THE STATE of ALASKA
GOVERNOR MICHAEL J. DUNLEAVY

Department of Environmental Conservation

DIVISION OF WATER
Director's Office

410 Willoughby Avenue
Juneau, Alaska 99811-1800
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May 13, 2022

Thomas S. Waldo
Earthjustice
325 Fourth Street
Juneau, AK 99801

RE: Donlin Gold Mine Certificate of Reasonable Assurance Remand Decision (3AN-21-06502CI)

Dear Mr. Waldo:

Consistent with the December 29, 2021 Order Granting Interlocutory Remand, find enclosed the Division's decision to affirm its April 5, 2019 decision to issue a 401 Certificate of Reasonable Assurance (POA-1995-120). After an exhaustive review by Division staff and a third-party expert, the Division asserts it has met the threshold of reasonable assurance for this project.

The Division acknowledges all models contain a degree of uncertainty. The objective of this remand was not to create more elaborate models, but to critically evaluate if the existing models provided by Donlin provided additional support for reasonable assurance of meeting water quality standards for mercury and temperature. After reviewing all of the provided expert opinion, the Division has even greater confidence of reasonable assurance noting that the mine will operate under a suite of permits, monitoring, sampling, and reporting requirements, engineering controls and adaptive management.

A person authorized under a provision of 18 AAC 15 may request an informal review of a contested decision by the Division Director in accordance with 18 AAC 15.185 and/or an adjudicatory hearing in accordance with 18 AAC 15.195 – 18 AAC 15.340. See DEC's "Appeal a DEC Decision" web page https://dec.alaska.gov/commish/review-guidance/ for access to the required forms and guidance on the appeal process. Please provide a courtesy copy of the adjudicatory hearing request in an electronic format to the parties required to be served under 18 AAC 15.200.

Sincerely,

Randy Bates
Director

Enclosed: The Division's Response to ONC Comments w/attachments

cc:

Jenn Currie, Department of Law
Kate Demarest, Department of Law
Erik Fjelstad, Perkins Coie LLP

THE DIVISION'S RESPONSE TO ONC COMMENTS

BACKGROUND

Donlin Gold LLC (Donlin) proposed to develop an open-pit, hard-rock gold mine in Southwest Alaska within the Crooked Creek watershed near the confluence of Crooked Creek and the Kuskokwim River. In July 2012, Donlin applied to the U.S. Army Corps of Engineers (Corps) for a permit under section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. The Corps determined that an Environmental Impact Statement (EIS) was necessary to inform the permit decision and issued a Draft EIS on November 25, 2015 for public notice and comment. The Corps issued the Final EIS (FEIS) on April 27, 2018.

On June 8, 2018, Donlin requested the Alaska Department of Environmental Conservation Division of Water (Division) consider issuing a Certificate of Reasonable Assurance (Certificate) required for the proposed 404 permit under Section 401 of the Clean Water Act. The Division issued notice of Donlin's materials on June 13, 2018 establishing a public comment period from June 13, 2018 to July 13, 2018. The Division issued a Certificate, Antidegradation Analysis, and a Response to Comments on August 10, 2018.

On August 13, 2018, the Corps and Bureau of Land Management (BLM) issued a joint Record of Decision and Permit Evaluation (ROD) along with a combined Clean Water Act Section 404 and Rivers and Harbors Act Section 10 permit.

On August 30, 2018, Orutsararmiut Native Council (ONC) submitted a request for informal review of the Certificate consistent with Title 18 Alaska Administrative Code, Chapter 15 (18 AAC 15). ONC amended this request on September 28, 2018. The Division Director

issued a decision on the amended request to remand the permit to the Division for review. The Division revised its Response to Comments and reissued the Certificate on April 5, 2019.

On April 24, 2019, ONC submitted a second request for informal review raising issues substantially like those identified in its first request. The Division Director issued a decision on the second request on May 8, 2019 remanding the Certificate to the Division to address issues raised by ONC. The Division revised its Response to Comments and affirmed the previously issued Certificate on May 7, 2020.

On June 5, 2020, ONC submitted a request consistent with 18 AAC 15 for an adjudicatory hearing on behalf of several Alaska Native tribes and other organizations. The Department Commissioner referred the adjudicatory hearing request to the Office of Administrative Hearings. On July 31, 2020, the Administrative Law Judge held that all but one party, ONC, had not commented during the public comment period and therefore ONC was the only party with standing to appeal.[1] He also recommended the Commissioner grant an adjudicatory hearing on three issues: mercury, water temperature and existing uses. A hearing on the briefs occurred. On May 27, 2021, the Commissioner found that reasonable assurance existed that the proposed mine project would not result in exceedance of the Alaska Water Quality Standards and denied the ONC request to rescind the Certificate.

On June 28, 2021, ONC submitted Notice of Appeal to the Superior Court for the State of Alaska, Third Judicial District for the Commissioner's May 27, 2021 decision to uphold the

[1] In ONC's comments on the two Donlin reports, ONC purports to add new parties to this appeal. The Division will be opposing this addition in the event ONC requests an adjudicatory hearing.

Certificate. On September 27, 2021, Donlin requested a temporary stay in briefing before the Court to allow Donlin to provide all parties additional information on two water quality standards at issue in ONC's appeal: mercury and water temperature limits. The Department filed a nonopposition to Donlin's request for stay on September 30, 2021. The Department received Donlin's reports on October 22, 2021 and ONC received the information on October 25, 2021. On November 19, 2021, the Department moved for an interlocutory remand back to the Division to evaluate whether, and to what extent, Donlin's technical submittals on mercury and water temperature affect the underlying certificate. On December 29, 2021, Superior Court Judge Easter granted the interlocutory remand and established procedures to apply on remand.

PROCESS FOR REVIEW OF DONLIN REPORTS

The Division reviewed the Donlin reports on mercury and water temperature and were also briefed on the findings by the consultants who prepared each report. Due to the technical complexity and specificity of the reports, the Division sought third-party expert review and analysis of the Donlin reports. In January 2022, the Division secured a contract with Exponent, a multi-disciplinary engineering and consulting firm, to analyze the Donlin reports and provide comment on the assertions made in each report. The analysis of the Donlin reports *Expert Report of Mark W. Johns In the Matter of: Orutsararmiut Native Council v. Alaska Department of Environmental Conservation and Donlin Gold LLC* (Exponent 2022) is attached as Exhibit 1 and includes a curriculum vitae.

The supplemental information Donlin provided was in the form of two reports. The first was *Donlin Gold project: analysis of Crooked Creek stream temperature (draft),* BCG Engineering Inc. (BGC 2021), Exhibit 2. The second report was *Draft Report: Donlin Gold*

Mine supplemental mercury modeling and mass balance analysis, Ramboll US Consulting, Inc. (Ramboll 2021), Exhibit 3. Exponent conducted their review based largely on analysis of the two submitted reports, cited references, and publicly available documents. Analysis for Ramboll 2021 reached a point where Exponent required additional information. Twice during the analysis, the Division facilitated a meeting between Exponent, Donlin and Ramboll to fulfill Exponent's request for information.

BGC 2021 used updated water budgets published after the FEIS and stream flow and temperature data collected for the FEIS to develop a quantitative model of stream temperature using SSTEMP, a stream temperature model from the USGS. The model used average groundwater data and maximum annual surface water temperatures (from 2005) as the basis for the model. Results from the model showed that the stream temperatures are not expected to exceed the relevant water quality temperature standards for either egg/fry incubation and spawning or migration routes.

Dr. Mark Johns of Exponent independently evaluated the updated temperature model in BGC 2021. Results from his analysis are presented in Exponent 2022. Dr. Johns concluded that the model chosen in BGC 2021 was appropriate for the environmental data, that the use of 2005 temperature data represented a conservative case because it was the warmest year for which data were available, and that the quantitative evaluation conducted in BGC 2021 was reasonable.

Ramboll 2021 used updated operational information published after the FEIS, additional chemical data, and more refined assumptions about the transport and sources of mercury in the environment to model the potential impact of the proposed Donlin mine on local stream mercury concentrations (Ramboll 2021). The model used for the transport of mercury from the mine

emissions was CALPUFF, which was the same model previously used in the FEIS. However, from the additional analysis, Ramboll concluded that the majority of mercury in local streams is related to the erosion of naturally occurring geological materials, rather than atmospherically deposited mercury, and the new analysis determined that only a fraction of the project-related mercury would be transported to streams. The study concluded that the mass of mercury entering the Crooked Creek watershed would decrease as a result of the project due to runoff control in the vicinity of the mine, particularly in the American Creek watershed, which would be nearly entirely within the mine boundaries.

Dr. Mark Johns of Exponent independently evaluated the updated mercury analysis in Ramboll 2021. Results from his analysis are presented in Exponent 2022. Dr. Johns concluded that the approach used by Ramboll relied on appropriate sources and was reasonable but noted that a small fraction (0.3%) of the American Creek watershed would be subject to increased deposition that could lead to localized exceedances of the mercury aquatic water quality standard if flow remained in that creek. This small area was not explicitly addressed in the Ramboll 2021 supplemental mercury report.

The Division reviewed the remaining 0.3% of American Creek drainage concern with the applicant. After briefing the Exponent findings, Donlin had additional questions regarding the drainage and the non-zero potential for concentration based exceedances of mercury WQS. The Division facilitated a meeting between Exponent, Donlin, and Ramboll staff on February 23, 2022 to allow the two consulting firms to discuss their modeling approach and results for the drainage in question. A follow-up meeting occurred on March 31, 2022. During these meetings, Dr. Johns explained the concern his analysis discovered with a small portion of the American Creek drainage that would remain and not become incorporated into the pit or waste facility.

The area of the American Creek drainage remaining outside the mine footprint is adjacent to Crooked Creek and would be subject to runoff. The existing monitoring site for American Creek would be eliminated when the mine facilities are constructed. The Division engaged Donlin to address these concerns. Donlin submitted a proposed revision to the project Monitoring Plan on April 22, 2022, which addressed mercury monitoring for the remaining portion of the American Creek drainage. The proposed plan included the addition of a monitoring station which will endure the mine construction and operation and continue to inform the permit of mercury in any remaining portion of American Creek for potential impact to Crooked Creek. The Division approved and placed into effect the new Monitoring Plan on May 6, 2022. The revised plan established a requirement for Donlin to implement adaptive management strategies consistent with the permit requirement at section 2.7 of the project Waste Management Permit 2019DB0001, which is issued and in effect.

ONC COMMENTS ON RAMBOL 2021 AND BGC 2021

On March 29, 2022 ONC provided comments regarding the Donlin supplemental reports BGC 2021 and Ramboll 2021.[2] Exhibit 4. ONC provided a cover letter of comments with attachments. These comments assert that there is no reasonable assurance of compliance with water quality standards and recommended rescinding the Certificate.

