Transmittal

RECEIVED
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WV DEP / DIV OF AIR QUALITY

Date: July 31, 2015 Reference No.: 082715

To: Ms. Beverly McKeone
NSR Permitting Program Manager
WV Department of Environmental Protection
Division of Air Quality
601 57th Street, SE
Charleston, WV 25304

Antero Resources
Male Station
033-00201
PD15-060
David Keatley

Subject: Permit Determination Form (PDF) Application - Male Well Pad

No. of Copies	Description/Title	Drawing No./ Document Ref.	Issue
1	Permit Determination Form (PDF) Application - Male Well Pad	Report 129	July 2015

Issued for: ☒ Your information ☐ As requested ☐ Construction ☐ Quotation
☐ Your approval/comments ☐ Returned to you ☐ For re-submission

Sent by: ☒ Overnight courier ☐ Same day courier ☐ Mailed under separate cover ☐ Mail enclosed

Remarks:

Copy to: Wm. Tracy Rothwell - NSR Permitting
Barry Schatz - Antero Resources

Completed by: Manuel Bautista
[Please Print]

Signed:

Filing: Correspondence File

GHD Services Inc.
6320 Rothway Suite 100 Houston Texas 77040 USA
T 713 734 3090 F 713 734 3391 W www.ghd.com

REGISTERED COMPANY FOR ISO 9001 ENGINEERING DESIGN

July 31, 2015

Reference No. 082715-04

Ms. Beverly McKeone
NSR Permitting Program Manager
Division of Air Quality
WV Department of Environmental Protection
601 57th Street, SE
Charleston, West Virginia 25304

Dear Ms. McKeone:

Re: Permit Determination Form (PDF) Application
Male Well Pad
Antero Resources Corporation

GHD Services Inc. (GHD) would like to re-submit this Permit Determination Form (PDF) application that we prepared on behalf of Antero Resources Corporation for a gas facility identified as Male Pad.

This was initially submitted to Mr. Jesse Adkins on August 26, 2014 together with 48 other dry gas sites in compliance with Consent Orders (CO-R13-E-2014-10 to CO-R13-E-2014-21) issued on June 30, 2014; however this application was rejected because it was co-located with a permitted Male Compressor Station (Facility ID 033-00201). I have included a copy of the first submittal cover letter for easy reference. On July 31, 2015, Antero Resources submitted a Certificate to Operate (CTO) stating that the Male Compressor Station has been decommissioned and permanently shutdown.

With the shutdown of the compressor station, we are requesting for your approval of this PDF application. Since the compressor station is no longer operational, the only source of emissions in this location is the Male pad and its emissions will be below the permit threshold.

Please let us know if you have any questions or require additional information.

Sincerely,

GHD Services Inc.

Manuel Bautista

MB/ma/129

Encl.

cc: William Tracy Rothwell, New Source Review Permitting, Division of Air Quality, WV-DEP
Barry Schatz, Antero Resources Corporation

GHD Services Inc.
6320 Rothway Suite 100 Houston Texas 77040 USA
T 713 734 3090 F 713 734 3391 W www.ghd.com

REGISTERED COMPANY FOR
ISO 9001
ENGINEERING DESIGN

CONESTOGA-ROVERS
& ASSOCIATES

6320 Rothway, Suite 100, Houston, Texas 77040
Telephone: (713) 734-3090 Fax: (713) 734-3391
www.CRAworld.com

August 26, 2014

Reference No. 082715-04

Mr. Jesse Adkins
Compliance and Enforcement
Division of Air Quality
WV Department of Environmental Protection
601 57th Street, SE
Charleston, West Virginia 25304

Dear Mr. Adkins:

Re: Permit Determination Form (PDF) Application
Male Pad
Antero Resources Corporation

Conestoga-Rovers & Associates (CRA) would like to submit this Permit Determination Form (PDF) application that we prepared on behalf of Antero Resources Corporation for a gas facility identified as Male Pad.

This is being submitted in compliance with Consent Orders (CO-R13-E-2014-10 to CO-R13-E-2014-21) issued on June 30, 2014.

Please let us know if you have any questions or require additional information.

