Alaska Department of Environmental Conservation

Air Permits Program

November 17, 2003

BP Exploration (Alaska) Inc.

Transportable Drilling Rigs

STATEMENT OF BASIS

of the terms and conditions for

Permit No. AQ0455TVP01

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AQ0455TVP01 Revision 2

October 12, 2007

Prepared by Shonda Oderkirk

AQ0455TVP01 Revision 3

September 20, 2010

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AQ0455TVP01 Revision 4

Draft June 20, 2013

Prepared by Aaron Simpson

INTRODUCTION

This document sets forth the statement of basis for the terms and conditions of Operating Permit No. AQ0455TVP01.

The operator may lease various drilling rigs, as available, over the lifetime of this permit. This permit is based on protecting ambient air quality standards during drilling and associated operations at well pads governed by a separate stationary source-wide operating permit. Worst-case modeling was used as the basis for determining emission levels for this permit. The drilling rigs are owned by contractors, but the stationary sources are operated by BP Exploration (Alaska) Inc., and BP Exploration (Alaska) Inc. is the Permittee for the operating permit for the Transportable Drilling Rigs.

STATIONARY SOURCE IDENTIFICATION

Section 1 of Operating Permit No. AQ0455TVP01 contains information on the stationary source as provided in the Title V permit application.

The SIC code for these stationary sources is 1311 Crude Petroleum and Natural Gas Production. The NAICS code of the stationary sources is 211111.

The Transportable Drilling Rigs include equipment used in drilling, well workovers and associated or supporting operations, including power generation, camp facilities, heating and lighting.

EMISSION UNIT INVENTORY AND DESCRIPTION

As provided in the application, the "worst case" drilling rig for modeling purposes operates five drilling engines, two rig electric generator engines, two camp electric generator engines, and ten light generator engines (light plants). The modeled rig also operates two rig boilers, three rig heaters, and a camp snow melter. The modeled inventory did not include a test heater, an incinerator, and a well test flare, since they have been removed from the permitted emission unit inventory of Operating Permit No. AQ0455TVP01. This equipment set was modeled as a worst-case scenario for impacts on ambient air quality standards. Other rigs may be substituted for the modeled rig at specific drill sites during the term of this permit.

The approved drilling rigs with emission unit group ratings that do not exceed the allowed "worst case" inventory group ratings are listed in Section 16 of the permit.

AMBIENT AIR QUALITY MODELING

The original five operating permits for the exploratory gas drilling program, permit nos. 9573-AA016 through -AA020, were issued in 1995 and 1996. As a requirement for obtaining these permits, air quality modeling was performed to demonstrate compliance with state regulations concerning human health, enjoyment of life and property, and plants and wildlife.

EMISSIONS

A summary of the potential to emit (PTE)[7] and assessable PTE as indicated in the previous permits from the Transportable Drilling Rigs is shown in the table below.

[7] *Potential to Emit or PTE* means the maximum quantity of a release of an air contaminant, considering a stationary source's physical or operational design, based on continual operation of all emission units within the stationary

Table A - Emissions Summary, in Tons Per Year (TPY) per Rig

Pollutant	NO_X	CO	PM-2.5/ PM-10	SO_2	VOC	Total
PTE (all emission units)	198.5	99.3	6.9	12.5	11.4	329
PTE (nonroad engines excluded)	12.5	3.1	1.25	12.5	0.21	30
Assessable PTE (per well pad)	198.5	99.3	--	12.5	11.4	322

The assessable PTE listed under Condition 1.1 is the sum of the emissions of each individual regulated air contaminant for which the stationary source has the potential to emit quantities greater than 10 TPY. The emissions listed in Table A are estimates that are for informational use only. The listing of the emissions does not create an enforceable limit to the stationary source.

The assessable PTE is limited by fuel sulfur content limit contained in Condition 10, the annual fuel usage limit contained in Condition 6, and the rig count limit contained in Condition 8. Reasonable assumptions were made to calculate the emissions of up to twelve drill rigs operating concurrently per year.

The assessable PTE for fee purposes does not match the emissions used to determine the facility operating permit classification ("PTE nonroad engines excluded") because emissions from the nonroad engines at the rig facility are not considered when determining operating permit classifications, per 18 AAC 50.100.

Each rig stationary source is an area emission unit (non-major emission unit) of HAPs. The potential HAP emissions calculated by BPXA using AP-42 emission factors and applying enforceable limitations on annual fuel consumption is below the 18 AAC 50.300(f) trigger of 10/25 TPY.

source 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 stationary source's emission units or the stationary source 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 as defined in AS 46.14.990(21), effective 1/18/97.

BASIS FOR REQUIRING AN OPERATING PERMIT

Section 2 of Operating Permit No. AQ0455TVP01 lists the regulatory classifications of the Transportable Drilling Rigs.

The Transportable Drilling Rigs each require an operating permit under 18 AAC 50.325(b)(1) because they will operate at sites governed by a separate stationary source-specific operating permit for a stationary source that has the potential to emit 100 tpy or more of a regulated air contaminant.

Alaska regulations require operating permit applications to include identification of "regulated emission units." As applied to the Transportable Drilling Rigs, the state regulations require a description of:

⇒ Each emission unit regulated by a standard in 18 AAC 50.055, Industrial Processes and Fuel Burning Equipment, under18 AAC 50.335(e)(4)(C);

⇒ Emission units subject to requirements in an existing Department permit 18 AAC 50.335(e)(5).

The emission units at Transportable Drilling Rigs classified as "regulated emission units" according to the above Department regulations are listed in Table 1 of Operating Permit No. AQ0455TVP01.

CURRENT AIR QUALITY PERMITS

Previous Air Quality Permit to Operate

The most recent permits to operate issued for the Transportable Drilling Rigs are permits-to-operate numbers 9573-AA016, -AA017, -AA018, -AA019, and -AA020, which are identical in terms and conditions. These permits-to-operate include all construction authorizations issued through November 29, 1996, since they were issued before January 18, 1997. All stationary source-specific requirements established in each respective previous permit are included in the new operating permit as described in Table B.

Construction Permits

No construction permits have been issued for the rig stationary sources since permit-to-operate nos. 9573-AA016, -AA017, -AA018, -AA019, and -AA020 were issued.

Title V Operating Permit Application History

The owner or operator submitted separate applications for the five drilling rig stationary sources in November, 1998. BPXA withdrew all but one application via a letter dated July 15, 2003 in favor of consolidating the identical terms and conditions under the five permits into a single Title V operating permit.

Revision 2 incorporated two Administrative Amendments and one Minor Permit Modification which included the following provisions:

1. Administrative Amendment, submitted on March 10, 2006, requested that four drill rigs be added to the approved drill rigs list contained in Section 16.

a. An updated table of approved drill rigs, reflecting the newly added rigs Nabors 16E, Nabors 3S, Doyon 15 and Doyon Arctic Fox, is shown in Section 16 and is accompanied with the following statement: "Use of an alternative drilling rig will require a permit revision in accordance with 18 AAC 50.370. Requests for the use of an alternative drill rig will qualify under 18 AAC 50.370(a)(5) provided the alternative drilling rig will operate according to the fuel use and fuel sulfur restrictions contained in Section 5 and Section 6 of this permit."

b. As stated in Condition 8, up to twelve drilling rigs may operate concurrently at well pads where drilling is authorized by this permit.

c. According to 18 AAC 50.326(c)(2), Title I and Title V application requirements for a change to Title V permit by administrative amendment under 40 CFR 71.7(d), must be met. This requested change does not involve Title I specific permit requirements.

