Hiland Partners Holdings LLC
a Kinder Morgan company

5151 E. Broadway, Suite 1680, Tucson, Arizona 85711

August 7, 2024 Electronic Submittal

Mr. Jim Semerad
Director of Air Quality
North Dakota Department of Environmental Quality
Division of Air Quality
4201 Normandy Street 2nd Floor
Bismarck ND 58503-1324

Re: Air Permit Application
Hiland Partners Holdings LLC
Firebird Compressor Station – AOP 28482 v1.0 and ACP 17925 v1.1
Williams County, North Dakota

Dear Mr. Semerad:

Hiland Partners Holdings LLC (Hiland) is planning to add one Caterpillar Unit (C2) and increase dehydrator throughput to 25 MMSCFD at Firebird Compressor Station. Attached is an application for the permit revision. A separate letter was sent with a $350 check.

Currently, there is one C1 Caterpillar engine and one C3 Waukesha engine. There are plans to move a Caterpillar unit from 4Runner Compressor Station to Firebird Compressor Station. The NDDEQ permit forms that are pertinent to the revision are included. The Site Emissions Summary highlights the changes;

- Addition of Engine C2 Caterpillar engine
- Revision of TEG Dehydrator Throughput from 16 MMSCFD to 25 MMSCFD
- Produced Water Tanks – ProMax model estimates slightly higher emissions for the produced water tanks. Condensed liquids from the BTEX condenser are routed to produced water tanks.

The Project Engineer is hoping to receive the permit by beginning of January 2025 at the latest.

If you need additional information or have any questions, please contact me at (520) 663-4249 or by email at Anu_Pundari@KinderMorgan.com.

Sincerely,

Anu Pundari

Anu Pundari
Engineer – Air Permitting & Compliance Staff

AIR QUALITY PERMIT TO CONSTRUCT

APPLICATION

NATURAL GAS COMPRESSOR STATION

Hiland Partners Holdings LLC

Firebird Compressor Station

Williams County, North Dakota

TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

1.0 INTRODUCTION

1.1 Introduction

Hiland Partners Holdings LLC (Hiland) is submitting the permit revision application to add one Caterpillar G3606 and increase TEG dehydrator throughput to 25 MMSCFD.

The Firebird Compressor Station located approximately 7 miles southeast of Tioga, North Dakota, in Williams County. The station will be used to compress natural gas from nearby wells for pipeline transmission.

Detailed information for the proposed equipment can be found in Section 2.0.

1.2 Application

In accordance with North Dakota Division of Air Quality requirements, permit application forms have been completed and are included in Appendix A.

1.3 Public Notice

Per North Dakota Administrative Code (NDAC) Section 33-15-14-02.6 - Public participation - Final action on application, this facility does qualify as a source category not subject to public participation procedures. The following discussion substantiates this claim:

NDAC Section	
33-15-14-02-6.a.(1)	This facility is not an affected facility per 40 CFR 61 - National Emission Standards For Hazardous Air Pollutants as incorporated by NDAC Chapter 33-15-13.
33-15-14-02-6.a.(2)	Since the compressor station does not have the potential to emit more than 100 tons per year of any criteria pollutant, the facility will not be subject to the Title V operating permit program.
33-15-14-02-6.a.(3)	This application is for a new facility, not a modification to an existing facility.
33-15-14-02-6.a.(4)	Potential emissions as reported in Appendix B are not expected to have a “major impact on air quality.”
33-15-14-02-6.a.(5) & (6)	As of the application date, no request for a public comment period has been received.

33-15-14-02-6.a.(7) Hiland is not requesting a federally enforceable permit which limits their potential to emit.

1.4 Site Location

The Firebird Compressor Station is located approximately 7 miles southeast of Tioga, North Dakota. The site location is split SE ¼ and SE ¼ of Section 23, Township 156 North, Range 95 West, in Williams County. The site elevation is approximately 2428 feet above sea level. A Firebird Plot Plan is presented in Appendix G.

1.5 Site Description

The terrain surrounding the facility is characterized as rolling hills. The surrounding area is mainly used for agriculture and livestock grazing. The air quality classification for the area is "Better than National Standards" or unclassifiable/ attainment for the National Ambient Air Quality Standards for criteria pollutants (40 CFR 81.335). There are no non-attainment areas within a reasonable distance of the site.

2.0 PROJECT SUMMARY

2.1 Process Description

The Firebird Compressor Station compresses natural gas from nearby wells for pipeline transmission to a local gas plant. The field gas is dehydrated and compressed into the pipeline.

The gas compression is achieved by two compressors driven by (2) natural gas fired engines.

One existing Waukesha L7044GSI Series 5 engine (i.e. C3). The Waukesha engine is equipped with Non-Selective Catalytic Reduction (NSCR) catalysts for control of emissions.

One existing Caterpillar G3606 engine (i.e. C1). The Caterpillar engine is equipped with oxidation catalysts.

This application is to add one natural gas fired Caterpillar G3606 engine (i.e. C2). The Caterpillar engine will be equipped with oxidation catalysts.

This application is to increase the throughput of the existing dehydrator to 25 MMSCFD. The gas is dehydrated using a TEG dehydration unit and associated an existing 0.5 MMBTU/hr TEG reboiler. Emissions from the dehydrator flash tank are recycled back into

the process. Emissions from the regenerator still column are routed to a BTEX condenser system, with non-condensable vapors exiting the condenser combusted in the TEG reboiler firebox. Condensed vapors (liquids) are routed to the Produced Water Tank. The reboiler also uses natural gas as fuel in addition to the uncondensed vapors. The two existing 400 barrel atmospheric tanks are used to store produced water for eventual shipment offsite via tank truck loading (PW-TL). All combustion equipment at the site is fired with a portion of natural gas after it has been processed at the station.

Emission sources with minor emissions include three 500 gallon methanol tanks, one 60,000 gallon natural gas liquid (NGL) pressurized bullet tank, NGL tank unloading, pig launchers and receivers, and compressor blowdowns required for maintenance. Most compressor blowdowns will be routed to the suction header. There will be a few compressor blowdowns routed to atmosphere.

2.2 Proposed Construction

Hiland is proposing to authorize addition of a Caterpillar 3606 engine (C2). Site work including piping and equipment that is not an emissions unit may be performed prior to air permit issuance as allowed by NDDEQ regulations. The placement of the Caterpillar engine will begin in January 2025 upon air permit issuance. The anticipated date of construction completion is March 2025. Table 2.1 summarizes engine information.

Table 2.1: Natural Gas-Driven Engine Specifications

Emitting Unit Description	Engine Type	Design Horsepower Rating	Max. Fuel Consumption (HHV)	Pollution Control Device
Existing Compressor Engine C1	4-Stroke Lean-Burn	1,875	7,506 Btu/bhp-hr	Oxidation Catalyst
New Compressor Engine C2	4-Stroke Lean-Burn	1,875	7,506 Btu/bhp-hr	Oxidation Catalyst
Existing Compressor Engine C3	4-Stroke Rich-Burn	1,900	8,253 Btu/bhp-hr	Non Selective Catalyst Reduction

3.0 EMISSION SOURCES

3.1 Criteria Pollutant Emission Inventory

The criteria air pollutants that will be emitted from the Firebird Compressor Station are as follows: nitrogen oxides (NOx), particulate matter with an aerodynamic diameter less than 10 microns (PM_{10}), sulfur dioxide (SO_2), volatile organic compounds (VOCs), and carbon monoxide (CO).

Appendix B provides a Tables which summarizes the potential emissions from the proposed sources.

3.2 Compressor Engine Emissions

The site consists of one existing Waukesha L7044 GSI Series 5 rich-burn engines for compression of natural gas. The existing engine is rated at 1,900 bhp at 1200 rpm and will is equipped with Non-Selective Catalytic Reduction (NSCR).

The site consists of one existing Caterpillar G3606 for compression of natural gas. The Caterpillar G3606 engine will be rated at 1875 bhp at 1000 rpm and equipped with oxidation catalysts.

The permit application is to add one Caterpillar G3606 for compression of natural gas. The Caterpillar G3606 engine will be rated at 1875 bhp at 1000 rpm and equipped with oxidation catalysts.

The Waukesha compressor engine NO_x and CO and VOC emissions were based on NSPS JJJJ Limit. Formaldehyde emissions are based on data from the vendor. PM/PM_{10} and SO_2 emissions were based on AP-42 Table 3.2-3 emission factors. Per AP-42, all particulate emissions from natural gas combustion are considered to be less than 1.0 micrometer in diameter.

The current permit limit for the Waukesha engine is the following:

1.0 g/hp-hr – NOx

2.0 g/hp-hr – CO

0.7 g/hphr – VOCs

The Caterpillar compressor engines NO_x and VOC emissions are based on the NSPS JJJJ Limit. The Caterpillar CO limit is below the NSPS JJJJ Limit so that the site wide CO emissions are below 100 tpy.

Formaldehyde emissions are based on vendor data. PM/PM_{10} and SO_2 emissions were based on AP-42 Table 3.2-3 emission factors. Per AP-42, all particulate emissions from natural gas combustion are considered to be less than 1.0 micrometer in diameter.

Emission calculations are provided in Appendix B. The engine specifications including information of controlled and uncontrolled emission rates are provided in Appendix F.

3.3 Glycol Reboiler Emissions

For the TEG reboiler, AP-42, Section 1.4 emission factors were used to calculate the NO_x, CO, VOC, PM/PM_{10} and SO_2 emissions. Per AP-42, all particulate emissions from natural gas combustion are considered to be less than 1.0 micrometer in diameter. Emission calculations are provided on Appendix B.

3.4 Glycol Dehydrator Emissions

VOC emissions from the dehydrator still vent were calculated using GRI-GLYCalc Version 4.0. The flash tank off-gas will be recycled. A condenser system will be used to reduce the VOC emissions in the overhead stream from the reboiler; non-condensable gas from the condenser will be routed to the reboiler firebox. A condenser system is used to reduce the VOC emissions in the overhead stream. Non-condensable gas from the condenser will be routed to the reboiler firebox with an assumed destruction efficiency of 95%. Condensed vapors (liquids) are routed to the Produced Water Tank. A 2023 gas analysis from inlet to dehydrator at Firebird Compressor Station was used in the calculations and is found in Appendix D.

The GRI-GLYCalc input and output reports are found in Appendix B. Emission calculations are provided in Appendix B.

3.5 Produced Water Storage Tank Emissions

The station receives an oil/water mixture which is routed to a slug catcher. The slug catcher separates the oil fraction and water fraction. The oil fraction routes to a pressurized Natural Gas Liquids (NGL) tank. The water fraction routes to the atmospheric produced water storage tanks. Hiland obtained pressurized liquid samples from the slug catcher drain that routes to the produced water storage tanks. A liquid sample was obtained from Sacramento Compressor Station as a representative site.

Using ProMax estimation software, working, breathing, and flashing losses were calculated for a tank with 15,000 bbls/year throughput. ProMax is a chemical process simulator that uses thermodynamic flash algorithms to determine flashing losses and

follows AP-42 regulation to calculate working and breathing losses. Although historical throughput has been less than 15,000 bbls/year, to be conservative, a throughput of approximately 15,000 bbls/year was chosen for the model.

Liquids from slug catcher, produced water from BTEX condenser, and recovered oil from BTEX condenser routed to the Produced Water tanks were modeled via ProMax. The ProMax simulation reports are found in Appendix D and the analyses are found in Appendix E. The analytical results show that Produced Water tanks contain primarily water (>99 % water).

3.6 Produced Water Truck Loading Emissions

The VOC emissions from tank truck loading were estimated using the equation from EPA's AP-42 Section 2, 5th Edition, June 2008, Equation 1:

$$L = \frac{12.46 * S * P * M}{T}$$

where:

L = Loading Losses, lb/1000 gallons

S = Saturation Factor, see Table 5.2-1 in AP-42, Section 5.2.

P = True vapor pressure, psia

M = Molecular weight of vapors, lb/lb-mol

T = Temperature of bulk liquid loaded, R (F + 460)

The contents being transported from the tanks will be mainly produced water. To be conservative, a 90% water content reduction has been taken on the total emissions. Emission calculations are provided in Appendix B.

3.7 Pigging Emissions

Gas lines are pigged to perform various maintenance activities on a pipeline. Emissions associated with pigging result from gaseous releases when the “pig” is loaded into a pig launcher or removed from a pig receiver.

The estimated MCF per event was calculated considering pig receiver/pig launcher volume, pressure, temperature, gas quality parameters, and gas compressibility. The estimated MCF per event was multiplied by lb/scf based on site specific gas analysis to calculate VOC emissions.

Pigging emissions are assumed to be 1.0 tpy.

3.8 Compressor Blowdown Emissions

At Hiland stations, compressor blowdowns are controlled manually. During the recycle process a pressure reduction valve is used to route compressor blowdowns directly into the suction header. Technicians manually open the valve during a blowdown event to route compressor discharge back to the suction header to be recycled back into the system. The discharge pressures range from 700 psig to 1250 psig. Technicians monitor a pressure gauge and when pressures reach 100 psig or lower the blowdown is vented to atmosphere. Emission calculations for compressor blowdowns assume the majority of compressor blowdowns occur at approximately 100 psig using this recycle design.

In certain instances the compressor blowdown must be vented directly to atmosphere. In these cases, there is a second compressor blowdown valve that a technician manually opens allowing the blowdown to vent directly to atmosphere.

Technicians monitor and document the number of blowdowns, discharge pressure and temperatures of each blowdown event.

The estimated MCF per event was calculated considering compressor volume, pressure, temperature, gas quality parameters, and gas compressibility. The estimated MCF per event was multiplied by lb/scf based on Firebird compressor station gas analysis to calculate VOC emissions.

Emission calculations are provided in Appendix B.

3.9 NGL Truck Loading Emissions

NGL truck loading emissions are conservatively estimated at 40,000 gallons/day. Any vapors from the NGL tank are routed to the inlet slug catcher. Any vapors from the inlet slug catcher are routed to the suction of the compressors. There are no emissions from the NGL tanks during the tank truck loading process. During unloading, there is a liquid line and vapor line that connects from the tanker truck to the tank. When the two lines are disconnected from the tank, there may be a small amount of emissions.

Emission calculations are provided in Appendix B.

3.10 Fugitives Estimate

Fugitive emissions are based on emission factors are from EPA's "Protocol for Equipment Leak Emission Estimates" EPA-453/R-95-017, 11/1995, Table 2-4. The total component count is based on estimated number of components for each compressor, tank, and TEG glycol dehydrator unit at the station.

Emission calculations are provided in Appendix B.

3.11 HAP Emissions

HAP emissions from natural gas combustion in the Waukesha compressor engines (except formaldehyde) and glycol reboiler were estimated using data from the following AP-42 tables: Table 3.2-3, Uncontrolled Emission Factors for 4-Stroke Rich-Burn Engines, dated July 2000; Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion; and Table 1.4-4, Emission Factors for Metals from Natural Gas Combustion, dated July 1998.

HAP emissions from natural gas combustion in the Caterpillar engines were estimated using emission factors based on AP-42 Section 3.2, Table 3.2-2 (07/00) for 4 stroke lean burn engines. Manufacturer’s information was used for the compressor engine formaldehyde emissions.

HAP emissions from the TEG dehydrator still vent were calculated using GRI GlyCalc Version 4.0. The flash tank off-gas will be recycled. A condenser system will be used to reduce the VOC emissions in the overhead stream from the reboiler; non-condensable gas from the condenser will be routed to the reboiler firebox. Condensable liquids are routed to the Produced Water tanks.

Potential HAP emissions at the station will not exceed the major source thresholds of 10 tpy of any individual HAP or 25 tpy of any combination of HAPs. HAP emission calculations are provided in Appendix B.

4.0 REGULATORY ANALYSIS

4.1 Permit Requirements

Hiland is required to obtain an air quality preconstruction permit for the proposed construction at the Firebird Compressor Station per NDAC 33-15-14-02: Permit to Construct**.**

4.2 Regulatory Requirements

Table 4.1 lists the rules potentially applicable to the Firebird Compressor Station. The rules are addressed individually in the following sections as they pertain to the facility.

Table 4.2 Potentially Applicable Rules

Rule Citation	Subject of the Rule
NDAC 33-15-01	General Provisions
NDAC 33-15-02	Ambient Air Quality Standards
NDAC 33-15-03	Restriction of Emission of Visible Air Contaminants
NDAC 33-15-04	Open Burning Restrictions
NDAC 33-15-05	Emissions of Particulate Matter Restricted
NDAC 33-15-06	Emissions of Sulfur Compounds Restricted
NDAC 33-15-07	Control of Organic Compounds Emissions
NDAC 33-15-08	Control of Air Pollution From Vehicles and Other Internal Combustion Engines
NDAC 33-15-10	Control of Pesticides
NDAC 33-15-11	Prevention of Air Pollution Emergency Episodes
NDAC 33-15-12	Standards of Performance for New Stationary Sources
NDAC 33-15-13	Emission Standards for Hazardous Air Pollutants

NDAC 33-15-14	Designated Air Contaminant Sources, Permit to Construct, Minor Source Permit to Operate, Title V Permit to Operate
NDAC 33-15-15	Prevention of Significant Deterioration of Air Quality
NDAC 33-15-16	Restriction of Odorous Air Contaminants
NDAC 33-15-17	Restriction of Fugitive Emissions
NDAC 33-15-18	Stack Heights
NDAC 33-15-19	Visibility Protection
NDAC 33-15-20	Control of Emissions From Oil and Gas Well Production Facilities
NDAC 33-15-21	Acid Rain Program
NDAC 33-15-22	Emissions Standards for Hazardous Air Pollutants for Source Categories
NDAC 33-15-23	Fees
NDAC 33-15-24	Standards for Lead-Based Paint Activities
NDAC 33-15-25	Regional Haze Requirements
	Policy for the Control of Hazardous Air Pollutant Emissions In North Dakota (Air Toxics Policy)

4.2.1 General Provisions (NDAC 33-15-01)

This facility is subject to all general requirements of this section (i.e., inspection, circumvention, shutdown/malfunction, compliance, enforcement, confidentiality of records, etc.).

4.2.2 Ambient Air Quality Standards (NDAC 33-15-02)

The air quality of the area is classified as "Better than National Standards" or unclassifiable/attainment of the National Ambient Air Quality Standards (NAAQS) for criteria pollutants (40 CFR 81.335). There are no nonattainment areas within a reasonable distance of the site.

Per the Criteria Pollutant Modeling Requirements for a Permit to Construct modeling policy memo, modeling is required when:

- The emissions vent from a stack with a height greater than or equal to 1.5 times the height of any nearby building, and potential emissions exceed 100 tons per year of NOx or SO_2 or 40 tons per year of PM_{10}.
- The emissions vent from a stack with a height less than 1.5 times the height of any nearby building, and potential emissions exceed 40 tons per year of NOx or SO_2 or 15 tons per year of PM_{10}.

The emissions at Firebird Compressor Station will vent from stacks with a height greater than or equal to 1.5 times the height of any nearby building. Because the facility's potential emissions will be lower than the modeling thresholds, modeling for criteria pollutants is not required for this application.

Hiland will abide by all standards set forth in these regulations.

4.2.3 Restriction of Emission of Visible Air Contaminants (NDAC 33-15-03)

NDAC 33-15-03 contains regulations governing particulate matter and opacity limits from new and existing sources. Hiland will comply with all applicable standards.

4.2.4 Open Burning Restrictions (NDAC 33-15-04)

Hiland will comply with all open burning regulations at the compressor station.

4.2.6 Emissions of Particulate Matter Restricted (NDAC 33-15-05)

This facility will operate natural gas-fired stationary combustion engines and will comply with the provisions of Sections 33-15-05-01 and 33-15-05-04. Fuel is also consumed for the purposes of indirect heating; therefore, Section 33-15-05-02 does apply.

4.2.6 Emissions of Sulfur Compounds Restricted (NDAC 33-15-06)

This facility combusts pipeline quality natural gas and, per Section 33-15-06-01.1.e, is not subject to the regulations of this Chapter.

4.2.7 Control of Organic Compounds Emissions (NDAC 33-15-07)

There is no water-oil separator or flare at this facility. The produced water tanks will be equipped with submerged fill pipes. Hiland will comply with the provisions of Section 33-15-07-02.

4.2.8 Control of Air Pollution From Vehicles and Other Internal Combustion Engines (NDAC 33-15-08)

This facility will operate natural gas-fired stationary combustion engines, and Hiland will comply with the restricted emissions regulation of Section 33-15-08-01. Hiland will also comply with Section 33-15-08-02.

4.2.9 Control of Pesticides (NDAC 33-15-10)

Hiland will comply with the provisions of NDAC 33-15-10 should pesticides be used at this facility.

4.2.10 Prevention of Air Pollution Emergency Episodes (NDAC 33-15-11)

Hiland will comply with any applicable source curtailment regulations when notified by the Department of an Air Pollution Emergency Episode.

4.2.11 Standards of Performance for New Stationary Sources (NDAC 33-15-12)

The Firebird Compressor Station does qualify as a designated source for NSPS per certain subparts of 40 CFR 60, as incorporated by Section 33-15-12-01.1.

New Source Performance Standards (NSPS) apply to certain source categories. Five subparts were reviewed for applicability in regards to the proposed construction.

NSPS Subpart Dc

Subpart Dc is applicable to steam generating units for which construction, modification, or reconstruction is commenced after June 9, 1989, and which have a maximum design heat input capacity greater than or equal to 10 MMBtu/hr but less than 100 MMBtu/hr. The TEG reboiler has a maximum design heat input capacity of less than 10 MMBtu/hr; therefore, the reboiler will not be subject to Subpart Dc.