[2] After ONC submitted its comments on March 29, Donlin submitted responsive comments. Exhibit 5. Weeks later, and five days before this decision was due, ONC submitted responses to Donlin's responses to ONC's comments. Those comments by ONC submitted on May 9, 2022 (Exhibit 6) are not generally detailed in this response to comments due to a lack of time. The Division did, however, review comments submitted by Miller and Myers and found essentially no new substantive ONC comments that would change its decision to issue this Certification. The Division does, however, respond to a few of Miller's comments and the Chambers report, since this was a completely new expert report. Subsequently Donlin submitted a response to ONC's May 9, 2022 comments (Exhibit 7). Calista also submitted comments. Exhibit 8.

ONC provided third-party expert review of Rambol 2021 and BGC 2021. For Mercury, ONC provided comment on Ramboll 2021 by Glenn C. Miller, Ph.D. Those comments were included as Exhibit 5, a memorandum prepared by Glenn C. Miller, Ph.D. Dr. Miller's memorandum provided a technical review of Ramboll's analysis of the potential for exceedances of the mercury water quality standards in Crooked Creek and nearby streams because of the proposed Project (Miller 2022). Dr. Miller concluded that the mercury estimates were unreasonably low because Ramboll 2021's analysis did not consider mercury-cyanide chemistry and because the emissions were much lower than those from the Goldstrike Mine in Nevada.

ONC also provided comment on BGC 2021 by Tom Myers, Ph.D. Those comments were included as Exhibit 6, a memorandum prepared by Tom Myers, Ph.D. Dr. Myers' memorandum provided a technical review of BGC's analysis of potential changes in Crooked Creek stream temperatures that may occur because of the proposed Project (Myers 2021). Myers concluded that the BGC analysis did not provide evidence indicating that "…the development of the Donlin Mine would not cause stream temperatures that would exceed standards."

DIVISION'S GENERAL RESPONSE TO ONC COMMENTS ABOUT REASONABLE ASSURANCE AND MODELING

ONC asserts that at the end of consideration of all of the scientific information in the case, the Division lacks reasonable assurance to issue the certification. The Division has adopted water quality standards, which establish numeric and narrative standards for the state's surface waters, as required by the federal Clean Water Act.[3]. EPA regulations implementing the Clean

[3] *See* 33 USC § 1313(a); 18 AAC 70.020

Water Act also direct the state to develop and adopt a statewide antidegradation policy and identify methods for implementing this policy.[4] Section 401 of the Clean Water Act requires a state to certify that an applicant for a federal license or permit to discharge pollution into navigable waters will comply with state and federal water quality standards and any other appropriate requirements of state law, which become a condition of the license and are binding on the federal license.[5]

The Division's regulations implement the certification requirement under Section 401 of the Clean Water Act for all federally licensed or permitted activities.[6] The process for certification is set out at 18 AAC 15.130–18 AAC 15.180. The federal regulations applicable to this certification require that the state's certification include a "statement that there is reasonable assurance that the activity will be conducted in a manner which will not violate applicable water quality standards," 40 CFR § 121.2(a)(3) (1971), and a "statement of any conditions which the certifying agency deems necessary or desirable with respect to the discharge of the activity."[7]

In issuing its certification pursuant to section 401, the Division is not required to provide absolute certainty that permittees will never violate water quality standards.[8] Instead, the Division must conclude that it has "reasonable assurance" that the permitted activity will

[4] 40 CFR § 131.12.
[5] 33 U.S.C. § 1341(d),
[6] 18 AAC 15.130(a); 18 AAC 15.180(a).
[7] 40 CFR § 121.2(a)(4) (1971).
[8] *Miners Advocacy Council v. State, Dep't of Envtl. Conservation*, 778 P.2d 1126, 1138 (Alaska 1989); *see also Port of Seattle v. Pollution Control Hearings Bd.*, 90 P.3d 659, 676 (Wash. 2004).

comply with water quality standards.[9] The certification must address future events and the likelihood that those events will result in violations of water quality standards.[10]

The Division can base reasonable assurance of compliance with water quality standards on conditions that are stated in the section 401 certificate, including conditions that are included in the certificate as a result of the Division's review of the certificate in an administrative appeal.[11] The Division can also base reasonable assurance of compliance with water quality standards on Donlin's compliance with current and future permits governing its activity.[12] The Division can rely upon monitoring requirements and adaptive management measures in assessing reasonable assurance of compliance. [13]

Finally, the certification finds that there is reasonable assurance that the project will comply with state water quality standards. ONC argues that "will comply" means that there must be no projected exceedances of water quality standards using models and when the mine is operation, no exceedances whatsoever. This argument is contrary to the rule. EPA addressed the issue of "will comply" in the Federal Register. It stated that

> The Agency disagrees with the suggestion that using ''will comply'' will place an impossible standard on certifying authorities. The Agency does not intend or believe that the statutory language requires States to ensure that a project will maintain strict compliance, in every respect, throughout its entire existence. The inclusion of the statutory language ''will comply'' does not require certifying authorities to provide absolute certainty that applicants for a federal license or

[9] *Miners Advocacy*, 778 P.2d at 1138.
[10] *Port of Seattle,* 90 P.3d at 676.
[11] *See, e.g., Port of Seattle*, 90 P.3d at 676 (board reviewing certification decision may add conditions to the certificate to achieve reasonable assurance); *Center for Environmental Law & Policy v. Washington Dep't of Ecology, Washington Pollution Control Hearings Board*, 2014 WL 2986620 at pp. 10-11.D
[12] *Port of Seattle*, 90 P.3d at 677-78.
[13] *Id.*

> permit will never violate water quality requirements. Indeed, future compliance depends on many factors besides just facility design and operation, and it would not be reasonable for an authority to certify that no unknown future event could ever result in a violation of the certification. The use of the language comparable to ''will comply'' is not uncommon in [Clean Water Act] regulatory programs. For example, CWA section 402 contemplates that an NPDES permits may issue only upon a showing that discharge ''will meet'' various enumerated provisions. 33 U.S.C. 1342(a). This standard has not precluded States, Tribes, or the EPA from routinely issuing NPDES permits for a variety of discharges; nor has it resulted in NPDES permits that are impossible for permittees to comply with. The Agency concludes that use of the statutory language ''will comply'' in the final rule remains loyal to the words that Congress chose when it enacted section 401. The Agency has no theoretical or empirical basis to conclude that the language in the final rule will materially change the way in which certifying authorities, including the EPA, process certification requests, so long as certifying authorities act in good faith and in accordance with CWA section 401.[14]

With respect to modeling, ONC spends much of its comments on the Ramboll 2021 and BGC 2021 reports deriding the use of modeling. Because the Donlin mine has not yet been constructed, as happens with a large number of projects across the United States, modeling is how we predict what will happen in future years.

Reasonable assurance is predictive in nature.[15] Models are used in the Clean Water Act and the Clean Air Act, to name only two, in making predictive determinations.[16] "Any model is an abstraction from and simplification of the real world. Nevertheless, administrative agencies have undoubted power to use predictive models."[17] "Modeling is an approach that uses observed

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[14] 85 FR 42210, 42277 (2020).
[15] *Sierra Club v. State Water Control Board*, 898 F.3d 383, 397 (4th Cir. 2018).
[16] *American Farm Bureau Federation v. U.S. E.P.A.*, 948 F.Supp.2d 289, 298 and 339 (D.C. Pa 2013)(Reasonable assurance on load allocations that WQS would be met utilizing models is appropriate); *Montana Sulphur and Chemical Co. v. U.S.E.P.A.*, 666 F.3d 1174 (9th Cir.2012)("The EPA therefore did not act arbitrarily or capriciously by relying on predictive modeling…" to make a CAA decision)
[17] *Sierra Club v. Costle*, 657 F.2d 298, 332 (D.C. Cir. 1981); *Maryland Dept. of Env. v. Anacostia Riverkeeper*, 134 A.3d 892 (CA MD 2016); *Small Refiner Lead Phase-Down Task Force v. U.S.E.P.A.*, 705 F.2d 506, 536 (D.C. Cir. 1983).

and simulated data to replicate what is occurring in the environment to make future predictions."[18] Courts routinely review 401 certifications that utilize modeling in order to predict the effects of a project on the environment.[19]

In Deep River Citizens' Coalition v. North Carolina Department of Environment and Natural Resources,[20] the Petitioner argued the Environmental Management Commission ("EMC") and trial court erred by determining the Randleman Dam and Reservoir project "would not violate certain water quality standards[,] specifically "water quality standards for chlorophyll *a*."[21] Petitioners contended the models used to predict the effects of the project on chlorophyll *a* were "flawed and unreliable."[22] Some models predicted chlorophyll levels within the applicable standard, other computer models predicted levels in excess.[23] The court in Deep River stated that when

> the Director of the Division of Water Quality issued the 401 Certification, he was aware of the potential for water quality standard violations and "specifically considered the existing Randleman Lake Water Supply Watershed Nutrient Management Strategy and the opportunity that the State would have to impose additional restrictions on nutrient sources in the event of actual or threatened water quality standard violations after the reservoir is constructed." We agree with respondents that "no one will know precisely whether or to what extent exceedances ... of the Standard will occur until construction of the dam and impoundment of the lake have been completed" but that mere "knowledge of the potential for exceedances ... of the chlorophyll *a* standard was not sufficient to preclude DENR from issuing the 401 Certification." The trial court therefore had before it substantial and competent evidence that, in the event water quality standards were actually threatened, the State could impose additional restrictions to avoid chlorophyll *a* violations. We conclude the trial court did not err in

[18] *Maryland Dep't of Env't* ,134 A.3d 892, 903 (CA MD 2016).
[19] *Port of Seattle v. Pollution Control Hearings Board*, 90 P3d 659 (S.C. Wa. 2004).
[20] 598 S.E.2d 565 (CA N.C. 2004).
[21] *Id.* at 567.
[22] *Id.* at 569.
[23] *See id.*

> concluding that DENR provided reasonable assurance that the State's water quality standards would not be violated by the proposed project.[24]

Subsequently, in Sound Rivers, Inc. v. N.C. Dep't of Env't Quality, Div. of Water Res.,[25] the court followed the same logic and stated that

> "no one will know precisely whether or to what extent violations of various water quality standards, including standards not addressed in this opinion, may occur until after discharge of wastewater begins." The ALJ and superior court determined that the Permit reasonably ensures compliance with water quality standards, but the Permit requires specific monitoring and reports, and if a violation does occur, DEQ can modify or revoke the Permit to prevent further violations of water quality standards. The reopener provision in no way allows DEQ 'to issue a permit expected to violate water quality standards' as Petitioner contends.[26]

In this case, models are required, since the mine has not been constructed yet. They are also appropriate for the predictive nature of reasonable assurance. As Port of Seattle noted about the use of modeling, "…safeguards exist because the Port must monitor actual flows and implement contingency measures accordingly."[27] Although models are used to predict the effect that Donlin will have on the environment, there are safeguards. Donlin will continue to monitor, as it has in the past years. This will provide real time data to determine if the predictive monitoring is representative of future events. In addition, there is a plan to address those situations where the predictive monitoring is straying from the conclusions reached, adaptive management.

