EOG Resources, Inc
600 Seventeenth Stre
Suite 1000N
Denver, CO 80202
Main: 303-572-9000
Fax: 303-824-5400

October 6, 2014

Attn: O&G Production Facilities
Wyoming Department of Environmental Quality
Air Quality Division
Herschler Building, 2-E
122 West 25th Street
Cheyenne, Wyoming 82002

OCT 2014
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AIR QUALITY
DIVISION

RE: EOG Resources, Inc.
Air Permit Application – Ballista 202-1003H Facility
Campbell County, Wyoming

Dear WDEQ:

EOG Resources, Inc. (EOG) is submitting the enclosed Chapter 6 Section 2 (C6 S2) air permit application in adherence to the Wyoming Department of Environmental Quality (WDEQ) Oil and Gas Production Facilities Permitting Guidance. The air permit application is being submitted for Ballista 202-1003H which is a new well.

Well Name	API Number	First Date of Production	Natural Gas Rate[1] (MMSCFD)	Crude Oil Rate[1] (BPD)
Ballista 202-1003H	49-005-61806	07/10/2014	0.731 [1]	390 [1]

[1] Based on 30 days production, after 0.6 decline factor.

The crude oil has an API gravity of 45.43 and is produced in five (5) storage tanks and hauled away by truck as necessary. The produced water is produced in two storage tanks and also hauled away as necessary. The tank vapors from both the crude and produced water tanks are routed to the smokeless Zeeco Tri-Tip Flare that has a vendor guaranteed destruction efficiency of 98%.

In the event the pipeline is shut-in and there is a need to flare the gas rather than put it into the pipeline, the gas from the fuel gas scrubber and the liquids off the treater will be sent into the emergency tank (ET) and then to the Tri-Tip Flare for control, instead of venting to atmosphere uncontrolled. An orifice plate has been installed to limit or slow the volume of gas flowing to the flare in the event of an upset. In addition, the tank has a high level controller to shut the well in and prevent tank overflows. We have included a very conservative 3,000 hours per year of flaring emissions in the calculations to account for planned shut-downs. The flare has a vendor guaranteed destruction efficiency of 98%.

The Ballista 202-1003H well is located in the SE/SE Quarter of Section 10, Township 41 North, Range 73 West, in Campbell County, Wyoming.

- Ballista 202-1003H - latitude 43.533897, longitude 105.607122

The signed original copy of the C6 S2 permit application is included as Attachment A. Attachments B and C contain a flow diagram/plot plan of the emissions unit and facility process description, while Attachment D contains the current production rates for the wells. Gas/oil analyses are contained in Attachment E,

and detailed emission calculations and supporting documentation are provided in Attachment F. Two additional copies of the C6 S2 application forms and attachments as discussed above are also included.

We trust the attached permit application package will meet your expectations and that you will not hesitate to call me at (303) 262-9914 or Jamie Christopher of SLR at (970) 999-3969 if you have any questions or need additional information. We appreciate your prompt attention to this most important project.

Sincerely,

Jason Rauen
EOG Environmental – Denver Division

cc: File – Well
Jamie Christopher, SLR

Attachments: As stated

SLR

Attachment A -Wyoming Permit Application Forms

WDEQ Form AQD-OG0

WDEQ Form AQD-OG00

WDEQ Form AQD-OG1

WDEQ Form AQD-OG2

WDEQ Form AQD-OG3

WDEQ Form AQD-OG6

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Oil & Gas Production Facilities C6 S2 Permit Application

Company Name: **EOG Resources Inc.**

Facility Name: **Ballista 202-1003H**

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DIVISION

To Be Completed by WDEQ-AQD

Reviewer _____

Copy to _____

Cynthia _____

D.E. _____

File: _____

Form AQD-OG0

Application March 2010

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division

Oil & Gas Production Facilities

Checklist for Complete Application

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INDUSTRY		DEQ-AQD
X	Company Name/Contact Information	
X	Well/Facility Name and API #	
X	Legal Locations	
X	Existing Permit/Waiver #'s	
X	List of Equipment Onsite	
X	Plot Plan	
X	Process Description	
X	Current Production Rates	
X	Gas/Condensate Analyses	
X	All Pertinent Dates (date of first production, control installation date)	
X	Emission Models (Input/Output)	
X	Other Calculations (heaters, pneumatic equipment, truck loading, etc.)	
X	All Applicable Application Forms	
X	DEQ Application Cover Sheet	
X	Facility Location **Specify:** STATEWIDE	
SCENARIO 1 SCENARIO 2 X	Dehydration Unit Presumptive BACT check appropriate box	SCENARIO 1 SCENARIO 2 NA

Form AQD-OG00

Completeness Checklist March 2010

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division
Oil and Gas Production Facilities C6 S2 Permit Application
Application Cover Sheet

OCT 2014 RECEIVED AIR QUALITY DIVISION

submit (1) one signed original copy AND (1) one electronic copy of the application OR (3) paper copies, one w/ original signature

Company Name **EOG Resources Inc.**

Facility Name **Ballista 202-1003H**

API Number **49-005-61806**

For more than one well, list additional wells & associated API numbers on Form AQD-OG8.

OFFICIAL CONTACT PERSON

Name **Jason Rauen** Title **Senior Environmental Specialist**

Address **600 17th Street, Suite 1000N, Denver, Colorado 80202**

Telephone **(303) 262-9914** Fax **(303) 262-9449** E-mail Jason_Rauen@eogresources.com

LOCATION

County **Campbell**

Legal Description 1/4 1/4 **SE/SE** Section **10** T **41N** R **73W**

Latitude **43° 32' 2.0292"** Longitude **105° 36' 25.6392"**

FACILITY INFORMATION

Type of Facility: Single Well ____ PAD **X** Central Tank Battery ____

Type of Application: New Construction **X** Modified Facility ____

First Date of Production **10-Jul-14** Date of Modification ____

Producing Field Name **Crossbow**

Producing Formation(s) **Niobrara**

Existing Air Quality Permit / Waiver Numbers **Not Applicable**

Pending Air Quality Permit Application Numbers **Not Applicable**

I, Jason Rauen Senior Environmental Specialist
Responsible Official **Title**

state that I have knowledge of the facts herein set forth and that the same are true and correct to the best of my knowledge and belief. I further certify that the emission rates listed on this certification reflect the anticipated emissions due to the operation of this facility. The facility will operate in compliance with all Wyoming Air Quality Standards and Regulations.

Signature ____ Signature Required **Date** 10/6/2014

FORM AQD-OG1

Application Coversheet March 2010

STATE OF WYOMING
Department of Environmental Quality - Air Quality Division
Oil and Gas Production Facilities C6 S2 Permit Application

Equipment List

Company Name **EOG Resources Inc.**

Facility Name **Ballista 202-1003H**

List all production equipment at the site including all pressurized vessels with the potential for flash emissions, all hydrocarbon liquids and produced water storage tanks, all dehydration units, all pneumatic pumps, all natural gas-fired burners and heaters and all emission control equipment and devices. Pressurized vessels with the potential for flash emissions are all vessels that vent vapors to the atmosphere during times other than upset or emergency conditions (water knockouts, 2-phase and 3-phase separators, heater treaters, gun barrels, scrubber pots, etc). Provide design ratings for dehys (MMCFD), process heaters, burners and pilots (MMBtu/hr, SCFH). Provide size of production & water storage tanks (BPD). For dehydration units indicate if the unit includes a glycol flash separator and/or reboiler still vent condenser. For emission control combustors/flares indicate design rating (MMBtu/hr, SCFD) and combustor/flare height (ft). Provide pneumatic pump motive gas useage (SCFH).

If more space is required, continue on page 2 of this sheet.

(1) Trace Line Heater 0.350 MMBtu/hr (Natco), S/N LL9F54901-02

(1) Treater w/ 0.750 MMBtu/hr (Baileys Welding & Machine), S/N 1051-4

(1) Vapor Recovery Tower (VRT) - RCH Industrial 27' X 24"OD, 125#WP S/N 14-15605, flashed gas from the VRT discharges into the Zeeco Tri-Tip Flare (Tri-Tip Flare).

(1) Truck Loading

(5) 400-bbl Kustom Koncepts Crude Oil Tanks (vent to Tri-Tip Flare)

(2) 400-bbl Kustom Koncepts Produced Water Tanks (vent to Tri-Tip Flare)

(1) Smokeless Zeeco Tri-Tip Flare, continuous pilot, S/N N/A (Tri-Tip Flare) for flashed gas from VRT emissions control and tanks installed prior to first date of production (07/10/2014)

(1) 400-bbl Kustom Koncepts Emergency Tank, installed prior to first date of production (07/10/2014)

(1) Sales Gas Scrubber - L&L Enterprices S/N 161, nonbleed dump controls

(1) Fuel Gas Scrubber - L&L Enterprices S/N n/a, nonbleed dump controls

(1) VRT Vent Line Combustor Scrubber - L&L Enterprises S/N 76 - nonbleed dump controls

(1) Tank Vent Line Combustor Scrubber - L&L Enterprises S/N 77 - nonbleed dump controls

(1) Pneumatic Trace Pump: (Vents to Tri-Tip Flare)

(1) Pneumatic Recycle Pump: (Vents to Tri-Tip Flare)

(1) Tank Vent Scrubber Pneumatic Pump (Vents to Tri-Tip Flare)

(1) VRT Scrubber Pneumatic Pump (Vents to Tri-Tip Flare)

Controllers are all Non-Bleed

Example:

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division
Oil and Gas Production Facilities C6 S2 Permit Application
Storage Tanks, Pressurized Vessels & Pneumatic Pumps

Use as many copies of this form as necessary to include all tanks, vessels and pumps.

Company Name EOG Resources Inc.

Facility Name Ballista 202-1003H

STORAGE TANKS

Below, list all atmospheric tanks used to store liquids transferred from an upstream vessel or wellhead. Upstream vessels include separators, treaters, flash tanks, FWKOs, gun barrels, tanks, etc. If more than one tank of the same size is used for the same purpose, receiving fluids from the same upstream vessel, those tanks may be combined on one line.

size (bbl)	use (condensate / oil / H_2O)	total throughput (bpd)	upstream vessel	upstream vessel pressure (psig)
5-400	oil	390	Heater Treater/VRT	125 / 250
2-400	Produced Water		Heater Treater/VRT	125 / 250
1-400	emergency tank		Heater Treater/VRT	125 / 250

PRESSURIZED VESSELS List each vessel separately.

Pressurized vessels include FWKO's, heater-treaters, separators (2-phase & 3-phase), gas boots, gun barrels, flash tanks, etc...

vessel	operating pressure (psig)	upstream vessel	upstream vessel pressure (psig)
Heater Treater	250	well head	
VRT	125	Heater Treater	

What is the API gravity of the SALES oil or condensate at this facility? 45.4

Does this facility handle sour oil / gas? YES ____ NO X

EMISSION CONTROL DEVICES & SYSTEMS for FLASH VAPORS & PRESSURE VESSEL PROCESS STREAMS

Identify each emission control system or device and the date(s) of installation for each.

All of the tanks are routed to the smokeless Tri-Tip Flare capable of 98% destruction efficiency.

Combustion Device Emission Controls (if applicable)

Date of Installation: Prior to first date of production (07/10/2014)

Manufacturer: Zeeco

Smokeless Design? Yes X No ____

Excess Oxygen (%): ____

VOC Destruction Effeciency (%): 98%

HAP Destruction Efficiency (%): 98%

Maximum Design Throughput (SCFD): ____

Minimum Design throughput (SCFD): ____

Actual Waste Gas Volume (SCFD): 2,253

Waste Gas Heat Content (Btu/SCF): 2,786

Burner Rating (MMBtu/hr): ____

Ignition System: Pilot X Electric Spark ____ Other ____

Continuous Pilot? Yes X No ____

Pilot Gas Volume (SCFM): 0.28

Is the Combustion Device Monitored? Yes X No ____ How? Infrared Sensor

PNEUMATIC PUMPS

Describe each pneumatic pump using natural gas as the motive gas. Indicate where motive gas is vented (atmosphere or other).

(1) Tank Vent Scrubber Pneumatic Pump (Vents to Tri-Tip Flare)
(1) VRT Scrubber Pneumatic Pump (Vents to Tri-Tip Flare)
(1) Pneumatic Heat Trace Pump (Vents to Tri-Tip Flare)
(1) Pneumatic Recycle Pump (Vents to Tri-Tip Flare)

Form AQD-OG3

STATE OF WYOMING

Department of Environmental Quality - Air Quality Division
Oil and Gas Production Facilities C6 S2 Permit Application

EMISSION SUMMARY

Company Name EOG Resources Inc.

Facility Name Ballista 202-1003H

This form must be completed for each emission source at the facility. A list of the emission sources which must be considered is found in Appendix B of the C6 S2 O&G Production Facilities Permitting Guidance.

UNCONTROLLED EMISSIONS (Tons Per Year)

These are the total uncontrolled, potential emissions from each source.

	EMISSION SOURCE (i.e., tank, natural gas-fired heater, reboiler still vent, glycol flash separator, pneumatic pump, separator gas vent, water knockout vent, etc.)	VOCs	total HAPs	NO_X	CO	SO_2	H_2S
Ballista 202-1003H	Crude Oil Tanks	46.05	1.50				
	Produced Water Tanks	0.34	0.01				
	Tri-Tip Flare - Tanks	note a	note a	0.09	0.50	0.00	
	Vapor Recovery Tower	413.60	15.38				
	Tri-Tip Flare - VRT	note b	note b	0.72	3.90	0.00	
	Process Heaters	0.02	0.01	0.38	0.16	0.00	
	Pneumatic Pumps	6.94	0.13				
	Truck Loading	5.18	0.25				
	Fugitives	1.78	0.09				
	Treater Gas Flare	967.95	17.57	10.23	55.67	0.07	
	Total	1,445.3	35.0	11.4	60.2	0.08	0.00

Note a: The VOC and HAP emissions from the Tri Tip Flare are accounted for in the crude oil and produced water tanks.