NSPS Subpart Kb

NSPS Kb applies to each storage vessel with a capacity greater than or equal to 75 cubic meters (m3) (17,027 gal or 648.6 bbl) that is used to store volatile organic liquids for which construction, reconstruction, or modification is commenced after July 23, 1984. The capacity of the produced water/condensate tanks is below the NSPS Kb applicability threshold. The pressurized NGL tank will have a capacity above the applicability threshold. However, the tank is exempt from this regulation per 60.110b(d)(4) which exempts vessels with a design capacity less than or equal to 1,589.874 m3 (360,934,388 gal) used for petroleum or condensate stored, processed, or treated prior to custody transfer.

NSPS Subpart JJJJ

Owners and operators are subject to Subpart JJJJ if construction, reconstruction, or modification of the spark ignition internal combustion engine (SI ICE) commenced after June 12, 2006, and if the engine was manufactured:

- On or after July 1, 2007, for engines with a maximum engine power greater than or equal to 500 HP (except lean-burn engines with a maximum engine power greater than or equal to 500 HP and less than 1,350 HP);
- On or after January 1, 2008, for lean-burn engines with a maximum engine power greater than or equal to 500 HP and less than 1,350 HP;
- On or after July 1, 2008, for engines with a maximum engine power less than 500 HP; or
- On or after January 1, 2009, for emergency engines with a maximum engine power greater than 19 KW (25 HP).

NSPS JJJJ is applicable to the existing Waukesha engine and existing Caterpillar engine and will be applicable to the new Caterpillar engine. Hiland will comply with the requirements of Subpart JJJJ.

NSPS Subpart OOOO/OOOOa

The facility may include reciprocating compressors subject to this regulation based on the Manufacture Date of the compressor. Hiland will comply with the requirements for reciprocating compressors as applicable.

NSPS Subpart OOOOb

Owners and operators are subject to Subpart OOOOb if they commence construction, modification or reconstruction after December 6, 2022, of one or more affected facilities. For a natural gas compressor station, an affected facility could include centrifugal

compressors, reciprocating compressors, storage vessels, certain pneumatic pumps/controllers, and equipment leaks.

There will be no centrifugal compressors at the compressor station.

Since produced water storage vessels will have potential VOC/methane emissions less than six tons per year and combined two tanks potential VOC/methane emissions less than twenty tons per year, the produced water storage tanks are not subject to the requirements in Subpart OOOOb.

The facility may include reciprocating compressors subject to this regulation. Hiland will comply with the requirements for reciprocating compressors as applicable.

The facility will not be designed with continuous bleed natural gas driven pneumatic controllers.

The facility is currently subject to requirements for performing surveys with the purpose of identifying fugitive emissions using either optical gas imaging (OGI) or Method 21.

The facility will be subject to requirements for performing AVO (audio, visual, olfactory) surveys with the purpose of identifying fugitive emissions.

The facility will be subject to the recordkeeping and reporting requirements associated with this regulation.

4.2.12 Emission Standards for Hazardous Air Pollutants (NDAC 33-15-13)

The process fluids at this facility (field gas) will not contain 10% or greater of Volatile Hazardous Air Pollutant (VHAP) as defined by §61.241 of 40 CFR 61; therefore, this facility is not subject to Subpart V, as incorporated by Section 33-15-13-01.1.

4.2.13 Designated Air Contaminant Sources, Permit to Construct, Minor Source Permit to Operate, Title V Permit to Operate (NDAC 33-15-14)

Since Firebird Compressor Station is not a major listed source, i.e., its PTE for all criteria pollutants and HAPs is below the major source thresholds, the facility is subject to the requirements of Section 33-15-14-03 - Minor Source Permit to Operate.

Since Firebird Compressor Station will not have the potential to emit more than 100 tons per year of any criteria pollutant and will not be a major source of HAPs, the facility will not be subject to the Title V operating permit program per NDAC 33-15-14-06.

Per the Criteria Pollutant Modeling Requirements for a Permit to Construct modeling policy memo, modeling is required when:

- The emissions vent from a stack with a height greater than or equal to 1.5 times the height of any nearby building, and potential emissions exceed 100 tons per year of NOx or SO_2 or 40 tons per year of PM_{10}.
- The emissions vent from a stack with a height less than 1.5 times the height of any nearby building, and potential emissions exceed 40 tons per year of NOx or SO_2 or 15 tons per year of PM_{10}.

The emissions will vent from stacks with a height greater than or equal to 1.5 times the height of any nearby building. Because the facility's potential emissions will be lower than the modeling thresholds, modeling for criteria pollutants is not required for this application.

In North Dakota, Best Available Control Technology (BACT) is not required for any source unless it is a PSD major source for criteria pollutants or HAPs, regardless if a construction permit is required.

4.2.14 Prevention of Significant Deterioration of Air Quality (NDAC 33-15-15)

PSD permitting regulations apply to major PSD stationary sources. A major PSD stationary source is defined as a listed facility with the potential to emit 100 tons per year or more of any regulated pollutant or a non-listed facility with the potential to emit 250 tons per year or more of any regulated pollutant.

Since the station is not a listed facility and does not have the potential to emit greater than 250 tons per year of any regulated pollutant (see Table 3.1), PSD is not applicable.

4.2.15 Restriction of Odorous Air Contaminants (NDAC 33-15-16)

Hiland will comply with all requirements concerning odorous air contaminants as applicable to sources outside a city or outside the area over which a city has exercised extraterritorial zoning as defined in North Dakota Century Code Section 40-47-01.1.

4.2.16 Restriction of Fugitive Emissions (NDAC 33-15-17) and Stack Heights (NDAC 33-15-18)

This facility is subject to the requirements of these chapters.

4.2.17 Visibility Protection (NDAC 33-15-19)

The Firebird Compressor Station is not a major PSD stationary source as defined by Section 33-15-15-01; therefore, these regulations do not apply per Section 33-15-19-01.

4.2.18 Control of Emissions From Oil and Gas Well Production Facilities (NDAC 33-15-20)

This facility does not meet the definition of an oil and gas production facility. Therefore, the requirements of this chapter do not apply to the compressor station.

4.2.19 Acid Rain Program (NDAC 33-15-21)

This facility is not a listed source per 40 CFR 72 and 73, as incorporated by Section 33-15-21-08.1; therefore, these rules do not apply.

4.2.20 Emissions Standards for Hazardous Air Pollutants for Source Categories (NDAC 33-15-22)

Title 40 CFR Part 63, National Emission Standards for Hazardous Air Pollutants (NESHAPs) for Source Categories, is incorporated into the North Dakota rules at NDAC 33-15-22-01.

Two NESHAP subparts were reviewed for applicability in regard to the facility: Subpart ZZZZ (National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines) and Subpart HH (National Emission Standards for Hazardous Air Pollutants from Oil and Natural Gas Production Facilities).

NESHAP Subpart HH

Subpart HH sets standards for reducing HAPs from TEG dehydration units, fugitives and storage vessels at major source or area sources of HAP emissions. This facility is an area source of HAPs; therefore, is subject to the certain requirements applicable to TEG dehydrators. The TEG dehydrator at the station will process up to 25 MMcfd of gas (greater than the exemption threshold of 85 Mcfd). However, the proposed TEG dehydration unit will include emission controls to limit annual potential benzene emissions to less than 0.9 megagrams/yr (1.0 tpy). Therefore, the facility is exempt from the standards listed in Subpart HH.

NESHAP Subpart ZZZZ

Owners and operators are subject to Subpart ZZZZ if they own or operate a stationary RICE at an area or major source of HAP emissions. The Firebird Compressor Station is an area source of HAPs. The engines are considered to be new stationary RICE because construction will commence or have commenced after June 12, 2006. Therefore, Subpart ZZZZ is applicable to the proposed compressor engines.

It is assumed that the engines are manufactured after July 1, 2007; therefore, they must meet the requirements in Subpart ZZZZ by meeting the requirements in NSPS Subpart JJJJ. There are no further requirements for any of the engines under Subpart ZZZZ. If any of the proposed engines will have a manufacture date before July 1, 2007, the applicability of NESHAP Subpart ZZZZ will be revisited.

4.2.21 Fees (NDAC 33-15-23)

NDAC 33-15-23 sets out applicable fees that will apply to the Firebird Compressor Station. Hiland is submitting $325 for the associated permit application fee. Hiland will pay the required annual operating fees based on the specifications in Section 33-15-23-03.

4.2.22 Standards for Lead-Based Paint Activities (NDAC 33-15-24)

This facility is not involved in lead-based paint activities as defined in 40 CFR 745 Subpart 745.223 as incorporated in NDAC 33-15-24-01; therefore, the requirements of this chapter do not apply.

4.2.23 Regional Haze Requirements (NDAC 33-15-25)

This facility is not located in a Class I Federal Area per 40 CFR Part 81 as incorporated in NDAC 33-15-25-02; therefore, the requirements of this chapter do not apply.

4.2.24 Policy for the Control of Hazardous Air Pollutant Emissions In North Dakota (Air Toxics Policy)

The compressor engines at Firebird Compressor Station are listed sources in NDAC 33-15-14-01. Therefore, per the applicability section of the North Dakota Air Toxics Policy, this facility is subject to these regulations. However, per the *Dispersion Modeling Requirements, Compressor Engines and Glycol Dehydration Memorandum,* dispersion modeling for air toxics is not required to be submitted with a permit application if all of the conditions in the memorandum are met.

1. *Emissions from all compressor engines at the facility are controlled with catalytic emissions control systems (or an equivalent control technology) which is designed to reduce non-methane hydrocarbons by at least 50%.*

   The Waukesha compressor engine is controlled by NSCRs. Although the NMHC are reduced by 25 % rather than 50 %, the actual emissions of the catalyst outlet are very low – i.e. 0.09 g/hp-hr and well below the NSPS limit of 0.7 g/hp-hr.

   The existing Caterpillar compressor engine is controlled by an oxidation catalyst. The new Caterpillar compressor engine will also be controlled by an oxidation catalyst. The oxidation catalyst will reduce VOC emissions by 65 % and assume NMHC emissions will also be reduced by 65%. The manufacturer estimates VOC emissions below the NSPS Subpart JJJJ limit.

2. *Emissions from all compressor engines at the facility are vented from a stack height which is greater than or equal to 1.5 times the nearest building height.*

   The emissions from the compressor engines at the facility will be vented from a stack height greater than or equal to 1.5 times the nearest building height.

3. *For glycol dehydration unit(s):*

   a. *Emissions from all glycol dehydration units(s) at the facility are controlled by combustion in the flare, process heater, boiler or other combustion device; or*

   b. *Emissions from all glycol dehydration unit(s) at the facility are controlled by a control technology with a VOC destruction and removal efficiency of at least 90%; or*

   c. *Combined air toxics emissions from all glycol dehydration units at the facility are less than 5.0 tons/year.*

   The emissions from the glycol dehydration units are controlled by a BTEX condenser and the non-condensable gas from the condenser will be routed to the reboiler firebox. The VOC destruction and removal efficiency will be at least 90 %. Combined air toxics emissions from the glycol dehydration unit is below 5.0 tons/year.

4. *If the facility is less than ¼ mile from a residence: combined air toxics emissions from the entire facility are less than 10.0 tons/year, benzene emissions are less than 2.0 tons/year, and formaldehyde emissions are less than 2.0 tons/year.*

   The facility is located approximately 1530 feet northwest from a residence; therefore, this section is not applicable.

5. *If the facility is at least ¼ mile from a residence: combined air toxics emissions from the entire facility are less than 10.0 tons/year, benzene emissions are less than 3.0 tons/year, and formaldehyde emissions are less than 3.0 tons/year.*

   The facility is located approximately 1530 feet northwest of a residence. The combined toxic emissions from the entire facility is less than 10 tons per year and benzene emissions are less than 3.0 tons per year.

   Although the formaldehyde emissions are greater than 3.0 tons/year, the Caterpillar engine estimate includes a 25 % safety factor of a manufacturer estimate. If the 25 % safety factor is not included, then total emissions are estimated to be 3.21 tons/year, slightly above 3.0 tpy.

Since the facility meets conditions 2, 3, and 4 and NMHC and VOC emission rates from the engines are extremely low, dispersion modeling for air toxics is not being submitted with this application. A dispersion modeling for air toxics will be submitted if requested by the Department.

APPENDIX A: STATE PERMIT APPLICATION FORMS

PERMIT APPLICATION FOR AIR CONTAMINANT SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8516 (9-2021)

SECTION A - FACILITY INFORMATION

Name of Firm or Organization Hiland Partners Holdings LLC - Firebird Compressor Station		
Applicant's Name Anu Pundari		
Title Senior Engineer	Telephone Number (520) 663-4249	E-mail Address anu_pundari@kindermorgan.com
Contact Person for Air Pollution Matters Anu Pundari		
Title Senior Engineer	Telephone Number (520) 663-4249	E-mail Address anu_pundari@kindermorgan.com
Mailing Address (Street & No.) 5151 E. Broadway Blvd. Suite 1680		
City Tucson	State AZ	ZIP Code 85711
Facility Name Firebird Compressor Station		
Facility Address (Street & No.) Located approximately 7 miles southeast of Tioga, North Dakota		
City Tioga	State ND	ZIP Code 58852

County Williams	Coordinates NAD 83 in Decimal Degrees (to forth decimal degree)	
	Latitude 48.31369200	Longitude 102.85095300

Legal Description of Facility Site

Quarter	Quarter	Section	Township	Range
SE	SE	23	156N	95W

Land Area at Facility Site 6.9 Acres (or) _____ Sq. Ft.	MSL Elevation at Facility 2428 feet

SECTION B – GENERAL NATURE OF BUSINESS

Describe Nature of Business	North American Industry Classification System Number	Standard Industrial Classification Number (SIC)
Natural Gas Compressor Station	213112	1389

SECTION C – GENERAL PERMIT INFORMATION

Type of Permit? ☒ Permit to Construct (PTC) ☐ Permit to Operate (PTO)

If application is for a Permit to Construct, please provide the following data:

Planned Start Construction Date	Planned End Construction Date
01/2025	03/2025

SECTION D – SOURCE IDENTIFICATION AND CATEGORY OF EACH SOURCE INCLUDED ON THIS PERMIT APPLICATION

		Permit to Construct				Minor Source Permit to Operate						
Your Source ID Number	Source or Unit (Equipment, Machines, Devices, Boilers, Processes, Incinerators, Etc.)	New Source	Existing Source Modification	Existing Source Expansion	Existing Source Change of Location	New Source	Existing Source Initial Application	Existing Source After Modification	Existing Source After Expansion	Existing Source After Change of Location	Existing Source After Change of Ownership	Other
C2	Compressor Engine C1	✓										
EU5	Dehydrator - 25 MMSCFD			✓								
EU6 and EU7	Produced Water Tanks											✓

Add additional pages if necessary

SECTION D2 – APPLICABLE REGULATIONS

Source ID No.	Applicable Regulations (NSPS/MACT/NESHAP/etc.)
Facility-wide	NSPS OOOOb - Fugitive Emissions at a Compressor Station
C1, C2,C3	NSPS OOOOa - Reciprocating Compressors
C1,C2,C3	NSPS JJJJ - Compressor Engines
EU5	MACT HH - TEG Still Vent

SECTION E – TOTAL POTENTIAL EMISSIONS

Pollutant	Amount (Tons Per Year)
NO_x	54.77
CO	98.43
PM	3.75

Pollutant	Amount (Tons Per Year)
PM_{10} (filterable and condensable)	3.75
$PM_{2.5}$ (filterable and condensable)	3.75
SO_2	0.11
VOC	69.36
GHG (as CO_2e)	22682
Largest Single HAP	4.0
Total HAPS	7.10

*If performance test results are available for the unit, submit a copy of test with this application. If manufacturer guarantee is used provide spec sheet.

SECTION F1 – ADDITIONAL FORMS

Indicate which of the following forms are attached and made part of the application

■ Air Pollution Control Equipment (SFN 8532)	☐ Fuel Burning Equipment Used for Indirect Heating (SFN 8518)
☐ Construct/Operate Incinerators (SFN 8522)	■ Hazardous Air Pollutant (HAP) Sources (SFN 8329)
☐ Natural Gas Processing Plants (SFN 11408)	☐ Manufacturing or Processing Equipment (SFN 8520)
■ Glycol Dehydration Units (SFN 58923)	■ Volatile Organic Compounds Storage Tank (SFN 8535)
☐ Flares (SFN 59652)	■ Internal Combustion Engines and Turbines (SFN 8891)
☐ Grain, Feed, and Fertilizer Operations (SFN 8524)	☐ Oil/Gas Production Facility Registration (SFN 14334)

SECTION F2 – OTHER ATTACHMENTS INCLUDED AS PART OF THIS APPLICATION

1.	Application Report	4.	Representative Gas Analysis
2.	Emissions Estimate Calculations	5.	GRI-GLY Calc and Tank Emission Estimate
3.	Engine Specifications	6.	Plot Plan

I, the undersigned applicant, am fully aware that statements made in this application and the attached exhibits and statements constitute the application for Permit(s) to Construct and/or Operate Air Contaminant sources from the North Dakota Department of Environmental Quality and certify that the information in this application is true, correct and complete to the best of my knowledge and belief. Further, I agree to comply with the provisions of Chapter 23.1-06 of the North Dakota Century Code and all rules and regulations of the Department, or revisions thereof. I also understand the permit is nontransferable and, if granted a permit, I will promptly notify the Department upon sale or legal transfer of this permitted establishment.

Signature	Date
Ann Purdare	07/30/2024

PERMIT APPLICATION FOR INTERNAL COMBUSTION ENGINES AND TURBINES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8891 (9-2021)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must include SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
Hiland Partners Holdings LLC	Firebird Compressor Station

SECTION B – FACILITY AND UNIT INFORMATION

Source ID Number (From form SFN 8516)
C2

Type of Unit (check all that apply)

- ☒ Stationary Natural Gas-Fired Engine
- ☐ Stationary Diesel and Dual Fuel Engine
- ☐ Stationary Gasoline Engine
- ☐ Stationary Natural Gas-Fired Turbine
- ☐ Emergency Use Only
- ☒ Non-Emergency Use
- ☐ Peaking
- ☐ Demand Response
- ☐ Other – Specify:

SECTION C – MANUFACTURER DATA

Make	Model	Date of Manufacture
Caterpillar	G3606	02/25/2019

Reciprocating Internal Combustion Engine

- ☒ Spark Ignition ☐ Compression Ignition ☒ Lean Burn
- ☒ 4 Stroke ☐ 2 Stroke ☐ Rich Burn

Maximum Rating (BHP @ rpm)	Operating Capacity (BHP @ rpm)
1875 @1000 rpm	1875 @ 1000 rpm

Engine Subject to:

- ☐ 40 CFR 60, Subpart IIII
- ☐ 40 CFR 60, Subpart JJJJ
- ☒ 40 CFR 63, Subpart ZZZZ
- ☐ 40 CFR 60, Subpart OOOO (for compressors)
- ☐ 40 CFR 60, Subpart OOOOa (for compressors)

Turbine
Dry Low Emissions? ☐ Yes ☐ No

Heat Input (MMBtu/hr)	Maximum Rating (HP)	75% Rating (HP)	Efficiency

Turbine Subject to:
☐ 40 CFR 60, Subpart GG ☐ 40 CFR 60, Subpart KKKK

SECTION D – FUELS USED

Natural Gas (10^6 cu ft/year)	Percent Sulfur	Percent H_2S
82.19 MMscf/year	Negligible	Negligible
Oil (gal/year)	Percent Sulfur	Grade No.
LP Gas (gal/year)	Other – Specify:	

SECTION E – NORMAL OPERATING SCHEDULE

Hours Per Day	Days Per Week	Weeks Per Year	Hours Per Year	Peak Production Season (if any)
24	7	52	8760	

SECTION F – STACK PARAMETERS

Emission Point ID Number		Stack Height Above Ground Level (feet)	
C2		1.5 X Building Height (approximately 35 feet)	
Stack Diameter (feet at top)	Gas Discharged (SCFM)	Exit Temp (°F)	Gas Velocity (FPS)
20 inches estimated	11915	816	91.07

SECTION G – EMISSION CONTROL EQUIPMENT

Is any emission control equipment installed on this unit?

☐ No ■ Yes – Complete and attach form SFN 8532

SECTION H – MAXIMUM AIR CONTAMINANTS EMITTED

Pollutant	Maximum Pounds Per Hour	Amount (Tons Per Year)	Basis of Estimate*
NO_x	4.13	18.11	NSPS JJJJ Limit
CO	7.03	30.78	Permit Limit
PM	0.27	1.20	AP-42 Table 3.2-3
PM_{10} (filterable and condensable)	0.27	1.20	AP-42 Table 3.2-3
$PM_{2.5}$ (filterable and condensable)	0.27	1.20	AP-42 Table 3.2-3
SO_2	0.01	0.04	AP-42 Table 3.2-3
VOC	3.35	14.67	NSPS JJJJ Limit
GHG (as CO_2e)	1645	7203	AP-42 Table 3.2-3
Largest Single HAP	0.455	1.99	Vendor Data
Total HAPS	0.702	3.07	Vendor Data/AP-42

* If performance test results are available for the unit, submit a copy of test with this application, if manufacture data used, submit manufacturers specification sheets.

IS THIS UNIT IN COMPLIANCE WITH ALL APPLICABLE AIR POLLUTION RULES AND REGULATIONS?

■ YES ☐ NO

If "NO" a Compliance Schedule (SFN 61008) must be completed and attached.