2. The Minor Permit Modification, submitted November 16, 2006, requested the rolling 12-month fuel limit be lowered to 1,250,000 gallons and a revision be made to the Statement of Basis Table A to reflect the new emission rates.

   a. BPXA discovered that the ambient analysis submitted previously for Air Quality Control Operating Permit AQ0455TVP01, Revision 1 and Air Quality Control Minor Permit AQ0977MSS01 contained incorrect emission rates.

   b. A memo from the Department, dated February 12, 2007, states that "BPXA corrected these emission rates in their current ambient analysis submitted with their November 16, 2006 application to revise Air Quality Control Minor Permit AQ0977MSS01. This revised modeling analysis shows that the aggregate rolling twelve month fuel limits defined in Air Quality Control Operating Permit AQ0455TVP01, Revision 1 and Air Quality Control Minor Permit AQ0977MSS01 should be reduced from 1,350,000 gallons to 1,250,000 gallons." See memo attached at end of this Statement of Basis.

   c. Conclusions of the memo are:
      i. "The NO_2, SO_2, PM-10 and CO emissions associated with operating the stationary source within the revised operating limit will not cause or contribute to a violation of the AAAQS provided in 18 AAC 50.010; and
      ii. BPXA conducted the analysis in a manner consistent with EPA's *Guideline on Air Quality Models*."

   d. The above mentioned memo has been reviewed and it is agreed upon that the twelve month rolling total be changed to 1,250,000 gallons per pad. The Statement of Basis Table A has been modified.

3. A second Administrative Amendment, submitted December 18, 2006, states that one drill rig was undergoing replacement of its two engines and heater. This request is valid for the following reasons:

a. The drill rig engines are non-road engines and have no emission unit-specific limits and the new engines can operate under the revised fuel consumption limit; and

b. The new engines will potentially emit less than the worst case scenario for the dispersion modeling.

c. The changes to the inventory are reflected in Section 16.

Revision 3 incorporates a Minor Permit Modification which included the following provisions:

1. A minor permit amendment, submitted on March 18, 2010, requested the addition of three drill rigs be added to the approved drill rigs list contained in Section 16. This request is valid for the following reasons:

    a. As stated in Condition 8, up to twelve drilling rigs may operate concurrently at well pads where drilling is authorized by the permit. The twelve drilling rigs are to be drawn from the pool of rigs listed in Section 16 of the Air Quality permit AQ0455TVP01. BP's request asks to revise this list with the deletion of several existing rigs and the addition of rigs known as Doyon 25, Parker 272, and Parker 273.

    b. The addition of these three rigs and the deletion of others meet the test criteria defining a minor permit amendment found in accordance with 40 C.F.R. 71.7(e)(1) as follows:

        i. The update of Section 16 with the new three rigs does not violate any permit term or conditions;

        ii. The proposed new rigs do not have PTEs in excess of the worst case rig scenarios.

        iii. The requested change does not significantly alter a monitoring, reporting and recordkeeping requirements. The proposed change does not constitute a significant modification under 40 C.F.R. 71.7(e)(3);

        iv. The change does not violate the prohibitions under 40 C.F.R. 71.7(e)(1(i)(3-6).

Revision 4 is classified as a Significant Modification which includes the following change:

1. Updates monitoring to include an equivalency factor for determining fuel use by drill rigs with cleaner Tier 2/Tier 3 engines to ensure compliance with the total rolling 12-month fuel use limit and associated conditions found in Section 6. This is a valid request because potential emissions have decreased for several drill rigs equipped with Tier 2/Tier 3 engines (e.g. Doyon 25 and Parker 272/273) that have replaced older engines. Due to BP's need to use both the older rigs with uncontrolled engines, as well as rigs with the newer Tier 2/Tier 3 engines, a fuel use equivalency factor has been developed which facilitates simplified reporting. This will enable BPXA to demonstrate compliance with the SO_2 and NO_X emission limits contained in the original permit to operate. Daily fuel usage and location of each rig is tracked and recorded. To demonstrate compliance with the total rolling 12-month fuel use limit, the rig engine type and fuel use data will be used to calculate total rolling 12-month fuel usage on a pad-by-pad basis using the fuel use equivalency factor. In addition, Section 1 is updated with correct contact information.

COMPLIANCE HISTORY

Review of the permit files for the drilling rig stationary sources, which includes the past inspection reports, indicates the stationary sources are generally operating in compliance with their operating permits.

STATIONARY SOURCE-SPECIFIC REQUIREMENTS CARRIED FORWARD

State of Alaska regulations in 18 AAC 50.350(d)(1)(D) require that an operating permit include each stationary source-specific requirement established in a prior operating permit. Table B below lists the permit condition that established a requirement in Operating Permit Nos. 9573-AA016, -AA017, -AA018, -AA019, and -AA020 and the new condition in Operating/Construction Permit No. AQ0455TVP01 that carries the old requirement into the new permit.

Table B - Comparison of Pre-January 18, 1997 Permit Nos. 9573-AA016, -AA017, -AA018, -AA019, and -AA020 Conditions to Operating/Construction Permit No. AQ0455TVP01 Conditions[8]

Permit Nos. 9573-AA016, -AA017, -AA018, -AA019, and -AA020 Condition Number	Description of Requirement	Permit No. AQ0455TVP01 Condition Number	How condition was revised
2	Permittee shall comply with the most stringent of applicable emission standards and specifications set out in….and Exhibit B	3, 4, and 5	The Alaska SIP limits have been carried forward with amendments as listed in 18 AAC 50 dated 5/3/02. The equipment operating hour limitations have been replaced by fuel use limitations based on amended permit application submitted March 2004.
5 through 8 and Exhibit B(I)	Operating limits for permitted equipment.	None	The equipment operating hour limitations have been replaced by fuel use limitations based on amended permit application submitted March 2004.
9	Liquid fuel sulfur limit	10	The sulfur limit has been reduced from 0.30% to 0.25% based on amended permit application submitted March 2004.

[8] This table does not include all standard and general conditions

Permit Nos. 9573-AA016, -AA017, -AA018, -AA019, and -AA020 Condition Number	Description of Requirement	Permit No. AQ0455TVP01 Condition Number	How condition was revised
10	Startup and relocation notification	9	Relocation notification is now by email or fax and a summary report is submitted quarterly with operating report based on amended permit application submitted March 2004.
15, 16, and Exhibit C	Process and fuel sulfur monitoring	5.1 and 6.1	No change, except requirements related to the flaring of formation gas have been removed since this permit does not include use of a flare by the allowed rigs.
20 and Exhibit D	Submit quarterly operating reports	44	No change
21	Permittee shall maintain, records….for not less than one year, and….accessible to the Department for not less than three years.	42	Record retention is now five years per regulation. Standard condition.
Exhibit D, item 4	Report the high, low, mean, and standard deviation of the liquid fuel sulfur content yearly	None	This information is no longer required by the Department.

STATEMENT OF BASIS FOR THE PERMIT CONDITIONS

The state and federal regulations for each condition are cited in Operating/Construction Permit No. AQ0455TVP01.

Conditions 1 and 2, Emission Fees

Legal Basis: The regulations require all permits to include due dates for the payment of fees and any method the Permittee may use to re-compute assessable emissions.

Factual Basis: These standard conditions require the Permittee to pay fees in accordance with the Department's billing regulations. The billing regulations set the due dates for payment of fees based on the billing date.

The default assessable emissions are emissions of each air contaminant authorized by the permit (AS 46.14.250(h)(1)(A)). Air contaminant means any regulated air contaminant and any hazardous air contaminant. Therefore, assessable emissions under AS 46.14.250(h)(1)(A) means the **potential** to emit any air contaminant identified in the

permit, including those not specifically limited by the permit. For example, hydrogen chloride (HCl) emissions from an incinerator are assessable emissions because they are a hazardous air contaminant, even if there is currently no emission limit on HCl for that class of incinerator.

The conditions also describe how the Permittee may calculate **actual** annual assessable emissions based on previous actual annual emissions. According to AS 46.14.250(h)(1)(B), assessable emissions are based on each air contaminant. Therefore, fees based on actual emissions must also be paid on any contaminant emitted whether or not the permit contains any limitation of that contaminant.

This standard condition specifies that, unless otherwise approved by the Department, calculations of assessable emission based on actual emissions use the most recent previous calendar year's emissions. Since each current year's assessable emission are based on the previous year, the Department will not give refunds or make additional billings at the end of the current year if the estimated emissions and current year actual emissions do not match. The Permittee will normally pay for actual emissions - just with a one-year time lag.

Projected actual emissions may differ from the previous year's actual emissions if there is a change at the stationary source, such as changes in equipment or an emission rate from existing equipment.

