ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
AIR PERMITS PROGRAM

TECHNICAL ANALYSIS REPORT

Air Quality Control Minor Permit AQ0183MSS02
BP Exploration (Alaska) Inc.
Gathering Center #2

H_2S LIMIT INCREASE

Prepared by Zeena Siddeek
Supervisor: John F. Kuterbach
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TABLE OF CONTENTS

1.0 Introduction....4
1.1 Stationary Source Description....4
1.2 Hydrogen Sulfide Limit History for GC-2....5
2.0 Application Description....7
3.0 Department Review of the Application....7
3.1 Regulatory Basis and Policy....7
3.2 Finding....8
3.1 Analysis of the H_2S Limit....8
3.2 Other facts....10
3.3 Decision....10
4.0 Project Emissions....11
4.1 SO_2 Emissions Due to Permit AQ0183MSS02....11
4.2 Assessable Emissions....13
5.0 Department Findings....13
6.0 Permit Conditions....14
6.1 Conditions Established Under 18 AAC 50.201....14
6.2 Requirements for a Title V Amendment under 18 AAC 50.326(c)(2)....15
7.0 Permit Administration....15
Appendix : Modeling Memorandum....17

ABBREVIATIONS/ACRONYMS

AAAQS.....Alaska Ambient Air Quality Standard
AAC.....Alaska Administrative Code
ADEC.....Alaska Department of Environmental Conservation
AS .....Alaska Statutes
BACT.....Best Available Control Technology
BPXA.....BP Exploration (Alaska) Inc.
GC-2.....Gathering Center #2
CFR.....Code of Federal Regulations
EPA.....Environmental Protection Agency
ORL.....Owner Requested Limit
PBU.....Prudhoe Bay Unit
PSD .....Prevention of Significant Deterioration
PTE .....Potential to Emit
TAR.....Technical Analysis Report

Units and Measures

gr./dscf .....grains per dry standard cubic foot (1 pound = 7,000 grains)
dscf.....dry standard cubic foot
gph.....gallons per hour
kW.....kilowatts electric[1]
lbs.....pounds
mmBtu.....million British Thermal Units
ppm .....parts per million
ppmv .....parts per million by volume
tpy .....tons per year
wt% .....weight percent

Pollutants

CO.....Carbon Monoxide
H_2S .....Hydrogen Sulfide
NO_X.....Oxides of Nitrogen
NO_2 .....Nitrogen Dioxide
PM-10 .....Particulate Matter with an aerodynamic diameter less than 10 microns
SO_2 .....Sulfur Dioxide
VOC .....Volatile Organic Compound

[1] kW refers to rated generator electrical output rather than engine output

1.0 Introduction

This Technical Analysis Report (TAR) provides the Alaska Department of Environmental Conservation's (Department's) basis for issuing Air Quality Control Minor Permit AQ0183MSS02 to BP Exploration (Alaska) Inc. (BPXA) for the Gathering Center #2 (GC-2).

BPXA submitted an application dated November 28, 2007 requesting a permit under 18 AAC 50.508(6) to increase the fuel gas hydrogen sulfide (H_2S) limit for the natural gas used as fuel from the Prudhoe Bay reservoir. The Department sent BPXA an incompleteness letter on February 21, 2008 stating that their application was incomplete and put the application on hold.

On January 7, 2010, BPXA submitted a letter to the Department, laying down the historic perspective for the fuel gas H_2S limit and a proposed path forward for revising the H_2S limit. In the letter, BPXA contended that the H_2S limit in Operating/Construction 183TVP01 is not an enforceable limit and asked the Department to accept the original 2007 application as complete.

The Department, BPXA and the U.S. Environmental Protection Agency (EPA) have discussed over the past few years, how to treat the sulfur dioxide (SO_2) emissions increase due to fuel gas souring over time. EPA has not yet made a final decision. Meanwhile the Greater Prudhoe Bay sources have curtailed production to comply with their permit limits.

In order to expedite the permit for emissions increase due to fuel gas souring, the Department reviewed BPXA's January 7, 2010 documentation, the documentation in the permit files and records of Alaska State Implementation Plan to determine the appropriate process for reviewing and permitting increased SO_2 emissions resulting from an increase to the H_2S limit for this stationary source.

1.1 Stationary Source Description[2]

Gathering Center #2 processes crude oil production fluids received from various crude oil accumulations located on the North Slope, including (not limited to) Well Pads H, J, M, N, Q, R, S, U, W, and Z of the Western Operating Area. The crude oil is processed to remove gas and water to meet the specifications for delivery to the Trans Alaska Pipeline system. The stationary source has been operational since 1974. The GC-2 is classified as a PSD major source for having the potential to emit greater than 250 tons per year (tpy) of one or more regulated pollutant.

The stationary source contains: two General Electric (GE) Frame 5 gas fired combustion turbines (Model MS5382C), rated at 38,000 hp, two Sulzer S3 gas fired combustion turbines rated at 7,910 hp, one Ruston gas fired combustion turbine (Model TB 5000) rated at 4,900 hp, two Ruston gas fired combustion turbines (Model TA 2500) rated at 2,500 hp, three Cleaver Brooks gas fired boilers rated at 33.5 MMBtu/hr, four Cleaver Brooks gas fired boilers rated at 20.9 MMBtu/hr two glycol regenerators rated at 2.7 MMBtu/hr, three Detroit Diesel emergency generators rated at 738 hp, two Detroit emergency generators rated at 280 hp, one Detroit emergency generator rated at 3,600 hp, one diesel fired emergency turbine generator rated at 5,000 hp and six emergency flares with a combined rating of 1.18 MMscf/day. These units are located at the Production Pad. Additionally, the source contains a gas fired Solar Mars Compressor turbine located at the W pad and a 37 MMBtu/hr heater at Pad Z. The heater at Pad Z was installed in 1998.

[2] As described in the Statement of Basis for the Operating /Construction permit 183TVP01.

The fuel gas burned in all of the gas fired emission units at GC-2 originates at the PBU Central Gas Facility (CGF).

1.2 Hydrogen Sulfide Limit History for GC-2

EPA issued the initial PSD permits for PBU. EPA issued four field-wide PSD permits (referenced in order as PSD-X79-05 [PSD I], PSD-X80-09 [PSD II], PSD-X81-01 [PSD III], and PSD-X81-13 [PSD IV] between May 1979 and September 1981 for new equipment proposed by the two PBU operators at the time: Atlantic Richfield Company *(*ARCO) and Sohio Petroleum Company[3]. However, only one of the permits (Permit PSD-X81-13) contains SO_2 BACT limits and these limits do not apply to any of the emission units located at CPS. EPA revised the emission limits and language in all four PSD permits on August 29, 1997.