POINT BY POINT RESPONSE TO ONC COMMENTS ON RAMBOLL 2021 AND BGC 2021.

[24] *Id.* at 569 (brackets omitted).
[25] 845 S.E.2d 802, 842 (CA N.C. 2020)
[26] *Id.*
[27] *Port of Seattle*, 90 P3d at 679.

EARTHJUSTICE COVER LETTER COMMENTS

Comment 1: Pg. 2, ¶1, I. Introduction and Summary: "Both draft studies rely on models to estimate the impacts of the proposed mine decades in the future."

The Division's Response: Models are the tool we use to evaluate conditions prior to construction of the proposed mine site. The reports by BGC 2021 and Ramboll 2021 rely on data collected and vetted in the FEIS,[28] and data collected since the FEIS was issued under the water monitoring plan, as well as data or literature values gathered for the modeling in the above reports.

Comment 2: Pg. 2, ¶2, I. Introduction and Summary: "Both of Donlin's models predict outcomes almost exactly at the applicable standard. Given the large range of potential deviation from those outcomes, the models provide no basis to believe that compliance is any more likely than non-compliance."

The Division's Response: BGC prepared a quantitative analysis of Crooked Creek Stream temperature to evaluate potential stream temperature changes to Crooked Creek attributable to the proposed Donlin Gold Project (Project). The quantitative analysis provided the magnitude and frequency of potential temperature changes on a daily basis, where the qualitative analysis in the FEIS did not. BGC used data that included water temperature (every 30 minutes) and streamflow discharge for 2005 to 2009 and 2011 during the open water season (typically early June to late September).

[28] USACE. 2018. Donlin Gold project, final environmental impact statement. U.S. Army Corps of Engineers. JBER, AK. 3,299 pp.

Ramboll's mercury analysis used emissions estimates from the air permit (based on pilot studies) and literature values. They used these emissions as an input to an air transport model, CALPUFF, to determine potential project-related deposition to the surrounding area. Literature values were used to estimate the amount of this mercury that would enter streams. This was combined with the geological mercury present in the streams (calculated from data collected from local minerals and background aerial mercury deposition estimates) to estimate potential stream mercury loadings under project conditions. The comparison of potential exceedances with and without the project was the output. This isn't "almost exactly at the applicable standard." The term "almost exactly" is meaningless for this reasonable assurance analysis.

Comment 3: Pg. 2, ¶3, I. Introduction and Summary: "Thus, the Department must not treat them as risk-averse screening models."

The Division's Response: "Risk-averse screening models" does not appear to be a specific term here, although in other fields (economics) it is apparently used to indicate low uncertainty models. The implication is that there should be an uncertainty or safety factor added to the results, however uncertainty factors should not be required in this part of the analysis. Regardless, each time a "conservative" choice was made in the modeling would be an acknowledgement and incorporation of uncertainty. Each model selected the worst-case data available, annotated this selection, and standard modeling approaches returned results which were below water quality standards. There is no established threshold of anticipated water quality standard compliance. Compliance is not expressed in terms of probability or likeliness. The Division must make a determination of reasonable assurance.

Comment 4: Pg. 2, ¶4, I. Introduction and Summary: "Neither of the draft reports attempts to quantify or characterize the degree of uncertainty associated with the projections."

The Division's Response: See Response to Comments 2 and 3.

Comment 5: Pg. 2, ¶5: I. Introduction and Summary: "…would be apparent even if one assumes they were well-designed and supported by ample data."

The Division's Response: As stated above, the stream temperature modeling is supported by a large database collected during the FEIS. Further, ONC's statement implies that no model could ever be used to satisfy the permit requirements. The mercury model incorporated results from a pilot study, more than a decade of water chemistry data, and hundreds of mineral/soil samples. As discussed above, it used a comprehensive air model that has been used by the USEPA.

Comment 6: Pg. 3, ¶1: I. Introduction and Summary: "…the likelihood of complying with both is lower still."

The Division's Response: This appears to be an either-or question. That is not how the regulatory environment works and implies that the Division is just hoping for the best. The assertion of reasonable assurance of water quality standards is not expressed as a probability or likelihood. Modeling data indicated compliance with water quality standards even using worst-case data to run the models.

Comment 7: Pg. 5, ¶4, Pg. 7, ¶2: Characterizing the temperature and mercury analyses as "so close to the standards…."

The Division's Response: This characterization is not appropriate. As a thought exercise, using Ramboll's approach, if you assume that they were off by 100% in their mercury deposition model, you would still end up with the same rate of exceedance of standards (i.e., only an increase in exceedances in American Creek, which will be removed). And BGC 2021 used the 2005 yearly results that were shown to be the highest measured and in the range of the climate change predictions as developed in the FEIS.

Comment 8: Pg. 6, ¶1 - 4: "The mine would be developed in a "mercury belt" with high concentrations of mercury occurring naturally in the environment" and "eliminating the principal conservative assumptions of the FEIS", etc.

The Division's Response: These comments try to both argue that you need to consider the background mercury and criticize Ramboll 2021 for taking into account the background mercury. This is internally inconsistent.

Comment 9: Pg. 6, ¶3: "Using conservative assumptions, the FEIS predicted a 40% increase in mercury concentrations."

The Division's Response: We are not reviewing the FEIS here. The Ramboll 2021 analysis was based on the Air Sciences 2021 report (Exhibit 9) and other newer analyses (i.e., SRK 2017 (Exhibit 10)) which do not seem to have been reviewed by the ONC's expert.

Comment 10: Pg. 11, ¶2: "It is potentially misleading for Ramboll to state that it was "conservative" to use the years of peak projected mercury emissions from the tailings disposal site and fugitive dust."

The Division's Response: See Response to Comment 34.

Comment 11: Pg. 11, ¶2: "Both of Donlin's draft models make the elementary mistake of presenting each outcome as a single, highly precise number"

The Division's Response: See Response to Comment 34.

Comment 12: Pg. 15, ¶2: List of sources that the Ramboll report relies on.

The Division's Response: Many of these sources are not ones that have quantifiable error and error bars would be inappropriate.

Comment 13: Ramboll does not provide information on whether they did a sensitivity analysis.

The Division's Response: This does not mean that the Ramboll 2021 model results cannot be used. The lack of a sensitivity analysis does not negate the validity of the model to the extent of the predictive capability inherent in the utilized model. Nor does the lack of a sensitivity analysis contribute substantially to meeting the requirement of reasonable assurance.

Comment 14: Pg. 16-18, Section E: Discussion of Dr. Miller's comments on the mercury report. It suggests that mercury emissions are being underestimated in Ramboll 2021 modeling according to Miller.

The Division's Response: This is a summary of Dr. Miller's opinions on the mercury emissions estimates. Dr. Miller's analysis is unreliable, because he didn't review the relevant documents (Air Sciences 2021 and SRK 2017) which are the sources for the stack emissions and the cyanide information, respectively.

Dr. Miller relied heavily upon emission data from a mining facility in Nevada with which Dr. Miller appeared to have significant personal experience. There appears to be little analysis

and comment on the relevant documents which succinctly address emissions and cyanide. Dr. Miller appears to have missed the mark substantially by only commenting in this report on the modeling results based on the data presented in the FEIS. Further, the Division adopts Donlin's response to this comment.

Donlin's Response: The estimated mercury emissions from the Donlin Gold tailings storage facility were not underestimated. The emissions are lower than the Twin Creeks emissions due to several relevant factors, including the ore mercury content at Donlin Gold that is more than an order of magnitude less than the Twin Creeks ore.

- Cyanide chemistry was considered in the mercury emission estimate for the tailings storage facility.
- The estimated mercury emissions for the Donlin Gold thermal units were not underestimated.
- An implausibly high mercury capture efficiency percentage was not assumed in the mercury emission estimates for the thermal units. In fact, the mercury emissions as a percentage of the total mercury in the feed ore at Donlin Gold are more conservative (i.e., lower) than the percentages for Twin Creeks and Goldstrike.
- The Donlin Gold thermal units do not process 30% more autoclave ore than Goldstrike; they process slightly less.
- The mercury emission estimates for the Donlin Gold thermal units did not rely solely on emission factors from the companies making the control equipment.

The estimates were based on engineering process modeling, Nevada mercury control guidance, actual emissions data from equivalent units, and consideration of the site-specific conditions at the Donlin Gold facility.

- Donlin Gold is not predicted to be the second largest producer of byproduct mercury.

Comment 15: P. 17 "[T]he draft model significantly underestimates mercury emissions from the tailings pond, because it apparently fails to consider the cyanide in the tailings fluid." "If, as appears to be the case, the Ramboll report failed to take the cyanide into account, the estimates of mercury concentrations in the tailings pond may be off by orders of magnitude.'"

The Division's Response: See Response to Comment 26. Further, the Division adopts Donlin's response.

Donlin's Response: Regarding the Donlin Gold tailings liquid mercury content, as explained in Ramboll's responses to the Letter, there was no failure to consider cyanide chemistry. The differences between the estimated mercury emissions for the Twins Creeks and Donlin Gold tailings storage facilities are explained by other relevant considerations, such as: 1) the differences in mercury concentrations, and 2) the differences in environmental factors.

Comment 16: P. 17 "He [Dr. Miller] also compares the proposed Donlin project to the Twin Creek[s] tailings facility, which has measured mercury emissions of 63 kg/year, far greater than the 7.5 kg/year Ramboll predicts for Donlin. Miller concludes, 'Ultimately, the combination of a much higher mercury content in tailings from the Donlin Mine and the larger tailings surface area suggest that the mercury volatilization from the tailings is dramatically underestimated.'"

The Division's Response: The comparison of the Twin Creeks facility and Donlin appears to be inconsistent with the ore characteristics and climate of the Donlin mine and did not appear to be a suitable comparison. Further the Division adopts Donlin's response.

Donlin's Response: The Donlin Gold tailings mercury content is significantly lower than Twin Creeks tailings mercury content. Because mercury emissions are "positively correlated with material Hg concentrations" (Eckley et al 2011, p. 514), Donlin Gold is expected to have a lower mercury emission flux rate than Twin Creeks. Similarly, mercury flux is positively correlated with solar radiation (Eckley et al 2011, p. 518). The lower solar radiation in Alaska compared to Nevada will result in lower mercury flux at Donlin Gold. In addition, Alaska has lower temperatures and more snow and ice cover than Nevada. All these factors contribute to lower mercury flux and emissions at Donlin Gold. Even though the overall tailings surface area at Donlin Gold is larger, the reduced mercury flux at Donlin Gold results in lower mercury emissions than Twin Creeks.

