ONEOK HYDROCARBON, L.P.

February 24, 2014

Mr. R.L. (Bob) Cheever
Air Permitting and Compliance Branch
Air & Waste Management Division
U.S. Environmental Protection Agency, Region 7
12201 Renner Boulevard
Lenexa, Kansas 66219

Re: Response to Questions
Application to Amend PSD Permit No. PSD-TX-106921-GHG
ONEOK Hydrocarbon, L.P.
Mont Belvieu NGL Fractionation Plant

Dear Mr. Cheever:

ONEOK Hydrocarbon, L.P. ("ONEOK") is submitting additional information and revised application pages for the above-referenced permit application. This information is submitted in response to your email dated February 11, 2014.

ONEOK is committed to working closely with EPA staff to facilitate the timely review of this application and issuance of a permit. To that end, if you have any questions or need any additional information during the course of your review please do not hesitate to contact Ms. Terrie Blackburn at (918) 561-8052 or by email at Terrie.Blackburn@oneok.com.

Sincerely,

Scott Schingen
Vice President – NGL Fractionation and Storage

Attachment

cc: Ms. Aimee Wilson, EPA Region 6, Dallas, w/enclosure
Ms. Melanie Magee, EPA Region 6, Dallas, w/enclosure

ATTACHMENT A

RESPONSE TO QUESTIONS

The information in this attachment is in response to your e-mail dated February 11, 2014. The text of your e-mail appears below in bold font, followed by a response in normal font.

1.) **The Heaters/Hot Oil System process description on page 9 of the application indicates there are six 154 MMBtu/hr (emphasis added) hot oil heaters. However, Heaters section in the emissions data discussion on page 11 requests an output based CO_2 limit combined for all nine heaters and the calculation used to derive this output based limit is based on 127 MMBtu/hr (emphasis added) per heater.**

    EPA requests ONEOK to clarify this difference and submit corrected information, as appropriate.

For the three heaters in the current permit, as well as the six heaters proposed in this application, the maximum short-term firing rate of the heater burners is equivalent to 154 MMBtu/hr (HHV basis). However, the anticipated sustainable design firing rate of the heater burners is equivalent to 127 MMBtu/hr (LHV basis) or 140 MMBtu/hr (HHV basis). For the purposes of calculating permit allowable emission rates, 154 MMBtu/hr was used for hourly emission calculations, as this represents the maximum short term emission potential, and thus, properly serves as the basis for an hourly based emission limit. However, as the output-based CO_2 limit is on a long term, 365-day rolling average basis, 127 MMBtu/hr (LHV basis) was used in this calculation. Similarly, 140 MMBtu/hr (HHV basis) was used in the annual CO_2e emission calculations.

2.) **Emission Point Summary , Table 1 (a) lists twelve (12) emission point numbers (EPNs) for the Vents-3 FIN for the Frac-3 and Frac-4 Process Vents to Heaters. The table indicates these EPNs are H-01, H-02, H-03, H-04, H-05, H-06, H-07, H-08, H-09, H-10, H-11, and H-12. PSD permit number PSD-TX-106921-GHG issued July 23, 2013 authorized emission from H-04, H-05 and H-06 for Frac-2 Heaters H-04, H-05 and H-06.**

    EPA requests ONEOK provide additional clarification and discussion regarding the interaction between these twelve (12) emission points and the six (6) new heaters associated with the two (2) new fractionation systems.

Heater EPNs H-01, H-02, and H-03 were permitted in April 2011 (TCEQ New Source Review Standard Permit No. 95807) and commenced actual construction in June 2011. Construction of these heaters pre-dated applicability of the GHG PSD permitting program for projects that were major only for GHG (July 1, 2011). Therefore, H-01, H-02, and H-03 do not appear in Permit No. PSD-TX-106921-GHG. As you noted, heater EPNs H-04, H-05, and H-06 are authorized in Permit No. PSD-TX-106921-GHG. With this application, we propose to authorize emissions from heater EPNs H-07 through H-12 from Frac-3 and Frac-4.

The vent stream/FGRU gas combustion calculations on page 23 of the application included the maximum total flow to the heaters as a group from the process vent emissions associated with the two new fractionation trains. The vent stream/FGRU gas can be combusted in any of the twelve heaters, and the proportion of the stream fed to each heater may vary. Rather than use the maximum vent stream/FGRU gas feed rate for each heater, which is likely unquantifiable due to the aforementioned variance, and therefore potentially over-estimate the emissions by a factor of twelve, the emissions are represented as coming from the group of heater EPNs.

3.) The maximum annual rate of MSS hydrocarbons going to the flare for Frac-3 and Frac-4, as shown in the table on page 31, are twice (two times) the rate of hydrocarbons going to the flare involved in the Frac-2 addition.

EPA requests that ONEOK provide a detailed explanation as the process difference that created this doubling of MSS hydrocarbons to the flare.

The doubling of the flare emissions basis is not the result of any process difference. It is the result of gathering actual operational experience and data with the recent startup of the Frac-1 fractionation train. Frac-1 started up at the end of 2013, and ONEOK was able to gather actual emissions data during the startup period. As a result of analyzing that data, it was determined that doubling planned MSS flaring emissions constitutes an appropriate permitting basis.

4.) All of the CO_2e calculation tables included with application used the global warming potentials (GWPs) of carbon dioxide (CO_2)=1, methane (CH_4)= 21 and nitrous oxide (N_2O)=310. However, on November 29, 2013, the EPA revised several of the GWPs including those associated with CH_4 and N_2O. These new GWPs became effective as of January 1, 2014 and all GHG PSD permits issued after 1/1/2014 shall use the new GWPs.

EPA requests ONEOK to revise and submit their CO_2e emission estimation calculations and tables utilizing the GWPs of CO_2=1, CH_4=25 and N_2O=298, which became effective 1/1/2014.

The following attachment contains updated emission calculations and summary tables utilizing the updated GWPs.

ATTACHMENT B

REVISED APPLICATION PAGES

As stated in the cover letter, ONEOK Hydrocarbon, L.P. is submitting these application revisions as a result of utilizing updated GWPs which became effective 1/1/2014. All application pages affected by this change are included in this attachment. The attachment also includes corrections to the process description, which are indicated using red font.

