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June 25, 2014 (REV_02 July 9, 2014)[1,2]

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Sent by email

Subject: ConocoPhillips Alaska, Inc. Greater Mooses Tooth 1 Alternative D2 (Roadless) Air Quality Impact Analysis

Dear Bridget:

This letter, attachment and electronic enclosures comprise the near-field and far-field ambient air quality impact analysis (AQIA) for the ConocoPhillips Alaska, Inc. (CPAI) Greater Moose's Tooth Wellsite 1 (GMT1) Alternative D2. In general, the only difference between Alternative D2 and Alternative D (referred to as Alternative D1 in this letter) described in the Draft Supplemental Environmental Impact Statement (DSEIS) is that Alternative D1 assumes developmental drilling will occur all year and Alternative D2 assumes seasonal drilling.

Table 1 details the major items that differentiate Alternative D1 from Alternative D2 and potentially impact the project emissions inventory and AQIA. The remainder of this letter summarizes how these differentiators were incorporated into the emissions inventory and air quality impact analysis which are further detailed in the following AQIA components:

- Alternative D2 Emissions Inventory: Transmitted digitally with this letter as a set of spreadsheets.
- Alternative D2 Near-Field Ambient Air Quality Impact Analysis: Included as Attachment A.
- Alternative D2 Model Input/Output Files: Transmitted digitally with this letter.
- Alternative D2 Far-Field Ambient Air Quality Impact Analysis: Reference the qualitative analysis described below.

Emissions Inventory

GMT1 Alternative D2 is very similar to Alternative D1 with the exception that drilling is assumed to occur during an 80 day period each year. Therefore, the emissions inventory developed for Alternative D1 was revisited and revised where necessary to account for this seasonality.

The revised emissions inventory has been transmitted digitally with this letter. Similar to the emissions inventory transmitted for Alternative A and D1, that emissions inventory is detailed in a set of activity-specific workbooks. The information in the activity-specific workbooks are then rolled up into two

[1] REV_01 July 7, 2014: The document was revised only to correct the original subject line which read "Revisions to the Air Quality Impact Analysis for Greater Mooses Tooth 1 Alternative A".
[2] REV_02 July 9, 2014: Attachment A, Table A-6 and Table A-7 were revised. The original version presented impacts from Alternative A and should have presented Alternative D1 results.

Table 1 Differentiator from GMT1 Alternative D1 Potentially Affecting the Emissions Inventory or Ambient Air Quality Impact Analysis

Differentiator from GMT1 Alternative D1		Ramification
1	Ice roads are only expected to be reliable enough to support drilling from February 1st through April 20th each year (80 days). For the purposes of the emissions inventory and modeling, this was expanded through the end of April (Active Drilling Season) to avoid providing estimates for partial months.	As will be described, this has little impact on short-term emissions, but will decrease annual emissions.
2	Ice road traffic associated with hauling drilling supplies will decrease since materials will not need to be stockpiled to support year-around drilling.	As will be described, this has little impact on short-term emissions, but will decrease annual emissions.
3	Cargo flights into GMT1 will decrease since all drilling can be supported via ice road.	As will be described, this has little impact on short-term emissions, but will decrease annual emissions.
4	The drill rig will be removed from the GMT1 pad after every season.	Limits the number of wells that can be drilled during a particular season.
5	Less than 2 wells will typically be drilled during a season.	Drilling will occur every season for 22 years to allow for drilling all project wells.
6	The first year of drilling will be delayed by one year since construction of the GMT1 wellsite will not be completed prior to the end of the Active Drilling Season. This results in no overlap between pad and infrastructure construction and drilling.	Decrease in short-term and long-term emissions during the initial phases of developmental drilling.

workbooks: 1) a workbook which provides the overall project emissions summary by month and rolling 12-month period (the emissions model), and 2) a workbook that details the emissions modeled to determine worst-case project air quality impacts (input to the air quality impact model).

Because of the similarity between Alternative D1 and D2, only some of the activity-specific workbooks required revising. **Table 2** provides the list of workbooks that comprise the emissions inventory, the purpose of each workbook and the status (i.e., revised from Alternative D1, new, or unchanged).