Attach and label separate sheet(s) if you need more space to explain any system or answers or to provide complete listings of Emissions, Contaminants, or other items.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
4201 Normandy Street, 2nd Floor
Bismarck, ND 58503-1324
(701) 328-5188

PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8532 (9-2021)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must also include forms SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
Hiland Partners Holdings LLC	Firebird Compressor Station

Source ID No. of Equipment being Controlled
C2

SECTION B – EQUIPMENT

Type: ☐ Cyclone ☐ Multiclone ☐ Baghouse ☐ Electrostatic Precipitator
☐ Wet Scrubber ☐ Spray Dryer ☐ Flare/Combustor
☒ Other – Specify: Oxidation Catalyst

Name of Manufacturer	Model Number	Date to Be Installed
Caterpillar	Unknown	upon startup

Application:
☐ Boiler ☐ Kiln ☐ Engine ☐ Other – Specify:

Pollutants Removed		CO	VOC	NMHC
Design Efficiency (%)		85 %	65 %	65 %
Operating Efficiency (%)		TBD	TBD	TBD

Describe method used to determine operating efficiency:

SECTION CD – GAS CONDITIONS

Gas Conditions			Inlet	Outlet
Gas Volume (SCFM; 68°F; 14.7 psia)				11915
Gas Temperature (°F)				816
Gas Pressure (in. H_2O)				
Gas Velocity (ft/sec)				91.07
Pollutant Concentration (Specify Pollutant and Unit of Concentration)	Pollutant	Unit of Concentration		
	NOx	g/bhp-hr	0.50	0.50 (permitting 1.0)
	CO	g/bhp-hr	2.39	0.36 (permitting 1.7)
	VOC	g/bhp-hr	0.67	0.23 (permitting 0.7)

Pressure Drop Through Gas Cleaning Device (in. H_2O)
TBD

PERMIT APPLICATION FOR HAZARDOUS AIR POLLUTANT (HAP) SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8329 (9-2021)

SECTION A1 - APPLICANT INFORMATION

Name of Firm or Organization Hiland Partners Holdings LLC - Firebird Compressor Station		
Applicant's Name Anu Pundari		
Title Senior Engineer	Telephone Number (520) 663-4249	E-mail Address anu_pundari@kindermorgan.com
Mailing Address (Street & No.) 5151 E. Broadway Blvd,. Suite 1680		
City Tucson	State AZ	ZIP Code 85711

SECTION A2 - FACILITY INFORMATION

Contact Person for Air Pollution Matters Anu Pundari		
Title Senior Engineer	Telephone Number (520) 663-4249	E-mail Address anu_pundari@kindermorgan.com
Facility Address (Street & No. or Lat/Long to Nearest Second) Located approximately 7 miles southeast of Tioga, North Dakota		
City Tioga	State ND	ZIP Code 58852
County Williams	Number of Employees at Location 0	
Land Area at Plant Site 6.9 Acres (or) Sq. Ft.	MSL Elevation at Plant 2428	

Describe Nature of Business/Process Natural Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) 20 " (estimated)	Height Above Grade (ft) 1.5 X Building Height (Approximately 35 feet)	
Gas Temperature at Exit (°F) 816	Gas Velocity at Exit (ft/sec) 91	Gas Volume (scfm) 11915
Basis of any Estimates (attach separate sheet if necessary)		
Are Emission Control Devices in Place? If YES – Complete SFN 8532 ☒ Yes ☐ No		
Nearest Residences or Building Residence	Distance (ft) 1530 feet approximately	Direction SouthEast
Nearest Property Line	Distance (ft)	Direction

SECTION C – EMISSION STREAM DATA

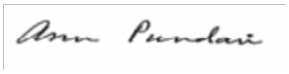
Source ID Number SFN 8516 C1	Mean Particle Diameter (um) Unknown
Flow Rate (scfm) 11915	Drift Velocity (ft/sec) Unknown
Stream Temperature (°F) 815	Particulate Concentration (gr/dscf) Unknown
Moisture Content (%) Unknown	Halogens or Metals Present? Unknown
Pressure (in. Hg) Unknown	Organic Content (ppmv) Unknown
Heat Content (Btu/scfm) Unknown	O_2 Content (%) Unknown

SECTION D – POLLUTANT SPECIFIC DATA
(Complete One Box for Each Pollutant in Emission Stream)

Pollutant Emitted Formaldehyde	Chemical Abstract Services (CAS) Number 50-00-0
Proposed Emission Rate (lb/hr) 0.455	Emission Source (describe) Caterpillar G3606A4 (1875 hp) Engine
Source Classification (process point, process fugitive, area fugitive) Process point	Pollutant Class and Form (organic/inorganic - particulate/vapor) Organic- Vapor
Concentration in Emission Stream (ppmv) Unknown	Vapor Pressure (in. Hg @ °F) 3890 mm Hg at 25 degrees Celius
Solubility >100 g/100 ml (20 degrees Celius)	Molecular Weight (lb/lb-mole) 30
Absorptive Properties Unknown	

Pollutant Emitted	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

(Add additional pages if necessary)

Signature of Applicant 	Date 07/18/2024

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
4201 Normandy Street, 2nd Floor
Bismarck, ND 58503-1324
(701) 328-5188

PERMIT APPLICATION FOR GLYCOL DEHYDRATION UNITS

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 58923 (9-2021)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must include SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
Hiland Partners Holdings LLC	Firebird Compressor Station

SECTION B - 40 CFR 63, SUBPART HH APPLICABILITY DETERMINATION

The facility is a (check one): ☐ major, or ■ area source of hazardous air pollutants (HAP) as defined in §63.761. Attach calculations showing expected HAP emissions in accordance with §63.760(a)(1).

The facility (check all that apply):

■ Processes, upgrades or stores hydrocarbon liquids prior to the point of custody transfer.

■ Processes, upgrades or stores natural gas prior to the point at which natural gas enters the transmission and storage source category or is delivered to a final end user.

Identify the 40 CFR 63 Subpart HH (MACT HH) affected source:

☐ Glycol (ethylene, diethylene, or triethylene) dehydration unit & associated equipment (located at a major source), or

■ Tryiethylene glycol (TEG) dehydration unit (located at an area source)

The facility is exempt from MACT HH because it:

☐ Is a qualifying black oil facility, or

☐ Is a major source facility, prior to the point of custody transfer, with a facility-wide actual annual average natural gas throughout less than 18.4 thousand standard cubic meters per day and a facility-wide actual annual average hydrocarbon liquid throughput less than 39,700 liters per day.

■ The facility is not exempt from MACT HH.

SECTION C – EMISSION UNIT INFORMATION

Emission Unit Description	Emission Unit Identifier (EU)	Emission Point Number (EP)	Pollutant*	Emission Rate lb/hr	Emission Rate ton/yr	Air Pollution Control Equipment
TEG Still Vent	5	4	VOC	0.3450	1.8255	Condenser and reboiler firebox.
TEG Still Vent	5	4	HAPs	0.0650	0.2846	Condenser and reboiler firebox.
TEG Still Vent	5	4	BTEX	0.0588	0.2576	Condenser and reboiler firebox.

* *Includes an estimate of greenhouse gas emissions (CO2e).*

Complete the following for each glycol and triethylene glycol dehydration unit.								
EU	Design Capacity (MMSCFD)	Actual Throughput (MMSCFD)	Gas Pressure (psig)	Gas Temp (°F)	Water Content (lb/MMSCF)		Glycol Recirc. Rate (gal/min)	VOC Emissions (ton/yr)
					Wet Gas	Dry Gas		
5	25	25	1200	100	Saturated	4.0	5.5	1.8255

SECTION D – STACK DATA

Inside Diameter (ft) NA	Height Above Grade (ft) NA	Gas Volume (scfm) Unknown
Gas Temperature at Exit (°F) Unknown	Gas Velocity at Exit (ft/sec) Unknown	
Are Emission Control Devices in Place? If YES – Complete SFN 8532		☒ Yes ☐ No
Nearest Residence or Building Residence	Distance (ft) 1530 (approximately)	Direction SouthEast
Nearest Property Line	Distance (ft)	Direction

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
4201 Normandy Street, 2nd Floor
Bismarck, ND 58503-1324
(701)328-5188

PERMIT APPLICATION FOR AIR POLLUTION CONTROL EQUIPMENT

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8532 (9-2021)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must also include forms SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
Hiland Partners Holding LLC	Firebird Compressor Station
Source ID No. of Equipment being Controlled EU5	

SECTION B – EQUIPMENT

Type: ☐ Cyclone ☐ Multiclone ☐ Baghouse ☐ Electrostatic Precipitator
☐ Wet Scrubber ☐ Spray Dryer ☐ Flare/Combustor
☒ Other – Specify: Condenser and Reboiler

Name of Manufacturer	Model Number	Date to Be Installed
Unknown	Unknown	Existing Unit

Application:
☐ Boiler ☐ Kiln ☐ Engine ☐ Other – Specify:

Pollutants Removed	VOC	HAPs	BTEX	
Design Efficiency (%)	96%	97%	97%	
Operating Efficiency (%)	96%	97%	97%	

Describe method used to determine operating efficiency:
GRI-GLY Calc Simulation

SECTION CD – GAS CONDITIONS

Gas Conditions			Inlet	Outlet
Gas Volume (SCFM; 68°F; 14.7 psia)				
Gas Temperature (°F)				
Gas Pressure (in. H_2O)				
Gas Velocity (ft/sec)				
Pollutant Concentration (Specify Pollutant and Unit of Concentration)	Pollutant	Unit of Concentration		
	VOC	lb/hr	8.8214 uncontrolled	0.3450 controlled
	HAPs	lb/hr	2.5084 uncontrolled	0.0650 controlled
	BTEX	lb/hr	2.3512 uncontrolled	0.0588 controlled
Pressure Drop Through Gas Cleaning Device (in. H_2O)				

PERMIT APPLICATION FOR HAZARDOUS AIR POLLUTANT (HAP) SOURCES

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8329 (9-2021)

SECTION A1 - APPLICANT INFORMATION

Name of Firm or Organization Hiland Partners Holdings LLC- Firebird Compressor Station		
Applicant's Name Anu Pundari		
Title Senior Engineer	Telephone Number (520) 663-4249	E-mail Address anu_pundari@kindermorgan.com
Mailing Address (Street & No.) 5151 E. Broadway Blvd. Suite 1680		
City Tucson	State AZ	ZIP Code 85711

SECTION A2 - FACILITY INFORMATION

Contact Person for Air Pollution Matters Anu Pundari		
Title Senior Engineer	Telephone Number (520) 663-4249	E-mail Address anu_pundari@kindermorgan.com
Facility Address (Street & No. or Lat/Long to Nearest Second) Located approximately 7 miles southeast of Tioga, North Dakota		
City Tioga	State ND	ZIP Code 58852
County Williams	Number of Employees at Location 0	
Land Area at Plant Site 6.9 Acres (or) Sq. Ft.	MSL Elevation at Plant 2428	

Describe Nature of Business/Process Natural Gas Compressor Station

SECTION B – STACK DATA

Inside Diameter (ft) Unknown	Height Above Grade (ft) Unknown	
Gas Temperature at Exit (°F) Unknown	Gas Velocity at Exit (ft/sec) Unknown	Gas Volume (scfm) Unknown
Basis of any Estimates (attach separate sheet if necessary)		
Are Emission Control Devices in Place? If YES – Complete SFN 8532 ■ Yes ☐ No		
Nearest Residences or Building Residence	Distance (ft) 1520 (approximately)	Direction SouthEast
Nearest Property Line	Distance (ft)	Direction

SECTION C – EMISSION STREAM DATA

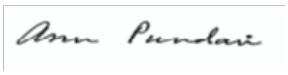
Source ID Number SFN 8516 EU5	Mean Particle Diameter (um) Unknown
Flow Rate (scfm) Unknown	Drift Velocity (ft/sec) Unknown
Stream Temperature (°F) Unknown	Particulate Concentration (gr/dscf) Unknown
Moisture Content (%) Unknown	Halogens or Metals Present? Unknown
Pressure (in. Hg) Unknown	Organic Content (ppmv) Unknown
Heat Content (Btu/scfm) Unknown	O_2 Content (%) Unknown

SECTION D – POLLUTANT SPECIFIC DATA
(Complete One Box for Each Pollutant in Emission Stream)

Pollutant Emitted Benzene	Chemical Abstract Services (CAS) Number 71-43-2
Proposed Emission Rate (lb/hr) 0.0407	Emission Source (describe) Dehydrator Still Vent
Source Classification (process point, process fugitive, area fugitive) Process point	Pollutant Class and Form (organic/inorganic - particulate/vapor) Organic
Concentration in Emission Stream (ppmv) Unknown	Vapor Pressure (in. Hg @ °F) 166 mm Hg
Solubility 0.18 g/100ml	Molecular Weight (lb/lb-mole) 78.11
Absorptive Properties Unknown	

Pollutant Emitted	Chemical Abstract Services (CAS) Number
Proposed Emission Rate (lb/hr)	Emission Source (describe)
Source Classification (process point, process fugitive, area fugitive)	Pollutant Class and Form (organic/inorganic - particulate/vapor)
Concentration in Emission Stream (ppmv)	Vapor Pressure (in. Hg @ °F)
Solubility	Molecular Weight (lb/lb-mole)
Absorptive Properties	

(Add additional pages if necessary)

Signature of Applicant 	Date 08/07/2024

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
4201 Normandy Street, 2nd Floor
Bismarck, ND 58503-1324
(701) 328-5188

PERMIT APPLICATION FOR VOLATILE ORGANIC COMPOUNDS STORAGE TANK

NORTH DAKOTA DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY
SFN 8535 (9-2021)

NOTE: READ INSTRUCTIONS BEFORE COMPLETING THIS FORM.
- Must include SFN 8516 or SFN 52858

SECTION A – GENERAL INFORMATION

Name of Firm or Organization	Facility Name
Hiland Partners Holdings LLC	Firebird Compressor Station

SECTION B – TANK DATA

Source ID Number (From SFN 8516)
EU6 and EU7

Capacity	Barrels 400		Gallons 16,800	
Dimensions	Diameter 12	Height 20	Length	Width

Shape: ☒ Cylindrical ☐ Spherical ☐ Other – Specify:

Materials of Construction (i.e., steel): Steel

Construction: ☐ Riveted ☒ Welded ☐ Other – Specify:

Color:

Condition: ☒ Good ☐ Fair ☐ Poor

Status: ☐ New Construction ☐ Alteration ☒ Existing (Give Date Constructed): 01/01/2019

Type of Tank:
☒ Fixed Roof
☐ Variable Vapor Space
☐ Pressure (low or high)
☐ External Floating
☐ Internal Floating
☐ Other – Specify:

Type of Roof: ☐ Pan ☐ Double Deck ☐ Pontoon ☒ Other – Specify:

Type of Seal	Metallic Shoe Seal	Liquid Mounted Resilient Seal	Vapor Mounted Resilient Seal
	☐ Primary Seal Only ☐ With Rim Mounted Seal ☐ With Shoe Mounted Secondary Seal	☐ Primary Seal Only ☐ With Rim Mounted Seal ☐ With Weather Shield	☐ Primary Seal Only ☐ With Rim Mounted Seal ☐ With Weather Shield

SECTION C – TANK CONTENTS

Name all liquids, vapors, gases, or mixtures of such materials to be stored in the tank.
Give density (lbs per gal) or A.P.I.

Produced water (mostly water)
Condensed liquids from BTEX condenser

SECTION D – VAPOR DISPOSAL

☒ Atmosphere ☐ Vapor Recovery Unit ☐ Flare ☐ Enclosed Combustor ☐ Other – Specify:

SECTION E – VAPOR PRESSURE DATA

psia	
Maximum True Vapor Pressure Unknown	Maximum Reid Vapor Pressure Unknown

SECTION F – OPERATIONAL DATA

Maximum Filling Rate (barrels per hour or gallons per hour) Unknown	Vapor Space Outage (See AP-42, 7.1-92, Equation 1-15) 10 feet (assume tank half full)
Average Throughput (barrels per day or gallons per day) 15,000 bbl/yr	Tank Turnovers per Year 37.23

SECTION G – SOLUTION STORAGE

If material stored is a solution, supply the following information:	
Name of Solvent	Name of Material Dissolved
Concentration of Material Dissolved (% by weight or % by volume or lbs/gal)	

SECTION H – AIR CONTAMINANATS EMITTED

Pollutant*	Maximum Pounds Per Hour	Tons Per Year	Basis and Calculations for Quantities (Attach separate sheet if needed)
VOC	0.3402	1.49	ProMax

* Include an estimate of greenhouse gas emissions (CO_2e)

SECTION I – STANDARDS OF PERFORMANCE

Tank subject to: ☐ 40 CFR 60, Subpart K ☐ 40 CFR 60, Subpart Ka ■ 40 CFR 60, Subpart Kb

☐ 40 CFR 60, Subpart OOOO ☐ 40 CFR 60, Subpart OOOOa

Are the standards of performance for new stationary sources; petroleum liquid storage vessels, 40 CFR Part 60, Subparts K, Ka, and Kb, OOOO, OOOOa being adhered to, where applicable?

☐ Yes ■ No – Explain:

NSPS Kb applies to each storage vessel with a capacity greater than or equal to 75 cubic meters (17,027 gal) that is used to store volatile organic liquids for which construction, reconstruction, or modification is commenced after July 23, 1984. The capacity of the produced water/condensate tanks is below the NSPS Kb applicability threshold. The pressurized NGL tank will have a capacity above the applicability threshold. However, these tanks are exempt from this regulation per 60.110b(d)(4) which exempts vessels with a design capacity less than or equal to 1,589.874 m3 (360,934,388 gal) used for petroleum or condensate stored, processed, or treated prior to custody transfer.

SEND COMPLETED APPLICATION AND ALL ATTACHMENTS TO:

North Dakota Department of Environmental Quality
Division of Air Quality
4201 Normandy Street, 2nd Floor
Bismarck, ND 58503-1324
(701) 328-5188

APPENDIX B: EMISSIONS CALCULATIONS

Firebird Compressor Station
Site Emissions Summary

Emissions Summary

Emission Unit #	Emission Unit Description	PM-10 (tpy)	NOx (tpy)	CO (tpy)	SOx (tpy)	VOC (tpy)	HAPS (tpy)	Formaldehyde (tpy)	CO2e (tpy)	GHG (tpy)
C1	Caterpillar G3606 - 1875 bhp w oxidation catalyst	1.20	18.11	30.78	0.04	14.67	3.07	1.99	7203	7196
C2	Caterpillar G3606 - 1875 bhp w oxidation catalyst	1.20	18.11	30.78	0.04	14.67	3.07	1.99	7203	7196
C3	Waukesha L7044 GSI - 1,900 bhp w/NSCR	1.33	18.35	36.69	0.04	12.86	0.43	0.02	8042	8034
EU4	TEG Reboiler (0.5 MMBtu/hr)	0.02	0.21	0.18	0.00	0.01	0.00	--	256	256
EU5	TEG Still Vent (TEG Dehy Unit rated at 25 MMscfd)	--	--	--	--	1.83	0.28	--	--	--
EU6	Produced Water Tank - 400 bbl - 15,000 bbl/year	--	--	--	--	1.49	--	--	--	--
EU7	Produced Water Tank - 400 bbl - 15,000 bbl/year	--	--	--	--	1.49	--	--	--	--
PW-TL	Produced Water Truck Loading	--	--	--	--	0.44	--	--	--	--
NGL-TL	NGL Truck Loading	--	--	--	--	0.71	--	--	--	--
FUG	Fugitives	--	--	--	--	3.61	0.03	--	--	--
TK	Three Methanol Chemical Storage Tanks	--	--	--	--	0.03	--	--	--	--
BD	Compressor Blowdowns w/recycle	--	--	--	--	16.56	0.20	--	--	--
PIG	Pigging	--	--	--	--	1.00	--	--	--	--
	Total Sitewide Emissions	**3.75**	**54.77**	**98.43**	**0.11**	**69.36**	**7.10**	**4.00**	**22705**	**22682**
	Total Sitewide Emissions without Fugitives	**3.75**	**54.77**	**98.43**	**0.11**	**65.75**	**7.06**	**4.00**	**22705**	**22682**

Notes:
1. Pigging emissions are conservatively assumed to be 1.00 tpy of VOC.
2. Methanol storage tank emissions are conservatively assumed to be 0.01 tpy of VOC for each tank.

Firebird Compressor Station
Engine Emissions

Equipment Data:

Emission Unit (EU):	C1 and C2
Emission Unit Name:	Caterpillar G3606
Engine Type:	4SLB

Fuel Usage =	82.19	MMscf/yr	(Calculated value based on max fuel combustion rate.)
Horsepower =	1,875	bhp	
Speed =	1,000	rpm	
Hours of Operation =	8,760	hr/yr	
Max. Fuel Combustion Rate (HHV) =	7,506	Btu/bhp-hr	(Based on Manufacturer Specs)
Fuel Heating Value (HHV) =	1,500	MMBtu/MMscf	estimated
Max. Heat Rate (HHV) =	14.07	MMBtu/hr	
		rpm	

Pollutant	Emission Factor	Units	Emission Factor Reference	Hourly Emissions (lb/hr)	Annual Emissions (ton/yr)
PM-10 (Front and Back Half)	0.01941	lb/MMBtu	AP-42 Table 3.2-3 (07/00)	0.27	1.20
NOx	1.00	g/BHP-hr	NSPS JJJJ Limit	4.13	18.11
CO	1.70	g/BHP-hr	Permit Limit	7.03	30.78
SOx	5.88E-04	lb/MMBtu	AP-42 Table 3.2-3 (07/00)	0.01	0.04
VOC	0.70	g/BHP-hr	NSPS JJJJ Limit	3.35	14.67
Total HAPs			Engine Vendor/AP-42 Table 3.2-3	0.70	3.07
Formaldehyde	0.110	g/BHP-hr	Manufacturer Controlled Emissions Estimate with 25 % safety factor	0.455	1.99
Pollutant	**Emission Factor**	**Units**	**Emission Factor Reference**	**Hourly Emissions (lb/hr)**	**Annual Emissions (ton/yr)**
CO_2e	--	--	--	1,645	7,203
GHG	--	--	--	1,643	7,196
CO_2	117	lb/MMBtu	Table C-1 to Subpart C of Part 98	1,643	7,196
CH_4	0.0022	lb/MMBtu	Table C-2 to Subpart C of Part 98	0.03	0.14
N_2O	0.00022	lb/MMBtu	Table C-2 to Subpart C of Part 98	0.00	0.01

Notes:

1. NO_x and VOC emissions based on 40 CFR 60 Subpart JJJJ standards. Formaldehyde emissions are based on manufacturer data. PM/PM_0 and SO_2 emissions based on AP-42 Table 3.2-3.
2. Per AP-42, all particulate is considered to be less than 1.0 micrometer in diameter.
3. VOC emissions include formaldehyde.

