ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Air Permits Program

TECHNICAL ANALYSIS REPORT
For
Air Quality Control Minor Permit AQ0237MSS03

Doyon Utilities, LLC
Fort Richardson – Electric Gas and Sanitary Services

Replacement of Back-up Diesel Generators

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ABBREVIATIONS/ACRONYMS

AAC .....Alaska Administrative Code
ADEC.....Alaska Department of Environmental Conservation; Department
CHPP.....Central Heat and Power Plant
DU .....Doyon Utilities
EF .....Emission Factor
EU.....Emission Units
FRA .....Fort Richardson Army Base
ICE .....Internal Combustion Engine
ID.....Identification Number of Emission Units
MR&R.....Maintenance, Recording, and Recording
N/A.....Not Applicable
NAICS.....North American Industrial Classification System
NTE.....Not-to-Exceed
ORL.....Owner Requested Limits
PTE.....Potential to Emit
SIC.....Standard Industrial Classification
TAR.....Technical Analysis Report
USAG.....United States Army Garrison

Units and Measures

BTU.....British Thermal Units
hphr.....horsepower-hour
hphr/yr .....horsepower-hours per year
lb, lbs .....pound, pounds
lb/1,000 gal.....pounds per thousand gallons burned
lb/MMBTU.....pounds per million British Thermal Unit input
kW .....kilowatts
MMBTU.....million British Thermal Units
MMBTU/hr .....million British Thermal Units per hour
MMCF/yr .....million cubic feet per year
MW.....megawatts
TPY, tpy .....tons per year

Pollutants

CO .....Carbon Monoxide
NO_x.....Oxides of Nitrogen
NO_2.....Nitrogen Dioxide (used interchangeably with NO_x)
PM.....Particulate Matter
PM-10.....Particulate Matter with an aerodynamic diameter less than 10 microns
SO_2 .....Sulfur Dioxide
SO_x .....Oxides of Sulfur (used interchangeably with SO_2)
VOC .....Volatile Organic Compound

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1. Introduction

This Technical Analysis Report (TAR) provides the Alaska Department of Environmental Conservation's (Department's) basis for issuing Air Quality Control Minor Permit AQ0237MSS03 to Doyon Utilities (DU). This minor permit authorizes the installation and operation of three new diesel Caterpillar generators to replace five existing generators at the Central Heating and Power Plant (CHPP) of Fort Richardson Army Base (FRA). This action requires a permit under 18 AAC 50.508(6) to revise terms of Title I Minor Permit AQ0237MSS02. This permit is also classified under 18 AAC 50.508(5) to avoid a minor permit classification under 18 AAC 50.502(c)(3).

1.1 Stationary Source Description

FRA is one of three United States Army posts that make up the United States Army Garrison, Alaska (USAG). FRA covers about 64,000 acres in the Anchorage Bowl, bounded by the Municipality of Anchorage, Knik Arm of Cook Inlet, and Chugach Mountain Range. At FRA, USAG prepares soldiers and equipment for deployment to the Pacific Rim and has been operational since 1947. Due to the critical nature of its operations FRA requires uninterrupted power and has several back-up generators to provide power when primary power is not available.

1.2 Permit History

The Department issued Construction Permit 237CP03 on October 6, 2003 to USAG post at FRA to authorize the operation of unpermitted emission units (EU) installed since 1980. On November 28, 2003, the Department issued an operating permit to FRA to include all terms and conditions in Permit 237CP03 and Permit-to-Operate 9421-AA006. In 2004, USAG requested the Department to disaggregate FRA stationary sources into 14 separate sources based on Standard Industrial Classification Codes (SIC). One of the 14 FRA stationary sources is Electric, Gas, and Sanitary Services with SIC 49 with Stationary Source ID 237.

USAG privatized its electric power, gas, and sanitary services at FRA to Doyon Utilities (DU). On December 11, 2008 the Department issued Permit AQ0237MSS02. On December 28, 2004, the Department rescinded the Title V operating permit (AQ0237TVP01), because after disaggregation, Stationary Source ID 237 emissions were less than 100 tons per year (tpy) for all regulated pollutants.