Emissions Inventory for Modeling

Based on factors including the project construction and operation schedule (and any overlapping therein); the location of GMT1 Project Roadless Alternative-related emissions and their proximity to ambient air or sensitive receptors; and the relative magnitude and type of emissions for each activity, emissions for use in dispersion modeling of criteria pollutants for Alternative D1 were developed for four operational scenarios expected to produce the highest air quality impacts when modeled. These same activities were also considered worst-case activities to represent Alternative D2 impacts:

- Construction Blasting (Clover Material Source),
- Pad Construction,
- Well Intervention, and
- Infill Drilling.

The amount of drilling activity did not factor into the modeled criteria pollutant emissions calculations for the Clover Material Source or Pad Construction modeling scenarios because these scenarios do not include emission sources specifically associated with drilling. Therefore, the Alternative D1 modeled emissions inventory for those scenarios is considered equal to Alternative D2.

Only the Well Intervention and Infilling Drilling modeling scenarios include emission sources associated with drilling. Therefore, criteria pollutant emissions for only these scenarios were updated. The details of the updated modeled emissions inventory can be found in the digital submittal transmitted separately (reference the spreadsheet titled “GMT1_Emissions_Parameters for Modeling Scenarios_RoadlessD2_ Ver1-0” shown in **Table 2**).

The following summarizes the impacts of the reduced drilling schedule of Alternative D2 on the previously calculated modeled emissions for Alternative D:

Short-Term (less than or equal to 24 hours) Emissions Updates

- Reduced cargo aircraft flights. – Drilling will only occur when there is an ice road present and capable of supporting the loads, and drilling will be directly supported by ice road; therefore, supplies will not need to be transported to GMT1 by air during drilling.
- Reduced amount of fugitive dust and tailpipe emissions due to reduced numbers of vehicles on roads. – For Alternative D2, materials are only required to be trucked in to support the current seasonal drilling activity. Traffic included in Alternative D2 to stockpile materials during the ice road season and then to truck the stockpiled materials from the storage pad to the wellsite are not necessary for Alternative D2.

Table 2 Description of Workbooks Comprising the Alternative D2 Emissions Inventory

Workbook Name (.xlsx or .xlsm)	Description	Status
GMT1_Emissions_Inventory_Summary_for Printing	Emissions from each of the activity-specific workbooks is rolled up and summarized in this workbook which presents project emissions overtime.	Revised
GMT1_Aircraft_Inventory_Emissions_RoadlessD2_Ver1-0	Aircraft emissions	Revised
GMT1_Construction_Equipment_Emissions_RoadlessD2_Ver1-0	Emissions associated with GMT1 wellsite construction. Includes the Clover Material Source	Unchanged
GMT1_Drilling_Inventory_Emissions_RoadlessD2_Ver1-0	Drill rig-specific emissions	Revised
GMT1_Fugitive_Dust_Emissions_RoadlessD2_Ver1-0	Fugitive dust emissions associated with exposed and disturbed areas	Revised
GMT1_Ice_Road_Emissions_RoadlessD2_Ver1-0	Emissions associated with ice road construction	Unchanged
GMT1_Mobile_Drilling_Inventory_Emissions_RoadlessD2_PL_D_Ver1-0	Emissions from on-road traffic traveling between the wellsite and storage pad supporting drilling	Revised
GMT1_Mobile_Drilling_Inventory_Emissions_RoadlessD2_PL_OffS_Ver1-0	Emissions from on-road traffic traveling between the wellsite and storage pad supporting well development when drilling is not occurring.	New
GMT1_Mobile_Drilling_Inventory_Emissions_RoadlessD2_Ver1-0	Emissions from on-road traffic traveling between the Alpine CPF and GMT1 to support drilling.	Revised
GMT1_Permanent_Operations_Criteria_and_GHG_RoadlessD2_PadLength_Ver1-0	Tailpipe emissions for road travel between the GMT1 wellsite pad and the airstrip pad.	Unchanged
GMT1_Permanent_Operations_Criteria_and_GHG_RoadlessD2_Ver1-0	Emissions from permanent stationary sources and tailpipe emissions for road travel between the GMT1 wellsite pad and the Alpine CPF.	Revised
GMT1_Permanent_Operations_HAP_ Emissions_RoadlessD2_Ver1-0	HAP emissions from permanent stationary sources and tailpipe emissions for road travel between the GMT1 wellsite pad and the Alpine CPF.	Revised
GMT1_Well_Flowback_Emissions_RoadlessD2_Ver1-0	Emissions from flowing new wells to open tanks.	Unchanged
GMT1_Emissions_Parameters for Modeling Scenarios_RoadlessD2_Ver1-0	Spreadsheet detailing modeled emission rates.	Revised