Sincerely,

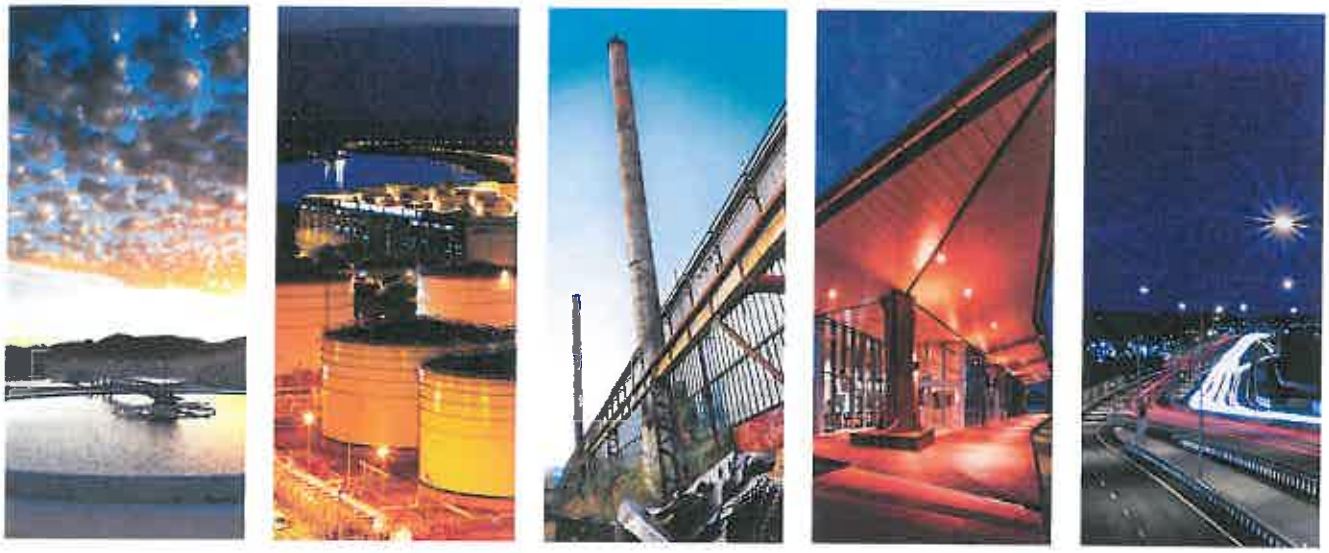
CONESTOGA-ROVERS & ASSOCIATES

Manuel Bautista

Encl.

cc: Donald Gray, Antero Resources Corporation

Equal
Employment Opportunity
Employer



Permit Determination Form (PDF) Application

Male Well Pad

Antero Resources Corporation

6320 Rothway, Suite 100 Houston Texas 77040

082715 | Report No 129 | July 2015

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WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY
601 57th Street, SE
Charleston, WV 25304
Phone: (304) 926-0475
www.dep.wv.gov/daq

PERMIT DETERMINATION FORM (PDF)

FOR AGENCY USE ONLY: PLANT I.D. # _____

PDF # _____ PERMIT WRITER: _____

1. NAME OF APPLICANT (AS REGISTERED WITH THE WV SECRETARY OF STATE'S OFFICE):
Antero Resources Corporation

2. NAME OF FACILITY (IF DIFFERENT FROM ABOVE):
Male Pad

3. NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (NAICS) CODE:
2 1 1 1 1 1

4A. MAILING ADDRESS:
1615 Wynkoop St., Denver, CO, 80202

4B. PHYSICAL ADDRESS:
1615 Wynkoop St., Denver, CO, 80202

5A. DIRECTIONS TO FACILITY (PLEASE PROVIDE **MAP** AS **ATTACHMENT A**):
From the east (on US-50 W); Keep left onto CR-9; Keep right to stay on CR-9; Keep straight onto Old US-50 / CR-11; Turn right onto road; Arrive at road on the right

5B. NEAREST ROAD:	5C. NEAREST CITY OR TOWN:	5D. COUNTY:
Old US-50	Clarksburg - North	Harrison
5E. UTM NORTHING (KM):	**5F. UTM EASTING (KM):**	**5G. UTM ZONE:**
4,350.0778	550.8799	17N

6A. INDIVIDUAL TO CONTACT IF MORE INFORMATION IS REQUIRED:
Barry Schatz

6B. TITLE:
Senior Environmental & Regulatory Manager

6C. TELEPHONE:	6D. FAX:	6E. E-MAIL:
303-357-7276	303-357-7315	bschatz@anteroresources.com

