of the FEIS and not on a speculative future resource condition at an undetermined time in the future. The Conceptual Mitigation Plan's "baseline information" should provide a "description of the ecological characteristics" of impacted sites, including "historic and *existing* conditions." *Id*. (emphasis added). Use of a debatable future condition as a benchmark to determine compensatory mitigation requirements for impacts to aquatic resources does not accurately reflect the existing conditions of the Poudre River stream and wetland habitats and does not ensure impacts to existing resources are adequately offset under the Mitigation Rule. *See* 40 C.F.R. § 230.93(a)(1) (mitigation shall compensate for the "aquatic resource functions that will be lost as a result of the permitted activity.").

Recommendation: All compensatory mitigation for Poudre River aquatic resource impacts must be based on existing habitat conditions as documented in the FEIS.

4.6 MITIGATION SHOULD OCCUR DURING THE INITIAL FILL PERIOD

Fish and Wildlife Mitigation and Enhancement Plan Section 5.2.2.4
"…diversions cannot be made through the Poudre River intake if there is insufficient demand from Participants…

Fish and Wildlife Mitigation and Enhancement Plan, Section 5.2.2.6
"The operations described for this program would apply to diversions filling storage space in Glade Reservoir that has already once been filled and is no longer under any type of fill restrictions…during this interim initial fill period, filling of storage space that remains underfill restrictions will be consistent with Tier 3 conditions. A bypass could be considered as part of the Adaptive Management Program."

Comment: Fort Collins is concerned about the lack of mitigation during the initial fill period. Both the base flow conveyance refinement and the Peak Flow Operation Program would not begin during this period, which according to the FEIS, Section 4.3.2.2.1, could be up to 10 years. If lower than average water years occur during the initial filling period, the Poudre River may undergo changes that are difficult to reverse. The Poudre River could see a transition to an alternate state (such as a smaller channel and embedded riverbed) that would limit opportunities to optimize river health through future management.

Recommendation: Northern should be required to mitigate the impacts during the initial fill period, and to not wait until the Project has been operated for nearly 10 years.

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SECTION 5: RECREATION-RELATED COMMENTS

Over decades, Fort Collins has spent tens of millions of dollars acquiring and improving land along the Poudre River, building recreation amenities on those lands, and restoration natural habitat. (See the City of Fort Collins Natural Areas Master Plan and Cache la Poudre River Natural Areas Management Plan Update). Fort Collins owns three parks on the River and over 1,800 acres of natural areas. In 2014, City Council adopted a Downtown Poudre River Master Plan that describes a vision for continuing to improve the most heavily visited reach of the River from Shields Street to Mulberry. A regional trail runs the length of the Poudre from Laporte to nearly I-25.

5.1 IMPACTS TO BOATING AND TUBING ARE UNDERESTIMATED

FEIS Section 4.16.3.3.2

"Segment B is popular for boating (tubing, canoeing, and kayaking) and is the location of a proposed whitewater park. Compared with Current Conditions hydrology, Alternative 2M would increase the number of days over the boating season (May through September) suitable for tubing and have no net effect on the number of days suitable for kayaking. The number of days suitable for freestyle kayaking would decrease by 8 days, with most of the decrease occurring in May (Table 4-113). Overall, Alternative 2M would have minor beneficial effect on tubing opportunities, no effect on kayaking, and a minor adverse impact of freestyle kayaking in Segment B."

Comment: The FEIS underestimates the reduction of tubing days, and possibly of boating days due to an assumption that tubing can occur at flows as low as 50 cfs. This is based on the proposed wave design of the Fort Collins whitewater park. However, the wave design is intended to concentrate flows to make it possible to tube at 50 cfs.

For the most popular tubing reach of the Poudre River, from Shields Street to Lee Martinez Park, it is not possible to tube at 50 cfs. Based on the accumulated experience of Fort Collins Staff, a more accurate minimum flow rate for tubing would be at least 75 cfs. A more enjoyable flow that would make it possible to tube the entire reach without walking would require approximately 150 cfs.

Recommendation: The mitigation Northern is required to offset boating impacts should take into account the above analysis and Northern should be required to mitigate these impacts.