If the Permittee does not choose to annually calculate assessable emissions, emissions fees will be based on “potential to emit” (PTE).

The PTE set forth in the condition is based on liquid fuel with a sulfur content of 0.25 percent by weight. If the actual sulfur content of the fuel is greater than these assumptions, the assessable emissions calculations provided by the Permittee should reflect the actual sulfur content.

Condition 3 and Section 7, Visible Emissions Standard

Legal Basis: This regulation applies to all “fuel-burning equipment” in Alaska. The emission units “Heaters and Boilers” are fuel-burning equipment. The Rig/Camp engines and light plants are classified as nonroad engines, which are not included in the definition of “fuel-burning equipment”.

Factual Basis: Condition 3 requires the Permittee to comply with the federal and the state visible emission standards applicable to fuel-burning equipment and incinerators. The Permittee shall not cause or allow the equipment to violate these standards.

This condition has recently been adopted into regulation as a standard condition. MR&R requirements are listed in Section 7 of the permit.

Monitoring – The visible emissions must be observed for all emission units operated more than seven consecutive days during a calendar year at the site governed by this permit using the Method-9 plan as detailed in Section 7.

Recordkeeping - The Permittee is required to record the results of all visible emission observations and record any actions taken to reduce visible emissions.

Reporting - The Permittee is required to report: 1) emissions in excess of the federal and the state visible emissions standard and 2) deviations from permit conditions. The Permittee is required to include copies of the results of all visible emission observations with the operating report.

Condition 4 and Section 7, Particulate Matter (PM) Standard

Legal Basis: This regulation applies to operation of all "fuel-burning equipment" in Alaska. The emission units "Heaters and Boilers" are fuel-burning equipment. The Rig/Camp engines and light plants are classified as nonroad engines, which are not included in the definition of "fuel-burning equipment".

Factual Basis: Condition 4 requires the Permittee to comply with the state PM (also called grain loading) standard applicable to fuel-burning equipment. The Permittee shall not cause or allow fuel-burning equipment to violate this standard.

MR&R requirements are listed in Section 7 of the permit.

Monitoring – The Permittee is required to conduct PM emission unit testing if threshold values for opacity are exceeded.

Recordkeeping - The Permittee is required to record the results of PM emission unit tests.

Reporting - The Permittee is required to report: 1) incidents when emissions in excess of the opacity threshold values have been observed, and 2) results of PM emission unit tests. The Permittee is required to include copies of the results of all visible emission observations with the operating report.

Condition 5, Sulfur Compound Emissions

Legal Basis: The sulfur emission standard applies to operation of all fuel-burning equipment in the State of Alaska. The emission units "Heaters and Boilers" are fuel-burning equipment. The SIP standard for sulfur dioxide applies because it is contained in the

federally approved SIP dated October 1983. The Rig/Camp engines and light plants are classified as nonroad engines, which are not included in the definition of "fuel-burning equipment".

Factual Basis: The condition requires the Permittee to comply with the sulfur emission standard applicable to fuel-burning equipment. The Permittee may not cause or allow the affected equipment to violate this standard.

Sulfur dioxide comes from the sulfur in the liquid, hydrocarbon fuel (e.g. diesel or No. 2 fuel oil). Fuel containing no more than 0.75 percent sulfur by weight will always comply with the emission standard. For fuels with a sulfur content higher than 0.75 percent, the condition requires the Permittee to use Section 15 to calculate the sulfur-dioxide concentration using the equations to show that the standard is not exceeded.

Fuel sulfur testing will verify compliance.

Recordkeeping - The Permittee is required to record the fuel sulfur content.

Reporting – The Permittee is required to report as "state" excess emissions whenever the fuel combusted causes sulfur compound emissions to exceed the standards in this condition. The

Permittee is required to include the material balance calculations for fuel oil in the excess emissions report.

The Permittee is required to include copies of the records mentioned in the previous paragraph with the operating report.

Condition 6, Owner Requested Fuel Usage Limits

Legal Basis: These operating restrictions apply because the Permittee has requested them as owner requested limits.

Factual Basis: These restrictions and operating limits are derived from the modeling conducted as part of the permit revision requested through May 11, 2004 and are intended to ensure that the ambient air quality standards are maintained. The fuel usage limits contained in Table 2 and Table 3 of Condition 6 are designed to protect the daily and annual Ambient Air Quality standards for sulfur dioxide, nitrogen dioxide, and particulate matter. Per the Minor Permit Modification dated November 16, 2006, the rolling 12 month fuel limit was changed to 1,250,000 gallons.

The multiple drill rig ambient analysis submitted by BP Exploration (Alaska) Inc. in support of their application for a minor permit for AQ0977MSS02 is also applicable to this Revision. The annual fuel consumption was lowered to 1,250,000 gallons per pad and will not cause or contribute to a violation of the Alaska Air Quality Standards provided in 18 AAC 50.010 (see Memorandum from Patrick Dunn dated February 6, 2007 attached at the end of this Statement of Basis)

On June 12, 2013 BP Exploration (Alaska) Inc. submitted a request for a significant modification to revise the monitoring method to calculate rolling 12-month total fuel usage that incorporates an equivalency factor of 0.513, for drilling rigs equipped with Tier 2/Tier 3 engines. To demonstrate compliance with the total rolling 12-month fuel use limit, the rig engine type and fuel use data will be used to calculate total rolling 12-month fuel usage on a pad-by-bad basis using the fuel use equivalency factor.

The modification will increase potential emissions of PM-10 by 4 tons, CO by 49 tons, and VOC by 6 tons; will decrease potential emissions of SO_2 by 7 tons; and will not causing a change in potential emissions of NO_X.

Conditions 7 and 8, Owner Requested Limits for Location and Site Restrictions

Legal Basis: These conditions apply because the Permittee has requested them as owner requested limits.

Factual Basis: These operating restrictions are derived from the modeling conducted as part of the permit application process.

Condition 9, Owner-Requested Limit

Legal Basis: This condition applies because the Permittee has requested it as an owner requested limit.

Factual Basis: Condition 9 states that the permit only authorizes emissions from drilling activities that qualify as temporary construction activities as defined in 18 AAC 50.990(92). For each drill rig and associated equipment, the drilling operations will be considered a permanent activity requiring additional review by the department if the drilling operations

(whether continuous or intermittent) at any well pad within an aggregated stationary source extends beyond a 24-month period. An Ambient Air Quality Analysis demonstrating protection of standards and increments will be required for approval.

Condition 10, Owner-Requested Limit for Liquid Fuel Sulfur Content

Legal Basis: This condition applies because the Permittee has requested it as an owner requested limit.

Factual Basis: Condition 10 requires the Permittee to use liquid fuel with a sulfur content of no greater than 0.25% in order to protect the Ambient Air Quality standard for sulfur dioxide.

Conditions 11 through 15 and Section 7, Visible Emissions and PM Monitoring Plan

Legal Basis: Apply because these conditions detail the monitoring, recordkeeping, and reporting required in Conditions 3 and 4.

Factual Basis: Each permit term and condition must include MR&R requirements showing verifiable compliance with each permit term and condition. The Permittee must establish by actual visual observations which can be supplemented by other means, such as a defined Facility Operation and Maintenance Program that the stationary source is in continuous compliance with the State's emission standards for visible emissions and particulate matter.

These conditions detail a stepwise process for monitoring compliance with the State's visible emissions and particulate matter standards for liquid fuel-fired emission units. Equipment types covered by these conditions at the stationary source are liquid fuel-fired boilers and heaters.

Monitoring frequencies for equipment fired using liquid hydrocarbon fuels are detailed in these conditions.

Reasonable action thresholds are established in these conditions that require the Permittee to progressively address potential visible emission problems from emission units either through maintenance programs and/or more rigorous tests that will quantify whether a specific emission standard has been exceeded.

More details are found in the Factual Basis statement for Conditions 3 and 4.

Conditions 16 through 20, Insignificant Emission units

Legal Basis: These general emission standards apply to all industrial processes, fuel-burning equipment, and incinerators regardless of size.