Environmental Protection Agency – Region 6
Permit No. PSD-TX-106921-GHG Amendment Application

ONEOK Hydrocarbon, L.P.
Mont Belvieu NGL Fractionation Plant

Mont Belvieu, Chambers County
TCEQ Regulated Entity No. RN106123714
TCEQ Customer No. CN603674086

January 2014
Revised: February 2014

Prepared by:

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ATTACHMENT VII.A.5

PROCESS DESCRIPTION

Process descriptions for the Frac-3 Unit and Frac-4 Units and associated utilities are summarized below. The two units are identical, and so the following descriptions are applicable to both Frac-3 and Frac-4.

Additional Frac-3 and Frac-4 Fractionation Trains

Inlet Gas Treating

The Y-Grade Feed (stream 1) is received via piping, water washed, and is then treated in an amine contactor to remove carbon dioxide and hydrogen sulfide as required to meet customer product specifications. The treated feed (stream 2) is sent to the Deethanizer section. The rich amine from the contactor is fed to an amine regeneration unit. The amine regeneration vent stream will be routed directly to the site's heaters and combusted. The amine regeneration flash gas stream is routed to the flare gas recovery unit (FGRU), where it is recovered and used as fuel gas in the site's heaters. Heat for the regeneration of the amine is supplied by the plant's hot oil system.

Deethanizer

The Deethanizer separates ethane as an overhead product (stream 3) and C3+ (Deethanizer bottoms) as a bottoms product (stream 4). Heat for the Deethanizer is supplied by the hot oil system. The ethane product exits the facility via piping. The Deethanizer bottoms stream (stream 4) is routed to the Depropanizer for further fractionating.

Depropanizer

The Deethanizer bottoms stream (stream 4) is fed to the Depropanizer. This stream is separated into propane as an overhead product (stream 5) and C4+ (Depropanizer bottoms) as a bottoms product (stream 6). Heat for the Depropanizer is supplied by the hot oil system. The propane product exits the facility via piping. The Depropanizer bottoms stream (stream 6) is routed to the debutanizer for further fractionating.

Debutanizer/Natural Gasoline Treating

The Depropanizer bottoms (stream 6) are fed to the Debutanizer and separated into mixed C4's as an overhead product (stream 7) and natural gasoline (primarily C5+) as the Debutanizer bottoms (stream 8). Heat for the Debutanizer is supplied by the hot oil system. The Debutanizer bottoms stream (natural gasoline product, stream 8) is fed to a Natural Gasoline Treating unit for treating.

The natural gasoline product streams may contain naturally occurring sulfur compounds that can be corrosive to downstream equipment and therefore must be treated to meet customer product specifications. These sulfur compounds (mercaptans) are converted to disulfide oil through an oxidation process over a catalyst bed. Vent streams from the treatment process are routed directly to the site's heaters and combusted. The treated natural gasoline exits the facility via piping.

Deisobutanizer

The Debutanizer overhead product (stream 7) is composed of two butane isomers (isobutane and n-butane). Separation of these isomers is accomplished by fractionation in a Deisobutanizer (DIB). The mixed butane stream is fed to the DIB unit (stream 7) and separated into isobutane as an overhead product and n-butane as a bottoms product. Heat for the Deisobutanizer is supplied by process to process heat transfer and the hot oil system. The isobutane and n-butane are routed to butanes treating units prior to exiting the facility via piping.

Butanes Treating

The isobutane (stream 9) and n-butane (stream 10) product streams may contain naturally occurring sulfur compounds. These sulfur compounds are removed from the isobutane product stream as well as the n-butane product stream using a caustic treatment process. The process consists of vessels containing a contactor. The contactor serves as a mass transfer device and utilizes catalyst infused caustic as the treating reagent to remove mercaptan from the isobutane stream and the n-butane stream. The isobutane stream and n-butane stream are treated independently after fractionation. Off gases from the process are routed directly to the site's heaters and combusted. The treated isobutane and n-butane exit the facility via piping.

Utilities and Ancillary Operations

Heaters/Hot Oil System

There are no steam boilers for these facilities. The heat required to operate the units is supplied by hot oil. This duty will be supplied by six 154 MMBtu/hr hot oil heaters (maximum short-term firing rate, HHV basis).

The hot oil heaters are fired with sweet natural gas. This natural gas mixture is enriched with recovered gas from the Flare Gas Recovery Unit (FGRU). The hot oil heaters are also designed to combust vent streams from the process equipment. Flue gas from the hot oil heater(s) is treated with selective catalytic reduction (SCR) prior to being released to the atmosphere.

Flare/FGRU

Process vent gases are collected throughout the plant and routed to the flare header. There is one flare for both the Frac-3 and Frac-4 units. The flare header is a closed-vent system. The flare header collects vapors from process vent streams and relief valves. The flare header may also process emergency upsets and startup, shutdown, or maintenance activities.

Rather than sending all waste gases to the flare stack for combustion some of the vapors are recovered and routed to the hot oil heaters as fuel via the flare gas recovery unit. The FGRU is composed of electric compressors which recover the vapors via condensing and pump them to the deethanizer feed or to storage. Any uncondensed vapors are routed to the heaters for use as fuel. The FGRU is designed to recover all of the vent gas, and the flare will only combust pilot and sweep gas during routine operations. During upset conditions, and/or other startup, shutdown or maintenance activities during which the FGRU is not operable, most vapors will route to the flare for combustion.

Compressors

Compressors will be electrically-powered.

Cooling Tower

The Frac-3 and Frac-4 Units will require cooling water service. In the cooling towers, re-circulated water enters the tower and is cooled by ambient air through evaporation. The cooled water is collected in the concrete basin of the tower and is distributed by pumps to the various cooling water users in the plant. The cooling water does not come in direct contact with the process material being cooled; however, the potential for leaks to occur from time to time is present. As a result, residual volatile organic compounds (VOCs) entrained in the cooling water may be released to the atmosphere during the cooling process. Some particulate matter is also entrained in the cooling tower's drift loss.

Tanks

Spent materials, cold oil storage, lube oil, amine, water treatment chemicals, and wastewater will be stored in atmospheric fixed roof storage tanks. Ammonia and propane refrigerant will be stored in pressurized storage tanks.

Loading

Finished products leave the plant by piping. Therefore, no loading fugitive emissions from finished products are expected.

Waste materials (spent caustic, wastewater) leave the plant by truck. Loading fugitive emissions from these operations are accounted for in the emission calculations.

