Donlin Gold DEIS (Part2)

The purpose of this assessment of the Donlin DEIS is to provide additional information to consider when formulating public comments on primarily the proposed action (Alternative 2) in the DEIS. At this phase in the NEPA process the Army Corps of Engineers (ACOE) is seeking what are considered "substantive" public comments on the DEIS. As a reminder the ACOE considers substantive comment as:

> *"Those that suggest the analysis is flawed in a specific way. Generally they challenge the accuracy of information presented, challenge the adequacy, methodology or assumptions of the environmental or social analysis (with supporting rationale), present new information relevant to the analysis, or present reasonable alternatives (including mitigation) other than those presented in the document."*

The public comment period closes May 31, 2016 by COB, and can be emailed directly to: POA.donlingoldeis@usace.army.mil or Fax comments to 907-753-5567.

Comments can be mailed to:
Keith Gordon, Project Manager
U.S. Army Corps of Engineers, Alaska District
CEPOA-RD-Gordon, P.O. Box 6898
JBER, AK, 99506-0898.

Please note: Comments sent via email, including all attachments, must not exceed a 25-megabyte file size per email. Please include in your comments your name, address, and affiliation (if any).

The following are areas of concern encountered in my review of the DEIS that we believe warrant additional study and/or discussion by the ACOE under NEPA guidelines, and should be addressed in a revised DEIS or in the final EIS:

1. **Hydrological modeling**: The uncertainty associated with this model related to the permeability "K Factor" (low K = low permeability, high K = high permeability) of the substrates and bedrock underlying Crooked Creek is significant, specifically in the lower reaches. This modeling provides the foundation for subsequent assessments evaluating impacts to aquatic habitats, species, and fisheries.

2. **Modeled groundwater depletion and its effects on aquatic habitat**: This evaluation is based on an integrated model (surface and ground water) which does not specifically evaluate the scenario of a high K Factor during baseflows conditions.

3. **Salmon productivity:** The analysis is based on the proportion of salmon escaping past the weir on Crooked Creek relative to established salmon escapement goals for tributaries of the Kuskokwim River. The values presented in the DEIS cite incorrectly the number of established tributary escapement goals and therefore presumably also the aggregated numbers. Additionally, the presumption that this type of comparison (proportional

abundance) is the only representative measure of salmon productivity does not reflect the best available science or current fisheries management practices and policy.

4. **Essential Fish Habitat (EFH):** The EFH assessment was prepared by a private contractor who is required to consult with the NMFS. One of the requirements is that the EFH assessment must include the federal agency's view of the effects (not the contractor's) of the proposed action. No such assessment was included in the EFH assessment, or the DEIS. The methodology used in the assessment did not take into consideration the high K scenario. Individual stream reaches were evaluated separately without consideration of cumulative effects. The conclusions of minor to no effects to EFH are flawed and directly contradict other assessments with no explanations provided.

5. **Cumulative Effects Assessment:** The cumulative effects assessment in the DEIS does not adequately address active mining claims near the proposed project. Approximately 100 sq miles of active claims occur along a 100 mile long, by 20 mile wide corridor extending from the proposed mine site to Takotna: including active Donlin claims in the George River watershed, less than 50 miles to the NE. Future development of these claims either by Donlin or some other Claimant is a reasonably foreseeable future action, or possibly even a connected action if the infrastructure developed by Donlin for the proposed mine is utilized in anyway.

6. **Subsistence:** The DEIS present two assessments of the impacts to subsistence; the ACOE assessment with a conclusion of only minor impacts, and the BLM 810 analysis which concludes that there will be significant restrictions to subsistence uses. The DEIS fails to provide any explanation of, or discussion on the two contradictory findings.