Factual Basis: Conditions 16 through 20 require the Permittee to comply with the general standards for insignificant emission units. The Permittee may not cause or allow their equipment to violate these standards. Insignificant emission units are not listed in the permit unless specific monitoring, recordkeeping and reporting are necessary to ensure compliance.

The Department finds that the insignificant emission units at this stationary source do not need specific monitoring, recordkeeping and reporting to ensure compliance under these conditions.

Condition 21, Good Air Pollution Control Practice

Legal Basis: Applies to all emission units, **except** NSPS regulated emission units.

Factual Basis: The condition requires the Permittee to comply with good air pollution control practices for all emission units.

Maintaining and operating equipment in good working order is fundamental to preventing unnecessary or excess emissions. Standard conditions for monitoring compliance with emission standards are based on the assumption that good maintenance is performed. Without appropriate maintenance, equipment can deteriorate more quickly than with appropriate maintenance. If appropriate maintenance is not applied to the equipment, the Department may have to apply more frequent periodic monitoring requirements (unless the monitoring is already continuous) to ensure that the monitoring results are representative of actual emissions.

The Permittee is required to keep maintenance records to show that proper maintenance procedures were followed, and to make the records available to the Department. The Department may use these records as a trigger for requesting emission unit testing if the records show that maintenance has been deferred.

Condition 22, Dilution

Legal Basis: This state regulation applies to the Permittee because the Permittee is subject to emission standards in 18 AAC 50.

Factual Basis: The condition prohibits the Permittee from diluting emissions as a means of compliance with any standard in 18 AAC 50. No specific monitoring for this condition is practical. Other than the required annual certification, no monitoring, recordkeeping or reporting is necessary for this condition. The Permittee presently does not dilute emissions. Dilution would probably require a physical change to the stationary source. A reasonable inquiry and certification by a responsible official as to whether such changes occurred over the reporting period is sufficient to assure compliance.

Condition 23, Reasonable Precautions to Prevent Fugitive Dust

Legal Basis: Bulk material handling requirements apply to the Permittee because the Permittee could engage in bulk material handling, transporting, or storing; or will engage in industrial activity at the stationary source.

Factual Basis: The underlying regulation, 18 AAC 50.045(d), requires the Permittee to take reasonable action to prevent particulate matter (PM) from being emitted into the ambient air.

Condition 24, Stack Injection

Legal Basis: Stack injection requirements apply to the stationary source because the stationary source contains a stack or emission unit constructed or modified after November 1, 1982.

Factual Basis: The condition prohibits the Permittee from releasing materials other than process emissions, products of combustion, or materials introduced to control pollutant emissions from a stack (i.e. disposing of material by injecting it into a stack). No specific monitoring for this condition is practical. Other than the required annual certification, no

monitoring, recordkeeping or reporting is necessary for this condition. The Permittee presently does not inject wastes into stacks at these stationary sources. Waste injection would probably require a physical change to the stationary sources. A reasonable inquiry and certification by a responsible official as to whether such changes occurred over the reporting period is sufficient to assure compliance. Compliance is ensured by inspections, because the emission unit or stack would need to be modified to accommodate stack injection.

Condition 25, Open Burning

Legal Basis: The open burning state regulation in 18 AAC 50.065 applies to the Permittee if the Permittee conducts open burning at the stationary source.

Factual Basis: The condition requires the Permittee to comply with the regulatory requirements when conducting open burning at the stationary source.

More extensive monitoring and recordkeeping is not warranted because the Permittee does not conduct open burning as a routine part of their business. Also, most of the requirements are prohibitions, which are not easily monitored. Additional monitoring is achieved through Condition 26, which requires a record of complaints.

Condition 26, Air Pollution Prohibited

Legal Basis: Air Pollution Prohibited requirements apply to the stationary source because the stationary source will have emissions.

Factual Basis: The condition prohibits the Permittee from causing any emission which is injurious to human health or welfare, animal or plant life, or property, or which would unreasonably interfere with the enjoyment of life or property. While the other permit conditions and emissions limitation should ensure compliance with this condition, unforeseen emission impacts can cause violations of this standard. These violations would go undetected except for complaints from affected persons. Therefore, to monitor compliance, the Permittee must monitor and respond to complaints.

The Permittee is required to report any complaints and injurious emissions. The Permittee must keep records of the date, time, and nature of all complaints received and summary of the investigation and corrective actions undertaken for these complaints and to submit copies of these records upon request of the Department.

The Department will determine whether the necessary actions were taken. No corrective actions are necessary if the complaint is frivolous or there is not a violation of 18 AAC 50.110, however this condition is intended to prevent the Permittee from prejudging that complaints are invalid.

Condition 27, Technology-Based Emission Standard

Legal Basis: Technology Based Emission Standard requirements apply to the stationary source because the stationary source contains equipment subject to a technology-based emission standard, such as BACT, MACT, LAER, NSPS or other “technologically feasible” determinations.

Factual Basis: The Permittee is required to take reasonable steps to minimize emissions if certain activity causes an exceedance of any technology-based emission standard in this permit. The conditions of this permit list applicable technology-based emission standards and

require excess emission reporting for each standard in accordance with Condition 43. Excess emission reporting under Condition 43 requires information on the steps taken to minimize emissions. The report required under Condition 43 is adequate monitoring for compliance with this condition.

Condition 28, Permit Renewal

Legal Basis: Applies if the Permittee intends to renew the permit.

Factual Basis: The Permittee is required to submit an application for permit renewal by the specific dates applicable to each stationary source as listed in this condition. Monitoring, recordkeeping, and reporting for this condition consist of the application submittal. No additional requirements are necessary to ensure compliance with this condition.

Condition 29, Requested Emission unit Tests

Legal Basis: Applies because this is a standard condition to be included in all permits.

Factual Basis: The Permittee is required to conduct emission unit tests as requested by the Department. Monitoring consists of conducting the requested emission unit test, and no recordkeeping or reporting requirements are necessary to ensure compliance with this condition.

Conditions 30 through 32, Operating Conditions, Reference Test Methods, Excess Air Requirements

Legal Basis: Apply because the Permittee is required to conduct emission unit tests by this permit.

Factual Basis: The Permittee is required to conduct emission unit tests as set out in Conditions 30 through 32. These conditions supplement the specific monitoring requirements stated elsewhere in this permit. Compliance monitoring with Conditions 30 through 32 consist of the test reports required by Condition 37.

Condition 33, Test Exemption

Legal Basis: Applies when the emission unit exhaust is observed for visible emissions.

Factual Basis: As provided in 18 AAC 50.345(a), 5/03/02, the requirements for test plans, notifications and reports do not apply to visible emissions observations by smoke readers, except in connection with required particulate matter testing.

Conditions 34 through 37, Test Deadline Extension, Test Plans, Notifications and Reports

Legal Basis: Apply because the Permittee is required to conduct emission unit tests by this permit.

Factual Basis: Standard conditions 18 AAC 50.345(l) - (o) are incorporated through these conditions. Because these standard conditions supplement specific monitoring requirements stated elsewhere in this permit no MR&R is required. The emission unit test itself is adequate to monitor compliance with this condition.

Condition 38, Particulate Matter (PM) Calculations

Legal Basis: Applies when the Permittee tests for compliance with the PM standard.

Factual Basis: The condition incorporates a regulatory requirement for PM emission unit tests. Because this condition supplements specific monitoring requirements stated elsewhere in this permit, no MR&R is required to ensure compliance with this condition.

Condition 39, Certification

Legal Basis: This is a standard condition to be included in all permits. Applies because every permit requires the Permittee to submit reports.

Factual Basis: This condition requires the Permittee to certify all reports submitted to the Department. To ease the certification burden on the Permittee, the condition allows the excess emission reports to be **certified** with the operating report, even though they must still be **submitted** more frequently than the operating report. This condition supplements the reporting requirements of this permit, therefore no additional MR&R is necessary to ensure compliance with this condition.

Condition 40, Submittals

Legal Basis: Applies because the Permittee is required to send reports to the Department.