- No changes to the short-term operation of other sources associated with drilling. – Short-term dispersion modeling is focused on capturing the worst-case set of emissions for the averaging period modeled. For periods less than or equal to 24 hours, it is assumed that the remainder of emission sources associated with drilling will be operated in the same manner as Alternative D regardless of season. Reducing drilling activities from 12 months to 3 months on a yearly basis does not affect the worst-case operating assumptions on a short-term basis. Therefore, the worst-case emissions that were developed for these sources for Alternative D1 remain valid for Alternative D2.

Annual Emissions Updates

- Reduced cargo aircraft flights. – For Alternative D1, cargo flights were needed to transport materials to the wellsite during periods of the year without ice road access. Because drilling for Alternative D2 is only occurring during periods with usable ice roads, there is no roadless drilling period, thus fewer cargo flights are required on an annual basis.
- Reduced amount of fugitive dust and tailpipe emissions due to reduced numbers of vehicles on roads. – Because stockpiling activities during the roadless season that were included in Alternative D1 are not needed in Alternative D2, fewer vehicles are required resulting in fewer emissions on an annual basis.
- Reduced operation of (non-permanent) stationary drilling sources. – Operation of the drill rig, boilers, cement pumps, and heaters will decrease from 12 months to 3 on an annual basis.
- Reduced operation non-mobile drilling support equipment. – Operation of the non-mobile drilling support equipment will decrease from 12 months to 3 on an annual basis.
- No changes to the permanent routine operation sources. – Operation of permanent stationary sources (i.e., production heater) remained at 12 months, similar to Alternative D1.

Modeling Methodology

The near-field ambient air quality impact analysis for Alternative D2 was conducted in the same manner as Alternative D1, and utilized the USEPA's Guideline[3] model AERMOD (Version 12345). The following high-level overview of dispersion modeling assumptions used to predict impacts from Alternative D2 were identical to those used for Alternative D1, both for criteria and air toxic pollutants:

- Regulatory model settings were utilized, with the exception of the non-regulatory Ozone Limiting Method (OLM) option, which was used for modeling nitrogen dioxide (NO_2) concentration estimates,
- Modeling used 5 years (2008-2012) of meteorological data from Nuiqsut (surface) and Barrow (upper air),
- Background pollutant concentrations used in the cumulative impact analysis were collected from 2010-2012 from the Nuiqsut Ambient Air Quality Monitoring Station,
- Identical in-stack ratios for refined NO_2 modeling,
- Same implementation of hourly varying emissions for 1-hour NO_2, 24-hour $PM_{2.5}$, and 24-hour PM_{10} to more appropriately account for the short duration of some activities over the modeled 5-year period,

[3] U.S. Environmental Protection Agency (USEPA). 2005. Guideline on Air Quality Models. Updated 2005. Environmental Protection Agency Office of Air Quality Planning and Standards, Research Triangle Park, North Carolina. Published in Federal Register, Vol. 70, No. 216. November 9, 2005.

- Identical receptor locations (including the use of a 2 kilometer receptor grid as well as locating a receptor to represent the closest Nuiqsut resident),
- Identical emission source layout, and
- Same assumptions for the air toxics impact assessment.

Near-Field Criteria Pollutant Cumulative Impact Analysis

Consistent with the revisions to emissions mentioned above, updated dispersion modeling was performed for the Infill Drilling and Well Intervention scenarios, respectively. **Table A-4** of Attachment A provides model predicted criteria pollutant impacts for activities associated with the Infill Drill scenario. Alternative D2 impacts for all pollutants and averaging periods (with the exception of 1-hour NO_2) are the same or slightly less than Alternative D1 impacts. Similar to Alternative D1, the table indicates an exceedance of the NAAQS/AAAQS for 24-hour PM_{10}, which is attributed to fugitive dust associated with windblown and vehicular/aircraft disturbance of dirt on the pad, hangar, and runway located at the airstrip.