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SECTION 6: SOCIOECONOMIC-RELATED COMMENTS

6.1 THE FEIS FAILS TO INCLUDE ANY ANALYSIS OF PROPERTY VALUE DIMINUTION

FEIS Section 4.20.3.2.2
"In sum, Alternative 2M may have a minor adverse effect on future flood risk and flood damages under a 100-yer flood event downstream of I-25 and a minor benefit on future flood risk and flood damages under a 25-year flood event."

Comment: The FEIS property value analysis focuses exclusively on flood risks; no analysis has been provided regarding the diminution of property values near the Poudre River and within Fort Collins' municipal limits should reduced river flows adversely impact the riparian forest. Recent private sector investment adjacent the Poudre River, such as the $200 million Woodward Campus development, show the area's present desirability given the Poudre River's value as a natural amenity.

Recommendation: Northern should be required to mitigate these impacts as described herein.

6.2 SOCIOECONOMIC IMPACT ANALYSIS IS INACCURATELY BASED ON PAST DATA

FEIS Section 4.20.3.2.4
"there is no direct way to estimate the effect (if any) of changes in peak flows in the Poudre River on business attraction or retention in Fort Collins", and that "Based on analysis of sales tax data for the City of Fort Collins during the spring and summer of 2012, a very dry year with unusually low flows in the Poudre River, there is no evidence of a systemic relationship between flow levels in the Poudre River and the overall Fort Collins economic conditions."

Comment: These statements are based on past conditions and not the projected development strategies described in adopted community plans. Recent multimillion dollar investment of public and private sector funds has been made to properties proximal to the Poudre River Corridor and many more are expected in the reasonably foreseeable future. This overall vision and strategy to develop employment, housing, lodging and service uses within the area is described in the recently adopted Fort Collins Downtown Plan (2017), and the North College and East Mulberry Corridor Plans. Most of the reasonably foreseeable uses described in the plans are not in the retail category and would, therefore, not be measured through sales tax data. Success of the future community vision expressed in these plans are predicated on a robust and healthy Poudre River ecosystem, with connections and access being made between the Downtown, the Downtown River Corridor, the North College Corridor and the East Mulberry Corridor. The economic impact to recent and projected public and private sector investments proximal to the Poudre River Corridor has not been described.

Recommendation: Northern should be required to mitigate these impacts as described herein.

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SECTION 7: AIR QUALITY-RELATED COMMENTS

7.1 NORTHERN SHOULD BE REQUIRED TO MITIGATE AIR QUALITY IMPACTS

FDEIS Section 4.14
"*The CDPHE's Air Pollution Control Division determined that NISP conforms based on the population analysis and that the project emissions are within the SIP emissions budgets and consistent with the reasonable further progress demonstration in the SIP.*"

FDEIS Section 4.14
"Northern Water would implement fugitive dust controls as a result of CDPHE's construction permitting and fugitive dust control regulations."

Comment: Regional impacts on ozone are the most important air quality impact for Fort Collins. As stated in the FEIS, there will be demonstrable impacts to NOx and VOC, which contribute to the formation of ozone. Major sources expected to contribute to these emissions upwind of Fort Collins include temporary emissions from construction activities (up to 15 years), and ongoing operations, including recreational boat traffic (small, high emitting 2-stroke engines) and recreational vehicle traffic to/from reservoir. The FEIS states all projects demonstrate general conformity with the 2016 Moderate Area SIP.

Particle and dust emissions will also be expected during construction. Dust is expected to be controlled per CDPHE rules and regulations. Fort Collins has also recently adopted a dust control ordinance that is more stringent than CDPHE regulations.

Recommendation: In addition to CDPHE requirements, it is requested that dust control strategies applied are also consistent with Fort Collins' requirements (such as limited speeds, limited stock pile heights, and high wind work restrictions) as described at (www.fcgov.com/dust).

To measure impacts to dust or particulate matter (PM2.5 and PM10), ozone and ozone precursors (NOx and VOC), it is recommended that an air quality monitoring station be installed at the mouth of the canyon, near the communities of Bellvue or LaPorte. It is requested that monitoring occur before, during and after construction, to demonstrate impacts on emissions in these communities, and transported emissions to Fort Collins.

Per post-construction operation, it is recommended that the size of the boats be limited, with no allowances for 2-stroke engines that both have relatively high air quality emission and leak raw gasoline (which could also impact water quality).