Factual Basis: This condition requires the Permittee to send submittals to the address specified in this condition. Receipt of the submittal at the correct Department office is sufficient monitoring for this condition. This condition supplements the reporting requirements of this permit, therefore no additional MR&R is necessary to ensure compliance with this condition.

Condition 41, Information Requests

Legal Basis: Applies to all Permittees and incorporates a standard condition.

Factual Basis: This condition incorporates a standard condition in regulation, which requires the Permittee to submit information requested by the Department. Receipt of the requested information is adequate monitoring.

Condition 42, Recordkeeping Requirements

Legal Basis: Applies because the Permittee is required by the permit to keep records.

Factual Basis: The condition restates the regulatory requirements for recordkeeping, and supplements the recordkeeping defined for specific conditions in the permit. The records being kept provide adequate evidence of compliance with this requirement, therefore, no additional MR&R is required.

Condition 43, Excess Emission and Permit Deviation Reports

Legal Basis: Applies when the emissions or operations deviate from the requirements of the permit.

Factual Basis: This condition satisfies two State regulations related to excess emissions - the technology-based emission standard regulation and the excess emission regulation. Although there are some differences between the regulations, the condition satisfies the requirements of each regulation.

The reports themselves and the other monitoring records required under this permit provide

an adequate monitoring of whether the Permittee has complied with the condition. Therefore, no additional MR&R is necessary to ensure compliance with this condition. Please note that there may be additional federally required excess emission reporting requirements.

Condition 44, Operating reports

Legal Basis: Applies to all permits.

Factual Basis: The condition restates the requirements for reports listed in regulation. The condition supplements the specific reporting requirements elsewhere in the permit and does not need any MR&R. The reports themselves are adequate monitoring for compliance with this condition.

Condition 45, Annual Compliance Certification

Legal Basis: Applies to all Permittees.

Factual Basis: This condition specifies the periodic compliance certification requirements, and specifies a due date for the annual compliance certification. Because this requirement is a report, no MR&R is needed.

Conditions 46 through 52, Standard Conditions

Legal Basis: Apply because these are standard conditions to be included in all permits.

Factual Basis: These are standard conditions required for all operating permits.

Condition 53, Permit Shield

Legal Basis: Applies because the Permittee has requested a shield for the applicable requirements listed under this condition.

Factual Basis: Table 4 of Operating Permit No. AQ0455TVP01 shows the permit shields that the Department granted to the Permittee. Should any of these shielded requirements become applicable, the Permittee is required to take necessary steps to comply with all applicable requirements in a timely manner. The following table shows the requests that were denied and the reasons that they were denied. The Department based the determinations on the permit application, past operating permit and inspection reports.

Table E - Permit Shields Denied

SHIELD REQUESTED FOR:	REASON FOR SHIELD REQUEST:	REASON FOR REQUEST DENIAL:
Stationary Source-Wide		
18 AAC 50.045(b) – Prohibitions	The permit implements all applicable air quality requirements for the stationary source. Since compliance with the permit will constitute compliance with applicable local, state, or federal air quality laws, this requirement is not applicable to the stationary source.	These prohibitions are ongoing requirements and therefore cannot be shielded. They have not been placed in the permit because they add no value to the permit with respect to controlling stationary source emission units. These prohibitions remain in effect because they are in regulation whether they appear in the stationary source operating permit or not.

SHIELD REQUESTED FOR:	REASON FOR SHIELD REQUEST:	REASON FOR REQUEST DENIAL:
18 AAC 50.045(c) – Prohibitions	This requirement will be implemented through 18 AAC 50.201, which is otherwise addressed in the permit. This requirement is not applicable because the Department will impose any special requirements to protect ambient air quality through permit conditions adopted under 50.201.	Shielding the applicant from subparagraph (b) for instance would have the effect of shielding the applicant from all requirements contained in the Air Quality Control Regulations including the requirement to obtain a permit if the shield requested is granted.
AQC Permits 9573-AA016, -AA017, -AA018, -AA019, and -AA020 Conditions 1, 3-4, 11-14, 17-19, and 22	These permit conditions are not "stationary source specific requirements". Therefore, they are not required in the Title V application [ref. 18 AAC 50.335(e)(5)]	There is no need to shield the Permittee from requirements of previous operating permits. According to state regulation 18 AAC 50.340(i) Permit Continuity an operator must comply with a permit issued before January 18, 1997 until the department issues a Title V operating permit. Therefore, there is no reason to shield BPXA from a permit that they no longer need to comply with once this operating permit is issued. Stationary source-specific conditions from permit numbers 9573-AA016, -AA017, -AA018, -AA019, and -AA020 that need to be carried forward or need not be carried forward into this operating permit according to regulation 18 AAC 50.350(d)(1)(D) have been identified in Table B of the basis.
AQC Permits 9573-AA016, -AA017, -AA018, -AA019, and -AA020 Condition 2	The proposed Title V permit conditions have included the most stringent applicable emission standards. This requirement is no longer needed.	
AQC Permits 9573-AA016, -AA017, -AA018, -AA019, and -AA020 Exhibit B, Short-term operating/emission limits or estimates	The short-term emission estimates/limits are not enforceable.	

MEMORANDUM

State of Alaska
Department of Environmental Conservation
Division of Air Quality

TO: Robert Dolan
Environmental Engineer Associate
Air Permits Program

DATE: May 19, 2004

FILE NO.: 455TVP01

THRU: Jim Baumgartner
Operating Permits, Acting Supervisor
Air Permits Program

PHONE: 465-5100
FAX: 465-5129

Sally Ryan
Construction Permits, Acting Supervisor
Air Permits Program

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

SUBJECT: Review of BPXA Multiple Rig Ambient Assessment

This memorandum summarizes my findings regarding the multiple drill rig ambient analysis submitted by BP Exploration (Alaska) Inc. (BPXA). BPXA submitted the analysis in support of their March 18, 2004 application for a Significant Operating Permit Revision to Air Quality Control Operating Permit 455TVP01. As described in this memorandum, BPXA's assessment adequately shows that operating their emission units within the requested constraints will not cause or contribute to a violation of the Alaska Ambient Air Quality Standards (AAAQS) provided in 18 AAC 50.010.

Permit 455TVP01 currently limits drilling operations to less than 24-months per pad. This provision pertains to "temporary construction activities" under 18 AAC 50.990(92). Emissions associated with temporary construction activities do not consume increment per 18 AAC 50.215(b)(2)(A).

BACKGROUND

BPXA is currently allowed, under Air Quality Control Operating Permit 455TVP01, to operate up to five transportable drilling rigs within a bounded area of the Alaska North Slope. The bounded area is referred as the "North Slope Drilling Area." The boundaries are the Colville River, the Canning River, within three miles of the Beaufort Sea shore-line, and latitude 69^0 30'. BPXA must also constrain their drilling operations as follows:

- limit operation of each "source group" to the annual hours shown in Table 2 of the permit (Permit Condition 6)
- limit the emission units to the drilling rigs (or equivalent) listed in the permit (Condition 9);
- do not operate a drilling rig on the same pad or within a quarter mile of another pad on which another drilling rig or test flare is simultaneously operating (Condition 10);

- do not intermittently or continuously operate a transportable drilling rig and associated equipment for more than 24 consecutive months per site (Condition 11); and
- limit the maximum sulfur content of diesel fuel to 0.30 percent, by weight (Condition 13).

The above restrictions originated in Air Quality Control Permits 9573AA016 through 9573AA020, which the Department carried forward into a combined Title V permit (455TVP01). The restrictions are based on several air quality modeling analyses submitted by BPXA in the mid-1990's.

BPXA desires to increase their operational flexibility. On February 2, 2004, BPXA submitted an ambient analysis for "Two Rig Drilling Operations" which incorporated a combined fuel limit (instead of group limits). However, BPXA's analysis also assumed the ambient air boundary would be established 400-meters outward from pad edge. This "exclusion zone" approach requires land owner permission to preclude public access within the ambient air boundary, and an access control plan for maintaining the boundary. This approach is cumbersome. In addition land owners may not preclude public access over navigable waters.