Note b: The VOC and HAP emissions from the flashing occuring in the VRT that are sent to the Tri Tip Flare are accounted for in the VRT. The vapors are currently sent to the Tri Tip Flare that has a vendor guaranteed destruction efficiency of 98% or higher. VRT emissions are presented separate from tank emissions to show where the emissions are coming from.

CONTROLLED EMISSIONS (Tons Per Year)

These are the total emissions from each source. Include controlled emissions from each controlled source and uncontrolled emissions from each source which does not require control, such as process equipment burners.

	EMISSION SOURCE	VOCs	total HAPs	NO_X	CO	SO_2	H_2S
Ballista 202-1003H	Crude Oil Tanks	0.92	0.03				
	Produced Water Tanks	0.01	0.00				
	Tri-Tip Flare - Tanks	note c	note c	0.09	0.50	0.00	
	Vapor Recovery Tower	8.27	0.31				
	Tri-Tip Flare - VRT	note d	note d	0.72	3.90	0.00	
	Process Heaters	0.02	0.01	0.38	0.16	0.00	
	Pneumatic Pumps	0.14	0.00				
	Truck Loading	5.18	0.25				
	Fugitives	1.78	0.09				
	Treater Gas Flare	19.36	0.35	10.23	55.67	0.07	
	Total	35.7	1.04	11.4	60.2	0.08	0.00

Note c: The VOC and HAP emissions from the Tri Tip Flare are accounted for in the crude oil and produced water tanks.

Note d: The VOC and HAP emissions from the flashing occuring in the VRT that are sent to the Tri Tip Flare are accounted for in the VRT. The vapors are currently sent to the Tri Tip Flare that has a vendor guaranteed destruction efficiency of 98% or higher. VRT emissions are presented separate from tank emissions to show where the emissions are coming from.

HAZARDOUS AIR POLLUTANT SUMMARY (Tons Per Year)

Complete this section for each emissions source if TOTAL HAPs from that source are 9 TPY or greater.

SOURCE	Benzene	Toluene	Ethyl-Benzene	Xylenes	Other
Not Applicable - HAP Emissions < 9 TPY					

Form AQD-OG6

Emission Summary March 2010

SLR

Attachment B - Flow Diagram and Plot Plan of Emission Units and/or Facility

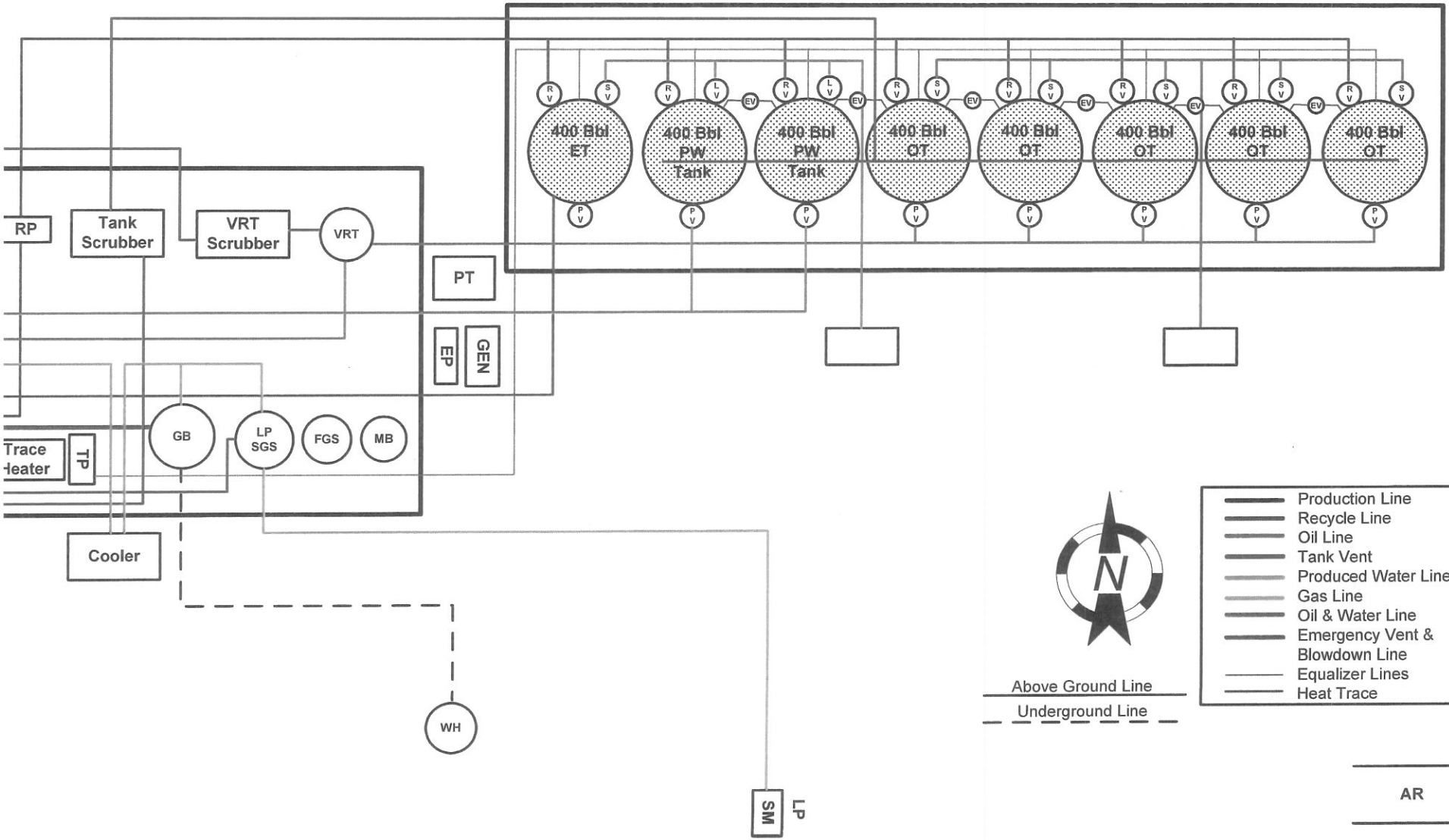
esources
ility Diagram

Well Name: Ballista 202-1003H
1/4 1/4: SE/SE Sec: 10 T: 41N R: 73W
Latitude: 43.533897 Longitude: -105.607122
County: Campbell State: WY
Lease: WYW145545 Unit :
CA: TBD PA:
Type of well: Oil

EOG Resources, Inc. site facility diagrams & site security plans are available electronically at all EOG Resources,Inc. offices. Normal business hours are 7:00am to 4:30pm MST.

Revised: 09/04/2014

Valve	Production Phase	Sales Phase	Water Drain
PV	SO	SC	SC
SV	SC	SO	SC
EV	SO	SC	SC
LV	SC	SO	SC
RV	SC	SC	SC



Abl

AM= A
AR = A
CHP =
CHT =
COM =
COMP
COMT
CONT
CP = C
CT = C
DH = D
DL = D
EP = E
ET = E
EV = E
FE = F
FGS =
FT = F
FW = F
FWKO
GB = G
GEN =
LACT =
LH = L
LP = L
LV = L
MAN =
MB = M
MBT =
MP = M
OT = O
PIGL =
PIGR =
PL = P
POC =
PP = P
PRT =
PT = P
PU = P
PV = P
PW = P
RL = R
RP = R
RV = R
SC = S
SGS =
SL = S
SM = S
SO = S
SP = S
SUMP
SV = S
TM = T
TP = T
TRFP =
TT = T
VM = V
VRT =
UNP =
WDP =
WD = V
WFP =
WH = V

SLR

Attachment C - Process Description

Process Description
Ballista 202-1003H Oil & Gas Production Facility

Ballista 202-1003H is an oil and gas production facility located in Converse County, Wyoming that currently receives production from one well (Ballista 202-1003H). The well produces both crude oil and natural gas. The facility consists of the following sources of emissions:

- Five (5) Crude Oil Storage Tanks (400 bbl capacity each);
- Two (2) Produced Water Storage Tanks (400 bbl capacity);
- One (1) Smokeless Zeeco Tri-Tip Flare (Tri-Tip Flare);
- Truck Loading Operation;
- One (1) Treater (0.750 MMBtu/hr burner capacity);
- One (1) Trace Line Heater (0.350 MMBtu/hr burner capacity);
- One (1) Vapor Recovery Tower (VRT);
- One (1) Pneumatic Trace Pump (controlled via Tri-Tip Flare);
- One (1) Pneumatic Recycle Pump (controlled via Tri-Tip Flare);
- Two (2) Pneumatic Scrubber Pumps (controlled via Tri-Tip Flare);
- Fugitive Components; and
- One (1) Emergency Tank (400 bbl capacity).

The crude oil has an API gravity of 45.4 and is produced in five storage tanks and hauled away by truck as necessary. The produced water is produced in two storage tanks and also hauled away as necessary. The tank vapors from the well's crude and produced water tanks are controlled and routed to the smokeless Zeeco Tri-Tip Flare (Tri-Tip Flare) that has a vendor guaranteed destruction efficiency of 98%.

Production from the well flows to the heater treater where liquids are separated and the water is sent to the produced water tanks and the oil is sent to the vapor recovery tower (VRT). Oil from the VRT is sent to the five (5) production oil tanks, and the flashed gas from the VRT and tanks is sent to the Tri-Tip Flare. All of the controllers are non-bleed.

In the event the pipeline is shut-in and there is a need to vent the gas rather than put it into the pipeline, the gas from the fuel gas scrubber and the liquids off the treater will be sent into the emergency tank (ET) and then to the Tri-Tip Flare for control, instead of venting to atmosphere uncontrolled. An orifice plate has been installed to limit or slow the volume of gas flowing to the flare in the event of an upset. In addition, the tank has a high level controller to shut the well in and prevent tank overflows. We have included a very conservative 3,000 hours per year of flaring emissions in the calculations to account for planned shut-downs. The flare has a vendor guaranteed destruction efficiency of 98%.

The Ballista 202-1003H well is located in the SE/SE Quarter of Section 10, Township 41 North, Range 73 West, in Campbell County, Wyoming.

- Ballista 202-1003H - latitude 43.533897, longitude 105.607122

SLR

Attachment D - Current Production Rates

Ballista 202-1003H

Date	Oil Prod (bbls)	Gas Prod (mcfd)	Water Prod (bbls)
9/3/2014	0	0	0
9/2/2014	0	0	0
9/1/2014	0	0	0
8/31/2014	0	0	0
8/30/2014	0	0	0
8/29/2014	0	0	0
8/28/2014	0	0	0
8/27/2014	0	0	0
8/26/2014	3	0	0
8/25/2014	10	32	7
8/24/2014	265	749	73
8/23/2014	259	759	67
8/22/2014	261	784	70
8/21/2014	282	771	67
8/20/2014	263	824	83
8/19/2014	257	735	70
8/18/2014	269	738	80
8/17/2014	293	801	86
8/16/2014	278	808	75
8/15/2014	277	814	130
8/14/2014	276	822	87
8/13/2014	290	940	90
8/12/2014	289	873	97
8/11/2014	659	907	110
8/10/2014	307	941	107
8/9/2014	293	953	107
8/8/2014	311	946	110
8/7/2014	309	921	110
8/6/2014	326	1073	137
8/5/2014	351	953	107
8/4/2014	312	965	113
8/3/2014	339	869	106
8/2/2014	333	911	133
8/1/2014	311	1186	136
7/31/2014	369	1073	172
7/30/2014	364	929	186
7/29/2014	365	1068	180
7/28/2014	378	1149	143
7/27/2014	388	1071	167
7/26/2014	417	1090	193
7/25/2014	389	1233	247
7/24/2014	427	1314	213
7/23/2014	419	1531	217
7/22/2014	593	1711	235

Ballista 202-1003H

Date	Oil Prod (bbls)	Gas Prod (mcfd)	Water Prod (bbls)
7/21/2014	569	1498	317
7/20/2014	598	1441	296
7/19/2014	1508	1327	281
7/18/2014	873	1417	267
7/17/2014	1625	1606	299
7/16/2014	1196	1794	276
7/15/2014	1475	2032	287
7/14/2014	1634	1988	250
7/13/2014	1017	1327	142
7/12/2014	675	1043	115
7/11/2014	925	665	204
7/10/2014	237	400	262
Totals	**23,864.0**	**49,782.0**	**7,307.0**
Daily AVG	**426.1**	**889.0**	**130.5**
Daily MAX	**1,634.0**	**2,032.0**	**317.0**

First 30 Days	Oil Prod (BPD)	Gas Sales (MMscfd)	Water Prod (BPD)
Daily AVG	634.4	1.218	196.7
0.6 Decline Factor	380.7	0.731	118.0

Last 30 days 8/24 - 7/26	Oil Prod (BPD)	Gas Sales (MMscfd)	Water Prod (BPD)
Daily AVG	323.0	0.914	62.3
0.6 Decline Factor	193.8	0.548	

Last 30 day Max	**659.0**	**1,186.0**	**193.0**

SLR

Attachment E - Oil and Gas Analyses

PRECISION ANALYSIS
GAS MEASUREMENT EMISSIONS TESTING LABORATORY
307.856.0866
www.precision-labs.com