Sample Calculation:

PM-10 Emissions (ton/yr) = (Emission Factor, lb/MMBtu) x (Max Heat Input Rate (HHV), MMBtu/hr) x (Hours of Operation, hr/yr) / (2,000 lb/ton)
PM-10 Emissions (ton/yr) = (0.01941 lb/MMBtu) x (14.07 MMBtu/hr) x (8,760 hr/yr) / (2,000 lb/ton) = 1.2 ton/yr

VOC Emissions (ton/yr) = (Emission Factor, g/bhp-hr) x (Horsepower, bhp) x (Hours of Operation, hr/yr) / (2,000 lb/ton) / (453.59 grams/1 lb)
VOC Emissions (ton/yr) = (0.7 g/bhp-hr) x (1875 bhp) x (8,760 hr/yr) / (2,000 lb/ton) / (453.59 g/lb) = 14.67 ton/yr

CO_2e Emissions (ton/yr) = (CO_2 emissions x 1) + (CH_4 emissions x 25) + (N_2O emissions x 298)
CO_2e Emissions (ton/yr) = ((7195.71 ton/yr x 1) + (0.14 ton/yr x 25) + (0.01 ton/yr x 298)) = 7203.15 ton/yr

GHG Emissions (ton/yr) = (CO_2 emissions) + (CH_4 emissions) + (N_2O emissions)
GHG Emissions (ton/yr) = (7195.71 ton/yr) + (0.14 ton/yr) + (0.01 ton/yr) = 7195.86 ton/yr

Firebird Compressor Station
Site Emissions Summary

HAP Emissions per engine

HAP Emissions from 2 Stroke Lean-Burn Compressor Engines

Engines	Horsepower (hp)	Hours per Year	Heat Input (MMBtu/yr)	Fuel Input (MMscf/yr)
Engine C1	1,875	8,760	123,286	82.19

HAP	Emission Factor (lb/MMBtu)	Emission Factor (g/bhp-hr)	Control Efficiency (%)	Emissions (tpy) (Controlled)	Notes
1,1,2,2-Tetrachloroethane	4.00E-05	--	0%	2.47E-03	1
1,1,2-Trichloroethane	3.18E-05	--	0%	1.96E-03	1
1,3-Butadiene	2.67E-04	--	0%	1.65E-02	1
1,3-Dichloropropene	2.64E-05	--	0%	1.63E-03	1
2-Methylnaphthalene	3.32E-05	--	0%	2.05E-03	1
2,2,4-Trimethylpentane	2.50E-04	--	0%	1.54E-02	1
Acenaphthene	1.25E-06	--	0%	7.71E-05	1
Acenaphthylene	5.53E-06	--	0%	3.41E-04	1
Acetaldehyde	8.36E-03	--	0%	5.15E-01	1
Acrolein	5.14E-03	--	0%	3.17E-01	1
Benzene	4.40E-04	--	0%	2.71E-02	1
Benzo(e)fluoranthene	1.66E-07	--	0%	1.02E-05	1
Benzo(e)pyrene	4.15E-07	--	0%	2.56E-05	1
Benzo(e)perylene	4.14E-07	--	0%	2.55E-05	1
Biphenyl	2.12E-04	--	0%	1.31E-02	1
Carbon Tetrachloride	3.67E-05	--	0%	2.26E-03	1
Chlorobenzene	3.04E-05	--	0%	1.87E-03	1
Chloroform	2.85E-05	--	0%	1.76E-03	1
Chrysene	6.93E-07	--	0%	4.27E-05	1
Ethylbenzene	3.97E-05	--	0%	2.45E-03	1
Ethylene Dibromide	4.43E-05	--	0%	2.73E-03	1
Fluoranthene	1.11E-06	--	0%	6.84E-05	1
Fluorene	5.67E-06	--	0%	3.50E-04	1
Formaldehyde	--	0.110	NA	1.992	1
Methanol	2.50E-03	--	0%	1.54E-01	1
Methylene Chloride	2.00E-05	--	0%	1.23E-03	1
n-Hexane	1.11E-03	--	0%	6.84E-02	1
Naphthalene	7.44E-05	--	0%	4.59E-03	1
PAH	2.69E-05	--	0%	1.66E-03	1
Phenanthrene	1.04E-05	--	0%	6.41E-04	1
Phenol	2.40E-05	--	0%	1.48E-03	1
Pyrene	1.36E-06	--	0%	5.59E-08	1
Styrene	2.36E-05	--	0%	9.70E-07	1
Tetrachloroethane	2.48E-06	--	0%	1.02E-07	1
Toluene	4.08E-04	--	0%	1.68E-05	1
Vinyl Chloride	1.49E-05	--	0%	6.12E-07	1
Xylene (mixed isomers)	1.84E-04	--	0%	7.56E-06	1
Total				**3.07**	

1) Emission factor based on EPA's AP-42 Section 3.2, Table 3.2-2 (07/00) [4-Stroke Lean-Burn Engines].

Firebird Compressor Station
Engine Emissions

Equipment Data:

Emission Unit (EU):	C3
Emission Unit Name:	Waukesha L7044GSI
Engine Type:	4SRB

Fuel Usage =	91.575	MMscf/yr	(Calculated value based on max fuel combustion rate.)
Horsepower =	1,900	bhp	
Speed =	1,200	rpm	
Hours of Operation =	8,760	hr/yr	
Max. Fuel Combustion Rate (HHV) =	8,253	Btu/bhp-hr	(Based on Manufacturer Specs)
Fuel Heating Value (HHV) =	1,500	MMBtu/MMscf	estimated
Max. Heat Rate (HHV) =	15.68	MMBtu/hr	

Pollutant	Emission Factor	Units	Emission Factor Reference	Hourly Emissions (lb/hr)	Annual Emissions (ton/yr)
PM-10 (Front and Back Half)	0.01941	lb/MMBtu	AP-42 Table 3.2-3 (07/00)	0.30	1.33
NOx	1.00	g/BHP-hr	NSPS JJJJ Limit	4.19	18.35
CO	2.00	g/BHP-hr	NSPS JJJJ Limit	8.38	36.69
SOx	5.88E-04	lb/MMBtu	AP-42 Table 3.2-3 (07/00)	0.01	0.04
VOC	0.70	g/BHP-hr	NSPS JJJJ Limit	2.94	12.86
Total HAPs			Engine Vendor/AP-42 Table 3.2-3	0.10	0.43
Formaldehyde	0.001	g/BHP-hr	Manufacturer Estimate	0.004	0.02
Pollutant	**Emission Factor**	**Units**	**Emission Factor Reference**	**Hourly Emissions (lb/hr)**	**Annual Emissions (ton/yr)**
CO_2e	--	--	--	1,836	8,042
GHG	--	--	--	1,834	8,034
CO_2	117	lb/MMBtu	Table C-1 to Subpart C of Part 98	1,834	8,034
CH_4	0.0022	lb/MMBtu	Table C-2 to Subpart C of Part 98	0.03	0.15
N_2O	0.00022	lb/MMBtu	Table C-2 to Subpart C of Part 98	0.00	0.02

Notes:

1. NO_x and VOC emissions based on 40 CFR 60 Subpart JJJJ standards. Formaldehyde emissions are based on manufacturer data. PM/PM_{10} and SO_2 emissions based on AP-42 Table 3.2-3.

2. Per AP-42, all particulate is considered to be less than 1.0 micrometer in diameter.
3. VOC emissions include formaldehyde.

Sample Calculation:

PM-10 Emissions (ton/yr) = (Emission Factor, lb/MMBtu) x (Max Heat Input Rate (HHV), MMBtu/hr) x (Hours of Operation, hr/yr) / (2,000 lb/ton)
PM-10 Emissions (ton/yr) = (0.01941 lb/MMBtu) x (15.68 MMBtu/hr) x (8,760 hr/yr) / (2,000 lb/ton) = 1.33 ton/yr

VOC Emissions (ton/yr) = (Emission Factor, g/bhp-hr) x (Horsepower, bhp) x (Hours of Operation, hr/yr) / (2,000 lb/ton) / (453.59 grams/1 lb)
VOC Emissions (ton/yr) = (0.7 g/bhp-hr) x (1900 bhp) x (8,760 hr/yr) / (2,000 lb/ton) / (453.59 g/lb) = 12.86 ton/yr

CO_2e Emissions (ton/yr) = (CO_2 emissions x 1) + (CH_4 emissions x 25) + (N_2O emissions x 298)
CO_2e Emissions (ton/yr) = ((8034.16 ton/yr x 1) + (0.15 ton/yr x 25) + (0.02 ton/yr x 298)) = 8042.46 ton/yr

GHG Emissions (ton/yr) = (CO_2 emissions) + (CH_4 emissions) + (N_2O emissions)
GHG Emissions (ton/yr) = (8034.16 ton/yr) + (0.15 ton/yr) + (0.02 ton/yr) = 8034.33 ton/yr

Firebird Compressor Station
Site Emissions Summary

HAP Emissions per engine

HAP Emissions from Rich-Burn Compressor Engines

Engines	Horsepower (hp)	Hours per Year	Heat Input (MMBtu/yr)	Fuel Input (MMscf/yr)
Engine C3	1,900	8,760	137,363	91.58

HAP	Emission Factor (lb/MMBtu)	Emission Factor (g/bhp-hr)	Control Efficiency (%)	Emissions (tpy) (Controlled)	Notes
1,1,2,2-Tetrachloroethane	2.53E-05	--	50%	8.69E-04	1,4
1,1,2-Trichloroethane	1.53E-05	--	50%	5.25E-04	1,4
1,1-Dichloroethane	1.13E-05		50%	3.88E-04	1,4
1,2-Dichloroethane	1.13E-05		50%	3.88E-04	1,4
1,2-Dichloropropane	1.30E-05		50%	4.46E-04	1,4
1,3-Butadiene	6.63E-04	--	50%	2.28E-02	1,4
1,3-Dichloropropene	1.27E-05	--	50%	4.36E-04	1,4
Acetaldehyde	2.79E-03	--	50%	9.58E-02	1,4
Acrolein	2.63E-03	--	50%	9.03E-02	1,4
Benzene	1.58E-03	--	50%	5.43E-02	1,4
Carbon Tetrachloride	1.77E-05	--	50%	6.08E-04	1,4
Chlorobenzene	1.29E-05	--	50%	4.43E-04	1,4
Chloroform	1.37E-05	--	50%	4.70E-04	1,4
Ethylbenzene	2.48E-05	--	50%	8.52E-04	1,4
Ethylene Dibromide	2.13E-05	--	50%	7.31E-04	1,4
Formaldehyde	--	0.001	NA	0.018	2
Methanol	3.06E-03	--	50%	1.05E-01	1,4
Methylene Chloride	4.12E-05	--	50%	1.41E-03	1,4
Naphthalene	9.71E-05	--	50%	3.33E-03	1,4
PAH	1.41E-04	--	50%	4.84E-03	1,4
Styrene	1.19E-05	--	50%	4.09E-04	1,4
Toluene	5.58E-04	--	50%	1.92E-02	1,4
Vinyl Chloride	7.18E-06	--	50%	2.47E-04	1,4
Xylene	1.95E-04	--	50%	6.70E-03	1,4
HAP	**Emission Factor (lb/MMscf)**		**Control Efficiency (%)**	**Emissions (tpy) (Uncontrolled)**	**Notes**
Arsenic	2.04E-04	--	0%	9.34E-06	3
Beryllium	1.20E-05	--	0%	5.49E-07	3
Cadmium	1.10E-03	--	0%	5.04E-05	3
Chromium	1.40E-03	--	0%	6.41E-05	3
Cobalt	8.40E-05	--	0%	3.85E-06	3
Manganese	3.80E-04	--	0%	1.74E-05	3
Mercury	2.60E-04	--	0%	1.19E-05	3
Nickel	2.10E-03	--	0%	9.62E-05	3
Selenium	2.40E-05	--	0%	1.10E-06	3
Total HAP Emissions				**0.43**	

1. Emission factor from AP-42 Table 3.2-3, Uncontrolled Emission Factors for 4-Stroke Rich-Burn Engines (July 2000)
2. Vendor Information.
3. Emission factor from AP-42 Table 1.4-4, Emission Factors for Metals from Natural Gas Combustion (July 1998)
4. Control efficiency from the dual catalytic converter unit was conservatively assumed to be 50% per verbal guidance by NDDH on 4/29/10.

Firebird Compressor Station
Glycol Reboiler Emissions

Equipment Data:

Emission Unit (EU):	**EU4**
Emission Unit Name:	TEG Reboiler
Rating:	0.5 MMBtu/hr

Maximum Fuel Usage =	2.92	MMscf/yr	(Calculated value based on max fuel combustion rate)
Maximum Fuel Usage =	0.0003	MMscf/hr	
Hours of Operation =	8,760	hr/yr	
design Heat Input Rate =	0.50	MMBtu/hr	
Fuel Heating Value (HHV) =	1,500	MMBtu/MMscf	
MMBtu =	4,380	MMBtu/yr	

Pollutant	Emission Factor	Units	Emission Factor Reference	Hourly Emissions (lb/hr)	Annual Emissions (ton/yr)
PM-10 (Front and Back Half)	7.6	lb/MMscf	AP-42 Table 1.4-2 (07/98)	0.004	0.02
NOx	100	lb/MMscf	AP-42 Table 1.4-1 (07/98)	0.049	0.21
CO	84	lb/MMscf	AP-42 Table 1.4-1 (07/98)	0.041	0.18
SOx	0.6	lb/MMscf	AP-42 Table 1.4-2 (07/98)	0.0003	0.001
VOC	5.5	lb/MMscf	AP-42 Table 1.4-2 (07/98)	0.003	0.01
Pollutant	**Emission Factor**	**Units**	**Emission Factor Reference**	**Hourly Emissions (lb/hr)**	**Annual Emissions (tons/yr)**
CO_2e	--	--	--	59	256
GHG	--	--	--	58	256
CO_2	117	lb/MMBtu	Table C-1 to Subpart C of Part 98	58	256
CH_4	0.0022	lb/MMBtu	Table C-2 to Subpart C of Part 98	0.00	0.005
N_2O	0.0002	lb/MMBtu	Table C-2 to Subpart C of Part 98	0.00	0.000

Notes:
1. Emission factors based on AP-42 Table 1.4-1 and Table 1.4-2. Per AP-42, all particulate is considered to be less than 1.0 micrometer in diameter.
2. AP-42 Table 1.4-1 and 1.4-2 emissions factors adjusted with ratio 1500 BTU/1020 BTU when calculating lb/hr.

Sample Calculation:

Fuel Usage (MMscf/yr) = (Design Heat Input Rate, MMBtu/hr) / (Fuel heating Value, MMBtu/MMscf) * (Hours of Operation, hr/yr)
Fuel Usage (MMscf/yr) = (0.5 MMBtu/hr) / (1500 MMBtu/MMscf) x (8,760 hr/yr) = 2.92 MMscf/yr

PM Total Emissions (lb/hr) = (Emission Factor, lb/MMscf) x (Fuel Heating Value, MMBtu/MMscf) / (1,020 MMBtu/MMscf) x (Fuel Usage, MMscf/yr) / (Hours of Operation, hr/yr)
PM Total Emissions (lb/hr) = (7.6 lb/MMscf) x (1500 MMBtu/scf) / (1,020 MMBtu/MMscf) x (7.6 MMscf/yr) / (8760 hr/yr) = 0.004 lb/hr

PM-10 Emissions (ton/yr) = (Hourly Emissions, lb/hr) x (8,760 hrs/yr) / (2,000 lb/ton)
PM-10 Emissions (ton/yr) = (0.004 lb/hr) x (8760 hr/yr) / (2000 lb/ton) = 0.02 ton/yr

Firebird Compressor Station
Glycol Reboiler HAPs Emissions

EU4 - TEG Reboiler - 0.5 MMBtu/hr

HAP Emissions

Equipment	Heat Input Rate (MMBtu/hr)	Fuel Consumption (MMscf/yr)
Rating:	0.50	2.92

HAP	Emission Factor[1] (lb/MMscf)	Control Efficiency (%)	Emissions (tpy) (Uncontrolled)
2-Methylanpthalene	2.40E-05	0%	3.50E-08
3-Methylchloranthrene	1.80E-06	0%	2.63E-09
7,12-Dimethylben(a)anthracene	1.60E-05	0%	2.34E-08
Acenapthene	1.80E-06	0%	2.63E-09
Acenapthylene	1.80E-06	0%	2.63E-09
Anthracene	2.40E-06	0%	3.50E-09
Benz(a)anthracene	1.80E-06	0%	2.63E-09
Benzene	2.10E-03	0%	3.07E-06
Benzo(a)pyrene	1.20E-06	0%	1.75E-09
Benzo(b)fluorathene	1.80E-06	0%	2.63E-09
Benzo(g,h,i)perylene	1.20E-06	0%	1.75E-09
Benzo(k)fluorathene	1.80E-06	0%	2.63E-09
Chrysene	1.80E-06	0%	2.63E-09
Dibenzo(a,h)anthracene	1.20E-06	0%	1.75E-09
Dichlorobenzene	1.20E-03	0%	1.75E-06
Fluoranthene	3.00E-06	0%	4.38E-09
Fluorene	2.80E-06	0%	4.09E-09
Formaldehyde	7.50E-02	0%	1.10E-04
Hexane	1.80E+00	0%	2.63E-03
Indeno(1,2,3-cd)pyrene	1.80E-05	0%	2.63E-08
Napthalene	6.10E-04	0%	8.91E-07
Phenanathrene	1.70E-05	0%	2.48E-08
Pyrene	5.00E-06	0%	7.30E-09
Toluene	3.40E-03	0%	4.96E-06
HAP	**Emission Factor[2] (lb/MMscf)**	**Control Efficiency (%)**	**Emissions (tpy) (Uncontrolled)**
Arsenic	2.04E-04	0%	2.98E-07
Beryllium	1.20E-05	0%	1.75E-08
Cadmium	1.10E-03	0%	1.61E-06
Chromium	1.40E-03	0%	2.04E-06
Cobalt	8.40E-05	0%	1.23E-07
Manganese	3.80E-04	0%	5.55E-07
Mercury	2.60E-04	0%	3.80E-07
Nickel	2.10E-03	0%	3.07E-06
Selenium	2.40E-05	0%	3.50E-08
Total HAP Emissions			**0.003**

1. Emission factor from AP-42 Table 1.4-3, Emission Factors for Speciated Organic Compounds from Natural Gas Combustion (July 1998).
2. Emission factor from AP-42 Table 1.4-4, Emission Factors for Metals from Natural Gas Combustion (July 1998).

Firebird Compressor Station
Glycol Still Vent Emissions

Equipment Data:

Emission Unit (EU):	EU5
Emission Unit Name:	TEG Dehydrator Still Vent

Emissions Data:

	Model
Wet Gas Pressure (psig)	1200
Wet Gas Temperature (°F)	100
Gas Throughput (mmscf/day)	25
Dry Gas Water Content (lb/H2O/mmscf)	4
Glycol Type =	TEG
Lean Glycol Water Content (wt% H20)	1.5
Lean Glycol Flow Rate (gpm)	5.5
Glycol Pump Type	Gas Injection
Gas Injection Pump Ratio (acfm gas/gpm glycol)	0.08
Flash Tank Pressure (psig)	55
Flash Tank Temperature (°F)	150
Flash Tank Control	Recycle/Recomp.
Regen Controls:	
Condenser Pressure (psig)	14.7
Condenser Temperature (°F)	100
Combustion Device:	
Destruction Efficiency:	95
Excess Oxygen:	5
Ambient Air Temperature (°F)	100

Pollutant	Controlled	
	Hourly Emissions	Annual Emissions
	lb/hr	tpy
-Propane	0.0886	0.3882
-Isobutane	0.0198	0.0865
-n-Butane	0.0910	0.3987
-Isopentane	0.0192	0.0843
-n-Pentane	0.0343	0.1502
-Cyclopentane	0.0024	0.0105
-n-Hexane	0.0060	0.0263
-Cyclohexane	0.0037	0.0161
-Other Hexanes	0.0082	0.0358
-Heptanes	0.0105	0.0458
-Methylcyclohexane	0.0023	0.0102
-2,2,4-Trimethylpentane	0.0002	0.0007
-Benzene	0.0407	0.1781
-Toluene	0.0146	0.0637
-Ethylbenzene	0.0000	0.0000
-Xylenes	0.0036	0.0158
-C8+ Heavies	0.0001	0.0002
Total VOC	**0.3450**	**1.8255**
Total HAPs	**0.0650**	**0.2846**
Total BTEX	**0.0588**	**0.2576**

Notes:

1. The flash tank off-gas will be recycled.
2. There is a condenser controlling the BTEX emissions.
3. The non-condensable gas from the condenser will be routed to the reboiler firebox.