Pressurized loading and unloading of propane refrigerant and ammonia also occur on site.

Emergency Engines

Diesel engines will power an emergency air compressor and firewater pump. A natural gas engine will power an emergency generator. Given that the actual configuration and sizing of this equipment may vary, the represented emissions cases include conservative, highest-possible emission estimates by accounting for the maximum expected horsepower of the engines.

Maintenance, Startup, and Shutdown (MSS)

Emissions can occur when lines or equipment are depressured and purged to the flare and when they are opened to the atmosphere. MSS emissions include all operations that open lines and equipment to the atmosphere, such as for unit shutdown, vessel inspection, valve maintenance, rupture disk replacement, pump maintenance, gasket/bolt replacement, and instrumentation maintenance.

ATTACHMENT VII.A.6

EMISSIONS DATA

The following is a description of the emissions calculation methodology for each source type at the plant. No GHG emissions are expected from the storage tanks or loading operations. The emission calculations use the current regulatory Global Warming Potentials (GWPs), which became effective January 1, 2014.

Heaters

The Frac-3 and Frac-4 units require a hot oil system which includes fired heaters as the heat source. Greenhouse gas emissions estimates from the natural gas fired heaters are based on the emission factors found in 40 CFR Part 98, Subpart C, Tables C-1 and C-2.

In addition to natural gas combustion in the heaters, vents from the treaters and FGRU are routed to the heaters for combustion of residual VOC and recovery of available heating value. Process simulations, which were used in the equipment design to perform mass and energy balances, were used to determine the CO_2 and methane content of the process vent streams. The heater emissions are calculated based on a minimum control efficiency of 99% of methane from the FGRU and vent streams. This control efficiency is consistent with EPA and TCEQ guidance for VOC control for streams routed to process heaters.

In the initial issuance of Permit No. PSD-TX-106921-GHG, EPA also included an output based limit for the hot oil heaters associated with Frac-2. ONEOK proposes the same output based limit for the new hot oil heaters. Therefore, ONEOK proposes that the existing heaters and new heaters be included in a single cap for the output based limit:

Emission Unit	Description	Output Based CO_2 Limit
H-04/H-05/H-06/H-07/H-08/H-09/H-10/H-11/H-12	Hot Oil Heaters 4, 5, 6, 7, 8, 9, 10, 11, and 12	14.25 lb CO_2/bbl of y-grade feed [1]

[1] Combined limit for all nine heaters, to be demonstrated on a 365-day rolling average basis, excluding periods of start-up, shutdown, or maintenance.

The proposed limit was derived as part of the initial issuance of Permit No. PSD-TX-106921-GHG based on a direct calculation using the proposed permitted CO_2 emissions rates divided by the represented design capacity for the Frac-2 fractionation train as shown in the calculation below.

$$\frac{116.9 \text{ lb CO2}}{\text{MMBtu}} \times \frac{127 \text{ MMBtu}}{\text{hr per heater}} \times 3 \text{ heaters} \times \frac{24 \text{ hrs}}{\text{day}} \times \frac{\text{day}}{75{,}000 \text{ bbl Y-Grade}} = \frac{14.25 \text{ lb CO2}}{\text{bbl Y-Grade feed}}$$

Although developed based on the parameters represented in the application, ONEOK validated this limit by conducting a series of process simulations in which variables such as feed composition, unit feed rate, and other equipment operating specifications. The feed composition and processing rate were found to have the greatest impact on the proposed output-based limit. After running 27 process simulation cases, the results of the forecasted output-based limit ranged from 8.20 to 12.60 lb CO_2/bbl of y-grade feed. Given the limitations of the model and the range of scenarios tested, maintaining the proposed limit based on the permit representations as outlined above was determined to be appropriate, in that it covers the cases ONEOK anticipated and provides for a 10-15% margin to cover variance from model to actual performance and/or alternative operating cases that ONEOK has not anticipated and modeled to date.

The maximum short-term firing rate of the heater burners is equivalent to 154 MMBtu/hr (HHV basis). However, the anticipated sustainable design firing rate of the heater burners is equivalent to 127 MMBtu/hr (LHV basis) or 140 MMBtu/hr (HHV basis). For the purposes of calculating permit allowable emission rates, 154 MMBtu/hr was used for hourly emission calculations, as this represents the maximum short term emission potential, and thus, properly serves as the basis for an hourly based emission limit. However, as the output-based CO_2 limit is on a long term, 365-day rolling average basis, 127 MMBtu/hr (LHV basis) was used in this calculation. Similarly, 140 MMBtu/hr (HHV basis) was used in the annual CO_2e emission calculations.

Flare

The flare system is equipped with an FGRU. Under normal operating conditions, the FGRU will recover the process vent streams, and the flare will only combust pilot and sweep gas. The flare header may also process emergency upsets and MSS activities. Anticipated emissions from MSS activities are discussed in the "MSS" section below.

Greenhouse gas emissions estimates from the flare are based on the emission factors found in 40 CFR Part 98, Subpart C, Tables C-1 and C-2 for each material sent to the flare.

Cooling Towers

GHG emissions from the cooling towers are estimated using the controlled emission factor from AP-42, Section 5.1 (1/95), Petroleum Refining, applying the speciation profile to account for the potential for methane emission leaks into the cooling water. The cooling water will be sampled so that leaks can be detected and repaired.

Emergency Engines

Greenhouse gas emissions estimates from the emergency engines are based on the emission factors found in 40 CFR Part 98, Subpart C, Tables C-1 and C-2.

Equipment Leak Fugitives

Equipment leak fugitive emissions are calculated using an estimated component count, TCEQ's Oil and Gas Production Operation emission factors, and a 28LAER LDAR program. The 28LAER program is TCEQ's most stringent fugitive Leak Detection and Repair (LDAR) permit condition, which specifies requirements for routine monitoring of equipment using audio, visual, and olfactory means and using EPA Method 21 to identify and repair leaking equipment. For example, under this condition, gas and light liquid valves, flanges, and connectors would be required to be monitored quarterly using a leak definition of 500 parts per million by volume (ppmv). The emission factors, control credits, and descriptions of the monitoring programs used are in the TCEQ guidance document "Equipment Leak Fugitives," dated October 2000.