1.3 Application Description

DU's application includes a request to add three new generators (EU90 through EU92) that will replace five backup generators (EU02a, EU03a, EU04, EU05, and EU06). DU will remove EU01a through EU01d and EU02a, EU3a, and EU04 from service prior to installing the new generators. EU05 and EU06 will remain operational until DU fully commissions the new generators. DU requests revisions to its Permit AQ0237MSS02 under 18 AAC 50.508(6) and requests Owner Requested Limits (ORLs) under 18 AAC 50.508(5) to avoid minor permit classification under 18 AAC 50.502(c)(3). Unrestricted, the three new generators can emit 785 tons of NO_x in a 12 consecutive month period. DU proposes an ORL of 480,000 gallons per 12 consecutive months for the new generators. The resulting emissions are 68 tons NO_x per rolling 12 consecutive month period. This is four tpy NO_x less than the replaced existing units.

DU estimates that installation of the new generators will start in March 2010 and end in October 2010. DU requests an interim ORL of 340,000 gallons per 12 consecutive months for the installed new generator(s) to ensure continuous emergency back-up capability while installing and commissioning the remaining new generator(s). .

Table 1 presents emission units during the installation of the new generators.

Table 1: Emission Units during Installation of Three Caterpillar Units

Unit ID	Building	Description	Make / Model	Rating / Size	Installed
EU22	772	Boiler	Burnham / V1106	1.328 MMBTU/hr	2003
EU24	36012	Boiler	Power Flame / C6-G0-30	14.215 MMBTU/hr	Unknown
EU25	28008	Boiler	Cleaver Brooks/M48-700-4000	4 MMBTU/hr	2003
EU26	28008	Boiler	Cleaver Brooks / M4HP-400	4 MMBTU/hr	Unknown
EU05	772	Back-up generator	Fairbanks-Morse / 31-A-18	2,500 kW	1951
EU06	772	Back-up generator	Fairbanks-Morse / 31-A-18	2,500 kW	1951
EU13	28008	Back-up Generator	Waukesha / F475DSU	75 kW	1990
EU14	28004	Back-up Generator	John Deere / 4039TF001	60 kW	1980
EU27	35610	IC Engine	Cummins / NHC-4-P	60 kW	1957
EU28	35620	IC Engine	Cummins / HRS-6-P	150 kW	1957
EU29	35630	IC Engine	Cummins / HRS-6-P	150 kW	1957

DU will remove EU05 and EU06 after installing EU90 through EU92. Table 2 presents emission units after the installation of the new generators.

Table 2: Emission Units after Installation of Three caterpillar Generators

Unit ID	Building	Description	Make / Model	Rating / Size	Installed
EU22	772	Boiler	Burnham / V1106	1.328 MMBTU/hr	2003
EU24	36012	Boiler	Power Flame / C6-G0-30	14.215 MMBTU/hr	Unknown
EU25	28008	Boiler	Cleaver Brooks/M48-700-4000	4 MMBTU/hr	2003
EU26	28008	Boiler	Cleaver Brooks / M4HP-400	4 MMBTU/hr	Unknown
EU13	28008	Back-up Generator	Waukesha / F475DSU	75 kW	1990
EU14	28004	Back-up Generator	John Deere / 4039TF001	60 kW	1980
EU27	35610	IC Engine	Cummins / NHC-4-P	60 kW	1957
EU28	35620	IC Engine	Cummins / HRS-6-P	150 kW	1957
EU29	35630	IC Engine	Cummins / HRS-6-P	150 kW	1957
EU90	772	Back-up Generator	Caterpillar C-175	3,000 kW	Est. 2010
EU91	772	Back-up Generator	Caterpillar C-175	3,000 kW	Est. 2010
EU92	772	Back-up generator	Caterpillar C-175	3,000 kW	Est. 2010

2. Emissions Summary and Permit Applicability

Emission estimates presented in this section assume maximum energy usage allowed by Permit AQ0237MSS02.

2.1 Fuel Consumption and Owner Requested Limits

During installation of the new units (EU90 through EU92), DU might need EU05 and EU06 for back-up and requests a combined total of 340,000 gallons diesel fuel consumption for EU90 through EU92 and 240 hours of operation for EU05 and for EU06 per 12 consecutive months. When fully commissioned, DU requests 480,000 gallons diesel fuel consumption for EU90

through EU92 per 12 consecutive months. The ORLs, Tab C of the application, Condition 14 of Minor Permit AQ0237MSS02, and Table A-1 of TAR for AQ0237MSS02 give the usage limits of the existing emission units and new emission units.