The Department has issued several permits for GC-2. The initial permit to operate for GC-2 was issued in 1975 prior to the advent of the PSD program. This permit was amended three times in the 1970s and three times in the 1980's. These permits to operate for GC-2 did *not* list specific fuel gas H_2S limits. These permits did specify that the permit was issued for operation as described in the respective permit applications. The Department does not have a record of all the applications but the Department has a record of an application submitted on March 20, 1980, that described the fuel as natural gas with sulfur content of 2000 grains/dscf (from AP-42). Another application submitted on August 18, 1981 described the fuel as natural gas with an H_2S concentration of 20 ppm. The Department first documented an explicit fuel gas H_2S limit (25 pm) on November 30, 1994 in Permit to Operate 9473-AA008. The Department did *not* specify an averaging period with the limit, but did impose monthly testing. The Department also required BPXA to calculate and report the resulting SO_2 emissions on a monthly basis. The Department maintained these requirements in Permit 9473-AA033, which was issued a month later on December 27, 1994 and in the permit amendment on April 5, 1995.

BPXA submitted an application for a construction/operating permit on November 25, 1997. In that application and in a previous correspondence dated January 19, 1997, BPXA asked the Department to remove the H_2S limit except for Units 3 and 5 approved under the EPA PSD-X81-13. BPXA stated none of the H_2S enforceability triggers listed in Permit to Operate 9473-AA033 existed for CPS, nor had BPXA been required to maintain such a limit to demonstrate compliance with the ambient air quality standards or increments with the exception of Units 3 and 5. BPXA also stated that for these units, EPA determined BACT to be 20 ppm H_2S and the Department subsequently raised this value to 25 ppm.

The Department obliged BPXA's request by not carrying forward the H_2S limit to the Operating/Construction Permit 183TVP01 issued on October 20, 2003 and allowed SO_2 emissions that were limited only by State Implementation Plan[4] (SIP) for all units except Units 1, 2, 3 and 5. BPXA requested the limit be carried forward for Units 3 and 5, because these units were subject to the EPA BACT limit. For Units 1 and 2, BPXA requested the limit because of the turbine upgrades in 1998. The 25 ppm limit in the Operating/Construction Permit 193TVP01 for Units 1, 2, 3 and 5 is listed as an annual average with the option to increase to 75 ppm after conducting a modeling analysis.

[3] The permitted sources at PBU are now operated by BPXA
[4] The SIP limit under 18 AAC 50.055(c) is equivalent to 4,000 ppmv H_2S.

BPXA is currently operating GC-2 under an application shield after applying for a timely operating permit renewal. For purposes of this minor permit action a brief history of the fuel gas H_2S limit at GC-2 is described below.

Table 1 - H_2S Permit History at GC-2

Permit Description	**Fuel gas H_2S / SO_2 limits and description**
EPA PSD-X81-13 issued September 29, 1981 revised through August 29, 1997	SO_2 limits of 2.2 tpy for Unit 3 and 1.5 tpy for Unit 5.
8230-AA008 issued October 2, 1981. This permit was due to expire on April 30, 1992, but the deadline was extended several times, ultimately to June 30 1994.	No limits
8436-AA007 issued May 31, 1984.	No limits
8736-AA016 issued April 22, 1987. This permit was scheduled to expire on April 30, 1992 but the expiration date was extended to August 30, 1993.	No limits
9473-AA008 issued November 30, 1994. This was a permit renewal with no modification involved. The permit was amended on April 5, 1995.	Established a 25 ppmv H_2S limits to all gas fired units. No averaging period was specified. The limit is in **bold** font with the following description: "The emission limits, fuel specifications and operating limits established in 18 AAC 50.040-060 (e.g., SIP limits), in a federal NSPS or NESHAP standard for HAP, as the result of a BACT determination or LAER determination, or as the result of an agreement pursuant to a request submitted under 18 AAC 50.300(e) are listed in bold font"
9473-AA033 issued December 27, 1994. This permit was issued to replace Permit 9473-AA008 because the Department inadvertently excluded several changes BPXA had requested to Permit 8736-AA016. The most significant change in this permit was to allow additional time until March 31, 1995 for BPXA to install and operate a continuous fuel monitoring system for the turbines. 9473-AA033 Amendment #1 was issued on April 5, 1994 to include the fuel monitoring waiver for the Ruston turbines that the Department inadvertently excluded in Permit	Carried over the 25 ppmv H_2S limit to all gas fired units from Permit 9473-AA008.

9473-AA033.	
AQ0183MSS01 issued on December 29, 2006. This permit authorized the addition of a 37 MMBtu/hr gas fired heater designated as Unit 36 at the Z pad.	No limit.
Operating Construction Permit 183TVP01 issued October 20, 2003.	Carried over the 25 ppmv H_2S limit for Units 1, 2, 3 and 5 with an option to increase the limit to 75 ppmv after air quality modeling. This permit removed the H_2S limit for all other gas fired units.

2.0 Application Description

Because the Prudhoe Bay gas reservoir has soured over time, the H_2S content of the fuel gas burned at CPS has gradually increased to the point where BPXA must either remove H_2S from the fuel gas or curtail operations to comply with the 25 ppmv annual average limit in Operating/Construction Permit 183TVP01.

BPXA therefore requested the following changes to Operating/Construction Permit 183TVP01 in their November 2007 minor permit application:

- Increase the annual average fuel gas H_2S limit for Units 1, 2, 3 and 5 in Condition 11 of the Construction/Operating Permit 183TVP01 from 25 ppmv to 125 ppmv;
- Add a “not to exceed” fuel gas H_2S limit of 195 ppmv when Ultra Low Sulfur Diesel (ULSD) is used; and
- Add a new liquid fuel sulfur limit of 0.11 percent, by weight.

BPXA requested the Department to make the above revisions under the 18 AAC 50.508(6) minor permit provisions. The Department’s review of the permit classification is discussed in Section 3.0 of this TAR.

On May 26, 2010, BPXA revised the “not to exceed” fuel gas H_2S limit from 195 ppmv to 185 ppmv when ULSD is used. BPXA also requested a fuel oil sulfur limit of 0.0415 percent by weight for fuel oil in the dual fuel fired boilers (Units 9 through 15). The project emissions associated with BPXA’s request are discussed in Section 4.0 of this TAR. The Department’s review of BXPA’s ambient demonstration is in the Modeling Memorandum in Appendix to this TAR.