1-hour NO_2 impacts for Alternative D2 are larger than that for D1 and exceed the NAAQS/AAAQS. This is explained as follows:

- The drill rig stationary sources are most culpable for the impacts.
- While there are no differences in short-term emissions for drill rig sources between Alternatives D1 and D2, the 1-hour NO_2 modeling included a refinement that incorporated the actual drilling profile (i.e., activity over time) which is different for each alternative. Alternative D1 assumed the drill rig sources operated continuously for 14 months to drill the first 9 wells, and then did not operate for the remaining 46 months of the modeled 5-year period. Alternative D2 assumed the drill rig sources operated for the 3 months of the Active Drilling Season, and then did not operate for the remaining 9 months of each of the 5 years modeled. The key point to highlight is that for Alternative D1, continuous drilling occurred over a shorter portion of the total 5-year modeling period leaving 3 modeled years with no drilling activity occurring.
- 1-hour NO_2 NAAQS compliance is based on the 5-year average 98th percentile of the annual distribution of 1-hour daily maximum modeled concentrations. Developing a 5-year average value factors in more years with zero concentration from the drill rig sources for Alternative D (3 years of zero impacts from drilling) than for Alternative D2 (no years with zero impacts from drilling). **Table 3** illustrates this point. Note that for Alternative D1, after the first 2 years, impacts decrease since drilling is complete in the first 14 months (1.17 years). The same in not the case for Alternative D2 which has drilling occurring in all 5 years to complete the same number of wells.

Table 3 Yearly 1-Hour NO_2 Modeled Concentrations for Alternatives D1 and D2

Alternative	98th Percentile of the Annual Distribution of 1-Hour Daily Maximum Concentrations ($\mu g/m^3$)					5-Year Average
	Year 1	Year 2	Year 3	Year 4	Year 5	
D1	185.5	135.1	89.1	101.5	76.9	117.6
D2	176.6	167.7	158.4	193.1	172.4	173.7

Table A-5 of Attachment A provides model predicted criteria pollutant impacts for activities associated with the Well Intervention scenario. For Alternative D2, impacts for all pollutants and averaging periods are the same or slightly less than Alternative D1 impacts. The table shows an exceedance of the 24-hour PM_{10} NAAQS/AAAQS, which is attributed to the same activities as was the culprit in the Infill Drilling scenario and is consistent with Alternative D1.

Tabulated impacts are also provided for the Access Road and Pad Construction and Clover Material Source scenarios in **Table A-6** and **Table A-7**, respectively. As previously discussed, and reflected in these tables, the impacts predicted for Alternative D2 are identical to those for Alternative D1 since these scenarios are not impacted by drilling.

For the three scenarios with activities on or near the GMT1 wellsite as well as the Clover Material Source activity, dispersion modeling was also conducted using a single receptor representing the community of Nuiqsut. **Table A-8** of Attachment A provides the results which are identical to that of Alternative D1. The table indicates compliance with the NAAQS/AAAQS for all scenarios, for all criteria pollutants and averaging periods.

Near-field dispersion modeling for criteria pollutants indicates that, in nearly all cases, the seasonal drilling operation associated with Alternative D2 results in equal or slightly lower air quality impacts than that for Alternative D1. The exception is for 1-hour NO_2 for Infill Drilling, where the larger impacts of Alternative D2 can be attributed to the persistent presence of a drill rig year after year and the fact that the design concentration is based on a 5-year average value.

Near-Field Criteria PSD Class II Impact Analysis

The results of the GMT1 Project Alternative D2 criteria pollutant increment analysis for the Infill Drilling scenario are compared to the PSD Class II Increments in **Table A-9** of Attachment A. Consistent with the methodology used for Alternative D1, the Infill Drilling scenario was selected because all other scenarios represent temporary activities not typically assessed as part of an increment analysis. All modeled concentrations are equal to or less than those found in the increment analysis for Alternative D1.

Near Field Air Toxics Impact Analysis

Consistent with dispersion modeling performed for Alternative D1, dispersion modeling of air toxics was performed for the Infill Drilling scenario. **Table A-10** provides the acute exposure assessment as well as the non-carcinogenic long-term exposure assessment at the wellsite pad edge. Maximum modeled 1-hour and annual concentrations for Alternative D2 were equal to or slightly less than those for Alternative D1 for all pollutants. Both 1-hour and annual concentrations were below the criteria levels for each of the air toxics evaluated.

