Response to Comments

For

Department of Environmental Conservation
Waste Management Permit No. 2017DB0001
And
Department of Natural Resources
Reclamation Plan Approval No. A20196226

Donlin Gold LLC
Donlin Gold Project

Public Noticed December 15, 2017 – February 13, 2018

FINAL

June 25, 2019

Introduction

Donlin Gold, LLC (Donlin Gold) is proposing the development of an open pit, hard rock gold mine in southwestern Alaska, about 277 miles west of Anchorage, 145 miles northeast of Bethel, and 10 miles north of the village of Crooked Creek.

This document summarizes and addresses comments received on Alaska Department of Environmental Conservation (DEC), draft Waste Management Permit (WMP) No. 2017DB0001 and Alaska Department of Natural Resources (DNR), draft Reclamation Plan Approval (RPA) No. A20196226 (Permits). The WMP regulates the containment and disposal of mine tailings, waste rock, wastewater, and other mine-related wastes at the Donlin Gold Project (Project), while the RPA regulates activities associated with the reclamation and closure of the Project.

The public comment period for the draft WMP began on December 15, 2017 and ended on February 13, 2018 with public hearings in Aniak, Alaska on January 17, 2018, Bethel, Alaska on January 23, 2018, and Anchorage, Alaska on January 26, 2018. The public notice period for the draft RPA spanned from July 9, 2018 through September 6, 2018 with a public hearing in Bethel, AK on August 28, 2018.

Permit-specific comments on the DEC WMP permit and the DNR RPA and the State's responses to those comments are contained in the following pages. There were changes made to the draft permits resulting from comments received during the public notice period that are reflected in the final permits. Where comments resulted in changes to the permits, associated changes are included in the response to those comments. There were also some minor changes made to the draft permit(s) after public notice to correct typographical and grammatical errors, formatting, and to clarify information. Minor changes to the permit(s) are not detailed in this document.

Informal Review Request and Decision

On January 18, 2019, DEC issued WMP 2017DB0001. On February 7, 2019, DEC received a timely request for informal review from EarthJustice to the DEC Division of Water Director. On February 14, 2019 informal review decision was issued based on the assertion that the issuance of the WMP violates Alaska Statute (AS) 46.03.100 because it appears to define the entire mine site as "treatment works." The informal review request included several items summarized as:

1. Inclusion of mine facilities generally and groundwater in the definition of treatment works is a drastic, unexplained change from the definition offered in the draft WMP issued for public comment,
2. The WMP should specify which features of the mine site are in fact treatment works and delineate the precise boundaries of those works,
3. Including groundwater in the definition of "treatment works" violates Alaska Statute (AS) 46.03.100 and is a departure from the definition provided therein. Groundwater occurs naturally at the site and therefore will not be "installed," let alone "installed for the purpose" of any waste treatment, and

4. Instead of artificially deeming the groundwater to be part of the treatment works DEC should require a liner under any waste storage sites with the potential to contaminate groundwater since prevention of groundwater pollution should take precedence to treatment of contaminated groundwater wherever possible.

The Director's informal review decision denied the request to vacate the permit on the grounds that it was issued in violation of applicable law; however, the waste management permit was remanded to the Division of Water, Wastewater Discharge Authorization Program in order to ensure only allowable items are included in the treatment works identified by the permit and a determination, consistent with the Informal Decision, that groundwater underlying treatment works can be included in the scope of the treatment works.

Following the Director's informal review decision, the language in Section 2.1 of the permit was modified and this summary was included in the response to comments document to satisfy the Directors remand criteria. Components of the proposed mine are designated as treatment works within the permit. Under 18 Alaska Administrative Code (AAC) 70.010(c), water quality standards promulgated at 18 AAC 70 do not apply to a treatment works authorized by the Department and that applicable water quality criteria "must be met in adjacent surface water and groundwater at and beyond the boundary of the treatment works." AS 46.03.900(33) defines treatment works as "a plant, disposal field, lagoon , pumping station, constructed drainage ditch or surface water intercepting ditch, incinerator, area devoted to sanitary landfills, or other works installed for the purpose of treating neutralizing, stabilizing, or disposing of sewage, industrial waste, or other wastes."

The following components of the Donlin Gold project are designated as treatment works as per 18 AAC 70.990(33) subject to 18 AAC 70.010(c) for the purpose of disposal of solid and liquid wastes, including: the Tailings Storage Facility (TSF); Waste Rock Facility (WRF); disposal trenches located within the WRF, ACMA and Lewis mine pits; and the Upper and Lower Contact Water Dams (CWD) (Appendix C).

The treatment works boundary for Anaconda Creek consists of the entire TSF area downstream to the seepage recovery system (SRS) pond, including the groundwater underlying the TSF downgradient to the SRS monitoring/interceptor wells. This permit requires; the collection of seepage and runoff below the TSF Dam, Lower CWD, and Upper CWD, authorizes the disposal of sludge produced from mine water and domestic wastewater treatment, and requires monitoring and reporting of groundwater downgradient of the designated treatment works. Runoff and seepage from mine facilities and disturbed ground in the American Creek drainage, including the excavations for the mine pits, WRF, Upper and Lower CWDs, ore stockpile berm and related support facilities would be managed as mine drainage, unless suitable for coverage under an Alaska Pollutant Discharge Elimination System (APDES) general permit for storm water discharges (e.g., soil stockpiles). A wastewater treatment plant is proposed to treat mine drainage prior to discharge into Crooked Creek under APDES Permit AK0055867 issued on May 24, 2018. The pits and pit perimeter dewatering well system around the pit area in the American Creek drainage are the downstream collection points of the treatment works. The permit requires monitoring and reporting of groundwater downgradient of the designated treatment works.

Comment	Topic or Permit Section	Commenter	Comment	Response
1.1	General Comment	Various Commenters	Objection or Support for Permit Decision	DEC received 27 comments submitted in general objection and 16 comments in general support of the proposed permit. Comments in general objection expressed concerns related to risks that the project will have on water quality and water use affecting food sources, drinking water, transportation and way of life in the area. Comments in general support expressed that the project can be constructed and operated in an environmentally sound manner and that the project brings economic and employment opportunity to the region. General comments, typically either in opposition or support for the proposed permit decision are a part of the administrative record of the permit and are noted in this Response to Comments document for the permit. However, since these general comments do not offer specific points applicable to regulation, data, information, or analysis from which the permit conditions were derived. No changes to the permit(s) were made as a result of these comments.
1.2	General Comment - Legality	Tom Lakosh	For DEC to issue a permit without having sufficient constitutional provisions in place between DNR and Fish and Game, and the other resource managers, it is improper for permits to be issued by the agency in violation of the rights to sustain yield and reasonable concurrent use of Alaskan residents. I would request that any permit be coordinated to ensure that the in-perpetuity trust that would be needed to maintain water quality for both surface and subsurface aquifers be sufficiently funded to adjust for higher standards of water treatment that may be found in the future and/or any catastrophic releases. And that only, and unless and until the permitting is coordinated in a manner between the	The statutory mandates in the Clean Water Act (CWA) and Alaska Statute (AS) 46.03 and regulatory requirements in 18 AAC 60 and 72 for protection of water quality were followed in the development of the permit. Coordination between the state agencies requested by the commenter is not required for issuance of this permit; however, both the DNR and Department of Fish & Game (DFG) were provided an opportunity to review and provide comment on the draft permit documents. The comment suggests that financial assurances be provided for surface and groundwater protection. DEC required financial assurance for site closure and long-term maintenance, treatment and monitoring that is implemented through this permit under statutory and regulatory authorities AS 46.03.100, 18 AAC

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			responsible state agencies to ensure that the constitutional provisions to due compensation when reasonable concurrent uses are violated, that the present plan for permit issuance is arbitrary, capricious, and in violation of the constitutional rights of all natural resources that may be affected by the operations being permitted.	60 and 18 AAC 72. No changes were made to the permit(s) as a result of this comment.
1.3	General Comment - National Environmental Policy Act	Sarah Durand	As a concerned member of the Alaskan public I would like to submit the following comment on the Notice of Proposed Issuance of an Alaska Pollutant Discharge Elimination System Individual Permit to Discharge to Waters of the U.S. and a Waste Management Permit - Donlin Gold Project 1 and Donlin Gold Waste Management Permit; As the Environmental Impact Statement (EIS) has not been completed nor a record of decision made for the Donlin Gold Project how can the DEC or any member of the public make an informed decision or supply adequate comments on the project in regards to permitting? The issuance of an Alaska Pollutant Discharge Elimination System (APDES) permit prior to the EIS completion seems unethical and a disservice to the Alaskan public. Please allow the completion of the Donlin Gold Project EIS, a published record of decision, and adequate time for the public to read and review the finalized document before additional public notice and considerations of permitting of the project. These are long term decisions that can have a large impact on the environment. A well informed decision should be made not a general inference from a draft document.	State permit actions are not contingent upon the completion of the National Environmental Policy Act (NEPA) EIS process. State permits are developed based on information submitted to DEC in permit applications. No changes were made to the permit as a result of this comment.

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1.4.1	General - Permitting	Kendra Zamzow, CSP2	How are the WMP and RPA tied together?	The WMP and the RPA are issued under separate authorities by DEC and DNR, respectively. Within these permitting authorities are financial responsibility requirements for site reclamation and long-term management of the facility. DEC authorities for the WMP permit include AS 46.03, 18 AAC 60 and 18 AAC 72. DNR authorities for the RPA include AS 27.19 and 11 AAC 97. Both the WMP and RPA contain financial responsibility elements and require implementation through demonstration of proof of financial responsibility. Through interagency cooperation, DEC and DNR conduct a cooperative review of the mine plan of operation and reclamation and closure estimates. The financial responsibility amount reflected in the RPA is adopted by reference into the WMP and represents the State-approved financial responsibility amount that satisfies both DNR and DEC regulatory requirements. No changes were made to the permit(s) as a result of this comment.
1.4.2	General - Permitting	Kendra Zamzow, CSP2	How is an “approval” or a “certificate” different from a permit?	Under DNR authorities, the type of authorization is dependent on the whether the project is located on state lands or not. DNR's authorization on private property is limited to an "Approval" of the reclamation plan. On state land DNR may issue a "Permit" that adopts by reference the mine Plan Of Operations. The resource and facilities for the mine are on private land for Donlin (The Kuskokwim Corporation owns surface rights and Calista Corporation owns surface and subsurface). No changes were made to the permit(s) as a result of this comment.
1.4.3	General - Permitting	Kendra Zamzow, CSP2	The RPA comes up for renewal every five years; will there be public comment for each renewal?	The DEC regulations requires that the WMP be issued for a duration of five years. The WMP is also subject to the public participation requirements of 18 AAC 15, 18 AAC 60 and 18 AAC 72. DNR does not have equivalent public participation requirements in order to issue an RPA.

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				Since the WMP has a public participation requirement and the financial responsibility amount is jointly reviewed and approved by DEC and DNR, the State offers the public to review and comment on the entire financial responsibility amount for the project through the WMP and required public participation process. No change to the permit(s) were made as a result of this comment.
1.4.4	General - Permitting	Kendra Zamzow, CSP2	Because the financial liability for closing the mine is part of the "approval", it seems like this is every bit as important as a "permit".	Financial responsibility is indeed a critical element of the WMP and RPA. No change to the permit(s) where made as a result of this comment.
1.4.5	General - Permitting	Kendra Zamzow, CSP2	Does the DEC WMP permit automatically go into effect as soon as the DNR Reclamation Plan Approval goes into effect?	No. They do not automatically go into effect together. Through agency coordination, DNR and DEC work to issue them concurrently due to the mutual connection to the financial assurance. No change to the permit(s) where made as a result of this comment.
1.4.6	General - Permitting	Kendra Zamzow, CSP2	Does the RPA need approval from both DEC and DNR?	No. DNR has authority to develop and issue the RPA without coordination or approval from DEC. However, both DEC and DNR work cooperatively to provide the public an opportunity to review and comment as described in the response to Comment 1.4.1. No change to the permit(s) where made as a result of this comment.
1.4.7	General - Permitting	Kendra Zamzow, CSP2	Do they both come to agreement on bond amounts and reclamation activities?	See Response to Comment 1.4.1.
1.4.8	General - Permitting	Kendra Zamzow, CSP2	Do they both need to approve RPA renewals?	No, just the financial assurance amounts.
1.4.9	General - Permitting	Kendra Zamzow, CSP2	Does approval of the RPA automatically become a statement of preference for the wet tailings option over Alternative 5A, the Dry Stack Tailings option? The reclamation bond calculation is based on the mine design that has a wet tailings facility and the RPA appears to not contest the Donlin Reclamation	The RPA simply approves the activities in the Reclamation Plan.

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			Plan statement: *The TSF would be constructed in eight stages over the mine life*	
2.1.1	Dam Safety	Alan Simeon	I work there at Donlin Creek. I'm very familiar with the material that's there. What the geologists call their bedrock is not bedrock. These rocks are full of fissures, they're cracked up, there's no stability or strength to it. And if you're going to be building these dams to hold back all of the water, I have a question, and it's what are you going to use to create your base? Because nothing is as strong as the beginning of your base. And if you're going to consider that rock up there, that bedrock, there is no strength to it. By trade I operate heavy equipment, so I do know what I'm talking about. That material there, if you're going to use other material, preferably river rock gravel, which you can compact, is going to take millions and millions of cubic yards to create this to be a safe dam. So, I want this question to be brought up and where is this going to come from? Are you going to use that material up there at Donlin Creek? That rock destroys itself in the sun and the rain. It's ridiculous. It has no strength. There might be gold there, but it's not much of the material that you want to use to build a dam. So that's what I wanted to bring up for the people here. That dam is supposed to hold back all of this bad stuff. Let's make it strong with proper material instead of what's up there.	The adequacy of available material at the project site to be used for dam construction is outside the jurisdiction of the permit. Review and approval of dam design for this project is subject to the respective dam safety regulations under Article 3 of 11 AAC 93 which are administered by the Alaska Dam Safety Program in DNR. No changes were made to the permit(s) as a result of this comment.

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2.1.2	Dam Safety	Grant Fairbanks	I believe that there could be a skip fault in the immediate area of this project and that in a worst case scenario, Crooked Creek could be flooded with untreated water. No water permit can cover this.	Geological hazards such as active faults are evaluated as a part of a review and permitting process that will require facility design standards and specifications for facility construction appropriate for the project location. This concern is outside the scope of this permit and regulated by the DNR Alaska Dam Safety Program. At this time, the project proponent has not yet submitted a complete permit application(s) for the dam construction of the tailings impoundment which will contain such geotechnical and seismic report(s) that will identify the geologic hazards in the project area which will be addressed in the review of the design in the DNR application process. Neither the APDES permit, which authorizes the discharge of treated wastewater into Crook Creek nor the WMP, which authorizes onsite wastewater (that are not to waters of the United States) nor solid waste disposal at the Donlin Gold Project site, authorizes a discharge caused by the failure of the impoundment structures proposed for this project. No change was made to the WMP as a result of this comment.

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2.1.3	Dam Safety	Kendra Zamzow, CSP2	The hydrogeology below the dam must be understood before construction.	The hydrogeology below the tailings dam is well characterized based on the results of geotechnical drill holes advanced to depths up to about 330 feet within the dam footprint and Anaconda Creek valley. Data from (including seasonal water levels, groundwater pressures, hydraulic gradients, hydraulic conductivity testing results and groundwater quality) from monitoring wells and grouted-in vibrating wire piezometers, and the results of both two-dimensional and three-dimensional numerical groundwater flow modeling. Additional detail is available in the following reports, including BGC Engineering Inc. (2014a, 2014b, and 2014c). This information has been used to develop the feasibility-level design of the TSF. Additional work will be done as part of detailed engineering to finalize the SRS design. All design work must be submitted to DEC and DNR for review and approval prior to construction. In addition, the hydrogeology and respective groundwater flow models will be reviewed by the DNR Alaska Hydrologic Survey in connection with the adjudication of water appropriations and usage authorizations. No change to the permit(s) was made as a result of this comment.
2.1.4	Dam Safety	Kendra Zamzow, CSP2	What will be the geochemistry of the dam's construction rock? Will it leach metals?	Non-acid generating (NAG) rock will be used for dam construction. This rock will leach arsenic and as a result systems are included to capture seepage and runoff from the dam. No change was made to the permit(s) as a result of this comment.

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2.2.1	Financial Assurance	David Chambers, CSP2	DNR has not disclosed how it arrived at a total financial assurance amount of $317,950,000. Not only should DNR disclose how it arrived at that figure, but it should also disclose how it expects the financial surety to change throughout the projected mine life, and what form of sureties it will accept from Donlin.	Upon review, the approved financial responsibility amount was updated to a total net present value (NPV) of $322,031,000 (NPV calculation is shown in Appendix A). Annual road maintenance costs were incorrectly input into the Standardized Reclamation Cost Estimator (SRCE) spreadsheet. Additionally, certain indirect costs items were revised.
2.2.2	Financial Assurance	Becky Long	DNR suggestion for the Donlin Reclamation Bond/Financial Surety to be $317.05 million is a joke and totally inadequate. That does not even cover the $2.078 billion Donlin says will be the total cost including 200 year water treatment. Donlin says if there is a premature closing scenario after 3 years, the cost would be $1.618 billion for closure. And these costs are probably underestimations of the indirect costs which will add to the total substantially. Why is the Walker administration accepting a bond that won't cover closure costs? How will financial surety be throughout the mining life? Donlin needs to submit to your office the cost of mine closure for every year of operation beyond the 3 year scenario. What form of financial security will the Walker Administration accept from Donlin? What discount rate/interest rate will DNR be using to calculate the reclamation bond? If it is more than 2 to 3 percent then the costs are a lot larger. This needs to be figured out in the amount for the bond. The bond should be for at least $3 Billion.	Several comments were received with concerns that the draft approved financial assurance amount is too low. The financial assurance amount determined for this project is based in part on the review and approval of the following documents, including, *Plan of Operations (PoO) Project Description Donlin Gold Project December 2017, PoO Water Resources Management Plan Donlin Gold Project December 2017, PoO Integrated Waste Management Plan (IWMP) Donlin Gold Project December 2017, PoO IWMP Tailings Management Plan Donlin Gold Project December 2017, PoO IWMP Waste Rock Management Plan Donlin Gold Project December 2017,* and *PoO Integrated Waste Management Monitoring Plan Donlin Gold Project (Monitoring Plan) December 2017.* These approved plans serve as the basis for the development of the financial assurance cost estimate provided by the project proponent to the State. The State conducts a detailed review of the cost estimate and determines the amount necessary for reclamation and long-term management of the facility necessary for construction and operation of the mine during the permit cycle. Some commenters have pointed out that the FEIS identifies a significantly greater financial assurance amount required of this project. However, it is important to note that the FEIS estimate is based on an end of mine life scenario where the facility is fully constructed, all economically

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				viable ore has been mined and processed after 27 years of mine development and operation. In comparison, the financial assurance authorization amount in this permit is based on the reclamation and long-term management cost based on the planned construction and mining activities that will occur from years zero to seven of mine life. Since the disturbance at the site is lower at the end of the permit cycle (seven years), the cost of reclamation and long-term management is lower in comparison to the total site disturbance at the end of mine life (27 years) represented in the FEIS. It is also important to note that the estimation methods calculate the financial assurance amount using the financial principle of time value of money, which is commonly used in the banking industry for value estimation of stocks and bonds. The basic premise of time value of money is that a dollar today is worth more in the future with investment due to a predicted rate of return. The financial assurance is evaluated with a conservative rate of return of 4.3%. The underlying principles of time value of money is represented by the following: NPV = FV ÷ (1+I)^N, where: NPV is the net present value FV is the future value I is the required return N is the number of years The financial assurance amount approved in the permits as NPV represents the amount or value that must be available to the State prior to commencement of construction and site disturbance. Upon reissuance of this permit (year 2024), DEC will review an updated financial assurance

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				estimate based on the total projected reclamation and long-term management cost through the next permit cycle and approve an updated financial assurance amount that the permittee will need to secure. Based on the life of mine plans by Donlin Gold, the amount is expected to increase significantly as a result of the financial assurance review that would occur upon permit reissuance. The State agencies, DNR and DEC, determined that the approved financial assurance amount satisfies statutory and regulatory requirements. No change to the permit(s) was made as a result of this comment.
2.2.3	Financial Assurance	Bob Shavelson, Cook Inlet Keeper	The other question I posed was how do we bond the loss of fisheries in Crooked Creek? There's nothing there. And, when I asked the question previously, it was -- it was, I think, presumed that I was talking about some type of catastrophic failure. I'm not. I'm talking about long-term changes to hydrology that when variably affect Crooked Creek and Kuskokwim downstream from there. A hundred percent certainty that you have adverse impacts that will stretch forever, if this mine is produced. Yet, there's no way to compensate the local people that rely on this resource on the current mechanisms that we have.	The comment suggests that financial assurances should be provided for the "loss of fisheries in Crooked Creek." State authorities for financial responsibility do not require bonding for compensation of the potential effects of fish resources due to the permitted activity. DEC authorities limit the financial responsibility requirement to site closure and long-term maintenance, treatment and monitoring that is implemented through the permit under statutory and regulatory authorities AS 46.03.100, 18 AAC 60 and 18 AAC 72. The Alaska Water Use Act (AS 46.15) requires DNR to consider the effect on fish and game resources, among other considerations, in determining the public interest when adjudicating applications for water rights. No changes were made to the permit(s) as a result of this comment.

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2.2.4	Financial Assurance	Bonnie Gestring, Earthworks	The proposed financial assurance amount is inadequate to ensure that reclamation is completed and long-term water treatment costs will be met.	The financial assurance calculation includes all aspects of reclamation and closure, including the long-term treatment of water. In addition, this calculation is reviewed at a minimum of every 5 years, and more often at the discretion of the agencies, to ensure that they reflect any changes in costs or operations to update the amount of financial assurance required. No change to the permit(s) were made as a result of this comment.

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2.2.5	Financial Assurance	Danielle Craven, Y-K River Alliance	DNR has proposed to accept a bond far below even Donlin's low estimates. It leaves a potential shortfall in the neighborhood of a billion dollars. Alaska law requires financial assurance that reflects the reasonable and probable costs of reclamation. That's from AS 27.19.040, Part A. The proposed bond falls far short. DNR and DEC must amend the bond that will insure sufficient funds to clean up our lands and our waters. Donlin proposes permanent human intervention through wastewater treatment in perpetuity. If Donlin is allowed to mine our lands, the company must take further measures to avoid permanent water treatment, such as dry tailings shortage, and irreplaceable replacements to the cover of our waste sites. If Donlin cannot design the mine in a way that ensures a permanently clean and stable site in a reasonable time after closure, without human intervention, the company should not be allowed to build the mine.	See response to Comment 2.2.2.
2.2.6	Financial Assurance	David Chambers, CSP2	The problem with the Premature Closure scenario is that it is good only for year-3 of operation. This scenario cannot be projected beyond year-3 because the amount of waste increases by year. It would be appropriate to use this estimate for years 1 & 2, but not for years 4 and later. Recommendation: Ask Donlin/SRK to produce a table that lists the calculated reclamation on a yearly basis for the Life-Of-Mine.	The financial assurance is revisited on a five year basis in Alaska. Therefore there is no need nor is it practicable to estimate life of mine reclamation costs for earthwork on an annual basis. The initial financial assurance is based on a 7 year scenario that includes four years of construction and three years of operations. Therefore the maximum disturbance is accounted for within the initial five year approval cycle. No change was made to the permit(s) as a result of this comment.
2.2.7	Financial Assurance	David Chambers, CSP2	It is likely that a good portion of the underestimate in indirect costs lies with the estimate for Contract/Agency Administration. The DOWL Report does not adequately consider this factor, and it should be raised for Alaska mines.	The proposed indirect cost estimate for the Contract Administration category is consistent with previously approved cost estimates for active hard-rock mining projects in Alaska. The Dowl Report referenced by the commenter is a draft guidance document that provides the typical cost estimate ranges for standardized categories

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				from past State financial responsibility reviews and approvals. The Contract/Agency Administration amount approved by the State is also within the consultant recommended range of 5% to 9% for this indirect cost category which was based on a review financial responsibility approvals from selected states with similar mining activity to Alaska. No change was made to the permit(s) as a result of this comment.
2.2.8	Financial Assurance	David Chambers, CSP2	The Contingency indirect cost used to determine the Donlin financial surety estimate needs to be increased.	The draft states 4%. The percentage has been increased to 6% within the range recommended in the draft guidance. See response to Comment 2.2.1.
2.2.9	Financial Assurance	David Chambers, CSP2	The proposed financial assurance amount is inadequate to ensure that reclamation is complete and long-term water treatment costs will be met. The proposed plan fails to ensure that mining operations shall be conducted in a manner that prevents unnecessary and undue degradation (AS 27.19.020).	In addition to the response to Comment 2.2.1 and 2.2.2, the following statute and regulations apply under DNR authorities: • AS 27.19.040(a) – Reclamation Financial Assurance. The commissioner shall require an individual financial assurance in an amount not to exceed an amount reasonably necessary to ensure the faithful performance of the requirements of the approved reclamation plan. The commissioner shall establish the amount of the financial assurance to reflect reasonable and probable costs of reclamation; • AS 27.19.020 – Reclamation Standard. A mining operation shall be conducted in a manner that prevents unnecessary and undue degradation of land and water resources, and the mining operation shall be reclaimed as contemporaneously as practicable with the mining operation to leave the site in a stable condition; and • AS 27.19.100(9) – Definitions. "Unnecessary and undue degradation" (A) means surface disturbance greater than would normally result when an activity is being accomplished by a prudent operator in

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				usual, customary, and proficient operations of similar character and considering site specific conditions. (B) Includes the failure to initiate and complete reasonable reclamation under the reclamation standard of AS 27.19.020 or an approved reclamation plan under AS 27.19.030(a); • 11 AAC 97.100 (b), AS 27.19.020 sets the minimum standard for conduct of mining operations in Alaska, without regard to land ownership; • 11 AAC 97.100(c) "nothing precludes a federal or state agency, a state corporation, the University of Alaska, a municipality, or a private landowner, acting under its own regulatory or proprietary authority, from establishing and enforcing additional requirements or higher standards for reclamation. Compliance with this chapter does not waive or excuse compliance with those additional requirements or higher standards." (Both Calista and the Kuskokwim Corporation, submitted comments indicating their concurrence with the requested amount for bonding for activities covered under the proposed permit time period.); and • 11 AAC 97.200 addresses Land Reclamation Performance Standards.
2.2.10	Financial Assurance	David Chambers, CSP2	The Reclamation Plan needs to clearly state the Discount Rate/Inflation Rate that is being used to calculate net present values for the financial surety. Likewise, DNR should make sure a conservative net discount rate is being utilized, or there is a danger the long-term financial surety could be insufficient.	The real rate of return that was used to calculate the NPV of the financial assurance amount is 4.3 %. This percentage is consistent with Bureau of Land Management (BLM) and U.S. Forest Service (USFS) financial assurance calculation methodology and it was also used in prior the NPV calculations for financial assurance authorizations for other mines operating in the State. The use of the 4.3% rate of return was first used for the Red Dog Mine financial assurance calculation based on rate of returns from the

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				previous 20 years of market performance. Assistance from the Alaska Department of Revenue was provided to DNR and DEC in developing the real rate of return percentage. Lastly, financial assurance for a mining facility must be reviewed at a minimum of every five-years or more frequently if determined necessary by the State. Such a review would include a re-evaluation of the real rate of return as well as all other aspects of the draft cost estimate. Regulation-required periodic financial assurance reviews is designed to ensure that permittee-paid funds are sufficient to cover the cost of reclamation and long-term management of the facility. No changes were made to the Permit(s) as a result of this comment.
2.2.11	Financial Assurance	David Chambers, CSP2	"28.5% is more than 16% lower than the average of the range of indirect costs cited in the DOWL Report (DOWL 2015, Table 1) – BLM (H-3809-1,9/2012), BLM (AK Guide 9/2014), USFS Guide (2004), OSM Handbook (4/2000), SRCE (NV), and AK DNR Guidelines (2014 draft). 16% of the direct costs at the Donlin mine is approximately a $160 million difference in the financial surety. If the state and federal agencies are faced with an operator default, this is more than a significant amount of money, it would be a financial disaster. Recommendation: It is likely there is some serious omission in the choice of indirect costs. These cost estimates should be carefully reviewed and corrected. "	Indirect costs as a percentage of directs generally decreases as the project scale increases. This is because indirect costs does not linearly increase with an increase of direct costs. The Donlin Gold project is proposed to be one of the largest mines in the State in terms of project scale and estimate financial responsibility cost and a lower indirect percentage was (relative than other active mines in Alaska) was estimated. The commenter incorrectly applies a 16 % increase of indirects to the sum of 100 years of direct costs instead of to the NPV of directs. The State does not believe a 16 % increase to the indirects is warranted. Donlin has increased the total indirect costs as described in responses 2.2.1 and 2.2.8 and is within 1% of the rate suggested by the guidelines (State of Alaska, 2017).