EXTENDED HYDROCARBON LIQUID STUDY
CERTIFICATE OF ANALYSIS

Company:	**EOG Resources Podwer River Basin**	Sample Name:	**Ballista 202-1003H**
Date Sampled:	7/10/2014	Sample Number:	14071101-03
Sample Location:	Wyoming	Date Tested:	7/11/2014
Sample Pressure:	800 PSI	Test Method:	GPA 2186M
Sample Temperature:	70 DEG F		
County:	Campbell	Date Reported:	7/11/2014
Sampling Method:	GPA 2174	Note: Due to the nature of H2S, the values of H2S reported may be lower than actual.	
Type Sample:	SPOT		

Components	Mole %	Weight %	Liq. Vol. %
Hydrogen Sulfide	0.0000	0.000	0.000
Oxygen	0.0000	0.000	0.000
Carbon Dioxide	0.1359	0.047	0.040
Nitrogen	0.0086	0.002	0.002
Methane	6.9374	0.867	2.023
Ethane	8.2895	1.942	3.814
Propane	10.8439	3.726	5.140
iso-Butane	2.0816	0.943	1.172
n-Butane	6.5227	2.954	3.538
iso-Pentane	2.9914	1.682	1.882
n-Pentane	4.2267	2.376	2.636
Hexanes	3.0790	2.067	2.178
Heptanes	7.1129	5.553	5.646
Octanes	5.9512	5.297	5.245
Nonanes	2.4196	2.418	2.343
Decanes+	32.8131	65.373	59.953
Benzene	0.3200	0.195	0.154
Toluene	1.6677	1.197	0.960
Ethylbenzene	0.1226	0.101	0.081
Xylenes	1.1217	0.928	0.750
n-Hexane	2.9872	2.006	2.113
2,2,4-Trimethylpentane	0.3674	0.327	0.328
Totals	100.000	100.000	100.000

EXTENDED ANALYSIS DATA

Components	Mole %	Weight %	Liq. Vol. %
Hydrogen Sulfide	0.0000	0.000	0.000
Carbon Dioxide	0.1359	0.047	0.041
Nitrogen	0.0086	0.002	0.002
Methane	6.9374	0.868	2.054
Ethane	8.2895	1.943	3.871
Propane	10.8439	3.728	5.217
iso-Butane	2.0816	0.943	1.189
n-Butane	6.5227	2.956	3.591
iso-Pentane	2.9914	1.683	1.910
n-Pentane	4.2267	2.378	2.675
Hexanes	3.0790	2.069	2.211
Heptanes	7.1129	5.557	5.730
Octanes	5.9512	5.300	5.324
Nonanes	2.4196	2.419	2.378
Decanes	2.9784	3.304	3.192
Benzene	0.3200	0.195	0.156
Toluene	1.6677	1.198	0.975
Ethylbenzene	0.1226	0.101	0.083
Xylenes	1.1217	0.928	0.761
n-Hexane	2.9872	2.007	2.145
2,2,4-Trimethylpentane	0.3674	0.327	0.333
Undecanes(C11)	2.0973	2.556	2.436
Dodecanes(C12)	2.1535	2.860	2.694
Tridecanes(C13)	2.4613	3.538	3.301
Tetradecanes(C14)	1.9838	3.068	2.837
Pentadecanes(C15)	2.1655	3.586	3.295
Hexadecanes(C16)	2.1235	3.749	3.396
Heptadecanes(C17)	1.7899	3.356	3.012
Octadecanes(C18)	1.6272	3.229	2.878
Nonadecanes(C19)	1.1564	2.421	2.123
Eicosanes (C20)	1.7915	3.946	3.552
Heneicosanes (C21)	1.4530	3.360	3.011
Docosanes (C22)	1.0938	2.649	2.416
Tricosanes (C23)	0.9409	2.381	2.121
Tetracosanes (C24)	0.6604	1.744	1.553
Pentacosanes (C25)	1.0533	2.896	2.566
Hexacosanes (C26)	0.6665	1.905	1.738
Heptacosanes (C27)	0.9211	2.734	2.488
Octacosanes (C28)	0.8950	2.755	2.423
Nonacosanes (C29)	0.6810	2.171	1.907
Triacosanes (C30)	0.6894	2.273	1.991
Hentriacontane Plus (C31+)	1.4303	4.871	4.427
Totals	100.000	100.000	100.000

ADDITIONAL BTEX DATA

Components	Mole %	Weight %	Liq. Vol. %
2-Methylpentane	2.201	1.478	1.558
3-Methylpentane	0.878	0.589	0.621
n-Hexane	2.987	2.006	2.113
2,2,4-Trimethylpentane	0.367	0.327	0.328
Benzene	0.320	0.195	0.154
Toluene	1.668	1.197	0.960
Ethylbenzene	0.123	0.101	0.081
m-Xylene	0.129	0.107	0.086
p-Xylene	0.802	0.663	0.536
o-Xylene	0.191	0.158	0.127

RELATIVE SPECIFIC GRAVITY OF DECANES+ (C10+) FRACTION, calculated	**0.76298**
AVERAGE MOLECULAR WEIGHT	**128.265**
AVERAGE MOLECULAR WEIGHT OF DECANES+ (C10+) FRACTION, calculated	**255.695**
TRUE VAPOR PRESSURE AT 100 F, PSIA, calculated	**440.296**
AVERAGE BOILING POINT, F, calculated	**261.402**
CUBIC FEET OF GAS / GALLON OF LIQUID, as Ideal Gas, calculated	**21.382**
BTU / GALLON OF LIQUID AT 14.73 PSIA, calculated	**117,206.35**
LBS / GALLON OF LIQUID, calculated	**5.834**

NOTATION: ALL CALCULATIONS PERFORMED USING PHYSICAL CONSTANTS FROM GPA 2145-09, THE TABLES OF PHYSICAL CONSTANTS FOR HYDROCARBONS AND OTHER COMPOUNDS OF INTEREST TO THE NATURAL GAS INDUSTRY.

FLASHED CRUDE OIL LIQUID STUDIES
CERTIFICATE OF ANALYSIS

Sample Name: **Ballista 202-1003H**
Sample Number: 14071107-03

TEST PERFORMED	RESULTS	DATE TESTED
API GRAVITY AT 60/60 F, (ASTM D-7777), calculated from SG	46.5	7/10/2014
SPECIFIC GRAVITY AT 60/60 F (ASTM D-7777), measured	0.7949	7/10/2014
API GRAVITY AT 100/100 F, (ASTM D-7777), calculated from SG	45.4	7/11/2014
SPECIFIC GRAVITY AT 100/100 F (ASTM D-7777), measured	0.8001	7/11/2014
REID VAPOR PRESSURE (ASTM D5191), PSIG AT 100 F, measured	5.40	7/11/2014
BOTTOM SEDIMENT & WATER (ASTM D-4007), weight %, measured	<0.025	7/11/2014
CLOUD POINT (ASTM D-97), deg C, measured	-25.0	7/11/2014
POUR POINT (ASTM D-97), deg C, measured	1.0	7/11/2014
SULFUR CONTENT BY XRAY (ASTM D-4294), weight %, measured	0.0007	7/11/2014
PARAFFIN CONTENT (UOP-46), weight %, measured	16.494	7/11/2014
EOG GRINDOUT (EOG METHOD), volume %, measured	5.500	7/11/2014
KINEMATIC VISCOSITY AT 100 F (ASTM D-445),	<32.0	7/14/2014
KINEMATIC VISCOSITY AT 120 F (ASTM D-445),	<32.0	7/14/2014
ASPHALTENES (ASTM D-3279), weight %, CL	<0.1	7/16/2014

PRECISION ANALYSIS
GAS MEASUREMENT EMISSIONS TESTING LABORATORY
307.856.0866
www.precision-labs.com

ASTM D86 Distillation
Certificate of Analysis

Date Tested:	7/24/2014	Qualifiers:
	% Recovery	DEG C @ 300mm Hg
	Intial Boiling Point	42
	5	81
	10	95
	20	109
	30	129
	40	151
	50	182
	60	216
	70	259
	80	300
	Final Boiling Point	N/A
	Volume % Recovery	80
	Volume % Residue	18
	Volume % Loss	2

Comments: Residue and loss observed
Temperatures are uncorrected for barometric pressure

PRECISION ANALYSIS

GAS MEASUREMENT EMISSIONS TESTING LABORATORY

307.856.0866
www.precision-labs.com

Client:	EOG Resources-Powder River Basin	**Analysis Date:**	7/14/2014
Sample ID:	Ballista 202-1003H	**Date Sampled:**	7-10-14
Unique #:	NI	**Purpose:**	NI
Sample Temperature:	70 DEG F	**Sample Pressure:**	1000 PSI
Sampled By:	A. McKerchie	**Type Sample:**	Spot
County:	Campbell		

Components	Mole %	Weight %	Liq. Vol. %
Carbon Dioxide.....	1.1464	2.532	1.045
Hydrogen Sulfide.....	0.0000	0.000	0.000
Nitrogen.....	0.4718	0.663	0.277
Methane.....	81.7060	65.785	74.015
Ethane.....	10.9453	16.517	15.641
Propane.....	3.9562	8.755	5.824
iso-Butane.....	0.3521	1.027	0.616
n-Butane.....	0.8706	2.540	1.467
iso-Pentane.....	0.1624	0.588	0.317
n-Pentane.....	0.1869	0.677	0.362
Cyclopentane.....	0.0100	0.035	0.016
n-Hexane.....	0.0410	0.177	0.090
Cyclohexane.....	0.0187	0.079	0.034
Other Hexanes	0.0497	0.215	0.109
Heptanes.....	0.0346	0.174	0.085
Methylcyclohexane.....	0.0158	0.078	0.034
2,2,4-Trimethylpentane...	0.0000	0.000	0.000
Benzene.....	0.0108	0.042	0.016
Toluene.....	0.0078	0.036	0.014
Ethylbenzene.....	0.0002	0.001	0.000
Xylenes.....	0.0012	0.007	0.003
C8+ Heavies.....	0.0125	0.071	0.034
Totals	100.000	100.000	100.000

ADDITIONAL BETX DATA

Components	Mole %	Weight %	Liq. Vol. %
Cyclopentane	0.0100	0.035	0.016
Cyclohexane	0.0187	0.079	0.034
2-Methylpentane	0.0313	0.135	0.069
3-Methylpentane	0.0184	0.080	0.040
n-Hexane	0.0410	0.177	0.090
Methylcyclohexane	0.0158	0.078	0.034
2,2,4-Trimethylpentane	0.0000	0.000	0.000
Benzene	0.0108	0.042	0.016
Toluene	0.0078	0.036	0.014
Ethylbenzene	0.0002	0.001	0.000
m-Xylene	0.0002	0.001	0.000
p-Xylene	0.0008	0.004	0.002
o-Xylene	0.0002	0.001	0.000

SPECIFIC GRAVITY @ 60/60 F, calculated	0.6880
TOTAL GPM (Ethane Inclusive)	4.603
CALCULATED BTU / REAL CF @ 14.73 PSIA, dry basis	1188.299
CALCULATED BTU / REAL CF @ 14.73 PSIA, wet basis	1168.384
AVERAGE MOLECULAR WEIGHT	19.925
MOLAR MASS RATIO	0.6880
RELATIVE DENSITY (G x Z (Air) / Z), calculated	0.6901
IDEAL GROSS HEATING VALUE, BTU / IDEAL CF @ 14.696 PSIA	1181.824
COMPRESSIBILITY FACTOR (Z)	0.99684

PROPANE GPM	1.0871
BUTANE GPM	0.3887
GASOLINE GPM (PENTANE AND HEAVIER)	0.2079

TOTAL ACID GAS MOLE %	1.1464
H2S MOLE %	0.0000
H2S PPM	0

VOC WEIGHT FRACTION	0.145

NOTATION: ALL CALCULATIONS PERFORMED USING PHYSICAL CONSTANTS FROM GPA 2145-09, THE TABLES OF PHYSICAL CONSTANTS FOR HYDROCARBONS AND OTHER COMPOUNDS OF INTEREST TO THE NATURAL GAS INDUSTRY.