An air toxics impact analysis was also performed for the single receptor representing the Nuiqsut Community. **Table A-11** shows that maximum modeled 1-hour and annual concentrations were below the criteria levels at the Nuiqsut Community receptor for each of the air toxics evaluated. Similar to the results at the pad edge, both 1-hour and annual concentrations for Alternative D2 were equal to or slightly less than those for Alternative D1.

Consistent with Alternative D, the long-term cancer risk assessment was carried out using annual GMT1 impacts predicted within the community of Nuiqsut. **Table A-12** shows that the total cancer risk for both the most likely exposure (MLE) and the maximally exposed individual (MEI) scenarios are less than that found for Alternative D1, and are less than 1.0E-06 which represents a less than one-in-one-million cancer risk.

Far-Field Dispersion Model Impacts and Conclusions

Given far-field Alternative A and D1 project-only impacts for air quality and Air Quality Related Values (AQRVs) were negligible at all Class II areas analyzed, and modeled emissions for Alternative D2 were equal to or less than those modeled for Alternative D1, Alternative D2 project-only far-field impacts will be equally negligible. This conclusion is easily supported without modeling considering the following:

Project-only impacts predicted for Alternative A and D2 are between 1 and 4 orders of magnitude smaller than the background concentration used for the air quality cumulative impact analysis. Therefore, the

Alternative A and D1 ambient air quality impact analyses demonstrate that the cumulative impact analysis is not sensitive to project emissions and indicate that the Alternative A and D1 conclusions are equally equivalent to Alternative D2.

Project-only visibility and sulfur and nitrogen deposition at each of the Class II areas analyzed were well below applicable thresholds (i.e., between 0 and 7% of applicable standards) and considered negligible for both Alternative A and D1. Similar to the far-field air quality impact analysis, a comparison of cumulative impacts (i.e., project plus Reasonably Foreseeable Development (RFD) sources) to AQRVs clearly indicates that RFD, and not project, sources dominate the cumulative impact analysis. Because of the lack of sensitivity of impacts to AQRVs from project-only emissions, and the small changes in modeled emissions between Alternative D2 and D1, Alternative D1 conclusions are equally equivalent to Alternative D2.

This concludes our summary of the GMT1 Alternative D2 emissions inventory and ambient air quality impact analysis. Please refer to Attachment A for a comprehensive list of project model predicted impacts, and the digital files that accompany this letter for the emissions inventory and supporting dispersion modeling input and output files. Please don't hesitate to contact us if you require additional details.

Sincerely,

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cc: Lynn DeGeorge (ConocoPhillips Alaska, Inc.)
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Attachment: Air Quality Impact Analysis Summary for GMT1 Alternative D2

Enclosures: Alternative D2 Emissions Inventory: Transmitted digitally along with this letter
Alternative D2 Model Input/Output Files: Transmitted digitally along with this letter.

Attachment A
Air Quality Impact Analysis Summary for GMT1 Alternative D2

Air Quality Impact Analysis Summary for ConocoPhillips Alaska, Inc. Greater Mooses Tooth – Alternative D2

Summary Air Quality Impacts

Summaries of near-field ambient air quality impacts predicted for the Greater Mooses Tooth 1 (GMT1) Project Alternative D2 are presented in the tables below. These include an analysis of impacts compared to the National and Alaska Ambient Air Quality Standards (NAAQS/AAAQS), Prevention of Significant Deterioration (PSD) Class II Increments and applicable thresholds for evaluating impacts from air toxics.

The analysis summarized below was conducted according to the methodologies presented above in the cover letter.

Table A-4 GMT1 Project Cumulative Impacts Compared to Established Ambient Criteria for Infill Drilling – Alternative D2

Pollutant	Averaging Period	Rank [1]	Maximum Model Predicted Concentration (µg/m^3)	Ambient Background (µg/m^3)	Total (µg/m^3)	NAAQS/ AAAQS (µg/m^3)	% of NAAQS/ AAAQS
CO	1-hour	H2H	861	1488	2,349	40,000	6%
	8-hour	H2H	420	1259	1,680	10,000	17%
SO_2	1-hour	99th	3.87	7.7	11.5	196	6%
	3-hour	H2H	3.84	18	21	1,300	2%
	24-hour	H2H	3.23	6.8	10	365	3%
	Annual	MAX	0.43	0.34	0.77	80	1%
NO_2	1-hour	98th	174	38	211	188	**112%**
	Annual	MAX	17.8	2.9	21	100	21%
PM_{10}	24-hour	H6H	104	48	152	150	**102%**
$PM_{2.5}$	24-hour	98th	27.4	7.1	35	35	99%
	Annual	MAX	4.86	2.2	7.1	12	59%

[1] H2H: Highest Second Highest value across all five modeled years.