As stated in the Donlin Gold mercury modeling report, "vapor mercury emissions (in the form of gaseous elemental mercury) from the proposed Donlin Gold Tailings Storage Facility (TSF) were estimated using methods similar to the studies for two active gold mines in Nevada … but using Donlin Gold-specific data and accounting for differences in solar radiation and geochemistry/mercury content between Donlin Gold and the Nevada mines." (Ramboll 2021, p. 3-12). Utilizing this methodology with site-specific data provides the best available estimation of mercury emissions from the Donlin Gold tailings storage facility.

Comment 17: P. 17 "[T]he draft model also significantly underestimates mercury emissions from thermal sources at the mine by assuming an implausibly high 99.8% efficiency in capturing mercury"

The Division's Response: See Response to Comments 22-33. Further the Division adopts Donlin's response.

Donlin's Response: The capture efficiency cited in the Letter and Exhibit 5 of "greater than 99.8% efficiency" (Waldo, Thomas S. 2022, p. 17) (Miller, Glenn C. 2022, p. 6) appears to be derived from the mercury emissions of 15.9 kg (Miller, Glenn C. 2022, p. 6) divided by the total amount of mercury in the ore of 15.7 metric tons (Miller, Glenn C. 2022, p. 6).[29] Although, this is a useful metric for comparison to other mines, it is not representative of the capture efficiency or removal efficiency of the mercury control systems. For gold ore processing facilities that do not use roasters, the majority of mercury in the ore remains with the ore and is released to the tailings storage facility. Nonetheless, using Dr. Miller's metric of *overall mercury control efficiency* shows that the Donlin Gold *overall mercury control efficiency* is conservatively low, and the mercury air emissions are conservatively high.

Comment 18: P. 17 "While Goldstrike emits 60 pounds (27 kg) of mercury per year from the autoclaved ore based on actual measurements, the Ramboll draft mercury model predicts only 35 pounds (16 kg) from Donlin. Miller concludes that 'the Donlin Mine is likely to emit at least 60 lbs of mercury, and perhaps more, since 30% more ore is being subjected to the autoclave based process.'"

[29] 1 – (15.9 kg of air emissions) / (15.7 metric tons of mercury in the ore processed) = 99.8987%

The Division's Response: The Division found Dr. Miller's assertions inconsistent with the proposed equipment, projected emissions, and mass of ore processed and could not substantiate his assertion of 60 lbs of mercury emissions. Further the Division adopts Donlin's response.

Donlin's Response: The following points are important to consider:

- The Goldstrike thermal units (excluding the two roasters and three uncontrolled autoclaves, which do not have corresponding equipment at the Donlin Gold project) emit only 15.5 pounds (7 kg) (Miller, Glenn C. 2022, p. 51-52), not 60 pounds (27 kg) as asserted by Dr. Miller.
- The Donlin Gold autoclaves process slightly less ore (3.7 million tons) than the equivalent Goldstrike autoclaves (3.8 million tons) (Miller, Glenn C. 2022, p. 51), not 30% more.

Comment 19: P. 17 "Miller attributes the underestimate in part to the fact that the Ramboll draft model relies on emission factor estimates from the companies making the control equipment rather than on actual emissions from operating mines like Goldstrike."

The Division's Response: The Division did not find this assertion to be factual. Ramboll 2021 appeared to use several sources, including guidance from Nevada and emissions from Goldstrike Mine itself for model inputs. It appears Dr. Miller did not fully explore the cited references in the submitted information. Further the Division adopts Donlin's response.

Donlin's Response: The assertion that the Ramboll model relies on emission factor estimates from the companies making the control equipment, rather than on actual emissions from

operating mines like Goldstrike, is not correct. The Donlin Gold mercury emission estimates for the thermal units are based on the following information:

- The Hatch Ltd. engineering consulting company process modeling.
- The Nevada Mercury Control Program Permitting Guidance, General Industry NvMACT Determinations, which includes documented mercury emission rates for mercury control technologies (NDEP 2016).
- Three years of stack test data (actual emissions data) from the Goldstrike Autoclaves 4-6, Kiln, EW Cells, Retorts 1-4, and Furnaces East and West.
- The lower mercury content in the Donlin Gold ore of 1.27 ppm versus the Goldstrike ore of 24.6 ppm.

Comment 20: Pg. 18: Section F: Probability analysis for each of the models being appropriate.

The Division's Response: The Division could not determine any relevance of a probability analysis when the standard is reasonable assurance.

Comment 21: Pg. 19, ¶3: "these outcomes are so close to the standard"

The Division's Response: The Division could not locate a regulatory requirement for the threshold of predictive modeling results to meet the standard of reasonable assurance. Reasonable assurance is met if the project's projected discharge will comply with water quality standards, not whether it will come "close." The Division also asserts that the monitoring, sampling and reporting requirements contained in the permitting suite for the project properly informs the Division, permittee and the public of trends.

The Division's Response to Comments: Miller Report, Exhibit 5

The Division's General Comments:

As an expert for ONC, Dr. Miller reviewed the 2021 supplemental mercury analysis and provided comments on the analysis. On a general level, Miller asserted that Ramboll 2021 was intentionally biased and provided overly low estimates of mercury emissions ("an example of goal-modelling a contaminant release that is designed to meet some regulatory standard", "focused on predicting minimum mercury releases", the goal of the study was to show an unrealistically low mercury volatilization", pg. 1), but did not provide specific examples to illustrate this. He also implied that models are inherently unreliable and uncertain and should not be used to predict whether a project would result in environmental chemical concentrations likely to exceed environmental thresholds. Many of Miller's comments seem to be related to the reliance on numbers from the FEIS that he disagrees with. Those numbers were not actually used by Ramboll 2021, who relied on updated information for the new analysis (see below).

Comment 22: P. 1. Dr. Miller suggests that the Ramboll estimates of emissions are unreliable and should have been discussed more explicitly ("While the information presented in the Donlin supplemental report does not provide adequate information to understand where those data originated. . . ",).

The Division's Response: The Ramboll 2021 report does not include all of the relied upon information within the text of the document but provides citations to those data (see additional discussion below). Dr. Miller apparently did not read any of the cited references in the Ramboll

report which provide detail. In particular, these include the Air Sciences 2021 report and SRK 2017.

Comment 23: P. 8 The Ramboll Report does not use conservative values in its modeling, does not incorporate uncertainty, and ignores real-world conditions that would increase the risk of violations of the water quality standards. ("In reality, the amount if mercury that will be discharged to the atmosphere from the Donlin Mine is truly fraught with uncertainties.").

The Division's Response: The Ramboll 2021 relied on multiple empirical data sources, some of which were generated subsequent to the publication of the FEIS. These included mercury water concentrations, stream flow information, particulate mercury measurements, and pilot scale study tailings filtrate concentrations. In situations where there was a lack of data for modeling, the Ramboll Study used conservative assumptions to account for the inability to quantify uncertainty of values. Further the Division adopts Donlin's response.

Donlin's Response: The Ramboll Study adds to the data that was contained in the FEIS by incorporating new data and new studies not available when the FEIS was published, peer reviewed literature and other publicly available reports to more precisely mirror site conditions in order to more accurately estimate the potential mercury concentrations in the Crooked Creek watershed as a result of the Project.

There are a number of ways to account for uncertainty when modeling. In environmental risk assessment, conservative estimates can be used as a method of accounting for uncertainty because they present a high-end, rather than central tendency, estimate of outcomes. The

Ramboll Study makes conservative assumptions to determine the effects on mercury in the streams.

Examples of conservative assumptions applied in the Ramboll Study:

- The modeled emissions from the Donlin Gold mine pit in the Study are conservatively high because they do not account for the in-pit retention of dust particles which would lower the estimated mercury deposition of fugitive dust emissions from the Project.
- The modeled tailings pond mercury concentration is conservatively high (likely as much as seven times too high) because it does not account for Donlin Gold's plan to use mercury settling-enhanced reagents.
- The Project mercury mass balance omits some activities that would reduce mercury mass loading to streams, such as the retention of stream water at the Snow Gulch reservoir and the effect of groundwater extraction for pit dewatering outside areas with runoff management.
- The mercury concentration in the Wastewater Treatment Plant (WTP) effluent is set equal to the State of Alaska Water Quality Standard (WQS) of 12 ng/l to derive a conservatively high estimate of mercury mass loading at the WTP outfall on Crooked Creek. The mercury concentration is unlikely to be this high because the majority (~72%) of the water fed to the WTP will be groundwater which includes low levels of mercury. As described in the WRMP (SRK 2017), the WTP is designed to treat 95th percentile mercury concentrations in pit dewatering, Seepage

Recovery Pond (SRS) and Contact Water Dam (CWD) source waters, and steady state concentrations from tailings storage facility reclaim (a minor source). Given the predicted flow rates from these sources during Project operation, and a 96% removal efficiency by reverse osmosis, the actual mercury concentration in WTP effluent is likely to be far lower than the WQS.

- Estimation of mercury loading from the WTP outfall to Crooked Creek makes use of projected flow rates presented in the WRMP (SRK 2017) under the most conservative water balance analysis scenario, i.e., above average precipitation case. In addition, although the WTP is only planned to operate seasonally (WRMP Section D-2), the Project mass balance estimates mercury mass loading from the WTP with the assumption that it would operate year-round. As shown in Table ES-3 in Ramboll (2021), even with these conservative assumptions, the predicted mercury mass loading from the WTP outfall is low relative to loading from background atmospheric and geogenic sources to areas downstream of the outfall.

- The geochemical fingerprinting analysis in the Study using site-specific data including new sampling data collected after the FEIS determined that the current background contribution of atmospheric mercury to soils, sediments, and suspended particulates was too small to be distinguished from the contribution of the background geologic sources. This supports the conclusion that Project atmospheric deposition impacts on water quality would be negligible. The baseline mercury mass balance (Table ES-2 in Ramboll (2021)) estimated a background atmospheric loading of 11% to 29% (depending on watershed) using a

combination of Crooked Creek watershed data and the peer reviewed literature. Although these estimated loadings were much higher than the (negligible) contribution identified from the geochemical fingerprinting analysis using site-specific data, the estimated loadings of 11% to 29% were included in the Study to be conservative.

When these conservative assumptions are incorporated in the modeling and analysis, the outcome is a conservative estimate that likely represents the upper bounds of potential effects from the Project. Therefore, the results presented are high-end characterizations (i.e., over-estimates) of effects. Adding uncertainty values around these results would overstate the upper limit of the potential effects; hence, the calculation of uncertainty measures such as confidence intervals would not be appropriate and is not necessary.