<u>Hydrogeology Modeling</u>

Groundwater hydrology is described in Chapter 3, section. 3.6 in the DEIS. The existing conditions and associated impacts for each of the alternatives is based on modeling well, bore hole, surface hydrology, and geologic data collected at various locations throughout the proposed project site, primarily at a local scale. The purpose of the hydrological modeling is stated on page 3.6-13 in the DEIS:

> *"A three-dimensional mathematical model of the groundwater flow system in the vicinity of the proposed mine pit and process facilities area has been constructed by BGC (2011d, h, i, 2014g, c) in order to accomplish the following primary goals:*
>
> - *Better understand pre-mining groundwater flow through the region;*
> - *Plan mine dewatering facilities;*
> - *Estimate the potential effects of the proposed mine on flow in local surface water, in particular Crooked Creek;*
> - *Estimate the effects of proposed tailings storage on groundwater flow;*
> - *Estimate the amount of groundwater that would be collected by the proposed tailings storage facility (TSF) underdrain and seepage collection systems; and*
> - *Estimate the amount of time it would take for the pit lake to fill after mining."*

Under NEPA requirements the ACOE is required to ensure the scientific integrity of all discussions and analyses presented in the DEIS, providing a "full and fair" discussion on the environmental effects of any proposed actions. Given that the hydrological modeling and more specifically the groundwater model is a fundamental component to evaluate the effects of many of the major aspects of the project, getting it "right" is imperative.

The DEIS states on page 3.6-25, emphasis added:

> *"The effects of pit dewatering on Crooked Creek are largest in the winter when streamflow is most supported by groundwater as baseflow. The base case groundwater model that simulates the mine scenario (see Section 3.6.1.4) predicts that some flow of Crooked Creek would be diverted to the pit dewatering system through stream leakage and groundwater flow. Sensitivity analysis simulations (see discussion below in this section) suggest that* ***prediction of the amount of streamflow depletion is difficult****."*

Furthermore the DEIS goes on to state on page 3.6-30, emphasis added:

> *"Using the integrated modeling approach, and examining the 10th percentile low flow and high hydraulic conductivity scenario, Crooked Creek is expected to go dry above American Creek during the low flow season (Table 3.5-26 in Section 3.5, Surface Water Hydrology). Under this scenario and compared to the low flow base-case hydraulic conductivity scenario, the maximum summertime predicted reduction in flow increases from 26 percent to 61 percent and the annual average predicted reduction in flow increases from 22 percent to 46 percent.* ***This verifies that the hydraulic conductivity of the bedrock aquifer is an important parameter of the model****.* ***Use of the base case results, even though they remain probable, should include consideration that other potential outcomes of the model, some quite different, are plausible. This is because bedrock hydraulic conductivity tends to vary from place to place by about three orders of magnitude and model projections based on a single realization of these values at or near the mean values have significant uncertainty.***
>
> *Similarly, a second sensitivity analysis was conducted that simulates hydraulic conductivity zones associated with known faults.* ***Observations in the areas of the faults have not indicated that these faults exhibit high hydraulic conductivity and the base case model did not assign values to faults any different than the surrounding rock.*** *Conceptually, this scenario evaluates the situation where faults subcrop beneath Crooked Creek and extend for some distance away from the creek.* ***Similarly to the high-hydraulic conductivity analysis described above, the calibration worsens under this scenario****.* ***The maximum percent reduction in flow of Crooked Creek at Station CCBO during wintertime increases from 30 percent to 83 percent of flow under this scenario.*** *The maximum summertime reduction in flow increases from 9 percent to 16 percent and the maximum average reduction in flow increases from 20 percent to 49 percent."*

Based on the sensitivity analysis, and the uncertainty associated with modeling groundwater flux throughout the project site the DEIS concludes on page 3.6-30, emphasis added:

> *"Together, these scenarios demonstrate that the model results showing impacts to Crooked Creek should be regarded as uncertain and that the analysis of project effects should include scenarios other than the base case (e.g., the sensitivity analyses described above).* ***Should most or all of the water (at least during winter) in Crooked Creek be diverted by groundwater conditions similar to these sensitivity analysis scenarios, the loss of streamflow and creek habitat could be of high magnitude and extend to a more regional distance downstream (but still limited by the mouth of Crooked Creek).*** *The effect would be long-term, lasting as long as the dewatering system is active during mine operations and with gradually declining impacts, through the closure period as the groundwater system recharges."*

Despite the precautions mentioned by the analysts that developed the groundwater model the DEIS summarizes the impacts to groundwater hydrology in Table 3.6-4, as minor to moderate. This conclusion appears to be arrived at by only considering the dewatering that will potentially occur around the open pit site, i.e. at a local scale. However, the model authors clearly state that under a low flow, high hydrologic conductivity (*High* K) scenario the effect could be observed at a more regional scale, possibly extending to the mouth of Crooked Creek.