H6H: Highest Sixth Highest value across five continuous modeled years.

98th: Average across all five modeled years of the 98th percentile of 1-hour daily maximum predicted concentrations (1-hour NO_2) or of 24-hour concentrations (24-hour $PM_{2.5}$).

99th: Average across all five modeled years of the 99th percentile of 1-hour daily maximum predicted concentrations.

MAX: Maximum period impact from among all individual modeled years.

Table A-5 GMT1 Project Cumulative Impacts Compared to Established Ambient Criteria for Well Intervention – Alternative D2

Pollutant	Averaging Period	Rank [1]	Maximum Model Predicted Concentration (µg/m^3)	Ambient Background (µg/m^3)	Total (µg/m^3)	NAAQS/ AAAQS (µg/m^3)	% of NAAQS/ AAAQS
CO	1-hour	H2H	495	1488	1,983	40,000	5%
	8-hour	H2H	328	1259	1,587	10,000	16%
SO_2	1-hour	99th	3.87	7.7	12	196	6%
	3-hour	H2H	3.84	18	21	1,300	2%
	24-hour	H2H	3.23	6.8	10	365	3%
	Annual	MAX	0.42	0.3	0.76	80	1%
NO_2	1-hour	98th	126.6	38	164	188	87%
	Annual	MAX	9.8	2.9	13	100	13%
PM_{10}	24-hour	H6H	104.3	48	152	150	**102%**
$PM_{2.5}$	24-hour	98th	27.4	7.1	35	35	99%
	Annual	MAX	4.81	2.2	7.0	12	58%

[1] H2H: Highest Second Highest value across all five modeled years.

H6H: Highest Sixth Highest value across five continuous modeled years.

98th: Average across all five modeled years of the 98th percentile of 1-hour daily maximum predicted concentrations (1-hour NO_2) or of 24-hour concentrations (24-hour $PM_{2.5}$).

99th: Average across all five modeled years of the 99th percentile of 1-hour daily maximum predicted concentrations.

MAX: Maximum period impact from among all individual modeled years.

Table A-6 GMT1 Project Cumulative Impacts Compared to Established Ambient Criteria for Pad and Access Road Construction – Alternative D2 (Identical to Alternative D1)

Pollutant	Averaging Period	Rank [1]	Maximum Model Predicted Concentration ($\mu g/m^3$)	Ambient Background ($\mu g/m^3$)	Total ($\mu g/m^3$)	NAAQS/ AAAQS ($\mu g/m^3$)	% of NAAQS/ AAAQS
CO	1-hour	H2H	1,820	1,488	3,308	40,000	8%
	8-hour	H2H	1,206	1,259	2,465	10,000	25%
SO_2	1-hour	99th	3.99	7.7	12	196	6%
	3-hour	H2H	4.10	18	22	1,300	2%
	24-hour	H2H	2.13	6.8	8.9	365	2%
	Annual	MAX	0.113	0.34	0.45	80	1%
NO_2	1-hour	98th	166	AERMOD[2]	166	188	88%
	Annual	MAX	28.5	2.9	31	100	31%
PM_{10}	24-hour	H6H	104	48	152	150	**102%**
$PM_{2.5}$	24-hour	98th	36.8	7.1	44	35	**125%**
	Annual	MAX	6.09	2.2	8.3	12	69%

[1] H2H: Highest Second Highest value across all five modeled years.

H6H: Highest Sixth Highest value across five continuous modeled years.

98th: Average across all five modeled years of the 98th percentile of 1-hour daily maximum predicted concentrations (1-hour NO_2) or of 24-hour concentrations (24-hour $PM_{2.5}$).

99th: Average across all five modeled years of the 99th percentile of 1-hour daily maximum predicted concentrations.

MAX: Maximum period impact from among all individual modeled years.

[2] Seasonally varying background was included as an input to the model run; therefore, a single ambient background concentration was not added in order to determine the cumulative impact.