Table 3 presents fuel consumption and energy demand before installation of EU90 through EU92.

Table 3: Fuel Consumption and Energy Demand before Installation of EU90 – EU92

Emission Unit ID(s)	Rated Capacity	Usage Limits per 12 months	Total hphr/yr
EU01a – EU01d	187 MMBTU/hr each	300 MMCF cumulative total	
EU02a, EU03a	835 kW each	240 hours each	537,473
EU04	1,100 kW	240 hours	354,024
EU05, EU06	2,500 kW each	240 hours each	1,609,200
EU13	75 kW	250 hours	25,144
EU14, EU27	60 kW each	250 hours each	40,230
EU22	1.328 MMBTU/hr	11 MMCF of natural gas	
EU24	14.2 MMBTU/hr	122 MMCF of natural gas	
EU25, EU26	4.0 MMBTU/hr each	34 MMCF of natural gas each	
EU28, EU29	150 kW each	250 hours each	100,576

Table 4 presents fuel consumption and energy demand during the installation of EU90 through EU92.

Table 4: Fuel Consumption and Energy Demand during Installation of EU90 – EU92

Emission Unit ID(s)	Rated Capacity	Usage Limits per 12 months	Total hphr/yr
EU05, EU06	2,500 kW each	240 hours each	1,609,200
EU13	75 kW	250 hours	25,144
EU14, EU27	60 kW each	250 hours each	40,230
EU22	1.328 MMBTU/hr	11 MMCF of natural gas	
EU24	14.2 MMBTU/hr	122 MMCF of natural gas	
EU25, EU26	4.0 MMBTU/hr each	34 MMCF of natural gas each	
EU28, EU29	150 kW each	250 hours each	100,576
EU90, EU91, EU92	3,000 kW each	340,000 gallons diesel total	

Table 5 presents fuel consumption and energy demand after the installation of EU90 through EU92.

Table 5: Fuel Consumption and Energy Demand after Installation of EU90 – EU92

Emission Unit ID(s)	Rated Capacity	Usage Limits per 12 months	Total hphr/yr
EU13	75 kW	250 hours	25,144
EU14, EU27	60 kW each	250 hours each	40,230
EU22	1.328 MMBTU/hr	11 MMCF of natural gas	
EU24	14.2 MMBTU/hr	122 MMCF of natural gas	
EU25, EU26	4.0 MMBTU/hr each	34 MMCF of natural gas each	
EU28, EU29	150 kW each	250 hours each	100,576
EU90, EU91, EU92	3,000 kW each	480,000 gallons diesel total	

2.2 Emission Factors for the Emission Units

Emission factors (EF) for all the existing emission units come from AP-42. Caterpillar, the manufacturers, provided worst case (not-to-exceed (NTE)) emission factors for EU90 through EU92. Table 6 presents EF for the emission units.

Table 6: Emission Factors for Emission Units at FRA

EU ID	CO	NO_x	PM-10	SO_x	VOC	Units	Reference
EU01a – EU01d	84	280	7.6	0.6	5.5	lb/MMSCF	AP 42, Table 1.4-1, 1.4-2
EU02a, EU03a	5.5	24	0.7	2.02	0.64	lb/1000 hphr	AP 42, Table 3.4-1
EU04	5.5	24	0.7	2.02	0.64	lb/1000 hphr	AP 42, Table 3.4-1
EU05, EU06	5.5	24	0.7	2.02	0.64	lb/1000 hphr	AP 42, Table 3.4-1
EU13, EU14, EU27	6.7	31	2.2	2.05	2.51	lb/1000 hphr	AP 42, Table 3.3-1
EU22 – EU26	84	100	7.6	0.6	5.5	lb/MMscf	AP 42, Table 1.4-1, 1.4-2
EU28, EU29	6.7	31	2.2	2.05	2.51	lb/1000 hphr	AP 42, Table 3.3-1
EU90 – EU92	60.95	281.72	2.81	7.05	12.00	lb/1000 gal	Manufacturer's data