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2.2.12	Financial Assurance	Denis Ransy	As proposed the Draft Plan is inadequate. DNR proposing $317,950,000 for the Reclamation Bond is totally inadequate. Such a figure is disrespectful of all the Y-K Delta lives and resources. Why would the state accept a bond that won't cover the cost of closure and reclamation? This needs to be explained. If the mine closes early or the company on the permit goes bankrupt, the state will not be able to cover the cost. This ensures the mercury, arsenic pollution of the waterways and destruction of habitat will not be compensated because the state does not have that kind of money. The bond or financial surety should be for $3 Billion. What financial security is the state going to require of Donlin?	See response to Comment 2.2.2.
2.2.13	Financial Assurance	Grant Fairbanks	In this new area of Scott Pruitt and the demise of the Environmental Protection Agency (EPA) under his direction, we wonder what the role the EPA will have on this mine. Our own state government has been cutting the budget of the DEC and I wonder what future funds will be available for the long-term monitoring of this Donlin mine. We are talking water quality monitoring to the end of time. Hundreds and hundreds of years.	See response to Comment 2.2.2.
2.2.14	Financial Assurance	Grant Fairbanks	Donlin, or whoever owns the mine, must be financially responsible to operate a water treatment facility forever. Should this mine be owned by a group not able to fulfill its task, then we, the public, will have to pay for the cleanup operation. The landowner, Calista, and the Kuskokwim Corporation might be left holding the bag if the financial instruments used by the Department of Natural Resources are not adequate. Sometimes there just won't be a bond or	The proof of financial assurance under AS 46.03.100 and 18 AAC 60 may be demonstrated by various financial instruments, including; self-insurance, insurance, surety, or other guarantee approved by DEC to assure compliance with applicable closure standards and post-closure monitoring requirements. Financial instruments provided by the permittee, such as self-insurance or corporate guarantee may be subject to a financial test to determine the corporation's financial health. Other financial instruments, such as sureties, bonds or trust funds are

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			financial vehicle big enough to repair a spill or occurrence from an earthquake.	provided or managed by the State of Alaska or third-party financial institutions independent of the permittee.
2.2.15	Financial Assurance	Grant Fairbanks	I ask that the public be involved when financial assurances are addressed. Donlin probably wants a prorated amount each year for 27 years. But if they were to build the mine and operate for only a few years, then the money needed won't be there. I feel that they need to have at least a billion dollars on deposit with a safe and secure 3rd party institute before starting production. Our state regulators must protect us from unfunded cleanup and remediation.	State approval of financial assurances for a mining project is a component of the DEC WMP and the DNR RPA. Through interagency coordination, DEC and DNR co-notice the WMP and the RPA because the financial assurance estimate is common to both permits and due to significant public interest in mine reclamation and closure bonding concerns. The WMP is required to public notice the draft permit for review and comment. Generally, the review and comment period for the WMP is for a minimum of 30 days. The comment suggests a trust fund as a possible financial instrument that the permittee may develop to satisfy the States financial assurance requirement for long-term management of the facility. The concept of a trust fund as applied to a mining project for reclamation and long-term management is that the trust fund would be funded at regular intervals during the operational life of the mine. The comment raises concern that if the permittee defaults prior to complete funding of the trust fund, the State will be left with the liability of the cost for reclamation and long-term management. This will not occur. Since the State must secure proof of financial assurance to cover the total cost of reclamation and long-term management before authorizing the mining activity, any difference between the approved financial assurance amount and the balance of the trust fund must be satisfied through another financial instrument up to the approved financial assurance total. See response to Comment 2.2.6.

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				See response to Comment 2.2.2 regarding the financial assurance amount.
2.2.16	Financial Assurance	Grant Fairbanks	Today we are here concerning DNR's issued permit for reclamation closure and financial assurances. And, again, another disappointment. I have read the 400-page document associated with this permit and there's still too many unanswered questions. But the real elephant in the room here today, is the low bonding amount the State of Alaska, through DNR, has requested from Donlin. We will make sure the Governor and the Legislature knows of the possible future cost to the state of this low bonding amount. It's -- it isn't increased to cover any unforeseeable event such as a realistic dam failure or early closure.	See response to Comment 2.2.2.
2.2.17	Financial Assurance	Sharon Neth	I share the concerns about monitoring and lack of funding for the state, lack of funding at the federal level so that is one of my concerns as well. As Grant mentioned, I'm concerned about the amount of money that they put forth and that that money has to be there in perpetuity because the liability of the mine lasts forever. So, I'm concerned that there be no 24-year time limit on this money being put up. So, I'm concerned about the amount of the money	The State requires that the project proponent provide financial assurance via the WMP so that in the event of a default, sufficient funds are available to the State at its determination to conduct reclamation, maintenance and long-term management of the facility. Demonstrating proof of financial assurance is a requirement of the permit and is required under AS 46.03.100, 18 AAC 15 and 18 AAC 60. A financial assurance estimate is based on State approved facility Reclamation Plan is reviewed and approved by the State to prevent the State from incurring costs associated

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			and the length of time into the future that that will cover.	with reclamation and closure. The permittee is also responsible for costs associated with the demonstration of proof of financial assurance. No changes were made to the permit(s) as a result of this comment.
2.2.18	Financial Assurance	Tom Lakosh	I'd like to comment upon the DEC issuance of permits to the Donlin mine as being premature without sufficient reservability to operate a water treatment facility in perpetuity and with sufficient constitutional protections for those that may be impacted by the chronic sub treatment of mine wastes and/or a catastrophic release from any of the tailings piles or ponds, impoundments that may happen in perpetuity.	See response to Comment 2.2.2.
2.2.19	Financial Assurance	Kendra Zamzow, CSP2	The bond amount should be the estimated full reclamation cost for the period of the RPA authorization, with provision for inflation. Bond money could be returned as reclamation estimates decreased over the years, and money collected as interest could be returned annually.	Inflation is accounted for in the financial assurance and can be either paid up front at the beginning of each 5 year renewal cycle or may be adjusted annually based on the Anchorage Consumer Price Index. No changes were made to the permit(s) as a result of this comment.
2.2.20	Financial Assurance	Kendra Zamzow, CSP2	Donlin should provide the state with an estimate of closure costs for every year of mining before the RPA is approved. This information should be available to the public.	The State is required to review a mine facility financial responsibility at a minimum of every five years and may conduct more frequent reviews if warranted. No changes were made to the permit(s) as a result of this comment.
2.2.21	Financial Assurance	Kendra Zamzow, CSP2	New owners should place the same approximately $1 billion bond amount of the cost of closure for the RPA authorization period.	See response to Comment 2.2.2. Any "New owners" would have to maintain the same reclamation liability including FA. 11 AAC 97.350 addresses requirements for the successor in interest for mining operations.
2.2.22	Financial Assurance	Kendra Zamzow, CSP2	Post-closure financial assurance should be required for unplanned events. All or some of the bond would be returned upon successful reclamation of the tailings facility, depending on risk analysis of the potential for damage if the dam breached after closure.	The State has no authority to require bonding for unplanned events as described or catastrophic events. AS 27.19.040 addresses reclamation financial assurance as reasonably necessary to ensure faithful performance. Further, 11 AAC 97.430 notes liabilities exceeding the bond amount. Regulation 11 AAC 93.172(a)(6)(C) requires

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				financial assurance for tailings dams that require long term care and maintenance in post-closure operations. During design, application review and during renewal periods, results from past monitoring are incorporated to determine and validate the adequacy of designs. Water management plans include a water balance that incorporates design storm events (typically the 100-year, 24-hour storm event or larger) which can be updated as appropriate with new information. Dam structures are designed to withstand the extreme seismic and hydrologic events with very low probabilities of occurrence in the region; e.g. large earthquakes or floods. These measures are proactive in avoiding unplanned events
2.2.23	Financial Assurance	Kendra Zamzow, CSP2	Self-insurance should not be allowed. Self-insurance should not be allowed for solid waste or any part of the reclamation bond.	AS 27.19.040 addresses reclamation financial assurance. AS 27.19.040 (e) describes acceptable forms of financial assurance that may be accepted by the commissioner. No changes were made to the permit(s) as a result of this comment.
2.2.24	Financial Assurance	Gail Vanderpool	As I had asked, if the State of Alaska requires an insurance bond. Which they do. What about if and when there is a CATASTROPHIC related incident. There is no insurance for catastrophic incidents. Whomever is mining, just walks away. No responsibility what so ever.	See response to Comment 2.2.22 and 2.2.23.
2.3.1	Groundwater Hydrology	Bonnie Gestring, Earthworks	There is insufficient information on groundwater hydrology – specifically whether deep groundwater could intersect the pit – to prevent unnecessary and undue degradation. The State of Alaska should require test drilling to determine the presence/absence of groundwater in the area of and to the depth of the planned pits before approving the reclamation plan. This cannot be determined during mining (pumps will be removing groundwater), and it will be very expensive and	The concern about the pit potentially being a flow-through pit lake was addressed in detail as part of the Final EIS process for which there is no evidence from the site investigations on the feasibility of the Donlin Gold Project to suggest the potential for a flow-through pit lake condition at closure. Very detailed technical responses to EIS Requests for Additional Information (RFAI) posed by Jim Munter (the third-party hydrogeology lead) during the Final EIS process (BGC Engineering Inc., 2017a, 2017c and 2017d). In addition, the hydrogeology and respective

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			impractical, if not impossible, to change the waste management design if it becomes obvious that groundwater was intersected after mining is complete.	groundwater flow models will be reviewed by the DNR Alaska Hydrologic Survey in connection with the adjudication of water appropriations and usage authorizations. No change was made to the permit(s) as a result of this comment.
2.4.1	Hazardous Chemical Storage	Sarah Durand	The plan states that the permit applies to hazardous chemical storage and containment. However Resource Conservation and Recovery Act (RCRA) requires a generator of hazardous waste to be responsible for shipping and disposal as well. Why is this not addressed and made available for public comment?	The permit contains stipulations for the storage and containment of hazardous chemicals as a measure to prevent the introduction of these chemicals into surface and groundwater in the project area. The disposal of hazardous wastes, subject to the RCRA is not allowed or authorized and is beyond the scope of this permit. Further, state permits are not required to reproduce federal requirements. No change was made of the permit(s) as a result of this comment.
2.4.2	Hazardous Chemical Storage	Sarah Durand	Although the plan states that it will handle cyanide as per federal regulation there is no mention of how it will store and contain the 11 tons of liquid mercury (quoted from Donlin Mercury White Paper and Mercury Management Overview) produced by the mine that will need to be shipped out annually. What disposal option will Donlin be using? As the generator of the hazardous waste it is their responsibility to handle it cradle to grave although it is not addressed anywhere within the public notice documents. The public should be able to read and make comments on this as it is a large part of their operations plan.	The beneficiation process proposed by Donlin will produce mercury as a byproduct which is proposed to be stored onsite and regularly shipped off site to appropriate facilities. Although the permit does not specifically address mercury, onsite containment and storage of the material is addressed through permit stipulations for hazardous waste. The question posed by the commenter is beyond the scope of the permit(s) and no change was made to the permit(s) as a result.

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2.5.1	Hazardous Waste	Sarah Durand	Spill cleanup debris including remediated residual or soil will be disposed of in the Class III Camp landfill with DEC approval. How does Donlin intend to meet polluted soil regulations for disposal of this material? Absorbents even as non-hazardous waste are not an acceptable waste stream in an interlandfill. The described disposal method in this plan is in violation of 18 AAC 60. Used filters are not inert waste. The described disposal method in this plan is in violation of 18 AAC 60. The plan states that "petroleum-contaminated soil would be managed on site and is considered a non-hazardous waste." Polluted soil often tests within the definition of hazardous waste and as stated in the plan this action would be a direct violation of 18 AAC 60. Very specific regulations apply to handling and disposal of petroleum and other contaminated soils. DEC should require they provide details on how it will be managed that do not violate their own regulations. Filters are not inert waste. The described disposal method in this plan is in violation of 18 AAC 60. All waste streams described in section 3 with the exception of scrap metal are not inert waste. The described disposal method in this plan is in violation of 18 AAC 60. An updated plan that	With the exception of natural minerals found in mine rock or residual wastes included as byproducts of the beneficiation process, Part 2.1.1.5 of the permit prohibits the disposal of acute hazardous wastes and spill cleanup debris without prior approval from DEC. Any request to dispose these materials in a designated landfill disposal trench will have to meet the standards of 18 AAC 60.020 and 18 AAC 60.025 as applicable. Permit Sections 2.1.1.5.1 and 2.2.8.5 were corrected as a result of this comment.

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			specifies a landfill that accepts these waste streams in a manner that is regulatory compliant is needed. This updated plan should also be made available for public comment prior to approving the plan or any permit issued. As section 3 is a large section of the plan this much of an update should constitute as a major change in operations and potential for environmental risk so a public comment period should be issued as per 18 AAC 60.	
2.6.1	Incineration	Sarah Durand	What are the predicted incinerator residual wastes that are not ash that will be produced?	The waste products from incineration include ash and wastewater. The wastewater from the incinerator is proposed for disposal in the TSF for ultimate treatment and discharge under APDES Permit AK0055867. No change to the permit(s) was made as a result of this comment.
2.6.2	Incineration	Sarah Durand	An incinerator is required for burning operations within a Class III Camp Landfill permit. How will Donlin Gold Project incinerate the waste as to not produce black smoke?	Incinerator emissions are regulated by the Air Quality permitting program and are generally beyond the scope of this permit. Permit Section 2.2.9 does contain required stipulations to minimize the potential for black smoke by operating the incinerator in accordance with the manufacturer's directions and by not burning wastes (tires, plastics, etc.) that are likely to generate black smoke. No change to the permit(s) was made as a result of this comment.
2.7.1	Inert Waste	Sarah Durand	What will be done with household batteries, lithium ion batteries, or any other types of batteries that are not lead acid for disposal or recycling at the Donlin Gold Project? Batteries are not inert waste. The described disposal method in this plan is in violation of 18	According to the approved Integrated Waste Management Plan, the project proponent must collect non-hazardous batteries for offsite recycling or reclamation. Since the IWMP is adopted by reference by the permit, the conditions within the IWMP are enforceable requirements of the permit. However, solid waste regulations do allow batteries that are regulated as non-hazardous waste to be disposed

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			AAC 60. Even if Donlin will permit a Class III landfill how this waste stream comply with 18 AAC 60?	on site. No change to the permit(s) was made as a result of this comment.
2.7.2	Inert Waste	Sarah Durand	An inert solid waste landfill is very different facility than the Class III Camp landfill that the 2016 Plan of Operations describes. This is contradictive as the two documents speak to two very different types of landfills.	The permit authorizes the disposal of incinerated municipal solid waste and non-hazardous solid waste in disposal trenches or cells within the proposed waste rock facility under the Class III landfill regulations, 18 AAC 60. The 2016 Plan of Operations documents referenced in the comment uses incorrect terminology for the classification of the landfill. Permit Section 1.2 requires the permittee to update DEC-approved plans adopted by reference in the permit within 90 days of permit issuance incorporating any changes necessary to be consistent with the terms of this permit. Correction of the facility classification will be addressed upon compliance with this permit requirement. No changes to the permit(s) were made as a result of this comment.
2.7.3	Inert Waste	Sarah Durand	Non-hazardous wastes are not all inert. Accepting all non-hazardous waste at an inert landfill is a violation of 18 AAC 60.	The comment is accurate, and the permit has been changed in acknowledgement. For clarification, all uses of "inert waste" have been replaced with "non-hazardous solid waste."
2.8.1	Integrated Waste Management Permit	Sarah Durand	A DEC Solid Waste Management Permit does not exist. It is unclear what Dolin Gold is trying to say here. Will DEC create a permit titled Solid Waste Management specific to Donlin Gold? If so will other mining facilities be utilizing this new type of permit? Where would the public look for regulatory details specific to this?	This permit is issued under the provisions of Alaska Statutes (AS) 46.03, and the Alaska Administrative Code (AAC), 18 AAC 15, 18 AAC 60, 18 AAC 70, and 18 AAC 72, as amended or revised, and other applicable state laws and regulations. Further, AS 46.03.100 authorizes DEC to issue an integrated waste management and disposal authorization covering multiple related or unrelated waste management or disposal activities to be conducted at a facility, including generation, treatment, storage, and disposal of solid or liquid waste. The 2016 Plan of Operations documents referenced in the

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				comment uses an incorrect permit title, "Solid Waste Management Permit" instead of Integrated Waste Management Permit, as defined in AS 46.03. 100. Permit Section 1.2 requires the permittee to update DEC-approved plans adopted by reference in the permit within 90 days of permit issuance incorporating any changes necessary to be consistent with the terms of this permit. Correction of the permit title within the plan of operations documents will be addressed upon compliance with this permit requirement. No change to the permit(s) was made as a result of this comment.
2.9.1	Landfill	Sarah Durand	Draft 2017DB0001 – Waste Management Permit for Donlin Gold, LLC Comments, Section 1.1, The plan states that the permit will cover Class III Camp Landfills. How many Class III Camp Landfills will Donlin be permitting?	The permit authorizes the disposal of incinerated municipal solid waste and non-hazardous solid waste in disposal trenches within the proposed waste rock facility subject to regulations for Class III municipal solid waste landfills (MSWLFs). The exact number of disposal trenches is unspecified in the application and permit. As with other permitted mine facilities operating in the State, the State actively manages oversight of the Class III MSWLFs located within a waste rock facility through plan review and approval to address changes that occur at the mine as it develops over time. Permit Section 1.1.1.3 was modified for clarification as a result of this comment.
2.9.2	Landfill	Sarah Durand	How will adequate compaction be achieved with a 10ft working face height?	The Class III landfill authorized under the permit is stipulated to have a maximum working height of 10 feet constructed within the waste rock facility. The Class III landfill is proposed for construction as cells or trenches within the waste rock facility containment. Although Permit Section 2.2.8.11 stipulates that waste placed in the disposal trenches must be compacted in four-foot lifts, the amount of compaction of the Class III landfill is not stipulated in the permit and is not required under 18 AAC 60. No change to the permit(s) was made as a result of this comment.

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2.9.3	Landfill	Sarah Durand	Where will the permitted landfill be located within the WRF?	The permit authorizes multiple disposal trenches within the boundaries of the WRF. The locations of the trenches within the WRF are unspecified as they will need to be located based on the changing configuration of the WRF over time. No change was made to the permit(s) as a result of this comment.
2.10.1	Leachate	Sarah Durand	A Class III Camp Landfill should be operated as to not produce leachate rather than trying to control the level of it to not exceed water quality standards. How will Donlin Gold Project operate the landfill to not produce leachate?	Permit Section 2.2 contains several stipulations to reduce or minimize the production of leachate in the landfill including controlling runoff away from the facility through ditches and berms, requiring compaction in four-foot lifts and by requiring intermediate and permanent soil covers. Further, Permit Section 2.2.8.17 prohibits an offsite exceedance of water quality standards. No change to the permit(s) was made as a result of this comment.
2.11.1	Long-Term Management	Tom Waldo, Earth Justice	Today I want to speak about one issue regarding the reclamation plan, which is water treatment in perpetuity. This does not meet the standards required by Alaska law for a reclamation plan. The statute applying to reclamation says that the miners are supposed to leave the site in a stable condition. Leave the site in a stable condition. That's the statutory standard, AS 27.19.020. And that's defined to mean, in part, re-establishment of renewable resources on the site within a reasonable period of time by natural processes. Well, this reclamation plan for Donlin doesn't do that at all. It requires water treatment in perpetuity. The plan is to create a 2-square mile pit lake that is projected never to meet water quality standards. So, for as long as can be foreseen, humans will have to operate a water treatment plan, and keep it going. Have enough money to keep it operating and in good repair for a long as can be foreseen. And that will be needed in order	The State does not have statute, regulation or policy that prohibits issuing a permit to a mining project that requires long-term water treatment and monitoring after mining is completed. If a permit applicant demonstrates that the proposed projects solid waste and wastewater discharges can meet the regulatory requirements for the protection of the environmental and human health during construction, operation and closure of the facility, DEC is compelled to develop and issue a permit authorizing that discharge. Although the commenter points out that permitting a project requiring long-term management after cessation of mining appears to be in conflict with AS 27.19.020, Reclamation Standard, which requires the mining operation must leave the site in stable condition, this statute is not in conflict with the proposed permit. Under AS 27.19.100(7), "stable condition" is defined as the rehabilitation, where feasible, of the physical environment of the site to a condition that allows for the reestablishment of renewable resources on the site within a reasonable period of time by natural processes. The statute, definition, and reclamation

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			to avoid pollution of Crooked Creek and the Kuskokwim River. That is inherently an unstable condition. It's inherently not by natural processes, and it doesn't meet the standard set in the statutes and regulations.	of "the physical environment" addresses topological stability from runoff, erosion and slope failure or site topography, whereas long-term management concerns such as water treatment addresses the chemical environment or water quality. No changes to the permit(s) were made as a result of this comment.
2.11.2	Long-Term Management	Elaine Thomas	1. It appears that this permit will allow contaminated mine wastes to be distributed and stored in up to 7 different sites in the quaintly named 25 square mile "Donlin Gold Project footprint". These contaminated wastes will surely come in contact with human, animal, and plant communities as well as our water and air. How can anyone guarantee the safety and future health and wellbeing of these communities? The mining industry has a very poor track record when it comes to protecting the environment. They leave destruction and devastation behind. Making large profits for stockholders is at the top of their list. 2. According to the ADN article the 1,356 acre tailing pond will hold 110 million tons of waste material FOREVER! How can DEC permit a mining company to store toxic waste which may negatively impact every generation to come? We owe it to future generations, as well as to our planet, to leave things as undisturbed and protected as possible.	See response to Comment 2.11.1.