Sample ID No.:	14071101-03
Sample Description:	Ballista 202-1003H
Sample Date:	7/10/2014
Laboratory:	Precision Analysis

Component	yi (Mol %) [1]	(Wt %)
Hydrogen Sulfide	0.0000	0.0000
Oxygen	0.0000	0.0000
Carbon Dioxide	0.1359	0.0470
Nitrogen	0.0086	0.0020
Methane	6.9374	0.8670
Ethane	8.2895	1.9420
Propane	10.8439	3.7260
Isobutane	2.0816	0.9430
n-Butane	6.5227	2.9540
Isopentane	2.9914	1.6820
n-Pentane	4.2267	2.3760
Cyclopentane (n-C5)	0.0000	0.0000
Cyclohexanes	0.0000	0.0000
Methylcyclohexane	0.0000	0.0000
Other Hexanes	3.0790	2.0670
Other Heptanes	7.1129	5.5530
Octanes	5.9512	5.2970
Nonanes	2.4196	2.4180
Decanes Plus	32.8131	65.3730
Benzene	0.3200	0.1950
Toluene	1.6677	1.1970
Ethylbenzene	0.1226	0.1010
Xylenes (Total)	1.1217	0.9280
n-Hexane	2.9872	2.0060
2,2,4-TMP	0.3674	0.3270
Total	100.00	100.00

Sample Temperature	70	°F
Sample Pressure	80	psig
Molecular Weight	128.2650	lb/lb-mol
Specific Gravity	0.7630	
API Gravity	45.4	
RVP	5.40	psig

Sample ID No.:	Ballista 202-1003H
Sample Description:	Ballista 202-1003H
Sample Date:	7/10/2014
Laboratory:	Precision Analysis

Component	MWi	yi (Mol %) [1]	yi (MolFrac)	yiMWi	lbi/lb (WtFrac)	(Wt %)
Oxygen	32	0.0000	0.0000	0.0000	0.0000	0.00
Nitrogen	28.01	0.4718	0.0047	0.1322	0.0066	0.66
Carbon Dioxide	44.01	1.1464	0.0115	0.5045	0.0253	2.53
Hydrogen Sulfide	34.8	0.0000	0.0000	0.0000	0.0000	0.00
Methane	16.041	81.7060	0.8171	13.1065	0.6579	65.79
Ethane	30.063	10.9453	0.1095	3.2905	0.1652	16.52
Propane	44.092	3.9562	0.0396	1.7444	0.0876	8.76
Isobutane	58.118	0.3521	0.0035	0.2046	0.0103	1.03
n-Butane	58.118	0.8706	0.0087	0.5060	0.0254	2.54
Isopentane	72.114	0.1624	0.0016	0.1171	0.0059	0.59
n-Pentane	72.114	0.1869	0.0019	0.1348	0.0068	0.68
Cyclopentane	70.13	0.0100	0.0001	0.0070	0.0004	0.04
Cyclohexane	84.16	0.0187	0.0002	0.0157	0.0008	0.08
2,2-Dimethylbutane	86.18	0.0000	0.0000	0.0000	0.0000	0.00
2,3-Dimethylbutane	86.18	0.0000	0.0000	0.0000	0.0000	0.00
2-Methyl Pentane	86.18	0.0000	0.0000	0.0000	0.0000	0.00
3-Methyl Pentane	86.18	0.0000	0.0000	0.0000	0.0000	0.00
Other Hexanes	86.18	0.0497	0.0005	0.0428	0.0021	0.21
Methycyclohexane	98.19	0.0158	0.0002	0.0155	0.0008	0.08
Heptanes	100.21	0.0346	0.0003	0.0347	0.0017	0.17
Octanes + Heavies	114.23	0.0125	0.0001	0.0143	0.0007	0.07
Nonanes	128.26	0.0000	0.0000	0.0000	0.0000	0.00
Decanes Plus	142.29	0.0000	0.0000	0.0000	0.0000	0.00
n-Hexane	**86.17**	0.0410	0.0004	0.0353	0.0018	0.18
Benzene	**78.12**	0.0108	0.0001	0.0084	0.0004	0.04
Toluene	**92.15**	0.0078	0.0001	0.0072	0.0004	0.04
Ethylbenzene	**106.17**	0.0002	0.0000	0.0002	0.0000	0.00
Xylenes (Total)	**106.17**	0.0012	0.0000	0.0013	0.0001	0.01
2,2,4-TMP	**114.23**	0.0000	0.0000	0.0000	0.000000	0.00
	Total	100.00	1.00		1.00	100.00
	Total Hydrocarbon (HC)		0.9838		0.9680	
	Total VOC (C3+)		0.0573		**0.1450**	
	Total HAP		0.0006		**0.0026**	
			Total MW	**19.92 lb/lb-mol**		

Lower Heating Value (dry)	**1,073 Btu/scf**
Lower Heating Value (dry)	20,540 Btu/lbm
Higher Heating Value (dry)	**1,185 Btu/scf**
Higher Heating Value (dry)	22,681 Btu/lbm

EOG Resources, Inc. - Ballista 202-1003H Facility Fuel Gas Data

FUEL COMPONENT	MOLE FRAC	COMP MOLES CARB	MOLES CARBON	COMP MOLE HYD	MOLE HYD	COMP LHV (BTU/SCF)	LHV (BTU/SCF)	COMP HHV (BTU/SCF)	HHV (BTU/SCF)	COMP MW (LBM/LBMOLE)	MASS FRAC (LBM/LBMOLE FUEL)
methane	0.81706	1	0.81706	4	3.26824	911.45	744.709337	1012.32	827.1261792	16.032	13.09910592
ethane	0.10945	2	0.218906	6	0.656718	1622.1	177.5437113	1773.42	194.1061393	30.048	3.288843744
propane	0.03956	3	0.118686	8	0.316496	2322.01	91.86335962	2523.82	99.84736684	44.064	1.743259968
i-butane	0.00352	4	0.014084	10	0.03521	3008.96	10.59454816	3261.17	11.48257957	58.08	0.20449968
n-butane	0.00871	4	0.034824	10	0.08706	3018.48	26.27888688	3270.69	28.47462714	58.08	0.50564448
i-pentane	0.00162	5	0.00812	12	0.019488	3708.01	6.02180824	4010.71	6.51339304	72.096	0.117083904
n-pentane	0.00187	5	0.009345	12	0.022428	3717.15	6.94735335	4019.65	7.51272585	72.096	0.134747424
hexane	0.00202	6	0.012138	14	0.028322	4415.23	8.93201029	4768.27	9.64621021	86.172	0.174325956
co2	0.01146									44	0.504416
n2	0.00472									28	0.132104
		-	1.233163		4.433962		1072.891015		1184.709221		
											19.90403108
	1.0000										

Specific Gravity	0.687
Lower Heating Value (BTU/scf)	1073
Lower Heating Value (BTU/lbm)	20540
Higher Heating Value (BTU/scf)	1185
Higher Heating Value (BTU/lbm)	22681

	Moles	Mass	Mass Frac
Carbon	1.244627	14.94797	0.750537
Hydrogen	4.433962	4.469434	0.22441
Oxygen	0.022928	0.366848	0.018419
Nitrogen	0.009436	0.132104	0.006633
		19.91636	

METHOD 19 FUEL FACTORS

Fd (Equations in Method 19, LHV)	9531
Fc (Equations in Method 19, LHV)	1173
Fd (Equations in Method 19, HHV)	8631
Fc (Equations in Method 19, HHV)	1062

SLR

Attachment F - Emissions Calculations and Supporting Documentation (ProMax® Model Runs)

Table A-1 **EOG Resources, Inc. - Ballista 202-1003H Oil & Gas Production Facility**
Estimated Potential Criteria & HAP Pollutant Emissions per Source

			Uncontrolled					
			Annual Criteria Emission Rates					Total
	ID	Emission Unit	NO_x	CO	VOC	SO_2	PM_{10}	HAPS
Ballista 202-1003H	1	Crude Oil Tanks			46.1 tpy			1.50 tpy
	2	Produced Water Tanks			0.34 tpy			0.01 tpy
	3	Zeeco Tri-Tip Flare [1]	0.09 tpy	0.50 tpy		0.000 tpy	0.01 tpy	
	4	Vapor Recovery Tower			413.6 tpy			15.38 tpy
	5	Zeeco Tri-Tip Flare [2]	0.72 tpy	3.90 tpy		0.002 tpy	0.10 tpy	
	6	Line Heater	0.12 tpy	0.05 tpy	0.01 tpy	0.001 tpy	0.01 tpy	0.008 tpy
	7	Heater Treater	0.26 tpy	0.11 tpy	0.02 tpy	0.002 tpy	0.02 tpy	
	8	Pneumatic Pumps			6.9 tpy			0.13 tpy
	9	Truck Loading			5.18 tpy			0.25 tpy
	10	Fugitive Components			1.78 tpy			0.09 tpy
	11	Treater Gas Flare Emissions	10.23 tpy	55.67 tpy	967.9 tpy	0.073 tpy	3.36 tpy	17.6 tpy
		Totals	**11.4 tpy**	**60.2 tpy**	**1,445.3 tpy**	**0.08 tpy**	**3.5 tpy**	**35.0 tpy**

The VOC and HAP emissions from the Tri Tip Flare are accounted for in the crude oil and produced water tanks.
The VOC and HAP emissions from the flashing occuring in the VRT that are sent to the Tri Tip Flare are accounted for in the VRT. The vapors are currently sent to the Tri Tip Flare that has a vendor guaranteed destruction efficiency of 98% or higher. VRT emissions are presented separate from tank emissions to show where the emissions are coming from.

			Controlled					
			Annual Criteria Emission Rates					Total
	ID	Emission Unit	NO_x	CO	VOC	SO_2	PM_{10}	HAPs
Ballista 202-1003H	1	Crude Oil Tanks			0.92 tpy			0.03 tpy
	2	Produced Water Tanks			0.01 tpy			0.00 tpy
	3	Zeeco Tri-Tip Flare [3]	0.09 tpy	0.50 tpy		0.000 tpy	0.01 tpy	
	4	Vapor Recovery Tower			8.27 tpy			0.31 tpy
	5	Zeeco Tri-Tip Flare [4]	0.72 tpy	3.90 tpy		0.002 tpy	0.10 tpy	
	6	Line Heater	0.12 tpy	0.05 tpy	0.01 tpy	0.001 tpy	0.01 tpy	0.008 tpy
	7	Heater Treater	0.26 tpy	0.11 tpy	0.02 tpy	0.002 tpy	0.02 tpy	
	8	Pneumatic Pumps			0.14 tpy			0.00 tpy
	9	Truck Loading			5.18 tpy			0.25 tpy
	10	Fugitive Components			1.78 tpy			0.09 tpy
	11	Treater Gas Flare Emissions	10.23 tpy	55.67 tpy	19.36 tpy	0.073 tpy	3.36 tpy	0.35 tpy
		Totals	**11.4 tpy**	**60.2 tpy**	**35.7 tpy**	**0.08 tpy**	**3.5 tpy**	**1.04 tpy**

The VOC and HAP emissions from the Tri Tip Flare are accounted for in the crude oil and produced water tanks.
The VOC and HAP emissions from the flashing occuring in the VRT that are sent to the Tri Tip Flare are accounted for in the VRT. The vapors are currently sent to the Tri Tip Flare that has a vendor guaranteed destruction efficiency of 98% or higher. VRT emissions are presented separate from tank emissions to show where the emissions are coming from.

Table A-2 EOG Resources, Inc. - Ballista 202-1003H Oil & Gas Production Facility
Tri-Tip Flare Emission Calculations
Tri-Tip Flare for Crude Oil & Produce Water Tanks

Emission Source:	Crude & PW Tanks
Source Type:	Tri-Tip Flare
Heat Input:	0.31 MMBtu/hr
Tank Vent Gas Flowrate:	93.9 scf/hr
Tank Vent Gas Flowrate:	0.82 MMscf/yr
Pilot Gas Flowrate:	16.8 scf/hr
Pilot Gas Flowrate:	0.15 MMscf/yr
Total Flowrate to Combustor Including Pilot:	0.97 MMscf/yr
Estimated HHV:	2,786 Btu/scf
Total VOC Destruction Efficiency:	98%
Sulfur Content of Fuel:	0.0020 gr/scf
Operating Hours per Year:	8,760 hr/yr

Pollutant	Emission Factors or Uncontrolled Emissions [a]	Emissions - Controlled	
		lb/hr [b], [c]	tpy [d]
NO_x	0.068 lb/MMBtu	0.021	0.09
CO	0.370 lb/MMBtu	0.114	0.50
VOC - Crude	46.05 tpy uncontrolled [e]	0.210	0.92
VOC - PW	0.338 tpy uncontrolled [e]	0.002	0.007
SO_2	0.00020 lb/MMBtu	0.0001	0.0003
PM_{10}	40.0 µg/L	0.002	0.0109
$PM_{2.5}$	40.0 µg/L	0.002	0.0109
Benzene-Crude	0.107 tpy uncontrolled [e]	0.0005	0.0021
Benzene-PW	0.003 tpy uncontrolled [e]	0.00001	0.0001
Toluene-Crude	0.205 tpy uncontrolled [e]	0.0009	0.0041
Toluene-PW	0.005 tpy uncontrolled [e]	0.00002	0.0001
Ethylbenzene-Crude	0.006 tpy uncontrolled [e]	0.0000	0.0001
Ethylbenzene-PW	0.00015 tpy uncontrolled [e]	0.000001	0.0000
Xylenes-Crude	0.047 tpy uncontrolled [e]	0.0002	0.0009
Xylenes-PW	0.0011 tpy uncontrolled [e]	0.000005	0.0000
n-Hexane-Crude	1.065 tpy uncontrolled [e]	0.0049	0.0213
n-Hexane-PW	0.002 tpy uncontrolled [e]	0.00001	0.0000
224-TMP-Crude	0.071 tpy uncontrolled [e]	0.0003	0.0014
224-TMP-PW	0.00002 tpy uncontrolled [e]	0.0000001	0.000000
Total HAPs	**1.512 tpy uncontrolled [e]**	**0.0069**	**0.0302**

Notes:

(a) Emission factors are from AP-42 Tables 13.5-1 & 2 (Industrial Flares)

40 µg/*L* is for lightly smoking flare (this is conservative as this unit is smokeless in design).

SO_2 emissions based on AP42, which is based on 100% conversion of sulfur to SO_2 at 2000 grains/MMscf.

(b) Hourly Emission Rate (lb/hr) except for PM_{10} = (Emission Factor, lb/MMBtuf) * (Heat Input, MMBtu/hr)

(c) (MMscf CH_4) (10.6 scf E/scf CH_4) (0.0283 m^3/scf E) (40 µ PM_{10}/L E) (1000 l/m^3) (g/106 µg) (lb/453.59 g) / (hr/yr) = lb PM_{10} / hr

(d) Annual Emission Rate (tpy) = (Hourly Emission Rate, lb/hr) * (hr/yr) / (2,000 lb/ton)

(e) For VOC & HAP there are no emission factors used, instead uncontrolled emissions are taken directly from Bryan Research & Engineering, Inc. ProMax™ 3.2 simulation software program using site specific compositional analysis (Precision Analysis 07-10-2014 for Ballista 202-1003H). Controlled emissions are based on 98% control efficiency for Tri-Tip Flare.