Rationale provided in the DEIS to explain why the ACOE chose to consider the precautionary recommendation for some of the impacts i.e. magnitude or intensity, but not others, i.e. the scope of the dewatering being limited to just around the pit site as described on page 3.6-42 is unclear, but addressed in the footnote at the bottom of Table 3.6-4 which states:

> *"The summary impact rating accounts for impact reducing design features proposed by Donlin Gold and Standard Permit Conditions and BMPs that would be required. It does not account for additional mitigation or monitoring and adaptive management measures the Corps is considering."*

Given the stated uncertainty in the groundwater model a reviewer is not able to determine if, and or how these "design features, standard permit conditions, and BMP's "would mitigate impacts to groundwater hydrology, and to what degree. The ACOE proposed further mitigation to address this data gap, specifically on page 3.6- 44-45 the ACOE suggested:

> *"As a result of the recognized uncertainty of model results, the groundwater flow model should be reexamined 3 years after the commencement of pit dewatering to minimize uncertainty about dewatering effects, with a 5-year review frequency thereafter, or when noteworthy unexpected conditions are encountered. Unexpected conditions should be used to revise projections and adjust management plans as needed. As required by permit conditions, relevant groundwater data such as production rates and water table levels) should be collected as mining progresses to facilitate model revisions;"*

Again, it is unclear how requiring additional monitoring and adaptive management practices would mitigate groundwater impacts. Presumably a revised model with less uncertainty would provide a better understanding of the groundwater flux throughout the project site and the impacts from proposed actions. However, given the possibility that the magnitude and scope of impacts could be significantly greater than those presented in the DEIS (as suggested by some subject matter experts, Myers Memo 2016) it is uncertain that simply modifying management plans would be sufficient mitigation. It is more likely that should significant differences in groundwater flux be revealed that corresponding significant changes to the project design would also be required to mitigate the impacts. Without adequate consideration of this potential in the DEIS or FEIS, the decision to approve permitting of the project by the ACOE based on the current understanding of groundwater flux would appear to be pre-decisional.

The technical aspects of the groundwater model are complex, and in reality, the validity of the model can only be fairly evaluated by subject matter experts. The numeric model was prepared by an independent contractor and provided to the ACOE for inclusion in the DEIS, stating in the DEIS that the modeling met industry standard. However, given the stated uncertainty in the model and the fundamental role it plays in the evaluation of impacts and consideration of alternatives a third party independent peer review of the model should have been conducted and provided in the FEIS, or a supplemental DEIS.

To our knowledge only one such review by a qualified expert has been conducted, by a Dr. Tom Myers under commission by the Northern Alaska Environmental Center. Dr. Myers Technical Memorandum "*Review of the Draft Environmental Impact Statement for the Donlin Gold Project"* provides a comprehensive review of the numerical groundwater model. His comments regarding the model presented on page 28-43 of the memo are incorporated by reference into this document, and included as an appendix.

It is our belief to provide a "full and fair" discussion on the environmental effects of the proposed actions, and allow the reviewer to make a "reasoned choice" among alternatives the ACOE must conduct, and provide the results from an independent peer review of the numerical groundwater model used in the DEIS, prior to the release of the FEIS.

<u>Ground and Surface Water Depletion and its Effects on Aquatic Habitats</u>

The assessment of impacts to aquatic habitats begins on page 3.13-81 of the DEIS. The section on assessment of changes in streamflow and its effects is unnecessarily confusing. The information was analyzed and presented in such a way that did not allow for direct comparison of the estimated reductions in habitat (Table 3.13-27 and 28) to the descriptions beginning on page 3.13-93, or the summary impacts shown in Table 3.13-30. This confusion results from the different assumptions about the degree of dewatering used in the various analyses. An example of this incongruence from the DEIS (page 3.13-96) is illustrated below, emphasis added:

> *"As shown in Table 3.13-28, the number of off-channel units and corresponding areas connected to the main channel relative to estimates of total off-channel habitat surface area were calculated for* ***baseflow conditions minus 16 percent****, at baseflow, and at increasing levels of flow representing 25, 50, 75, and 100 percent of bankfull stage (OtterTail 2012e)."*