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2.12.1	Mercury	Sarah Durand	The soil located within the Donlin Gold Project is high in naturally occurring mercury. Once the soil is exposed to the environment how will Donlin ensure that surface water run off outside the landfill facility not leach the mercury? As this is going to be located in an unknown place within the WRF all the soil may produce mercury leaching and volatilization. There are different regulations that govern the WRF than a Class III Camp Landfill. Please address how Dolin will test and insure the naturally occurring mercury in the soil will not leach or volatilize at the landfill?	The regulation of mercury from the beneficiation process, exhalation and fugitive dust from local rock and soil is not regulated under this permit and are regulated through other permitting programs. Mercury is a parameter of concern for this project and the permit does require surface water and groundwater monitoring for mercury. All contact water within the mine footprint is proposed to be collected and stored in the tailings facility and contact water ponds for ultimate treatment and discharge under APDES Permit AK0055867 to minimize the risk of mercury release to the environment. No change to the permit(s) was made was a result of this comment.
2.12.2	Mercury	Sarah Durand	A Mercury Management Plan should be included within this document for public notice. As this is a major hazardous waste stream produced by Donlin (as written in their Mercury White Paper and Mercury Management Overview) as such this plan is incomplete. The plan was “currently being developed” in the EIS draft that was available for public comment. Why is the public being left in the dark as to how mercury will be handled? How can the DEC permit a plan if they do not have all the pertinent information, in this specific case, a mercury management plan? Given the quoted amounts of mercury and cyanide in other Dolin Gold documents why have they not determined what type of generator they will be and include a federal and state regulatory plan for handling, collection, storage, and disposal for the Hazardous waste they will be producing? This is a waste management plan please provide details on how the waste will be managed. 28. It is a disservice to the Alaskan public that a mercury	Mercury bearing hazardous wastes are either specifically listed as hazardous wastes or are hazardous because they exhibit the characteristic of toxicity for mercury. Different categories of mercury hazardous waste have different regulatory requirements including waste management requirements under RCRA where these wastes are required to be properly treated before being land disposed to reduce mobility and toxicity and to provide protection to human health and the environment. EPA regulates mercury containing hazardous waste by setting treatment standards for all hazardous waste bound for land disposal (40 CFR 268.40). This permit prohibits the disposal of mercury containing hazardous waste within the disposal facilities regulated under this permit. The comments regarding requiring the permittee to develop a "Mercury Management Plan" for the handling, collection storage and disposal for mercury containing waste is beyond the scope of this permit and underlying authorities and will be addressed through other applicable regulatory authorities. No change to the permit(s) was made was a result of this comment.

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			management plan has not been provided as part of this plan or permitting based on this plan. As this section is titled Specific Hazardous Materials Handling Requirements a mercury management plan should be included and evaluated prior to any permitting or approval of this plan. Is there a shipping company in Alaska that services the Kuskokwim River that is certified and is willing to take on the responsibility that Donlin is stating in this plan for shipping their hazardous wastes up and down the river? As there is an extremely high potential for environmental disaster if a spill event did occur with these types of materials a high level of precaution is needed. Who will oversee this?	
2.12.3	Mercury	Sarah Durand	How will Donlin ensure that mercury is not volatilizing from the cover material used at the landfill?	The proposed cover material for the Class III disposal trenches will be waste rock. Mercury emissions from the landfill cover material are regulated by the Air Quality permitting program and are beyond the scope of this permit. No change to the permit(s) was made as a result of this comment.
2.13.1	Monitoring	Bonnie Gestring, Earthworks	Aquatic life studies should be conducted under the reclamation plan approval.	Aquatic life studies, including benthic and periphyton testing along with fish population and tissue work is being required under the Title 16 permits issued by DFG on August 30, 2018. An Aquatic Resource Monitoring Plan is being finalized to capture these requirements from DFG along with various hydrologic measurements to be taken regularly. No change to the permit(s) was made as a result of this comment.

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2.13.2	Monitoring	Dan Gillikan, Native Village of Napaimute	I do have a couple of comments related to the proposed Donlin monitoring plan that I briefed this afternoon. And, first and foremost, there is not one mention in the entire monitoring plan of any fish monitoring. Perhaps I missed it. They do discuss monitoring avian and terrestrial wildlife, but no mention of any type of fish monitoring. Surface water monitoring sites are high in the drainage near the outfall. I did not see any sites that were located lower in the drainage where you might have spawning salmon and rearing juvenile salmon. And I think that's very important that we do include monitoring in those lower reaches of Crooked Creek that are being used by salmon for spawning and rearing habitat. Thank you very much.	The permit adopts by reference Donlin Gold's *Plan of Operations (PoO) Integrated Waste Management Monitoring Plan, Donlin Gold Project (Monitoring Plan) December 2017* which describes the monitoring and sampling program for the proposed project. The monitoring and sampling described in this Monitoring Plan includes only the monitoring activities that will be reported to DEC as part of the Integrated Waste Management Permit. Monitoring for other resources, such as aquatic resources, dam safety, and permitted air and water discharges are addressed under specific permit requirements and/or other monitoring plans. Permit requirements from other agencies or programs will be addressed by amendments to this Plan or preparation of additional monitoring plans when the specific permit conditions are known. No changes to the permit(s) were made as a result of this comment.
2.13.3	Monitoring	Kendra Zamzow, CSP2	All categories of waste rock should undergo humidity cell testing (HCT).	All categories of waste rock have been tested in HCTs. Some testing has continued for more than 13 years demonstrating predicted leaching characteristics. Material tests have been suspended when they reach an asymptotic result (no further change in leaching characteristics). This information will continue to be used in any Waste Rock Management Plan updates. No change was made to the permit(s) as a result of this comment.
2.13.4	Monitoring	Kendra Zamzow, CSP2	Aquatic resources management plan should be added to the WMP.	This plan is being managed under the Title 16 permits issued by DFG. No changes were made to the permit(s) as a result of this comment.

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2.13.5	Monitoring	Sarah Durand	The plan states that settled solids from sumps, ditches, and degritting basins will be disposed of in the Class III landfill. As this is an industrial site the solids should be tested for hazardous materials prior to disposal.	Settled solids from sumps, ditches, and degritting basins is approved for disposal in the Class III landfill under Permit Section 2.1.1.8 which specifies that only "non-hazardous solid wastes" can be disposed in the landfill trenches. The commenter suggests that the material should be monitored prior to disposal. However, since the settled solids will be composed of water transported sediment derived from local rock and soil and that the material proposed for disposal will be chemically similar to the material contained in the waste rock facility, DEC determined that monitoring prior to disposal is unnecessary. Permit Section 2.1.1.8 was modified for clarification as a result of this comment.
2.14.1	Open Burning	Sarah Durand	Waste cannot be burned as described in all areas of this plan in an inert waste landfill. This is a direct violation of 18 AAC 60. Again waste cannot be burned as described in all areas of this plan in an inert waste landfill. This is a direct violation of 18 AAC 60. 23. Open burning on the ground is illegal in ALL landfills within the state of Alaska. This is a direct violation of 18 AAC 60. Open burning is not allowed in any landfill within the state of Alaska. The described disposal method in this plan is in violation of 18 AAC 60. Thank you for the opportunity to read through the plans and I look forward to reading the response document.	Permit Section 2.2.7 authorizes burning in the disposal trenches under specific conditions and limitations. Under 18 AAC 60.355, open burning is prohibited for Class I and II but this prohibition does not apply to a Class III landfill authorized under this permit. The 2016 Plan of Operations documents referenced in the comment uses incorrect terminology for the classification of the landfill as an "inert waste landfill" rather than as a Class III landfill. Permit Section 1.2 requires the permittee to update DEC-approved plans adopted by reference in the permit within 90 days of permit issuance incorporating any changes necessary to be consistent with the terms of this permit. Correction of the facility classification will be addressed upon compliance with this permit requirement. No change to the permit(s) was made as a result of this comment.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.15.1	Pit	Kendra Zamzow, CSP2	Disposing of material in the pit without the baseline data to determine whether the pit will intersect deep aquifer/reginal groundwater field should be added to the WMP. It is critical to consider before permitting whether the pit lake could be a flow-through pit lake. The drawdown pumping tests conducted in the bedrock showed hydraulic conductivity that varied by three orders of magnitude, but wells were shallow (less than 200 feet deep) and were not designed to make a determination on the potential nature of pit intersection with groundwater at depths. Additionally, a relatively deep well in the pit location (182 feet deep) was artesian.	See response to Comment 2.3.1.
2.16.1	Public Notice	Becky Long	Thank you for extending the public comment period. However, considering this is for such a large gold mine, the comment period should have been extended two months instead of one. DNR picked the busiest time of the entire year to process this Plan. This indicates the "dumbing" down by state agencies of the public process. There is no consideration for the realities of the public.	The public participation requirements for the development of this permit is regulated under 18 AAC 15, 18 AAC 60 and 18 AAC 72. Opportunities for the public to review and comment on this permit include several notices for review and comment as well as Question & Answer (Q&A) workshops and formal public hearings. Public comment for the draft permit occurred from December 15, 2017 to February 13, 2018. A Q&A workshop and formal public hearings were held in Aniak on January 17, 2018, Bethel on January 23, 2018 and in Anchorage on January 26, 2018. Additionally, public review and comment to adopt DEC of Natural Resources (DNR) draft Reclamation Plan Approval (A20186226) and closure cost estimate through reference into the permit from July 9, 2018 and extended to September 6, 2018. During the second public notice and comment period, a public hearing was held in Bethel on August 28, 2018, at the request of the Yukon-Kuskokwim River Alliance. The Q&A workshops where held to provide the public with plain-language presentations of the permit and permit and provide an opportunity to ask questions about the proposed permit directly to agency staff involved

Comment	Topic or Permit Section	Commenter	Comment	Response
				with the permit development. At the workshops and the public hearings held in Bethel, a Yup'ik translator was provided to assist elders in communicating questions, comment and formal testimony. DEC followed all regulatory requirements for public participation in the development of this permit. No changes to the permit(s) were made as a result of these comments.
2.16.2	Public Notice	Danielle Craven, Y-K River Alliance	30 day comment period extension request	See response to Comment 2.16.1.
2.16.3	Public Notice	Dave Cannon	I just have a concern with the process in general as far as you're gathering tonight. You said that you would want to give everybody, all people a chance to comment, but I think there's other villages upriver that it would behoove you to actually hold this same event at. Crooked Creek just being one example. Because, as I think you probably know after flying in how difficult it is to get here to Aniak. Even Chuathbaluk, I see some folks here from Chuathbaluk, and luckily the conditions are probably better than they were a day ago. I know they were horrendous yesterday or the day before. So, anyway, that would be my comment is try to get this information out to other villages in the drain. Thank you.	See response to Comment 2.16.1.
2.16.4	Public Notice	Lachlan Gillispie	30 day comment period extension request	See response to Comment 2.16.1.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.16.5	Public Notice	Nicholas Kameroff	What I'm worried about is our subsistence way of life and culture due to the discharge of the wastewater and the waste management plan that you guys were talking about. What comes to mind before I even got here, two things, I didn't even know about this meeting until last minute when I saw several of the gentlemen coming here? Two, I didn't have access to any of this information so I'm ignorant at the moment. So, I feel that we should have more opportunity and extend the time for our public comment period for everybody throughout the whole river, not only just Aniak, Bethel, and Anchorage. We have people who depend on the resources throughout the whole river and they can be affected, their cultural way of life, their lifestyles and the way they take care of their families. So that's all. My point is just short, sweet and I hope people take time to go to every village and then make sure everybody understands this, like Patty was saying, it's so big words that they go over our heads and we need to be able to look at it and understand what we're saying. I've been to a lot of workshops and everybody, the scientists and all of the presenters always using big words and I always tell them, break it down to my level. I'm not a scientist. So, bring it down to our level.	See response to Comment 2.16.1.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.16.6	Public Notice	Patricia Yaska	I have tried my best to read and review the information. Both draft permits and the associated plans with the waste management plan provided for public review. As a member of the population who will be affected by the proposed mine, I have to say that I barely understood one word of both permits. The information that the public is supposed to be reviewing and commenting on is so technical and it is also so important because it's going to affect our lifeblood, the Kuskokwim River, but we, the general public, cannot understand what is being provided to us. I'm sorry if I'm not speaking for everyone, but I can't understand it. I am asking to please give us a version that we can understand or possibly send us a bridge, someone who can speak plain English to us because the permits that Donlin is applying for, it's the wastewater and it's the waste management plan.	See response to Comment 2.16.1.
2.16.7	Public Notice	Patricia Yaska,	I'm also asking that DEC extend the comment period for both permits combined from 60 days to at least 90 days because I was unaware that the permits came out in December. That's around the holidays and I didn't get back to work until January, and so we have basically 45 days to review those hundreds of pages, which I cannot understand. Thank you.	See response to Comment 2.16.1.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.16.8	Public Notice	Sarah Durand	Why are plans and permits out for public comment prior to the EIS being finalized? As a member of the public I need to be able to have adequate time to read and understand a finalized EIS and then read through proposed plans that include the findings of the EIS as part of the plan. How can the DEC provide an honest evaluation of these plans for permitting without a completed EIS? On the same note why are Donlin Gold draft plans out for public comment? As a resident of the state of Alaska I want to read and comment on a finalized plan. These plans are contradictive, have direct violations to state regulations, and do not provide an adequate picture of what is actually going to occur within operations at Donlin Gold Project. I am requesting that a finalized plan be made available for public comment prior to any permitting.	State permit actions are not contingent upon the completion of the EIS process. State permits are developed based on information submitted to DEC in permit applications. No changes were made to the permit(s) as a result of this comment.
2.16.9	Public Notice	Steven McEvoy	It would be nice to have a third party, a bridge, to help break this down. I don't really know anything about this stuff. But I feel like the best management practices that Donlin might wish to pursue, it would be nice to have somebody independent party breakdown what all this stuff is and if it's harmful or not. Somebody that we can trust, to win the public affection, I think a good way to do it would be to allow someone from the group here to pick somebody that can kind of make that bridge, that gap, to help explain all this stuff. That's all I've got to say.	See response to Comment 2.16.1.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.17.1	Reclamation	Bonnie Gestring, Earthworks	The reclamation plan needs more detail concerning the proposed water treatment plant, scheduling for construction and treatment requirements. High density sludge (HDS) treatment will not remove selenium	The life of mine (LOM) reclamation and long-term management cost estimate is based on detailed assumptions related to the labor and material costs necessary to construct the water treatment plant to ensure its availability to treat pit water at year 50 after closure. Based on current estimates of flow and water quality, the proposed HDS system will generally provide the necessary level of removal to ensure compliance with water quality standards. The SRCE model estimates for the capital and operating costs of the water treatment system are based on the detailed engineering provided for these facilities in Donlin Gold's Feasibility Study Update (FSU #2). They are further based on the actual costs for similar systems, adapted for rural Alaska conditions, in operation at mines and other industrial applications throughout the world. The SRCE model also presents the schedule when these facilities would be constructed and operated - noting that the cost estimate provides for full replacement of the HDS system every 30 years. Table 3.7-42 in the FEIS shows that at mine closure, wastewater discharge is projected to have selenium levels below the water quality standards. However, it is recognized that HDS treatment performance for selenium can be limited especially where selenium occurs as selenate. As the project moves through construction and operation, there will be more specific information available on the actual selenium levels found in different waters (especially waste rock) and the speciation of the parameter. As the plan of operations and financial assurance undergo regular review during construction and operation, the closure treatment system will be re-evaluated every five year permit cycle to determine the potential need for an

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				additional polishing step to remove selenium (e.g., by ion exchange). Additionally, Section 2.9.1 of Waste Management Permit 2017DB0001 requires the permittee to adjust reclamation and monitoring plans to address current conditions when mining and milling are permanently terminated. No changes were made to the permit(s) as a result of this comment.
2.17.2	Reclamation	Bonnie Gestring, Earthworks	More detail is needed in the proposed reclamation concerning potential suspensions of operations.	According to Section 2.8.1 of Waste Management Permit 2017DB0001, the permittee must submit a conceptual suspension of operations plan to DEC before the latter of (i) 90 days after the effective date of the permit or (ii) 90 days to prior to commencing facility construction. Additionally in the event of a default by the permittee, the financial assurance includes two years suspension carrying costs; allowing time to update closure plans as necessary, then contract and mobilize crews initiating closure and reclamation activities. No changes were made to the permit(s) as a result of this comment.
2.17.3	Reclamation	Bonnie Gestring, Earthworks	The reclamation plan should include provisions to address the effects of climate change on mine operations, reclamation, closure and post closure – particularly for the increase in rate and severity of large storm events and changes in precipitation patterns and temperature	The project is required to submit annual monitoring plans and undergoes a full permit review and renewal every five years. This requires an update to the water balance. Climate data collected at the site will be used to determine if there is a trend or shift in patterns that would affect design storm events for the water management facilities. No changes were made to the permit(s) as a result of this comment.
2.17.4	Reclamation	Kendra Zamzow, CSP2	How long will it take for tailings seepage to reach water quality criteria?	In the estimated LOM closure scenario, the length of time required for pumping from the SRS pond to the pit is referenced in Section 4.8.4 of the Reclamation and Closure Plan. According to the Final EIS, it estimates that consolidation of the tailings will be completed at 52 years

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				after closure and, as such, potential seepage into the pond is expected to decrease to the point that it will no longer be necessary to pump water to the pit. Although some runoff from the dam face will continue to flow into the SRS, the Plan notes that covers will be applied to some areas as necessary to limit long-term leaching potential. Further, the plan contains provisions that the SRS pond and downstream monitoring wells will be maintained in the event that the water quality necessitates longer term seepage management in the pit. The behavior of the ultimate TSF and potential for seepage is currently based on conservative modeling because of uncertainty. As the mine develops over decades, better information will allow further and more accurate analysis to demonstrate how long seepage pumping to the pit will be needed. Additionally, the closure plan and financial assurance will be re-evaluated every five years. Finally, because of the current uncertainties, the 3-year of operation pre-mature closure scenario provides for seepage collection and pumping to treatment and ultimately to the pit over the full duration of the post-closure. Note the 3-year scenario is being used to establish the initial financial assurance requirements for the project. No change was made to the permit(s) as a result of this comment.
2.17.5	Reclamation	Kendra Zamzow, CSP2	The reclamation plan and procedures should stick to objective plans and results and not mischaracterize them with broad meaningless descriptions and categories. DNR should require the full details of post-mine topography. The mining company should describe and detail the post-mine topography (and pre-mine	The Reclamation Plan is appropriate for a large scale mine of this type with a long mine life. Specific details may be incorporated at any time throughout the mine life and at least once every five years when the approval comes up for renewal. No change was made to the permit(s) as a result of this comment.

Comment	Topic or Permit Section	Commenter	Comment	Response
			and during-mine) to ensure that the full topography is acceptable and problem sites and unanticipated consequences are avoided.	
2.17.6	Reclamation	Kendra Zamzow, CSP2	The RPA should require minimizing disturbance and compaction of reclamation material storage areas. This should include minimization of driving equipment over the storage areas to reduce compaction and using equipment for final reclamation that is suited to minimizing compaction.	The approved Reclamation Plan was amended to address the minimization of compaction and is adopted by reference into the RPA. No change was made to the permit(s) as a result of this comment.
2.17.7	Reclamation	Kendra Zamzow, CSP2	DNR should require measurable erosion goals and responses to failures to meet them. The Reclamation Plan should establish clear, measurable erosion goals including success criteria (such as “less than x-feet of rilling per y-area and no erosion wider or deeper than z-inches”). Further, the Plan should identify responses to failure to meet the erosion criteria, including but not limited to, treatment protocols; timeframes over which success will be measured; how criteria failure or re-treatment activities will re-start timeframes, etc.	Reclamation standards including those regarding erosion, are well established in Alaska Statutes and Regulations and Donlin will be held to those standards. The reclamation activities described in the Reclamation Plan are consistent with the State requirements. No change was made to the permit(s) as a result of this comment.
2.17.8	Reclamation	Kendra Zamzow, CSP2	The Reclamation Plan needs to calculate the post-mine soil amounts. The Plan should identify the necessary post-mine soil depths needed for all disturbed surfaces and using those depths calculate the total amount of soil needed. This amount should be the minimum amount of soil used in reclamation. If the total amount of salvageable soil is greater than this amount, then the extra salvageable soil should be used to enhance reclamation. If the amount of salvageable soil is less than this amount, then the mine should be required to find additional sources.	The plan does provide an estimate of available growth media with organic growth media detailed as well as an estimate of the volumes of these materials necessary to complete reclamation. The identified stockpiles are estimated to contain in excess of 2.5 times the amount required to provide minimum coverage. No change was made to the permit(s) as a result of this comment.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.17.9	Reclamation	Kendra Zamzow, CSP2	The RPA should require salvage of all topsoil and subsoil from areas disturbed by mining.	State regulations require the salvage of all growth media and this would include "topsoil" that supports the re-growth of vegetation. It is generally not practicable to separate A, B, and C, soil horizons given the scale of equipment used. AS 27.19 requires that a mining operation shall be conducted in a manner that prevents unnecessary and undue degradation of land and water resources, and the mining operation shall be reclaimed as contemporaneously as practicable with the mining operation to leave the site in a stable condition.") and 11 AAC 97.200 ("A miner shall reclaim an area disturbed by a mining operation so that the surface contours after reclamation is complete are conducive to natural revegetation or are consistent with an alternate post-mining land use approved under AS 27.19.030(b) on state, federal, or municipal land, or with the postmining land use intended by the landowner on private land.") address reclamation performance standards. No change was made to the permit(s) as a result of this comment.
2.17.10	Reclamation	Kendra Zamzow, CSP2	The RPA should require nurse crops on material storage areas. Nurse crops reduce compaction and increase soil nutrients and value.	The RPA is the approval of the Donlin Gold Reclamation Plan. The Reclamation Plan describes the utilization of test plots throughout the mine life to determine best seed mixtures, suitable depths of growth media, and other procedures for final reclamation. No change was made to the permit(s) as a result of this comment.
2.17.11	Reclamation	Kendra Zamzow, CSP2	Topsoil and stored materials should be characterized, using specific criteria, prior to reclamation. Characterization of materials to be salvaged should include field observation and not rely solely on some kind of 'standardized' depth measurement.	See response to Comment 2.17.9.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.17.12	Reclamation	Kendra Zamzow, CSP2	The RPA should require that the mining company demonstrate that organic materials salvaged from the site will be used in a beneficial way and not wasted or cause nutrient imbalance.	See response to Comment 2.17.9.
2.17.13	Reclamation	Kendra Zamzow, CSP2	All disturbed areas should receive growth material and seed. The Plan should ensure that all disturbed sites are reclaimed with soil and seed (and other appropriate amendments/treatments) - and the mine should bear the burden of demonstrating that these treatments are not of material benefit at any site the mine proposes will not have them.	See response to Comment 2.17.9.
2.17.14	Reclamation	Kendra Zamzow, CSP2	The first paragraph of Reclamation Plan section, 4.7.3 is confusing because of how it uses the phrase “growth media.”	This section is Seedbed Preparation which states that compacted surfaces are unsuitable for revegetation. In reviewing the sentence for which the comment is based "Growth media (whether applied or in situ) and the underlying subsurface must be prepared in such a manner as to retain moisture and allow adequate root development and penetration in those areas where infiltration and surface water retention are desired.” Growth media is defined on the Donlin Gold Reclamation Plan Page 4-1 stating that the growth media for any given area may need to be loosened or placed in a manner with minimal compaction prior to seeding to promote revegetation. No change was made to the permit(s) as a result of this comment.
2.17.15	Reclamation	Kendra Zamzow, CSP2	Local seed should be harvested to the extent reasonably practicable.	See response to Comment 2.17.10.
2.17.16	Reclamation	Kendra Zamzow, CSP2	The Plan should include specific criteria for seedbed preparation to ensure that the post-mining soil profile is of appropriate size to achieve revegetation goals.	See response to Comment 2.17.10.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.17.17	Reclamation	Kendra Zamzow, CSP2	Soil amendments should only be applied within the goals of establishing a self-sustaining ecosystem. The Plan should treat amendments carefully to ensure that they are not used to artificially support or sustain plant establishment or sustainability.	A balance is needed between soil amendments to promote rapid revegetation to protect areas from soil erosion and allowing natural invasion of local plants into a reclaimed area. Typically soil amendments are only applied in the initial years to establish a protective vegetation layer over the growth media. No change was made to the permit(s) as a result of this comment.
2.17.18	Reclamation	Kendra Zamzow, CSP2	Specific criteria for soil and growth amendments should be set. The Reclamation Plan should establish criteria for pH, sulfide content, nitrogen, phosphorus, potassium, sodium absorption ratio, electrical conductivity, texture, available water holding capacity, and organic matter. Where the growth media is deficient for these items the Plan should commit the mine to amending the growth media to achieve the criteria.	See response to Comment 2.17.10.
2.17.19	Reclamation	Kendra Zamzow, CSP2	The RPA should require the Reclamation Plan to include an invasive plant prevention program. Clear criteria for successfully preventing invasives from establishing should be necessary for financial assurance reduction or release.	Natural revegetation is encouraged with state statutes and regulations. 11 AAC 34 addresses seed requirements, including noxious weeds, within the State of Alaska. No change was made to the permit(s) as a result of this comment.
2.17.20	Reclamation	Kendra Zamzow, CSP2	The revegetation plan should establish minimum-percentage vegetative cover goals of at least 50% after three years and at least 80% for five years to determine “success” or allowing relevant bond release.	Alaska Reclamation regulations provide re-vegetation standards that have proven to be successful throughout Alaska. Donlin will be held to these standards. AS 27.19.020 notes the reclamation standard. 11 AAC 97.200 addresses Land reclamation performance standards. No change was made to the permit(s) as a result of this comment.
2.17.21	Reclamation	Kendra Zamzow, CSP2	The revegetation plan should establish clear alpha and beta diversity requirements for vegetative cover and include measurement of aerial and basal coverage-percentages.	See response to Comment 2.17.20.
2.17.22	Reclamation	Kendra Zamzow, CSP2	Revegetation success should be measured no sooner than five years after revegetation goals have been met - without additional treatments or	See response to Comment 2.17.20.