3.0 Department Review of the Application

3.1 Regulatory Basis and Policy

The Alaska Department of Environmental Conservation (the Department), BP Exploration, Alaska (BPXA), and the United States Environmental Protection Agency (EPA) have struggled over the past few years with how to treat the increase in Sulfur Dioxide emissions that occur when the natural gas used as fuel from a reservoir sours over time. Prior to 2003, the Department charted its own path on this question through permits issued under the state’s

federally approved implementation plan. In 2002, the Air Permits Working Group[5] recommended that the Department adopt regulations more closely aligned with the Federal PSD permit program[6], and follow federal guidance except where Alaska's climate and geography make such guidance impractical. Federal policy and guidance has not been clear on whether increased SO_2 resulting from reservoir souring is a modification under the federal permitting rules, or the appropriate process for changing a limit related to SO_2 emissions. BPXA and the Department asked EPA to clarify the federal position. Until a federal decision clarified the matter, the Department agreed to continue to process permits which followed the most stringent permitting requirements (i.e. PSD). EPA continues to struggle with the pros and cons of national policy with respect to reservoir souring.

Permitting according to the PSD rules proceeds at a slow, steady pace, but the subject sources in Greater Prudhoe Bay currently curtail production to comply with their permit limits. To determine if any of the pending emission increases can be permitted more quickly, the Department will make its own best interpretation of the limited federal guidance. The Department will adopt any future EPA guidance specific to reservoir souring.

Until EPA clarifies its interpretation of the PSD rules with respect to field gas souring, the Department will treat the use of fuel gas with a greater concentration of H_2S than specified by the permit as a change in the method of operation under the PSD rules (use of an alternative fuel) unless such use is exempt from the definition of "Major modification" under 40 CFR 51.166(b)(2)(iii). For purposes of field gas souring, this means the use of higher H_2S fuel must not be prohibited under a federally enforceable permit condition established after January 6, 1975 pursuant to 40 CFR 52.21 (Federal PSD regulations), or under regulations approved pursuant to 40 CFR Subpart I (SIP review of new sources and modifications), or 40 CFR 51.166 (State-approved PSD program).

3.2 Finding

The Department established a 25 ppmv H_2S limit in Air Quality Control Permit to Operate 9473-AA008[7]. This permit was issued under the rules approved by EPA in the Department's SIP. The H_2S limit in this permit is a federally enforceable limit established after January 6, 1975 to control SO_2 emissions. The limit was not established under 40 CFR 52.21or under regulations approved pursuant to 40 CFR 51.166. It is unclear as to whether the limit was established under regulations approved pursuant to 40 CFR 51 Subpart I. At BPXA's request, the Department removed the H_2S limit for most of the emission units at GC-2 in 2003.

3.1 Analysis of the H_2S Limit

Although BPXA's January 7, 2010 letter to the Department states that they found no clear basis for the permit condition, it seems likely that the Department intended to properly document the source's potential to emit to evaluate changes in future permitting decisions. The term "potential to emit" (PTE) was not used in the department statutes or regulations prior to 1993. In 1993, the legislature passed statutes creating AS 46.14, and defined potential to emit:

[5] A workgroup of stakeholder representatives, including the Alaska Oil and Gas Association, convened by the Department to address air permit funding and service issues.
[6] Alaska Statutes were changed in 2003 and the Department adopted regulations in 2004.
[7] The limit was originally established in Permit 9473-AA008 on November 30, 1994. This permit was replaced by Permit 9473-AA033 on December 27, 1994 to include changes BPXA requested but the Department inadvertently left out in Permit 9473-AA008.

(19) "potential to emit" means the maximum quantity of a release of an air contaminant, considering a facility's physical or operational design, based on continual operation of all sources within the facility for 24 hours a day, 365 days a year, reduced by the effect of pollution control equipment and approved state or federal limitations on the capacity of the facility's sources or the facility to emit an air contaminant, including limitations such as restrictions on hours or rates of operation and type or amount of material combusted, stored, or processed; "potential to emit" does not include

(A) a one-time, accidental release of an air contaminant; or

(B) the fugitive emissions specifically exempted under 42 U.S.C. 7401 - 7671q (Clean Air Act);

The explicit phrase "approved state or federal limitations on the capacity of the facility's sources or the facility to emit an air contaminant, including limitations such as restrictions on hours or rates of operation and type or amount of material combusted" incorporated the federal concept of PTE in Alaska's rules. Before this statute, permits were often written presuming certain rates of operation or type or amount of material combusted. These permits relied on the common permit condition which specified that the permit only authorized operation in accordance with the permit application[8]. After 1993, the Department became more careful about establishing the PTE for emission units and began to insist on including presumed limitations as permit conditions.

The rules approved in Alaska pursuant to 40 CFR 51.166 are documented in 40 CFR 52.96. In 1994 these included "The State of Alaska Department of Environmental Conservation Air Quality Control Regulations as in effect on June 2, 1988 (specifically 18 AAC 50.020, 50.021, 50.300, 50.400, 50.510, 50.520, 50.530, 50.600, 50.620, and 50.900) and the State air quality control plan (SAQCP) as in effect on June 2, 1988." The rules approved under 40 CFR 51 Subpart I are documented in 40 CFR 52.70, and include the same regulatory citations. The question to be answered is whether the H_2S permit limit was established pursuant to these rules.

The rules required a permit to operate and describe the necessary application under 18 AAC 50.300. The rules specified how to review the application and issue the permit under 18 AAC 50.400. The SAQCP further explains how to apply the rules.

Section 18 AAC 50.300(b)(3) required an engineering report outlining the method of operation. For a large fuel-burning source, Section IV.F.2-5 of the SAQCP requires to specify the percent sulfur content of fuel in its application. Section 18 AAC 50.400 provides little detail on specific permit conditions, but Section IV.H-3 provides an example Permit-to-Operate. This example includes language that the permit is issued for operation as described in the permit application and supplementary material. Section IV.H of the State Air Quality control plan specifies that "The purpose for issuing an air quality control permit is to assure a facility maintains compliance with applicable air quality regulations. Every effort will be made to eliminate permit requirements not necessary to achieve this purpose." Nothing in the regulations or SAQCP appear to have specifically required or precluded fuel H_2S permit limits—they could be included if necessary to achieve the purpose of compliance with regulations.

Permit 9473-AA008 was established pursuant to 18 AAC 50.300 and 18 AAC 50.400 in effect at the time. The question is whether the subject limit should have been included in the permit.

[8] For example, Permit 8230-AA008 for the Gathering Center #2 authorized *"operation of Gathering Center No. 2, associated fuel burning equipment and emergency flaring system as listed in Exhibit A of this permit and as described in ….. Sohio Alaska Petroleum Company letter with attachments dated August 18, 1981."* This application submitted on August 18, 1981 specified the fuel as natural gas with 20 ppm H_2S.

There is no clear documentation that the limit was imposed to ensure compliance with the regulations. One cannot, however, conclude from a lack of documentation that the limit was imposed by mistake. That question is best answered when the limit is first imposed, when the reasoning is fresh in the minds of the persons involved, not many years later by persons not involved with the original action. For this reason, the deadline for appeal of a permit is shortly after the permit is issued. For the GC-2 permit, the deadline for appeal is long past.