And, from page 3.13-94:

> *"During Year 20 of operations, the maximum winter flow reductions in stream reaches near the mine site and in lower Crooked Creek would vary from:*
>
> *85-100 percent in March **based on a low flow year and High K scenario**; flows would be reduced by **85 percent** at Crevice Creek, **40 percent** below Getmuna Creek, and **31 percent** below Bell Creek."*

Additionally the DEIS goes on to summarize the impacts of reduced streamflow and Mainstem Aquatic Habitats and states that the analysis presents the "most conservative case". This clearly is not the case, since the DEIS then goes on to say the *High* K scenario was not considered in the analysis which, as shown above would represent the most conservative case, page 3.13-98, emphasis added:

> *"Estimates of Crooked Creek habitat loss were predicted based on Year 20, monthly 10-year low flow projections (Table 3.13-27). As described in the sections below, estimates for summer and winter low-flow scenarios provide a **high-end (most conservative case)** estimate of potential aquatic habitat loss as a result of proposed project operations (however, **they did not predict habitat losses corresponding to High K scenario flow reductions**)."*

This use of different assumptions occurred consistently throughout most of the analysis presented in section 3.13 of the DEIS. This results in summary impact (Table 3.13-30) conclusions that run the full range of possibilities, i.e. from negligible to major for the same components at the same locations, which is effectively meaningless without proper context. This then leaves it up to the reviewer to decide which scenario is most appropriate to use, but (as discussed previously) the DEIS provides no basis of direct comparison between scenarios.

The issues discussed in the previous section regarding the uncertainty associated with the groundwater model are obviously the major contributing factor to the previous discussion. We believe that until those issues are satisfactorily resolved, and a reanalysis and conclusions (based on consistent assumptions) are provided a rational evaluation of the potential impacts to fish and aquatic resources is not possible.

<u>Salmon Productivity</u>

The assessment of streamflow reductions in Crooked Creek and its tributaries on salmon productivity (beginning on page 3.13-108) is conceptually inadequate. In addition to suffering from the same issues raised in the previous two sections: it also limits the scope of the analysis to only the abundance of Crooked Creek salmon populations(s) within the context of the overall Kuskokwim Basin salmon population(s).

It is recognized by fisheries scientists that salmon "productivity" is not strictly a numbers game, but that biological diversity also plays a critical role in the long term sustainability of fish populations, and is inherent in any assessment of "productivity". Lichatowich and Williams said it best in their 2015 report to the Bering Sea Fisherman's Association titled: *A Rationale For Place-Based Salmon Management:*

"Genetic diversity, life history diversity, and population diversity are ways salmonids respond to their complex and connected habitats. Those factors are the basis of salmonid productivity and contribute to the ability of salmonids to cope with environmental variation that is typical of freshwater and marine environments."

Furthermore, in a combined analysis for Chinook salmon in the AYK region, particularly the Kuskokwim, McPhee et al. (2009), Waples (2009), and Utter et al. (2009) recommended that Chinook salmon to be managed at a local population level to preserve biological diversity.

Sustained productivity of salmon has been shown to be possible only if genetic diversity and population structure are maintained (NRC 1996; Hilborn et al. 2003). Only a few studies specific to the genetic diversity of Kuskokwim Chinook salmon have been conducted, and none included the Crooked Creek population. One of the conclusions reached by researchers, Templin, et al. (2004) when looking at the genetic diversity of Kuskokwim salmon was:

"Significant population structure exists among populations of Chinook salmon from the Kuskokwim Management Area. In particular, populations spawning upriver of the confluence with the Holitna River are particularly genetically divergent, both within and between populations."