Maintenance, Startup and Shutdown

Given vessel volume and materials stored, degassing amounts are calculated using the ideal gas law. The degassing calculations quantify the emissions sent to the flare and the residual emissions to atmosphere for each vessel. A 30% allowance was included to account for the volume of associated piping, based on volumetric estimates from the engineering design contractor. The estimated degassing volumes also account for methane purges used during commissioning and decommissioning the equipment.

Greenhouse gas emissions estimates from the flare are based on the emission factors found in 40 CFR Part 98, Subpart C, Tables C-1 and C-2 for each material sent to the flare. Emissions from methane are based on 99% destruction efficiency for MSS venting to the flare. Maximum site-wide annual emissions from degassing to the flare are calculated by conservatively assuming each vessel is cleared once per year when the FGRU is not operational. Note that the FGRU will not function to recover MSS emissions associated with degassing because the process heaters used for the recovered fuel stream will not be operating at that time.

Maximum site-wide annual emissions from degassing of residual vapors to atmosphere are calculated by conservatively assuming each vessel is cleared four times per year. The assumed residual VOC content of the vessel is 10,000 ppmv, which is 20% of methane's lower explosive limit (LEL).

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emission Point Summary

Date:	Revised: February 2014	Permit No.:	PSD-TX-106921-GHG	Regulated Entity No.:	RN106123714
Area Name:	Mont Belvieu NGL Fractionation Plant			Customer Reference No.:	CN603674086

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			2. Component or Air Contaminant Name	3. Air Contaminant Emission Rate	
(A) EPN	(B) FIN	(C) Name		(A) Pounds per Hour	(B) TPY
H-07	H-07	Hot Oil Heater 7	CO_2e		430,651
H-08	H-08	Hot Oil Heater 8	CO_2e		
H-09	H-09	Hot Oil Heater 9	CO_2e		
H-10	H-10	Hot Oil Heater 10	CO_2e		
H-11	H-11	Hot Oil Heater 11	CO_2e		
H-12	H-12	Hot Oil Heater 12	CO_2e		
H-01/H-02/H-03/ H-04/H-05/H-06/ H-07/H-08/H-09/ H-10/H-11/H-12	VENTS-3	Frac-3 and Frac-4 Process Vents to Heaters	CO_2e		30,000
FL-01/FL-02	FL-02 and MSS-FL-3	Frac-3 and Frac-4 Flaring	CO_2e		5,247
CT-05	CT-05	Frac-3 Cooling Tower	CO_2e		Work Practice Standard
CT-06	CT-06	Frac-4 Cooling Tower	CO_2e		Work Practice Standard
ENG-07	ENG-07	Frac-3 & Frac-4 Emergency Air Compressor	CO_2e		28
ENG-08	ENG-08	Frac-3 & Frac-4 Firewater Pump	CO_2e		29
ENG-09	ENG-09	Frac-3 & Frac-4 Emergency Generator	CO_2e		15
FUG-04	FUG-04	Frac-3 Equipment Leak Fugitives	CO_2e		Work Practice Standard
FUG-05	FUG-05	Frac-4 Equipment Leak Fugitives	CO_2e		Work Practice Standard
MSS-FUG-3	ATM-MSS-3	MSS-Degassing (Frac-3 & Frac-4 Contribution)	CO_2e		Work Practice Standard

EPN = Emission Point Number
FIN = Facility Identification Number

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Table 1(a) Emission Point Summary

Date: Revised: February 2014	Permit No.: PSD-TX-106921-GHG	Regulated Entity No.:	RN106123714
Area Name: Mont Belvieu NGL Fractionation Plant		Customer Reference No.:	CN603674086

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA			EMISSION POINT DISCHARGE PARAMETERS										
1. Emission Point			4. UTM Coordinates of Emission Point			Source							
						5. Building Height (Ft.)	6. Height Above Ground (Feet)	7. Stack Exit Data			8. Fugitives		
(A) EPN	(B) FIN	(C) Name	Zone	East (Meters)	North (Meters)			(A) Diameter (Ft.)	(B) Velocity (FPS)	(C) Temperature (°F)	(A) Length (Ft.)	(B) Width (Ft.)	(C) Axis Degrees
H-07	H-07	Hot Oil Heater 7	15	317633	3304663		146.33	8.33	25	305			
H-08	H-08	Hot Oil Heater 8	15	317651	3304669		146.33	8.33	25	305			
H-09	H-09	Hot Oil Heater 9	15	317669	3304675		146.33	8.33	25	305			
H-10	H-10	Hot Oil Heater 10	15	317642	3304635		146.33	8.33	25	305			
H-11	H-11	Hot Oil Heater 11	15	317660	3304641		146.33	8.33	25	305			
H-12	H-12	Hot Oil Heater 12	15	317678	3304647		146.33	8.33	25	305			
H-01/H-02/H-03/ H-04/H-05/H-06/ H-07/H-08/H-09/ H-10/H-11/H-12	VENTS-3	Frac-3 and Frac-4 Process Vents to Heaters	15	Various	Various		146.33	8.33	25	305			
FL-01/FL-02	FL-02 and MSS-FL-3	Frac-3 and Frac-4 Flaring	15	317769	3304328		210	3	65.6	1832			
CT-05	CT-05	Frac-3 Cooling Tower	15	317577	3304936		30	30	15	Amb.			
CT-06	CT-06	Frac-4 Cooling Tower	15	317636	3304936		30	30	15	Amb.			
ENG-07	ENG-07	Frac-3 & Frac-4 Emergency Air Compressor	15	317699	3304454		8	0.5	100	800			
ENG-08	ENG-08	Frac-3 & Frac-4 Firewater Pump	15	317427	3305077		8	0.67	100	800			
ENG-09	ENG-09	Frac-3 & Frac-4 Emergency Generator	15	317713	3304443		8	0.42	100	800			
FUG-04	FUG-04	Frac-3 Equipment Leak Fugitives	15	317625	3304713		3				244	612	-18.6
FUG-05	FUG-05	Frac-4 Equipment Leak Fugitives	15	317482	3304417		3				488	208	-18.6
MSS-FUG-3	ATM-MSS-3	MSS-Degassing (Frac-3 & Frac-4 Contribution)	15	317685	3304743		30				20	20	0

EPN = Emission Point Number
FIN = Facility Identification Number

TCEQ-10153 (Revised 04/08) Table 1(a)
This form is for use by sources subject to air qualitypermit requirements and may be revised periodically. (APDG 5178 v5)