3.2 Other facts

The establishment of the H_2S limit in Permit 9473-AA008 is not well-documented, and the Department has made inconsistent decisions related to field gas H_2S limits in the past for other Prudhoe Bay sources. The rate of field gas souring is unpredictable. The Department has found for BPXA's CGF that additional controls are not a cost effective control technology[9], and it is unlikely that the Department would find differently for GC-2. Therefore, a PSD permit would likely only ensure compliance with ambient air quality standards and increments for SO_2.

3.3 Decision

The Department is unwilling to determine conclusively that the existing limit has no basis or is unenforceable. At the same time the Department acknowledges some ambiguity associated with requiring a PSD permit for changing this limit. Until EPA provides definite guidance, the Department has decided to process the change for this source under the simple minor permit procedures, but require compliance with both the standard and increments. This will provide essentially the same level of ambient protection as would be gained under a PSD permit. (The Department is confident that any BACT assessment would conclude that there are no cost effective control options.) This will also establish a clear basis for evaluating future SO_2 emission increases.

Minor permits do not usually require demonstrating compliance with the increment. However, BPXA has included in the permit application an analysis of the predicted ambient air quality impacts compared to the SO_2 standards and increments in order to establish their requested limits for ambient air protection. In addition, the Department finds that the higher fuel gas H_2S content has the likelihood of causing or contributing to violations of the SO_2 ambient air quality standards and increments and is also requiring the analysis of the increment under 18 AAC 50.201. Furthermore, EPA policy regarding fuel gas souring indicates that the increase in SO_2 emissions associated with a change in fuel sulfur content consumes increment and a compliance demonstration is required.[10]

The new H_2S limit established in Minor Permit AQ0183MSS02 is a limit under regulations approved pursuant to 40 CFR Part 51Subpart I. Unless EPA provides different guidance in the interim, any change to this H_2S limit, will be considered a change in the method of operation and evaluated for PSD applicability.

[9] Technical Analysis Report for Permit AQ0270CPT04 issued on October 13, 2009 for BPXA's Central Gas Facility.

[10] See, for example, the March 26, 1979 memo from Edward E. Reich, EPA Director of Stationary Source Enforcement re: Applicability of PSD to the Consolidated Edison Company.

4.0 Project Emissions

4.1 SO_2 Emissions Due to Permit AQ0183MSS02

Sulfur dioxide is the only pollutant affected by Permit AQ0183MSS02. There are no changes to emissions for any other pollutants. In their November 2007 application, BPXA submitted potential emissions for each of the gas fired emission units using fuel gas H_2S content of 125 ppmv and oil fired units using fuel oil sulfur content of 0.11 percent by weight. The Department revised the PTE for SO_2 using the alternative option of burning fuel gas with H_2S content 185 ppmv and ULSD fuel based on BPXA's May 26, 2010. For the dual fuel fired boilers (Units 18 through 24), BPXA has requested a limit to burn fuel oil with sulfur content no more than 0.0415 ppmv. The Department finds that the worst case SO_2 emissions are when these units burn fuel gas with H_2S content of 185 ppmv. Therefore, the PTE for these units are based on 185 ppmv.

The Department also included the PTE for the Bath Heater (Unit 36) authorized in Permit AQ0183MSS01. The emissions from this unit were not included in BPXA's SO_2 emissions calculations. The emissions for all of the emission units at GC-2 are shown in Table 2.

Table 2 – SO_2 Emissions After Permit AQ0183MSS02

ID	Tag No.	Name	Rating	PTE
1	GRTB-02-7000	GE MS5382C	38,000 hp ISO	55.1
2	GRTB-02-7001			55.1
3	GRTB-W-3152	Solar Mars Compressor	12,600 hp ISO	2.2[a]
4	GRTB-02-7704A	Sulzer S3 Pump	7,910 hp ISO	11.91
5	GRTB-02-7704B			1.5[a]
6	GRTB-02-7529	Ruston TA 5000 Pump	4,900 hp ISO	7.47
7	GRTB-02-7504A	Ruston TA 2500 Pump	2,500 hp ISO	4.66
8	GTRB-02-7504B			4.66
9	B-02-7000	Cleaver Brooks 200800 EG Heater (Dual fired)	33.5 MMBtu/hr (heat input, LHV)	4.81[b]
10	B-02-7001			4.81[b]
11	B-02-7002			4.81[b]
12	B-02-0001	Cleaver Brooks 200800 EG Heater (Dual fired)	20.9 MMBtu/hr (heat input, LHV)	3.03
13	B-02-0002			3.03
14	B-02-0003			3.03
15	B-02-0004			3.03
16	B-02-0067	BS&B TEG Reboiler	7.73 MMBtu/hr (heat input, LHV)	1.12
17	B-02-0068			1.12
18	GNED-02-0001	Detroit Diesel Emergency Firewater Pump	550 kW (737.6 hp)	0.001[c]
19	GNED-02-0002			0.001[c]
20	GNED-02-0011			0.001[c]
21	PED-02-0049	Detroit Diesel Emergency Firewater Pump	280 hp	0.000[c]
22	PED-02-7004			0.000[c]
23	GNED-02-7500	Detroit Diesel Emergency Generator	2,685 kW (3600 hp)	0.004[c]
24	GTRB-02-8001	Alison 501KB Emergency Turbine Generator	5,000 hp (3730 kW)	0.008[c]
25	FL-02-0001	KALDAIR LP/HP Vertical Emergency Flares	1.18 MMscf/day total (pilot & purge gas)	0.0
26	FL-02-0002			
27	FL-02-0003			6.72
28	FL-02-0004			
29	FL-02-0005	KALDAIR HP Vertical Emergency Flares		
30	FL-02-0006			
31	FL-02-0007			
32	FL-02-0008	National Horizontal Burn Pit Emergency Flare		
36		GTS Bath Heater	37 MMBtu/hr (HHV)	5.31
Total Emissions				**184**

Table 2 Notes:

[a] PTE is limited by annual SO_2 BACT limit by EPA PSD Permit PSD-X81-13.

[b] The emissions are based on boilers burning fuel gas with H_2S content of 185 ppmv. This scenario represents the worse case SO_2 emissions than burning fuel oil with sulfur content 0.0415 percent by weight.

[c] The emissions for these emergency units are based on 200 hours of operation.

4.2 Assessable Emissions

The assessable emissions for GC-2 are shown in Table 3. These values (except SO_2) are copied from Table 2 of the TAR for Minor Permit AQ0183MSS01. The Department is establishing the SO_2 component of the assessable emissions in Permit AQ0183MSS02 based on the new PTE for GC-2.