Comment	Topic or Permit Section	Commenter	Comment	Response
			activities. If additional treatments or activities are undertaken, the 5-year clock should restart to ensure that revegetation and long-term plant establishment is actually achieved.	
2.17.23	Reclamation	Kendra Zamzow, CSP2	Best, proven technology should be used. The State of Alaska should insist on actual best available technology in reclamation – and in waste management as it ties to reclamation. The State of Alaska should only allow proven techniques. New techniques must be shown to have a proven track record, at a minimum at a smaller operational mine with similar geoenvironmental conditions. Dry stack is one technique that has a proven track record at the Greens Creek mine in Alaska.	The technologies supporting the facility reclamation plan and design for mining facilities are typically based on modern mining industry standard practices that have developed to meet modern regulatory requirements both nationally and internationally. In cases where a mining company proposes to use new technology or technology unfamiliar to existing Alaska mines, the agencies may require an extensive review, study and demonstration before authorizing its use in the facility. It is important to note that State authorities applicable to the WMP and RPA do not provide the agencies with prescriptive authority to require one technology over another but rather, the permitting agency must determine if the proposed technology can meet the regulatory objectives required for approval. No change was made to the permit(s) as a result of this comment.
2.17.24	Reclamation	Kendra Zamzow, CSP2	New technologies should be specially screened - and avoided - in areas with high ecological, social/cultural, or other values.	See response to Comment 2.17.23.
2.17.25	Reclamation	Kendra Zamzow, CSP2	The mining company should bear the burden of proof. The burden of proof for demonstrating the effectiveness, safety, and applicability of all reclamation technologies - including new technologies – should be on the mining company. The proof should employ widely accepted/implemented methods and be fully transparent. The government (regulators) and the public should not have the burden to demonstrate the new technology's lack of effectiveness or liabilities.	All of the burden associated with demonstrating reclamation success, including compliance with State standards is the responsibility of Donlin Gold. As a matter of policy, DNR would require Donlin Gold to take corrective action if goals and regulatory requirements are not being met. In addition, any proposed release of financial assurance must be based on documentation of the success of reclamation activities. No change was made to the permit(s) as a result of this comment.

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2.17.26	Reclamation	Kendra Zamzow, CSP2	DNR must require Donlin to clear up the contradictions in the FEIS and Reclamation Plan regarding how long it will take for tailings seepage (wet tails and Dry Stack options) to reach water quality criteria. DNR should require technology – including liners and covers, and potentially to include the Dry Stack option – that eliminates the need for in perpetuity pumping systems.	DNR authority is only related to the Reclamation Plan as submitted. No change was made to the permit(s) as a result of this comment.
2.17.27	Reclamation	Kendra Zamzow, CSP2	The RPA should require a change in language in the Reclamation Plan to obligate the company to offer equipment and material to local communities.	According to 11 AAC 97.100(c), *"Nothing in AS 27.19 precludes a federal or state agency (including the Department of Natural Resources), a state corporation, the University of Alaska, a municipality, or a private landowner, acting under its own regulatory or proprietary authority, from establishing and enforcing additional requirements or higher standards for reclamation. Compliance with this chapter does not waive or excuse compliance with those additional requirements or higher standards."* There are no specific authorities which govern the RPA that provides DNR with the authority to obligate a permittee to another government entity as a part of a reclamation plan approval. No change was made to the permit(s) as a result of this comment.
2.17.28	Reclamation	Kendra Zamzow, CSP2	The RPA should require a change in language in the Reclamation Plan to obligate the company to recycle piping and other non-hazardous materials.	There are no specific authorities which govern the RPA that requires DNR to obligate a permittee to recycle piping and non-hazardous material as a part of a reclamation plan approval. No change was made to the permit(s) as a result of this comment.
2.17.29	Reclamation	Kendra Zamzow, CSP2	The RPA should include language verifying public notice and public comment periods for requests to amend, renew, or transfer the RPA.	While no public notice is required, DNR generally provides a courtesy notice or coordinates a public notice concurrently with the DEC WMP. Regulation 11 AAC 97.320 notes requirements for approval and renewals of reclamation

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				plans. No change was made to the permit(s) as a result of this comment.
2.17.30	Reclamation	Kendra Zamzow, CSP2	Annual reclamation reports should provide easily understood interpretations of data, activities, and trends. Reports should be available to the public.	The RPA does require annual reporting that summarizes annual activities with monitoring data and updated maps which is used by the agencies to determine compliance with the permit conditions. These documents are in the public domain and may be requested from the agency through the Alaska Information Act. Further, Donlin has communicated to the State that it is developing plans with its partners The Kuskokwim Corporation (TKC) and Calista Corporation (Calista) on how to best share information in the region regarding operations and monitoring results. No change was made to the permit(s) as a result of this comment.
2.17.31	Reclamation	Kendra Zamzow, CSP2	DNR should ensure third party auditors are truly independent.	The RPA and WMP require the use of a third-party consultant to conduct an environmental audit of the facility once per permit term. DNR and DEC reviews the consultant's qualifications and past projects and may reject the permittee selection of consultant if there is concern about a conflict of interest that may affect the objectivity of the audit. No change was made to the permit(s) as a result of this comment.
2.17.32	Reclamation	Kendra Zamzow, CSP2	Keep language allowing unannounced inspections	The RPA includes language for inspections. No change was made to the permit(s) as a result of this comment.
2.17.33	Reclamation	Kendra Zamzow, CSP2	The RPA should add language requiring 30 days advance notice of planned permanent mine closure and intended permanent closure after a notice of unplanned temporary closure.	The RPA includes language for temporary or permanent closures whether planned or unplanned. No change was made to the permit(s) as a result of this comment.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.17.34	Reclamation	Kendra Zamzow, CSP2	A substantial sum of the bond should be retained until the pit lake is full and water treatment begins.	Financial assurance is retained throughout filling of the pit lake and for as long as water treatment is necessary not just for when treatment begins. No change was made to the permit(s) as a result of this comment.
2.18.1	Resolution for Stand for Salmon Initiative	Native Village of Kwiginllingok	Resolution for Stand for Salmon Initiative	Alaska Ballot Measure 1, Salmon Habitat Protections and Permits Initiative, was defeated in the November 6, 2018 general election. No changes were made to the permit(s) as a result of this comment.
2.19.1	Separation Distance	Sarah Durand	How will Donlin ensure that there is a minimum of 10ft separation distance between with bottom of the trench and the top of the groundwater table at all times? How does one predict future ground water table depth with accuracy?	The permit approved disposal trenches subject to regulations for Class III MSWLFs are proposed for construction within the waste rock facility consisting of unconsolidated rock deposited within containment. Due to the constructed elevation of the waste rock facility relative to groundwater elevation, maintaining vertical separation between the bottom of the landfill and the water table is not expected to be a concern. Further, 18 AAC 60.217 states that a new unlined landfill may not be located closer than 10 feet above the highest measured level of an aquifer of resource value unless the landfill is constructed two feet or more above the natural ground surface. No change to the permit(s) was made as a result of this comment.
2.19.2	Separation Distance	Sarah Durand	Landfills must have a separation distance of 500ft from any drinking water source. The plan quotes 200ft, this is a direct violation of 18 AAC 60.	State drinking water regulation, 18 AAC 80, require 200 feet of separation from a contaminant source to the water source. State Solid Waste regulations, 18 AAC 60.040, requires 500 feet of separation between a new landfill and a well to be used as a drinking water source. Based on the submitted plans for this permit, the separation distance requirements of both 18 AAC 80 and 18 AAC 60 will be maintained. No change to the permit(s) was made as a result of this comment.
2.20.1	Tailings Management Plan	Tom Waldo, Earth Justice	It is unclear whether acidic tailings would compromise or weaken the liner over time.	The tailings will not be acidic because the autoclave circuit used at the mine processing plant neutralizes acid generating potential. The sulfate in the ore is oxidized in the autoclaves through the addition of oxygen. The

Comment	Topic or Permit Section	Commenter	Comment	Response
				resulting acid is then neutralized with carbonate material as part of the process. The acid-forming potential of the ore is thereby expended in the process plant prior to discharge to the TSF. As documented in Section 3.7.2.4.4 of the Final EIS, test work conducted on tailings from pilot-scale processing plant operations further confirm that they will not be acid generating. No change was made to the permit(s) as a result of this comment.
2.20.2	Tailings Management Plan	Tom Waldo, Earth Justice	During construction of the Seepage Recovery System, pumps should be initially installed in the monitoring/interceptor wells.	The plan for the monitoring/interceptor wells is for shallow and deep wells that are 4" to 6" diameter and capable of being pumped if needed. The design intent is to equip these wells with pumps and a flow manifold prior to deposition of tailings in the TSF. The flow manifold will include a sampling port to allow the collection of groundwater quality samples from the well. It is important to note that while the overall design of the SRS is at the feasibility level; additional testing is required to confirm the plan for the monitoring and interceptor well system. Final well locations, sizes, depths, and designs will be dependent upon the results of this additional work. According to Section 2.3.3.2 of the Waste Management Permit 2017DB0001, final plans must be submitted to DEC for review and approval prior to construction of the TSF. No change was made to the permit(s) as a result of this comment.
2.20.3	Tailings Management Plan	Kendra Zamzow, CSP2	The Tailings Management Plan says that the TSF will be designed for a 100-year, 24-hour rain on snow event, but elsewhere in the Project Description it says that the TSF will be built to store a 200-year, 24-hour probable maximum rain event. Which is it?	The TSF is conceptually designed for an inflow design flood (IDF) which includes the 24-hr duration Probable Maximum Precipitation (PMP) plus the 200-year snowmelt. The detailed hydrologic design of the TSF is subject to approval by the DNR Alaska Dam Safety Program which will require comparison of various low-probability, long duration events, such as the 72 hour PMP and the 60 day, 1000 year storm (annual exceedance probability of 0.001) to select the final IDF for design and operation to ensure the safety of the TSF dam. No change was made to the permit(s) as a result of this comment.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.21.1	Waste Management Plan	Gail Vanderpool	How do we know if the tailings piles are on stable rock, not on soft shale rock with water pockets?	The adequacy of the proposed TSF design to address site conditions including foundation conditions is subject to review by the DNR Alaska Dam Safety Program before the construction of the tailings storage facility will be approved by DNR. No changes were made to the permit(s) as a result of this comment.
2.21.2	Waste Management Plan	Kendra Zamzow, CSP2	Seismic monitoring should be required for the TSF and WRF.	The stability of the WRF under seismic loading was assessed using a pseudo-static analysis approach, and the geometry of the WRF exceeds the design basis factor of safety. As indicated in the Waste Rock Management Plan, the physical conditions in the WRF would be monitored as standard operating procedures throughout construction, including after any seismic activity is felt at the mine site. The results of this monitoring and any follow-up actions would be documented in the annual reports submitted by the permittee to DEC. The TSF and WRF will be visually inspected following seismic events that are felt at the project site, in addition to the regular physical stability inspections (at least weekly in active placement areas and monthly in inactive areas). These visual inspections will include inspection of the entire length of the crest for signs of cracking or displacement, along the toe for any signs of bulging, and of the face for any signs of displacement. Inclinometers installed in the TSF will also be read following seismic events. The results of all monitoring and any required follow-up actions will be provided to DEC; all TSF stability monitoring will also be submitted to the DNR Alaska Dam Safety Program. In addition, the specific types of geotechnical instrumentation in the TSF dam and other dams is subject to review and approval under the DNR Alaska Dam Safety Program. Currently, seismic monitoring in Alaska is conducted by the USGS and the University of Alaska-

Comment	Topic or Permit Section	Commenter	Comment	Response
				Fairbanks Alaska Earthquake Information Center. Post-earthquake inspections will be a requirement for operation, maintenance and surveillance plans required by the DNR Alaska Dam Safety Program. No change was made to the permit(s) as a result of this comment.
2.21.3	Waste Management Plan	Kendra Zamzow, CSP2	Given the risk of TSF liner tears, shouldn't the monitoring/interceptor wells be equipped with pumps during their initial construction?	Plans include pumps in the monitoring/interceptor wells prior to the start of deposition of tailings within the TSF. However, those plans are still preliminary and have yet to be submitted to DEC for review and approval according to Section 2.3.3.2 of the Waste Management Permit 2017DB0001. No change was made to the permit(s) as a result of this comment.
2.21.4	Waste Management Plan	Kendra Zamzow, CSP2	Why is overburden going in the WRF? The IWMP application documents note that up to 8% of the material that will go into the WRF is overburden. It might be better placed as cover material for the TSF or the WRF in reclamation.	Based on material balance estimates, there is more soil and overburden excavated than is needed to achieve reclamation. See material balance supplement supplied by the permittee with the comments on the Reclamation Plan Approval. The current plans show the stockpiles will store in excess of 2.5 times the growth media needed to achieve the minimum cover depth for reclamation. No change to the permit(s) was made as a result of this comment.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.21.5	Waste Management Plan	Kendra Zamzow, CSP2	I urge DEC to require installation of deep wells, or take any other action necessary, to understand the nature of groundwater that will be intercepted by the pit, and to do so under the IWMP. This has implications for operational management of waste rock.	Existing data and analyses found in BGC Engineering Inc., (2017a, 2017c, and 2017d) support the conclusion that there are no deeper flow-through conditions in the pit lake area. However, additional hydrogeological testing is proposed to support the final design of the open pit slope depressurization and mine dewatering system. As planned, the additional work will include: • Completing a pumping test designed to assess the feasibility of depressurizing lower permeability siltstones, shales and mudstones that may be exposed at depth in the pit highwall later in the mine life. • A larger scale and longer duration pumping test during which all of the existing pumping test wells, and a new one to be installed as noted above, would be commissioned and pumped for as long as possible (e.g., several months) at as high a rate as these wells can safely sustain. • The results of this testing will be used to support detailed design of the depressurization and dewatering system. According to Section 2.3.3.2 of Waste Management Permit 2017DB0001, the final designs will be submitted to DEC for review and approval prior to the start of mine site construction. In addition, the hydrogeology and respective groundwater flow models will be reviewed by the DNR Alaska Hydrologic Survey in connection with the adjudication of water appropriations and usage authorizations. No change to the permit(s) was made as a result of this comment.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.21.6	Waste Management Plan	Kendra Zamzow, CSP2	The potential risk of in perpetuity pumping at the TSF dam seepage pond should be considered when the IWMP specifies the type of rock allowed for dam construction.	As indicated in the Reclamation and Closure Plan, only non-PAG (NAG) waste rock would be used in the construction of the dam. The Plan acknowledges that this rock can be a source of metal leaching and describes placement of 1-foot of colluvium beneath 1.15 ft. of organic growth medium on portions of the dam face. The runoff from the dam face will be only a portion of the inflows to the SRS pond and most of the flow will be from natural seepage from below the TSF. Over time and as the Plan continues to be evaluated, the characteristics of the inflows and assess long-term management needs for the LOM closure scenario are re-assessed and revised accordingly. This includes continually re-assessing how much of the dam face should be covered and what type of cover could be installed. Further, actual data will be available for each rock category on its specific leaching behavior over the long term. As noted in the Response on Row No. 1, the 3-year operation pre-mature closure scenario includes pumping from the SRS pond to the pit indefinitely. Note that the initial financial assurance is based on the 3-year operation closure scenario. No change to the permit(s) was made as a result of this comment.
2.21.7	Waste Management Plan	Kendra Zamzow, CSP2	HCT and field barrel testing should focus on NAG 4 and PAG 5 waste rock characteristics in the long term in order to manage waste rock to minimize contaminant release.	The existing HCT program (which is still ongoing) comprehensively covers all the waste rock management categories (WRMCS) and provided sufficient information to advance waste management planning for the project. The purpose of the barrel tests was to provide a comparison between field and laboratory leaching results, and evaluate arsenic solubility. The current barrel tests provided sufficient information to confirm relative leaching patterns related to arsenic content, and demonstrate acid neutralizing minerals function to consume acid from sulfide oxidation. Further field barrel testing by WRMC is not necessary because the large ongoing HCT program allowed differences between WRMCs to be evaluated in more

Comment	Topic or Permit Section	Commenter	Comment	Response
				detail. The next stage of testing will be the monitoring of full-scale facilities as the mine operates. No change to the permit(s) was made as a result of this comment.
2.21.8	Waste Management Plan	Kendra Zamzow, CSP2	All water storage and water conveyance facilities (dams, reservoirs, drains, ponds) should be sized for a 200-year, 24-hour precipitation event, and additional contingency measures should be in place to prepare for a potential 1,000 year storm event.	The design events are appropriate for the waters being managed in each facility. This includes retention of the 24-hour duration Probable Maximum Precipitation event plus the 200-year snowmelt in the TSF. Additionally, the project is required to submit annual monitoring plans and undergoes a full permit review and renewal every five year permit cycle. This requires an update to the water balance. Climate data collected at the site will be used to determine if there is a trend or shift in patterns that would affect design storm events for the water management facilities. In addition, the final hydrologic design of the dams and appurtenant works are subject to review and approval by the DNR Alaska Dam Safety Program. This includes the size of the storm events. See response to comment 2.20.3. No change to the permit(s) was made as a result of this comment.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.21.9	Waste Management Plan	Tom Waldo, Earth Justice	The Waste Rock Management Plan does not explain where drainage from the isolated cells would flow (presumably to a contact-water pond below the waste rock pile), nor does it indicate how seepage from the temporary stockpiles would be intercepted. DEC cannot issue a permit without greater assurances that high-risk waste rock will not produce acid rock drainage (ARD).	Drainage from all areas of the WRF will be directed into the Lower Contact Water Dam during operations; this includes drainage that may originate from the PAG cells located in Rob's Gulch. A diversion will be constructed to direct any flows from Rob's Gulch around the right abutment of the Lower Contact Water Dam and into the Lower Contact Water Dam Pond. At closure, seepage flows from the WRF will be collected and piped to the bottom of the pit lake. Because the open pit will transect American Creek, and because the pit lake level will be managed at a level that is below the elevation of Crooked Creek, untreated surface water flows and groundwater flows cannot bypass the open pit and discharge to the creek. BGC Engineering Inc. (2017d) from the FEIS process provides additional discussion on this topic. Since the comment specifically cites ARD, it is assumed the reference to "temporary stockpiles" relates to the ore stockpile that also serves as the storage area for PAG waste rock (prior to this material being backfilled to the pit). No changes to the permit(s) were made as a result of these comments.
2.21.10	Waste Management Plan	Tom Waldo, Earth Justice	DEC should consider requiring Donlin Gold to move level-6, not merely level-7, rock to the pit as soon as the pit becomes available.	It is appropriate to manage most of the PAG 6 material (about 10 percent will be backfilled) in the isolated cells in Rob's Gulch since all drainage will be properly contained and managed throughout operations and closure. No changes to the permit(s) were made as a result of these comments.
2.21.11	Waste Rock Management Plan	Tom Waldo, Earth Justice	Donlin Gold's plan to counteract acid generation with less acidic waste rock does not ensure that ARD will not occur. The company has rejected the more conservative ratios of alkaline-to-acidic rock used by other jurisdictions, such as California and British Columbia, in favor of a ratio indicated by site-specific test results.	DEC approves the site-specific approach to manage segregation of PAG and non-PAG waste which considered the mineralogical occurrence of acid generating and acid consuming minerals and the relative rate of acid generation and consumption as indicated by geochemical studies on the project's waste rock. The neutralization potential ratios (NPRs) developed are fully consistent with geochemical first principles. NPRs specified in generic guidance documents are intended for situations where site-specific information

Comment	Topic or Permit Section	Commenter	Comment	Response
				is lacking. Regulators in British Columbia, which has been at the forefront of developing guidance for decades, accept the site-specific approach as demonstrated in Mines Act permits. Acid-base accounting cut-off values below 2.0 have been accepted for a number of projects where the site-specific analyses support them. No change to the permit(s) was made as a result of this comment.
2.21.12	Waste Rock Management Plan	Tom Waldo, Earth Justice	With overburden removal and the presence of ice rich soils, does the stability analysis of the WRF reasonably offer assurance of stability during seismic events? There should be requirements for seismic monitoring of the WRF.	The stability of the WRF under seismic loading was assessed using a pseudo-static analysis approach and the geometry of the WRF exceeds the design basis factor of safety. As indicated in the Waste Rock Management Plan, the physical conditions in the WRF would be monitored as standard operating procedures throughout construction, including after any seismic activity is felt at the mine site. The results of this monitoring and any follow-up actions shall be documented in the annual reports and submitted by the permittee to DEC. See response to comment 2.21.2. No change was made to the permit(s) as a result of this comment.
2.21.13	Waste Rock Management Plan	Tom Waldo, Earth Justice	The assertion that areas of permafrost underneath WRF would be shielded from warming is unsupported.	Permafrost within the footprint of the WRF is shallow and relatively low grade, i.e. close to 0° C. As a result, for stability assessments it has been assumed that the permafrost will degrade during construction of the WRF, or over the longer term. As part of foundation preparation efforts during WRF construction, fine grained and ice-rich soils will be removed along the lower portions of the WRF to improve foundation conditions and maintain stability. Excess pore pressures beneath the WRF due to melting permafrost are not anticipated. However, if localized pockets of ground ice or permafrost are still present in the foundation after foundation preparation, water generated from the melting ice would drain through coarse waste rock placed in the toe area of the WRF. No change was made to the permit(s) as a result of this comment.