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SECTION 8: WILDLIFE-RELATED COMMENTS

8.1 IMPACTS TO WILDLIFE FROM A SLOW CHANGE IN RIPARIAN HABITATS MUST BE MITIGATED

SDEIS Section 4.10.3

"*A predicted shift in species composition favoring plant species adapted to greater fluctuations in ground water levels could result in slight habitat changes in Segment B for the common garter snake, northern leopard frog, smoky-eyed brown butterfly, two-spotted skipper and other wildlife that may use these habitats. The predicted changes in vegetation would occur slowly over a long period of time and would likely be negligible and imperceptible given the dynamics of riparian areas. Wildlife using these habitats typically use a wide range of aquatic, wetlands, and riparian habitats and would likely adapt to the new habitat conditions that currently occur within the riparian areas of the rivers*."

Comment: The assumption that a slow change in riparian habitats would be negligible and imperceptible and that wildlife would likely adapt to new habitat conditions is repeated throughout the FEIS in Sections 4.10 and 4.11. A loss of wetland and riparian habitat will take place due to a reduction in high flows. *See* 40 C.F.R. § 230.32(b) (citing loss of habitat due to change in water flows as a factor considered in evaluating impacts to aquatic ecosystems). This loss of habitat is a real and cumulative change that must be considered in assessing the adequacy of mitigation regardless of the time needed for this change to occur or the rate of change. *See id*. § 230.75 (setting forth minimization measures to address adverse effects on wildlife); *see also* § 230.93(d) (listing habitat status and trends as factors in determining whether a compensatory mitigation site is "ecologically suitable"). The reduction in habitat is significant and will affect the species mentioned above, along with many other wildlife species.

Riparian habitats are very rare throughout Colorado (less than 3% land cover) but have, "the highest species richness of all major ecosystem types in Colorado" (Mammals of Colorado, Second Edition 2011) and 80% of resident bird species depend on them (Colorado Partners in Flight, 2000).

The assertion that wildlife will adapt to the new habitat conditions is also incorrect. Many species require specific habitats and will not adapt to changes in relatively short time intervals. Lower river flows will lead to an overall reduction of riparian habitats, which will either lead to a reduction of wildlife species richness and abundance or a change in species composition along the river, regardless of temporal scale or rate of change.

The Natural Areas Department has invested considerable financial resources into improving riparian wildlife habitat and ecosystem function through the implementation of several riparian and wetland restoration projects along the Poudre River. Additional restoration efforts are planned through 2025 and beyond. Projects to date have lowered river banks allowing for an increased frequency for overbank flows to reach the floodplain and restore important components of

ecosystem function such as natural cottonwood regeneration and a more structurally diverse riparian habitat.

Although these projects are designed for a variety of river flows, lower average river flows resulting from NISP represent a diminishing return on wildlife habitat value. Importantly, with fewer overbanking high flows, important ecosystem functions such as cottonwood regeneration and varied riparian habitat structure will be negatively affected.

Recommendation: Northern should be required to monitor and quantify long and short-term reductions in habitat and develop actions to restore or replace as impacts are identified, and to mitigate such impacts.

8.2 IMPACTS TO FISH SHOULD BE MITIGATED

Aquatic Biological Resources Technical Report Section 2.4.2.1
"There are no standard approaches and each project developed approaches appropriate for the specific conditions of the project."

Comment: The data interpretation for the Habitat Time Series analysis was non-standard and the quote above appears to be the justification for this choice. The Habitat Time Series is a fundamental tool for quantifying effects on aquatic habitats resulting from changes to the flow regime. While some practitioners have deviated from the standard protocols, the developers of the protocol were very specific as to how this analysis should be done (Bovee et al., 1997).

The approach utilized by GEI was borrowed from the science of hydrology, whereby a synthetic hydrograph representing a particular type of water year could be represented. This may work in hydrology; a wet water year tends to produce large high flows and substantial low flows and dry water years have smaller runoff events and lower base flows. This concept is at best hypothetical when applied to habitat time series. The concept is attributable to the phenomenon of persistence, most applicable to meteorology and hydrology. In its most simplified version, persistence can be expressed as "today's weather is most probably going to look like yesterday's." In other words, if it is a wet water year, it's likely to exhibit higher-than-average stream flows all year. Furthermore, next year will likely also be higher than normal, but not by quite as much.