Table 3 – Assessable Emissions for GC-2

	EMISSIONS IN TONS PER YEAR						
	NO_X	**CO**	**PM-10**	**SO_2**	**VOC**	**HAP**	**Total**
New Assessable Emissions	2,389	688	86	184	32	0	3,379

5.0 Department Findings

The Department finds that:

1. The GC-2 is classified as a PSD major stationary source under 40 CFR 52.21(b)(1)(i) because it has the ability to emit more than 250 tons of a regulated pollutant.
2. BPXA submitted a permit application under 18 AAC 50.508(6) requesting to establish fuel gas H_2S limits of 125 ppmv (annual average) and fuel oil sulfur content limit of 0.11% by weight for the fuel oil burned at the source. BPXA application also requested a fuel gas H_2S limit of 185 ppmv when the fuel oil sulfur content is 0.0015% by weight.
3. The reason for the fuel gas H_2S limit that originated in Permit 9473-AA008 in November 1994, is not documented. The Department removed the limit for all the units except for Units 1, 2, 3, and 5 in the Operating/Construction permit 183TVP01, in 2003 at BPXA's request. The Department believes that the fuel gas H_2S limit that was established in Permit 9473-AA008 is a federally enforceable limit.
4. With one exception, the application for Minor Permit AQ0183MSS02 adequately addressed the effect of increasing the fuel gas H_2S content by submitting a modeling analysis to show compliance with the SO_2 Alaska Ambient Air Quality Standards (AAAQS) and increments.
5. The exception regards BPXA's desire to use an *annual* averaging period for the 125 ppmv H_2S limit. Since BPXA used the 125 ppmv value in demonstrating compliance with the 3-hour and 24-hour SO_2 AAAQS and increments, the averaging period must not exceed the shortest of these periods (i.e., 3-hours). For simplicity purposes, the Department is imposing this limit as a not to exceed value.
6. The basis for the historical 200 hours annual limit for the emergency generator Units 18 through 24 is unclear. The limit was carried over from Permit 9473-AA033 to Permit 183TVP01. For the current permit action, BPXA relied on the limit to demonstrate compliance with the SO_2 AAAQS and increments.
7. Operating/Construction Permit 183TVP01 contains Title 1 provisions carried forward from Permit 9473-AA033. Permit 183TVP01 has expired, and these Title 1 provisions have also expired. The Department did not intend for Title 1 provisions to expire, and this result is an artifact of the combined nature of Permit 183TVP01 and the change in permitting rules adopted in 2004. The Department is establishing the

revised fuel gas H_2S limit and re-establishing the operating hour limit for the emergency generators.

8. The stationary source is located in the North Slope Borough. The project is consistent with the Alaska Coastal Management Program (ACMP) through AS 46 40.040(b)(1). The Department did not notify the local district and resource agencies of the permit action to request additional ACMP review because the North Slope Borough Coastal District plan does not have an enforceable policy in effect at this time. The Department informed the Coastal District Coordinator of the proposed project. The coastal District Coordinator has the opportunity to comment on the preliminary decision and the resource agencies have the opportunity to comment during the public notice period.

6.0 Permit Conditions

As described in 18 AAC 50.544(a)(1), each minor permit issued under 18 AAC 50.542 must identify the stationary source, the project, the Permittee, and contact information. The permit cover page identifies the stationary source, the project, Permittee and contact information.

As required under 18 AAC 50.544(a)(2), Section 2 of this minor permit contains the fee requirements of 18 AAC 50.400 – 18 AAC 50.499. An assessable emission fee of 3,379 tpy is included in the Minor Permit AQ0183MSS02 equal to that shown in Table 3 of this TAR.

As required under 18 AAC 50.544(a)(3), this minor permit contains conditions established under 18 AAC 50.201. See Section 6.1 below. The limits under this requirement are included in Section 3 of the Minor Permit AQ0183MSS02.

The requirements in 18 AAC 50.544(a)(4), do not apply to this permit because the Department did not establish any Owner Requested Limits under 18 AAC 50.225 to avoid a permit classification under AS 46.14.130 described in 18 AAC 50.508(5).

As required under 18 AAC 50.544(a)(5), the minor permit contains the standard permit conditions listed under 18 AAC 50.345(c)(1) and (2) and (d) – (h) to ensure that the Permittee will construct and operate the stationary source in accordance with 18 AAC 50. These requirements are in Section 4 of Minor Permit AQ0183MSS02 under "Standard Permit Conditions."

6.1 Conditions Established Under 18 AAC 50.201

BPXA submitted a modeling analysis with their application for a permit under 18 AAC 50.508(6), to demonstrate compliance with the SO_2 standards and increments. Because there is a likelihood that the H_2S increase will cause or contribute to violations of the ambient standards and increments, an ambient demonstration was necessary. BPXA's modeling analysis satisfied the ambient air quality investigation requested under 18 AAC 50.201.

The Department's review of BPXA's modeling analysis found that in order to protect the SO_2 air quality standards and increments, the following limits are necessary.

1. Limit the fuel-gas H_2S content to no more than:
    a. 125 ppmv when ULSD is <u>not</u> in use; and
    b. 185 ppmv when ULSD is in use;

2. Limit the liquid fuel sulfur content to 0.0415 percent by weight for dual fuel fired heater Units 9, 10 and 11;
3. Limit the liquid fuel sulfur content for all other units to 0.11 percent by weight; and
4. Limit the annual operations for the emergency generators to 200 hours.

For monitoring fuel gas H_2S content, BPXA asked that the Department cross-reference the monitoring in the operating permit. Since the language in the operating permit is specific for New Source Performance Subpart GG fuel sulfur monitoring, the Department included specific language in this minor permit. The Department did not however, revise the H_2S testing method or increase the current monthly testing frequency because the fuel gas H_2S increase is a very slow process and there is no benefit in increasing the monitoring frequency.

The monitoring requirements to comply with the 200 hour annual limit for the emergency generators are the same as the requirements in the operating permit. The Department has cross-referenced this requirement in this minor permit.

6.2 Requirements for a Title V Amendment under 18 AAC 50.326(c)(2)

The Department examined whether the Title I permit changes made by the minor permit to be Clean Air Action Section 502(b)(10) changes for the purposes of Title V permitting. Section 502(b)(10) changes are defined in 40 CFR 71.2 as

> *changes that contravene an express permit term. Such changes do not include changes that would violate applicable requirements or contravene federally enforceable permit terms and conditions that are monitoring (including test methods), recordkeeping, reporting, or compliance certification requirements.*

There are no changes to monitoring required of the Permittee. BPXA will continue to monitor the fuel gas H_2S content on a monthly basis as before. The old H_2S limit could be exceeded under the new condition, but the old limit will no longer be an applicable requirement under the definition of *Applicable Requirement* in 40 CFR 71.2 because it is replaced by the new condition.