Comment	Topic or Permit Section	Commenter	Comment	Response
2.21.14	Waste Rock Management Plan	Kendra Zamzow, CSP2	NAG 4 and NAG 5 should undergo barrel testing.	Four of the six barrel composites were NAG. Barrel ARD4 was NAG 4 material. It had a NPR between 1.4 and 1.8, and As/S>196 mg/kg/%, and As>250 mg/kg. NAG 5 has not been barrel tested but PAG 6 has. The difference between NAG 5 and PAG 6 is the amount of NP resulting in lower NP/AP for PAG 6 and earlier onset of ARD than NAG 5. However, the onset period remains on the order of a decade or more in both cases and there was no specific need to barrel test NAG 5 separately. No change to the permit(s) was made as a result of this comment.
2.22.1	Water Quality	Becky Long	The FEIS for the Donlin Mine projects violations of numerous state water quality standards for mercury, stream temperature, and arsenic during the life of the mine. This is after extensive studies and taking into consideration the baseline data of naturally-occurring metal elevations. These violations will impair the existing stream uses along with reduced streamflow and rainbow smelt habitat damage. And the extent of these violations are probably greater than the FEIS states. The majority of hard rock mining EISs underestimates the potential for mine activities to cause violations of water quality standards and harm existing uses. THUS, IT IS SAFE FOR THE PUBLIC TO ASSUME THAT THE NEGATIVE IMPACTS ARE GOING TO BE SUBSTANTIALLY MORE THAN WHAT IS IN THE DOCUMENTS.	DEC maintains that this permit is in full compliance with the statutory and regulatory authorities under which permit was developed to protect the environment and human health. Alaska Pollutant Discharge Elimination System (APDES) Permit Number AK55867 does authorize a discharge into Crooked Creek with specified limits for the parameters of concern including those mentioned by the commenter. The permittee is required to verbally report a water quality violation within 24-hours of discovery and provide a written report within five-days summarizing the cause and any completed or planned corrective actions to prevent the violation reoccurrence. DEC has authority to impose more intensive compliance and enforcement actions if the violation is not resolved. The WMP does not authorize wastewater discharges into waters of the United States. If the activities covered under the WMP causes an unauthorized discharge into waters of the United States, the permittee would be subject to compliance and/or enforcement actions to return to compliance with the conditions of the permit and any pertinent regulation(s). Please note that DEC is not legally obligated to respond to items identified in the Final EIS-related documents developed consistent with the NEPA when developing and responding to comments on a WMP; these separate

Comment	Topic or Permit Section	Commenter	Comment	Response
				regulatory structures result in separate regulatory actions. No change to the permit(s) was made as a result of this comment.
2.23.1	Water Resources Management Plan	Tom Waldo, Earth Justice	If contaminated water flowed from the ore stockpile berm, through groundwater, into Crooked Creek, that outcome would arguably be an unauthorized discharge into waters of the United States, violating the CWA. Even after the ACMA pit intrudes into the American Creek drainage, migration of contaminants via groundwater could prove problematic.	The ore stockpile berm will be designed as a water-retaining structure to collect surface runoff from the stockpile. It will be equipped with sufficient pumping capacity to limit the potential for bypass around this facility. Appropriate design measures will installed to promote runoff and also limit potential for seepage into groundwater. The open pit will completely transect American Creek about one year before the start of processing operation, and it will be necessary to install dewatering wells upgradient of the pit and downgradient of the ore stockpile. As a result, any surface water or groundwater, originating upstream of the pit will be intercepted by the pit or the pit slope depressurization system wells. Additionally, the Waste Management Permit requires water quality monitoring at 10 locations along Crooked Creek for the specifically to assure that transport of contaminants into the creek is being prevented. No change to the permit(s) was made as a result of this comment.
2.23.2	Water Resources Management Plan	Tom Waldo, Earth Justice	Excess precipitation could upset the mine's water balance and overwhelm diversion channels, retention structures, and the water treatment plant. For example, the overburden stockpiles and their sediment ponds would only accommodate	The design events are appropriate for the waters being managed in each facility. This includes retention of the 24-hour duration Probable Maximum Precipitation event plus the 200-year snowmelt in the TSF. See response to

Comment	Topic or Permit Section	Commenter	Comment	Response
			rainwater from the 10-year return-period, 24-hour storm.	comment 2.20.3. No change to the permit(s) was made as a result of this comment.
2.23.3	Water Resources Management Plan	Tom Waldo, Earth Justice	If mine construction and operations dramatically reduce flow in Crooked Creek, discharges of waste water into the stream would have more-acute effects on water quality.	As document in the APDES permit application and FEIS, the water treatment plant discharge is projected to ensure that water quality complies with applicable water quality standards. As such, the discharge will not contribute to any exceedances of standards in Crooked Creek, and there will not be any "acute" effects regardless of the flow changes. Further, Section 3.7.3.2.2 of the FEIS presents an analysis of downstream water quality during operations under reduced flow conditions. This analysis indicates that "it is unlikely that reduced flows would measurably affect water quality in Crooked Creek downstream of the Mine Site." In addition, the Alaska Water Use Act (AS 46.15) require DNR to consider the effect on public health, among other considerations, in determining the public interest when adjudicating applications for water rights. This will include the flow rates in Crooked Creek. No change to the permit(s) was made as a result of this comment.
2.24.1	Wildlife Deterrence	Sarah Durand	It is Donlin Gold Projects responsibility to operate the Class III Camp as to not attract wildlife. A fence will not deter ravens or eagles. How will these be deterred through operational and institutional controls?	The permit places a number of stipulations on the Class III landfill to deter local wildlife from entering the landfill including; incineration of combustible waste, containerization of wildlife attractants, fencing, fill placement, and wildlife hazing. Based on experience with operating mines, the effectiveness and need for wildlife deterrents are site specific to the project area. No change to the permit(s) was made as a result of this comment.
2.24.2	Wildlife Deterrence	Sarah Durand	"The plan states that containers that are left uncovered and exposed to the elements may result in the material in the container becoming contaminated and unusable." Why under any decent operations and management would this be	The Plan of Operations document referenced in the comment is incorrect. In Section 1.2 of Waste Management Permit 2017 DB0001, it requires the permittee to update DEC-approved plans adopted by reference in the permit within 90 days of permit issuance incorporating any changes necessary to be consistent with the terms of this

Comment	Topic or Permit Section	Commenter	Comment	Response
			occurring? This has the potential to create a spill hazardous or otherwise. How will a closed dumpster containing putrescible waste deter a bear or other wildlife as it's only means? Donlin should be utilizing bear proof dumpsters, fully enclosed storage, and potentially electric fencing to deter wildlife for storage areas containing putrescible waste. Burning these wastes on a daily basis in the incinerator rather than allowing them to accumulate would also be helpful to deter wildlife. Please provide additional details as to how wildlife will be deterred from putrescible wastes prior to treatment at the landfill.	permit. Correction of the issue within the plan of operations documents will be addressed upon compliance with this permit requirement. The permit places a number of stipulations on the Class III landfill to deter local wildlife from entering the landfill including; incineration of combustible waste, containerization of wildlife attractants, fencing, fill placement, and wildlife hazing. The effectiveness and need for wildlife deterrents are site specific to the project area. No change to the permit(s) was made as a result of this comment.
3.1	2.1.1.7, 2.6.1, and 2.7.2	Donlin Gold LLC	These provisions all address when corrective action is required following a statistically significant increase. These provisions should be consistent. In addition, background water quality could exceed water quality standards (WQS). Corrective action should only be required when there is a statistically significant increase above groundwater quality and an exceedance of the WQS.	Sections, 2.1.1.7 and 2.7.2, have been revised and are now consistent with Section 2.6.1. These three sections now agree in stating, "When a statistically significant increase in a constituent concentration above a WQS is discovered…"
3.2	2.8.1	Donlin Gold LLC	This provision should be similar to Section 2.5.14 requiring submittal of the quality assurance project plan (QAPP) within 90 days of the effective date of the permit or prior to commencing facility construction.	Section 2.8.1 has been changed as suggested. It now states, "The permittee shall submit a conceptual suspension of operations plan to DEC before the latter of (i) 90 days after the effective date of the permit or (ii) 90 days to prior to commencing facility construction."

REFERENCES

BGC Engineering Inc., 2014a, Donlin Gold Project Conceptual Hydrogeologic Model. BGC Document No.: ER-0011165.0028 A, July 18, 2014.

___., 2014b, Donlin Gold Project Numerical Hydrogeologic Model. BCG Document No.: ER-0011165.0029A., July 18, 2014.

___., 2014c, Donlin Creek LLC, Donlin Creek Gold Project Feasibility Study Update II, Tailings Storage Facility Design, Final. Document No: DC11-025, July 18, 2014.

___., 2017a, Donlin Gold Project Memorandum, RFAI #101 – Plan and profile Evolution of Groundwater Near Pit Lake Responses, February 17, 2017.

___., 2017b, Donlin Gold Project Memorandum, RFAI #102 – WRF Perched Aquifer Analysis Responses, February 3, 2017.

___., 2017c, Donlin Gold Project Memorandum, RFAI #98 – Intermediate and Regional Groundwater Flow Analysis, March 14, 2017.

___., 2017d, Donlin Gold Project Memorandum, RFAI #103 – Rock Fracturing, Faulting, and flow Analysis, February 27, 2017.

State of Alaska, 2017, State of Alaska, Department of Natural Resources, Department of Environmental Conservation, Mine Reclamation and Closure Cost Estimation Guidelines, July, 2017.

Appendix A – Net Present Value Calculation of Reclamation and Long Term Care & Wastewater Treatment – Mine Operations – Up to 7 Years

Years after termination[1]	Phase of Closure	Suspension & Reclamation Annual Cash Flows[2]	Suspension & Reclamation Net Present Value[3]	Long Term Care & Wastewater Treatment Net Present Value[4]	Net Present Value[5]
0			$210,330,000	$111,700,000	$322,030,000
1	suspension	$1,030,000	---	---	---
2	suspension	$1,090,000	---	---	---
3	earthwork & wastewater treatment	$78,410,000	---	---	---
4	earthwork & wastewater treatment	$45,660,000	---	---	---
5	earthwork & wastewater treatment	$56,180,000	---	---	---
6	earthwork & wastewater treatment	$47,400,000	---	---	---
7	earthwork & wastewater treatment	$12,950,000	---	---	---

[1]Year 0 begins once the State of Alaska has accessed the financial responsibility funds. All values have been rounded to the nearest $10,000 and include both direct and indirect costs that are detailed in the *Plan of Operations Reclamation and Closure Plan Donlin Gold Project*.

[2]This column represents the present values for suspension and reclamation costs that are scheduled during the first seven years after the termination of mining and milling.

[3]This amount represents the net present value and applies a real rate of return of 4.3%.

[4]This column represents the net present value for long term care and wastewater treatment beginning on the eight year after termination of mining and milling and continuing indefinitely. This amount is based on an annual schedule of present value costs for mine life years eight through 94 and includes indirect costs, direct costs, and wastewater treatment plant replacement and maintenance, as found in the *Plan of Operations Reclamation and Closure Plan Donlin Gold Project*. Additionally, the balance at year 94 post operation provides a corpus of $705,910 (present value) to ensure long term care and wastewater treatment indefinitely. The net present value applies a real rate of return of 4.3%.

[5]This is the sum of the net present values for suspension and reclamation work and long term care and wastewater treatment applying a real rate of return of 4.3%.

Appendix B – Acronyms

The following acronyms are terms found in the this permit.

AS 27.19	Alaska Statute. Title 27 Mining. Chapter 19 Reclamation
AS 46.03	Alaska Statute. Title 46 Water, Air, Energy, and Environmental Conservation. Chapter 03 Environmental Conservation
11 AAC 97	Alaska Administrative Code. Title 11 Natural Resources, Chapter 97: Mining Reclamation
18 AAC 15	Alaska Administrative Code. Title 18 Environmental Conservation, Chapter 15: Administrative Procedures
18 AAC 60	Alaska Administrative Code. Title 18 Environmental Conservation, Chapter 60: Solid Waste Management
18 AAC 72	Alaska Administrative Code. Title 18 Environmental Conservation, Chapter 72: Wastewater Disposal
AAC	Alaska Administrative Code
APDES	Alaska Pollutant Discharge Elimination System
ARD	Acid rock drainage
AS	Alaska Statute
BLM	Bureau of Land Management
CWA	Clean Water Act
CWD	Contact Water Dam
DEC	Department of Environmental Conservation
DFG	Department of Fish & Game
DNR	Department of Natural Resources
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FEIS	Final Environmental Impact Statement
HCT	Humidity Cell Test
HDS	High density sludge
IDF	Inflow design flood
IWMP	Integrated Waste Management Plan
LOM	Life of mine

NAG	Non-acid generating
NEPA	National Environmental Policy Act
NPV	Net present value
PAG	Potentially Acid Generating
POO	Plan of Operations
PMP	Probable maximum precipitation
QAPP	Quality assurance project plan
RCRA	Resource Conservation and Recovery Act
RFAI	Request for Additional Information
RPA	Reclamation Plan Approval
SRCE	Standardized Reclamation Cost Estimator
SRS	Seepage Recovery system
TSF	Tailings Storage Facility
USFS	U.S. Forest Service
WMP	Waste Management Permit
WQS	Water quality standards
WRF	Waste rock facility
WRMCS	Waste rock management categories

Appendix C – Supplemental Information – Donlin Treatment Works

April 12, 2019

Gene McCabe, Program Manager
Alaska Department of Environmental Conservation
Division of Water – Wastewater Discharge Authorization
555 Cordova Street
Anchorage, AK 99501

Re: Supplemental Information – Donlin Treatment Works

Dear Gene:

On February 7, 2019, a request was filed pursuant to the Alaska Administrative Code (AAC) 18 AAC 15.185 for informal review of the Alaska Department of Environmental Conservation's (ADEC) decision to issue Waste Management Permit 2017DB0001 for Donlin Gold, LLC's Donlin Gold Project. On February 14th, ADEC agreed with the request regarding the definition of "treatment works" as stated in the permit and granted an informal review. On March 1, 2019, the Director of the ADEC Division of Water completed his review and remanded the waste management permit to the Division of Water Wastewater Discharge Authorization Program staff for two purposes: (1) to ensure only allowable items are included in the treatment works identified by the permit and (2) to determine whether groundwater underlying the more narrowly defined treatment works can be included in the scope of the treatment works. Donlin Gold is providing the legal and factual analyses presented in this letter and the attached technical memorandum for ADEC to consider as part of the remand process.

Facilities Comprising the Treatment Works

Accurately describing the components of the proposed mine operation that are treatment works is important for a number of reasons, including the fact that that the water quality standards promulgated at 18 AAC 70 do not apply to a treatment works authorized by ADEC. 18 AAC 70.010(c) mandates that the applicable water quality criteria "must be met in **adjacent surface water and groundwater** at and **beyond the boundary** of the treatment works (emphasis added)." Defining the boundaries of the treatment works thus is essential to establishing the point at which Alaska's water quality standards must be met.

AS 46.03.900(33) defines treatment works as follows:

> *treatment works means a plant, disposal field, lagoon, pumping station, constructed drainage ditch or surface water intercepting ditch, incinerator, area devoted to sanitary landfills, or other works installed for the purpose of treating, neutralizing, stabilizing, or disposing of sewage, industrial waste, or other wastes;*

Enclosed with this letter is a technical memorandum and associated figures that describe and depict each component of the facilities in American Creek and Anaconda Creek that Donlin Gold proposes to construct as treatment works that comprise the Project's integrated water management system. Donlin Gold designed these facilities as a closed system that will capture and manage water that comes into contact with mine facilities ("contact water") such that there are no uncontrolled discharges of contact water from the Project area. As explained in the technical memorandum, these facilities are designed to function in an integrated manner as a single water treatment works. The technical memorandum describes how each component of the treatment works contributes to the overall containment, management, transport, and treatment of contact waters whether the contact water is on the surface or in the ground beneath a specific Project facility (e.g., the Waste Rock Facility or Tailings Storage Facility). The figures accompanying the technical memorandum depict the limits of the treatment works. Donlin Gold believes that the technical memorandum and figures provide a comprehensive, specific, and enforceable definition of the treatment works authorized by Waste Management Permit 2017DB0001.

Treatment Works Include Surface and Subsurface Features

The definition of treatment works provided by AS 46.03.900(33) is broad and the list of facilities included in the definition is not exclusive because the definition includes "other works installed for the purpose of treating, neutralizing, stabilizing, or disposing of sewage, industrial waste, or other wastes." As described in the technical memorandum, the facilities Donlin Gold proposes to construct to manage contact waters include rock drains (to be placed along topographical features below Project facilities), horizontal drains, sumps, and wells. These components are specifically intended to capture and manage water present in the ground. Other components, such as diversion channels and ponds, will be constructed to capture and manage contact water present on the surface. In both cases, the components will be "installed for the purpose of treating, neutralizing, stabilizing, or disposing of [contact waters]." As such, the components are treatment works as defined by AS 46.03.900(33).

The boundaries of the treatment works beyond which compliance with the Alaska Water Quality Criteria (AWQC) is required by 18 AAC 70.010(c) must be determined by the area over which the installed component functions. For example, a diversion ditch is intended to contain drainage from the area upgradient of the ditch and convey the water from one point to another. As such, the sides and bottom of the ditch and the drainage boundary above it define the boundaries of the treatment works. Water inside the ditch is not subject to compliance with the AWQC. For components that are intended to manage groundwater (for example a well, rock drain, sump, pumping station or horizontal drain), the boundaries of the treatment works are defined by the area of the subsurface ground subject to the component's function (i.e., the zone of capture or influence of the well, rock drain, sump, pumping station or horizontal drain). For example, the treatment works boundaries of a well constructed to pump contact water from the ground cannot rationally be limited to the casing of the well because the contact water to be pumped is outside of the casing until captured by the well. The logical interpretation of treatment works in this context is to include the area of groundwater subject to capture by the well within the treatment works boundaries for that well. Similarly, the treatment works boundaries of a

downgradient sump (e.g., the Pit) intended to capture drainage through the ground from upgradient facilities must include the subsurface ground draining to the sump.

These conclusions are supported by 18 AAC 70.010(c)'s requirement that applicable water quality criteria "be met in adjacent surface water and groundwater at and beyond the boundary of the treatment works." The reference to "adjacent groundwater" acknowledges that the treatment works will encompass both surface and subsurface areas.

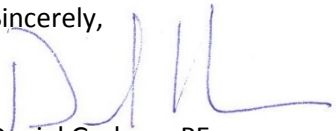
Construing the definition of treatment works to encompass groundwater finds further support in 18 AAC 60.825 which prescribes the requirements for groundwater monitoring systems for waste disposal facilities and is applicable to mining waste. *See* 18 AAC 60.455, listing the various provisions of 18 AAC 60 that apply to mining waste. Under that regulation, ADEC establishes a "relevant point of compliance," at which downgradient groundwater quality must comply with the AWQC. Groundwater upgradient of the "relevant point of compliance" is not subject to the AWQC. This is consistent with incorporating subsurface ground upgradient of a constructed facility (e.g., well, sump, rock drain, or horizontal drain) in the treatment works as defined by AS 46.03.900(33).

For these reasons, Donlin Gold concludes that it is appropriate for ADEC to include subsurface ground upgradient of the components of Donlin Gold's integrated water management system within the boundaries of the treatment works for purposes of Waste Management Permit 2017DB0001. These boundaries are depicted on the figures accompanying the attached technical memorandum. Section 2.1 of the Waste Management Permit describes the components of the authorized treatment works as "the mine facilities, including the Lewis and ACMA mine pits, the TSF, the Lower and Upper CWDs, and groundwater underlying the mine site." The remand to staff gives ADEC the opportunity to more clearly and specifically describe the Project components that are part of the treatment works, and also to provide the technical basis for including each component as part of the treatment works authorized by the permit.

The attached technical memorandum is provided to assist ADEC staff in these efforts. The attachment identifies and discusses each component of the treatment works proposed for the Project, and how each component functions as part of the overall water management system designed to collect and manage all water affected by Project operations, whether surface flow or groundwater, to effectively prevent any water quality exceedances outside the defined treatment works boundaries. A series of figures is included that illustrate the hydrology and hydrogeology of the Project area, the layout of the Project facilities, and the boundaries of the proposed treatment works.

If you have any questions regarding the information presented in this letter and the technical memorandum and figures, please contact me at dgraham@donlingold.com or by phone on my direct line at 907-369-0344.

Sincerely,



Daniel Graham, PE
Permitting and Environmental Manager

Attachment: Technical Memorandum: Project Site Treatment Works

TECHNICAL MEMORANDUM

Date: April 12, 2019

RE: PROJECT SITE TREATMENT WORKS

Introduction

Donlin Gold LLC (Donlin Gold) is proposing the development of an open pit, hardrock gold mine in southwestern Alaska, about 277 miles west of Anchorage, 145 miles northeast of Bethel, and 10 miles north of the village of Crooked Creek.

The overall water management strategy for the proposed Donlin Gold Project requires the construction, maintenance, and operation of numerous structures. The structures and facilities are contained primarily in two drainage basins: American Creek and Anaconda Creek. Facilities within each drainage are designed to function in an integrated manner as a single water "treatment works." The layout of the facilities is shown on Figure 1. The treatment works are summarized as follows:

Primary Drainage	Structures and Facilities[1]
American Creek	Upper Contact Water Dam (CWD), American Creek Fresh Water Diversion Dam (FWDD, temporary), Lower CWD, Waste Rock Facility (WRF), Ore Stockpile Berm, Open Pit area, Pit perimeter dewatering wells, and Water Treatment Plant (WTP)*
Anaconda Creek	North FWDD and South FWDD (both temporary), Tailings Storage Facility (TSF), Seepage Recovery System (SRS) and WTP*

*The WTP is a shared facility for treating water from the entire site

The following sections focus on the integrated function of the treatment works components. The treatment works are designed as a closed system: i.e., the treatment works are designed such that there are no uncontrolled discharges from the mine area. Consequently, the boundaries of the facilities used to manage contact water define the extent of the treatment works. The treatment works incorporate the groundwater below the facilities into the closed system which means that groundwater beneath the facilities does not discharge to surrounding groundwater systems, but instead is captured by the treatment works. A specific focus of this memorandum is on how the groundwater systems function beneath each component of the treatment works and contribute to the

[1] Collectively referred to as the "treatment works"

overall containment, management, and treatment of the various site waters; this includes defining the limits of the groundwater components of the treatment works. The following Figures 1-11 are included in Attachment A and are referenced throughout this memorandum:

- Figure 1 Donlin Gold Project Site Layout
- Figure 2 Anaconda Creek (TSF Area) Water Table at End of Mining (Pre-Closure)
- Figure 3 Cross Sections of Anaconda Creek at End of Mining (Pre-Closure)
- Figure 4 American Creek Pre-Mining (current) Conditions Water Table
- Figure 5 American Creek Cross Sections Pre-Mining
- Figure 6 American Creek Year 3 of Production Water Table
- Figure 7 American Creek Cross Sections for Year 3 of Production
- Figure 8 American Creek End of Mining Water Table (Pre-Closure)
- Figure 9 American Creek Cross Sections End of Mining (Pre-Closure)
- Figure 10 American Creek Post-Closure Conditions Water Table
- Figure 11 American Creek Cross Sections Post-Closure

Hydrologic Discussion – Existing Conditions

American Creek

Surface Water

The American Creek watershed is approximately 6.8 square miles in area and ranges in elevation from 341 feet to 2,083 feet, with a total basin relief of approximately 1,842 feet and mean basin elevation of 1,004 feet. The main channel length is approximately 4.1 miles. Beaver activity is present throughout the drainage, which causes the stream channel to be braided in many areas (NES, 1996). The stream channel is moderately sinuous, narrow, and incised with a gravel bottom in areas not affected by beavers.

Streamflow in the Project area is dominated by surface water runoff during freshet and the summer months, typically from April or May through October. During the snow-covered months, flow in the creeks is attributed to baseflow.

Streamflow data were collected on American Creek during the open-water season between 1996 and 2011; however, no data were collected in 2001 and 2004. The stream gauging station (named AMER) is located upstream from the confluence with Crooked Creek at the downstream edge of the proposed Pit area. The channel at the gauging station is approximately 5 feet wide and 3 feet deep. The long-term average daily discharge between June 1st and September 30th ranges between 5 and 19 cubic feet per second (cfs). The overall average discharge for the sampling period was 11 cfs (BGC 2012).

Lewis Gulch[2] is a small tributary of Crooked Creek north of American Creek. Queen Gulch is a small drainage just north of Lewis Gulch. Omega Gulch is a small tributary of Crooked Creek located upstream from Anaconda Creek. All three gulches have catchment areas of approximately one square mile or less, main channel lengths of approximately 1.5 miles, and based on streamflow data, appear to exhibit intermittent flow regimes.

Periodic manual discharge measurements were made on Lewis and Queen gulches during the open-water season between 1996 and 2003. The minimum discharge measured in Lewis Gulch was 0.24 cfs, and the maximum discharge was 4.74 cfs. The minimum discharge observed in Queen Gulch was 0.30 cfs, and the maximum discharge was 4.25 cfs (HMH 2004). Only one discharge measurement was made in Omega Gulch, in June 2005, at a flow rate of 1.3 cfs (BGC 2012).

Groundwater

Current groundwater conditions for American Creek and the adjoining gulches are shown in Figures 4 (plan view) and 5 (cross-sections). Groundwater recharge enters the system from precipitation and snowmelt typically 6 months of the year (May or June through October) and leaves the system at zones of surface discharge (i.e., American Creek or Crooked Creek, gulches and low-lying areas) year-round and seasonally via evapotranspiration (ET). The water table generally mimics the surface topography and is near or above ground surface (i.e., artesian conditions) in low lying areas, particularly around Crooked Creek, and is found at greater depths along ridges and ridge tops. The shallow or artesian groundwater elevations observed in low lying areas adjacent to Crooked Creek suggest it is a gaining stream near the proposed Pit area.

Within the American Creek drainage, the direction of groundwater flow is from the ridges and slopes toward the valley bottom, where flow converges and discharges to the creek or flows west along the drainage toward Crooked Creek, where it ultimately discharges. Within the smaller drainages (i.e., Lewis, Queen, and Omega gulches) groundwater flow is predominately toward Crooked Creek.

The pre-mining groundwater flow directions below the WRF footprint are from the American Creek ridgelines toward American Creek, or toward the smaller sub-drainages (like Rob's Gulch), before reporting to American Creek. The pre-mining groundwater flow directions within the open Pit footprint are generally toward Crooked Creek.

Anaconda Creek

Surface Water

The Anaconda Creek watershed covers approximately 7.6 square miles and ranges in elevation from 300 feet to 1,425 feet, with a total basin relief of approximately 1,125 feet and mean basin elevation of 734 feet. The main channel length is approximately 3.6 miles. Anaconda Creek is moderately sinuous, with a relatively deep, incised channel and undercut banks (OtterTail Environmental Inc. 2007).

[2] Lewis Gulch, Queen Gulch, and Omega Gulch directly flow into Crooked Creek; they are not part of the American Creek drainage. They are described here because small portions of the Pit area extend into these drainages.

Streamflow data were collected on Anaconda Creek during the open-water season, between 2002 and 2011. The gauging station (named ANDA) is located upstream from the confluence with Crooked Creek and downstream of the proposed TSF. The channel at the gauging station is approximately 6.5 to 8 feet wide. The long-term average daily discharge for the open-water monitoring season is 5 and 18 cfs. In addition to the long-term average, the average daily discharge data from 2003, 2005, and 2006 show seasonal variability during the monitoring period. The minimum average daily recorded discharge occurred in mid-August 2005 and was approximately 2 cfs. The maximum average daily recorded discharge occurred in early July 2003 and was approximately 78 cfs. The 2006 hydrograph shows a peak discharge occurring in mid-August, a function of a late summer rainfall event. The variability of seasonal discharge in Anaconda Creek is similar to that of Crooked Creek, and is a function of precipitation event timing, duration, and intensity, and existing soil moisture conditions.

Due to river ice conditions in the winter and early spring, limited discharge data are available for Anaconda Creek during periods other than the open-water season. However, one discharge measurement was taken each year in December from 2007 to 2010, with the discharge ranging from 1.3 to 3.5 cfs (BGC 2012).

Groundwater

Groundwater conditions for Anaconda Creek are shown in Figures 2 (plan view) and 3 (cross-sections). Groundwater recharge enters the system from precipitation and snowmelt during the warmer months of the year (typically May or June through October) and leaves the system at zones of discharge (i.e., as baseflow to Anaconda Creek) year-round and seasonally via ET. The water table generally mimics the surface topography and is near or above ground surface (i.e., artesian conditions) in low lying areas, and is found at greater depths along the ridges and ridge tops. Within the Anaconda Creek drainage, the direction of groundwater flow is from the ridges and slopes toward the valley bottom, where flow converges and discharges to the creek or flows west along the drainage toward Crooked Creek, where it ultimately discharges.

Treatment Works – Physical Description and Operational Aspects

American Creek

Treatment Works

The treatment works boundaries within American Creek and Lewis, Queen, and Omega gulches are shown in Figures 6, 8 and 10, and consist of all of the water management components described below, and the groundwater underlying these components to the downgradient boundary of the Pit perimeter dewatering system.