Comment 24: The model used in the Ramboll Study seeks "to eliminate the principal conservative assumptions of the FEIS" and focuses "on predicting minimum mercury releases and water concentrations."

The Division's Response: There are multiple refinements in the Ramboll 2021 report that explicitly build on additional information collected since the FEIS. This includes the incorporation of additional process information (e.g. Air Sciences 2021), additional environmental data (e.g., geogenic mercury) and more realistic assumptions about the behavior of atmospherically deposited mercury. The overly simplistic assumption that one hundred percent of atmospherically deposited mercury reaches the stream is scientifically unsupported, and was identified as an area for further work in the initial mercury modeling effort. This

refinement does not represent the removal of a conservative assumption. Further the Division adopts Donlin's response.

Donlin's Response: The FEIS assumed that the correlation between atmospheric mercury deposition and mercury concentration in surface water is linear in the vicinity of the Project but caveated this assumption by noting that "only a small fraction [of the mercury deposited from atmospheric sources] would be present as aqueous mercury in surface water." Additional study, data gathering, and analysis show that the FEIS assumption was very conservative and, in fact, that only a very small fraction of the atmospherically deposited mercury reaches surface waters. At the time of the FEIS, there was no empirical data at the time to quantify how much atmospheric mercury ultimately migrates to the surface water versus the input of geologic mercury. A new literature review indicated that there was significant retention and provided specific retention rates for this type of watershed. Additionally, an analysis from Arcadis (2020) showed that mercury in Crooked Creek is primarily associated with the suspended solid load and suspended iron in particular, suggesting geologic origin. Based on this information, new data were collected in 2021 to determine the geologic versus atmospheric contributions of mercury in Crooked Creek. These new results showed that mercury in Crooked Creek carried a strong geologic, rather than atmospheric, signature (Ramboll 2021, section 3.1.3), demonstrating that atmospheric mercury was strongly retained in the soils. This evidence informed the assessment of the contribution of geologic mercury to Crooked Creek and validated the high mercury retention value estimated from the literature review. This provided a compelling scientific basis for updating the FEIS assumption. Ignoring this new evidence to maintain a prior assumption, now properly understood to be overly conservative, would be poor scientific practice.

Comment 25: Comparison to Nevada Mines Pg. 1, ¶3: Miller uses the Goldstrike Mine in Nevada as the appropriate comparison for the Donlin project, without giving relevant comparisons.

The Division's Response: Dr. Miller may have professional knowledge of the Goldstrike Mine in Nevada, but he does not draw a clear correlation between it and the proposed Donlin mine. The atmospheric differences between Nevada and Alaska are vast, and Alaska has numerous mining operations available for comparison. There are likely differences between emissions technologies in the nearly 50 years between the construction of the two mines.

Comment 26: ONC states that the Ramboll Study's "draft model significantly underestimates mercury emissions from the tailings pond, because it apparently fails to consider the cyanide in the tailings fluid."

The Division's Response: This is incorrect. Miller's conclusion is that the mercury concentration is unreasonably low because Ramboll 2021 did not use a number that considered cyanide, and he gives a very detailed discussion of cyanide chemistry. However, in SRK 2017 (cited in Ramboll 2021), there is a discussion of the recent pilot plant study that included optimization of the cyanide process to minimize mercury emissions. The numbers from this report were used to generate the leachate concentration that Ramboll 2021 used (which thus included cyanide). Miller apparently did not read this reference. As a result, the whole discussion on cyanide and the tailings pond is therefore irrelevant. Further the Division adopts Donlin's response.

Donlin's Response: More specifically, cyanide is accounted for in estimating mercury concentration in the tailings leachate. Tailings filtrates were generated in pilot-scale studies of the actual Project process plant operations that included treatment with cyanide, and a mercury concentration of 0.0242 mg/L was measured (Donlin Creek, 2011). This measured concentration was further increased by a factor of 3 to account for recycling of the pond water, to obtain a final tailings pond concentration of 0.073 mg/L (SRK 2017). Therefore, mercury availability due to the presence of cyanide was accounted for in the Project tailings mercury emissions calculations.

The Donlin Gold tailings pond mercury emissions were reasonably estimated using best available data and robust methods as discussed in the Ramboll Study. Also important, increasing these emissions would not have a material impact on estimated Project water quality impacts because (i) they constitute a relatively small fraction of total Project emissions (5%, see Table 3.2-12 in Ramboll (2021)), (ii) they consist of gaseous elemental mercury which has negligible solubility in water, and (iii) the atmospheric loading contribution to creek mercury loading is very small compared to geogenic loading in this region as discussed in the Study.

The Study does not ignore the contribution to mercury "loss" (emissions) from dry tailings. It includes an assessment of mercury emissions from dry surfaces of tailings. In general, tailings mercury emissions are highly dependent on soil moisture (Eckley et al. 2011). So, the Study applies different correlations for wet and dry surfaces at the Project tailings storage facility recognizing that the moisture level affects the mercury emission flux.

The ONC comments attempt to compare measured mercury emissions from a tailings facility at a Nevada gold mine to the estimated tailings emissions for Donlin Gold. However, there are

several differences between the Donlin Gold and Twin Creeks/Goldstrike mine sites which would cause lower tailings emissions at the Donlin Gold mine:

- Goldstrike is 130 metric tons per year, while Donlin is estimated at 15.7 metric tons per year. This is an order of magnitude difference, and the implied similarities in the first (tailings) section seem inappropriate. (Mark)
- The average mercury concentration in ore is significantly lower at Donlin Gold (1.27 parts per million (ppm)) than Twin Creeks (24 ppm[30]) and Goldstrike (24.6 ppm[1]).
- As noted by Eckley et al. (2011), lower solar radiation results in lower mercury emission fluxes. Solar radiation is typically lower at Donlin Gold than at Twin Creeks and Goldstrike. The effect of sunlight on emissions is accounted for in the Ramboll modeling using observations of solar radiation at the Donlin Gold site.
- The presence of ice cover during winter months (roughly half the year) at Donlin Gold reduces tailings emissions considerably.
- The tailings solution mercury concentration at Donlin Gold (0.073 mg/L) is approximately 15% that of Twin Creeks (0.496 mg/L; Eckley et al. 2010).

[30] The mercury concentrations for Twin Creeks and Goldstrike were obtained from the stack test reports used for 2020 annual emissions reporting, available from the Nevada Division of Environmental Protection.

Comment 27: P. 5 "The mercury present in the ore is quite high, and the byproduct mercury projected to be recovered is 34,600 lbs (15.7 metric tons)[31] and would make the Donlin Gold mine (if located in Nevada) the second largest producer of byproduct mercury in the state (and perhaps in the nation)".

The Division's Response: A large portion of Miller's discussion focuses on the Nevada Goldstrike mine, which has higher mercury emissions than are predicted for the Donlin project. In general, Dr. Miller uses this as evidence that the Donlin estimates are too low, but does not address the differences such as climate, mineralogy, or technology that may make the comparison inappropriate. More specifically, the operations at the Goldstrike and Donlin mines are not directly comparable due to process differences as described in SRK 2017. Miller does not appear to consider this document. Further the Division adopts Donlin's response.

Donlin's Response: The amount of mercury recovered cited above assumes that 100 percent of mercury in the ore will be recovered by Donlin Gold's mercury control systems. The actual fraction of mercury recovered depends on the gold ore processing method. Roasting facilities will recover the largest fraction because of the high ore roasting temperature. Autoclaving facilities will recover a much smaller fraction. For the Donlin Gold autoclaves, the mercury recovery will be further reduced because only a portion of the total ore mined (roughly 15%) is autoclaved and further processed for gold recovery.

[31] Correctly calculated, these numbers are: 1.62 mg/kg * 21,535,000 metric tons * 1,000 kg/metric ton = 34,900 kg (34.9 metric tons) (Miller, Glenn C. 2022, p. 6).

Twin Creeks recovered 2.7 to 16.5 tons (2.4 to 15.0 metric tons)[32] of mercury byproduct from processing roughly 4 million tons of autoclave ore (Miller, Glenn C. 2022, p. 22). At an ore mercury concentration of approximately 24 to 33 ppm, the total amount of mercury in the ore processed is 99 tons (90 metric tons) to 136 tons (123 metric tons). The mercury recovery in this example is 2% to 17% percent, well below 100%. Donlin Gold would be expected to recover less total mercury than Twin Creeks because of the lower ore mercury concentration.

In summary, the Project is not predicted to be the second largest producer of byproduct mercury because the Donlin Project does not utilize roasters to process its ore and the Donlin Gold ore contains low levels of mercury.

Comment 28: - Miller asserts that the "Ramboll draft model relies on emission factor estimates from the companies making the control equipment rather than on actual emissions from operating mines like Goldstrike."

The Division's Response: It appears that Miller did not review the correct documents to evaluate the thermal emissions. For example, on pg. 5, he points to a table from the FEIS and comments that the table does not match the mercury control efficiencies used in the Ramboll study. However, Ramboll 2021 did not use the FEIS numbers. Table 2-2-1 in the Ramboll study compares initial mercury analysis (left column) vs. Ramboll 2021 analysis (right column) and clearly shows the changes in data sources. This comment is therefore not relevant. Further the Division adopts Donlin's response.

[32] 15-year high and low

Donlin's Response – This is incorrect. In fact, the mercury emissions estimates for the autoclaves and carbon regeneration kiln at Donlin Gold used source test data from similar units at the Goldstrike Mine (while accounting for Project-specific stack flow data) and emissions estimates for the other units at Donlin Gold are based on the Nevada Mercury Control Program Permitting Guidance, General Industry NvMACT Determinations, which includes documented mercury emission rates for mercury control technologies (NDEP 2016) (NDEP 2016). Moreover, the modeled Project mercury speciation profiles are based on mercury speciation test data from the Goldstrike Mine. Additional details on the Project thermal emissions and reasons for differences in total emissions from the Nevada mines are provided in Air Sciences (2021, 2022).

Comment 29: Pg. 5, Table from FEIS: Miller comments that this table does not match the mercury control efficiency used in the Ramboll Study.

The Division's Response: See Response to Comments 17 and 22-33.

Comment: Pg. 6, ¶2: Miller compares the Goldstrike mine using FEIS data for comparison.

The Division's Response: These are not the updated numbers used in Ramboll 2021 therefore this discussion is not relevant.

Comment 30: Pg. 7, ¶1: Miller compares the autoclave process between Goldstrike and Donlin.

The Division's Response: The pilot studies discussed in SRK 2017 indicate a process optimization through pilot studies that suggest that the Goldstrike and Donlin mines are not directly comparable. It does not appear that Miller read this document.