Firebird Compressor Station
Fugitive Emissions

Component Type	Service	Emission Factor [1] (lb/hr/comp)	Component Count	Total Loss (lb/hr)	Total Loss (tpy)
Valves	Gas/Vapor	0.00992	58	0.58	2.52
	Light Liquid	0.0055	26	0.14	0.63
Pumps	Gas Vapor	0.00529	0	0.00	0.00
	Light Liquid	0.02866	1	0.03	0.13
Flanges [2]	Gas/Vapor	0.00086	1092	0.94	4.11
	Light Liquid	0.000243	54	0.01	0.06
Connectors	Gas/Vapor	0.00044	0	0.00	0.00
	Light Liquid	0.000463	0	0.00	0.00
Open Ended Lines	Gas/Vapor	0.00441	0	0.00	0.00
	Light Liquid	0.00309	0	0.00	0.00
Other [3]	Gas/Vapor	0.0194	0	0.00	0.00
	Light Liquid	0.0165	0	0.00	0.00
Compressors	Gas/Vapor	0.0194	3	0.06	0.25
	Light Liquid	0.0165	0	0.00	0.00
Component Emission Total Losses				1.76	7.70
Gas/Vapor Emissions				1.57	6.89
Light Liquid Emissions				0.18	0.81

Component	Gas (wt%)	Gas/Vapor Emissions		Total Emissions [4]	
		(lb/hr)	(tpy)	(lb/hr)	(tpy)
CO_2	1.7360	0.027	0.120	0.027	0.120
Nitrogen	2.6300	0.041	0.181	0.041	0.181
H_2S	0.0000	0.00E+00	0.00E+00	0.000	0.000
Methane	32.6005	0.513	2.246	0.513	2.246
Ethane	22.2977	0.351	1.536	0.351	1.536
Propane	19.3428	0.304	1.332	0.304	1.332
i-Butane	3.0548	0.048	0.210	0.048	0.210
n-Butane	10.7869	0.170	0.743	0.170	0.743
i-Pentane	2.2986	0.036	0.158	0.036	0.158
n-Pentane	3.3243	0.052	0.229	0.052	0.229
Benzene	0.0432	0.001	0.003	0.001	0.003
n-Hexane	0.3999	0.006	0.028	0.006	0.028
Hexanes	0.6666	0.010	0.046	0.010	0.046
Toluene	0.0238	0.000	0.002	0.000	0.002
Heptanes	0.5388	0.008	0.037	0.008	0.037
Ethylbenzene	0.0000	0.000	0.000	0.000	0.000
Xylenes	0.0117	0.000	0.001	0.000	0.001
Octanes	0.0884	0.001	0.006	0.001	0.006
Nonanes	0.0094	0.000	0.001	0.000	0.001
C10+	0.0850	0.001	0.006	0.001	0.006
Total	**99.938**	**1.572**	**6.884**	**1.572**	**6.884**
Total VOC	**40.674**	**0.640**	**2.802**	**0.824**	**3.611**
Total HAPs	**0.479**	**0.008**	**0.033**	**0.008**	**0.033**

Notes:

1. Emission factors are from EPA's "Protocol for Equipment Leak Emission Estimates" EPA-453/R-95-017, 11/1995, Table 2-4.

2. Maintenance Plugs & Blind Flanges are treated as screwed connectors. Per TCEQ's "Air Permit Technical Guidance for Chemica Sources: Equipment Leak Fugitives" dated October 2000, screwed fittings should be estimated as flanges.

3. For Oil and Gas Production Operations, "Other" includes compressors, diaphrams, drains, dump arms, hatches, instruments, meters, pressure relief valves, polished rods, relief valves, and vents.

4. The total emissions include the light liquid emissions assuming 100% VOC of light liquid.

5. Water/Oil emissions are assumed to be 100% VOC.

6. Assume n-hexane weight percent is sum of n-hexane, cyclohexane, other hexanes, and methylcyclohexane weight percent.

Firebird Compressor Station
Produced Water Storage Tank Emissions

Equipment Data:

Emission Unit (EU):	EU6	EU7
Emission Unit Name:	Produced Water Storage Tank	Produced Water Storage Tank

Emissions Data:

Tank Contents = Produced Water
Tank Type = Vertical Fixed Roof
Tank Capacity = 16,800 gallons
Annual Throughput = 15,000 bbl/year per tank
Annual Throughput = 630,000 gallons/year per tank

Emission Unit	Standing Losses (lb/hr)	Working Losses (lb/hr)	Total Losses (lb/hr)	Standing Losses (ton/yr)	Working Losses (ton/yr)	Total Losses (ton/yr)
Produced Water Storage Tank EU5	0.1164	0.2237	0.3402	0.510	0.980	1.490
Produced Water Storage Tank EU6	0.1164	0.2237	0.3402	0.510	0.980	1.490
					TOTAL	2.98

Notes:
1. Emissions calculated using ProMax model.

Firebird Compressor Station
Compressor Blowdowns

Emission Unit	Designation	Compressor Volume (ft^3)	Compressor Pressure (psig)	Number of Events (#/ per Year)	Gas VOC Weight % (%)	Gas MW (lb/lb-mol)	Average Gas Temperature (°F)	Estimated MCF per event	Estimated SCF per event	Estimated SCF per year	Potential VOC Emissions lb/scf	lb/year	(tpy)
(3) Engines [1 and 2]	Compressor	197.00	100	150	40.7	27.15	60	1.59	1590	238500	0.029	6951	3.48
(3) Engines [3]	Compressor	197.00	1,250	24	40.7	27.15	60	37.4	37400	897600	0.029	26160	13.08
												Total Losses	**16.56**
													40.641

Notes:
1. Assumed 50 events/year controlled blowdown events at 100 psig per engine.
2. Assumes the majority of blowdowns are using the recycle process of reducing the pressure to 100 psig.
3. Assumes 24 blowdowns/year released to atmosphere at 1250 psig.

Notes:
VOC weight percentage is from Inlet Gas Analysis
Molecular Weight of Gas = 27.151 approx
VOC Weight Percent = 40.736% approx
Molecular Weight of Gas = 27.151
HAPs Weight Percent = 0.489%
Universal Gas Content = 379.5 ft^3/lb-mol @ 60 F and 14.696 psia
Specific Gravity = 0.93753
Calculation:
Pound " X"/ scf = Wt Fraction (wt%) * MW of Gas * 1 lb mol/379.5 scf

lbs NM/E VOC/scf = 0.029
lbs/scf= 0.072
lb HAPs/scf = 0.00035
Estimated MCF per event from using Blowdown Volumes Compressibility Spreadsheet
Emissions (tpy) = (Estimated scf/event * number of events per year * lb/scf)/2000 (lb/ton)

Component	MW (g/mol)	Mol%	Gas Weight (lb/lbmol)	Wt %		Emissions (tpy)
Carbon Dioxide	44.010	1.071	0.4713	1.736		0.706
Hydrogen Sulfide	34.082	0.000	0.0000	0.000		0.000
Nitrogen	28.013	2.549	0.7141	2.630		1.069
Methane (C1)	16.042	55.175	8.8514	32.601		13.249
Ethane (C2)	30.069	20.134	6.0541	22.298		9.062
Propane (C3)	44.096	11.910	5.2518	19.343		7.861
iso-Butane (C4)	58.122	1.427	0.8294	3.055		1.241
nor-Butane (C4)	58.122	5.039	2.9288	10.787		4.384
iso-Pentane (C5)	72.149	0.865	0.6241	2.299		0.934
nor-Pentane	72.149	1.251	0.9026	3.324		1.351
Cyclopentane	72.149	0.017	0.0123	0.045		0.018
n-Hexane	86.180	0.126	0.1086	0.400		**0.163**
Cyclohexane	86.180	0.016	0.0138	0.051		0.021
Other Hexanes	86.180	0.210	0.1810	0.667		0.271
Heptanes (C7+)	100.200	0.146	0.1463	0.539		0.219
Methylcyclohexane	86.180	0.011	0.0095	0.035		0.014
2,2,4 Trimethyl pentane	72.149	0.004	0.0029	0.011		0.004
Benzene	78.110	0.015	0.0117	0.043		0.018
Toluene	92.140	0.007	0.0064	0.024		0.010
Ethylbenzene	106.170	0.000	0.0000	0.000		0.000
Xylenes (M, P, O)	106.170	0.003	0.0032	0.012		0.005
Octanes (C8+)	114.230	0.021	0.0240	0.088		0.036
Nonanes (C9+)	128.260	0.002	0.0026	0.009		0.004
Decanes (C10+)	142.290	0.001	0.0014	0.005		0.002
Total		100.000	27.1512	100.000	**Total**	40.641
Vapor MW (lb/lb-mol)		**27.151**	-	-	**VOC Total**	16.555
VOC (%)		**21.071**	-	**40.736**	**HAPs Total**	0.199

Firebird Compressor Station
Tank Truck Loading Emissions

Parameter		
Product	Produced Water	
Saturation Factor, S [1]	0.6	
Vapor MW [2]	62.00	lb/lb-mol
Maximum Vapor Pressure	10.06	psia
Average Vapor Pressure	7.93	psia
Max Temperature	78.28	°F
Average Temperature	64.9	°F
Short-Term Loading Loss Factor [4, 5]	8.67	lb/1000 gal
Annual Loading Loss Factor [4, 5]	7.01	lb/1000 gal
Hourly Throughput	7,560	gal/hr
Annual Throughput	1,260,000	gal/yr
Water Content Reduction (%) [7]	90%	

Fugitive Losses		
Hourly Losses	65.52	lb/hr
Annual Losses	4.41	tpy
Hourly Losses (minus water)	6.55	lb/hr
Annual Losses (minus water)	0.44	tpy

Notes:
1. Saturation factor is from EPA's AP-42, 5th Edition, Section 5.2, Table 5.2-1; for submerged loading; dedicated normal service.
2. Molecular weight of vapors was taken from Tanks 4.09d.
3. Vapor pressure was determined using AP-42, Figure 7.1-13b.
4. Losses are based on the loading losses equation from EPA's AP-42, Section 2, 5th Edition, June, 2008, Equation 1:

$$L = \frac{12.46 * S * P * M}{T}$$

where:

L = Loading Losses, lb/1000 gallons
S = Saturation Factor, see Table 5.2-1 in AP-42, Section 5.2.
P = True vapor pressure, psia
M = Molecular weight of vapors, lb/lb-mol
T = Temperature of bulk liquid loaded, R (F + 460)

5. Short-term loading loss factor is calculated based on the worst-case (highest) temperature and vapor pressure.
6. Annual loading loss factor is calculated based on the average temperature and vapor pressure.
7. The volume of liquids loaded are estimated to be 90% water; therefore, overall fugitive losses from loading are assumed to be 10% of the total emissions.

NGL Truck Loading Emissions

Assumptions

1. Approximately 10 inches of 2 inch diameter pipe for liquid connection from tanker truck to NGL tank. Assume 12 inches of pipe when calculating volume.
2. Approximately 10 inches of 2 inch diameter pipe for vapor connection from tanker truck to NGL tank. Assume 12 inches of pipe when calculating volume.
3. Average pressure in tank is approximately 30 psig to 50 psig.
4. Assume Gas/Vapor Weight percent equals 100 %.
5. As a conservative measure, assume Vapor Molecular Weight is 97 lb/lb-mol by assuming all Hexanes+ as Decanes.

Liquid DisConnect - 12 inches of 2 inch pipe =	0.022	cubic feet of pipe	
Vapor DisConnect - 12 inches of 2 inch pipe =	0.022	cubic feet of pipe	
Total (Liquids + Vapor) =	0.044		
Expected Max NGL Daily Volume =	40,000	gal/day	Maximum with 20 % safety factor
Expected Max NGL Annual Volume =	14,600,000	gal/yr	
Average Tank Truck Capacity =	9,000	gal	
Number of Annual Truck Loads =	1622	truckloads per year	

Vapor Portion of Disconnect

26.4381	cubic feet vapor per gallon from Watford NGL Analysis
5.345	lb/gallon from Watford NGL Analysis
0.20217	lb/cubic feet (lb/gallon divided by cubic feet /gallon)
0.022	cubic feet Vapor Disconnect
0.004408	lbs for each disconnect (lb/cubic feet * cubic feet)
1622	number of disconnects per year
7.15	lbs per year

Liquid Portion of Disconnect

5.345	lb/gallon from Watford NGL Analysis
0.022	cubic feet Liquid Disconnect
0.16	gallon of pipe for each disconnect (7.48 gal/cubic feet * 0.022 cubic feet)
0.87	lbs for each disconnect (5.345 lb/gallons * 0.16 gallon)
1622	number of disconnects per year
1414	lbs per year

Liquid + Vapor Portion

1421	lbs per year
0.71	tons per year

NGL Gasoline Tank	MW (g/mol)	Mol%	Gas Weight (lb/lbmol)
Nitrogen	28.013	0	0.000
Methane	16.042	0	0.000
Carbon Dioxide	44.01	0	0.000
Ethane	30.069	0	0.000
Propane	44.096	0	0.000
i-Butane	58.122	0	0.000
n-Butane	58.122	3.221	1.872
i-Pentane	72.149	24.4	17.604
n-Pentane	72.149	36.565	26.381
Hexanes+*	142.29	35.814	50.960
		MW =	**96.817**

** To be conservative, assume MW Decanes rather than MW Hexanes in calculation of NGL Molecular Weight.*

Firebird Compressor Station
Pigging Blowdown Emissions

Pig Receiver/Pig Launcher	Designation	Pigging Volume	Pig Receiver or Launcher Pressure	Number of Events	Gas VOC Weight %	Gas MW	Average Gas Temperature	Estimated MCF per event	Estimated SCF per event	Estimated SCF per year	Potential VOC Emissions		
		(ft^3)	(psig)	(#/ per Year)	(%)	(lb/lb-mol)	(°F)				lb/scf	lb/year	(tpy)
High Pressure	Pigging	16	1,250	12	40.74	27.15	60	3.04	3040	36480	0.029	1063	0.53
Low Pressure	Pigging	11	250	52	40.74	27.15	60	0.22	220	11440	0.029	333	0.17
Low Pressure	Pigging	11	250	52	40.74	27.15	60	0.22	220	11440	0.029	333	0.17
												Total Losses	**0.87**

Notes:
1. Assume 12 events per year for each high pressure (HP) launcher/receiver and 52 events per year for each low pressure(LP) launcher/receiver.

VOC weight percentage is from Firebird Inlet Gas Analysis 10/19/2022.
Molecular Weight of Gas = 27.15 approx
VOC Weight Percent = 40.74% approx
Universal Gas Content = 379.5 ft^3/lb-mol @ 60 F and 14.696 psia
Specific Gravity = 0.93753
Calculation:
Pound " X"/ scf = Wt Fraction (wt%) * MW of Gas * 1 lb mol/379.5 scf

lbs NM/E VOC/scf = 0.029

Estimated MCF per event from using Blowdown Volumes Compressibility Spreadsheet
Emissions (tpy) = (Estimated scf/event * number of events per year * lb/scf)/2000 (lb/ton)

Firebird Compressor Station
Gas Analysis

Sample name	Gas Taken Before Dehydrator
Sample location	Firebird Compressor Station
Sample temperature and pressure	100 °F, 900 psig
Date of sample	10/25/2023

Component	**MW (g/mol)**	**Mole %**	**Gas Weight (lb/lbmol)**	**Weight %**
CO2	44.010	1.071	0.471	1.7360
H2S	34.082	0.000	0.000	0.0000
Nitrogen	28.013	2.549	0.714	2.6300
methane (C1)	16.042	55.175	8.851	32.6005
ethane (C2)	30.069	20.134	6.054	22.2977
propane (C3)	44.096	11.910	5.252	19.3428
iso-butane (C4)	58.122	1.427	0.829	3.0548
nor-butane (C4)	58.122	5.039	2.929	10.7869
iso-pentane (C5)	72.149	0.865	0.624	2.2986
n-pentane	72.149	1.251	0.903	3.3243
Cyclopentane	72.149	0.017	0.012	0.0452
n-Hexane	86.180	0.126	0.109	0.3999
Cyclohexane	86.180	0.016	0.014	0.0508
Other Hexanes	86.180	0.210	0.181	0.6666
heptane (C7+)	100.200	0.146	0.146	0.5388
Methylcyclohexane	86.180	0.011	0.009	0.0349
2,2,4 Trimethyl pentane	72.149	0.004	0.003	0.0106
benzene	78.110	0.015	0.012	0.0432
toluene	92.140	0.007	0.006	0.0238
Ethylbenzene	106.170	0.000	0.000	0.0000
xylenes (M, P, O)	106.170	0.003	0.003	0.0117
octane (C8+)	114.230	0.021	0.024	0.0884
nonane (C9+)	128.260	0.002	0.003	0.0094
decane (C10+)	142.290	0.001	0.001	0.0052
Total		100.0000	27.1512	100.0000
Vapor MW (lb/lb-mol)		**27.151**		
VOC Weight (%)		**40.7358**		
HAPs Weight (%)		**0.4892**		

Specific Gravity =	0.93753

APPENDIX C: GRI-GLYCalc Reports

GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name: Firebird July 2024 Permit Revision
File Name: Z:\Firebird\Permits\2024 July Permit Revision to Add C2\Dehydrator\Firebird ND July 2024 Permit Rev.ddf
Date: July 02, 2024

DESCRIPTION:

Description:

Annual Hours of Operation: 8760.0 hours/yr

WET GAS:

Temperature: 100.00 deg. F
Pressure: 1200.00 psig
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	1.0710
Nitrogen	2.5490
Methane	55.1750
Ethane	20.1340
Propane	11.9100
Isobutane	1.4270
n-Butane	5.0390
Isopentane	0.8650
n-Pentane	1.2510
Cyclopentane	0.0170
n-Hexane	0.1260
Cyclohexane	0.0160
Other Hexanes	0.2100
Heptanes	0.1460
Methylcyclohexane	0.0110
2,2,4-Trimethylpentane	0.0040
Benzene	0.0150
Toluene	0.0070
Xylenes	0.0030
C8+ Heavies	0.0200

DRY GAS:

Flow Rate: 25.0 MMSCF/day
Water Content: 4.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TEG
Water Content: 1.5 wt% H2O
Flow Rate: 5.5 gpm

PUMP:

Glycol Pump Type: Gas Injection
Gas Injection Pump Volume Ratio: 0.080 acfm gas/gpm glycol

FLASH TANK:

Flash Control: Recycle/recompression
Temperature: 150.0 deg. F
Pressure: 55.0 psig

REGENERATOR OVERHEADS CONTROL DEVICE:

Control Device: Condenser
Temperature: 100.0 deg. F
Pressure: 14.7 psia

Control Device: Combustion Device
Destruction Efficiency: 95.0 %
Excess Oxygen: 5.0 %
Ambient Air Temperature: 100.0 deg. F

GRI-GLYCalc VERSION 4.0 - AGGREGATE CALCULATIONS REPORT

Case Name: Firebird July 2024 Permit Revision
File Name: Z:\Firebird\Permits\2024 July Permit Revision to Add C2\Dehydrator\Firebird ND July 2024 Permit Rev.ddf
Date: July 02, 2024

DESCRIPTION:

Description:

Annual Hours of Operation: 8760.0 hours/yr

EMISSIONS REPORTS:

CONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.0209	0.502	0.0917
Ethane	0.0508	1.220	0.2227
Propane	0.0886	2.127	0.3882
Isobutane	0.0198	0.474	0.0865
n-Butane	0.0910	2.185	0.3987
Isopentane	0.0192	0.462	0.0843
n-Pentane	0.0343	0.823	0.1502
Cyclopentane	0.0024	0.057	0.0105
n-Hexane	0.0060	0.144	0.0263
Cyclohexane	0.0037	0.088	0.0161
Other Hexanes	0.0082	0.196	0.0358
Heptanes	0.0105	0.251	0.0458
Methylcyclohexane	0.0023	0.056	0.0102
2,2,4-Trimethylpentane	0.0002	0.004	0.0007
Benzene	0.0407	0.976	0.1781
Toluene	0.0146	0.349	0.0637
Xylenes	0.0036	0.087	0.0158
C8+ Heavies	<0.0001	0.001	0.0002
Total Emissions	0.4168	10.003	1.8255
Total Hydrocarbon Emissions	0.4168	10.003	1.8255
Total VOC Emissions	0.3450	8.280	1.5112
Total HAP Emissions	0.0650	1.560	0.2846
Total BTEX Emissions	0.0588	1.411	0.2576

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.4188	10.051	1.8342
Ethane	1.0191	24.458	4.4636
Propane	1.7901	42.963	7.8407
Isobutane	0.4034	9.683	1.7671
n-Butane	1.8769	45.047	8.2210
Isopentane	0.4158	9.979	1.8212
n-Pentane	0.7562	18.148	3.3121
Cyclopentane	0.0547	1.312	0.2394
n-Hexane	0.1514	3.633	0.6629
Cyclohexane	0.1005	2.412	0.4402

Other Hexanes	0.1926	4.622	0.8435
Heptanes	0.3824	9.177	1.6748
Methylcyclohexane	0.0827	1.985	0.3623
2,2,4-Trimethylpentane	0.0058	0.139	0.0254
Benzene	1.1895	28.549	5.2102
Toluene	0.6951	16.681	3.0444
Xylenes	0.4666	11.199	2.0438
C8+ Heavies	0.2577	6.185	1.1288
Total Emissions	10.2593	246.223	44.9357
Total Hydrocarbon Emissions	10.2593	246.223	44.9357
Total VOC Emissions	8.8214	211.715	38.6379
Total HAP Emissions	2.5084	60.201	10.9867
Total BTEX Emissions	2.3512	56.429	10.2984

FLASH GAS EMISSIONS

Note: Flash Gas Emissions are zero with the Recycle/recompression control option.