40 CFR 71.6(a)(13)(i) allows the permittee to make Section 502(b)(10) changes without a permit revision if the changes are not Title 1 modifications, and the changes do not exceed emissions allowable emissions under the permit. Under this rule, Title I modifications are PSD/NSR major modification, and modifications under NSPS or under CAA Section 112. Therefore, this is not a Title I modification (see Section 3.2 of this TAR) for this purpose. However, since the emissions exceed allowable emissions, this change at GC-2 does not qualify for the operational flexibility provisions of 40 CFR 71.6(a)(13). Therefore, the change requires a Title V permit revision before BPXA can operate under the provisions of Permit AQ0183MSS02.

7.0 Permit Administration

BPXA is currently operating GC-2 under Operating/Construction Permit 183TVP01 (expired but operating under a permit shield after applying for operating permit renewals).

For reasons described in Section 6.2 of this TAR BPXA must obtain a permit revision to the operating permit before operating GC-2 under the provisions of Minor Permit AQ0183MSS02.

The Department notes that the operating permit renewal for GC-2 is underway but a public notice draft Title V operating permit renewal was not ready at the time of public notice of this

permit. Therefore, the Department will administratively revise the expired operating permit 183TVP01 with the provisions of this minor permit AQ0183MSS02.

Minor Permit AQ0183MSS01 remains in effect except as revised by Minor Permit AQ0183MSS02.

Appendix : Modeling Memorandum

MEMORANDUM

State of Alaska
Department of Environmental Conservation
Division of Air Quality

TO: File

DATE: July 19, 2010

THRU:

FILE NO: AQ0183MSS02 – Modeling

PHONE: 465-5112
FAX: 465-5129

FROM: Alan E. Schuler, P.E.
Environmental Engineer
Air Permits Program

SUBJECT: Review of BPXA's H_2S Ambient Assessment for GC-2

This memorandum summarizes the Department's findings regarding the sulfur dioxide (SO_2) ambient analysis submitted by BP Exploration (Alaska) Inc. (BPXA) for Gathering Center 2 (GC-2). BPXA submitted this analysis in support of their November 2007 minor permit application (AQ0183MSS02) to revise an existing hydrogen sulfide (H_2S) limit. As described in this memorandum, BPXA's analysis adequately shows that operating their emission units within the requested constraints will not cause or contribute to a violation of the SO_2 Alaska Ambient Air Quality Standards (AAAQS) listed in 18 AAC 50.010; or the SO_2 maximum allowable increases (increments) listed in 18 AAC 50.020.

BACKGROUND

GC-2 is located within the Prudhoe Bay Unit (PBU) of Alaska's North Slope. It is classified as a major stationary source under the Prevention of Significant Deterioration (PSD) program. BPXA is currently operating GC-2 under Operating/ Construction Permit 183TVP01 and Minor Permit AQ0183MSS01.

GC-2 does not have a source-wide H_2S limit on their fuel gas. However, Operating/Construction Permit 183TVP01 limits the annual average H_2S content for select emission units to 25 parts per million by volume (ppmv). Permit 183TVP01 also includes a provision for increasing the limit to 75 ppmv upon completion of a Department approved modeling analysis.

BPXA has since determined that modeling supports a higher H_2S limit than 75 ppmv. Based on this determination, BPXA submitted a minor permit application in November 2007 to rescind the 25 ppmv limit and to impose new source-wide H_2S and liquid fuel-sulfur limits. BPXA submitted similar H_2S minor permit applications for four other PBU stationary sources between November and December 2007. The subsequent events and ultimate permitting strategy is described in the body of the Technical Analysis Report. In summary, the Department decided in February 2010 to proceed with processing the GC-2 application under the minor permit program, provided BPXA demonstrated compliance with the SO_2 ambient air quality standards *and* increments.

BPXA generally followed their August 2001 modeling protocol "Modeling Protocol for an Air Quality Impact Analysis of SO_2 Emissions at the Prudhoe Bay Unit," which the Department approved with comment on April 18, 2002. However, BPXA updated various aspects to incorporate emission unit/stationary source changes that have occurred since 2001, and to incorporate recent Department findings regarding other North Slope ambient assessments.

I discussed the modeling analysis with BPXA's consultant (AECOM) on May 14, 2010 and May 17, 2010. AECOM provided on behalf of BPXA a written reply, including a revised analysis on May 27, 2010. The reply included several corrections to previously overlooked errors, and minor revisions to the H_2S/fuel sulfur limits requested in November 2007.[1] This memorandum references the May 27th reply, unless noted otherwise.

BPXA used the same general approach to model the requested H_2S increases at the other PBU stationary sources. This memorandum therefore makes frequent references to the recently reviewed SO_2 modeling analysis for Central Power Station (CPS) and Gathering Center 3 (GC-3). The Department's findings regarding the H_2S ambient assessment for CPS and GC-3 is provided in my June 17, 2010 memorandum, *Review of BPXA's H_2S Ambient Assessment for CPS and GC-3 (REVISED)*.

APPROACH

BPXA used computer analysis (modeling) to predict the ambient air quality impacts. AECOM conducted the modeling analysis on behalf of BPXA.

BPXA assessed two general H_2S/fuel sulfur scenarios at GC-2 (see additional discussion in the Emission Rate and Stack Parameter section of this memorandum). They also included a third scenario to address the unusual, but possible circumstance where the dual-fired heaters are burning liquid fuel rather than fuel gas.

Model Selection

BPXA primarily used the same dispersion model as used in the CPS/GC-3 analysis – i.e., the U.S. Environmental Protection Agency's (EPA's) *Industrial Source Complex Short-Term 3* (ISCST3) model. ISCST3 was as a "preferred" model at the time BPXA submitted their permit application. The Department therefore accepts the use of ISCST3 for this analysis.

BPXA used the same SECOR variation of ISCST3 as used in the CPS/GC-3 analysis. The Department has previously accepted this code change in a number of assessments conducted in support of North Slope applicants. The code change remains acceptable since EPA has not changed their guidance regarding the modeling of horizontal/capped stacks with ISCST3.

BPXA also used EPA's SCREEN3 dispersion model (version 96043) to address potential cavity zone impacts for the emission units flagged by ISCST3. SCREEN3 is an appropriate model for assessing cavity zone impacts. It may be used for regulatory applications per 18 AAC 50.215(e),

[1] AECOM noted that Table III-6 of the November 2007 application erroneously indicated that the BS&B TEG Reboilers (Emission Units 16 and 17) are dual-fired, when in reality they are only gas-fired. AECOM also noted that BPXA replaced the burners in 2004 (as an off-permit change), which increased the ratings from 5.7 MMBtu/hr to 7.73 MMBtu/hr. AECOM used the current equipment rating in the revised modeling analysis.

when used in a manner consistent with EPA guidance. The "Downwash" section of this memorandum provides additional discussion regarding BPXA's cavity zone analysis.