Table Notes:
1. The emissions factors shown in table come from Table C-6 of application. The Department verified the EFs.
2. SO_x EF for EU90 through EU92 was estimated from mass balance. The application states the units will burn fuel with S content of 0.05 wt%.
3. SO_x EF for other diesel emission units assume the S content of diesel fuel they burn is 0.25 wt% as specified in Condition 12.1 of Permit AQ0237MSS02.
4. Density of diesel fuel is 7.05 lb/gal (AP-42, Appendix A, Density of Selected Fuels)

2.3 Emissions from Emissions Units

The applicant provided a summary of emissions from existing emission units for pre-installation and during-installation phases and provided detailed calculations and summary of emissions for the new emission units. Initially, it was not clear how the applicant obtained the emissions of the existing emission units. To check the applicant's estimates, the Department multiplied emission factors in Table 6 with fuel consumption or energy output in the TAR of Permit AQ0237MSS02 to obtain emissions of the existing emission units. The Department's emission estimates agreed with the applicant's emission estimates. Table 7 presents emissions for the existing situation.

Table 7: Stationary Source Emissions for Existing Emission Units (Tons per 12-rolling months)

Emission Unit ID(s)	CO	NO_x	PM-10	SO_2	VOC	Total
EU01a – EU01d	12.6	42.0	1.1	0.1	0.8	56.6
EU02a, EU03a	1.5	6.5	0.2	0.5	0.2	8.9
EU04	1.0	4.3	0.1	0.4	0.1	5.9
EU05, EU06	4.4	19.3	0.6	1.6	0.5	26.4
EU13, EU14, EU27	0.2	1.0	0.1	0.1	0.1	1.5
EU22 – EU26	8.4	10.1	0.8	0.1	0.6	20.0
EU28, EU29	0.3	1.6	0.1	0.1	0.1	2.2
Total	**28.4**	**84.8**	**3.0**	**2.9**	**2.4**	**121.5**

Table 8 presents emissions during installation of EU90through EU92.

Table 8: Stationary Source Emissions during Installation of EU90 – EU92 (Tons per rolling 12 months)

Emission Unit ID(s)	CO	NO_x	PM-10	SO_2	VOC	Total
EU05, EU06	4.4	19.3	0.6	1.6	0.5	26.4
EU13, EU14, EU27	0.2	1.0	0.1	0.1	0.1	1.5
EU22 – EU26	8.4	10.1	0.8	0.1	0.6	20
EU28, EU29	0.3	1.6	0.1	0.1	0.1	2.2
EU90 – EU92	10.4	47.9	0.5	1.2	2.0	62
Total	**23.7**	**79.9**	**2.1**	**3.1**	**3.3**	**112.1**

Table 9 presents emissions after installation of EU90 through EU92.

Table 9: Stationary Source Emissions after the Installation of EU90 – EU92 (Tons per rolling 12 months)

Emission Unit ID(s)	CO	NO_x	PM-10	SO_2	VOC	Total
EU13, EU14, EU27	0.2	1.0	0.1	0.1	0.1	1.5
EU22 – EU26	8.4	10.1	0.8	0.1	0.6	20
EU28, EU29	0.3	1.6	0.1	0.1	0.1	2.2
EU90 – EU92	14.6	67.6	0.1	1.7	2.9	86.9
Total	**23.5**	**80.3**	**1.1**	**2**	**3.7**	**110.6**

2.4 Permit Classification Tests under the Owner Requested Limits

Table 10 compares emissions for existing situation with emissions during installation and after installation of EU90 through EU92. Parenthetical entries represent decreases in emissions relative to the existing situation.

Table 10: Comparison of Existing Emissions with Emissions during Installation (tpy)

Description of Phase	**CO**	**NO_x**	**PM-10**	**SO_2**	**VOC**
Existing Situation	28.4	84.8	3.0	2.9	2.4
During Installation	23.7	79.9	2.1	3.1	3.3
Change in emissions	(4.7)	(4.9)	(0.9)	0.2	0.9
Minor Permit Threshold	N/A	10	10	10	N/A
Minor Permit Triggered?	**N/A**	**No**	**No**	**No**	**N/A**

Table 11 compares emissions before and after the installation of EU90 through EU92.