Comment 31: Pg. 8, ¶1: "In reality, the amount of mercury that will be discharged to the atmosphere from the Donlin Mine is truly fraught with uncertainties."

The Division's Response: This appears to be Miller's main statement, and he summarizes his conclusions below it. Most of his comments are based on outdated information from the FEIS that was not used by Ramboll 2021 However, to address concerns about uncertainty, the Division recalculated potential WQS exceedances based on the assumption that Ramboll's modeled mercury deposition was too low by 100%. The number of predicted potential exceedances was unchanged.

Comment 32: Pg. 8, ¶8: "While this review did not focus on the processes that will deliver mercury to surface waters from soils, it is generally the case that higher concentrations of mercury in the surface soils will result in higher amounts of mercury delivered to the streams in an approximately linear fashion…Thus, twice as much mercury released from the mine will result in approximately twice as much mercury released to streams."

The Division's Response: This statement is technically true, but misleading. A doubling of the mercury emissions would double the amount of mine-related mercury reaching streams (based on the assumptions in Ramboll 2021) but this does not equate to a doubling of the in-stream concentrations, an important factor, because this ignores the geogenic background mercury, which would not be affected by mine-related deposition and is inconsistent with the relatively low fraction of atmospherically derived mercury in the streams as described by Ramboll 2021. Further the Division adopts Donlin's response.

Donlin's Response: This is erroneous. In this response, we assume that "released from the mine" refers to mercury emissions to the atmosphere from mine-related activities. The concentration of mercury in water in the stream does depend on the overall amount of mercury in the soils surrounding the streams. However, the overall amount of mercury in those soils is not proportionally affected by changes in the atmospheric deposition resulting from any mine-related mercury emissions. The large amount of existing geologic mercury (as also noted in the ONC letter, page 6, "high concentrations of mercury occurring naturally in the environment") in the Crooked Creek area means that changes in the atmospheric deposition rate only slightly affect the total mercury in the surface soils. Moreover, there is significant retention in the soil (as also noted in the ONC letter Exhibit 5, page 8, "a good portion of the mercury is sorbed onto the surrounding soils"). Therefore, changes in the atmospheric deposition rate only minimally affect mercury concentrations in the streams. The net effect on stream water quality is negligible (and in some cases beneficial) as shown in the Study when considering Donlin Gold's runoff control measures (which reduce both geogenic and anthropogenic mercury loadings) under Project conditions.

Comment 33: Miller concludes with the assertion that because "it is generally the case that higher concentrations of mercury in the surface soils will result in higher amounts of mercury delivered to the streams," that "twice as much mercury released from the mine will result in approximately twice as much mercury released to streams."

The Division's Response: See Response to Comment 32. Further the Division adopts Donlin's response.

Donlin's Response: This is erroneous. In this response, we assume that "released from the mine" refers to mercury emissions to the atmosphere from mine-related activities. The concentration of mercury in water in the stream does depend on the overall amount of mercury in the soils surrounding the streams. However, the overall amount of mercury in those soils is not proportionally affected by changes in the atmospheric deposition resulting from any mine-related mercury emissions. The large amount of existing geologic mercury (as also noted in the ONC letter, page 6, "high concentrations of mercury occurring naturally in the environment") in the Crooked Creek area means that changes in the atmospheric deposition rate only slightly affect the total mercury in the surface soils. Moreover, there is significant retention in the soil (as also noted in the ONC letter Exhibit 5, page 8, "a good portion of the mercury is sorbed onto the surrounding soils"). Therefore, changes in the atmospheric deposition rate only minimally affect mercury concentrations in the streams. The net effect on stream water quality is negligible (and in some cases beneficial) as shown in the Study when considering Donlin Gold's runoff control measures (which reduce both geogenic and anthropogenic mercury loadings) under Project conditions.

The Division's Response to Comments: Myers' Report, Exhibit 6

The Division's General Comments

On page 1 of his report, Myers states that "[t]he Donlin Gold Project Final Environmental Impact Statement (FEIS) contained only qualitative discussion of stream temperatures" and that "BGC's analysis provided evidence that allowed BGC to conclude that stream temperatures would remain just below the permit requirement."

The FEIS contained the stream temperature data necessary to evaluate proposed project impacts on the stream." BGC 2021 prepared a quantitative analysis of Crooked Creek Stream temperature to evaluate potential stream temperature changes to Crooked Creek attributable to the proposed Project. The quantitative analysis provided the magnitude and frequency of potential temperature changes on a daily basis, where the qualitative analysis in the FEIS did not. BGC 2021 used data that include water temperature (every 30 minutes) and streamflow discharge for 2005 to 2009 and 2011 during the open water season (typically early June to late September). The data used in the FEIS analysis were presented in Appendix A of the 2021 report by BGC.

Comment 34: P. 2 "BGC (p 5) claims that the 2005 air temperature at Camp Station was 58.3°F which is almost 7 degrees warmer than the 51.4° average temperature for May through September at that station."'

The Division's Response: Table 3.26-7 of the FEIS shows the projected air temperature increases in Alaska under two climate scenarios. The anticipated air temperature increase for scenario B1 is 0 to 4°F and for Scenario A2 is 0 to 6°F. The 58.3°F air temperature was measured and is above the anticipated air temperature due to climate change models. During the 2005 season water temperatures in Crooked Creek were high as were water temperatures at American Creek and Anaconda Creek stations. This was a weather year high temperature event not related to modeled climate change. That is why 2005 is an appropriate year to model proposed mine temperature impacts. Results from the model showed that the stream temperatures are not expected to exceed the relevant water quality temperature standards for either egg/fry incubation and spawning or migration routes.

Comment 35: P. 2 "However, BGC presents no analysis as to the frequency that the low flows or high temperatures observed in summer 2005 have occurred so the predictive power of that knowledge is limited."

The Division's Response: See Response to Comment 34.

Comment 36: P. 2 "The model used to predict temperatures caused by the mine is a simple mixing model of flows with specified temperatures without any consideration of thermal effects between the points on the creeks, or nodes, at which temperatures are estimated."

The Division's Response: The model is populated by a large dataset that has been collected from nodes that are relatively closely spaced. The liner distance between American and Anaconda Creek confluences is less than 3 miles. The thermal effects between stream monitoring stations do not need to be estimated. The FEIS data was collected at locations that were closely spaced. In addition, BGC 2021 noted that "[t]he potential removal of riparian vegetation along Crooked Creek due to the proposed Project. This factor is not considered significant because there are no plans for the riparian zone of Crooked Creek to be disturbed, except for one bridge crossing." Myers assumed that this was an underestimate (Myers 2021, Exhibit 6, Page 3 of 18). The stream temperature measurements at a frequency of every 30 minutes eliminates the chance of underestimated temperatures and introducing solar radiation modeling error. In addition, because the stations are closely located the FEIS noted that the temperature and solar radiation are not likely to be notably different between the sites (FEIS, pg. 3.5-26 and 27. The FEIS, Section 3.5, pg. 3.5-133 April 2018 also noted that the "[d]esign and implementation of erosion control procedures and BMPs at each water body crossing would

minimize potential impacts to surface water flow and sediment load. Finally, see prior discussion on the use of modeling.

Comment 37: "Flow Assumptions" – "The first assumption is that stream flows will not be any lower than analyzed. The year 2005 had the lowest flows of the presented record but there is no indication as to the probability of those low flows being exceeded. If the background streamflow is lower than occurred in 2005, the mine would have more substantial effects on the stream temperatures than predicted by BGC."

The Division's Response: The Division agrees that model inputs based on observed and measured data provides a higher level of confidence than speculative inputs. The purpose of the BGC 2021 report was to use the actual stream temperature data collected every 30 minutes combined with the proposed mine dewatering plan to evaluate impacts on Crooked Creek. Their analysis showed that there were no predicted exceedances in stream temperature. Further the Division adopts Donlin's response.

Donlin's Response: BGC did not make assumptions about stream flow or temperatures. Instead, BGC used actual continuous stream flow and temperature data, measured over the summer months for 5 years. It is clearly recognized that BGC's analysis does not include all potential combinations of streamflow and stream temperature, given both the type of analysis conducted and the length of record available (2005, 2006, 2007, 2009 and 2011). However, it is not productive to replace the actual data with speculation about whether lower or higher levels might be observed. Actual data is a strong foundation for assessing likely future compliance with water quality standards. Moreover, Dr. Myers's comment assumes that there is a direct correlation between streamflow and stream temperatures. This assumption is not borne out by the

actual observations. For example, the 2005 data includes two days with identical streamflow at CCAC (53.3 cubic feet per second (cfs) on both July 23 and August 4). Despite identical streamflow on these two days, the stream temperatures were significantly different: 51.7°F on July 23 and 46.5°F on August 4. Because of these complexities, BGC's analysis focused on dates where corresponding streamflow and stream temperature data through the summer months in Crooked Creek, American Creek, and Anaconda Creek were available.

Comment 38: Streamflow as a Function of Watershed Area – "BGC assumed a linear flow to area relationship which means the stream gains flow as a function of area. While correct on a broad scale in the Donlin area, the reality is that the relationship varies with length and with the wetness in the watershed. During dry periods, most flow enters in select gaining reaches or at points of inflow. During storm runoff periods, for streams of this size and topography, there are probably discrete inflow points but they probably spread along the stream reach so the area relationship may be more accurate. BGC should have done a synoptic analysis on Crooked Creek to determine the actual relationship of flow with area during both wet and dry conditions."

The Division's Response: The Division can see the point Dr. Myers is trying to make, but when dry periods occur, a larger percentage of the remaining Crooked Creek flow will be derived from groundwater. During these periods, it is reasonable to expect Crooked Creek to reduce in temperature due to the average groundwater temperature of approximately 36° F. A synoptic analysis of the watershed is not appropriate given the number of variables to consider in the drainage. Climatic conditions in the region generate complex freeze, thaw, snow melt, and rainfall conditions. As ONC notes, the linear flow to area relationship which means the stream

gains flow as a function of area is correct on a broad scale. Further the Division adopts Donlin's response. Donlin's comment below evaluated the non-linear flow condition and shows minor impact on water temperature.

Donlin's Response: It is assumed that when referring to a synoptic study, Dr. Myers is describing coordinated, intensive sampling over a short time period (several days) during wet and dry periods where streamflow would be measured in Crooked Creek at a number of locations between American Creek and Anaconda Creek. A sensitivity analysis demonstrates that such additional streamflow data would not have a significant influence on the analysis. Therefore, even when accounting for a non-linear flow to watershed area relation, the impacts on stream temperature are relatively minor, with predicted stream temperatures in Crooked Creek remaining below the State of Alaska's water quality temperature standard of 55.4° F for egg/fry incubation in the years with available data.