ONEOK Frac-3 and Frac-4 Emissions Summary

FIN	EPN	Description	Previously Authorized (tons/yr)	Proposed (tons/yr)	Increase/(Decrease) (tons/yr)	Basis of Change
Proposed New Equipment/Emissions						
H-07	H-07	Hot Oil Heater 7	0	430,651	430,651	New Emissions Unit
H-08	H-08	Hot Oil Heater 8	0			New Emissions Unit
H-09	H-09	Hot Oil Heater 9	0			New Emissions Unit
H-10	H-10	Hot Oil Heater 10	0			New Emissions Unit
H-11	H-11	Hot Oil Heater 11	0			New Emissions Unit
H-12	H-12	Hot Oil Heater 12	0			New Emissions Unit
VENTS-3	H-01/H-02/H-03/ H-04/H-05/H-06/ H-07/H-08/H-09/ H-10/H-11/H-12	Frac-3 and Frac-4 Process Vents to Heaters	0	30,000	30,000	New Emissions Unit
FL-02 and MSS-FL-3	FL-01/FL-02	Frac-3 and Frac-4 Flaring	0	5,247	5,247	New Emissions Unit
CT-05	CT-05	Frac-3 Cooling Tower	0	0.33	0.33	New Emissions Unit
CT-06	CT-06	Frac-4 Cooling Tower	0	0.33	0.33	New Emissions Unit
ENG-07	ENG-07	Frac-3 & Frac-4 Emergency Air Compressor	0	28	28	New Emissions Unit
ENG-08	ENG-08	Frac-3 & Frac-4 Firewater Pump	0	29	29	New Emissions Unit
ENG-09	ENG-09	Frac-3 & Frac-4 Emergency Generator	0	15	15	New Emissions Unit
FUG-04	FUG-04	Frac-3 Equipment Leak Fugitives	0	12.6	12.6	New Emissions Unit
FUG-05	FUG-05	Frac-4 Equipment Leak Fugitives	0	12.6	12.6	New Emissions Unit
ATM-MSS-3	MSS-FUG-3	MSS-Degassing (Frac-3 & Frac-4 Contribution)	0	50	50	New Emissions Unit
Total			-	**466,000**	**466,000**	

Hot Oil Heater 7

EPN: **H-07**
FIN: **H-07**

Annual Average Duty:	140	MM Btu/hr (HHV)	
Maximum Duty:	154	MM Btu/hr (24-hr average, HHV)	
Hours of Operation:	8760	hr/yr	
Fuel Heating Value:	1000	Btu/scf	(HHV basis, natural gas average)

Pollutant	Assumed MW	Emission Factor				Emissions		GWP	CO2e	
		lb/MM scf	lb/MM Btu	ppmvd @ 3% O2	Source	lb/hr	(ton/yr)		lb/hr	(ton/yr)
CH4			0.00220		40 CFR 98 Subpart C, Table C-2	0.3	1.4	25.00	9	35
CO2			116.9		40 CFR 98 Subpart C, Table C-1	18,000	71,700	1.00	18,000	71,700
N2O			0.00022		40 CFR 98 Subpart C, Table C-2	0.0	0.1	298.00	10	40
								Total CO2e	18,019	71,775

Notes
1. lb/hr Emissions = Maximum Duty * Emission Factor
2. ton/yr Emissions = Annual Average Duty * Annual Operating Hours* Emission Factor / 2000

Hot Oil Heater 8

EPN: **H-08**
FIN: **H-08**

Annual Average Duty:	140	MM Btu/hr (HHV)	
Maximum Duty:	154	MM Btu/hr (24-hr average, HHV)	
Hours of Operation:	8760	hr/yr	
Fuel Heating Value:	1000	Btu/scf	(HHV basis, natural gas average)

Pollutant	Assumed MW	Emission Factor				Emissions		GWP	CO2e	
		lb/MM scf	lb/MM Btu	ppmvd @ 3% O2	Source	lb/hr	(ton/yr)		lb/hr	(ton/yr)
CH4			0.00220		40 CFR 98 Subpart C, Table C-2	0.3	1.4	25.00	9	35
CO2			116.9		40 CFR 98 Subpart C, Table C-1	18,000	71,700	1.00	18,000	71,700
N2O			0.00022		40 CFR 98 Subpart C, Table C-2	0.0	0.1	298.00	10	40
								Total CO2e	18,019	71,775

Notes
1. lb/hr Emissions = Maximum Duty * Emission Factor
2. ton/yr Emissions = Annual Average Duty * Annual Operating Hours* Emission Factor / 2000

Hot Oil Heater 9

EPN: H-09
FIN: H-09

Annual Average Duty:	140	MM Btu/hr (HHV)	
Maximum Duty:	154	MM Btu/hr (24-hr average, HHV)	
Hours of Operation:	8760	hr/yr	
Fuel Heating Value:	1000	Btu/scf	(HHV basis, natural gas average)

Pollutant	Assumed MW	Emission Factor				Emissions		GWP	CO2e	
		lb/MM scf	lb/MM Btu	ppmvd @ 3% O2	Source	lb/hr	(ton/yr)		lb/hr	(ton/yr)
CH4			0.00220		40 CFR 98 Subpart C, Table C-2	0.3	1.4	25.00	9	35
CO2			116.9		40 CFR 98 Subpart C, Table C-1	18,000	71,700	1.00	18,000	71,700
N2O			0.00022		40 CFR 98 Subpart C, Table C-2	0.0	0.1	298.00	10	40
								Total CO2e	18,019	71,775

Notes
1. lb/hr Emissions = Maximum Duty * Emission Factor
2. ton/yr Emissions = Annual Average Duty * Annual Operating Hours* Emission Factor / 2000

Hot Oil Heater 10

EPN: **H-10**
FIN: **H-10**

Annual Average Duty:	140	MM Btu/hr (HHV)	
Maximum Duty:	154	MM Btu/hr (24-hr average, HHV)	
Hours of Operation:	8760	hr/yr	
Fuel Heating Value:	1000	Btu/scf	(HHV basis, natural gas average)