From the 3-phase separator, liquids are sent to a Vapor Recovery Tower (VRT) where the majority of the flashing occurs and the vapors are sent to the enclosed combustor (COM). The liquids from the VRT are then sent to the tanks where the pressure differential is about 1.75 psia and a little flashing occurs along with working and breathing losses. These vapors from both the oil and produced water tanks are also captured and routed to the Tri-Tip Flare that has a vendor guaranteed destruction efficiency of 98% or higher.

(tpy uncontrolled) * (100-95%) / (100) = tpy controlled

(tpy controlled) (2000 lb/ton) / (8760 hr/yr) = lb/hr controlled

Table A-3 EOG Resources, Inc. - Ballista 202-1003H Oil & Gas Production Facility
Vapor Recovery Tower Emissions Controlled by Tri-Tip Flare

Emission Source:	VRT with Tri-Tip Flare
Source Type:	Process Vessel
Heat Input:	2.41 MMBtu/hr
VRT Vapor Flowrate:	873.9 scf/hr
Tank Vent Gas Flowrate:	7.66 MMscf/yr
Pilot Gas Flowrate:	16.8 scf/hr
Pilot Gas Flowrate:	0.15 MMscf/yr
Total Flowrate to Combustor Including Pilot:	7.80 MMscf/yr
Estimated HHV:	2,701 Btu/scf
Total VOC Destruction Efficiency:	98%
Sulfur Content of Fuel:	0.0020 gr/scf
Operating Hours per Year:	8,760 hr/yr

Pollutant	Emission Factors or Uncontrolled Emissions [a]	Emissions - Controlled	
		lb/hr [b], [c]	tpy [d]
NO_x	0.068 lb/MMBtu	0.16	0.72
CO	0.370 lb/MMBtu	0.89	3.90
VOC	413.6 tpy uncontrolled [e]	1.89	8.27
SO_2	0.00021 lb/MMBtu	0.0005	0.0022
PM_{10}	40.0 µg/L	0.023	0.1013
$PM_{2.5}$	40.0 µg/L	0.023	0.1013
Benzene	1.104 tpy uncontrolled [e]	0.0050	0.0221
Toluene	2.102 tpy uncontrolled [e]	0.0096	0.0420
Ethylbenzene	0.065 tpy uncontrolled [e]	0.0003	0.0013
Xylenes	0.476 tpy uncontrolled [e]	0.0022	0.0095
n-Hexane	10.98 tpy uncontrolled [e]	0.0501	0.2196
224-TMP	0.658 tpy uncontrolled [e]	0.0030	0.0132
Total HAPs	**15.38 tpy uncontrolled [e]**	**0.0702**	**0.3076**

Notes:

(a) Emission factors are from AP-42 Tables 13.5-1 & 2 (Industrial Flares)

40 µg/*L* is for lightly smoking flare (this is conservative as this unit is smokeless in design).

SO_2 emissions based on AP42, which is based on 100% conversion of sulfur to SO_2 at 2000 grains/MMscf.

(b) Hourly Emission Rate (lb/hr) except for PM_{10} = (Emission Factor, lb/MMBtuf) * (Heat Input, MMBtu/hr)

(c) (MMscf CH_4) (10.6 scf E/scf CH_4) (0.0283 m^3/scf E) (40 µ PM_{10}/L E) (1000 l/m^3) (g/106 µg) (lb/453.59 g) / (hr/yr) = lb PM_{10} / hr

(d) Annual Emission Rate (tpy) = (Hourly Emission Rate, lb/hr) * (hr/yr) / (2,000 lb/ton)

(e) For VOC & HAP there are no emission factors used, instead uncontrolled emissions are taken directly from Bryan Research & Engineering, Inc. ProMax™ 3.2 simulation software program using site specific compositional analysis (Precision Analysis 07-10-2014 for Ballista 202-1003H Controlled emissions are based on 98% control efficiency for Tri-Tip Flare.

From the 3-phase separator, liquids are sent to a Vapor Recovery Tower (VRT) where the majority of the flashing occurs and the vapors are also sent to the Tri-Tip Flare that has a vendor guaranteed destruction efficiency of 98% or higher.

(tpy uncontrolled) * (100-95%) / (100) = tpy controlled (tpy controlled) (2000 lb/ton) / (8760 hr/yr) = lb/hr controlled

Bryan Research & Engineering, Inc.

ProMax® 3.2

with

TSWEET® & PROSIM®

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Simulation Report

Project: Ballista 202-1003H.pmx

Licensed to SLR International Corporation and Affiliates

Client Name: EOG Resources
Location: Ballista 202-1003H
Job: Tank Emissions Estimate

ProMax Filename: N:\Fort Collins\EOG\Wyoming\Ballista 202-1003H\Ballista 202-1003H.pmx
ProMax Version: 3.2.13330.0
Simulation Initiated: 9/25/2014 12:46:43 PM

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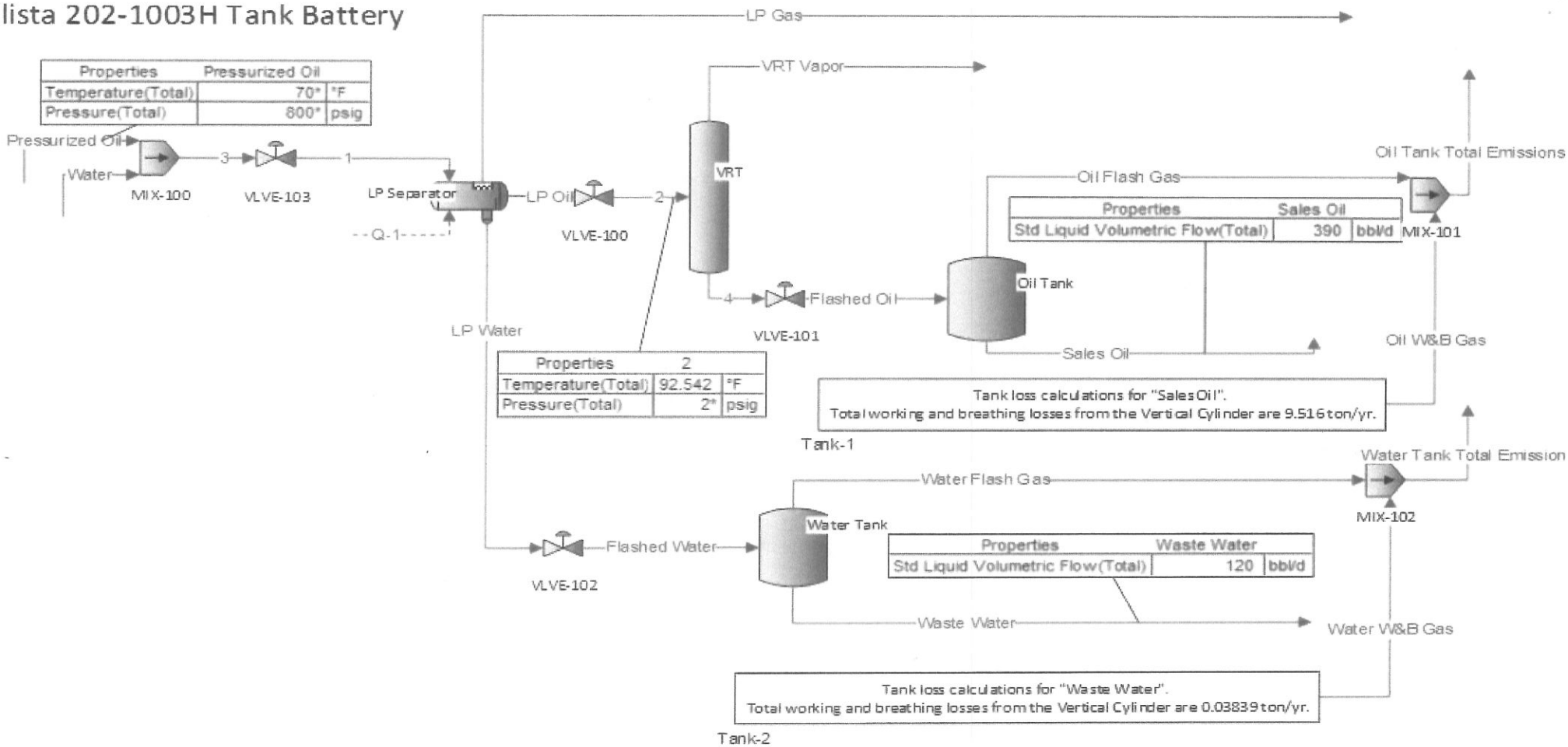
Report Navigator can be activated via the ProMax Navigator Toolbar.
An asterisk (*), throughout the report, denotes a user specified value.
A question mark (?) after a value, throughout the report, denotes an extrapolated or approximate value.

EOG Resources

Ballista 202-1003H Tank Battery



Condensate Tank Emissions

Stream Oil Tank Total Emissions C3+ Mass Flow =46.05 ton/yr

VOC Emission Factor = 0.647 lb/bbl

Names	Units	Oil Flash Gas	Oil W&B Gas	Oil Tank Total Emissions
n-Hexane(Mass Flow)	ton/yr	1.052	0.01268*	1.065
Benzene(Mass Flow)	ton/yr	0.1059	0.0009828*	0.1069
Toluene(Mass Flow)	ton/yr	0.2013	0.003639*	0.205
Ethylbenzene(Mass Flow)	ton/yr	0.006181	0.0001905*	0.006371
m-Xylene(Mass Flow)	ton/yr	0.005536	0.0002171*	0.005753
Std Vapor Volumetric Flow	MSCFD	1.784	0.4249	2.209
Molecular Weight	lb/lbmol	50.09	46.57	49.41
Gross Ideal Gas Heating Value	Btu/ft^3	2820	2640	2786

Produced Water Tank Emissions

Stream Water Tank Total Emissions C3+ Mass Flow =0.3381 ton/yr

VOC Emission Factor = 0.01544 lb/bbl

Names	Units	Water Flash Gas	Water W&B Gas	Water Tank Total Emissio
n-Hexane(Mass Flow)	ton/yr	0.002091	5.728e-010*	0.00209
Benzene(Mass Flow)	ton/yr	0.002546	2.322e-007*	0.00254
Toluene(Mass Flow)	ton/yr	0.004827	2.085e-007*	0.00482
Ethylbenzene(Mass Flow)	ton/yr	0.0001494	3.148e-009*	0.000149
m-Xylene(Mass Flow)	ton/yr	0.0001348	3.302e-009*	0.000134
Std Vapor Volumetric Flow	MSCFD	0.03945	0.004294	0.0437
Molecular Weight	lb/lbmol	32.7	18.59	31.3
Gross Ideal Gas Heating Value	Btu/ft^3	1781	90.6	161

EOG Resources, Inc. - Ballista 202-1003H
ProMax Summary of Crude and Produced Water Tanks and Vapor Recovery Tower