FLASH TANK OFF GAS

Component	lbs/hr	lbs/day	tons/yr
Methane	92.0096	2208.231	403.0022
Ethane	67.9827	1631.586	297.7644
Propane	58.6140	1406.735	256.7292
Isobutane	9.1771	220.249	40.1955
n-Butane	33.3582	800.596	146.1087
Isopentane	6.7158	161.178	29.4150
n-Pentane	9.9421	238.610	43.5464
Cyclopentane	0.1819	4.366	0.7969
n-Hexane	1.1588	27.812	5.0757
Cyclohexane	0.1958	4.699	0.8577
Other Hexanes	1.9127	45.905	8.3777
Heptanes	1.5017	36.041	6.5775
Methylcyclohexane	0.1294	3.105	0.5667
2,2,4-Trimethylpentane	0.0437	1.050	0.1916
Benzene	0.3618	8.684	1.5849
Toluene	0.1429	3.430	0.6260
Xylenes	0.0408	0.980	0.1789
C8+ Heavies	0.1384	3.321	0.6061
Total Emissions	283.6076	6806.581	1242.2011
Total Hydrocarbon Emissions	283.6076	6806.581	1242.2011
Total VOC Emissions	123.6152	2966.764	541.4345
Total HAP Emissions	1.7482	41.957	7.6571
Total BTEX Emissions	0.5456	13.095	2.3898

COMBINED REGENERATOR VENT/FLASH GAS EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.0209	0.502	0.0917
Ethane	0.0508	1.220	0.2227
Propane	0.0886	2.127	0.3882

Isobutane	0.0198	0.474	0.0865
n-Butane	0.0910	2.185	0.3987
Isopentane	0.0192	0.462	0.0843
n-Pentane	0.0343	0.823	0.1502
Cyclopentane	0.0024	0.057	0.0105
n-Hexane	0.0060	0.144	0.0263
Cyclohexane	0.0037	0.088	0.0161
Other Hexanes	0.0082	0.196	0.0358
Heptanes	0.0105	0.251	0.0458
Methylcyclohexane	0.0023	0.056	0.0102
2,2,4-Trimethylpentane	0.0002	0.004	0.0007
Benzene	0.0407	0.976	0.1781
Toluene	0.0146	0.349	0.0637
Xylenes	0.0036	0.087	0.0158
C8+ Heavies	<0.0001	0.001	0.0002
Total Emissions	0.4168	10.003	1.8255
Total Hydrocarbon Emissions	0.4168	10.003	1.8255
Total VOC Emissions	0.3450	8.280	1.5112
Total HAP Emissions	0.0650	1.560	0.2846
Total BTEX Emissions	0.0588	1.411	0.2576

COMBINED REGENERATOR VENT/FLASH GAS EMISSION CONTROL REPORT:

Component	Uncontrolled tons/yr	Controlled tons/yr	% Reduction
Methane	404.8365	0.0917	99.98
Ethane	302.2280	0.2227	99.93
Propane	264.5699	0.3882	99.85
Isobutane	41.9626	0.0865	99.79
n-Butane	154.3298	0.3987	99.74
Isopentane	31.2362	0.0843	99.73
n-Pentane	46.8585	0.1502	99.68
Cyclopentane	1.0362	0.0105	98.99
n-Hexane	5.7386	0.0263	99.54
Cyclohexane	1.2979	0.0161	98.76
Other Hexanes	9.2212	0.0358	99.61
Heptanes	8.2523	0.0458	99.44
Methylcyclohexane	0.9291	0.0102	98.90
2,2,4-Trimethylpentane	0.2170	0.0007	99.67
Benzene	6.7951	0.1781	97.38
Toluene	3.6703	0.0637	98.26
Xylenes	2.2227	0.0158	99.29
C8+ Heavies	1.7349	0.0002	99.99
Total Emissions	1287.1368	1.8255	99.86
Total Hydrocarbon Emissions	1287.1368	1.8255	99.86
Total VOC Emissions	580.0724	1.5112	99.74
Total HAP Emissions	18.6438	0.2846	98.47
Total BTEX Emissions	12.6881	0.2576	97.97

EQUIPMENT REPORTS:

CONDENSER AND COMBUSTION DEVICE

Condenser Outlet Temperature:	100.00	deg. F
Condenser Pressure:	14.70	psia
Condenser Duty:	3.35e-002	MM BTU/hr
Hydrocarbon Recovery:	0.15	bbls/day
Produced Water:	3.45	bbls/day
Ambient Temperature:	100.00	deg. F
Excess Oxygen:	5.00	%
Combustion Efficiency:	95.00	%
Supplemental Fuel Requirement:	3.35e-002	MM BTU/hr

Component	Emitted	Destroyed
Methane	5.00%	95.00%
Ethane	4.99%	95.01%
Propane	4.95%	95.05%
Isobutane	4.90%	95.10%
n-Butane	4.85%	95.15%
Isopentane	4.63%	95.37%
n-Pentane	4.53%	95.47%
Cyclopentane	4.37%	95.63%
n-Hexane	3.97%	96.03%
Cyclohexane	3.66%	96.34%
Other Hexanes	4.25%	95.75%
Heptanes	2.74%	97.26%
Methylcyclohexane	2.83%	97.17%
2,2,4-Trimethylpentane	2.82%	97.18%
Benzene	3.42%	96.58%
Toluene	2.09%	97.91%
Xylenes	0.77%	99.23%
C8+ Heavies	0.02%	99.98%

ABSORBER

NOTE: Because the Calculated Absorber Stages was below the minimum allowed, GRI-GLYCalc has set the number of Absorber Stages to 1.25 and has calculated a revised Dry Gas Dew Point.

Calculated Absorber Stages:	1.25	
Calculated Dry Gas Dew Point:	2.51	lbs. H2O/MMSCF
Temperature:	100.0	deg. F
Pressure:	1200.0	psig
Dry Gas Flow Rate:	25.0000	MMSCF/day
Glycol Losses with Dry Gas:	8.4266	lb/hr
Wet Gas Water Content:	Saturated	
Calculated Wet Gas Water Content:	51.54	lbs. H2O/MMSCF
Calculated Lean Glycol Recirc. Ratio:	6.46	gal/lb H2O

Component	Remaining in Dry Gas	Absorbed in Glycol
Water	4.85%	95.15%
Carbon Dioxide	99.64%	0.36%
Nitrogen	99.95%	0.05%
Methane	99.97%	0.03%
Ethane	99.93%	0.07%
Propane	99.93%	0.07%

Isobutane	99.93%	0.07%
n-Butane	99.91%	0.09%
Isopentane	99.93%	0.07%
n-Pentane	99.91%	0.09%
Cyclopentane	99.62%	0.38%
n-Hexane	99.91%	0.09%
Cyclohexane	99.55%	0.45%
Other Hexanes	99.92%	0.08%
Heptanes	99.88%	0.12%
Methylcyclohexane	99.63%	0.37%
2,2,4-Trimethylpentane	99.95%	0.05%
Benzene	95.53%	4.47%
Toluene	95.62%	4.38%
Xylenes	94.54%	5.46%
C8+ Heavies	99.92%	0.08%

FLASH TANK

Flash Control: Recycle/recompression
Flash Temperature: 150.0 deg. F
Flash Pressure: 55.0 psig

Component	Left in Glycol	Removed in Flash Gas
Water	99.19%	0.81%
Carbon Dioxide	4.39%	95.61%
Nitrogen	0.44%	99.56%
Methane	0.45%	99.55%
Ethane	1.48%	98.52%
Propane	2.96%	97.04%
Isobutane	4.21%	95.79%
n-Butane	5.33%	94.67%
Isopentane	5.91%	94.09%
n-Pentane	7.16%	92.84%
Cyclopentane	23.30%	76.70%
n-Hexane	11.65%	88.35%
Cyclohexane	35.14%	64.86%
Other Hexanes	9.32%	90.68%
Heptanes	20.40%	79.60%
Methylcyclohexane	40.28%	59.72%
2,2,4-Trimethylpentane	11.87%	88.13%
Benzene	77.76%	22.24%
Toluene	84.20%	15.80%
Xylenes	92.94%	7.06%
C8+ Heavies	65.91%	34.09%

REGENERATOR

No Stripping Gas used in regenerator.

Component	Remaining in Glycol	Distilled Overhead
Water	47.88%	52.12%
Carbon Dioxide	0.00%	100.00%
Nitrogen	0.00%	100.00%

Methane	0.00%	100.00%
Ethane	0.00%	100.00%
Propane	0.00%	100.00%
Isobutane	0.00%	100.00%
n-Butane	0.00%	100.00%
Isopentane	1.43%	98.57%
n-Pentane	1.39%	98.61%
Cyclopentane	1.12%	98.88%
n-Hexane	0.91%	99.09%
Cyclohexane	5.24%	94.76%
Other Hexanes	1.98%	98.02%
Heptanes	0.64%	99.36%
Methylcyclohexane	5.22%	94.78%
2,2,4-Trimethylpentane	1.58%	98.42%
Benzene	5.99%	94.01%
Toluene	8.75%	91.25%
Xylenes	13.20%	86.80%
C8+ Heavies	3.67%	96.33%

STREAM REPORTS:

WET GAS STREAM

Temperature: 100.00 deg. F
Pressure: 1214.70 psia
Flow Rate: 1.04e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	1.09e-001	5.38e+001
Carbon Dioxide	1.07e+000	1.29e+003
Nitrogen	2.55e+000	1.96e+003
Methane	5.51e+001	2.43e+004
Ethane	2.01e+001	1.66e+004
Propane	1.19e+001	1.44e+004
Isobutane	1.43e+000	2.28e+003
n-Butane	5.03e+000	8.04e+003
Isopentane	8.64e-001	1.71e+003
n-Pentane	1.25e+000	2.48e+003
Cyclopentane	1.70e-002	3.27e+001
n-Hexane	1.26e-001	2.98e+002
Cyclohexane	1.60e-002	3.70e+001
Other Hexanes	2.10e-001	4.97e+002
Heptanes	1.46e-001	4.02e+002
Methylcyclohexane	1.10e-002	2.97e+001
2,2,4-Trimethylpentane	4.00e-003	1.26e+001
Benzene	1.50e-002	3.22e+001
Toluene	6.99e-003	1.77e+001
Xylenes	3.00e-003	8.75e+000
C8+ Heavies	2.00e-002	9.36e+001
Total Components	100.00	7.47e+004

DRY GAS STREAM

Temperature: 100.00 deg. F
Pressure: 1214.70 psia
Flow Rate: 1.04e+006 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	5.28e-003	2.61e+000
Carbon Dioxide	1.07e+000	1.29e+003
Nitrogen	2.55e+000	1.96e+003
Methane	5.52e+001	2.43e+004
Ethane	2.01e+001	1.66e+004
Propane	1.19e+001	1.44e+004
Isobutane	1.43e+000	2.28e+003
n-Butane	5.04e+000	8.04e+003
Isopentane	8.65e-001	1.71e+003
n-Pentane	1.25e+000	2.48e+003
Cyclopentane	1.69e-002	3.26e+001
n-Hexane	1.26e-001	2.98e+002
Cyclohexane	1.59e-002	3.68e+001
Other Hexanes	2.10e-001	4.97e+002
Heptanes	1.46e-001	4.01e+002
Methylcyclohexane	1.10e-002	2.96e+001
2,2,4-Trimethylpentane	4.00e-003	1.25e+001
Benzene	1.43e-002	3.07e+001
Toluene	6.70e-003	1.69e+001
Xylenes	2.84e-003	8.27e+000
C8+ Heavies	2.00e-002	9.35e+001
Total Components	100.00	7.46e+004

LEAN GLYCOL STREAM

Temperature: 100.00 deg. F
Flow Rate: 5.50e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.85e+001	3.05e+003
Water	1.50e+000	4.64e+001
Carbon Dioxide	1.52e-011	4.72e-010
Nitrogen	3.07e-012	9.50e-011
Methane	8.98e-018	2.78e-016
Ethane	1.74e-007	5.40e-006
Propane	1.38e-008	4.26e-007
Isobutane	1.64e-009	5.08e-008
n-Butane	5.92e-009	1.83e-007
Isopentane	1.94e-004	6.02e-003
n-Pentane	3.43e-004	1.06e-002
Cyclopentane	2.00e-005	6.19e-004
n-Hexane	4.51e-005	1.40e-003
Cyclohexane	1.80e-004	5.56e-003
Other Hexanes	1.25e-004	3.88e-003
Heptanes	8.00e-005	2.48e-003
Methylcyclohexane	1.47e-004	4.56e-003
2,2,4-Trimethylpentane	3.00e-006	9.29e-005
Benzene	2.45e-003	7.58e-002
Toluene	2.15e-003	6.67e-002

Component	Conc. (wt%)	Loading (lb/hr)
Xylenes	2.29e-003	7.10e-002
C8+ Heavies	3.17e-004	9.82e-003
Total Components	100.00	3.10e+003

RICH GLYCOL AND PUMP GAS STREAM

Temperature: 100.00 deg. F
Pressure: 1214.70 psia
Flow Rate: 6.29e+000 gpm
NOTE: Stream has more than one phase.

Component	Conc. (wt%)	Loading (lb/hr)
TEG	8.82e+001	3.05e+003
Water	2.83e+000	9.78e+001
Carbon Dioxide	2.66e-001	9.20e+000
Nitrogen	2.24e-001	7.74e+000
Methane	2.67e+000	9.24e+001
Ethane	2.00e+000	6.90e+001
Propane	1.75e+000	6.04e+001
Isobutane	2.77e-001	9.58e+000
n-Butane	1.02e+000	3.52e+001
Isopentane	2.06e-001	7.14e+000
n-Pentane	3.10e-001	1.07e+001
Cyclopentane	6.86e-003	2.37e-001
n-Hexane	3.79e-002	1.31e+000
Cyclohexane	8.73e-003	3.02e-001
Other Hexanes	6.10e-002	2.11e+000
Heptanes	5.46e-002	1.89e+000
Methylcyclohexane	6.27e-003	2.17e-001
2,2,4-Trimethylpentane	1.44e-003	4.96e-002
Benzene	4.71e-002	1.63e+000
Toluene	2.62e-002	9.05e-001
Xylenes	1.67e-002	5.78e-001
C8+ Heavies	1.17e-002	4.06e-001
Total Components	100.00	3.46e+003

FLASH TANK OFF GAS STREAM

Temperature: 150.00 deg. F
Pressure: 69.70 psia
Flow Rate: 4.13e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	4.07e-001	7.97e-001
Carbon Dioxide	1.84e+000	8.80e+000
Nitrogen	2.53e+000	7.71e+000
Methane	5.28e+001	9.20e+001
Ethane	2.08e+001	6.80e+001
Propane	1.22e+001	5.86e+001
Isobutane	1.45e+000	9.18e+000
n-Butane	5.28e+000	3.34e+001
Isopentane	8.56e-001	6.72e+000
n-Pentane	1.27e+000	9.94e+000

Cyclopentane	2.39e-002	1.82e-001
n-Hexane	1.24e-001	1.16e+000
Cyclohexane	2.14e-002	1.96e-001
Other Hexanes	2.04e-001	1.91e+000
Heptanes	1.38e-001	1.50e+000
Methylcyclohexane	1.21e-002	1.29e-001
2,2,4-Trimethylpentane	3.52e-003	4.37e-002
Benzene	4.26e-002	3.62e-001
Toluene	1.43e-002	1.43e-001
Xylenes	3.54e-003	4.08e-002
C8+ Heavies	7.47e-003	1.38e-001
Total Components	100.00	3.01e+002

FLASH TANK GLYCOL STREAM

Temperature: 150.00 deg. F
Flow Rate: 5.62e+000 gpm

Component	Conc. (wt%)	Loading (lb/hr)
TEG	9.66e+001	3.05e+003
Water	3.07e+000	9.70e+001
Carbon Dioxide	1.28e-002	4.04e-001
Nitrogen	1.08e-003	3.41e-002
Methane	1.33e-002	4.19e-001
Ethane	3.23e-002	1.02e+000
Propane	5.67e-002	1.79e+000
Isobutane	1.28e-002	4.03e-001
n-Butane	5.95e-002	1.88e+000
Isopentane	1.34e-002	4.22e-001
n-Pentane	2.43e-002	7.67e-001
Cyclopentane	1.75e-003	5.53e-002
n-Hexane	4.84e-003	1.53e-001
Cyclohexane	3.36e-003	1.06e-001
Other Hexanes	6.22e-003	1.96e-001
Heptanes	1.22e-002	3.85e-001
Methylcyclohexane	2.76e-003	8.73e-002
2,2,4-Trimethylpentane	1.87e-004	5.89e-003
Benzene	4.01e-002	1.27e+000
Toluene	2.41e-002	7.62e-001
Xylenes	1.70e-002	5.38e-001
C8+ Heavies	8.47e-003	2.68e-001
Total Components	100.00	3.16e+003

FLASH GAS EMISSIONS

Control Method: Recycle/recompression
Control Efficiency: 100.00

Note: Flash Gas Emissions are zero with the Recycle/recompression control option.

REGENERATOR OVERHEADS STREAM

Temperature: 212.00 deg. F

Pressure: 14.70 psia
Flow Rate: 1.14e+003 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	9.32e+001	5.06e+001
Carbon Dioxide	3.05e-001	4.04e-001
Nitrogen	4.04e-002	3.41e-002
Methane	8.67e-001	4.19e-001
Ethane	1.12e+000	1.02e+000
Propane	1.35e+000	1.79e+000
Isobutane	2.30e-001	4.03e-001
n-Butane	1.07e+000	1.88e+000
Isopentane	1.91e-001	4.16e-001
n-Pentane	3.48e-001	7.56e-001
Cyclopentane	2.59e-002	5.47e-002
n-Hexane	5.83e-002	1.51e-001
Cyclohexane	3.96e-002	1.01e-001
Other Hexanes	7.42e-002	1.93e-001
Heptanes	1.27e-001	3.82e-001
Methylcyclohexane	2.80e-002	8.27e-002
2,2,4-Trimethylpentane	1.69e-003	5.80e-003
Benzene	5.05e-001	1.19e+000
Toluene	2.50e-001	6.95e-001
Xylenes	1.46e-001	4.67e-001
C8+ Heavies	5.02e-002	2.58e-001
Total Components	100.00	6.13e+001

CONDENSER PRODUCED WATER STREAM

Temperature: 100.00 deg. F
Flow Rate: 1.01e-001 gpm

Component	Conc. (wt%)	Loading (lb/hr)	(ppm)
Water	9.99e+001	5.03e+001	999243.
Carbon Dioxide	5.04e-003	2.54e-003	50.
Nitrogen	9.78e-006	4.93e-006	0.
Methane	2.43e-004	1.22e-004	2.
Ethane	7.09e-004	3.57e-004	7.
Propane	1.07e-003	5.41e-004	11.
Isobutane	1.33e-004	6.72e-005	1.
n-Butane	8.36e-004	4.21e-004	8.
Isopentane	1.28e-004	6.45e-005	1.
n-Pentane	2.48e-004	1.25e-004	2.
Cyclopentane	1.31e-004	6.58e-005	1.
n-Hexane	3.75e-005	1.89e-005	0.
Cyclohexane	1.39e-004	6.99e-005	1.
Other Hexanes	4.05e-005	2.04e-005	0.
Heptanes	3.72e-005	1.87e-005	0.
Methylcyclohexane	4.29e-005	2.16e-005	0.
2,2,4-Trimethylpentane	3.82e-007	1.92e-007	0.
Benzene	4.81e-002	2.42e-002	481.
Toluene	1.47e-002	7.38e-003	147.
Xylenes	4.02e-003	2.02e-003	40.
C8+ Heavies	9.84e-008	4.95e-008	0.

Total Components	100.00	5.04e+001	1000000.