In another study, Olsen et al. (2004) evaluating the effective population sizes of Kuskokwim River tributaries with small populations of Chinook salmon writes:

"Maintaining genetic diversity is necessary for maintaining healthy, viable populations. This tenet of conservation is most relevant for populations that are small or are experiencing significant declines in abundance. Small populations are of particular concern because loss of genetic diversity is inversely proportional to population abundance. In this context, abundance refers to the effective size of the population (Ne), not the census size (N), and theory suggests genetic diversity is lost at a rate equal to 1/(2Ne) per generation. Thus, the Ne is an important indicator of the genetic health and viability of a population. Conservation guidelines have been established from theoretical studies that suggest isolated populations having an Ne below 500 (50) are at risk of significant long-term (short-term) loss of genetic diversity. These threshold values of 500 and 50 provide a yardstick with which to evaluate Ne estimates."

The Olsen study further goes on to provide *Ne/N* ratios that can be used as surrogates when genetic information is not available to estimate the effective population size for Chinook populations where demographic information is available. Olsen calculated the average Ne/N ratio to be (0.28 ± 0.12) assuming a 1:1 sex ratio, no immigration, and random variation in reproductive success. For discussion purposes if we apply Olsen's surrogate ratio to the average Chinook escapement reported in the DEIS (59 Chinook), we can estimate an effective population size (Ne) at 16.5 fish. This means that the population is actually losing genetic diversity at the rate of the Ne population size (16.5), and not the census size (59). Estimating the genetic loss per generation (using the formula provided above) we can arrive at approximately 3.0 % per generation for a Ne (16.5), and 0.8 % for N (59). Assuming an average generation time for Kuskokwim Chinook to be 5 years, we can then get a rough idea of the genetic diversity of Crooked Creek Chinook salmon over time under current conditions, Table 1.

Table 1. Estimated Loss of Genetic Diversity for Crooked Creek Chinook over Time

	Size	Loss over 1 gen or 5 yr.	Loss over 4 gen or 20 yr.	Loss over 10 gen or 50 yr.	Loss over 20 gen or 100 yr.
N (census size)	59	0.8%	3.2%	8%	16%
Ne (effective size)	16.5	3.0%	12%	30%	60%

The purpose of the previous exercise and discussion was not to precisely attempt to quantify the biological diversity of Crooked Creek salmon but simply to demonstrate their possible vulnerability, and that while these populations may be small in the overall context of the Kuskokwim, they are important as reservoirs of genetic diversity. Fisheries Managers and Biologists on the Kuskokwim River recognize the importance of this fact, and are currently (or attempting to) employ strategies to preserve biological diversity. These strategies are well documented in studies evaluating what has been termed the "portfolio effect" (Schindler et al. 2010) and how it contributes to long term productivity and provides for sustainable yield.

Fundamentally the assessment as presented in the DEIS suggest that the proportion of Crooked Creek salmon to the overall Kuskokwim Basin salmon returns is so minor that the loss of some, or potentially all the salmon would be inconsequential to "productivity". The DEIS summaries on page 3.13-124 all mine site area impacts to salmon as:

> *"Potential impacts from anticipated flow reductions in Crooked Creek would be minor relative to broader populations of fish in the Kuskokwim River. "*

For reasons previously stated, a conclusion that only considers this broader context is not an accepted principle of fisheries management, conservation, and contrary to specific direction provided in policy. For example despite **not** being mentioned in the DEIS Regulatory Framework section on page 3.13-4: the State of Alaska Policy for the Management of Sustainable Salmon Fisheries (5 AAC 39.222) provides detailed and clear direction on the management and conservation of salmon. Any future assessment should contain a thorough discussion on the principles found in the Sustainable Salmon Fisheries Policy, and how any proposed activities will comply with the direction contained within it.

<u>Essential Fish Habitat Assessment</u>

The Essential Fish Habitat Assessment (EFH) was prepared by a private contractor and provided to the ACOE for inclusion in the DEIS, as Appendix Q, page 1 states the following:

> *"Section 305(b)(2) of the MSFCMA requires federal agencies to consult with National Marine Fisheries Service (NMFS) on all actions or proposed actions authorized, funded, or undertaken by the agencies that might adversely affect EFH.*
>
> *The EFH Guidelines, 50 Code of Federal Regulation (CFR) 600.05 – 600.930, outline procedures that federal agencies must follow to satisfy MSFCMA consultation requirements. Federal agencies must provide the NMFS with an EFH Assessment if the*

federal action may adversely affect EFH. An EFH assessment is to include the following contents (50 CFR 600.920(e)): 1) a description of the action, 2) an analysis of the potential effects of the action on EFH and managed species, 3) the federal agency's view of the effects of the action, and 4) proposed mitigation, if necessary."