Water Management Components

Runoff from mine facilities and disturbed ground in the American Creek drainage, including the excavations for the Pit area, WRF, Upper and Lower CWDs, Ore Stockpile Berm and related support facilities as shown on Figure 1, would be managed as contact water, unless suitable for coverage under an Alaska Pollutant Discharge Elimination System (APDES) general permit for stormwater discharges (e.g., soil stockpiles). A WTP is proposed to treat contact water prior to discharge into Crooked Creek under APDES Permit AK0055867 issued on May 24, 2018. The Pit(s) and Pit perimeter dewatering

well system around the Pit area in the American Creek drainage are the downstream collection points of the treatment works. The functions of the individual treatment works components are further described in the following subsections. The discussion follows the general downstream flow of water as shown on Figures 4 through 11, including the three water dams, WRF, Ore Stockpile Berm, and Pit perimeter dewatering wells and in-pit sump system.

Upper CWD - The Upper CWD will be constructed at the ultimate upstream extent of the WRF in the American Creek drainage. The Upper CWD will retain surface water and stormwater from undisturbed areas in the upper American Creek drainage. The Upper CWD also will provide additional capacity for storage of contact water by pumping water from the Lower CWD. Construction of the Upper CWD will be complete at the end of life-of-mine (LOM) Year -1 (one year before the start of production).

The Upper CWD was designed to optimize the placement of waste rock. The approximate maximum storage capacity of the Upper CWD will be 3,240 acre-feet (SRK 2017). The Upper CWD would have a spillway with sufficient capacity to convey the probable maximum flood (PMF) event. Water flowing over the spillway would ultimately flow to the Lower CWD.

Water in the Upper CWD would primarily be used as a source of a make-up water for the process plant although some water would be sent to the WTP and discharged via the APDES permitted outfall.

American Creek FWDD - To limit inflows to the Lower CWD during construction, a temporary FWDD is proposed to be constructed on American Creek upstream of the WRF in LOM Year -2. Excess fresh water (non-contact) accumulating in the American Creek FWDD would be stored up to a maximum capacity of 867 acre-feet (the volume of the 100-year snowmelt), with the excess discharged to Crooked Creek at Omega Gulch. To minimize the potential for overflows to occur, the installed pumping capacity will be capable of a maximum flow rate of 3,963 gpm. The FWDD would only be utilized to divert non-contact water until the end of the first year of operations when that water will be needed for make-up water. By the end of LOM Year 2, the FWDD will be removed and the area will be covered by the WRF.

WRF - The WRF would ultimately cover an approximate area of 3.5 square miles. Runoff from the WRF would be captured by the Lower CWD, immediately upstream of the Pit area. Seepage flows from the WRF would be expected to follow topographic controls within the WRF footprint drainages and would be collected in engineered rock underdrains that would discharge into the Lower CWD. Any seepage that bypasses the rock underdrains would flow downgradient and be collected by the in-pit sumps or by the Pit perimeter dewatering system.

Lower CWD - The Lower CWD, will be constructed in the American Creek drainage and will be completed at the end of the first quarter of LOM Year -1. The Lower CWD would receive water from a variety of sources:

- All surface runoff and seepage from the WRF (bare and reclaimed areas)
- Runoff from undisturbed ground upgradient of the WRF

- Surface runoff and horizontal drains within the Pit footprint collected by the in-pit sump system
- Pit perimeter dewatering well water not required for process make-up or not sent directly to the WTP
- Runoff and seepage collected within the Ore Stockpile Berm

There is no spillway proposed for the Lower CWD because there would be sufficient capacity in the pond to store the 24-hour probable maximum precipitation (PMP) event, plus a substantial operating pond. The approximate storage capacity of the Lower CWD during operations would be 7,150 acre-feet.

Like the Upper CWD, water in the Lower CWD would primarily be used as a source of a make-up water for the process plant although some water would be sent to the WTP and discharged via the APDES permitted outfall.

Ore Stockpile Berm - During construction, contact water will be generated downstream of the Lower CWD from the ore stockpile, as well as from shallow seepage from the Lower CWD. This water will be captured in the Ore Stockpile Berm which will be constructed above the ACMA Pit area. Water from the lower reaches of Rob's Gulch will also be captured by the Ore Stockpile Berm. Water in the Ore Stockpile Berm area will be pumped back to the Lower CWD. Once the ACMA Pit intersects American Creek in LOM Year 1, the Ore Stockpile Berm is not required to capture contact water as the Pit area would capture seepage from the Lower CWD and runoff from the ore stockpile. However, the berm will remain in operation throughout the LOM in order to minimize the amount of runoff reporting to the Pit area.

The Ore Stockpile Berm would not be sized to contain a particular runoff event; rather, the berm would be designed to minimize upslope drainage entering the Pit. The bermed area would have an approximate storage volume of 16.2 acre-feet and an approximate height of 10 feet.

In-pit Sump System - Runoff and snowmelt in the Pit area would be collected and pumped to the Lower CWD using an extensive collection system of surface water ditches, sumps, submersible pumps, booster pumping stations, and pipelines. There would be two main components of this system, a network of pumping stations and gravity sumps installed around the crest of the Pit, and a network of in-pit pipelines, pumps, and ditches for lifting water out of the Pit.

The pumping system would be designed with a peak capacity of 8,300 gpm. The Pit surface water management system would be designed to pump runoff from a 2-year return period, 24-hour storm event of 1.2 inches from the excavation within 3 days, and a 100-year return period, 24-hour storm event of 3 inches within 7 days.

Pit Perimeter Dewatering System - The ultimate combined footprint for the Lewis and ACMA pits would be 1,462 acres, and the Pit would require dewatering to depressurize the Pit slopes and provide safe working conditions for mine crews. The Pit dewatering wells are summarized in the following table.

Open Pit Dewatering Wells	Value
Average Perimeter well depth (feet)	705
Average In-pit well depth (feet)	617
Minimum pumping rate: combined wells (gpm)	1,066
Maximum pumping rate: combined wells (gpm)	2,744
Number of Wells Over Mine Life	115
Perimeter wells	35
In-pit Wells	80
Maximum number of wells operational at any one time	52 (LOM Years 14 and 15)

Source: Numerical Hydrogeologic Model, BGC 2014

As the Pit expands, the number of dewatering wells would increase to a dewatering scenario incorporating a total of 115 wells (i.e., 35 perimeter and 80 in-pit) over the mine life. The total average annual groundwater extraction rate for the dewatering scenario is predicted to increase from approximately 1,700 gpm when the system is turned on in LOM Year -2, to approximately 2,400 gpm in LOM Year 12. After LOM Year 20, the total average annual dewatering rate is predicted to generally decrease to approximately 1,100 gpm because the perimeter wells surrounding the Pit would be progressively turned off during Pit backfilling activities (BGC 2014, 2016). Remaining groundwater inflows to the Pit would be captured by horizontal drains. It is estimated that approximately 167 miles of horizontal drains would be required over the LOM to aid in depressurizing the Pit slopes (BGC 2014).

Extraction of groundwater through the Pit perimeter dewatering wells, in-pit dewatering wells and horizontal drains will lower the groundwater table in the mine area, creating a collection point for any contaminants transported by groundwater. In LOM Year 20, the water table will reach its lowest level at approximately -1,100 feet above mean seal level (amsl).

During operations, all groundwater from Pit dewatering wells would be sent to the process plant as a source of water, unless the combined CWD storage exceeds 1,460 acre-feet. In that event, water from the dewatering wells would be sent to the WTP and discharged via the APDES permitted outfall.

Groundwater Conditions During Operations and Closure

Hydrogeological conditions for the American Creek watershed during LOM Year 3 are shown in Figure 6 (plan view) and Figure 7 (cross-sections). Hydrogeological conditions for the American Creek watershed at the end of mining (pre-closure) are shown in Figure 8 (plan view) and Figure 9 (cross-sections).

Groundwater withdrawals as part of Pit dewatering will result in a cone of depression extending from the footprint of the Pit area and dewatering well network. The minimum predicted water table elevations within the Pit during LOM Year 3 and at the end of

mining (just prior to Pit lake filling) are -250 feet and -850 feet amsl, respectively. The deepest portion of the Pit throughout mining falls along the center of the American Creek drainage, and therefore the dewatering system and Pit will capture any flow originating from upstream within the catchment.

Any groundwater recharge (or net percolation) to the phreatic surface below the WRF is expected to report to the Pit dewatering system during operations (and to the Pit lake at closure) since the WRF is located directly upstream of the Pit in the American Creek watershed. This is illustrated in Figures 6 through 11. Groundwater flow directions beneath the WRF are towards the Pit, or from the American and Anaconda Creek ridgelines towards American Creek, and then towards the Pit. The groundwater flow directions and water table contours presented illustrate that any seepage through the WRF that bypasses the rock drains, or any subsurface releases from other upstream facilities in the American Creek drainage that could reach the groundwater table would be cut off by the Pit dewatering system or discharge directly to the Pit.

Once Pit dewatering ceases at the end of mining operations, groundwater elevations in the Pit area will begin to recover and the Pit lake will form (see Figures 10 and 11). When the Pit fills to its maximum stage (i.e., 328 feet, approximately 50-60 years after mine closure), the Pit water level will be managed by seasonal pumping, treatment and discharge of Pit water via the APDES permitted outfall to Crooked Creek. This will preclude uncontrolled flow from the Pit to surface water. A numerical hydrogeological model (NHM) was used in combination with the site-wide Water Balance Model (BGC 2011) to estimate the Pit filling period and groundwater inflows and outflows from the Pit during the filling period, and to describe impacts of groundwater level recovery and long-term management of the Pit lake on the surrounding water resources.

During the first 8 years after closure, water is predicted to seep out of the Pit into a limited area comprised of the dewatered bedrock and the pore space of the waste rock placed as backfill within the Pit. From Year 8 to 60 after closure, such seepage or outflow is simulated to decline as groundwater elevations rise toward stable levels. Once the Pit fills and groundwater elevations stabilize around the Pit, seepage from the Pit is predicted to cease. The managed Pit water elevation stage results in a hydraulic gradient oriented toward the Pit, allowing the Pit to continue acting as a groundwater sink for the surrounding area (BGC 2014).

To evaluate the potential impact of the predicted seepage from the Pit during the period of Pit filling, a transient particle tracking analysis was performed (BGC 2014). The analysis indicates that flow from the Pit to surrounding groundwater during the recovery period will eventually return back to the Pit, as the hydraulic gradients in the area are predicted to always be directed towards the Pit. In other words, the analysis predicts that water will flow locally from the Pit to the dewatered areas near the Pit during the period of groundwater recovery, but that this water will later flow back to the Pit. The model predicts that the local groundwater table will always be higher than the Pit water stage, i.e., that the hydraulic gradient will always be directed to the Pit.

When the Pit has filled to the elevation at which active management would begin, the simulated water table beneath the WRF footprint (and the full American Creek watershed upstream of the Pit) is similar to the simulated water table at the end of mining (see

Figures 10 and 11), though the water table has rebounded adjacent to the Pit (BGC 2014). Groundwater flow directions beneath the WRF footprint for closure conditions are very similar to those predicted for the end of operations. Therefore, any groundwater recharge (or net percolation) to the phreatic surface below the WRF is expected to report to the Pit at closure since the WRF is located directly upstream of the Pit in the American Creek watershed.

Anaconda Creek

Treatment Works

The treatment works boundary for Anaconda Creek is shown in Figure 2 and consists of the entire TSF area downstream to the SRS pond, including the groundwater underlying the TSF downgradient to the SRS monitoring/interceptor wells.

Water Management Components

As shown in Figure 1, the primary water management component in the Anaconda Creek drainage is the TSF. Like the facilities in the American Creek drainage, the TSF has been designed as a closed system with no discharges of potentially affected surface or groundwater to the Anaconda Creek watershed below the facility. The TSF dam would be constructed in the Anaconda Creek valley of compacted rock fill using a downstream construction method. It would have a 60 mil, single-side textured (lower side) linear low-density polyethylene (LLDPE) composite liner on the upstream face to prevent seepage through the dam. The tailings impoundment footprint would also be lined with a 60-mil textured LLDPE liner over a thick layer of broadly-graded silty sand and gravel which would act as a cushion layer. Storm water runoff from the downstream face of the dam would be collected at the toe. A ditch along the base of the dam would direct this storm water runoff to the SRS pond.

During the first three years of operations, two FWDDs (North and South) constructed at the upper reaches of the TSF would limit the amount of fresh water entering the TSF. These FWDDs would be removed after three years. Diversion ditches would also be constructed around the TSF to convey upgradient surface drainage around the TSF to a discharge point in Anaconda Creek below the dam. Towards the end of the mine life, the diversion ditches would be removed since the TSF would generally span much of the width of the Anaconda Creek drainage.

The TSF would provide sufficient storage capacity for the tailings, operating pond, inflow design flood (IDF) water, and emergency freeboard of 6.6 feet. The IDF is the 200-year snowmelt, plus runoff from a 24-hour PMP event. The TSF would store the full volume of the IDF without discharge and, therefore, the dam design does not include a spillway. Reclaim water from the tailings pond would be pumped back to the process plant for re-use or, in very limited quantities, be treated and discharged through the APDES permitted outfall.

A geotextile wrapped rock fill underdrain would be placed beneath the TSF liner system along the main Anaconda Creek bed and significant tributaries. The underdrain would be constructed prior to installing the impoundment liner. Since very low volumes of seepage are expected through the liner, the primary purpose of the underdrain is to collect unaffected groundwater from areas upgradient of the TSF and direct it to the pond below

the dam. However, the underdrain would also serve to convey any seepage from the liner to the SRS pond. While the predicted under flow would vary somewhat during operations, the quantity of water captured by the underdrain is estimated to be about 450 gpm, of which 18 gpm is estimated to be seepage from the TSF. See BGC 2014 and SRK 2017 for additional details on how these values were determined.

As noted above, the SRS pond, located at the toe of the TSF dam, would be the collection point for any water that enters the TSF underdrain as well as any surface water runoff from the downstream dam face. The pond would be sized to provide storage for 3 days of underdrain flow as well as the 200-year, 24-hour rainfall event. The total SRS pond storage volume required is 16.2 acre-feet. The 16.4 feet deep, 98.4 feet wide unlined pond would be constructed in bedrock. A 3-foot high rock fill berm, with a LLDPE liner on the upstream face, would be constructed on three sides of the pond. The SRS pond water would be pumped to either: (1) the TSF pond, (2) the process plant as make-up water or (3) the WTP for treatment and discharge through the APDES permitted outfall.

Monitoring/interceptor wells would be installed downgradient of the SRS pond. These would include two 164-foot deep wells and two 328-foot deep wells. Each well would have a submersible pump and together the four wells would be capable of pumping up to a maximum design rate of 1,760 gpm. The monitoring/interceptor wells would only be pumped if monitoring required by the Waste Management Permit shows constituent levels exceeding background levels and Alaska Water Quality Criteria (AWQC).

Compliance monitoring wells would be located further downgradient of the monitoring/interceptor wells. These wells would be sampled in the event that exceedances of AWQC and background levels are observed in the monitoring/interceptor wells. Under the Waste Management Permit, corrective action would be required in the unlikely event that AWQC and background levels are exceeded in these wells.

At closure, water would be pumped from the TSF operating pond to the Pit. Over a four-year period, an engineered cover would then be installed over the tailings with runoff directed to a pond at the southeast corner of the TSF. Water in this pond would be sent to the Pit until it meets all AWQC and can be discharged without treatment to Crevice Creek. SRS pond water and any water pumped from the monitoring/interceptor wells would also be sent to the Pit.

Groundwater Conditions during Operations and Closure

The simulated water table for the Anaconda Creek watershed is presented on Figure 2 (plan view) and Figure 3 (cross-sections) for the end of mining. Despite reduced recharge to the groundwater system within the impoundment footprint, the water table remains high along the Anaconda Creek watershed boundary, with groundwater flow originating from the ridgelines and slopes and flowing towards the center of the valley, before flowing west along the valley bottom.

Along the valley slopes, the water table is typically below the liner, while in the low-lying areas of the valley, where the underdrain is located, the water table is generally just below the liner, within the underdrain. As such, any seepage through the liner is expected to flow along the underdrain to the SRS pond. Should there be a bypass of seepage to the SRS pond, it would flow along the center of the valley (see Figures 2 and 3) at depths of 0 feet to 300 feet below ground. As described above, the monitoring/interceptor wells

located in the valley center just downstream of the SRS pond (see Figure 2) to depths of 164 feet and 328 feet below ground would intercept any bypass, if it is observed. These wells would be screened over a large enough interval to intercept seepage over the potential depth range specified.

Water Treatment Plant

A key component to the treatment works is the WTP. This plant, located between the Pit and the process facility, would treat water from the following sources:

- Pit perimeter and in-pit dewatering wells
- SRS water
- Contact water from the Upper and Lower CWDs
- TSF reclaim water

The maximum monthly predicted cumulative flows that would be sent to the operations WTP over the LOM range from 1,469 gpm at start up to 4,441 gpm in LOM year 12. The maximum flow to the WTP from the dewatering wells is predicted to be approximately, 2,300 gpm and is predicted to occur in LOM Year 12. Over the operations period, the predicted maximum seasonal treatment rates are approximately 1,100 gpm from the CWDs, 44 gpm from the TSF, and 800 gpm from the SRS.

The WTP will utilize clarification, oxidation and greensand filtration, with reverse osmosis as required. The WTP will have a combined maximum design capacity of approximately 4,750 gpm. The WTP will discharge to Crooked Creek at the APDES permitted outfall.

Summary and Conclusions

The designs, layouts, and functions of the treatment works components described above provide for closed systems with integrated containment and management of both surface and subsurface water flows; with water generally flowing downgradient from east to west in each drainage. At the downstream ends of these systems, a combination of surface and groundwater collection systems is provided, with the water being pumped to a variety of common locations, including the process plant, one of a number of ponds, or the WTP for treatment and discharge to Crooked Creek. Figures 2, 6, 8 and 10 clearly define the boundaries of the Project treatment works. Surface water and groundwater monitoring required by the Waste Management Permit will serve to ensure that the treatment works operate as designed and there are no releases of contaminated waters to surrounding surface water and groundwater.

References

BGC (BGC Engineering Inc.) 2011. Donlin Creek Gold Project Feasibility Study Update II, Water Management Plan. Vancouver, BC.

BGC. 2012. Donlin Creek Gold Project – Hydrometric Stations: Data and Installation Summary (Draft). Vancouver, BC.

BGC. 2014. Numerical Hydrogeologic Model, Donlin Gold Project. Vancouver, BC.

BGC. 2016. Mine Water Technical Meeting, Groundwater Model related issues, December 12, 2016. Trevor Crozier presentation, Donlin Hydrogeology. Vancouver, BC.

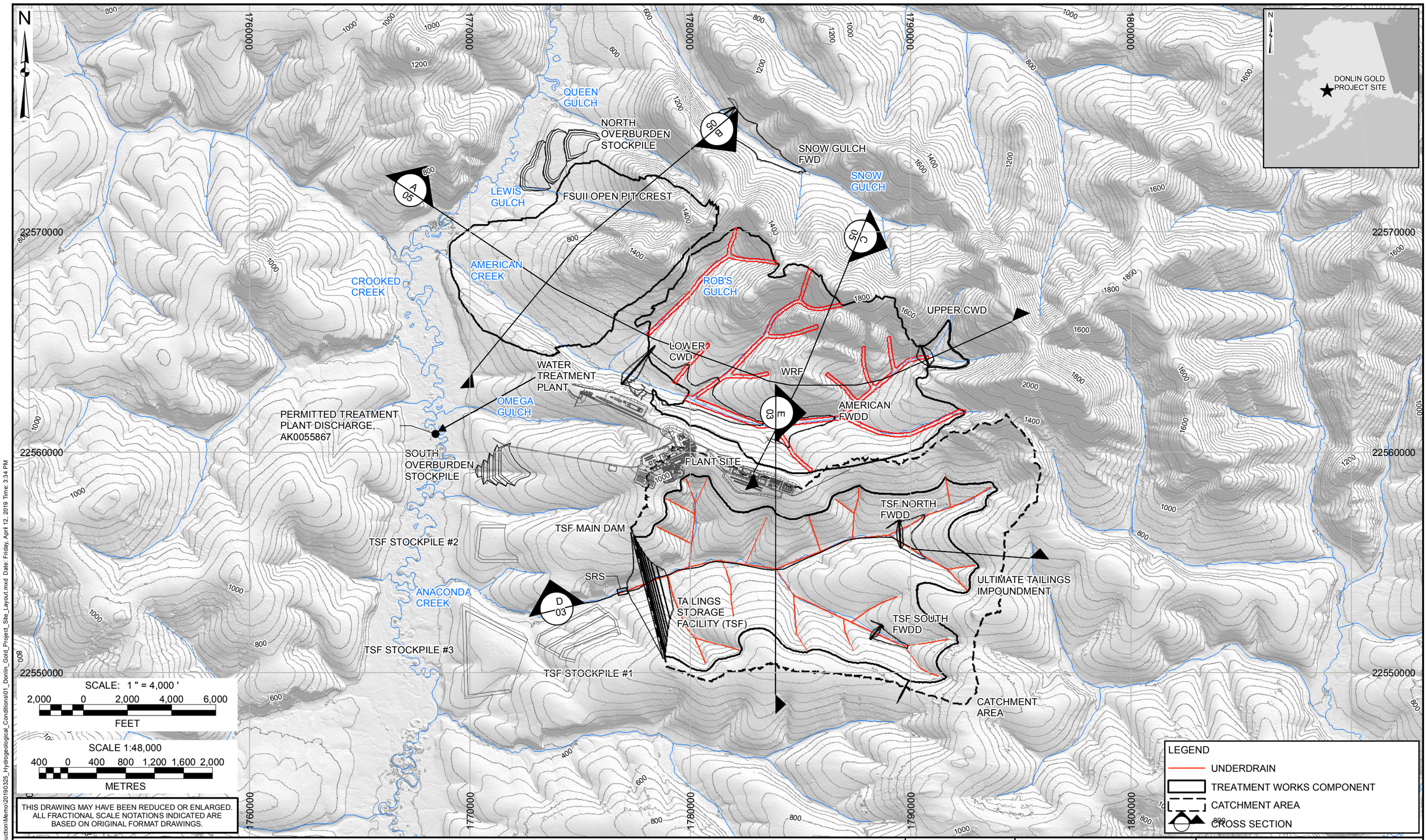
HMH (HMH Consulting, LLC.). 2004. Donlin Creek Project. Year 2003 Baseline Surface Water Monitoring Report. Anchorage, Alaska.

NES (Northern Ecological Services). 1996. Letter to Placer Dome - Summary of August 14-17, 1996 Field Investigation of Fish Habitats. Donlin Creek Gold Project. Anchorage, Alaska.

OtterTail (OtterTail Environmental, Inc.). 2007. Aquatic Biomonitoring Technical Report for the Donlin Creek Mine Project 2004-2006. Wheat Ridge, Colorado.

SRK (SRK Consulting US, Inc.). 2017. Plan of Operations, Water Resources Management Plan. Anchorage, Alaska.

U.S. Army Corps of Engineers (USACE). April 2018. Donlin Gold Project Final Environmental Impact Statement, JBER, AK



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4. PIT SHELL PROVIDED BY BARRICK, JANUARY 2011.
5. PLANT SITE LAYOUT PROVIDED BY AMEC, APRIL 2011.
6. ULTIMATE WASTE ROCK FACILITY PROVIDED BY BARRICK, JANUARY 2011.
7. PROJECTION IS NAD 1983 UTM ZONE 4N FT. VERTICAL DATUM IS UNKNOWN.