Comment 39: P. 3 "The second assumption is there will be no thermal effects on the stream, meaning BGC ignored sources of heat that would add to stream temperatures … At the latitude of Donlin, longwave atmospheric radiation and conduction of heat from the atmosphere during warm days are likely to be the largest source of heating. Shortwave radiation, including direct sunlight onto the creek, reflects from surface water such that at lower than a 30-degree angle little heat would be absorbed. Reflected shortwave radiation however could hit the riparian vegetation thereby heating it thereby increasing long-wave radiation to the creek. At the low temperatures considered here, evaporation would remove only a small amount of heat. It seems likely that at least during warm weather periods with long days there would be a net gain of heat in the creek. Additionally, the stream meanders

substantially, as seen on BGC (2021) Figure 2-4; the meandering increases the surface area of the stream exposed to the factors listed above. By ignoring thermal effects, BGC ignored a substantial source of heat and has underestimated the temperature at the downstream end of the stream reach affected by the mine."

The Division's Response: The model is populated by a large dataset that has been collected from nodes that are relatively closely spaced. The linear distance between American and Anaconda Creek confluences is less than 3 miles. The thermal effects between stream monitoring stations do not need to be estimated. The FEIS data was collected at locations that were closely spaced. In addition, BGC 2021 noted that "[t]he potential removal of riparian vegetation along Crooked Creek due to the proposed Project. This factor is not considered significant because there are no plans for the riparian zone of Crooked Creek to be disturbed, except for one bridge crossing." Myers assumed that this was an underestimate (Myers 2021, Exhibit 6, Page 3 of 18). The stream temperature measurements at a frequency of every 30 minutes eliminates the chance of underestimated temperatures and introducing solar radiation modeling error. In addition, because the stations are closely located the FEIS noted that the temperature and solar radiation are not likely to be notably different between the sites (FEIS, pg. 3.5-26 and 27. The FEIS, Section 3.5, pg. 3.5-133 April 2018 also noted that the "[d]esign and implementation of erosion control procedures and BMPs at each water body crossing would minimize potential impacts to surface water flow and sediment load. Finally, see prior discussion on the use of modeling. Further the Division adopts Donlin's response.

Donlin's Response: The model is populated by a large dataset that has been collected from nodes that are relatively closely spaced. The liner distance between American and Anaconda

Creek confluences is less than 3 miles. The stream does meander significantly however, under the existing mine operations scenarios the riparian cover remains intact. Thermal impacts are measured as actual water temperature in the unimpacted stream. In addition, Myer's comment is overly simplistic in that the measured discharge and stream temperature implicitly accounts for the upstream radiation impacts on stream temperature. Therefore, thermal effects have not been accounted for as they would result in less conservative results. Furthermore, riparian and stream conditions on Crooked Creek would not be directly impacted by the proposed Project.

Comment 40: Effluent Discharge to the Stream – "The third unjustified assumption is that effluent temperatures would not be high enough to affect the stream. BGC provided no references to support the assumption. Effluent includes tailings decant water and runoff from waste rock and pit walls which could all be warmer than the stream temperatures during the summer due to radiation from the sun having warmed the source. There is also no discussion or evidence regarding heat that could be added to the water during treatment."

The Division's Response: BGC 2021 noted that 72% of the treated water would be from groundwater sources which has a measured temperature of approximately 36° F. The Division found no substantial argument that solar radiation would likely raise the volume of groundwater in the project area to over 55° F for which the model was conducted. Further the Division adopts Donlin's response.

Donlin's Response: The proposed water treatment includes a high-rate clarifier (HRC) and greensand filter, followed by reverse osmosis (RO). Neither of these treatment methods involve the addition of heat to the water. Therefore, the effluent temperature will generally be determined by the temperature of the water inputs fed through the water treatment plant (WTP).

To date, Donlin Gold has not modelled what the potential range of the treated effluent could be. However, for the September 28, 2021 report, we assumed a temperature of 55° F for the treated effluent. This temperature is a very conservative (i.e., high) assumption because:

- The proposed treatment methods do not involve the application of heat to the process.
- A majority of the predicted treatment volumes are modelled to be sourced from perimeter pit groundwater wells (29%), in-pit groundwater wells (19%), and the TSF Seepage Recovery System (SRS) (24%) (BGC, December 7, 2016). Together, these groundwater sources account for 72% of the modelled treatment volumes in July and August. As noted in BGC (September 28, 2011) groundwater has an average temperature of 35.6°F based on temperatures measured in the wells and vibrating wire piezometers installed in the immediate vicinity of the Donlin Project. Given that these three groundwater sources will be pumped directly to the WTP for treatment and will not be temporarily held in storage ponds, an assumed temperature of 55° F for the treated effluent is conservatively high.

Comment 41: P. 3 "BGC also ignored the potential that climate change would affect the thermal factors considered above. It could affect the stream in two ways. It could decrease flows during warm, dry periods and increase the air temperature and therefore the flux of heat from the air to the water. Both would increase the stream temperature. Because climate change would affect the stream temperatures regardless of the mine, it is necessary to consider it as part of any analysis of the impacts of the mine."

The Division's Response: Section 3.26.3 of the FEIS discusses climate change impacts to the proposed mine site extensively. Additionally, Dr. Myers assumes a static permitting process. The project's permits are renewed and reviewed on a recurring basis to incorporate new data from the previous permit cycle. The concept that an unexpected and unpredictable event 20 years in the future may cause exceedances discounts the adaptive permitting strategy which will account for changing conditions during each permit reissuance. Further the Division adopts Donlin's response.

Donlin's Response: The intent of BGC's analysis was to model potential increases in Crooked Creek stream temperature as a result of mining operations using available streamflow and stream temperature data. It is clearly recognized that BGC's analysis does not include all potential combinations of streamflow and stream temperature, including the potential impacts of climate change, given both the type of analysis being conducted and the length of record available.

The highest stream temperature measured at Crooked Creek during the 2005-2011 period was 51.7°F on July 23, 2005. Given the projected increases to air temperatures for northern climates in the coming century, it is possible that higher stream temperatures will occur in the future even if the Donlin Project does not proceed.

Comment 42: P. 4 "Uncertainty in the Predictions" - On Pages 4, 5, and 6 of his report, Myers states that BGC should have considered uncertainty for the following variables:

- Higher effluent temperatures
- Lower flow on Crooked Creek, which could make moderating temperatures on the effluent more difficult

- More cold water removed due to dewatering than the estimated 0.79 cfs.

The Division's Response: BGC 2021used a value of 2 cfs to conduct the modeling effort, which exceeds the maximum value expected of 1.66 cfs of removal from Crooked Creek. This decision appears to model for a circumstance which exceeds the maximum expected values and addresses some of the uncertainties inherent in predictive expected flows. Further the Division adopts Donlin's response.

Donlin's Response: The comment on higher effluent temperatures is addressed in Section 2.4. Effluent temperatures can be controlled by Donlin Gold and therefore represents a potential mitigation strategy. We assume the second bullet refers to issues already addressed in Sections 2.1 and 2.2. The final bullet refers to BGC's model assumption that the pit dewatering wells could remove 0.79 cfs from the hyporheic zone of Crooked Creek during operations, with the temperature of the captured water assumed to be at a typical groundwater temperature of 35.6^{o}F.

It is first noted that in BGC's analysis of September 28, 2021, a loss in Crooked Creek water of 2 cfs was entered into the calculation, rather than the actual value of 0.79 cfs. At the same time, the model results did not account for the potential loss of groundwater flows in smaller tributaries adjacent to the open pit BGC, May 6, 2016). Total average groundwater loss from these tributaries is approximately 0.34 cfs over the life-of-mine. Combined with the Crooked Creek losses of 0.79 cfs, the average loss in groundwater inflows is then 1.13 cfs. Looking at the maximum annual values over the life-of-mine, which would occur in about Year 20 (Table 1 of BGC, May 6, 2016), this value of 1.13 cfs increases to 1.66 cfs, which is less than the 2 cfs used in the September 28, 2021 report. Therefore, this effectively results in another area of conservativeness in the calculations – using a number above the predicted maximum annual

value.

Comment 43: P. 5 "BGC does not account for potential uncertainties in the dewatering forecast. The dewatering forecast is based on groundwater modeling which has inherent uncertainties in the parameters used for analysis."

The Division's Response: This is an extension of the same comment regarding uncertainty. The Division acknowledges uncertainty exists, and the BGC 2021 report appears to address uncertainties by selecting model inputs which are conservative in nature. Modeling is the only reliable predictive tool at the Division's disposal to evaluate potential impact before the construction and operation of a proposed project. It is critical to keep in mind that the complex web of permits under which the mine will operate are not static in nature. The permits require monitoring and reporting and require the applicant to adapt their strategies if unanticipated results occur.

Comment 44: P. 2 "Conclusions - BGC (2021) does not provide evidence indicating that the development of the Donlin Mine would not cause stream temperatures that would exceed standards. In fact, there are so many assumptions necessary to keep the temperatures from exceeding the standards that it is likely that future stream temperatures will exceed the standards, especially as climate change increases the background temperatures that the mine will only increase with its effects."

The Division's Response: The Division again acknowledges uncertainties exist in all modeling efforts. In many instances where a discretionary decision was made regarding model inputs, BGC appeared to select conservative values. Dr. Myers provided no indication that there was no

possibility the project could meet WQS, only that the number of assumptions, be they logical and conservative or not, only makes it likely there will be temperature exceedances. He also appears to focus on the design of more elaborate models versus making an assertion if the presented model satisfies the threshold of reasonable assurance.

The Division's Response to Comments: Limited Response to Dr. Miller's Supplemental Report

Comment 45: Miller, May 8, pg 1: Tailings Mercury – Dr. Miller asserted in his May 8, 2022 memo that reliance on a single value estimating the mercury concentrations in the tailings impoundment was not reflective of his experience with Nevada mines.

Division's Response: Dr. Miller further refined his opinion on the relationship between mercury concentrations and Weak Acid Dissociable (WAD) cyanide concentrations in the gold extraction circulation water. The Division acknowledges this relationship. It is curious, however, there is criticism for using literature values in parts of the study, but then asserting the use data from mines in different parts of the country at other times. The Donlin ore composition, solar radiation, climate, and waste rock concentrations vary greatly from the Nevada mines Dr. Miller offers as a random, but perhaps not representative, sample. In addition, the Division adopts Donlin's response.