Table A-7 GMT1 Project Cumulative Impacts Compared to Established Ambient Criteria for Activities within the Clover Material Source – Alternative D2 (Identical to Alternative D1)

Pollutant	Averaging Period	Rank [1]	Maximum AERMOD Predicted Concentration ($\mu g/m^3$)	Ambient Background ($\mu g/m^3$)	Total ($\mu g/m^3$)	NAAQS/ AAQS ($\mu g/m^3$)	% of NAAQS/ AAAQS
CO	1-hour	H2H	1,884	1,488	3,373	40,000	8%
	8-hour	H2H	1,227	1,259	2,487	10,000	25%
SO_2	1-hour	99th	16.0	7.7	24	196	12%
	3-hour	H2H	28.3	18	46	1,300	4%
	24-hour	H2H	6.57	6.8	13	365	4%
	Annual	MAX	0.116	0.34	0.46	80	1%
NO_2	1-hour	98th	145	38	183	188	97%
	Annual	MAX	38.4	2.9	41	100	41%
PM_{10}	24-hour	H6H	52.4	48	101	150	67%
$PM_{2.5}$	24-hour	98th	28.3	7.1	35	35	**101%**
	Annual	MAX	3.97	2.2	6.2	12	51%

[1] H2H: Highest Second Highest value across all five modeled years.

H6H: Highest Sixth Highest value across five continuous modeled years.

98th: Average across all five modeled years of the 98th percentile of 1-hour daily maximum predicted concentrations (1-hour NO_2) or of 24-hour concentrations (24-hour $PM_{2.5}$).

99th: Average across all five modeled years of the 99th percentile of 1-hour daily maximum predicted concentrations.

MAX: Maximum period impact from among all individual modeled years.

Table A-8 GMT1 Project Cumulative Impacts Compared to Established Ambient Criteria at the Community of Nuiqsut – Alternative D2

Pollutant	Averaging Period	Rank	Maximum AERMOD Predicted Concentrations (µg/m^3)					Ambient Background (µg/m^3)	Total (µg/m^3)	NAAQS/ AAAQS (µg/m^3)	% of NAAQS/ AAAQS
			Infill Drilling	Well Interv.	Pad & Access Road Constr.	Clover Material Source	Max				
CO	1-hour	H2H	27	24	81	176	176	1488	1,664	40,000	4%
	8-hour	H2H	4.3	3.5	10	26	26	1259	1,286	10,000	13%
SO_2	1-hour	99th	0.067	0.054	0.06	1.40	1.40	7.7	9.1	196	5%
	3-hour	H2H	0.043	0.037	0.08	1.08	1.08	18	19	1,300	1%
	24-hour	H2H	0.0080	0.0070	0.012	0.19	0.19	6.8	7.0	365	2%
	Annual	MAX	0.00026	0.00021	0.00009	0.0011	0.0011	0.3	0.34	80	0%
NO_2	1-hour	98th	7.1	9.1	28	42	42	38	80	188	43%
	Annual	MAX	0.021	0.011	0.026	0.11	0.11	2.9	3.0	100	3%
PM_{10}	24-hour	H6H	0.18	0.19	0.64	1.12	1.12	48	49	150	33%
$PM_{2.5}$	24-hour	H1H	0.05	0.06	0.53	0.74	0.74	7.1	7.8	35	22%
	Annual	MAX	0.0080	0.0071	0.0084	0.0062	0.0084	2.2	2.2	12	18%

[1] H2H: Highest Second Highest value across all five modeled years.

H6H: Highest Sixth Highest value across five continuous modeled years.

98th: Average across all five modeled years of the 98th percentile of 1-hour daily maximum predicted concentrations (1-hour NO_2) or of 24-hour concentrations (24-hour $PM_{2.5}$).

99th: Average across all five modeled years of the 99th percentile of 1-hour daily maximum predicted concentrations.

MAX: Maximum period impact from among all individual modeled years.

Table A-9 GMT1 Project Impacts Compared to the Class II PSD Increments for Infill Drilling – Roadless Alternative – Alternative D2

Pollutant	Averaging Period	Rank [1]	Maximum Model Predicted Concentration (µg/m^3)	Class II PSD Increments
SO_2	3-hour	H2H	3.8	512
	24-hour	H2H	3.2	91
	Annual	MAX	0.43	20
NO_2	Annual	MAX	18	25
PM_{10}	24-hour	H2H	112	30
	Annual	MAX	36	17
$PM_{2.5}$	24-hour	H2H	73	9
	Annual	MAX	5.4	4

[1] H2H: Highest Second Highest value across all five modeled years.
MAX: Maximum period impact from among all individual modeled years.