Meteorological Data

BPXA used the same five years of PBU A Pad data (1991-1995) as used in the CPS/GC-3 analysis. The Department considers the A Pad meteorological data as site-specific for GC-2. Therefore, the Department accepts the 1991 - 1995 A Pad data for the GC-2 analysis. The Department allowed BPXA to compare the high, second-high (h2h) concentration to the short-term AAAQS/increments since they used site-specific data.

Emission Unit Inventory

BPXA accounted for all of the SO_2-emitting emission units listed in Operating/Construction Permit 183TVP01 and Minor Permit AQ0183MSS01. Most of these emission units are located at the GC-2 "Production Pad." However, BPXA also operates a gas-fired heater at Z-Pad. The following aspects of the emission unit inventory warrant additional discussion.

Flares

Operating/Construction Permit 183TVP01 lists eight flares (emission units 25 through 32) which may operate under a combined daily limit. BPXA did not model two of these flares (emission units 25 and 26) since they are no longer operational. However, BPXA allocated the allowed emissions to the remaining flares. Therefore, there is no ambient air reason for removing the un-modeled flares from the emission unit inventory.

Intermittent Well Servicing Equipment

BPXA excluded intermittent well servicing equipment for the reasons described in my April 21, 2010 memorandum, *Review of BPXA's H_2S Ambient Assessment for CPS and GC-3*. The Department continues to accept BPXA's approach.

Increment Analysis

BPXA used the same approach for modeling the baseline and increment consuming emission units as used in the CPS/GC-3 analysis. In summary, BPXA assumed the SO_2 emissions from all *gas-fired* emission units are *entirely* increment consuming since the baseline H_2S level is unknown (i.e., they did not take any credit for the baseline SO_2 emissions). They likewise did not take credit for the increment expanding emissions associated with the decrease in liquid fuel sulfur content. Both of these assumptions result in a larger SO_2 modeled increment impact than what would really occur.

Drill Rig Equipment

BPXA included the drill rig activity that could occur at the GC-2 Q-Pad under Operating Permit 455TVP01. They characterized the drill rig activity in the same manner as used in support of Revision 1 to Operating Permit 455TVP01 (see Patrick Dunn's February 12, 2007 memorandum, *Review of Revised BPXA Multiple Rig Ambient Assessment*; and my May 19, 2004 memorandum, *Review of BPXA Multiple Rig Ambient Analysis*.) Since Operating Permit 455TVP01 limits the drill rig operation to temporary construction activities, as defined in 18 AAC 50.990(92), BPXA excluded the drill rig activity from the increment analysis, as required under 18 AAC 50.215(b)(2)(A).

Emission Rates and Stack Parameters
The assumed emission rates and stack parameters have significant roles in an ambient demonstration. Therefore, the Department checks these parameters very carefully.

SO_2 Emissions
SO_2 emissions are directly related to the amount of sulfur in the fuel. The sulfur in fuel gas is in the form of H_2S. The sulfur in liquid fuel (e.g., diesel) is in the form of elemental sulfur.

BPXA varied the assumed H_2S and fuel sulfur contents between the three operating scenarios. They also modeled both types of fuel in the dual-fired emission units at GC-2. In the first two scenarios, BPXA assumed that the seven dual-fired emission units (the Cleaver Brooks EG Heaters: Emission Units 9 through 15) are burning fuel gas – which is their typical mode of operation. In the third scenario, BPXA assumed the dual-fired emission units are burning diesel instead of fuel gas.

The first scenario reflects the highest allowed liquid fuel sulfur content: 0.11 percent or 1100 parts per million by weight (ppmw). The second scenario reflects the highest allowed H_2S content: 185 parts per million by volume (ppmv). BPXA used the first scenario fuels for most of the third scenario (dual-fired units on liquid fuel). However, BPXA reduced the maximum fuel sulfur content for the three increment-consuming dual-fired emission units (Emission Units 9 through 11) from 1100 ppmw to 415 ppmw, in order to protect the 24-hour SO_2 increment. The H_2S and fuel sulfur content for each scenario are summarized in Table 1.

Table 1 - Assumed H_2S and Fuel Sulfur Content

Scenario	Description	Fuel Type in Dual-Fired Units	Fuel Gas H_2S Content (ppmv)	Liquid Fuel Sulfur Content (ppmw)	
				Units 9 - 11	All Other Units Burning Liquid Fuel
1	Highest Allowed Liquid Fuel Sulfur	Gas	125	NA	1100
2	Highest Allowed H_2S	Gas	185	NA	15
3	Dual-fired Units on Liquid Fuel	Liquid	125	415	1100

Liquid fuel with a sulfur content of no more than 15 ppmw is also known as ultra-low sulfur diesel (ULSD). BPXA did *not* include a fourth scenario where the dual-fired units are burning ULSD since the SO_2 emissions would be less than what they modeled under Scenario 2 (i.e., where the dual-fired units are burning gas with 185 ppmv H_2S).

BPXA requested an annual averaging period for the 125 ppmv H_2S limit. However, they used this value for estimating the short-term emission rates from the gas-fired emission units. Therefore, the Department will impose the 125 ppmv assumption as a not-to-exceed limit.

BPXA assumed the maximum liquid fuel sulfur content is 0.11 percent, by weight. This is a notable reduction from the current 0.75 percent threshold associated with the 500 ppm SO_2

emission limit listed in 18 AAC 50.055(c). The Department is therefore imposing BPXA's liquid fuel sulfur assumptions as permit limits in order to protect the SO_2 AAAQS/increments.

Operational Restrictions
BPXA assumed the gas-fired emission units at GC-2 are constantly operating. They assumed each liquid-fired emission unit only operates 200 hours per year. The 200 hour per year assumption matches the existing operational limits for these units. However, the Department is now expanding the basis for the 200 hour per year limit to include ambient air protection (of the annual average SO_2 AAAQS/increment).

Horizontal/Capped Stacks
BPXA continued to use EPA's recommended approach for characterizing horizontal/capped stacks – i.e., reset the exit velocity to 0.001 meters per second and reset the stack diameter as needed to conserve the volumetric flow rate of the exhaust gas.

Ambient Air Boundary
BPXA used the pad edge as the ambient air boundary. This is an appropriate boundary for North Slope sources.

Receptor Grid
BPXA used the following grid density in the preliminary runs submitted in November 2007:

- 25-meter resolution along the product pad ambient air boundary;
- 25-meter resolution within 100 meters of the production pad boundary;
- 100-meter resolution from the 25-meter grid outward to 1 kilometer (km) in each direction; and
- 250-meter resolution from the 1 km grid outward to 2 km in each direction.