Process Streams		Flashed Oil	Flashed Water	LP Gas	LP Oil	LP Water	Oil Flash Gas	Oil Tank Total Emissions	Oil W&B Gas	Pressurized Oil	Sales Oil	VRT Vapor	Waste Water	Water	Water Flash Gas	Water Tank Total Emissions	Water W&B Gas
Composition	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Total	From Block:	VLVE-101	VLVE-102	LP Separator	LP Separator	LP Separator	Oil Tank	MIX-101	--	--	Oil Tank	VRT	Water Tank	--	Water Tank	MIX-102	--
	To Block:	Oil Tank	Water Tank	--	VLVE-100	VLVE-102	MIX-101	--	MIX-101	MIX-100	--	--	--	MIX-100	MIX-102	--	MIX-102
Mass Flow		lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h	lb/h
Carbon Dioxide		0.0451954	0.0224746	1.88785	0.284781	0.0224746	0.0153907	0.0204788	0.00508815*	2.19511*	0.0298047	0.239585	0.0196818	0*	0.00279281	0.00311009	0.000317273*
Nitrogen		2.80619E-05	2.85217E-05	0.0869329	0.00145946	2.85217E-05	2.33842E-05	2.39860E-05	5.81811E-07*	0.0884209*	4.67770E-06	0.00143140	4.57608E-06	0*	2.39457E-05	2.39994E-05	5.37447E-08*
Methane		0.0967796	0.0258806	38.9951	1.82578	0.0258806	0.0615536	0.0674786	0.00592505*	40.8468*	0.0352260	1.72900	0.00726759	0*	0.0186130	0.0187285	0.000115428*
Ethane		4.13851	0.0528954	73.6361	17.7936	0.0528954	1.00655	1.36339	0.356843*	91.4826*	3.13197	13.6550	0.0159177	0*	0.0369777	0.0371489	0.000171251*
Propane		38.8072	0.0661343	98.4937	76.9378	0.0661343	3.37936	4.23761	0.858242*	175.498*	35.4279	38.1306	0.0191805	0*	0.0469538	0.0469977	4.38749E-05*
i-Butane		20.6933	0.00376581	15.4637	28.9373	0.00376581	0.768667	0.937427	0.168760*	44.4048*	19.9246	8.24405	0.000491645	0*	0.00327416	0.00327455	3.93209E-07*
n-Butane		77.6403	0.0218529	39.0791	100.042	0.0218529	2.10861	2.53920	0.430586*	139.143*	75.5317	22.4012	0.00561321	0*	0.0162397	0.0162427	3.02158E-06*
i-Pentane		61.0098	0.00384708	11.0856	68.1230	0.00384708	0.678819	0.800530	0.121712*	79.2125*	60.3310	7.11321	0.000686888	0*	0.00316019	0.00316032	1.30849E-07*
n-Pentane		91.2157	0.00461882	12.5369	99.3819	0.00461882	0.780637	0.913119	0.132482*	111.923*	90.4351	8.16611	0.000867449	0*	0.00375137	0.00375149	1.19993E-07*
Isohexane		88.6560	0.000907294	5.11478	92.2673	0.000907294	0.327024	0.377367	0.0503434*	97.3830*	88.5289	3.41136	9.19988E-05	0*	0.000815296	0.000815301	4.94005E-09*
n-Heptane		255.361	0.000371702	3.76485	257.820	0.000371702	0.235347	0.262879	0.0275327*	261.585*	255.126	2.45877	2.23195E-05	0*	0.000349383	0.000349383	2.27442E-10*
n-Octane		247.463	0.000111370	1.24664	248.253	0.000111370	0.0753498	0.0828541	0.00750429*	249.499*	247.388	0.789294	6.18219E-06	0*	0.000105187	0.000105187	1.77078E-11*
n-Nonane		113.573	2.59787E-05	0.200000	113.696	2.59787E-05	0.0117114	0.0126788	0.000967389*	113.896*	113.561	0.122981	2.07900E-06	0*	2.38997E-05	2.38997E-05	1.67231E-12*
C10		155.379	7.09708E-06	0.0971382	155.436	7.09708E-06	0.00543594	0.00581201	0.000376070*	155.533*	155.373	0.0572901	3.36159E-07	0*	6.76092E-06	6.76092E-06	7.68298E-14*
Benzene		8.52496	0.0218541	0.375174	8.77694	0.0218541	0.0241710	0.0243954	0.000224386*	9.17397*	8.50079	0.251983	0.0212729	0*	0.000581273	0.000581326	5.30217E-08*
Toluene		55.1541	0.0345456	0.727602	55.6340	0.0345456	0.0459651	0.0467958	0.000830724*	56.3961*	55.1082	0.479838	0.0334435	0*	0.00110209	0.00110213	4.76041E-08*
Ethylbenzene		4.73841	0.000862865	0.0230369	4.75318	0.000862865	0.00141112	0.00145462	4.35019E-05*	4.77708*	4.73700	0.0147663	0.000828751	0*	3.41142E-05	3.41149E-05	7.18657E-10*
m-Xylene		4.99161	0.000834722	0.0207709	5.00485	0.000834722	0.00126384	0.00131341	4.95635E-05*	5.02645*	4.99035	0.0132323	0.000803945	0*	3.07775E-05	3.07782E-05	7.53962E-10*
o-Xylene		31.0500	0.00653003	0.118024	31.1252	0.00653003	0.00717974	0.00741606	0.000236323*	31.2497*	31.0428	0.0751726	0.00635326	0*	0.000176762	0.000176766	4.56703E-09*
p-Xylene		7.38926	0.00117893	0.0316450	7.40944	0.00117893	0.00192783	0.00199251	6.46859E-05*	7.44227*	7.38733	0.0201821	0.00113218	0*	4.67482E-05	4.67491E-05	9.36119E-10*
n-Hexane		88.2126	0.000519473	3.75997	90.7191	0.000519473	0.240289	0.243183	0.00289420*	94.4796*	87.9723	2.50642	4.20952E-05	0*	0.000477377	0.000477378	1.30770E-10*
2,2,4-Trimethylpentane		15.0241	5.14396E-06	0.228719	15.1742	5.14396E-06	0.0143777	0.0161845	0.00180674*	15.4030*	15.0097	0.150134	7.41199E-08	0*	5.06984E-06	5.06984E-06	8.42463E-13*
C11		120.280	2.01159E-06	0.0245185	120.294	2.01159E-06	0.00131704	0.00139713	8.00908E-05*	120.319*	120.279	0.0139261	1.08030E-07	0*	1.90356E-06	1.90356E-06	6.79252E-15*
C12		134.612	2.73153E-07	0.0112461	134.618	2.73153E-07	0.000584042	0.000610253	2.62105E-05*	134.629*	134.611	0.00619217	4.58920E-09	0*	2.68564E-07	2.68564E-07	8.43768E-17*
C13		166.536	4.59077E-07	0.00443680	166.538	4.59077E-07	0.000219713	0.000229131	9.41760E-06*	166.542*	166.535	0.00233840	3.15493E-08	0*	4.27528E-07	4.27528E-07	1.68467E-16*
C14		144.444	1.73096E-07	0.00119199	144.444	1.73096E-07	5.62552E-05	5.86989E-05	2.44369E-06*	144.445*	144.444	0.000601043	1.65017E-08	0*	1.56594E-07	1.56594E-07	2.63614E-17*
C15		168.823	1.97129E-08	0.000576358	168.823	1.97129E-08	2.62290E-05	2.71632E-05	9.34180E-07*	168.824*	168.823	0.000281048	4.85026E-10	0*	1.92279E-08	1.92279E-08	2.53429E-19*
C16		176.481	1.87477E-09	0.000232042	176.481	1.87477E-09	1.01418E-05	1.04053E-05	2.63528E-07*	176.481*	176.481	0.000109021	1.12975E-11	0*	1.86348E-09	1.86348E-09	1.59296E-21*
C17		157.970	3.28169E-11	8.42293E-05	157.970	3.28169E-11	3.54047E-06	3.61254E-06	7.20617E-08*	157.971*	157.970	3.81766E-05	9.77863E-15	0*	3.28071E-11	3.28071E-11	0*
C18		151.988	3.36180E-11	3.12087E-05	151.988	3.36180E-11	1.27881E-06	1.30122E-06	2.24142E-08*	151.988*	151.988	1.38151E-05	2.83159E-14	0*	3.35897E-11	3.35897E-11	0*
C19		113.966	7.96728E-12	8.77958E-06	113.966	7.96728E-12	3.45724E-07	3.49917E-07	4.19358E-09*	113.966*	113.966	3.74674E-06	0	0*	0	0	0*
C20		185.780	1.23173E-11	4.58920E-06	185.780	1.23173E-11	1.72494E-07	1.74365E-07	1.87088E-09*	185.780*	185.780	1.87637E-06	2.67399E-14	0*	1.22906E-11	1.22906E-11	0*
C21		158.157	2.81136E-12	1.53818E-06	158.157	2.81136E-12	5.56696E-08	5.63177E-08	6.48101E-10*	158.157*	158.157	6.07390E-07	0	0*	0	0	0*
C22		124.690	2.77249E-13	5.22139E-07	124.690	2.77249E-13	1.82514E-08	1.83941E-08	1.42687E-10*	124.690*	124.690	1.99682E-07	0	0*	0	0	0*
C23		112.103	2.33487E-13	1.42964E-07	112.103	2.33487E-13	4.75931E-09	4.78907E-09	2.97592E-11*	112.103*	112.103	5.22739E-08	0	0*	0	0	0*
C24		82.0830	6.44851E-14	3.68056E-08	82.0830	6.44851E-14	1.17324E-09	1.18306E-09	9.81894E-12*	82.0830*	82.0830	1.29310E-08	0	0*	0	0	0*
C25		136.340	8.57734E-14	2.42434E-08	136.340	8.57734E-14	7.44387E-10	7.50036E-10	5.64937E-12*	136.340*	136.340	8.22886E-09	0	0*	0	0	0*
C26		89.7036	1.41949E-14	5.27999E-09	89.7036	1.41949E-14	1.54700E-10	1.56177E-10	1.47718E-12*	89.7036*	89.7036	1.71654E-09	0	0*	0	0	0*
C27		128.712	6.97389E-14	2.07435E-09	128.712	6.97389E-14	5.76200E-11	5.82336E-11	6.13620E-13*	128.712*	128.712	6.42101E-10	0	0*	0	0	0*
C28		129.672	5.26625E-15	1.02307E-09	129.672	5.26625E-15	2.75578E-11	2.76146E-11	5.68150E-14*	129.672*	129.672	3.07838E-10	0	0*	0	0	0*
C29		102.173	1.99823E-15	3.65219E-10	102.173	1.99823E-15	9.51944E-12	9.53916E-12	1.97184E-14*	102.173*	102.173	1.06616E-10	0	0*	0	0	0*
C30		328.938	2.88156E-15	4.18969E-10	328.938	2.88156E-15	1.04575E-11	1.04613E-11	3.75292E-15*	328.938*	328.938	1.17528E-10	0	0*	0	0	0*
Water		0.0465816	1750.60	3.60221	0.394191	1750.60	0.0196295	0.0196308	1.32284E-06*	0*	0.0269521	0.347610	1750.60	1754.60*	0.00611713	0.0142303	0.00811322*
C31+		0	0	0	0	0	0	0	0*	0*	0	0	0	0*	0	0	0*
Property	**Units**																
Temperature	°F	91.8496	100.067	100*	100	100	91.8496	85.9891	59.2909*	70*	91.8496	92.5422	100.067	70*	100.067	96.2182	59.2909*
Pressure	psig	0.25*	0.25*	30	30	30	0.25	0.25	1.60916	800*	0.25	2	0.25	800*	0.25	-11.6485	-11.6485
Molecular Weight	lb/lbmol	165.882	18.0168	35.3153	156.223	18.0168	50.0912	49.4143	46.5718	128.062	166.767	47.9391	18.0162	18.0153	32.7009	31.3156	18.5889
Mass Density	lb/ft^3	22.9893	57.6153	0.253265	45.6199	61.9431	0.104583	0.104286	0.115171	45.5594	46.2104	0.114441	61.9434	62.3196	0.0666439	0.00137305	0.000873156
Mass Flow	lb/h	4282.86	1750.87	310.618	4393.26	1750.87	9.81292	11.9855	2.17263*	4700.15	4273.05	110.403	1750.73	1754.60	0.141661	0.150426	0.00876487*
Std Vapor Volumetric Flow	MMSCFD	0.235148	0.885078	0.0801067	0.256122	0.885078	0.00178419	0.00220908	0.000424883	0.334270	0.233363	0.0209747	0.885038	0.887037	3.94546E-05	4.37489E-05	4.29436E-06
Std Liquid Volumetric Flow	sgpm	11.4119	3.50063	1.38308	11.8365	3.50063	0.0369403	0.0455346	0.00859426	13.2126*	11.3750	0.424511	3.50000	3.50757*	0.000634780	0.000653691	1.89113E-05
Net Ideal Gas Heating Value	Btu/ft^3	8340.60	0.130624	1839.33	7861.32	0.130624	2599.19	2566.80	2430.82	6464.59	8384.50	2488.13	0.0579924	0	1629.39	1473.25	38.7312
Gross Ideal Gas Heating Value	Btu/ft^3	8970.40	50.4477	2006.34	8457.01	50.4477	2820.32	2785.69	2640.25	6960.77	9017.43	2701.36	50.3705	50.31	1781.29	1615.33	90.5973

EOG Resources, Inc. - Ballista 202-1003H
ProMax Summary of Crude and Produced Water Tanks and Vapor Recovery Tower