CONDENSER RECOVERED OIL STREAM

Temperature: 100.00 deg. F
Flow Rate: 4.44e-003 gpm

Component	Conc. (wt%)	Loading (lb/hr)
Water	3.93e-002	7.42e-004
Carbon Dioxide	2.08e-002	3.93e-004
Nitrogen	7.32e-004	1.38e-005
Methane	7.23e-003	1.37e-004
Ethane	1.01e-001	1.91e-003
Propane	9.09e-001	1.72e-002
Isobutane	4.33e-001	8.18e-003
n-Butane	2.97e+000	5.61e-002
Isopentane	1.63e+000	3.09e-002
n-Pentane	3.72e+000	7.03e-002
Cyclopentane	3.59e-001	6.79e-003
n-Hexane	1.65e+000	3.11e-002
Cyclohexane	1.43e+000	2.70e-002
Other Hexanes	1.54e+000	2.90e-002
Heptanes	9.16e+000	1.73e-001
Methylcyclohexane	1.90e+000	3.59e-002
2,2,4-Trimethylpentane	1.34e-001	2.53e-003
Benzene	1.86e+001	3.52e-001
Toluene	2.10e+001	3.97e-001
Xylenes	2.08e+001	3.92e-001
C8+ Heavies	1.36e+001	2.57e-001
Total Components	100.00	1.89e+000

CONDENSER VENT STREAM

Temperature: 100.00 deg. F
Pressure: 14.70 psia
Flow Rate: 7.51e+001 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Water	6.51e+000	2.32e-001
Carbon Dioxide	4.60e+000	4.01e-001
Nitrogen	6.15e-001	3.41e-002
Methane	1.32e+001	4.19e-001
Ethane	1.71e+001	1.02e+000
Propane	2.03e+001	1.77e+000
Isobutane	3.43e+000	3.95e-001
n-Butane	1.58e+001	1.82e+000
Isopentane	2.69e+000	3.85e-001
n-Pentane	4.80e+000	6.86e-001
Cyclopentane	3.44e-001	4.78e-002
n-Hexane	7.05e-001	1.20e-001
Cyclohexane	4.41e-001	7.35e-002
Other Hexanes	9.58e-001	1.64e-001
Heptanes	1.06e+000	2.09e-001
Methylcyclohexane	2.41e-001	4.68e-002

2,2,4-Trimethylpentane	1.45e-002	3.27e-003
Benzene	5.26e+000	8.13e-001
Toluene	1.60e+000	2.91e-001
Xylenes	3.43e-001	7.22e-002
C8+ Heavies	2.96e-003	9.99e-004
Total Components	100.00	9.00e+000

COMBUSTION DEVICE OFF GAS STREAM

Temperature: 1000.00 deg. F
Pressure: 14.70 psia
Flow Rate: 3.32e+000 scfh

Component	Conc. (vol%)	Loading (lb/hr)
Methane	1.49e+001	2.09e-002
Ethane	1.94e+001	5.08e-002
Propane	2.30e+001	8.86e-002
Isobutane	3.89e+000	1.98e-002
n-Butane	1.79e+001	9.10e-002
Isopentane	3.05e+000	1.92e-002
n-Pentane	5.44e+000	3.43e-002
Cyclopentane	3.90e-001	2.39e-003
n-Hexane	7.98e-001	6.01e-003
Cyclohexane	5.00e-001	3.67e-003
Other Hexanes	1.09e+000	8.18e-003
Heptanes	1.20e+000	1.05e-002
Methylcyclohexane	2.73e-001	2.34e-003
2,2,4-Trimethylpentane	1.64e-002	1.64e-004
Benzene	5.96e+000	4.07e-002
Toluene	1.81e+000	1.46e-002
Xylenes	3.89e-001	3.61e-003
C8+ Heavies	3.35e-003	4.99e-005
Total Components	100.00	4.17e-001

GRI-GLYCalc VERSION 4.0 - STREAM REPORT

Case Name: Firebird July 2024 Permit Revision
File Name: Z:\Firebird\Permits\2024 July Permit Revision to Add C2\Dehydrator\Firebird ND July 2024 Permit Rev.ddf
Date: July 02, 2024

CONDENSER RECOVERED OIL STREAM

Temperature: 100.00 deg. F
Flow Rate: 4.44e-003 gpm

Component	Conc. (wt%)	Loading (lb/hr)
Water	3.93e-002	7.42e-004
Carbon Dioxide	2.08e-002	3.93e-004
Nitrogen	7.32e-004	1.38e-005
Methane	7.23e-003	1.37e-004
Ethane	1.01e-001	1.91e-003
Propane	9.09e-001	1.72e-002
Isobutane	4.33e-001	8.18e-003
n-Butane	2.97e+000	5.61e-002
Isopentane	1.63e+000	3.09e-002
n-Pentane	3.72e+000	7.03e-002
Cyclopentane	3.59e-001	6.79e-003
n-Hexane	1.65e+000	3.11e-002
Cyclohexane	1.43e+000	2.70e-002
Other Hexanes	1.54e+000	2.90e-002
Heptanes	9.16e+000	1.73e-001
Methylcyclohexane	1.90e+000	3.59e-002
2,2,4-Trimethylpentane	1.34e-001	2.53e-003
Benzene	1.86e+001	3.52e-001
Toluene	2.10e+001	3.97e-001
Xylenes	2.08e+001	3.92e-001
C8+ Heavies	1.36e+001	2.57e-001
Total Components	100.00	1.89e+000

GRI-GLYCalc VERSION 4.0 - STREAM REPORT

Case Name: Firebird July 2024 Permit Revision
File Name: Z:\Firebird\Permits\2024 July Permit Revision to Add C2\Dehydrator\Firebird ND July 2024 Permit Rev.ddf
Date: July 02, 2024

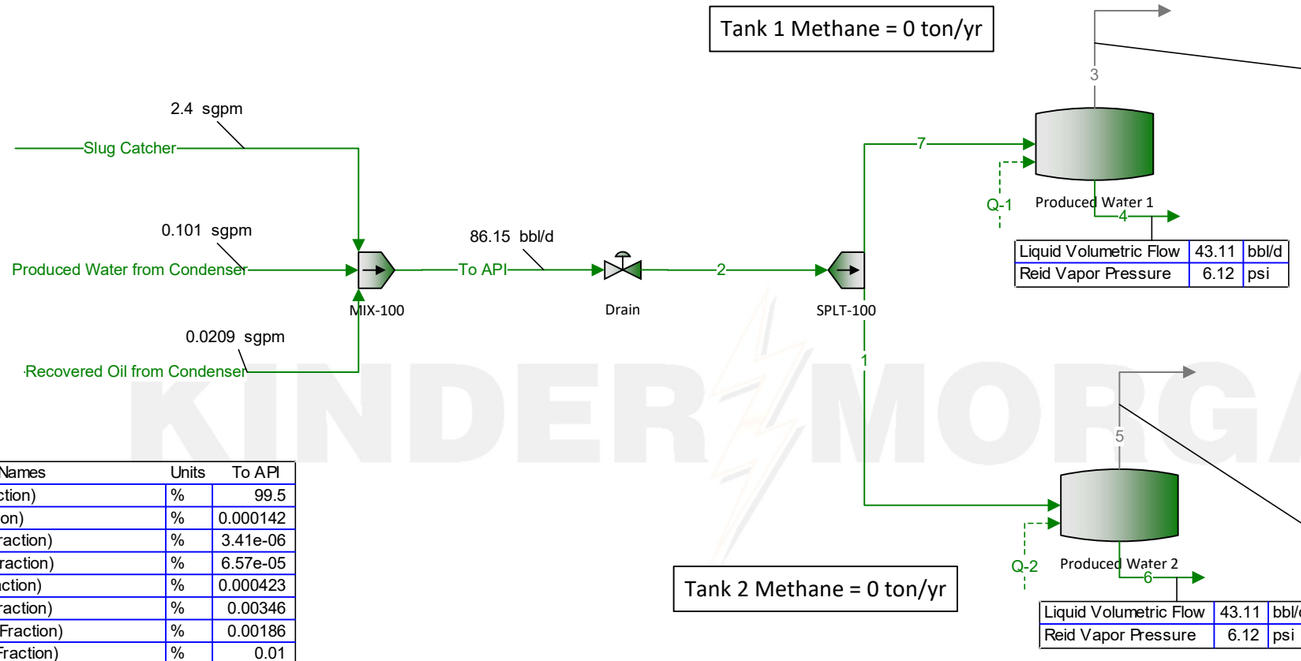
CONDENSER PRODUCED WATER STREAM

Temperature: 100.00 deg. F
Flow Rate: 1.01e-001 gpm

Component	Conc. (wt%)	Loading (lb/hr)	(ppm)
Water	9.99e+001	5.03e+001	999243.
Carbon Dioxide	5.04e-003	2.54e-003	50.
Nitrogen	9.78e-006	4.93e-006	0.
Methane	2.43e-004	1.22e-004	2.
Ethane	7.09e-004	3.57e-004	7.
Propane	1.07e-003	5.41e-004	11.
Isobutane	1.33e-004	6.72e-005	1.
n-Butane	8.36e-004	4.21e-004	8.
Isopentane	1.28e-004	6.45e-005	1.
n-Pentane	2.48e-004	1.25e-004	2.
Cyclopentane	1.31e-004	6.58e-005	1.
n-Hexane	3.75e-005	1.89e-005	0.
Cyclohexane	1.39e-004	6.99e-005	1.
Other Hexanes	4.05e-005	2.04e-005	0.
Heptanes	3.72e-005	1.87e-005	0.
Methylcyclohexane	4.29e-005	2.16e-005	0.
2,2,4-Trimethylpentane	3.82e-007	1.92e-007	0.
Benzene	4.81e-002	2.42e-002	481.
Toluene	1.47e-002	7.38e-003	147.
Xylenes	4.02e-003	2.02e-003	40.
C8+ Heavies	9.84e-008	4.95e-008	0.
Total Components	100.00	5.04e+001	1000000.

APPENDIX D: ProMax Report

Firebird Compressor Station
Produced Water Tank Analysis



Names	Units	To API
Water(Mole Fraction)	%	99.5
CO2(Mole Fraction)	%	0.000142
Nitrogen(Mole Fraction)	%	3.41e-06
Methane(Mole Fraction)	%	6.57e-05
Ethane(Mole Fraction)	%	0.000423
Propane(Mole Fraction)	%	0.00346
Isobutane(Mole Fraction)	%	0.00186
n-Butane(Mole Fraction)	%	0.01
Isopentane(Mole Fraction)	%	0.0113
n-Pentane(Mole Fraction)	%	0.0101
Cyclopentane(Mole Fraction)	%	0.000619
Hexane(Mole Fraction)	%	0.00638
Cyclohexane(Mole Fraction)	%	0.00205
Heptane(Mole Fraction)	%	0.0206
Octane(Mole Fraction)	%	0.0364
2,2,4-Trimethylpentane(Mole Fraction)	%	0.0011
Benzene(Mole Fraction)	%	0.0349
Toluene(Mole Fraction)	%	0.0468
Ethylbenzene(Mole Fraction)	%	0.00191
m-Xylene(Mole Fraction)	%	0.0285
p-Xylene(Mole Fraction)	%	0.0191
o-Xylene(Mole Fraction)	%	0.00862
TEG(Mole Fraction)	%	0.155

Annual tank loss calculations for "To API".
Total working and breathing losses from the Vertical Cylinder are 2.979 ton/yr.
Flashing losses are 0 ton/yr.
* Only Non-Exempt VOCs are reported.
Vapor adjusted to ensure mass balance

Water(Mole Fraction)		%
Hydrogen Sulfide(Mole Fraction)		%
CO2(Mole Fraction)		%
Nitrogen(Mole Fraction)		%
Methane(Mole Fraction)		%
Ethane(Mole Fraction)		%
Propane(Mole Fraction)		%
Isobutane(Mole Fraction)		%
n-Butane(Mole Fraction)		%
Isopentane(Mole Fraction)		%
n-Pentane(Mole Fraction)		%
Cyclopentane(Mole Fraction)		%
Hexane(Mole Fraction)		%
Cyclohexane(Mole Fraction)		%
Heptane(Mole Fraction)		%
Octane(Mole Fraction)		%
2,2,4-Trimethylpentane(Mole Fraction)		%
Benzene(Mole Fraction)		%
Toluene(Mole Fraction)		%
Ethylbenzene(Mole Fraction)		%
m-Xylene(Mole Fraction)		%
p-Xylene(Mole Fraction)		%
o-Xylene(Mole Fraction)		%
TEG(Mole Fraction)		%

Water(Mole Fraction)		%
Hydrogen Sulfide(Mole Fraction)		%
CO2(Mole Fraction)		%
Nitrogen(Mole Fraction)		%
Methane(Mole Fraction)		%
Ethane(Mole Fraction)		%
Propane(Mole Fraction)		%
Isobutane(Mole Fraction)		%
n-Butane(Mole Fraction)		%
Isopentane(Mole Fraction)		%
n-Pentane(Mole Fraction)		%
Cyclopentane(Mole Fraction)		%
Hexane(Mole Fraction)		%
Cyclohexane(Mole Fraction)		%
Heptane(Mole Fraction)		%
Octane(Mole Fraction)		%
2,2,4-Trimethylpentane(Mole Fraction)		%
Benzene(Mole Fraction)		%
Toluene(Mole Fraction)		%
Ethylbenzene(Mole Fraction)		%
m-Xylene(Mole Fraction)		%
p-Xylene(Mole Fraction)		%
o-Xylene(Mole Fraction)		%
TEG(Mole Fraction)		%

Process Stream	To API	
Tank Geometry	Vertical Cylinder	
Shell Length	12	ft
Shell Diameter	20	ft
Number of Storage Tanks Employed	2	
Location	Williston, North Dakota	
Time Frame	Year	
Report Components	Non-exempt VOC	
Set Bulk Temperature to Stream Temperature?	FALSE	
Use AP42 Raoult's Vapor Pressure?	FALSE	
Maximum Fraction Fill of Tank	90	%
Average Fraction Fill of Tank	50	%
Material Category	Light Organics	
Tank Color	Tan	
Shell Paint Condition	Good	
Operating Pressure	0.25	psig
Breather Vent Pressure	0.25	psig
Breather Vacuum Pressure	-2.51E-02	psig
Roof Type	Cone	
Slope of Coned Roof	0.0625	
Roof Color	Tan	
Roof Paint Condition	Good	
Flashing Temperature	54.57	°F
Calculate Loading Losses?	FALSE	
Output Flashing Losses?	TRUE	
Output Working/Breathing Losses?	TRUE	

Atmospheric Pressure	13.82	psia
True Vapor Pressure at Average Temperature	3.24	psia
Average Liquid Surface Temperature	46.45	°F
Maximum Liquid Surface Temperature	54.57	°F
Bulk Liquid Temperature	43.01	°F
Annual Tank Turnover Rate	26.01	
Flashing Losses	0.00	ton/yr
Loading Losses	0.00	ton/yr
Maximum Hourly Loading Loss	0.00	lb/hr
Total W/B Losses	2.98	ton/yr
Working Losses per Tank	0.98	ton/yr
Standing Losses per Tank	0.51	ton/yr
Rim Seal Losses per Tank	0.00	ton/yr
Withdrawal Loss per Tank	0.00	ton/yr
Deck Fitting Losses per Tank	0.00	ton/yr
Deck Seam Losses per Tank	0.00	ton/yr

Vertical Cylinder

Components	Working Losses (ton/yr)	Breathing Losses (ton/yr)	Total Losses (ton/yr)
Mixture	1.956	1.023	2.979
Propane	0.2975	0.1556	0.4531
Isobutane	0.1754	0.09179	0.2672
n-Butane	0.6156	0.3221	0.9377
Methanol	1.18E-05	6.19E-06	1.80E-05
Isopentane	0.3062	0.1602	0.4665
n-Pentane	0.1971	0.1031	0.3003
Cyclopentane	0.007182	0.003758	0.01094
Cyclohexane	0.008838	0.004624	0.01346
Heptane	0.038	0.01988	0.05788
Methylcyclohexane	0.004524	0.002367	0.006891
Octane	0.01996	0.01045	0.03041
Nonane	0.001089	0.0005698	0.001659
Decane	0.004397	0.002301	0.006698
2-Methylpentane	0.02514	0.01315	0.0383
3-Methylpentane	0.007258	0.003798	0.01106
Hexane	0.03599	0.01883	0.05483
2,2,4-Trimethylpentane	0.00253	0.001324	0.003853
Benzene	0.133	0.06959	0.2026
Toluene	0.05629	0.02945	0.08575
Ethylbenzene	0.0006871	0.0003595	0.001047
m-Xylene	0.009448	0.004943	0.01439
p-Xylene	0.006696	0.003503	0.0102
o-Xylene	0.002576	0.001348	0.003924
TEG	5.90E-10	3.09E-10	8.98E-10

Flashing Emissions Report
Annual Emissions
Tank flashed at the daily maximum surface temperature (54.57 °F) and the average atmospheric pressure of Williston, North Dakota (13.82 psia)

There are no flashing losses at the given temperature and pressure.

Vapor adjusted to ensure mass balance

APPENDIX E: Representative Gas/Liquid Analysis

AMERICAN MOBILE RESEARCH, INC.

P.O. BOX 2909
CASPER, WYOMING 82602

(307) 235-4590 PHONE
(307) 265-4489 FAX

EXTENDED HYDROCARBON GAS (GLYCALC) STUDY

CERTIFICATE OF ANALYSIS

Company ..... **KINDER MORGAN, INC.**
Lab Number CR-23892
Date Sampled 10-17-2023
Time Sampled ..... 11:30 AM
Method of Analysis ..... Dual TCD-FID Chromatography

Study Number CR-8
Date Tested 10-25-2023
Time Tested ..... 1:05 PM
Ambient Temp at Sampling ..... 55 F

Sample Identification ..... **GAS TAKEN BEFORE DEHYDRATOR**
FIREBIRD COMPRESSOR STATION

Sample Location ..... ALEXANDER, NORTH DAKOTA.
Type Sample ..... Spot
Effective Date ..... N/A
Sample Pressure ..... 900 PSIG
Cylinder ID ..... AMR 504
Instrument Used ..... Shimadzu GC-2014
Sample Method ..... Trap & Purge
Test Method GPA-2286

County ..... McKENZIE
Composite From ..... N/A
Sample Temperature ..... 100 F
Cylinder Heated To ..... 130 F
Calibration Date 10-25-2023
Un-Normalized Total ..... 97.966 %
Sampled By ..... KMI - K. Knutson

Components	Mole %	Weight %	Liq. Vol. %
Carbon Dioxide	1.071	1.736	0.848
Hydrogen Sulfide	0.000	0.000	0.000
Nitrogen	2.549	2.630	1.301
Methane	55.175	32.598	43.405
Ethane	20.134	22.296	24.986
Propane	11.910	19.341	15.226
iso-Butane	1.427	3.054	2.167
n-Butane	5.039	10.786	7.372
iso-Pentane	0.865	2.298	1.468
n-Pentane	1.251	3.324	2.104
Cyclopentane	0.017	0.044	0.023
n-Hexane	0.126	0.400	0.240
Cyclohexane	0.016	0.050	0.025
Other Hexanes	0.210	0.666	0.398
Heptanes	0.146	0.539	0.313
Methylcyclohexane	0.011	0.040	0.021
2,2,4-Trimethylpentane	0.004	0.017	0.010
Benzene	0.015	0.043	0.019
Toluene	0.007	0.024	0.011
Ethylbenzene	0.000	0.000	0.000
Xylenes	0.003	0.012	0.005
Octanes	0.021	0.088	0.050
Nonanes	0.002	0.009	0.005
Decanes +	0.001	0.005	0.003
Totals	**100.000**	**100.000**	**100.000**

ADDITIONAL BETX DATA

Components	Mole %	Weight %	Liq. Vol. %
Cyclopentane	0.017	0.044	0.023
Cyclohexane	0.016	0.050	0.025
2-Methylpentane	0.150	0.477	0.284
3-Methylpentane	0.060	0.190	0.113
n-Hexane	0.126	0.400	0.240
Methylcyclohexane	0.011	0.040	0.021
2,2,4-Trimethylpentane	0.004	0.017	0.010
Benzene	0.015	0.043	0.019
Toluene	0.007	0.024	0.011
Ethylbenzene	0.000	0.000	0.000
m-Xylene	0.000	0.002	0.001
p-Xylene	0.002	0.007	0.003
o-Xylene	0.001	0.003	0.001
Hexanes, Total	0.369	1.160	0.687
Heptanes, Total	0.176	0.639	0.362
Octanes, Total	0.031	0.124	0.066
Nonanes, Total	0.002	0.009	0.005
Decanes+, Total	0.001	0.005	0.003

SPECIFIC GRAVITY AT 60/60 F, calculated	0.93753
TOTAL GPM (ETHANE INCLUSIVE)	11.703
CALCULATED BTU / REAL CF AT 14.73 PSIA, dry basis	1550.545
CALCULATED BTU / REAL CF AT 14.73 PSIA, wet basis	1523.821
AVERAGE MOLECULAR WEIGHT	27.154
MOLAR MASS RATIO	0.93753
RELATIVE DENSITY (G x Z (Air) / Z), calculated	0.94330
IDEAL GROSS HEATING VALUE, BTU / IDEAL CF AT 14.696 PSIA, calculated	1537.534
COMPRESSIBILITY FACTOR (Z)	0.99389

ETHANE GPM	5.3708
PROPANE GPM	3.2728
iso-BUTANE GPM	0.4658
n-BUTANE GPM	1.5845
iso-PENTANE GPM	0.3155
n-PENTANE GPM	0.4523
GASOLINE RANGE (HEXANES+) GPM	0.2414

NOTATION: ALL CALCULATIONS PERFORMED USING PHYSICAL CONSTANTS FROM GPA 2145-16, THE TABLES OF PHYSICAL CONSTANTS FOR HYDROCARBONS AND OTHER COMPOUNDS OF INTEREST TO THE NATURAL GAS INDUSTRY.

James A. Kane, President
American Mobile Research, Inc.

APPENDIX F: Engine Specifications

G3606
NON-CURRENT

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
Kinder Morgan - EF6625 Kinder Morgan

CATERPILLAR®

GAS COMPRESSION APPLICATION

ENGINE SPEED (rpm):	1000
COMPRESSION RATIO:	7.6
AFTERCOOLER TYPE:	SCAC
AFTERCOOLER - STAGE 2 INLET (°F):	130
AFTERCOOLER - STAGE 1 INLET (°F):	214
JACKET WATER OUTLET (°F):	230
ASPIRATION:	TA
COOLING SYSTEM:	JW+1AC, OC+2AC
CONTROL SYSTEM:	ADEM4
EXHAUST MANIFOLD:	DRY
COMBUSTION:	LOW EMISSION
NOx EMISSION LEVEL (g/bhp-hr NOx):	0.5
SET POINT TIMING:	17

RATING STRATEGY:	STANDARD
RATING LEVEL:	CONTINUOUS
FUEL SYSTEM:	GAV WITH AIR FUEL RATIO CONTROL

SITE CONDITIONS:

FUEL:	8-15-23 Little Missouri Fuel
FUEL PRESSURE RANGE(psig): (See note 1)	58.0-70.3
FUEL METHANE NUMBER:	59.6
FUEL LHV (Btu/scf):	1151
ALTITUDE(ft):	2400
INLET AIR TEMPERATURE(°F):	110
STANDARD RATED POWER:	1875 bhp@1000rpm

				MAXIMUM RATING	SITE RATING AT MAXIMUM INLET AIR TEMPERATURE		
RATING		**NOTES**	**LOAD**	**100%**	**100%**	**75%**	**50%**
ENGINE POWER	(WITHOUT FAN)	(2)	bhp	1875	1875	1406	938
INLET AIR TEMPERATURE			°F	110	110	110	110
ENGINE DATA							
FUEL CONSUMPTION (LHV)		(3)	Btu/bhp-hr	6813	6813	7090	7670
FUEL CONSUMPTION (HHV)		(3)	Btu/bhp-hr	7506	7506	7811	8450
AIR FLOW (@inlet air temp, 14.7 psia)	(WET)	(4)(5)	ft3/min	5010	5010	3791	2598
AIR FLOW	(WET)	(4)(5)	lb/hr	20926	20926	15836	10853
FUEL FLOW (60°F, 14.7 psia)			scfm	185	185	144	104
INLET MANIFOLD PRESSURE		(6)	in Hg(abs)	103.7	103.7	79.3	56.1
EXHAUST TEMPERATURE - ENGINE OUTLET		(7)	°F	816	816	887	970
EXHAUST GAS FLOW (@engine outlet temp, 14.5 psia)	(WET)	(5)(8)	ft3/min	11915	11915	9531	6952
EXHAUST GAS MASS FLOW	(WET)	(5)(8)	lb/hr	21563	21563	16333	11212
EMISSIONS DATA - ENGINE OUT							
NOx (as NO2)		(9)(10)	g/bhp-hr	0.50	0.50	0.50	0.50
CO		(9)(10)	g/bhp-hr	2.39	2.39	2.40	2.40
THC (mol. wt. of 15.84)		(9)(10)	g/bhp-hr	3.35	3.35	3.54	3.49
NMHC (mol. wt. of 15.84)		(9)(10)	g/bhp-hr	1.63	1.63	1.72	1.69
NMNEHC (VOCs) (mol. wt. of 15.84)		(9)(10)(11)	g/bhp-hr	0.67	0.67	0.70	0.69
HCHO (Formaldehyde)		(9)(10)	g/bhp-hr	0.23	0.23	0.11	0.12
CO2		(9)(10)	g/bhp-hr	448	448	461	492
EXHAUST OXYGEN		(9)(12)	% DRY	11.3	11.3	11.1	10.7
HEAT REJECTION							
HEAT REJ. TO JACKET WATER (JW)		(13)	Btu/min	20958	20958	17203	14158
HEAT REJ. TO ATMOSPHERE		(13)	Btu/min	6651	6651	6535	6401
HEAT REJ. TO LUBE OIL (OC)		(13)	Btu/min	11711	11711	10803	9350
HEAT REJ. TO A/C - STAGE 1 (1AC)		(13)(14)	Btu/min	16675	16675	7751	1665
HEAT REJ. TO A/C - STAGE 2 (2AC)		(13)(14)	Btu/min	10592	10592	6736	3674
COOLING SYSTEM SIZING CRITERIA							
TOTAL JACKET WATER CIRCUIT (JW+1AC)		(14)(15)	Btu/min	40563			
TOTAL STAGE 2 AFTERCOOLER CIRCUIT (OC+2AC)		(14)(15)	Btu/min	25175			

A cooling system safety factor of 0% has been added to the cooling system sizing criteria.