Table A-10 Air Toxics Acute Exposure Assessment and Long-term Non-carcinogenic Exposure Assessment at the GMT1 Pad Edge – Alternative D2

Pollutant	REL (1-hour) (µg/m^3)	Maximum Modeled 1-hour Concentration (µg/m^3)	Non-carcinogenic RfC[3] (Annual) (µg/m^3)	Maximum Modeled Annual Concentration (µg/m^3)
Benzene	1,300 [1]	3.3	30	0.094
Ethyl benzene	350,000 [2]	0.52	1,000	0.013
Formaldehyde	55 [1]	7.9	9.8	0.38
n-Hexane	390,000 [2]	69	700	0.27
Toluene	37,000 [1]	2.6	5,000	0.031
Xylene	22,000 [1]	1.1	100	0.032

[1] USEPA Air Toxics Database, Table 2[4].
[2] No REL available for these air toxics. Values shown are from (IDLH/10), USEPA Air Toxics Database, Table 2[5].
[3] USEPA Air Toxics Database, Table 1[6].

[4] U.S. Environmental Protection Agency (USEPA). 2011. Air Toxics Database, Table 2, Acute Dose-Response Values for Screening Risk Assessments (12/19/2011). Office of Air Quality Planning and Standards (OAQPS). Technology Transfer Network Air Toxics Website.(http://www.epa.gov/ttn/atw/ toxsource/Table2.pdf).
[5] Ibid. 4
[6] U.S. Environmental Protection Agency (USEPA). 2012b. Air Toxics Database, Table 1, Prioritized Chronic Dose-Response Values (5/7/2012). Office of Air Quality Planning and Standards (OAQPS). Technology Transfer Network Air Toxics Website. (http://www.epa.gov/ttn/atw/toxsource/ Table1.pdf).

Table A-11 Air Toxics Acute Exposure Assessment and Long-term Non-carcinogenic Exposure Assessment for Nuiqsut Community Receptor – Alternative D2

Pollutant	REL (1-hour) (µg/m^3)	Maximum Modeled 1-hour Concentration (µg/m^3)	Non-carcinogenic RfC[3] (Annual) (µg/m^3)	Maximum Modeled Annual Concentration (µg/m^3)
Benzene	1,300 [1]	0.19	30	7.00E-05
Ethyl benzene	350,000 [2]	0.03	1,000	1.00E-05
Formaldehyde	55 [1]	0.39	9.8	2.50E-04
n-Hexane	390,000 [2]	3.89	700	2.00E-04
Toluene	37,000 [1]	0.15	5,000	3.00E-05
Xylene	22,000 [1]	0.06	100	2.00E-05

[1] USEPA Air Toxics Database, Table 2[7].

[2] No REL available for these air toxics. Values shown are from (IDLH/10), USEPA Air Toxics Database, Table 2[8].

[3] USEPA Air Toxics Database, Table 1[9].

Table A-12 Air Toxics Long-term Cancer Risk Analysis for Nuiqsut Community Receptor – Roadless Alternative – Alternative D2

Exposure Scenario[1]	Pollutant	Maximum Modeled Annual Concentration (µg/m^3)	Carcinogenic Unit Risk Factor[2] (1/µg/m^3)	Exposure Adjustment Factor	Cancer Risk
MLE	Benzene	7.0E-05	7.8E-06	0.43	2.3E-10
MLE	Ethyl benzene	1.0E-05	2.5E-06	0.43	1.1E-11
MLE	Formaldehyde	2.5E-04	1.3E-05	0.43	1.4E-09
				Total Inhalation Cancer Risk	**1.6E-09**
MEI	Benzene	7.0E-05	7.8E-06	0.43	2.3E-10
MEI	Ethyl benzene	1.0E-05	2.5E-06	0.43	1.1E-11
MEI	Formaldehyde	2.5E-04	1.3E-05	0.43	1.4E-09
				Total Inhalation Cancer Risk	**1.6E-09**

[1] MLE = most likely exposure; MEI = maximally exposed individual.

[2] USEPA Air Toxics Database, Table 1[10].

[7] Ibid. 4
[8] Ibid. 4
[9] Ibid. 6
[10] Ibid. 6