Pollutant	Assumed MW	Emission Factor				Emissions		GWP	CO2e	
		lb/MM scf	lb/MM Btu	ppmvd @ 3% O2	Source	lb/hr	(ton/yr)		lb/hr	(ton/yr)
CH4			0.00220		40 CFR 98 Subpart C, Table C-2	0.3	1.4	25.00	9	35
CO2			116.9		40 CFR 98 Subpart C, Table C-1	18,000	71,700	1.00	18,000	71,700
N2O			0.00022		40 CFR 98 Subpart C, Table C-2	0.0	0.1	298.00	10	40
								Total CO2e	18,019	71,775

Notes
1. lb/hr Emissions = Maximum Duty * Emission Factor
2. ton/yr Emissions = Annual Average Duty * Annual Operating Hours* Emission Factor / 2000

Hot Oil Heater 11

EPN: H-11
FIN: H-11

Annual Average Duty:	140	MM Btu/hr (HHV)	
Maximum Duty:	154	MM Btu/hr (24-hr average, HHV)	
Hours of Operation:	8760	hr/yr	
Fuel Heating Value:	1000	Btu/scf	(HHV basis, natural gas average)

Pollutant	Assumed	Emission Factor				Emissions		GWP	CO2e	
	MW	lb/MM scf	lb/MM Btu	ppmvd @ 3% O2	Source	lb/hr	(ton/yr)		lb/hr	(ton/yr)
CH4			0.00220		40 CFR 98 Subpart C, Table C-2	0.3	1.4	25.00	9	35
CO2			116.9		40 CFR 98 Subpart C, Table C-1	18,000	71,700	1.00	18,000	71,700
N2O			0.00022		40 CFR 98 Subpart C, Table C-2	0.0	0.1	298.00	10	40
								Total CO2e	18,019	71,775

Notes
1. lb/hr Emissions = Maximum Duty * Emission Factor
2. ton/yr Emissions = Annual Average Duty * Annual Operating Hours* Emission Factor / 2000

Hot Oil Heater 12

EPN: H-12
FIN: H-12

Annual Average Duty:	140	MM Btu/hr (HHV)	
Maximum Duty:	154	MM Btu/hr (24-hr average, HHV)	
Hours of Operation:	8760	hr/yr	
Fuel Heating Value:	1000	Btu/scf	(HHV basis, natural gas average)

Pollutant	Assumed	Emission Factor				Emissions		GWP	CO2e	
	MW	lb/MM scf	lb/MM Btu	ppmvd @ 3% O2	Source	lb/hr	(ton/yr)		lb/hr	(ton/yr)
CH4			0.00220		40 CFR 98 Subpart C, Table C-2	0.3	1.4	25.00	9	35
CO2			116.9		40 CFR 98 Subpart C, Table C-1	18,000	71,700	1.00	18,000	71,700
N2O			0.00022		40 CFR 98 Subpart C, Table C-2	0.0	0.1	298.00	10	40
								Total CO2e	18,019	71,775

Notes
1. lb/hr Emissions = Maximum Duty * Emission Factor
2. ton/yr Emissions = Annual Average Duty * Annual Operating Hours* Emission Factor / 2000

Frac-3 and Frac-4 Process Vents to Heaters

EPN: H-01/H-02/H-03/H-04/H-05/H-06/H-07/H-08/H-09/H-10/H-11/H-12
FIN: VENTS-3
Conversion Factor = 385 scf/lbmol
Hours of Operation = 8760 hr/yr

Chemical	Mol. Wt.	Rich Amine Flash	Amine Acid Gas	Butanes Treating Vent	Natural Gasoline Treating Vent	Total Flow to Fuel Gas	Destruction Efficiency	Methane	CO2	CO2e	Methane	CO2	CO2e
(—)	(lb/lbmol)	(lbmol/hr)	(lbmol/hr)	(lbmol/hr)	(lbmol/hr)	(lbmol/hr)	%	(lb/hr)	(lb/hr)	(lb/hr)	(ton/yr)	(ton/yr)	(ton/yr)
Cabon Dioxide	44.01	0.02	157.06	0	0	157	—	—	6900	6900	—	30000	30000
Methane	16.04	0.14	0.04	0	0	0.18	99	0.029	—	0.725	0.13	—	3.2
								0.029	**6900**	**6900**	**0.13**	**30000**	**30000**

Note CO2 from products of combustion is already accounted for in heater emissions calculations based on total heat input.

Frac-3 and Frac-4 Flaring

EPN: **FL-02**
FIN: **FL-02**

Pilot/Sweep Gas Flow Rate:	2500	scf/hr	
Hours of Operation:	8760	hr/yr	
Fuel Heating Value:	1000	Btu/scf	(HHV basis, natural gas average)

Pollutant	Emission Factor		Emissions		GWP	CO2e	
	(lb/MM Btu)	Source	(lb/hr)	(ton/yr)		lb/hr	(ton/yr)
CH4	0.00220	40 CFR 98 Subpart C, Table C-2	0.0055	0.024	25.00	0.1	0.6
CO2	116.9	40 CFR 98 Subpart C, Table C-1	290	1300	1.00	290.0	1,300.0
N2O	0.00022	40 CFR 98 Subpart C, Table C-2	0.00055	0.0024	298.00	0.2	0.7
					Total CO2e	290	1,301

Notes
1. Emissions are from combustion of pilot and sweep gas only and does not include emissions from other vent streams

Cooling Tower

EPN: CT-05
FIN: CT-05

Inputs:

Water circulation rate =	48000	gal/min
Annual hours of operation =	8760	hr/yr
VOC Emission Factor -Short Term (AP-42, Chapter 5) =	0.7	$lb/10^6$ gal cooling water
VOC Emissions Factor - Annual	0.3	$lb/10^6$ gal cooling water

Calculations:

EPN	Source Description	HC Emissions	
		lb/hr	(ton/yr)
CT-05	Frac-3 Cooling Tower	2.00	3.80

Speciation:

Assume composition is same as inlet gas feed.

Component	Mass Fraction	Emissions (lb/hr)	Emissions (ton/yr)	CO2e lb/hr	CO2e tpy	GWP
Methane	0.003	0.0066	0.013	0.17	0.33	25

Cooling Tower

EPN: CT-06
FIN: CT-06

Inputs:		
	Water circulation rate =	48000 gal/min
	Annual hours of operation =	8760 hr/yr
	VOC Emission Factor -Short Term (AP-42, Chapter 5) =	0.7 lb/10^6 gal cooling water
	VOC Emissions Factor - Annual	0.3 lb/10^6 gal cooling water

Calculations:

EPN	Source Description	HC Emissions	
		lb/hr	(ton/yr)
CT-06	Frac-4 Cooling Tower	2.00	3.80

Speciation:

Assume composition is same as inlet gas feed.