Process Streams		Flashed Oil	Flashed Water	LP Gas	LP Oil	LP Water	Oil Flash Gas	Oil Tank Total Emissions	Oil W&B Gas	Pressurized Oil	Sales Oil	VRT Vapor	Waste Water	Water	Water Flash Gas	Water Tank Total Emissions	Water W&B Gas
Composition	Status:	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved	Solved
Phase: Vapor	From Block:	VLVE-101	VLVE-102	LP Separator	LP Separator	LP Separator	Oil Tank	MIX-101	--	--	Oil Tank	VRT	Water Tank	--	Water Tank	MIX-102	--
	To Block:	Oil Tank	Water Tank	--	VLVE-100	VLVE-102	MIX-101	--	MIX-101	MIX-100	--	--	--	MIX-100	MIX-102	--	MIX-102
Mole Fraction		%	%	%			%	%	%			%			%	%	%
Carbon Dioxide		0.178515	1.46489	0.487706			0.178515	0.191846	0.247828			0.236387			1.46489	1.47117	1.52895
Nitrogen		0.000426109	0.0197319	0.0352821			0.000426109	0.000352716	4.45197E-05			0.00221873			0.0197319	0.0178350	0.000406890
Methane		1.95860	26.7827	27.6360			1.95860	1.73416	0.791694			4.67988			26.7827	24.3035	1.52597
Ethane		17.0875	28.3875	27.8425			17.0875	18.6937	25.4386			19.7189			28.3875	25.7196	1.20787
Propane		39.1204	24.5801	25.3951			39.1204	39.6205	41.7206			37.5481			24.5801	22.1880	0.211022
i-Butane		6.75087	1.30037	3.02487			6.75087	6.64952	6.22392			6.15897			1.30037	1.17286	0.00143479
n-Butane		18.5190	6.44977	7.64433			18.5190	18.0115	15.8801			16.7355			6.44977	5.81775	0.0110255
i-Pentane		4.80273	1.01109	1.74690			4.80273	4.57450	3.61610			4.28101			1.01109	0.911884	0.000384635
n-Pentane		5.52311	1.20024	1.97560			5.52311	5.21787	3.93608			4.91469			1.20024	1.08246	0.000352723
Isohexane		1.93713	0.218394	0.674807			1.93713	1.80541	1.25226			1.71892			0.218394	0.196957	1.21578E-05
n-Heptane		1.19893	0.0804884	0.427177			1.19893	1.08162	0.588992			1.06550			0.0804884	0.0725878	4.81396E-07
n-Octane		0.336722	0.0212568	0.124080			0.336722	0.299043	0.140822			0.300036			0.0212568	0.0191702	3.28774E-08
n-Nonane		0.0466120	0.00430156	0.0177293			0.0466120	0.0407566	0.0161682			0.0416363			0.00430156	0.00387933	2.76535E-09
C10		0.0195024	0.00109689	0.00776207			0.0195024	0.0168412	0.00566573			0.0174840			0.00109689	0.000989224	1.14522E-10
Benzene		0.157958	0.171779	0.0546075			0.157958	0.128761	0.00615764			0.140076			0.171779	0.154932	0.000143961
Toluene		0.254654	0.276111	0.0897820			0.254654	0.209392	0.0193264			0.226133			0.276111	0.249019	0.000109575
Ethylbenzene		0.00678495	0.00741756	0.00246706			0.00678495	0.00564890	0.000878342			0.00603949			0.00741756	0.00668960	1.43565E-06
m-Xylene		0.00607681	0.00669205	0.00222439			0.00607681	0.00510050	0.00100073			0.00541209			0.00669205	0.00603531	1.50618E-06
o-Xylene		0.0345216	0.0384339	0.0126393			0.0345216	0.0287996	0.00477157			0.0307460			0.0384339	0.0346621	9.12347E-06
p-Xylene		0.00926936	0.0101646	0.00338891			0.00926936	0.00773774	0.00130606			0.00825457			0.0101646	0.00916706	1.87007E-06
n-Hexane		1.42336	0.127875	0.496064			1.42336	1.16344	0.0719915			1.26294			0.127875	0.115323	3.21834E-07
2,2,4-Trimethylpentane		0.0642509	0.00102454	0.0227648			0.0642509	0.0584142	0.0339045			0.0570709			0.00102454	0.000923970	1.56417E-09
C11		0.00430109	0.000281120	0.00178340			0.00430109	0.00368509	0.00109834			0.00386863			0.000281120	0.000253525	9.21630E-12
C12		0.00175027	3.63958E-05	0.000750644			0.00175027	0.00147707	0.000329843			0.00157852			3.63958E-05	3.28233E-05	1.05057E-13
C13		0.000608345	5.35306E-05	0.000273613			0.000608345	0.000512399	0.000109498			0.000550756			5.35306E-05	4.82761E-05	1.93800E-13
C14		0.000144747	1.82209E-05	6.83115E-05			0.000144747	0.000121986	2.64038E-05			0.000131553			1.82209E-05	1.64323E-05	0
C15		6.30320E-05	2.08956E-06	3.08492E-05			6.30320E-05	5.27219E-05	9.42719E-06			5.74521E-05			2.08956E-06	1.88445E-06	0
C16		2.28624E-05	1.89966E-07	1.16506E-05			2.28624E-05	1.89450E-05	2.49463E-06			2.09057E-05			1.89966E-07	1.71319E-07	0
C17		7.51568E-06	3.14934E-09	3.98238E-06			7.51568E-06	6.19370E-06	6.42368E-07			6.89366E-06			3.14934E-09	2.84020E-09	0
C18		2.56502E-06	3.04674E-09	1.39423E-06			2.56502E-06	2.10798E-06	1.88791E-07			2.35714E-06			3.04674E-09	2.74768E-09	0
C19		6.57225E-07	0	3.71734E-07			6.57225E-07	5.37257E-07	3.34768E-08			6.05878E-07			0	0	0
C20		3.11634E-07	1.00413E-09	1.84664E-07			3.11634E-07	2.54426E-07	1.41935E-08			2.88361E-07			1.00413E-09	9.05563E-10	0
C21		9.58183E-08	0	5.89672E-08			9.58183E-08	7.82900E-08	4.68431E-09			8.89291E-08			0	0	0
C22		2.99957E-08	0	1.91126E-08			2.99957E-08	2.44158E-08	9.84733E-10			2.79156E-08			0	0	0
C23		7.48380E-09	0	5.00702E-09			7.48380E-09	6.08220E-09	1.96505E-10			6.99213E-09			0	0	0
C24		1.76845E-09	0	1.23565E-09			1.76845E-09	1.44027E-09	6.21505E-11			1.65800E-09			0	0	0
C25		1.07741E-09	0	7.81534E-10			1.07741E-09	8.76790E-10	3.43364E-11			1.01314E-09			0	0	0
C26		2.15345E-10	0	1.63700E-10			2.15345E-10	1.75587E-10	8.63478E-12			2.03257E-10			0	0	0
C27		7.72530E-11	0	6.19436E-11			7.72530E-11	6.30590E-11	3.45473E-12			7.32304E-11			0	0	0
C28		3.56348E-11	0	2.94651E-11			3.56348E-11	2.88403E-11	3.08508E-13			3.38609E-11			0	0	0
C29		1.18872E-11	0	1.01576E-11			1.18872E-11	9.62073E-12	1.03398E-13			1.13249E-11			0	0	0
C30		1.26253E-11	0	1.12660E-11			1.26253E-11	1.02007E-11	0			1.20698E-11			0	0	0
Water		0.556201	7.83817	2.27334			0.556201	0.449254	0.000157399			0.837839			7.83817	16.4442	95.5123
C31+		0	0	0			0	0	0			0			0	0	0

Table A-4 ***EOG Resources, Inc. - Ballista 202-1003H Oil & Gas Production Facility***
Process Heater(s) Emission Calculations

AP-42 Emission Factors for Natural Gas Combustion		
NO_x Emission Factor =	100.0 lb/MMscf	[AP-42, Table 1.4-1; <300,000 Btu/hr]
NO_x Emission Factor =	94.0 lb/MMscf	[AP-42, Table 1.4-1; >300,000 Btu/hr]
CO Emission Factor =	84.0 lb/MMscf	[AP-42, Table 1.4-1; <300,000 Btu/hr]
CO Emission Factor =	40.0 lb/MMscf	[AP-42, Table 1.4-1; >300,000 Btu/hr]
VOC Emission Factor =	5.5 lb/MMscf	[AP-42, Table 1.4-2]
SO_2 Emission Factor =	0.00048 lb/MMBtu	AP42 Table 1.4-2, 2,000 grains S/MMscf
PM_{10} Emission Factor =	7.6 lb/MMscf	[AP-42, Table 1.4-2]
$PM_{2.5}$ Emission Factor =	7.6 lb/MMscf	[AP-42, Table 1.4-2]

Natural Gas Higher Heating Value =	1,185 Btu/scf	[from gas analyses]
Annual Hours of Operation	8,760 hr/yr	

Process Unit	Input Duty	Fuel Consumption	No. Of Units
Ballista 202-1003H Trace Line Heater	0.350 MMBtu/hr	2.59 MMscf/yr	1
Ballista 202-1003H Heater Treater	0.750 MMBtu/hr	5.55 MMscf/yr	1
Total Heat Input & Fuel Consumption	1.100 MMBtu/hr	8.13 MMscf/yr	2

	NO_x (tpy)	VOC (tpy)	CO (tpy)	SO_2 (tpy)	PM_{10} (tpy)	$PM_{2.5}$ (tpy)
Ballista 202-1003H Trace Line Heater	**0.12**	**0.007**	**0.05**	**0.0007**	**0.010**	**0.010**
Ballista 202-1003H Heater Treater	**0.26**	**0.015**	**0.11**	**0.0016**	**0.021**	**0.021**
Total Process Heater Emissions	**0.38**	**0.02**	**0.16**	**0.00**	**0.03**	**0.03**

(MMBtu/hr) / (Btu/scf) * (8,760 hr/yr) = MMscf/yr

(lb/MMscf) * (MMscf/yr) / (2,000 lb/ton) = tpy

Table A-4(a) EOG Resources, Inc. -Ballista 202-1003H Oil & Gas Production Facility
Process Heater(s) Hazardous Air Pollutant Emissions Calculations

Annual Hours of Operation	8,760 hr/yr
Total Maximum Heat Input	1.100 MMBtu/hr
Natural Gas Higher Heating Value	1,185 Btu/scf
Fuel Consumption (HHV)	0.0009 MMscf/hr
Fuel Consumption (HHV)	8.13 MMscf/yr
Number of Heaters	2

Pollutant	Emission Factor (lb/MMscf) [a]	Emission Rates Total for Two (2) Heaters (lb/hr) [b]	(lbs/yr)	(tpy) [c]
2-Methylnaphthalene	2.4E-05	2.23E-08	1.95E-04	9.76E-08
3-Methylchloranthrene	1.8E-06	1.67E-09	1.46E-05	7.32E-09
7,12-Dimethylbenz(a)anthracene	1.6E-05	1.49E-08	1.30E-04	6.51E-08
Acenaphthene	1.8E-06	1.67E-09	1.46E-05	7.32E-09
Acenaphthylene	1.8E-06	1.67E-09	1.46E-05	7.32E-09
Anthracene	2.4E-06	2.23E-09	1.95E-05	9.76E-09
Benz(a)anthracene	1.8E-06	1.67E-09	1.46E-05	7.32E-09
Benzene	2.1E-03	1.95E-06	1.71E-02	8.54E-06
Benzo(a)pyrene	1.2E-06	1.11E-09	9.76E-06	4.88E-09
Benzo(b)fluoranthene	1.8E-06	1.67E-09	1.46E-05	7.32E-09
Benzo(g,h,i)perylene	1.2E-06	1.11E-09	9.76E-06	4.88E-09
Benzo(k)fluoranthene	1.8E-06	1.67E-09	1.46E-05	7.32E-09
Chrysene	1.8E-06	1.67E-09	1.46E-05	7.32E-09
Dibenzo(a,h)anthracene	1.2E-06	1.11E-09	9.76E-06	4.88E-09
Dichlorobenzene	1.2E-03	1.11E-06	9.76E-03	4.88E-06
Fluoranthene	3.0E-06	2.79E-09	2.44E-05	1.22E-08
Fluorene	2.8E-06	2.60E-09	2.28E-05	1.14E-08
Formaldehyde	7.5E-02	6.96E-05	6.10E-01	3.05E-04
Hexane	1.8E+00	1.67E-03	1.46E+01	**7.32E-03**
Indeno(1,2,3-cd)pyrene	1.8E-06	1.67E-09	1.46E-05	7.32E-09
Naphthalene	6.1E-04	5.66E-07	4.96E-03	2.48E-06
Phenanathrene	1.7E-05	1.58E-08	1.38E-04	6.91E-08
Pyrene	5.0E-06	4.64E-09	4.07E-05	2.03E-08
Toluene	3.4E-03	3.16E-06	2.77E-02	1.38E-05
			Heater Total HAPs	**0.0077 tpy**
			Maximum Individual HAF	**0.0073 tpy**

Notes:

(a) Emission factors from AP-42, Section 1.4, Table 1.4-3 (7/98).

(b) Hourly Emission Rate (lb/hr) = (MMscf/hr) * (lb/MMscf)

(c) Annual Emission Rate (tpy) = (MMscf/yr) * (lb/MMscf) / (2,000 lb/ton)

Table A-5 *EOG Resources, Inc. - Ballista 202-1003H Oil & Gas Production Facility*
Pneumatic Pump Emissions Calculations

Heat Trace & Recycle Pumps (scfh)	52
Hours/year	8760
Molecular Weight of Gas (lb/lb-mol)	19.9243
Number of pumps	2
Gas Vented (tpy)	23.95
% VOC	14.50%
% HAPs	0.26%
Uncontrolled VOCs (tpy)	3.47
Uncontrolled HAPs (tpy)	0.06
Control Efficiency (%)	98.0%
Controlled VOCs (tpy)[1]	0.07
Controlled HAPs (tpy)[1]	0.001
Total Controlled VOCs (tpy)[1]	0.14
Total Controlled HAPs (tpy)[1]	0.003

Tank Vent & VRT Scrubber Pumps (scfh)	52
Hours/year	8760
Molecular Weight of Gas (lb/lb-mol)	19.9243
Number of pumps	2
Gas Vented (tpy)	23.95
% VOC	14.50%
% HAPs	0.26%
Uncontrolled VOCs (tpy)[2]	3.47
Uncontrolled HAPs (tpy)[2]	0.06
Control Efficiency (%)	98.0%
Controlled VOCs (tpy)[1]	0.07
Controlled HAPs (tpy)[1]	0.001

Calculations:

Pump Rate (scf/hour) * Number of Pumps * lb/lb-mol * lb-mol/379 scf * 8760 hrs/yr / 2000 lbs/ton = Amount of gas vented (tons/yr)
%VOC was calculated from the mol % wet gas average of four wells, converted to weight percent, VOC = All C3+ components
% VOC of gas x pneumatic gas vented (tons/yr) = ton/yr of VOC emitted

Notes:

[1] The pneumatic pumps vapors are captured and routed through the flare to achieve 98% destruction efficiency

Wet Gas Composite [2]

Component	Mol%	Mol%/100	MW	(R*S)	VOC	HAPs
Carbon Dioxide	1.1464	0.0115	44.0098	0.5045		
Hydrogen Sulfide	0.0000	0.0000	34.0758	0.0000		
Nitrogen	0.4718	0.0047	28.0134	0.1322		
Methane	81.7060	0.8171	16.0426	13.1078		
Ethane	10.9453	0.1095	30.0694	3.2912		
Propane	3.9562	0.0396	44.0962	1.7445	1.7445	
Isobutane	0.3521	0.0035	58.12	0.2046	0.2046	
n-Butane	0.8706	0.0087	58.12	0.5060	0.5060	
Isopentane	0.1624	0.0016	72.15	0.1172	0.1172	
n-Pentane	0.1869	0.0019	72.15	0.1348	0.1348	
Cyclopentane	0.0100	0.0001	70.134	0.0070	0.0070	
n-Hexane	0.0410	0.0004	86.18	0.0353	0.0353	0.0353
Cyclohexane	0.0187	0.0002	84.16	0.0157	0.0157	
Other Hexanes	0.0497	0.0005	84.18	0.0418	0.0418	
Heptanes	0.0346	0.0003	100.2	0.0347	0.0347	
Methylcyclohexane	0.0158	0.0002	98.19	0.0155	0.0155	
2,2,4 Trimethylpentane	0.0000	0.0000	114.23	0.0000	0.0000	0.0000
Benzene	0.0108	0.0001	78.11	0.0084	0.0084	0.0084
Toluene	0.0078	0.0001	92.14	0.0072	0.0072	0.0072
Ethylbenzene	0.0002	0.0000	106.17	0.0002	0.0002	0.0002
Xylenes	0.0012	0.0000	106.17	0.0013	0.0013	0.0013
C8+ Heavies	0.0125	0.0001	142.29	0.0143	0.0143	
Total	**100.0000**			**19.9243**	**2.8887**	**0.0524**

VOC %	HAPs %	
14.50%	**0.26%**	HAP Fraction of Total Gas
	1.82%	HAP Fraction of VOC

[2] From Precision Analysis Ballista 202-1003H Gas Analysis - sample date 07-10-2014.