Donlin's Response: The Ramboll modeling and analysis provides reasonable science-based estimates using best available site-specific data, the peer-reviewed literature, and information from other existing mines as appropriate. Specifically, the analysis uses mercury concentration data from Donlin Gold ore, solar radiation, waste rock and water quality data at the Donlin Gold site, and mercury tailings concentration data from the Donlin Gold pilot processing study which

accounted for cyanide treatment. The temporal variability in emissions noted by Dr. Miller (e.g., variability due to sunlight and changes in cyanide/mercury concentrations) is on the timescale of days to months while the impact on creek concentrations is on the timescale of tens to hundreds of years due to retention in soils as discussed in the Ramboll (October 2021) report. Therefore, deposition resulting from a spike in emissions such as emission from tailings facility thaws would not immediately cause an increase in soil and creek concentrations; rather the latter are driven by longer-term average emissions. Moreover, to account for uncertainties in the data, the Ramboll study applied a series of conservative assumptions as discussed in the October 2021 report and in the April 2022 response to comments.

Comment 46: Miller, May 8, pg 4: Mercury Monitoring – Dr. Miller asserted the company should be required to monitor the concentrations of mercury in the tailings facility.

Division's Response: Mercury concentration monitoring at the tailings facility is a requirement of Section 2.5 of the Donlin Monitoring Plan (as revised and approved May 6, 2022), which is a required element of the Division's Waste Management Permit for Donlin. In addition, the Division adopts Donlin's response. The Division determined there is sufficient data available from the Monitoring Plan to inform the permit on potential mercury emissions from the tailings facility.

Donlin's Response: Quarterly monitoring of mercury concentrations at the tailings storage facility will be conducted by Donlin Gold per ADEC's waste management permit requirement and allow verification of the tailings concentration estimates. The Donlin Gold thermal facilities will be subject to mercury emissions testing as well as ongoing monitoring of mercury emission controls pursuant to EPA's National Emission Standards for Hazardous Air Pollutants: Gold

Mine Ore Processing and Production Area Source Category, 40 CFR 63.11640 - 11653. Furthermore, periodic monitoring of mercury concentrations at the tailings storage facility will be conducted by Donlin Gold per ADEC's waste management permit.

The Division's Response to Comments: Limited Response to Dr. Myers' Supplemental Report

Comment 47: Myers, May 9 (Memo dated April 29), pg 1: Dr. Myers asserted that "It is common in the scientific realm and a frequent regulatory requirement that low flow analysis be done of the 10-year return interval low flow. Having only a select five years of record, it is not possible to be analyzing a low flow that would be exceeded (flow less than that analyzed) at a ten-year or higher return interval."

Division's Response: The Division finds that using additional modeled inputs regarding the flows of Crooked Creek would insert additional uncertainties with little added benefit. The existing five-year period (2005, 2006, 2007, 2009, 2011) has measured values associated with measured flows. In addition, the Division adopts Donlin's response.

Donlin's Response: It is not clear what purpose that calculation would serve, as there would not be associated water temperatures with that estimate. He also re-iterates his position of potential thermal effects between model nodes due to reduced flows increasing the ratio of stream surface to flow area. The estimated reduction of flow in Crooked Creek due to activities in American Creek is minor relative to the total flow in Crooked Creek. A process-based stream temperature model could be employed to analyze the factors advocated by Dr. Myers. However, such a model would have much more uncertainty associated with the various required inputs than the use of actual data.

The Division's Response to Comments: Chambers Report

Center for Science in Public Participation – David M. Chambers, dated May 5, 2022.

A series of new comments were introduced by ONC via an expert, Dr. David M. Chambers. Dr. Chambers was asked to comment on the applicability of some of the water treatment procedures proposed by BGC 2021 and provided comments in "Response to BGC Engineering—Temperature of Treated Effluent" (May 5, 2022). These comments are new comments, and focus on the idea that controlling temperature of the treated effluent will be difficult at the mine site and untested at any mine. According to Dr. Chambers, "historically for most mines, there hasn't been much emphasis on temperature control when managing water treatment plant operation. The emphasis is typically on the level of metals in the discharge." Dr. Chambers asserts that Donlin has not "conducted any studies to evaluate the feasibility of this proposal. BGC Engineering's mitigation proposals are all theoretical, and moving something from theory, to lab demonstrations, then into practical field applications has historically been problematic for the mining industry."

BGC 2021 used updated water budgets published after the FEIS and stream flow and temperature data collected for the FEIS to develop a quantitative model of stream temperature using SSTEMP, a stream temperature model from the USGS. The model used average groundwater data and maximum annual surface water temperatures (from 2005) as the basis for the model. Table 3.26-7 of the FEIS shows the projected air temperature increases in Alaska under two climate scenarios. The anticipated air temperature increase for scenario B1 MAAT Range is 0 to 4°F and for Scenario A2 MAAT range is 0 to 6°F. The 58.3°F air temperature was measured and is above the anticipated air temperature due to climate change models. During the

2005 season water temperatures in Crooked Creek were high as were water temperatures at American Creek and Anaconda Creek stations. This was a weather year high temperature event not related to modeled climate change. That is why 2005 is an appropriate year to model proposed mine temperature impacts. Results from the model showed that the stream temperatures are not expected to exceed the relevant water quality temperature standards for either egg/fry incubation and spawning or migration routes.

Dr. Mark Johns of Exponent independently evaluated the updated temperature model in BGC 2021. Results from his analysis were presented in Exponent 2022. Dr. Johns concluded the model chosen in BGC 2021 was appropriate for the environmental data, that the use of 2005 temperature data represented a conservative case because it was the warmest year for which data were available, and that the quantitative evaluation conducted in BGC 2021 was reasonable.

As Dr. Chambers mentions, in the project memorandum of April 14, 2022, BGC 2021 asserts that "Donlin Gold can control the temperature of the treated effluent by managing the quantity (i.e., flow) of the water sources that are fed to the WTP [Water Treatment Plant]." A range of measures such as using groundwater rather than surface water sources, cooling treated effluent, releasing impounded water from the Snow Gulch Dam, adding groundwater from new wells outside the mine area, and assessing options to reduce the loss of water from Crooked Creek's hyporheic zone due to the dewatering wells are a suite of options available to implement as an adaptive management approach in regards to temperature if necessary.

CONCLUSION

After an unprecedentedly immersive review of the available data, predictive models and the additional information contained in the submitted Ramboll 2021, BGC 2021, Air Sciences and SRK 2017 supplemental reports, and third-party review by Exponent, the Division asserts that there is sufficient predictive modeling to support a determination of reasonable assurance of meeting water quality standards. The level of rigor applied to the evaluation and modeling of the proposed discharges to Waters of the United States provides the Division an even greater level of assurance that WQS will be attained. The Division is affirming its issuance of the Section 401 Certificate of Reasonable Assurance.

ONC's repeated assertions that models have uncertainties is generally acknowledged as axiom. The Division did not expect any predictive model used to have zero potential for error. In fact, its own third-party expert highlighted a previously unaccounted potential source of exceedances. This process highlights how permits should and do work. Once a potential for exceedance is known or observed, the permittee and the Division take appropriate management actions to mitigate, reduce or eliminate the discharge. By incorporating a concern the Division became aware of in the Monitoring Plan, greater assurance was attained with meeting WQS for mercury.

ONC seemed to assert that if at any time in the future unanticipated events were to happen, the models could not account for that and should not be relied upon for meeting the reasonable assurance criteria. In the presented models, real-world data was input into the models to develop predictive outcomes. In most cases, modelers selected "worst-case" real-world data. ONC suggests future conditions may not be the same as past conditions. But to suggest that even

the data input to the predictive models should itself be modeled for unknown future changes seems to be introducing more, not less, uncertainty.

ONC also sets an unattainable expectation for reasonable assurance without providing a regulatory basis. ONC asserts that reasonable assurance must include that the predictive models not only result in satisfying WQS, but they must satisfy them by an unspecified threshold, and satisfy them at all points in the future without any adaptive management or involvement from the Division. These absurd and ill-defined thresholds make nearly any project of moderate length unlikely to attain any assurance.

It is important to note that reasonable assurance establishes an expectation that a proposed project has reasonable and realistic likelihood that it can comply with water quality standards when operated under a suite of permits and monitoring plans. Simply imagining a multitude of scenarios, under which the permittee and Division take no action whatsoever, that exceed WQS does not remove reasonable assurance. The intent of reasonable assurance is to provide the Department and public that a federally permitted action, when properly permitted and operated within the confines of the permit conditions, has a reasonable expectation of meeting the permit requirements. It is not the intent of reasonable assurance to continuously and endlessly refine predictive modeling efforts, which will always include uncertainty. It is for this reason the Division strongly asserts it has more than met the threshold of reasonable assurance.

ONC asserted the models were not conservative in nature yet provided no insight for the regulatory basis for that requirement nor did they offer a definition of conservative models. The Division observed in cases where there was a range of data for model input, the models in Ramboll 2021 and BGC 2021 selected worst-case or higher end of the data spectrum data. While

the Division does not concur that a formal declaration of conservative modeling is a regulatory requirement to attain reasonable assurance, these actions alone appear to point to a modeling effort which is, at the very least, made broad assumptions and refrained from selecting data which led to bast-case results. Similarly where predictive values were necessary to model results, the BGC 2021 and Ramboll 2021 reports cited literature values which were cautious.

The BGC 2021 study conducted a quantitative analysis which provided the magnitude and frequency of potential temperature changes on a daily basis, in contrast to the qualitative analysis in the FEIS. The Ramboll 2021 analysis used emissions estimates from the air permit and literature values to conduct a quantitative analysis to estimate potential stream mercury loadings under project conditions. ONC asserts the Division should not consider these models as "risk-averse", but again, provides no regulatory basis for the Division to do so, or provide a definition. The implication from ONC appears to be that no model could ever be used to satisfy the requirement of reasonable assurance.

ONC asserts the Ramboll 2021 and BGC 2021 reports were hastily prepared in response to litigation. During the Division and third-party review of the Ramboll 2021, BGC 2021, Miller 2022, Myers 2022, and Chambers 2022 reports, the Division did not find this to be the case. In fact, in the Miller 2022 report, Dr. Miller asserts Ramboll 2021 failed to consider the effect of cyanide on mercury chemistry in the tailings pond. Ramboll 2021 did, however, include a detailed discussion of pilot studies that included optimization of the cyanide process to minimize mercury emissions. It appears the majority of concerns Dr. Miller stated were based on outdated information from the FEIS and not the most recent sources Ramboll 2021 cited. The Division

does not question the experience and credentials of Dr. Miller, but it does appear there was little time provided to Dr. Miller for review and comment on the Ramboll 2021 report.

The Division has completed its own review and an independent third-party review of the additional studies (BGC 2021 and Rambol 2021) Donlin submitted. Through third-party review the Division was made aware of a small potential for mercury exceedances in a very small portion of land remaining after the mine is constructed. Due to this review, the Division was able to engage Donlin and put in place mechanisms to obtain heretofore unreported data on water quality and improve the responsiveness of the reporting and adaptive management. The Division has greater confidence of reasonable assurance WQS will be met and affirms the decision to issue the Certificate.