Table 11: Comparison of Existing Emissions with Emission after Installation (tpy)

Description of Phase	**CO**	**NO_x**	**PM-10**	**SO_2**	**VOC**
Existing Situation	28.4	84.8	3.0	2.9	2.4
After Installation	23.5	80.3	1.1	2.0	3.7
Change in emissions	(4.9)	(4.5)	(1.9)	(0.9)	1.3
Minor Permit Threshold	N/A	10	10	10	N/A
Minor Permit Triggered?	N/A	No	No	No	N/A

With the ORLs in place, this project does not trigger minor permit requirements under 18 AAC 50.502(c).

2.5 Assessable Emissions

The Department bases a stationary source's annual fees on its assessable PTE emissions or actual emission it reports for a calendar year. From Table 7, the PTE for the Power, Gas, and Sanitary Services at FRA are 122 tpy. Removing EU01a through EU01d permanently and replacing EU02a through EU06 with EU90 through EU92 resulted in emission reductions. Assessable emissions are estimated pollutant by pollutant. Assessable emissions for a pollutant are the PTE emissions of that pollutant exceeding 10 tpy. If PTE emissions of a pollutant are less than 10 tpy, the assessable emissions for that pollutant are zero. The assessable emissions for a stationary source are the sum of assessable emissions for each pollutant.

Table 12 presents new assessable emissions of the stationary source based on PTE.

Table 12: Existing PTE, Change in Emissions, and New Assessable Emissions (TPY)

Description of Emissions	CO	NOx	PM-10	SO_2	VOC	Total
Existing PTE	28.4	84.8	3.0	2.9	2.4	121.5
Change in Emission during installations	(4.7)	(4.8)	(1.0)	0.2	1.0	(9.3)
New PTE Emissions during installations	23.7	80.0	2.0	2.7	3.4	111.8
New Assessable Emissions during installation	23.7	80.0	0	0	0	104
Existing PTE	28.4	84.8	3.0	2.9	2.4	121.5
Change in Emission after installations	(4.9)	(4.5)	(1.9)	(0.9)	1.3	(10.9)
New PTE emissions after installations	23.5	80.3	1.1	2.0	1.1	108
New Assessable Emissions after installation	23.5	80.3	0	0	0	104

2.6 Department Findings

The Department has made the following findings regarding DU's application:

1. FRA is classified as a minor source with respect to Title V classification because regulated pollutants it emits are below 100 tpy.
2. The project is classified under 18 AAC 50.508(5) to limit increase in potential emissions of NO_x, SO_2, and PM-10 to less than 10 tpy. The ORLs ensure that the emissions do not exceed project classification thresholds under 18 AAC 50.502(c)(3).
3. The project is classified under 18 AAC 50.508(6) because the applicant requests revisions to Minor Permit AQ0237MSS02 to add and remove emission units.
4. Every substantive condition in existing Minor Permit AQ0237MSS02 required revision. The new permit contains all applicable stationary source requirements and carries forward all relevant conditions in Minor Permit AQ0237MSS02. This permit rescinds all conditions in Permit AQ0237MSS02 that apply to removed emission units and adds conditions that apply to the new emission units (EU90 through EU92).
5. Applicant demonstrated with calculations that show EU90 through EU92 will comply with the 0.05 grains per standard cubic foot standard in 18 AAC 50.055(b)(1). Emission units burning diesel fuel containing less than 0.75 wt percent sulfur will comply with the sulfur compound emission standard in 18 AAC 50.055(c). Permit AQ0237MSS02 limits sulfur content in diesel fuel burned by existing units to 0.25 percent by weight. The

application states the new emission units will burn diesel fuel containing no more than 0.05 percent by weight of sulfur.

6. FRA is located in the Anchorage Inset Coastal District[1]. This permit is classified under 18 AAC 50.508(5). This classification is not on the ACMP C list, therefore the ACMP project modification and Department single agency review procedures do not apply.