Component	Mass Fraction	Emissions (lb/hr)	Emissions (ton/yr)	CO2e lb/hr	CO2e tpy	GWP
Methane	0.003	0.0066	0.013	0.17	0.33	25

Frac-3 and Frac-4 Auxiliary Diesel Engines

EPN: ENG-07, ENG-08
FIN: ENG-07, ENG-08

Air Compressor Engine:	560	hp	
Firewater Pump Engine:	542	hp	
Diesel Fuel HV:	137,000	BTU/gal	AP-42 Appendix A
Air Compressor Fuel Usage Rate:	25.2	gal/hr	Tier 3 Emissions Compliant
Firewater Pump Fuel Usage Rate:	25.6	gal/hr	Tier 3 and NSPS IIII Emissions Compliant
Hours of Operation:	100	hr/yr	

GHG Emissions

EPN	Pollutant	Emission Factor			Emissions		GWP	CO2e	
		kg/MMBtu	lb/MM Btu	Source	lb/hr	(ton/yr)		lb/hr	(ton/yr)
ENG-07	CH4	0.003	0.0066	40 CFR 98 Subpart C, Table C-2	0.023	0.001	25.00	0.57	0.029
	CO2	73.96	163.1	40 CFR 98 Subpart C, Table C-1	563	28.1	1.00	562.93	28.146
	N2O	0.0006	0.0013	40 CFR 98 Subpart C, Table C-2	0.0046	0.0002	298.00	1.36	0.068
	Total CO2e							565	28
ENG-08	CH4	0.003	0.0066	40 CFR 98 Subpart C, Table C-2	0.023	0.001	25.00	0.58	0.029
	CO2	73.96	163.1	40 CFR 98 Subpart C, Table C-1	572	28.6	1.00	571.86	28.593
	N2O	0.0006	0.0013	40 CFR 98 Subpart C, Table C-2	0.0046	0.0002	298.00	1.38	0.069
	Total CO2e							574	29

Frac-3 and Frac-4 Auxiliary Natural Gas Engine

EPN: ENG-09
FIN: ENG-09

Generator Engine:	368	hp	
Natural Gas HV:	1000	Btu/scf	(HHV basis, natural gas average)
Generator Fuel Usage Rate:	2586	scf/hr	
	2.59	MMBtu/hr	
Hours of Operation:	100	hr/yr	

GHG Emissions

EPN	Pollutant	Emission Factor			Emissions		GWP	CO2e	
		kg/MMBtu	lb/MM Btu	Source	lb/hr	(ton/yr)		lb/hr	(ton/yr)
ENG-09	CH4	0.001	0.0022	40 CFR 98 Subpart C, Table C-2	0.006	0.0003	25.00	0.14	0.007
	CO2	53.02	116.9	40 CFR 98 Subpart C, Table C-1	303	15.1371	1.00	302.74	15.137
	N2O	0.0001	0.0002	40 CFR 98 Subpart C, Table C-2	0.022	0.0011	298.00	6.57	0.328
	Total CO2e							309	15

Unit: Frac-3 Equipment Leak Fugitives
EPN: FUG-04
FIN: FUG-04

Hours of Operation: 8760 hr/yr

Equipment Type	Component Count	Emission Factor* (lb/hr-component)	Control Efficiency*	Emission Rate (lb/hr)	Emission Rate (tons/yr)
Compressors - GV	7	0.0194	0.85	0.020	0.089
Flanges - GV	1834	0.00086	0.97	0.047	0.207
Flanges - HL	1212	8.6E-07	0.3	0.001	0.003
Flanges - LL	3942	0.000243	0.97	0.0287	0.1259
Pressure Relief Valves - GV	69	0.0194	0.97	0.040	0.176
Pressure Relief Valves - HL	10	0.0000683	0	0.001	0.003
Pressure Relief Valves - LL	33	0.0165	0.97	0.016	0.072
Pumps - HL	11	0.00113	0	0.012	0.054
Pumps - LL	35	0.02866	0.85	0.150	0.659
Valves - GV	975	0.00992	0.97	0.290	1.271
Valves - HL	758	0.0000185	0	0.014	0.061
Valves - LL	2985	0.0055	0.97	0.493	2.157

* The emission factors are from the TCEQ's 2000 "Equipment Leak Fugitives" Guidance for Oil and Gas Production Operations.

Material Name	Mass Fraction	Hourly Emissions lb/hr	Annual Emissions tpy	CO2e lb/hr	CO2e tpy	GWP
Methane	0.1	0.115	0.502	2.875	12.55	25
CO2	0.004	0.0045	0.0197	0.0045	0.0197	1
Total	**1.00**	**1.12**	**4.88**	**2.88**	**12.60**	

Unit: Frac-4 Equipment Leak Fugitives
EPN: FUG-05
FIN: FUG-05

Hours of Operation: 8760 hr/yr

Equipment Type	Component Count	Emission Factor* (lb/hr-component)	Control Efficiency*	Emission Rate (lb/hr)	Emission Rate (tons/yr)
Compressors - GV	7	0.0194	0.85	0.020	0.089
Flanges - GV	1834	0.00086	0.97	0.047	0.207
Flanges - HL	1212	8.6E-07	0.3	0.001	0.003
Flanges - LL	3942	0.000243	0.97	0.0287	0.1259
Pressure Relief Valves - GV	69	0.0194	0.97	0.040	0.176
Pressure Relief Valves - HL	10	0.0000683	0	0.001	0.003
Pressure Relief Valves - LL	33	0.0165	0.97	0.016	0.072
Pumps - HL	11	0.00113	0	0.012	0.054
Pumps - LL	35	0.02866	0.85	0.150	0.659
Valves - GV	975	0.00992	0.97	0.290	1.271
Valves - HL	758	0.0000185	0	0.014	0.061
Valves - LL	2985	0.0055	0.97	0.493	2.157

* The emission factors are from the TCEQ's 2000 "Equipment Leak Fugitives" Guidance for Oil and Gas Production Operations.