BPXA submitted a revised ambient analysis with their March 18, 2004 application. The revised analysis eliminated the need for an exclusion zone by reducing annual fuel consumption, revising emission factors and stack parameters, and eliminating use of a camp incinerator. However, BPXA maintained use of a combined fuel limit and incorporated greater flexibility in fuel sulfur content and drilling rig selection.

BPXA's proposal is classified under 18 AAC 50.375(h) as a significant permit revision. Transportable drilling rigs that operate at specific multiple locations for temporary periods of time are also considered as temporary operations under AS 46.14.215. Therefore, BPXA is required to submit an ambient impact demonstration in accord with 18 AAC 50.335(f)(2).

The Department received BPXA's ambient demonstration on March 22, 2004. I provided comments regarding the demonstration via electronic mail on April 22, 2004. BPXA provided a reply, including a revised nitrogen dioxide (NO_2) analysis on May 11, 2004. This memorandum provides my comments regarding BPXA's March 22nd sulfur dioxide (SO_2), particulate matter (PM-10) and carbon monoxide (CO) analysis, and their May 11th NO_2 analysis.

APPROACH

BPXA used computer analysis (modeling) to predict the ambient NO_2, SO_2, PM-10 and CO air quality impacts. SECOR International Incorporated (SECOR) conducted the analysis on behalf of BPXA.

BPXA developed a worst-case, generic approach for characterizing the drilling operations. They assumed two drilling rigs are concurrently operating on the pad, in order to make the assessment applicable for multiple rig operations. They assumed all drilling and support equipment emissions are vented through a single, worst-case stack. This approach allowed BPXA to use a combined fuel limit in the analysis, rather than the current group limits. BPXA used a generic well pad for the analysis.

BPXA reviewed the North Slope Drilling Area to find cases where the drilling impacts would overlap the impacts from permanent emission units. They selected the following two scenarios as "worst-case conditions:"

1) drilling on a satellite pad with permanent emission units; and
2) drilling on a satellite pad with no permanent emission units, but located near an oil or gas processing facility.

The well pad with the largest existing permanent emission units is Milne Point Unit (MPU) C-Pad. The C-Pad inventory consists of two heaters, one turbine and two reciprocating engines. Therefore, BPXA characterized the C-Pad units as if they were located on the generic pad in Scenario 1. To avoid site-specific geometry issues (i.e., to keep the analysis generic), BPXA collocated each C-Pad emission unit.

BPXA examined the existing well pad locations relative to existing processing facilities to select a worst-case near-field inventory and geometry (based on overlapping impacts dues to predominate wind directions) for Scenario 2. BPXA selected the Prudhoe Bay Unit (PBU) Q Pad and Gathering Center 2 (GC-2) distance and geometry as worst-case. Therefore, BPXA included the GC-2 emission units in Scenario 2 and placed them in the same relative location to the generic pad as they would be relative to Q Pad.

BPXA's approach represents the worst-case inventory and geometry condition for most North Slope well pads. However, it does not represent the worst-case inventory for pads with large-scale process equipment collocated with drilling activities, such as Northstar, Endicott and Badami. Therefore, BPXA's approach is not applicable for drilling operations conducted at locations where drilling and processing concurrently take place.

Model Selection

BPXA used the U.S. Environmental Protection Agency's (EPA) *Industrial Source Complex Short-Term 3 (ISCST3)* model for the ambient analysis. ISCST3 is an appropriate model for this analysis. BPXA used the current version of ISCST3 (version 02035).[9]

BPXA used "source groups" in order to model both scenarios in a single run (for each modeled pollutant and meteorological data year). The Scenario 1 source group, "MPU_AG," consisted of the generic rig, the C-Pad units, and the other MPU emission units (as "off-site" sources). The Scenario 2 source group, "GC2_AG," included the generic rig and the GC-2 emission units as off-site sources. Off-site sources are further discussed in the "Off-site Impact" section of this memorandum.

BPXA made a minor error in the SO_2, PM-10 and CO Scenario 1 source groups. When using ISCST3, modelers use eight character names to identify the modeled emission units. Modelers must then include these names in the command creating the source group in order for ISCST3 to know which units are included in the source group. BPXA made typographical errors when

[9] In many recent applications, SECOR has modified ISCST3 to better account for horizontal/capped stacks. SECOR *did not* use their modified version for this application. They instead used EPA's release of ISCST3.

referencing two off-site 30 million BTU per hour gas heaters in the Scenario 1 source group.[10] Therefore, ISCST3 did not include the impacts from these heaters in the Scenario 1 output.

Gas heaters have fairly small SO_2, PM-10 and CO emissions. These heaters are also off-site, which means they have minimal impacts in the area of interest. For these reasons, I did not ask BPXA to correct these errors for this analysis. However, BPXA should correct these errors in future submittals.

Meteorological Data
ISCST3 requires hourly meteorological data to estimate plume dispersion. According to EPA's *Guideline on Air Quality Models*, five years of representative data should be used, when available, to account for year-to-year variation.

BPXA used the same meteorological data as used in the previous drill rig assessments. BPXA used five years (1991-1995) of surface data collected at PBU Pad A and concurrent upper air data from the National Weather Service (NWS) station in Barrow. These data are appropriate for this analysis.

Ambient Air Boundary and Receptor Grid
For purposes of air quality modeling, "ambient air" means outside air to which the public has access. Ambient air typically excludes that portion of the atmosphere within a source's boundary.

BPXA used the edge of the generic well pad as the ambient air boundary. They used the following receptor grid density:

- 25-meter spacing along the pad edge,
- 25-meter resolution from pad edge outward to at least 100 meters,
- 100-meter resolution from the 25-meter grid outward to 1 kilometer in each cardinal direction, and
- 250-meter resolution from the 100-meter grid outward to 2 kilometers in each cardinal direction.

BPXA also placed a 25-meter grid along the GC-2 pad edge. By using a 25-meter grid at both GC-2 and the generic well pad, BPXA was able to estimate the maximum near-field impact at both locations (i.e., the maximum impact due to plume overlap from the generic well pad at GC-2 and the maximum impact due to plume overlap from GC-2 at the generic well pad). BPXA's receptor grid is illustrated in Figure 3-2 of their March 2004 submittal. The ambient boundary and receptor grid is adequate and appropriate for this analysis.

Load Screening Analysis
The Department frequently asks applications to conduct a load analysis of their larger emission units to determine the worst-case stack conditions. BPXA assumed all operations occur under full load. This is an appropriate assumption for drilling operations.

[10] The H5302A heater was labeled as PU5302A, and the H5302B heater was labeled as PU5302B, in the Scenario 1 source group. BPXA made this same error in the March NO_2 analysis, but corrected the error in the May submittal.

Emission Rates and Stack Parameters

BPXA included drill rig units and support equipment in the generic analysis. The rig units include drill rig engines, boilers and heaters. The support equipment includes camp generators, light plants, and a snow melter. BPXA dropped the currently permitted camp incinerator from the analysis in order to demonstrate compliance with the AAAQS. BPXA did not include a flare in the permit application and did not include a flare in the analysis.

BPXA compared the stack parameters for most of the rig and support equipment units to determine the worst-case stack conditions.[11] The maximum impacts from drilling operations occur in the immediate near-field. Therefore, BPXA conducted the analysis using a modified version of EPA's "M-Factor" to find the stack with the least buoyant plume (i.e., the stack that would provide the maximum near-field impacts). BPXA then used this worst-case stack to model the combined emissions. The rig boilers and heaters have the worst-case stack parameters (they have identical stack designs).[12]

BPXA used PM-10 emission rates instead of the previously assumed total particulate emissions. The PM-10 emission rates are correctly based on EPA's AP-42 emission factors.

In the March submittal, BPXA assumed the rig boilers and heaters operate on par with the rig engines (i.e., when the engines are running at full load, the boilers/heaters are also running at full load). This is an unreasonable assumption for estimating the annual average NO_2 impacts since the boilers/heaters operate according to ambient temperature, not drilling conditions.