SCALE:	1" = 1,500'
DATE:	APR 2019
DRAWN:	LL
CHECKED:	SLH
APPROVED:	AC

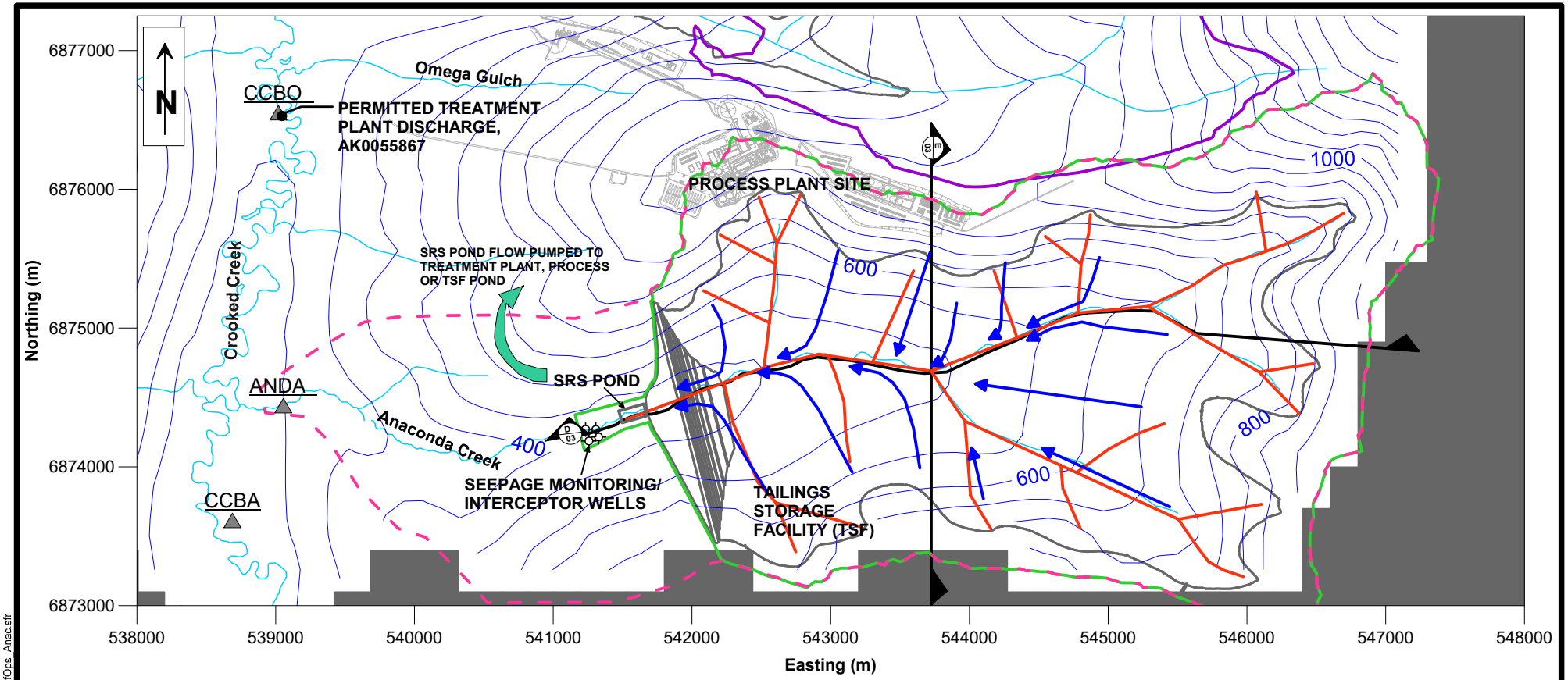
BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: DONLIN GOLD

PROJECT: DONLIN APRIL 2019 TECHNICAL MEMORANDUM: PROJECT SITE TREATMENT WORKS

TITLE: DONLIN GOLD PROJECT SITE LAYOUT

PROJECT No.:	FIG No:
0011-300	01



NOTES:
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3. ULTIMATE WASTE ROCK FACILITY AND OPEN PIT PROVIDED BY BARRICK JANUARY 2011.
4. WATER TABLE CONTOURS PRESENTED ARE FROM THE GROUNDWATER MODEL PRESENTED IN BGC (JULY 2014) "DONLIN GOLD PROJECT NUMERICAL HYDROGEOLOGIC MODEL", DOC NO. ER-0011165.0029A.

NAD 1983 UTM Zone 4N

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DATE:	APRIL 2019	CHECKED:	RT
DRAWN:	RT	APPROVED:	TC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

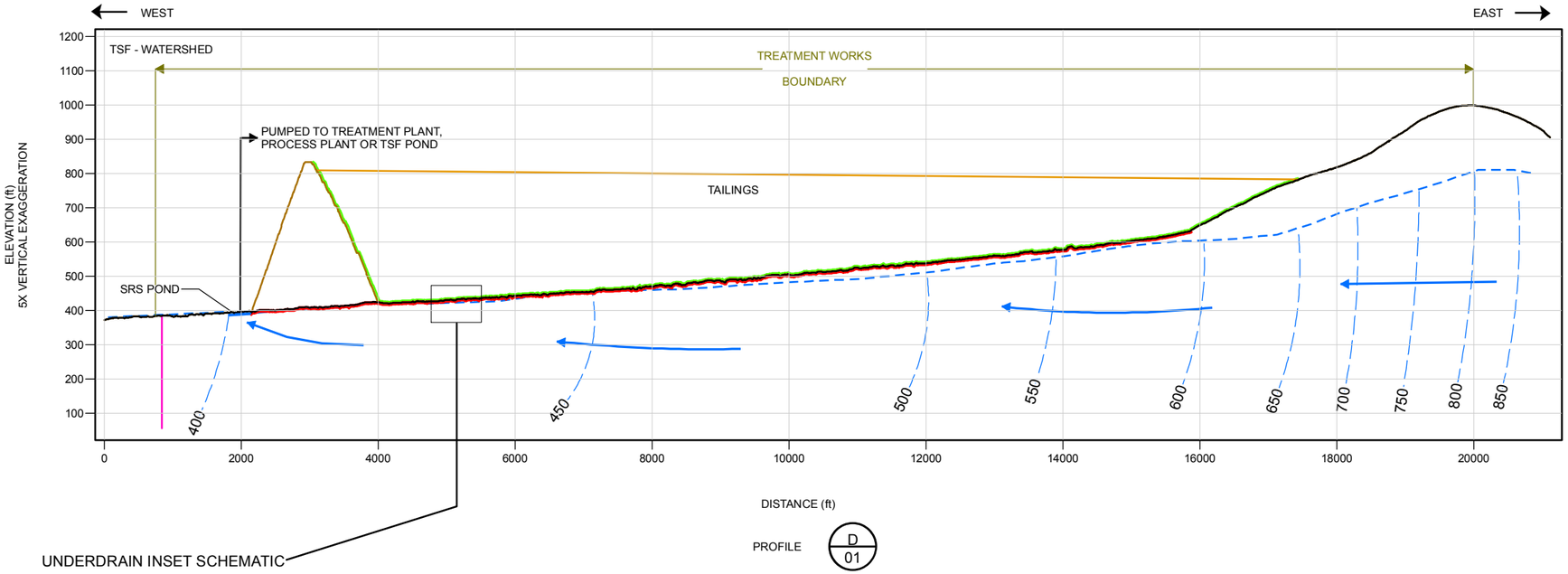
CLIENT: DONLIN GOLD

PROJECT: DONLIN GOLD PROJECT
HYDROGEOLOGICAL CONDITIONS

TITLE: ANACONDA CREEK (TSF AREA) WATER TABLE AT END OF MINING (PRE-CLOSURE)

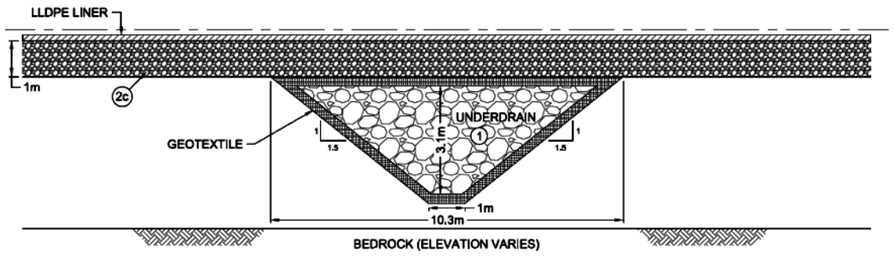
PROJECT No.	FIG No.	REV.
0011-300	2	

N:/BGC/Projects/0011/300 ARMP and WMP support/WMP support memo/Figures/2_Watertable_endofOps_Anac.sfr

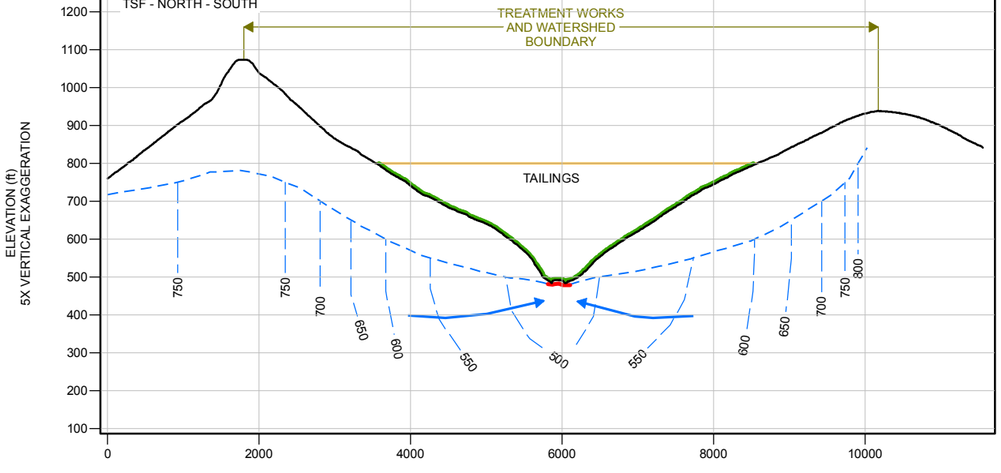


PROFILE D/01

UNDERDRAIN INSET SCHEMATIC



LEGEND
- (1) ROCKFILL (12" MINUS)
- (2c) BEDDING (TERRACE GRAVELS)
- GEOTEXTILE (10oz. NON-WOVEN)
- LLDPE LINER (60mil)



PROFILE E/01

LEGEND
- PRE-MINING GROUND SURFACE (CURRENT CONDITIONS)
- ULTIMATE TSF DESIGN
- TOP OF TAILINGS SURFACE
- LLDPE LINER
- UNDERDRAIN
- SRS POND
- SRS MONITORING / INTERCEPTOR WELL
- END OF MINING WATER TABLE
- HEAD CONTOURS (50 ft)
- GROUNDWATER FLOW DIRECTION

SCALE 1 " = 2,000 '

1,000 0 1,000 2,000 3,000

FEET

SCALE 1:24,000

200 0 200 400 600 800 1,000

METRES

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BGC ENGINEERING INC.
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CLIENT: DONLIN GOLD

PROJECT: DONLIN APRIL 2019 TECHNICAL MEMORANDUM: PROJECT SITE TREATMENT WORKS

TITLE: CROSS SECTIONS FOR ANACONDA CREEK AT END OF MINING (PRE-CLOSURE)

PROJECT No.:	FIG No:
0011 300	03

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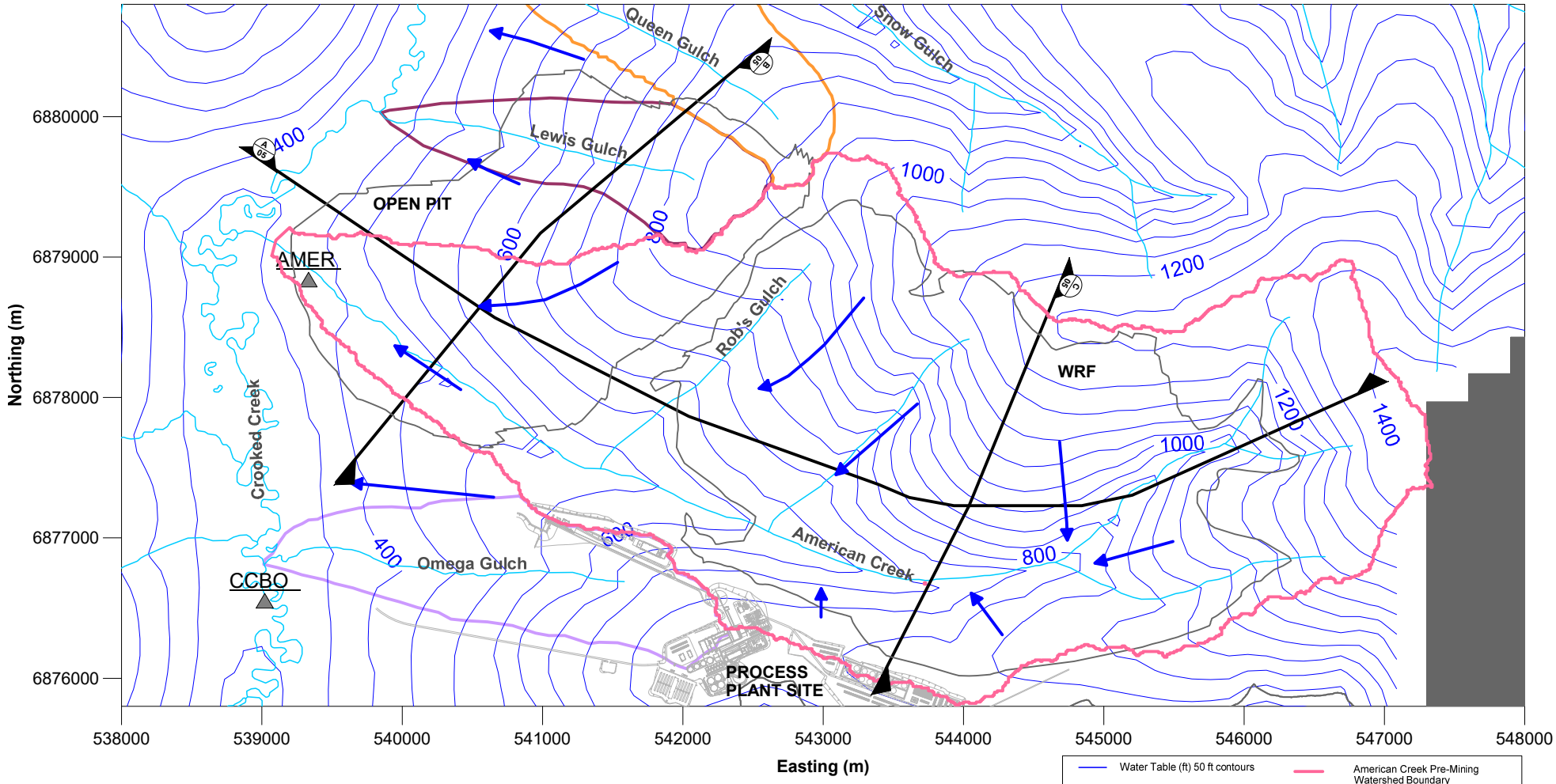

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NAD 1983 UTM Zone 4N

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BGC ENGINEERING INC.
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CLIENT: DONLIN GOLD

PROJECT: DONLIN GOLD PROJECT
HYDROGEOLOGICAL CONDITIONS

TITLE: AMERICAN CREEK PRE-MINING (CURRENT) CONDITIONS WATER TABLE

PROJECT No.	FIG No.	REV.
0011-300	4	

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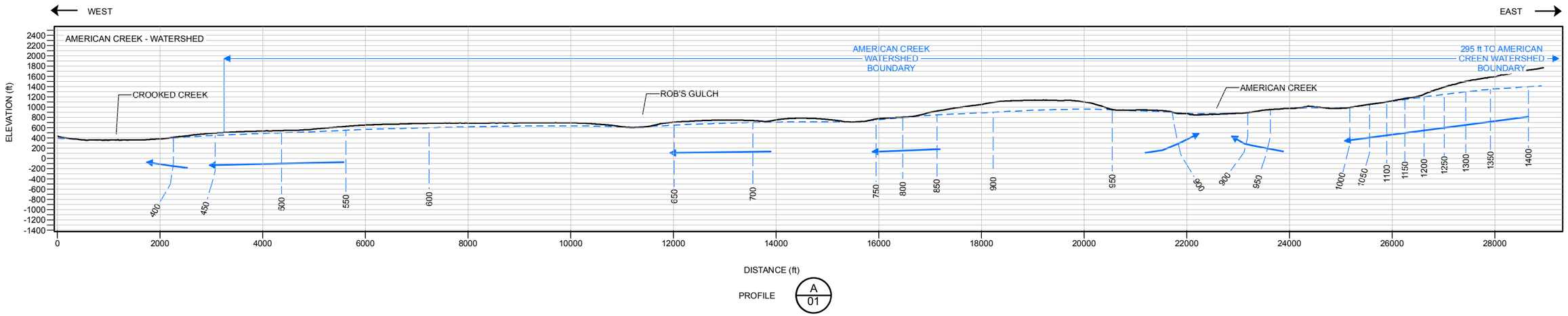

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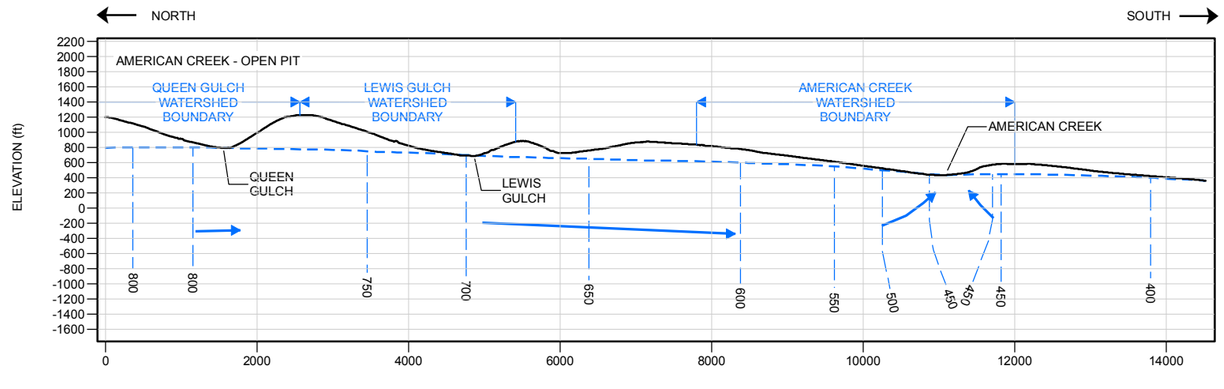

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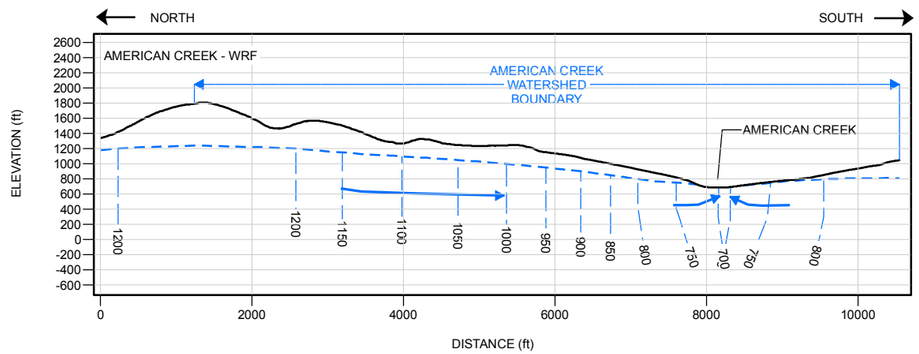

PROFILE C 01

SCALE 1 " = 2,000 '

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FEET

SCALE 1:24,000

200 0 200 400 600 800 1,000

METRES

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LEGEND

- PRE-MINING GROUND SURFACE (CURRENT CONDITIONS)
- HEAD CONTOURS (50 ft)
- PRE-MINING WATER TABLE
- GROUNDWATER FLOW DIRECTION

NOTES:
1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
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TITLE: AMERICAN CREEK CROSS SECTIONS PRE-MINING

PROJECT No.:	FIG No:
0011 300	05

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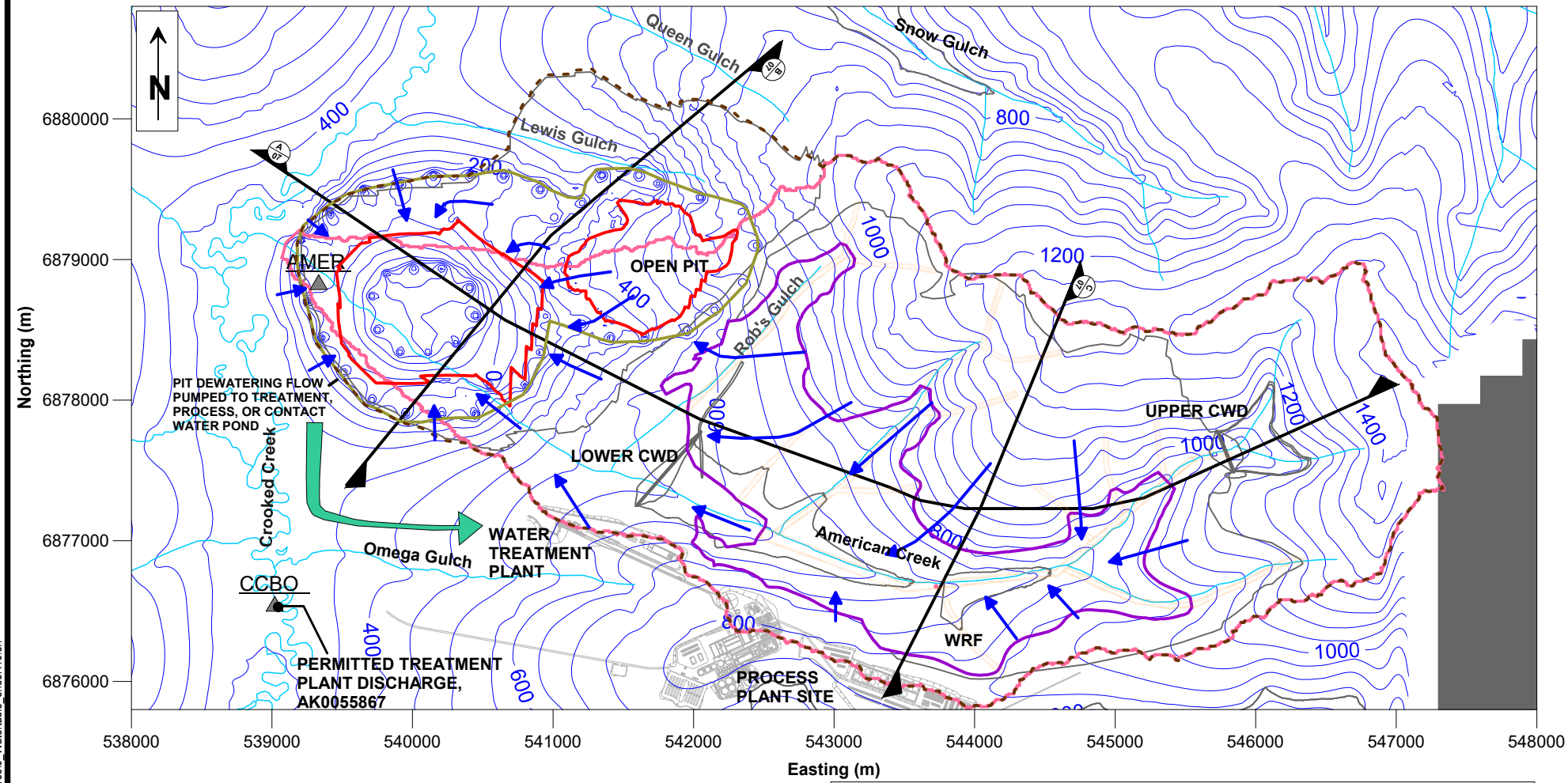

Water Table (ft) 50 ft contours
Creeks
Groundwater Flow Direction
Inactive Cells (in groundwater model)
Stream Monitoring Stations
American Creek Pre-Mining Watershed Boundary
FSU II Pit Outline
Ultimate Facility Footprints and Impoundments
Process Plant Site
WRF Rock Underdrain
American Creek Treatment Works Boundary
Pit dewatering flow pumped to Treatment Plant, Process or Contact Water Pond
Waste Rock Facility Outline
Pit Dewatering System Limits
Cross Section

NOTES:
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PROJECT: DONLIN GOLD PROJECT
HYDROGEOLOGICAL CONDITIONS

TITLE: AMERICAN CREEK YEAR 3 (PRODUCTION) OF MINE LIFE WATER TABLE

PROJECT No.	FIG No.	REV.
0011-300	6	

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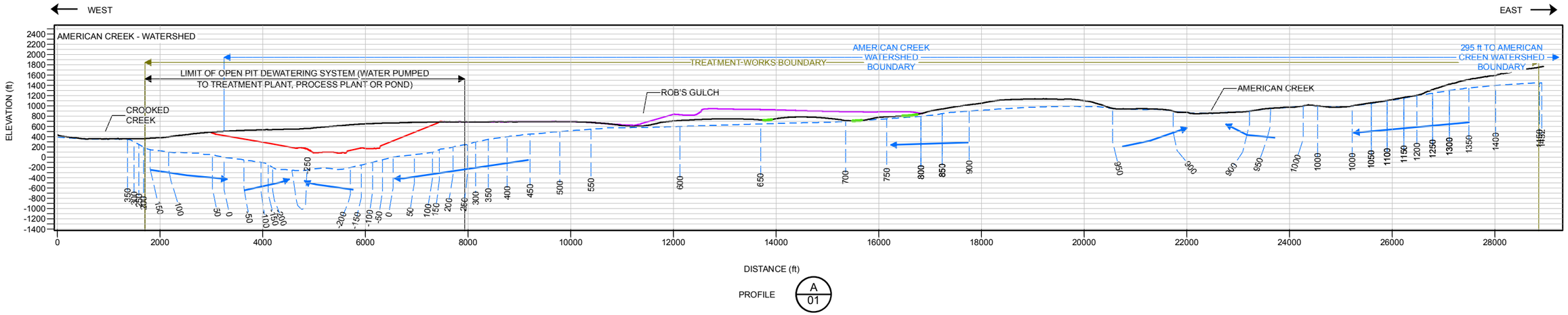