3. Permit Requirements

3.1 Requirements for All Minor Permits

As required by 18 AAC 50.544(a), a minor permit issued under 18 AAC 50.542 must identify the stationary source, the project, the Permittee, contact information, the requirement to pay fees, ORLs that apply to the source, and the applicable standard permit conditions in 18 AAC 50.345. The permit identifies the stationary source, project, Permittee, and contact information. The permit contains standard sections of a Title I permit. Standard sections of a Title I permit include:

(a) emission unit inventory that describes the characteristics of the emission units;
(b) emission fees that describe fee requirements and assessable emissions;
(c) section that describes general certification and information required of source;
(d) section on generic standard conditions needed to make the permit enforceable;
(e) section that describes applicable source test (if any) and monitoring requirements; and
(f) documentation that lists major events during the development of the permit.

3.2 Requirements for a Minor Permit issued under 18 AAC 50.508(5)

This permit authorized the installation of new emission units EU90 through EU92. It is issued under 18 AAC 50.508(5) to avoid classification under 18 AAC 50.502(c)(3). A permit issued under 18 AAC 50.508(5) need not include performance tests to show initial compliance with state standards. Therefore, no initial compliance demonstration for Title I purposes is required for EU90 through EU92.

Per 18 AAC 50.544(h), each minor permit issued under 18 AAC 50.508(5) must contain terms and conditions that describe the ORL, including specific testing, monitoring, recordkeeping, and reporting (MR&R) requirements, list all equipment covered by the ORL, and describe each permit classification the ORLs allow the operator to avoid. Minor Permit AQ0237MSS03 describes the Owner Requested Limits (ORL), lists all equipment covered by the ORLs, describes MR&R, and states that the ORLs allow the operator to avoid classification under 18 AAC 50.502(c)(3).

DU requested a combined limit of 340,000 gallons of diesel oil for EU90 through EU92 during their installation. DU also requested to keep the existing limit of 240 hours per year for EU05 and for EU06 during the installation. After installing EU90 through EU92, DU requests a combined limit of 480,000 gallons for EU90 through EU92. The permit includes these ORLs and the operation characteristics of other emission units allowed by Permit AQ0237MSS02 that DU will not remove. DU must track, record, and report usage hours of EU05, EU06, and other

[1] Alaska Coastal Management Program Boundaries Map; http://www.alaskacoast.state.ak.us/GIS/IndexMap.pdf; accessed Sep 29, 2009

emission units allowed in Permit AQ0237MSS03. DU must track, record, and report fuel consumption and operation characteristics of emission units as specified in Permit AQ0237MS003 during and after the installation of EU90 through EU92.

3.3 Requirements for a Minor Permit issued under 18 AAC 50.508(6)

Permit AQ0237MSS03 revises and rescinds Permit AQ0237MSS02. The ORLs in the previous permit made it possible for operator to avoid a Title V permit. The revisions continue to allow the source to avoid Title V permit. Conditions that apply to existing emission units as specified in Permit AQ0237MSS02 are left as they are, except when they are revised to reflect current language of Title V and Title I permit templates. Conditions that apply to the new emission units are added. The Department based the conditions applicable to the new units on the ORL and applicant's own suggested language.

The Department customized the current Title V template for VE, PM, sulfur emissions and applicable MR&R and inserted them into the permit. The permit contains state standards for PM, sulfur, and visible emissions in 18 AAC 50.055, and MR&R requirements necessary to keep the stationary source in compliance.

3.4 Requirements for a Minor Permit not subject to Title V

The stationary source is not subject to Title V permitting under 18 AAC 50.326 because it does not emit 100 tons of any criteria pollutant, 10 tons of a hazardous air pollutant (HAP), or 25 tons of total HAPs. As required by 18 AAC 50.544(d), the permit contains a periodic affirmation that the application submitted by the operator and permit issued by the Department still accurately describe the stationary source and any change the owner has made that requires a new permit. The ORLs imposed by this permit continue to keep the stationary source out of Title V.

4. Permit Administration

This permit retains permit conditions applicable to existing emissions units as specified in Permit AQ0237MSS02, adds new ORLs under 18 AAC 50.508(5) to avoid project classification under 18 AAC 50.502(c)(3), and revises and rescinds Minor Permit AQ0237MSS02 under 18 AAC 50.508(6). The provisions include diesel oil consumption limits during and after the installation of EU90 through EU92.

This source does not have a Title V permit, so DU may operate under this permit upon issuance.