BPXA used the 25-meter and 100-meter grids in the May 2010 cumulative impact assessment. They also added a 25-meter grid around Q-Pad (per Department request). BPXA's receptor grid is adequate for determining the maximum SO_2 impacts.

Downwash
BPXA continued to use the current version of EPA's "Building Profile Input Program" (BPIP) to determine the building profiles needed by ISCST3.

ISCST3 is unable to assess cavity zone impacts. Therefore, BPXA used SCREEN3 to further assess the cavity impacts from the emission units flagged by ISCST3 as having potential cavity zone impacts. SCREEN3 provides the length of the cavity zone (measured from the lee-side of the building). BPXA adequately demonstrated that all of the cavity zone lengths are less than the applicable distance between the building and the ambient air boundary. Therefore, there is no need to include cavity zone impacts from the flagged emission units.

Off-Site Impacts
In a cumulative impact analysis, the applicant must include impacts from large sources located within 50 km of the applicant's SIA. These impacts from "off-site" sources are typically assessed through modeling. However, the off-site impacts in an AAAQS analysis can also be

accounted for with ambient monitoring data, if representative data is available. BPXA included the permitted stationary sources located within Prudhoe Bay, Endicott, Milne Point, Kuparuk and Deadhorse in the modeled off-site inventory. BPXA's approach is consistent with the approved modeling protocol.[2]

Background Concentrations

The background concentration represents impacts from sources not included in the modeling analysis. Typical examples include natural, area-wide, and long-range transport sources. The background concentration must be evaluated on a case-by-case basis for each ambient analysis. Once the background concentration is determined, it is added to the modeled concentration to estimate the total ambient concentration.

BPXA used the maximum 3-hour, 24-hour and annual average concentrations measured at their Prudhoe Bay A Pad monitoring station during 2007 to represent the background concentrations. This is an appropriate data set for this application. It's also the same data set ultimately used in the CPS/GC-3 assessment. The maximum values are provided in the "Results and Discussion" section of this memorandum.

RESULTS AND DISCUSSION

The maximum SO_2 AAAQS impacts, along with the background concentrations, total impacts, and AAAQS are shown below for each of the three scenarios. All of the total impacts are less than the AAAQS. Therefore, BPXA has demonstrated compliance with the AAAQS.

Table 2 - Maximum AAAQS Impacts for Scenario 1
(125 ppmv H_2S; 1100 ppmw sulfur; Dual-fired Units on Gas)

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)	Bkgd Conc ($\mu g/m^3$)	TOTAL IMPACT: Max conc plus bkgd ($\mu g/m^3$)	Ambient Standard ($\mu g/m^3$)
SO_2	3-hr	633.2	41.9	**675**	1,300
	24-hr	275.3	34.0	**309**	365
	Annual	17.0	2.6	**20**	80

[2] The Department conducted a cursory sensitivity analysis of the off-site inventory to help address a couple of inconsistencies found between the GC-2 and the CPS/GC-3 assessments. For the 1991 meteorological data year (the only year ran by the Department), the maximum 24-hour off-site impact at any location within the 25-meter and 100-meter grid is 12 micrograms per cubic meter ($\mu g/m^3$). This is well above the 5 $\mu g/m^3$ significant impact level (SIL). However, most of this impact is due to the nearest off-site source, Gathering Center #1 (GC-1). The maximum impacts from two of the more distant sources (GC-3/CPS and Endicott) are well below the 5 $\mu g/m^3$ SIL. Therefore, it appears that a much smaller off-site inventory *could have* been used for this analysis. The Department also determined that the inconsistencies were inconsequential for this assessment.

Table 3 - Maximum AAAQS Impacts for Scenario 2
(185 ppmv H_2S; ULSD; Dual-fired Units on Gas)

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)	Bkgd Conc ($\mu g/m^3$)	TOTAL IMPACT: Max conc plus bkgd ($\mu g/m^3$)	Ambient Standard ($\mu g/m^3$)
SO_2	3-hr	167.3	41.9	**209**	1,300
	24-hr	89.5	34.0	**124**	365
	Annual	14.6	2.6	**17**	80

Table 4 - Maximum AAAQS Impacts for Scenario 3
(125 ppmv H_2S; 1100/415 ppmw sulfur; Dual-fired Units on Diesel)

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)	Bkgd Conc ($\mu g/m^3$)	TOTAL IMPACT: Max conc plus bkgd ($\mu g/m^3$)	Ambient Standard ($\mu g/m^3$)
SO_2	3-hr	633.2	41.9	**675**	1,300
	24-hr	279.6	34.0	**314**	365
	Annual	39.4	2.6	**42**	80

The maximum SO_2 increment impacts are shown below, along with the Class II increments, for each of the three scenarios. Once again, all of the maximum impacts are less than the applicable Class II increments.

Table 5 - Maximum Increment Impacts for Scenario 1
(125 ppmv H_2S; 1100 ppmw sulfur; Dual-fired Units on Gas)

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)	Class II Increment Standard ($\mu g/m^3$)
SO2	3-hr	148	512
	24-hr	78	91
	Annual	10	20

Table 6 - Maximum Increment Impacts for Scenario 2 (185 ppmv H_2S; ULSD; Dual-fired Units on Gas)

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)	Class II Increment Standard ($\mu g/m^3$)
SO2	3-hr	167	512
	24-hr	89	91
	Annual	15	20

Table 7 - Maximum Increment Impacts for Scenario 3 (125 ppmv H_2S; 1100/415 ppmw sulfur; Dual-fired Units on Diesel)

Air Pollutant	Avg. Period	Maximum Modeled Conc ($\mu g/m^3$)	Class II Increment Standard ($\mu g/m^3$)
SO_2	3-hr	162	512
	24-hr	90	91
	Annual	10	20

It is important to note that since ambient concentrations vary with distance and direction from each source, the maximum values shown represent the highest annual and h2h short-term value that may occur within the area. Except for maximum short-term concentrations which are allowed to exceed the respective standards once per year, the concentrations at other locations within the modeling domain should be less than the values reported above.

CONCLUSION

The Department reviewed BPXA's SO_2 modeling analysis and concluded the following:

1. The SO_2 emissions associated with operating the GC-2 emission units will not cause or contribute to a violation of the SO_2 AAAQS listed in 18 AAC 50.010, or the SO_2 increments in 18 AAC 50.020.
2. BPXA conducted their modeling analysis in a manner consistent with EPA's *Guideline on Air Quality Models*, as required under 18 AAC 50.215(b)(1).

The Department developed conditions in Minor Permit AQ0183MSS02 to ensure BPXA complies with the SO_2 AAAQS and increments. These conditions are summarized below.

1. Comply with the H_2S and fuel sulfur limits listed in Table 1; and
2. Maintain the existing 200 hour per year operational limits on the liquid-fired units to protect the annual average SO_2 AAAQS/increment.