BPXA revised their approach in the May 2004 submittal by assuming the boilers/heaters operate on par with monthly average temperature. When using this approach, the boilers/heaters operate 63 percent of the time at full load and 37 percent of the time at 10 percent load. In terms of fuel consumption, this usage is equivalent to operating the boilers/heaters 67 percent of the time at full load, and not operating them the rest of the year. BPXA's revised approach is reasonable.

Downwash

Downwash refers to conditions where the plume pattern is influenced by nearby structures. Downwash can occur when a stack height is less than a height derived by a procedure called "Good Engineering Practice," as defined in 18 AAC 50.910(43). The modeling of downwash-related impacts requires the inclusion of dimensions from nearby buildings. EPA has established specific algorithms for determining which buildings must be included and for determining the profile dimensions that would be "seen" by a given stack. They have also incorporated these algorithms in a separate computer program called the "Building Profile Input Program" (BPIP).

[11] Per my direction, BPXA did not include the light plant stacks in the stack comparison. Light plant engines and stacks are very small. Therefore, light plant stacks are not representative of the typical stack associated with drilling operations. BPXA eliminated the camp snow melter stack for the same reason.

[12] The stack parameters originally used for the Caterpillar D3412 engine (rig engine and camp generator) are incorrect. Therefore, BPXA updated the stack parameters for the rig generator in the May 11, 2004 submittal. BPXA should have also updated the camp generator stack parameters. However, this omission does not affect the conclusion regarding the worst-case stack, and is therefore, moot. The update did not change the previous conclusions.

BPXA used BPIP (version 95086) to determine the building profiles needed by ISCST3. This was the current version of BPIP at the time BPXA conducted the analysis.[13]

Ambient NO_2 Modeling
The modeling of ambient NO_2 concentrations can sometimes be refined through the use of ambient air data or assumptions. BPXA used the national default ambient NO_2-to-NOx ratio of 0.75, as provided in EPA's *Guideline on Air Quality Models*, to refine the estimated ambient NO_2 concentrations. The 0.75 ratio is appropriate for this analysis.

Ambient SO_2 Modeling
SO_2 emissions are directly related to the amount of sulfur in the fuel. The current permit limits the maximum fuel sulfur content to 0.30 percent, by weight. BPXA requested this limit be lowered to 0.25 percent, by weight, or 2,500 parts per million by weight (ppmw). BPXA also proposed a prorated daily fuel consumption limit based on fuel sulfur content.
BPXA developed a base case where the drilling operations could burn 18,000 gallons of fuel per day, when using fuel with a 1,500 ppmw sulfur content. This results in an SO_2 emission rate of 15.0 pounds per hour (lb/hr). If the fuel sulfur content increases to 2,000 ppmw, then the daily fuel consumption must be reduced to 13,400 gallons to maintain the 15.0 lb/hr SO_2 emission rate. If the sulfur content increases to 2,500 ppmw, then the daily fuel consumption must be further reduced to 10,800 gallons. BPXA asked the Department to incorporate these daily fuel limits into the permit in order to protect the 24-hour SO_2 AAAQS.

EPA allows applicants to compare the high second-high (h2h) modeled concentration to the short-term air quality standards and increments if at least one year of temporally representative site-specific, or five years of representative off-site data, are used. When these criteria are not met, applicants must use the high first-high (h1h) estimate. In all cases, applicants must compare the h1h modeled concentration to annual average standards and increments. I allowed BPXA to compare the h2h modeled concentrations to the short-term standards and increments since they used five years of meteorological data.

Ambient PM-10 Modeling
EPA allows applicants to compare the highest sixth-high (h6h) concentration over a five-year meteorological period to the 24-hour PM-10 ambient air quality standard. This approach is less conservative than using the h2h concentration in any one-year, but better matches the PM-10 monitoring method upon which the standard is based. I allowed BPXA to compare the h6h modeled concentration to the 24-hour PM-10 AAAQS since they used five years of meteorological data.

Off-site Impacts
The ambient analysis must address potential air quality impacts from off-site facilities. These impacts are typically assessed through modeling.

[13] EPA released a new version of BPIP (04112) on April 29, 2004. EPA only changed the number of buildings and emission units that can be processed in a single run. They did not revise the actual downwash algorithms. Therefore, version 95086 provides the same downwash parameters as 04112.

As previously noted, BPXA included the MPU emission units as off-site sources in Scenario 1 and the GC-2 emission units as off-site sources in Scenario 2. BPXA assumed the impacts from other North Slope sources are represented in the background concentration. BPXA's approach regarding off-site sources is appropriate. The GC-2 inventory and parameters are consistent with previous assessments.

BPXA has made several recent revisions at MPU. Therefore, I compared the MPU parameters to those previously modeled. The MPU emission unit inventory is correct. Some of the emission rates are larger than previously modeled. In a few cases, the SO_2 and PM-10 emission rates for the smaller heaters are less than previously modeled. However, the total MPU emissions are more than what BPXA previously modeled. Therefore, the modeled MPU emission rates are acceptable for this application. The MPU stack parameters are also acceptable.

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 impact analysis. Once the background concentration is determined, it is added to the modeled concentration to estimate the total ambient concentration.

BPXA used the highest concentrations measured at either PBU Pad A (January 1, 2000 through December 31, 2002) or Kuparuk River Unit (KRU) Drill Site 1F (July 1, 2001 through June 30, 2002) to represent the background concentrations for the North Slope Drilling Area. These stations were sited to measure the general ambient concentrations within PBU and KRU. Therefore, these data represent appropriate background concentrations.

RESULTS AND DISCUSSION

The maximum Scenario 1 and Scenario 2 AAAQS impacts are shown below in Tables 1 and 2, respectively. The background concentrations, total impacts and AAAQS are also shown. As shown in Tables 1 and 2, the total impacts are less than the respective AAAQS. Therefore, BPXA has demonstrated compliance with the AAAQS.

Table 1 – Maximum Scenario 1 AAAQS Impacts
Multiple Rig Operation with Permanent On-Site Units
(e.g., MPU C-Pad)

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 ($\mu g/m^3$)
NO_2	Annual	88.1	7.5	**96**	100
SO_2	3-hr	633.5	28.8	**662**	1,300
	24-hr	276.9	13.1	**290**	365
	Annual	13.4	0	**13**	80
PM-10	24-hr	75.8	60.4	**136**	150
	Annual	2.0	6.2	**8**	50

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 ($\mu g/m^3$)
CO	1-hr	3,172	1,150	**4,322**	10,000
	8-hr	1,598	575	**2,173**	40,000

Table 2 – Maximum Scenario 2 AAAQS Impacts
Multiple Rig Operation without Permanent On-Site Units
(e.g., GC-2 Q-Pad)

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 ($\mu g/m^3$)
NO_2	Annual	90.6	7.5	**98**	100
SO_2	3-hr	608.4	28.8	**637**	1,300
	24-hr	270.2	13.1	**283**	365
	Annual	13.8	0	**14**	80
PM-10	24-hr	53.5	60.4	**114**	150
	Annual	3.9	6.2	**10**	50
CO	1-hr	3,165	1,150	**4,315**	10,000
	8-hr	1,483	575	**2,058**	40,000

It is important to note that since ambient concentrations vary with distance from each source, the maximum values shown represent the highest value that may occur somewhere in the local airshed. They do *not* represent the highest concentration that could occur at *all* locations in the area.

CONCLUSION

I reviewed BPXA's multiple rig modeling analysis and concluded the following:

1. The NO_2, SO_2, PM-10 and CO emissions associated with operating the stationary source within the requested operating limits will not cause or contribute to a violation of the AAAQS provided in 18 AAC 50.010; and
2. BPXA conducted the analysis in a manner consistent with EPA's *Guideline on Air Quality Models*.

BPXA incorporated several assumptions and requested operating limits in their ambient demonstration, which should be included in the operating permit. Therefore, please incorporate permit conditions that address the following items. These conditions are needed to protect the AAAQS and increments.

1. Limit the annual fuel consumption to 1,350,000 gallons per pad.[14]

2. Limit the maximum fuel sulfur content to 0.25 percent, by weight (2,500 ppmw).

3. Limit the daily fuel consumption as follows:
   - 18,000 gallons when the fuel sulfur content is no greater than 1,5000 ppmw;
   - 13,440 gallons when the fuel sulfur content is no greater than 2,000 ppmw; and
   - 10,880 gallons when the fuel sulfur content is no greater than 2,500 ppmw.