As specified above the ACOE is required to submit the EFH report to the NMFS for review and consultation, no record of that occurring is included in Chapter 6: Consolation and Coordination of the DEIS. Additionally no "federal agency's view" (also stipulated above), from either the ACOE, or the NMFS is included in the EFH assessment. The oversight agency's (NMFS) views on the assessment would be invaluable at determining the validity of the EFH assessment, and their comments should have been included in the DEIS, as required by 50 CFR 600.920(e)): 3.

Fundamentally, the EFH assessment is wholly inadequate because it does not take into consideration in its assessments of impacts to Crooked Creek the potential of increased dewatering of the *High* K scenario, previously discussed. Additionally, the EFH assessment evaluates impacts only within the broader context of Kuskokwim returns, stating on page 32 of the EFH assessment:

"While salmon escapement values for the entire Kuskokwim River system are not available, because all tributaries are not surveyed or enumerated, annual ADF&G Chinook salmon escapement goals for all 14 monitored tributaries combined were 25,050 to 59,730 (aggregate escapement goal range) (Conitz et al., 2012). By comparison, the average 2008 to 2012 Chinook salmon escapement at the Crooked Creek weir represents between 0.1% and 0.2% of the total escapement goal range for all 14 Kuskokwim River stocks for which escapement goals have been established."

The statement above is factually incorrect. The Kuskokwim River currently has only 3 established Chinook escapement goals on tributaries with weirs, which provide estimate of total escapement, a fourth goal for the Tuluksak River was dropped in 2010. In 2013 a Basin Wide goal of 65,000-120,000 was also established. A total of 12 aerial index sites are surveyed intermittently, 7 of which have established escapement goals, and these however are only proportional indices of the total escapement. The remaining three goals referred to above are not for tributaries of the Kuskokwim River, but instead for Kuskokwim Bay.

Recognizing, if such a comparison were to be made it would be more appropriate to use the established Basin Wide escapement goal range of 65,000-120,000, in context with the Crooked Creek average escapement of 59 Chinook. This gives a range of less than one tenth of one percent that Crooked Creek Chinook contribute to the overall Chinook escapement goal for the Kuskokwim: even lower than what is reported in the EFH assessment. Hopefully the previous point serves to illustrate that using only abundance estimates in such a broad context should not be the only factor considered when evaluating impacts to fisheries, for all the reasons previously discussed.

In the EFH assessment the mention of the removal of beaver dams from Crooked Creek as mitigation, page 44 is not only short-sided, but illustrates a lack of understanding by the authors preparing the assessment regarding salmon/beaver/riverine ecology. It is recommend prior to any type of stream manipulation proposed as mitigation that a limiting factor analysis of spawning, rearing, and overwintering habitat be conducted for each species of salmon found in Crooked Creek.

Cumulative Effects Assessment

As stated on page 4-1 of the cumulative effects assessment:

> *"the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such actions" (40 CFR 1508.7)."*

The cumulative effects assessment in the DEIS does not adequately address active mining claims near the proposed project, Figure 1, and considered them to be small scale placer mining operation or exploration activity. Approximately 100 sq miles of active claims occur along a 100 mile long, by 20 mile wide corridor extending from the proposed mine site to Takotna: including active Donlin claims in the George River watershed, less than 50 miles to the NE.

Future development of these claims either by Donlin or some other Claimant is a reasonably foreseeable future action, or possibly even a connected action if the infrastructure developed by Donlin for the proposed mine is utilized in anyway. A revised assessment should be conducted that is inclusive of the potential development of these claims and to what degree the Donlin project would/ or would not facilitate their development.

Subsistence

The DEIS present two assessments of the impacts to subsistence; the ACOE assessment with a conclusion of only minor impacts, and the BLM 810 analysis which concludes that there will be significant restrictions to subsistence uses. The DEIS fails to provide any explanation of, or discussion on the two contradictory findings. The result is that the DEIS does not allow the reviewer to make a "reasoned choice" among alternative.

Figure 1. Active mining claims near the proposed Donlin Project. See attachment

References

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