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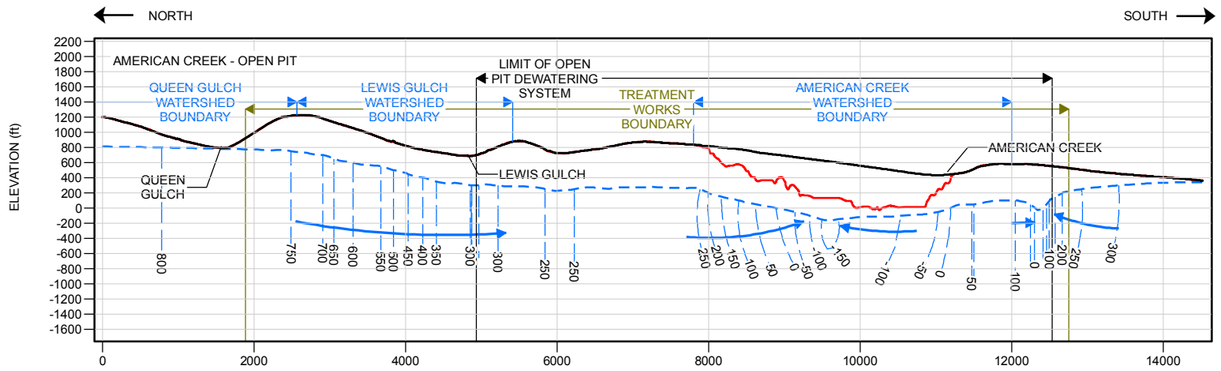

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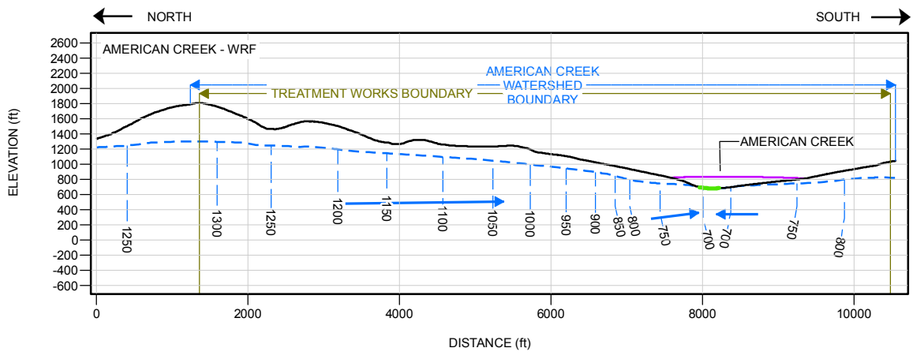

PROFILE C 01

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FEET

SCALE 1:24,000

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METRES

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LEGEND

- PRE-MINING GROUND SURFACE (CURRENT CONDITIONS)
- YEAR 3 OPEN PIT
- YEAR 3 WRF
- WRF ROCK DRAIN
- HEAD CONTOURS (50 ft)
- YEAR 3 WATER TABLE
- GROUNDWATER FLOW DIRECTION

NOTES:
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PROJECT: DONLIN APRIL 2019 TECHNICAL MEMORANDUM: PROJECT SITE TREATMENT WORKS

TITLE: AMERICAN CREEK CROSS SECTIONS FOR YEAR 3 OF PRODUCTION

PROJECT No.:	FIG No:
0011 300	07

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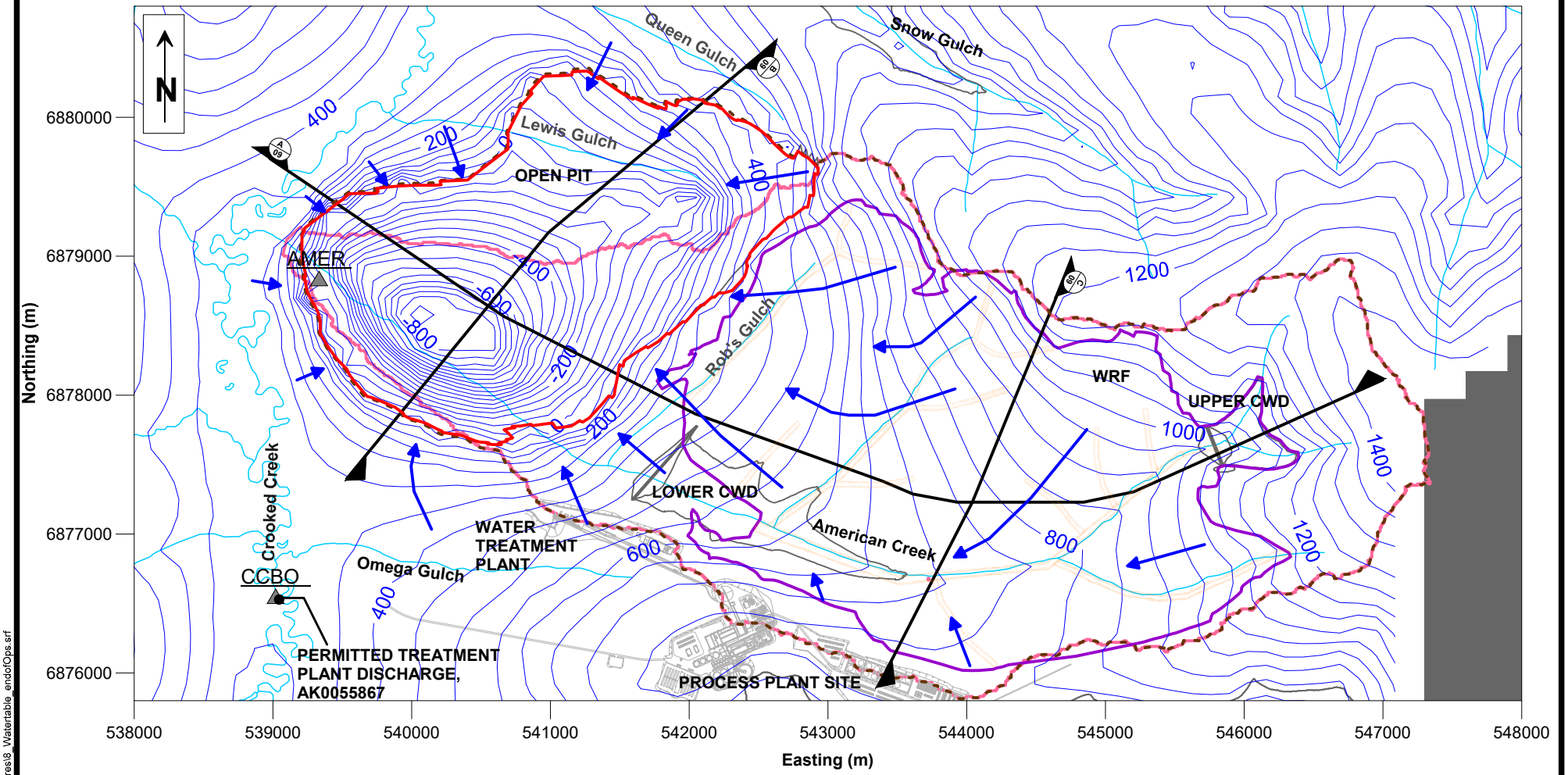

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NAD 1983 UTM Zone 4N

- Water Table (ft) 50 ft contours
- Creeks
- Groundwater Flow Direction
- Inactive Cells (in groundwater model)
- Stream Monitoring Stations
- American Creek Pre-Mining Watershed Boundary
- FSU II Pit Outline
- Ultimate Facility Footprints and Impoundments
- Process Plant Site
- WRF Rock Underdrain
- American Creek Treatment Works Boundary
- Waste Rock Facility Outline
- Cross Section (C 05)

SCALE:	As Shown	DESIGNED:	CT/RT
DATE:	APRIL 2019	CHECKED:	RT
DRAWN:	RT	APPROVED:	TC

BGC ENGINEERING INC.
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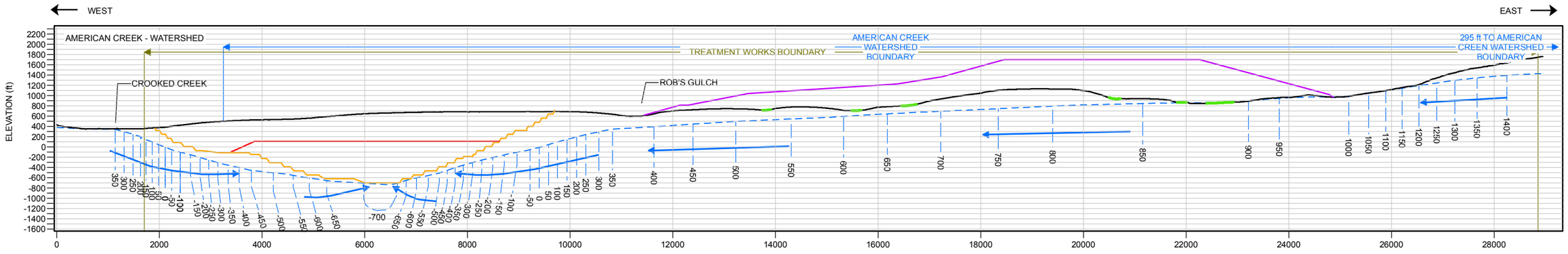
CLIENT: DONLIN GOLD

PROJECT: DONLIN GOLD PROJECT
HYDROGEOLOGICAL CONDITIONS

TITLE: AMERICAN CREEK END OF MINING
WATER TABLE (PRE-CLOSURE)

PROJECT No.	FIG No.	REV.
0011-300	8	

N:\BGC\Projects\0011\300 ARMP and WMP support\WMP support memo\Figures\8_Watertable_endofOps.srf



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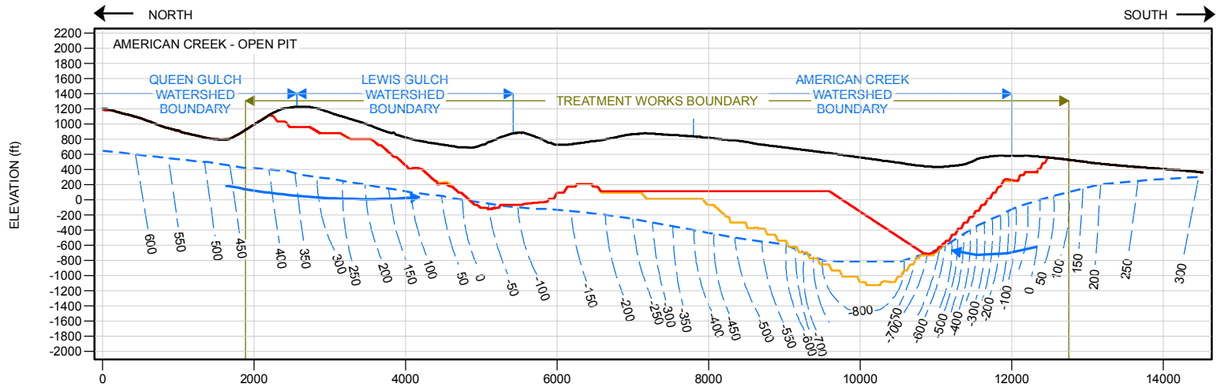

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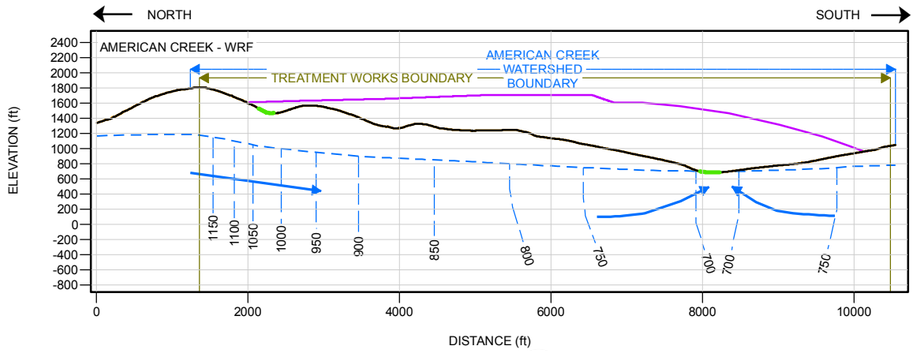

PROFILE C 01

SCALE 1 " = 2,000 '

1,000 0 1,000 2,000 3,000

FEET

SCALE 1:24,000

200 0 200 400 600 800 1,000

METRES

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LEGEND

- PRE-MINING GROUND SURFACE (CURRENT CONDITIONS)
- END OF MINING, OPEN PIT BACKFILLED
- END OF MINING, OPEN PIT WITH NO BACKFILL
- END OF MINING WRF
- WRF ROCK DRAIN
- HEAD CONTOURS (50 ft)
- END OF MINING WATER TABLE
- GROUNDWATER FLOW DIRECTION

NOTES:
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CLIENT: DONLIN GOLD

PROJECT: DONLIN APRIL 2019 TECHNICAL MEMORANDUM: PROJECT SITE TREATMENT WORKS

TITLE: AMERICAN CREEK CROSS SECTIONS END OF MINING (PRE-CLOSURE)

PROJECT No.:	FIG No:
0011 300	09

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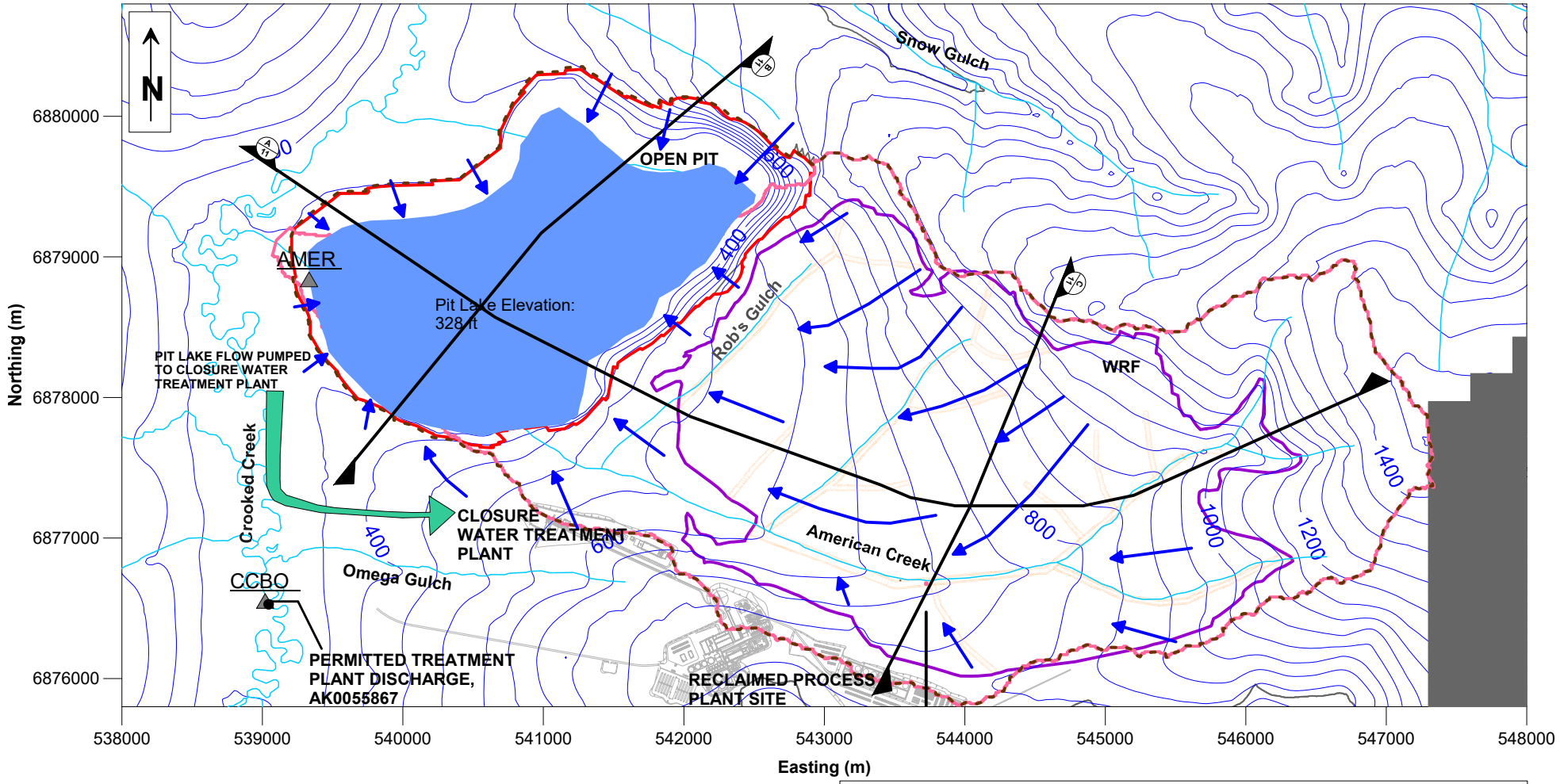


NOTES:
1. THIS FIGURE MUST BE READ IN CONJUNCTION WITH DONLIN GOLD'S MEMO TITLED "DONLIN APRIL 2019 TECHNICAL MEMORANDUM: PROJECT SITE TREATMENT WORKS" AND DATED APRIL 2019.
2. PLANTSITE LAYOUT PROVIDED BY AMEC APRIL 20, 2011.
3. ULTIMATE WASTE ROCK FACILITY AND OPEN PIT PROVIDED BY BARRICK JANUARY 2011.
4. WATER TABLE CONTOURS PRESENTED ARE FROM GROUNDWATER MODEL PRESENTED IN BGC (JULY 2014) "DONLIN GOLD PROJECT NUMERICAL HYDROGEOLOGIC MODEL", DOC NO. ER-0011165.0029A.

NAD 1983 UTM Zone 4N

- Water Table (ft) 50 ft contours
- Creeks
- Groundwater Flow Direction
- Inactive Cells (in groundwater model)
- Stream Monitoring Stations
- American Creek Pre-Mining Watershed Boundary
- FSU II Pit Outline
- Ultimate Facility Footprints and Impoundments
- Process Plant Site
- WRF Rock Underdrain
- American Creek Treatment Works Boundary
- Pit Lake flow pumped to Closure Water Treatment Plant
- Waste Rock Facility Outline
- Cross Section

SCALE:	As Shown	DESIGNED:	RT
DATE:	APRIL 2019	CHECKED:	RT
DRAWN:	RT	APPROVED:	TC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

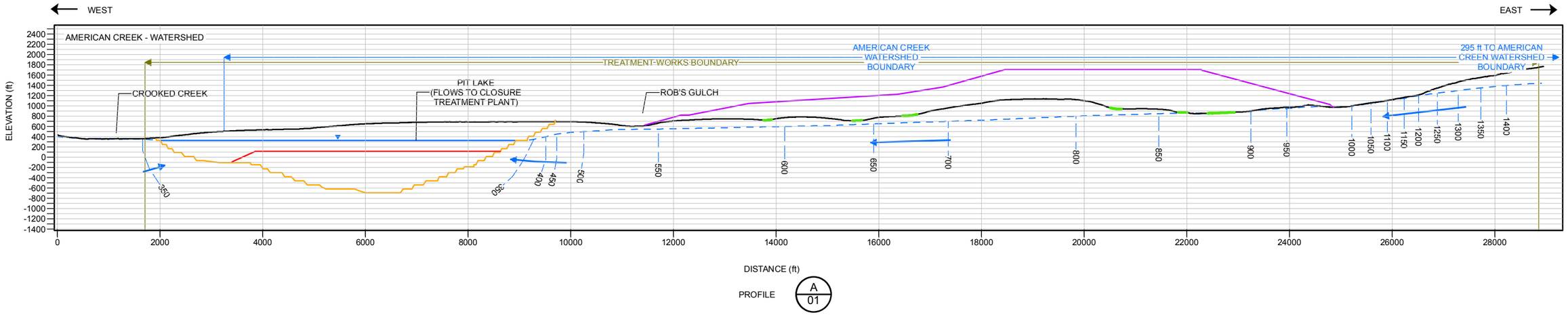
CLIENT: DONLIN GOLD

PROJECT: DONLIN GOLD PROJECT
HYDROGEOLOGICAL CONDITIONS

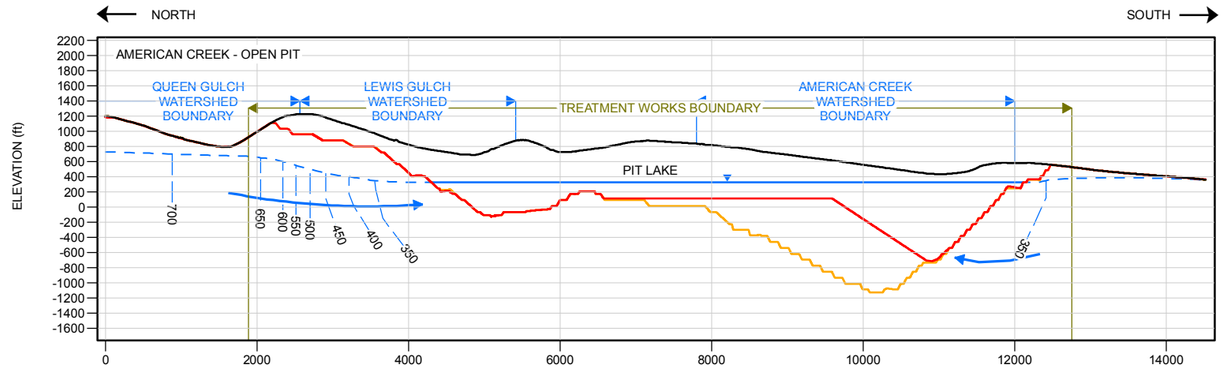
TITLE: AMERICAN CREEK CLOSURE CONDITIONS
WATER TABLE (60 YEARS POST-CLOSURE)

PROJECT No.	FIG No.	REV.
0011-300	10	

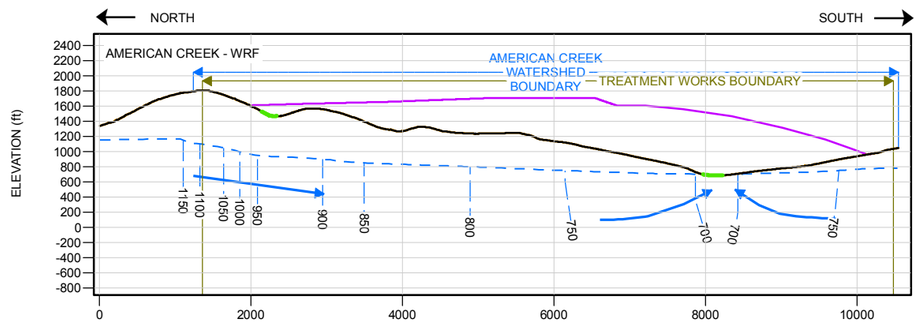
N:\BGC\Projects\0011\300 ARMP and WMP support\WMP support memo\Figures\10_Watertable_Closure.srf



PROFILE A 01



PROFILE B 01



PROFILE C 01

SCALE 1 " = 2,000 '

1,000 0 1,000 2,000 3,000

FEET

SCALE 1:24,000

200 0 200 400 600 800 1,000

METRES

THIS DRAWING MAY HAVE BEEN REDUCED OR ENLARGED. ALL FRACTIONAL SCALE NOTATIONS INDICATED ARE BASED ON ORIGINAL FORMAT DRAWINGS.

LEGEND

- PRE-MINING GROUND SURFACE (CURRENT CONDITIONS)
- END OF MINING, OPEN PIT BACKFILLED
- END OF MINING, OPEN PIT WITH NO BACKFILL
- END OF MINING WRF
- WRF ROCK DRAIN
- HEAD CONTOURS (50 ft)
- END OF MINING WATER TABLE
- GROUNDWATER FLOW DIRECTION
- PIT LAKE ELEVATION (328 ft)

NOTES:
1. ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE NOTED.
2. THIS FIGURE MUST BE READ IN CONJUNCTION WITH DONLIN GOLD'S MEMO TITLED "DONLIN APRIL 2019 TECHNICAL MEMORANDUM: PROJECT SITE TREATMENT WORKS", AND DATED APRIL 2019.
3. BASE TOPOGRAPHIC DATA BASED ON BASED ON LIDAR PROVIDED BY DONLIN, DATED 2004.
4. WATER TABLE SHOWN IS FROM THE GROUNDWATER MODEL PRESENTED IN BGC'S REPORT "DONLIN GOLD PROJECT NUMERICAL HYDROGEOLOGIC MODEL" (JULY 2014). DOC. NO. ER-0011165.0029A. HEAD CONTOURS SHOWN ARE CONCEPTUAL.
5. PROJECTION IS NAD 1983 UTM ZONE 4N FT.
6. UNLESS BGC AGREES OTHERWISE IN WRITING, THIS DRAWING SHALL NOT BE MODIFIED OR USED FOR ANY PURPOSE OTHER THAN THE PURPOSE FOR WHICH BGC GENERATED IT. BGC SHALL HAVE NO LIABILITY FOR ANY DAMAGES OR LOSS ARISING IN ANY WAY FROM ANY USE OR MODIFICATION OF THIS DOCUMENT NOT AUTHORIZED BY BGC. ANY USE OF OR RELIANCE UPON THIS DOCUMENT OR ITS CONTENT BY THIRD PARTIES SHALL BE AT SUCH THIRD PARTIES' SOLE RISK.

SCALE:	AS SHOWN
DATE:	APR 2019
DRAWN:	LL
CHECKED:	RT
APPROVED:	TC

BGC ENGINEERING INC.
AN APPLIED EARTH SCIENCES COMPANY

CLIENT: DONLIN GOLD

PROJECT: DONLIN APRIL 2019 TECHNICAL MEMORANDUM: PROJECT SITE TREATMENT WORKS

TITLE: AMERICAN CREEK CROSS SECTIONS CLOSURE CONDITIONS WATER TABLE (60 YEARS POST CLOSURE)

FIG No: 0011 300

FIG No: 11

X:\Projects\0011\300\GIS\Production\Memo\20190325_Hydrogeological_Conditions\11_American_Creek_Cross_Section_Closure_Conditions_60_yr_post_closure.mxd Date: Friday, April 12, 2019 Time: 3:42 PM