4. Remove the incinerator from the emission unit inventory.

5. Do not list a flare in the emission unit inventory or authorize flaring activities.

6. Preclude use of this permit (455TVP01) at pads with equipment that separates sales oil from the process stream.

7. Develop monitoring, record keeping, and reporting consistent to the revised ambient air quality operating limits and durations listed above.

BPXA demonstrated compliance by assuming multiple rigs are operating on the same pad. Therefore, we may also drop Condition 10 from the existing permit.

The permit must clearly state that the authorization is limited to temporary construction activities. BPXA will need to demonstrate compliance with the NO_2, SO_2 and PM-10 increments if they desire to conduct long-term drilling operations.

I also recommend changing the phrase "*operating* permit" in paragraph 3 of page 1 of 455TVP01 to "*air quality* permit" so that it encompasses *both* operating and construction permits.

AES/cmd

cc: Cynthia Espinoza, ADEC/AQ/AP Anchorage
Jack Coutts, ADEC/AQ/AP Deadhorse

[14] BPXA requested an annual limit of 1,500,000 gallons in the March 2004 submittal, but changed their request to 1,350,000 gallons in the May submittal. The revised fuel limit is needed to protect the annual average NO_2 AAAQS.

MEMORANDUM

State of Alaska
Department of Environmental Conservation
Division of Air Quality

TO: File

DATE: February 12, 2007

FILE NO.: AQ0977MSS02 - Modeling

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

PHONE: 269-7577
FAX: 269-7508

FROM: Patrick Dunn.
Environmental Engineer Assistant
Air Permits Program

SUBJECT: Review of Revised BPXA Multiple Rig Ambient Assessment

This memorandum summarizes the Department's findings regarding the multiple drill rig ambient analysis submitted by BP Exploration (Alaska) Inc. (BPXA). BPXA submitted the analysis in support of their November 16, 2006 application for a minor permit to revise Air Quality Control Minor Permit AQ0977MSS01. This analysis is also in support of BPXA's November 28, 2006 application for a Significant Operating Permit Revision to Air Quality Control Operating Permit AQ0455TVP01, Revision 1. As described in this memorandum, BPXA's assessment adequately shows that operating their emission units within the requested constraints will not cause or contribute to a violation of the Alaska Ambient Air Quality Standards (AAAQS) provided in 18 AAC 50.010.

BPXA had previously submitted an analysis in support of their March 18, 2004 application for a Significant Operating Permit Revision to Air Quality Control Operating Permit AQ0455TVP01. This previous analysis was also used to support their December 2, 2005 application for Air Quality Control Minor Permit AQ0977MSS01. The Department approved BPXA's previous ambient analysis and the findings are documented in the May 19, 2004 memorandum, "Review of BPXA Multiple Rig Ambient Analysis." Today's memorandum only addresses those items that have changed subsequent to the May 19, 2004 memorandum.

Permits AQ0455TVP01, Revision 1 and AQ0977MSS01 currently limit drilling operations to less than 24-months per pad. This provision pertains to "temporary construction activities" under 18 AAC 50.990(92). Emissions associated with temporary construction activities do not consume increment per 18 AAC 50.215(b)(2)(A).

BACKGROUND COMMENTS

BPXA is currently allowed, under Air Quality Control Operating Permit AQ0455TVP01, Revision 1 to operate up to twelve transportable drilling rigs at aggregated well pads within a bounded area of the Alaska North Slope. The bounded area is referred as the "North Slope

Drilling Area." The boundaries are the Colville River, the Canning River, within three miles of the Beaufort Sea shore-line, and latitude 69° 30'). BPXA is also allowed, under Air Quality Control Minor Permit AQ097MSS01 to operate up to twelve transportable drilling rigs at unaggregated well pads within the same bounded area.

BPXA recently discovered that the ambient analysis submitted in support of Air Quality Control Operating Permit AQ0455TVP01, Revision 1 and Air Quality Control Minor Permit AQ0977MSS01 contained incorrect emission rates. BPXA found that the Milne Point Unit (MPU) C-Pad emission rates did not match those documented in a July 17, 2002 revision to the C-Pad Title V permit application. In addition to the incorrect C-Pad emission rates, emission rates for MPU emission units did not match emissions documented in Attachment AA of the Statement of Basis for Air Quality Control Operating Permit AQ0200TVP01.

BPXA has corrected these emission rates in their current ambient analysis submitted with their November 16, 2006 application to revise Air Quality Control Minor Permit AQ0977MSS01. This revised modeling analysis shows that the aggregate rolling twelve month fuel limits defined in Air Quality Control Operating Permit AQ0455TVP01, Revision 1 and Air Quality Control Minor Permit AQ0977MSS01 should be reduced from 1,350,000 gallons to 1,250,000 gallons. Daily fuel limits and short term emission rates remain unchanged from the previous ambient analysis.

BPXA modeled two scenarios using the same source groups as in their previous ambient analysis and corrected a minor source group error documented in the previous memorandum. No emission rates for Scenario 2 emission units increased in the current ambient analysis. Although BPXA was not required to submit an analysis for Scenario 2, BPXA did include Scenario 2 in the current ambient analysis and the Department has included the results in this memorandum.

RESULTS AND DISCUSSION

The revised maximum Scenario 1 and Scenario 2 AAAQS impacts are shown below in Tables 1 and 2, respectively. The background concentrations, total impacts and AAAQS are also shown. As shown in Tables 1 and 2, the total impacts are less than the respective AAAQS. Therefore, BPXA has demonstrated compliance with the AAAQS.

Table 1 – Maximum Scenario 1 AAAQS Impacts
Multiple Rig Operation with Permanent On-Site Units
(e.g., MPU C-Pad)

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 ($\mu g/m^3$)
NO_2	Annual	89.6	7.5	**97**	100
SO_2	3-hr	658	28.8	**687**	1,300
	24-hr	290	13.1	**303**	365
	Annual	12.5	0	**13**	80
PM-10	24-hr	74.2	60.4	**135**	150

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 ($\mu g/m^3$)
	Annual	2.8	6.2	**9**	50
CO	1-hr	3,268	1,150	**4418**	10,000
	8-hr	1,675	575	**2,250**	40,000

Table 2 – Maximum Scenario 2 AAAQS Impacts
Multiple Rig Operation without Permanent On-Site Units
(e.g., GC-2 Q-Pad)

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 ($\mu g/m^3$)
NO_2	Annual	84.4	7.5	**92**	100
SO_2	3-hr	608.4	28.8	**637**	1,300
	24-hr	270.2	13.1	**283**	365
	Annual	11.5	0	**12**	80
PM-10	24-hr	53.5	60.4	**114**	150
	Annual	3.9	6.2	**10**	50
CO	1-hr	3,165	1,150	**4,315**	10,000
	8-hr	1,578[a]	575	**2,153**	40,000

a – The Department noted that this value increased from the previous ambient analysis although the emissions rates for Scenario 2 did not increase. The Department did not believe pursuing the cause was worthwhile because the total impact is much less than the ambient standard.

It is important to note that since ambient concentrations vary with distance from each source, the maximum values shown represent the highest value that may occur somewhere in the local airshed. They do *not* represent the highest concentration that could occur at *all* locations in the area.

CONCLUSION

I reviewed BPXA's multiple rig modeling analysis and concluded the following:

1. The NO_2, SO_2, PM-10 and CO emissions associated with operating the stationary source within the revised operating limit will not cause or contribute to a violation of the AAAQS provided in 18 AAC 50.010; and
2. BPXA conducted the analysis in a manner consistent with EPA's *Guideline on Air Quality Models*.

BPXA incorporated the revised annual fuel consumption in their ambient demonstration, which should be included in the revised minor permit and revised operating permit. Therefore, please incorporate a permit condition that addresses the following item. This condition is needed to protect the AAAQS.

1. Reduce the annual fuel consumption to 1,250,000 gallons per pad.

PED/slb

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