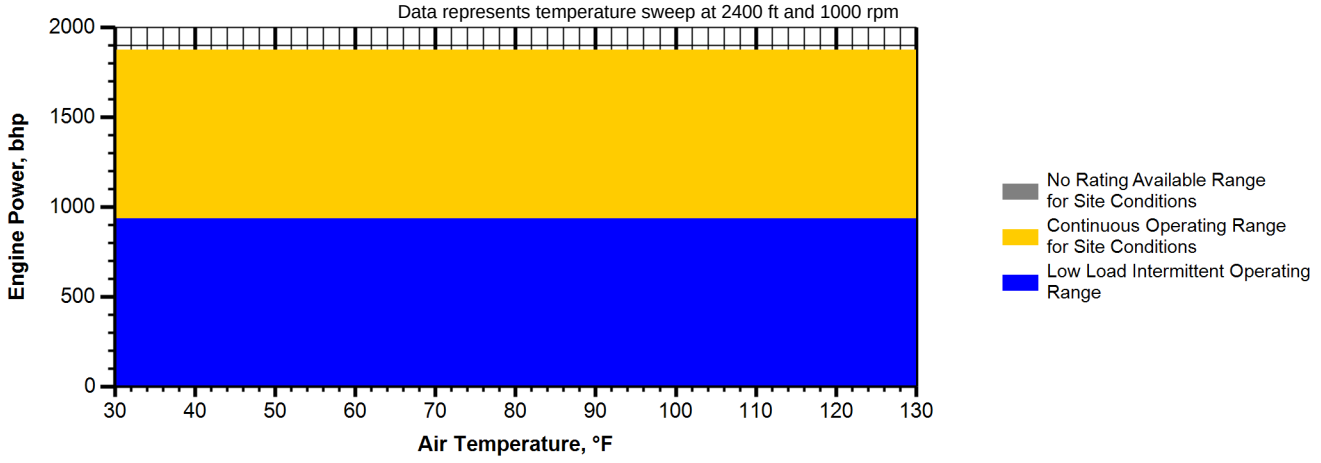
CONDITIONS AND DEFINITIONS

Engine rating obtained and presented in accordance with ISO 3046/1, adjusted for fuel, site altitude and site inlet air temperature. 100% rating at maximum inlet air temperature is the maximum engine capability for the specified fuel at site altitude and maximum site inlet air temperature. Maximum rating is the maximum capability at the specified aftercooler inlet temperature for the specified fuel at site altitude and reduced inlet air temperature. Refer to product O&M manual for details on additional lower load capability. No overload permitted at rating shown.

For notes information consult page three.

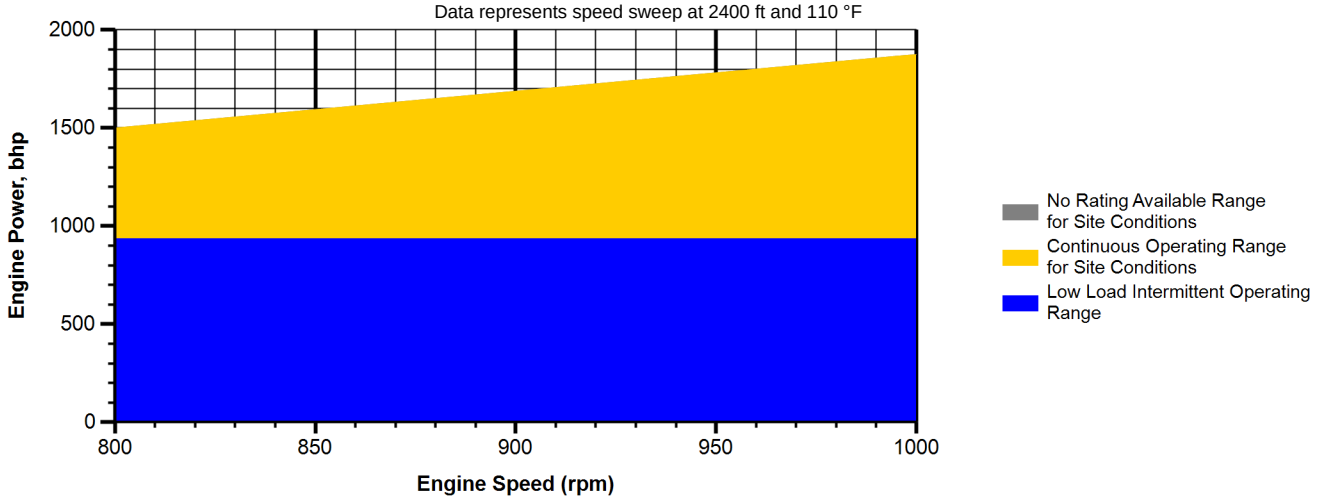
Engine Power vs. Inlet Air Temperature

Data represents temperature sweep at 2400 ft and 1000 rpm



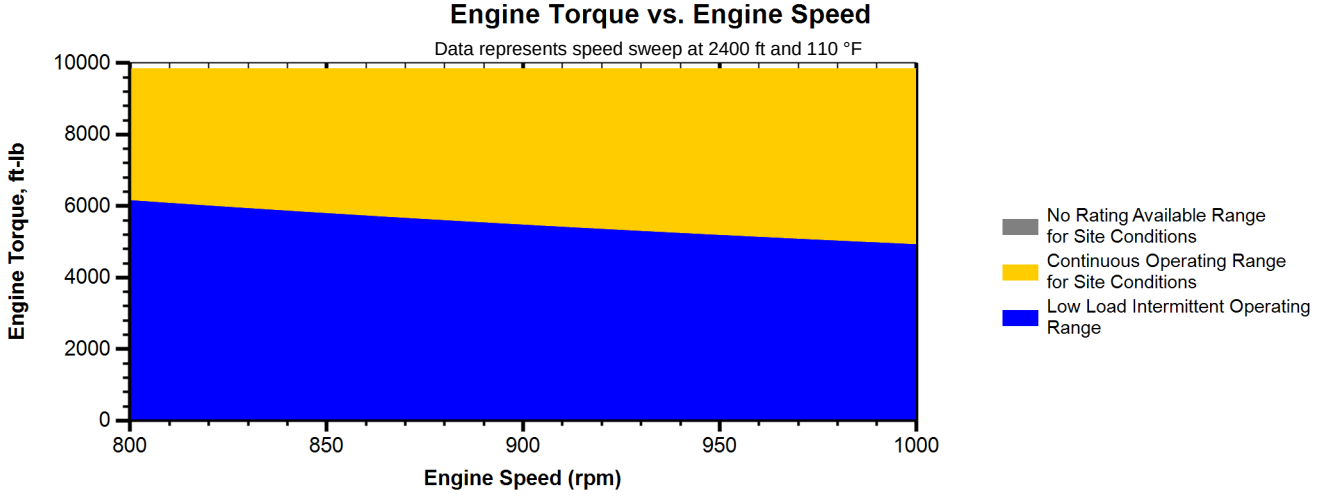
Engine Power vs. Engine Speed

Data represents speed sweep at 2400 ft and 110 °F



Engine Torque vs. Engine Speed

Data represents speed sweep at 2400 ft and 110 °F



Note:
At site conditions of 2400 ft and 110°F inlet air temp., constant torque can be maintained down to 800 rpm. The minimum speed for loading at these conditions is 800 rpm.

NOTES:

1. Fuel pressure range specified is to the engine gas shutoff valve (GSOV). Additional fuel train components should be considered in pressure and flow calculations.

2. Engine rating is with two engine driven water pumps. Tolerance is ± 3% of full load.

3. Fuel consumption tolerance is ± 2.5% of full load data.

4. Air flow value is on a 'wet' basis. Flow is a nominal value with a tolerance of ± 5 %.

5. Inlet and Exhaust Restrictions must not exceed A&I limits based on full load flow rates from the standard technical data sheet.

6. Inlet manifold pressure is a nominal value with a tolerance of ± 5 %.

7. Exhaust temperature is a nominal value with a tolerance of (+)63°F, (-)54°F.

8. Exhaust flow value is on a "wet" basis. Flow is a nominal value with a tolerance of ± 6 %.

9. Emissions data is at engine exhaust flange prior to any after treatment.

10. Values listed are higher than nominal levels to allow for instrumentation, measurement, and engine-to-engine variations. They indicate the maximum values expected under steady state conditions. Fuel methane number cannot vary more than ± 3. THC, NMHC, and NMNEHC do not include aldehydes. An oxidation catalyst may be required to meet Federal, State or local CO or HC requirements.

11. VOCs - Volatile organic compounds as defined in US EPA 40 CFR 60, subpart JJJJ

12. Exhaust Oxygen level is the result of adjusting the engine to operate at the specified NOx level. Tolerance is ± 0.5.

13. Heat rejection values are nominal. Tolerances, based on treated water, are ± 10% for jacket water circuit, ± 50% for radiation, ± 20% for lube oil circuit, and ± 5% for aftercooler circuit.

14. Aftercooler heat rejection includes an aftercooler heat rejection factor for the site elevation and inlet air temperature specified. Aftercooler heat rejection values at part load are for reference only. Do not use part load data for heat exchanger sizing.

15. Cooling system sizing criteria are maximum circuit heat rejection for the site, with applied tolerances.

GAS ENGINE SITE SPECIFIC TECHNICAL DATA
Kinder Morgan - EF6625 Kinder Morgan

Constituent	Abbrev	Mole %	Norm
Water Vapor	H2O	0.0000	0.0000
Methane	CH4	69.2400	69.2393
Ethane	C2H6	19.3110	19.3108
Propane	C3H8	6.8750	6.8749
Isobutane	iso-C4H10	0.4560	0.4560
Norbutane	nor-C4H10	0.9110	0.9110
Isopentane	iso-C5H12	0.0560	0.0560
Norpentane	nor-C5H12	0.0520	0.0520
Hexane	C6H14	0.0150	0.0150
Heptane	C7H16	0.0000	0.0000
Nitrogen	N2	2.1730	2.1730
Carbon Dioxide	CO2	0.9120	0.9120
Hydrogen Sulfide	H2S	0.0000	0.0000
Carbon Monoxide	CO	0.0000	0.0000
Hydrogen	H2	0.0000	0.0000
Oxygen	O2	0.0000	0.0000
Helium	HE	0.0000	0.0000
Neopentane	neo-C5H12	0.0000	0.0000
Octane	C8H18	0.0000	0.0000
Nonane	C9H20	0.0000	0.0000
Ethylene	C2H4	0.0000	0.0000
Propylene	C3H6	0.0000	0.0000
TOTAL (Volume %)		100.0010	100.0000

Fuel Makeup:	8-15-23 Little Missouri Fuel
Unit of Measure:	English

Calculated Fuel Properties

Caterpillar Methane Number:	59.6
Lower Heating Value (Btu/scf):	1151
Higher Heating Value (Btu/scf):	1268
WOBBE Index (Btu/scf):	1326
THC: Free Inert Ratio:	31.42
Total % Inerts (% N2, CO2, He):	3.08%
RPC (%) (To 905 Btu/scf Fuel):	100%
Compressibility Factor:	0.996
Stoich A/F Ratio (Vol/Vol):	11.93
Stoich A/F Ratio (Mass/Mass):	15.81
Specific Gravity (Relative to Air):	0.754
Fuel Specific Heat Ratio (K):	1.275

CONDITIONS AND DEFINITIONS

Caterpillar Methane Number represents the knock resistance of a gaseous fuel. It should be used with the Caterpillar Fuel Usage Guide for the engine and rating to determine the rating for the fuel specified. A Fuel Usage Guide for each rating is included on page 2 of its standard technical data sheet.

RPC always applies to naturally aspirated (NA) engines, and turbocharged (TA or LE) engines only when they are derated for altitude and ambient site conditions.

Project specific technical data sheets generated by the Caterpillar Gas Engine Rating Pro program take the Caterpillar Methane Number and RPC into account when generating a site rating.

Fuel properties for Btu/scf calculations are at 60F and 14.696 psia.

Caterpillar shall have no liability in law or equity, for damages, consequently or otherwise, arising from use of program and related material or any part thereof.

FUEL LIQUIDS

Field gases, well head gases, and associated gases typically contain liquid water and heavy hydrocarbons entrained in the gas. To prevent detonation and severe damage to the engine, hydrocarbon liquids must not be allowed to enter the engine fuel system. To remove liquids, a liquid separator and coalescing filter are recommended, with an automatic drain and collection tank to prevent contamination of the ground in accordance with local codes and standards.

To avoid water condensation in the engine or fuel lines, limit the relative humidity of water in the fuel to 80% at the minimum fuel operating temperature.

ENERFLEX

Enerflex Contract Compression Unit Information Form

Date: 8/22/2023

ECC Unit #	EF6625	Unit Description	G3606A4 - JGC/4

Engine Make	Caterpillar	**Compressor Make**	ARIEL
Engine Model	G3606A4	**Compressor Model**	JGC/4
Engine Serial Number	JFE01665	**Compressor Serial Number**	F62370
Engine Manufactured Date	10/25/2019	**Compressor Manufacture Date**	2/11/2020
Engine Rated Horsepower	1875		
Engine Max RPM	1000	**Compressor Max RPM**	1000
Engine Combustion Type	4 Cycle Lean Burn		
Engine Displacement (in3)	7762	**Engine Modified or**	
Fuel Delivery Method	Gas Admission Valve	**Reconstructed**	N/A
Turbo or Naturally Aspirated	Turbo		

Air Environmental Regulations

Engine Federal Requirements: Subject to NSPS JJJJ Tier 2 emissions limits

	NSPS JJJJ Emissions Limits:	Uncontrolled Emission:	Catalyst Performance:	Controlled Emissions:
	g/bhp-hr	g/bhp-hr	% Conversion	g/bhp-hr
NOx	1	0.5	N/A	1
CO	2	2.39	85	2
VOC	0.7	0.67	65	0.7
HCHO		0.23	70	0.09

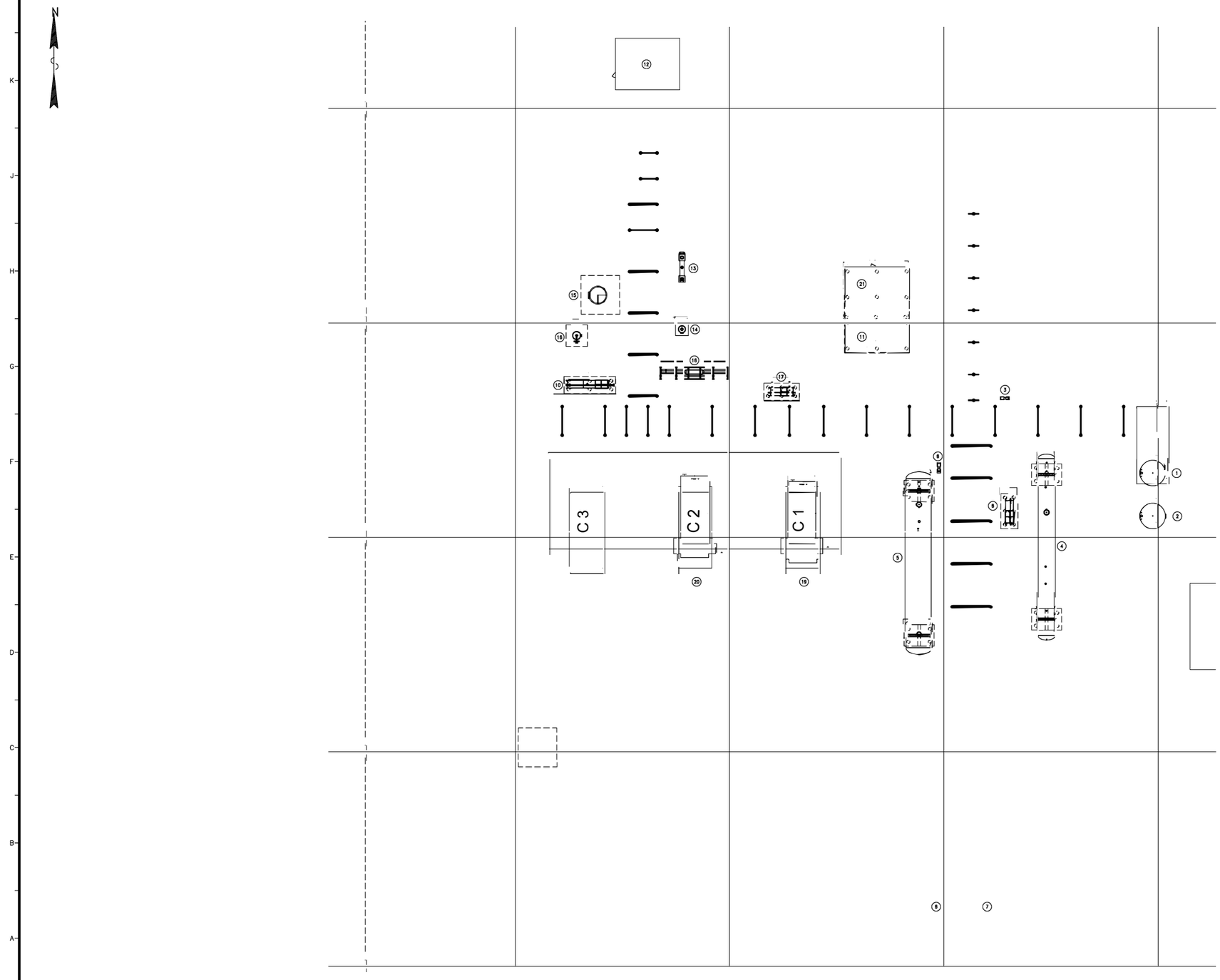
AFR Make	CAT	**Catalyst Housing Make**	Catalytic Combustion
AFR Model	ADEM 4 / NOX	**Catalyst Housing Model**	REMB-3615F-D-15HF-HFX4
		Catalyst Element Type	Oxdation
		# of Catalyst Elements in Housing	3
Customer Gas Analysis Provided	Yes	**Other Engine Emissions Controls**	N/A

Notes

8-15-23 Little Missouri Fuel GA used for calculations

All emissions values are based on Engine. AFR controller & Catalyst Manufacturer specification assuming a "Pipline Quality" (~905 BTU) fuel gas composition, 1200ft elevation and 100F max air inlet temp unless otherwise specified. Note that Emissions values are based on 100% engine load operation with fresh or cleaned catalyst. Some emissions values are nominal and are not representative of Not-to-Exceed values unless otherwise specified. It is recommended to apply a safety factor to all emissions values for air permitting to allow for operational flexibility and variations in fuel gas

APPENDIX G: Facility Plot Plan



EQUIPMENT LIST

ITEM NO.	TAG NO.	DESCRIPTION
1	TK-1210	WASTE WATER TANK
2	TK-1211	WASTE WATER TANK
3	P-1170	PRESSURIZED LIQUIDS LOAD OUT PUMP
4	V-1160 A	NGL BULLET
5	V-1000	INLET SLUG CATCHER
6	R-1001	PIG RECEIVER/LAUNCHER
7	R-1002	PIG RECEIVER/LAUNCHER
8	M-1160	STORAGE METER
9	P-1100 A	L.P. PUMP
10	M-1150	SALES METER
11	–	MCC BUILDING
12	–	TEG REGEN BUILDING
13	F-1120	FILTER COALESCER
14	V-1090	DISCHARGE SCRUBBER
15	V-1130	SULFATREAT
16	V-1150	GLYCOL CONTACTOR
17	M-1155	FUEL GAS METER
18	–	JT SKID
19	C-1030	COMPRESSOR
20	C-1031	COMPRESSOR
21		INSTRUMENT AIR BUILDING

Revision	Description	Project ID	Date
0	AS-BUILT	216593	07-11-2023

NOTES:

KINDER MORGAN

HILAND PARTNERS

Reference Drawings

EQUIPMENT LOCATION MAP

PONTIAC FIREBIRD COMPRESSOR STATION :Facility Name

Status: AS-BUILT

State: NORTH DAKOTA | PIN No:

County: WILLIAMS | Scale: NTS

Category: EQUIPMENT

File Name: ND-FIR-AA-1000.dwg

Drawing No: ND-FIR-AA-1000 | Rev 0

Jul 11, 2023 - 12:12PM