Material Name	Mass Fraction	Hourly Emissions lb/hr	Annual Emissions tpy	CO2e lb/hr	CO2e tpy	GWP
Methane	0.1	0.115	0.502	2.875	12.55	25
CO2	0.004	0.0045	0.0197	0.0045	0.0197	1
Total	**1.00**	**1.12**	**4.88**	**2.88**	**12.60**	

MSS Hydrocarbons to Flare Emissions Summary (Frac-3 & Frac-4 Contribution)

FIN: MSS-FL-3

EPN: FL-01/FL-02

						GWP	25.00	GWP	1	GWP	298.00	
Constituent	**Molecular Weight**	**Max Annual Rate****	**Max Annual Rate****	**Heating Value**	**Destruction Efficiency**	**Methane Emissions**		**CO2 Emissions**		**N2O Emissions**		**CO2e Emissions**
	(lb/lbmol)	**(lb/yr)**	**(scf/yr)**	**(BTU/scf)**	**(%)**	**(lb/MMBtu)**	**(tpy)**	**(lb/MMBtu)**	**(tpy)**	**(lb/MMBtu)**	**(tpy)**	**(tpy)**
Methane	16.04	1,570,000	37,700,000	896	99	N/A	7.850	116.9	1975	0.0002	0.0037	2172
Ethane	30.07	227,000	2,910,000	1595	N/A	0.0066	0.015	138.1	320	0.0013	0.0031	321
Propane	44.1	378,000	3,300,000	2282	N/A	0.0066	0.025	135.5	510	0.0006	0.0023	511
Butanes	58.12	368,000	2,440,000	2958	N/A	0.0066	0.024	143.1	516	0.0006	0.0022	517
Pentanes	72.15	183,000	977,000	3618	N/A	0.0066	0.012	154.4	273	0.0006	0.0011	274
Hexanes+	86.18	101,000	451,000	4305	N/A	0.0066	0.006	154.4	150	0.0006	0.0006	150
Total							**7.93**		**3744**		**0.0129**	**3946**

MSS Hydrocarbons to Atmosphere Summary (Frac-3 & Frac-4 Contribution)

FIN: ATM-MSS-3

EPN: MSS-FUG-3

Constituent	Concentration*	Residual Mass in Unit	Methane Emissions***	CO2e	GWP
	(ppmv)	(lb/unit)	(ton/yr)	(ton/yr)	
Methane	10,000	500	2.00	50.00	25

* Assumes controlled degassing down to 20% or less of methane LEL.

*** Based on total volume of each unit being degassed 4 times per year.

recovered flare gas, and process vent gases). The proposed form of the emission limitations is summarized in the following table:

Category	Demonstration
Limitations	Greenhouse gas emissions from the group of hot oil heaters will be limited to 430,651 tons CO_2e per year on a 365-day rolling average. The hot oil heaters will maintain a minimum efficiency by maintaining a maximum stack exit temperature of 385 degrees F on a 365-day rolling average basis, excluding periods of start-up and shutdown.
	In accordance with 40 C.F.R. Part 63, Subpart DDDDD, the permittee will conduct annual tune-up (burner inspection and cleaning, flame inspection and optimization, air-to-fuel ratio, and CO optimization).
Monitoring Requirements	The permittee shall maintain compliance with 40 C.F.R. Part 98, Subpart C including flow monitoring of fuel usage and fuel gas analysis. The permittee shall maintain a flue gas temperature monitor to continuously record flue gas exit temperature on each hot oil heater while the heaters are in service.
Compliance Demonstration	The permittee shall calculate compliance with the 365-day rolling average limitations following the procedures specified in 40 C.F.R. Part 98, Subpart C, with a conversion from metric tons to short tons.
	The permittee shall maintain records of flue gas temperature and annual heater tuning performed for compliance and may utilize normal business records for this purpose.

Because the proposed BACT is inclusive of a number of design and operating strategies associated with efficiency, the following summary table is being provided to describe with specificity the design and practices proposed for each heater. Overall, the heater is designed for up to a 91% overall thermal efficiency. This efficiency is based on the initial design. Actual operating efficiency may vary over time based on normal performance degradation even with ongoing maintenance. The efficiency will also vary with operating mode based on start-up and shutdown conditions, and a small percentage of operating hours in natural draft mode due to operating conditions. Benchmarking data for the heaters are not available because they are custom-fabricated units that will be purpose-built for this operation.

available and technically feasible control options available for the flares, with the potential for reducing GHG emissions by more than an estimated 90% in total.

TCEQ flare guidance provides that maintaining compliance with 40 CFR Section 60.18 demonstrates a minimum destruction efficiency of 98% for all hydrocarbons, and 99% for hydrocarbons containing two carbons or less, including Methane.

Step 4: Evaluate most effective controls and document results.

Energy, environmental, and economic impacts are considered for each of the control options during Step 4 only if the most effective control option is not proposed as BACT: "However, an applicant proposing the top control alternative need not provide cost and other detailed information in regard to other control options. In such cases the applicant should document that the control option chosen is, indeed, the top and review for collateral environmental impacts." (As shown in the EPA NSR Manual, page B.8.)

ONEOK is proposing to implement good combustion practices and flare gas recovery as BACT. In combination, these are the top control alternatives that have been determined to be available and technically feasible. There are no expected adverse collateral energy, environmental, or economic impacts as a result of these measures proposed as BACT.

Step 5: Select the BACT.

In the fifth step, the most effective control option, based on the impacts quantified in Step 4, is proposed as BACT for the pollutant and emission unit under review. For the flares, ONEOK proposes use of the top two and only remaining options as BACT, which are to implement good combustion practices and flare gas recovery. The proposed form of the emission limitations is summarized in the following table:

Category	Demonstration
Limitations	Greenhouse gas emissions from contributions to the flare from the Frac-3 and Frac-4 process units will be limited to 5,247 tons CO_2e per year on a 365-day rolling average, for all non-emergency operations.
Monitoring Requirements	The permittee shall maintain compliance with 40 C.F.R. Part 98, Subpart W, including maintaining records of flow measurements and composition.
Compliance Demonstration	The permittee shall calculate compliance with the 365-day rolling average limitations following the procedures specified in 40 C.F.R. Part 98, Subpart W, with a conversion from metric tons to short tons.

BACT for MSS Emissions

GHG emissions from MSS emissions are the result of degassing process vessels and equipment. The emissions are dominated by carbon dioxide (CO_2) emissions from degassing