Table A-6 ***EOG Resources, Inc. - Ballista 202-1003H Oil & Gas Production Facility***
VOC Emissions from Truck Loading [AP-42 Chapter 5.2 (1/95)]

Site	Product	Loading Mode	Sales	Sales (kgal/year)	Saturation Factor (S) [1]	True Vapor Pressure (P) [psia]	Molecular Weight (M) [lb/lb-mol]	Bulk Temp. (T) [F]	Uncontrolled Loading Loss (L_L) [2] [lb/kgal]	Control Efficiency [%]	Controlled Loading Loss (L_L) [lb/kgal]	VOC Emissions	
												Uncontrolled	Controlled
Ballista 202-1003H	crude oil	Submerged loading: dedicated vapor balance service	142,350 bbl/year	5,978.7	0.6	2.37	49.41	45	1.73	0.00%	1.732	5.2 tpy	5.2 tpy

142,350 bbls/yr assumes that 390 bbl/day of crude is loaded to trucks for 365 days per year.

[1] Source: AP-42 Table 5.2-1 (1/95)

[2] Equation 1 for loading losses: (12.46) * (SPM / T) = L_L

Where:

L_L = loading losses, lbs/1000 gal of liquid loaded
S = saturation factor
P = true vapor pressure of liquid loaded (psia)
M = Molecular wt of vapors, lb/lb-mol (from Bryan Research & Engineering, Inc. ProMax™ 3.2 simulation software program using Precision Extended Liquid Analysis: 07-10-14 for Ballista 202-1003H)
T = temperature of bulk liquids loaded °R (°F = 460)

AP-42 Chapter 5.2, Table 5.2-1 (1/95)	
Tank trucks and rail tank cars Submerged loading of a clean cargo tank	0.5
Submerged loading: dedicated normal service	***0.6***
Submerged loading: dedicated vapor balance service	1.0
Splash loading of a clean cargo tank	1.45
Splash loading: dedicated normal service	1.45
Splash loading: dedicated vapor balance service	1
Marine vesselsa Submerged loading: ships	0.2
Submerged loading: barges	0.5

		HAP Emissions			
HAP	Wt. % [3]	Uncontrolled		Controlled	
n-Hexane	0.1950	20.2 lb/yr	0.01 tpy	20.19 lb/yr	0.01 tpy
Benzene	1.1970	124.0 lb/yr	0.06 tpy	123.95 lb/yr	0.06 tpy
2,2,4 Trimethylpentane	0.1010	10.5 lb/yr	0.01 tpy	10.46 lb/yr	0.01 tpy
Toluene	0.9280	96.1 lb/yr	0.05 tpy	96.10 lb/yr	0.05 tpy
Ethylbenzene	2.0060	207.7 lb/yr	0.10 tpy	207.73 lb/yr	0.10 tpy
Xylenes	0.3270	33.9 lb/yr	0.02 tpy	33.86 lb/yr	0.02 tpy
Total		492.3 lb/yr	**0.25 tpy**	492.29 lb/yr	**0.25 tpy**

[3] From Precision Analysis Ballista 202-1003H Oil Analysis - 07-10-2014.

Table A-7

EOG Resources, Inc. - Ballista 202-1003H Oil & Gas Production Facility
Equipment Leak Emission Factors
Ballista 202-1003H

Component Description	Service	Component Count (N)	TOC Emission Factor [1]		Emission Rates							
			(kg/hr/source)	(lb/hr/source)	TOC (tpy)	VOC (tpy)	$C6^+$ (lb/yr)	Benzene (lb/yr)	Toluene (lb/yr)	Ethylbenzene (lb/yr)	Xylenes (lb/yr)	Total HAP (tpy)
Valves	Gas	64	4.50E-03	9.92E-03	2.78	0.097	18.80	1.28	2.17	0.11	0.56	0.011
	Heavy Oil		8.40E-06	1.85E-05								
	Light Oil	50	2.50E-03	5.51E-03	1.21	0.352	58.66	0.65	1.81	0.41	0.87	0.031
	Water/Oil	24	9.80E-05	2.16E-04	0.02	0.023	0.00	0.05	0.01	0.00	0.00	0.000
Pump Seals	Gas		2.40E-03	5.29E-03								
	Heavy Oil											
	Light Oil	1	1.30E-02	2.87E-02	0.13	0.037	6.10	0.07	0.19	0.04	0.09	0.003
	Water/Oil		2.40E-05	5.29E-05								
Others: pressure relief valves, compressors, instruments, diaphrams, drains, hatches, meters, and vents.	Gas	32	8.80E-03	1.94E-02	2.72	0.095	18.38	1.25	2.12	0.11	0.54	0.011
	Heavy Oil		3.20E-05	7.05E-05								
	Light Oil	4	7.50E-03	1.65E-02	0.29	0.085	14.08	0.16	0.43	0.10	0.21	0.007
	Water/Oil	6	1.40E-02	3.09E-02	0.81	0.811	0.00	1.95	0.52	0.02	0.06	0.001
Connectors	Gas	395	2.00E-04	4.41E-04	0.76	0.027	5.16	0.35	0.60	0.03	0.15	0.003
	Heavy Oil		7.50E-06	1.65E-05								
	Light Oil	277	2.10E-04	4.63E-04	0.56	0.164	27.30	0.30	0.84	0.19	0.40	0.015
	Water/Oil	51	1.10E-04	2.43E-04	0.05	0.054	0.00	0.13	0.03	0.00	0.00	0.000
Flanges	Gas	9	3.90E-04	8.60E-04	0.03	0.001	0.23	0.02	0.03	0.00	0.01	0.000
	Heavy Oil		3.90E-07	8.60E-07								
	Light Oil	8	1.10E-04	2.43E-04	0.01	0.002	0.41	0.00	0.01	0.00	0.01	0.000
	Water/Oil	4	2.90E-06	6.39E-06	0.00	0.000	0.00	0.00	0.00	0.00	0.00	0.000
Open-Ended Lines	Gas	7	2.00E-03	4.41E-03	0.14	0.005	0.91	0.06	0.11	0.01	0.03	0.001
	Heavy Oil		1.40E-04	3.09E-04								
	Light Oil	3	1.40E-03	3.09E-03	0.04	0.012	1.97	0.02	0.06	0.01	0.03	0.001
	Water/Oil	5	2.50E-04	5.51E-04	0.01	0.012	0.00	0.03	0.01	0.00	0.00	0.000
					9.6 tpy	**1.8 tpy**	**152.0 lb/yr**	**6.3 lb/yr**	**8.9 lb/yr**	**1.0 lb/yr**	**3.0 lb/yr**	**0.09 tpy**

Service	Stream VOC & HAP Component Weight Fraction (Estimated weight fractions of TOC emissions)							
	Methane	NMHC	VOC	$C6^+$	Benzene	Toluene	Ethylbenzene	Xylenes
Gas Production [2]	0.92	0.08	0.035	0.00338	0.00023	0.00039	0.00002	0.0001
Heavy Oil [2]	0.942	0.058	0.03	0.00752	0.00935	0.00344	0.00051	0.00372
Light Oil [2]	0.613	0.387	0.292	0.0243	0.00027	0.00075	0.00017	0.00036
Water/Oil [3]			1.000		0.0012	0.00032	0.00001	0.00004

Sample Calculations: TOC emissions = (N) * (lb / hr/ source) * (8,760 hr/yr) (ton / 2,000 lb) = ton TOC / yr
VOC emissions = (TOC ton / yr) * (VOC wt. fraction) = ton VOC / yr
HAP emissions = (TOC ton / yr) * (HAP wt. fraction) (2,000 lb / ton) = lb HAP / yr

References:

[1] EPA Protocol for Equipment Leak Emission Estimates, November 1995 (EPA-453/R-95-017). Table 2-4, Page 2-15.

[2] Oil and Gas Production Facilities, Chapter 6, section 2 Permitting Guidance, WDEQ, Air Quality Division; Fugitive Emissions Pg. 71 of 81

[3] Gas Research Institute (GRI) Technical Reference Manual for GRI-HAPCalc, Software for Estimating Emissions of Hazardous Air Pollutants and Criteria Air Pollutants from Natural Gas Industry Operations, GRI-96/0346

Table A-8 ***EOG Resources, Inc. - Ballista 202-1003H Oil & Gas Production Facility***
Flare Emission Calculations
Ballista 202-1003H

Source Type:	Tri-Tip Flare
Heat Input:	100.31 MMBtu/hr
Flowrate:	2,032,000 scf/day
assumes that Flowrate:	84,666.7 scf/hr
Flowrate:	254.00 MMscf/yr
Estimated HHV:	1,185 Btu/scf
Total VOC Destruction Efficiency:	98%
Molecular Weight:	19.9 lb/lb-mol
VOC Fraction of Gas:	0.1450
Sulfur Content of Fuel:	0.0020 gr/scf
Operating Hours per Year:	3,000 hr/yr

Pollutant	Emission Factors [(a)]	Emissions	
		lb/hr [(b), (c)]	tpy [(d)]
NO_x	0.068 lb/MMBtu	6.82	10.2
CO	0.370 lb/MMBtu	37.11	55.7
SO_2	0.00048 lb/MMBtu	0.05	0.07
PM_{10}	40.0 μg / L ^{3}	2.24	3.4
$PM_{2.5}$	40.0 μg / L ^{3}	2.24	3.4

Pollutant	Wt. Fraction of Gas	VOC & HAP Emission Rates [(e)]			
		Uncontrolled		Controlled	
VOC	0.1450	645.3 lb/hr	967.9 tpy	12.91 lb/hr	19.4 tpy
Benzene	0.0004	1.88 lb/hr	5,652.8 lb/yr	0.04 lb/hr	113.1 lb/yr
Toluene	0.0004	1.61 lb/hr	4,815.8 lb/yr	0.03 lb/hr	96.3 lb/yr
Ethylbenzene	0.0000	0.05 lb/hr	142.3 lb/yr	0.00 lb/hr	2.8 lb/yr
Xylenes	0.0001	0.28 lb/hr	853.6 lb/yr	0.01 lb/hr	17.1 lb/yr
n-Hexane	0.0018	7.89 lb/hr	23,671.2 lb/yr	0.16 lb/hr	473.4 lb/yr
2,2,4-TMP	0.000000	0.00 lb/hr	0.0 lb/yr	0.00 lb/hr	0.0 lb/yr

Notes:

(a) Emission factors are from AP-42 Tables 13.5-1 & 2 (Industrial Flares)

40 μg / L is for lightly smoking flare (this is conservative as this unit is smokeless in design).

SO_2 emissions based on AP42 Table 1.4-2, which is based on 2,000 grains S/MMscf and 100% conversion

(b) Hourly Emission Rate (lb/hr) except for PM_0 = (Emission Factor, lb/MMBtuf) * (Heat Input, MMBtu/hr)

(c) (MMscf CH_4) (10.6 scf E/scf CH_4) (0.0283 m^3/scf E) (40 μ PM_{10}/L E) (1000 l/m^3) (g/106 μg) (lb/453.59 g) / (hr/yr) = lb PM_0 / hr

(d) Annual Emission Rate (tpy) = (Hourly Emission Rate, lb/hr) * (hr/yr) / (2,000 lb/ton)

(e) VOC & HAP emisssions:

Uncontrolled

(scf/hr) (lb/lb-mol) (VOC Fraction) (lb-mol/379.3 scf) = lb VOC/hr

(scf/hr) (lb/lb-mol) (HAP Fraction) (lb-mol/379.3 scf) = lb HAP/hr

(lb /hr) (hr/yr) (ton/2,000 lb) = ton VOC/yr

(lb /hr) (hr/yr) = lb HAP/yr

Controlled

(lb VOC/hr) (100 - 95%) / (100) = lb/hr

(lb HAP/hr) (100 - 95%) / (100) = lb/hr

(ton VOC/yr) (100 - 95%) / (100) = tpy

(lb HAP/yr) (100 - 95%) / (100) = lb/yr

VOC & HAP fraction from Ballista 202-1003H Gas Analysis - sample date 07-10-2014.