Habitat time series do not work in this way because habitat limitations occur at both ends of the hydrologic spectrum. Therefore, a 20th percentile habitat time series can easily consist of some of the low habitat events caused by high flows and some by low flows. This makes interpretation of cause and effect very difficult, and in turn makes formulation of good mitigation alternatives nearly impossible. The approach utilized by GEI in their habitat time series analysis is likely to overestimate benefits of Alternative 2M and underestimate the negative effects. This is because the most biologically relevant statistics produced in the FEIS are the average 20th percentile values from the time series. This metric approximates biologically relevant limiting habitat events, but it ignores the events most likely to constrain populations, inhibit recruitment, or alter species compositions.

Recommendation: Maintaining healthy fish populations is central to managing for a healthy river ecosystem and thus Fort Collins expects it will also be a priority for NISP mitigation and adaptive management. Because the approach used by GEI may underestimate negative impacts, Fort Collins recommends all future fisheries objectives in adaptive management are established based on the correct (standard) interpretation of the FEIS data. The author of this protocol is local (Fort Collins) and has already developed the tools with the FEIS data to make this request easily attainable.

Second, while high flows are common habitat limiting events for small-bodied fish, high flows are also absolutely necessary to maintain the structural components of fish habitat, including channel dimensions, width to depth ratios, riffle-pool periodicity, meander wavelength, substrate composition, deposits of large woody debris, and vegetative encroachment. Therefore, the recommendations under geomorphology are a priority for the fish communities as well.

Third, impairments to water quality, in particular temperature, is directly threatening to fish. All efforts to ensure good water quality with NISP, including the recommendations set forth in this document, are a priority for fish as well.

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SECTION 9: ADAPTIVE MANAGEMENT COMMENTS

9.1 THE ADAPTIVE MANAGEMENT PLAN SHOULD BE REVISED TO MEET THE GOALS OF MITIGATION AND ENHANCEMENT

FEIS: Appendix B, Conceptual Mitigation Plan, 2.8 Adaptive Management

Comment: Fort Collins appreciates the inclusion of the concept of adaptive management in NISP conceptual mitigation plan. As Fort Collins understands it, the purpose of adaptive management is to identify and adaptively respond to unpredicted impacts. As described in the above comments, Fort Collins is concerned that the impacts of Alternative 2M may have been underestimated, which will result in insufficient mitigation. Therefore, an effective adaptive management program is a Fort Collins priority to ensure that Fort Collins does not incur undue risk, cost, and burden because of NISP. Fort Collins agrees with the description provided of adaptive management in the conceptual mitigation plan. However, Fort Collins is concerned that certain omissions will lead to an ineffective adaptive management program and presents the following recommendations to remedy this concern.

Recommendations: Performance standards in the adaptive management program should be based on FEIS-predicted impacts, a modified to factor in uncertainty as described herein. For example, if changes to channel morphology are predicted as minor in the FEIS, then the adaptive management objective should be maintain today's conditions with additional minor changes. Any observed changes beyond minor, should trigger an actionable response. The objectives and thresholds for actionable response should be clearly defined in enforceable legal documents.

For adaptive management to be successful, clear structures must be established, including those regarding what entities are participating and their role(s), funding and spending mechanisms, and enforcement/response.

The City recommends that the adaptive management program be required for no less than 50 years from full operation of the Project, due to the fact that NISP will operate in perpetuity.

As discussed above, Fort Collins' River Health Assessment Framework would be useful in providing the adaptive management program participants with a holistic picture of river conditions and elucidating issues and opportunities for specific mitigation projects. Quantitative measures can be added within the existing River Health Assessment Framework for NISP. Changes to physical parameters can be most directly attributed to NISP and are recommended as the primary measures for this program. Two examples of physical performance standards the could be measured annually and directly attributable to changes from NISP are suggested:

- Establish performance standards around the function of flushing flows. For example, monitor sediment transport and physical embeddedness prior to NISP construction to be able to tie these parameters and behavior specific to the Poudre to the historical flow record. This relationship can then be applied to changes observed with NISP.

- Establish performance standards related to the bio-geomorphic feedback loop that may change in the Fort Collins reaches with an annual survey using permanent cross sections to observe possible aggradation and vegetation encroachment.

With clear objectives, structures, monitoring programs, and performance standards, determining the response mechanism in advance is the final step towards ensuring an effective adaptive management program. Systemic impacts are most effectively remedied with systemic efforts. Therefore, Fort Collins recommends flow (flow releases or bypasses) are provided as the first response mechanism.

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APPENDIX A

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