7A. DAQ PLANT I.D. NO. (FOR AN EXISTING FACILITY ONLY):
___ ___ ___ - ___ ___ ___ ___ ___

7B. PLEASE LIST ALL CURRENT 45CSR13, 45CSR14, 45CSR19 AND/OR TITLE V (45CSR30) PERMIT NUMBERS ASSOCIATED WITH THIS PROCESS (FOR AN EXISTING FACILITY ONLY):
NA

7C. IS THIS PDF BEING SUBMITTED AS THE RESULT OF AN ENFORCEMENT ACTION? IF YES, PLEASE LIST:
YES, TWELVE (12) CONSENT ORDERS (CO-R13-E-2014-10 TO CO-R13-E-2014-21) ISSUED ON JUNE 30, 2014

8A. TYPE OF EMISSION SOURCE (CHECK ONE):
☒ **NEW SOURCE** ☐ **ADMINISTRATIVE UPDATE**
☐ **MODIFICATION** ☐ **OTHER (PLEASE EXPLAIN IN 11B)**

8B. IF ADMINISTRATIVE UPDATE, DOES DAQ HAVE THE APPLICANT'S CONSENT TO UPDATE THE EXISTING PERMIT WITH THE INFORMATION CONTAINED HEREIN?
☐ **YES** ☐ **NO** X **NA**

9. IS *DEMOLITION* OR PHYSICAL *RENOVATION* AT AN EXISTING FACILITY INVOLVED? ☐ **YES** ☒ **NO**

10A. DATE OF ANTICIPATED INSTALLATION OR CHANGE:
N/A

10B. DATE OF ANTICIPATED START-UP/ START DATE:
2009-12-11

11A. PLEASE PROVIDE A **DETAILED PROCESS FLOW DIAGRAM** SHOWING EACH PROPOSED OR MODIFIED PROCESS EMISSION POINT AS **ATTACHMENT B.**

11B. PLEASE PROVIDE A **DETAILED PROCESS DESCRIPTION** AS **ATTACHMENT C.**

12. PLEASE PROVIDE **MATERIAL SAFETY DATA SHEETS (MSDS)** FOR ALL MATERIALS PROCESSED, USED OR PRODUCED AS **ATTACHMENT D.** FOR CHEMICAL PROCESSE, PLEASE PROVIDE A MSDS FOR EACH COMPOUND EMITTED TO AIR.

13A. **REGULATED AIR POLLUTANT EMISSIONS:**

⇒ **FOR A NEW FACILITY,** PLEASE PROVIDE PLANT WIDE EMISSIONS BASED ON THE POTENTIAL TO EMIT (PTE) FOR THE FOLLOWING AIR POLLUTANTS INCLUDING ALL PROCESSES.

⇒ **FOR AN EXISTING FACILITY,** PLEASE PROVIDE THE PROPOSED CHANGE IN EMISSIONS BASED ON THE PTE OF ALL PROCESS CHANGES FOR THE FOLLOWING AIR POLLUTANTS.

PTE FOR A GIVEN POLLUTANT IS TYPICALLY BEFORE AIR POLLUTION CONTROL DEVICES AND IS COLLECTED BASED ON THE MAXIMUM DESIGN CAPACITY OF PROCESS EQUIPMENT.

POLLUTANT	HOURLY PTE (LB/HR)	YEARLY PTE (TON/YR) (HOURLY PTE MULTIPLIED BY 8760 HR/YR) DIVIDED BY 2000 LB/TON
PM	1.2146	0.0265
PM_{10}	0.5680	0.1058
VOCs	0.0719	0.3137
CO	0.2370	1.0380
NO_x	0.2821	1.2357
SO_2	0.0017	0.0074
Pb	1.41E-006	6.18E-006
HAPs (AGGREGATE AMOUNT)	0.0053	0.0233
TAPs (Benzene)	0.0000	0.0000
TAPs (Formaldehyde)	2.12E-004	9.27E-004
OTHER (INDIVIDUALLY)	NA	NA

13B. PLEASE PROVIDE ALL **SUPPORTING CALCULATIONS** AS **ATTACHMENT E.**

CALCULATE AN HOURLY AND YEARLY PTE OF EACH PROCESS EMISSION POINT (SHOWN IN YOUR DETAILED PROCESS FLOW DIAGRAM) FOR ALL AIR POLLUTANTS LISTED ABOVE INCLUDING INDIVIDUAL HAP'S (LISTED IN SECTION 112[b] OF THE 1990 CAAA), TAP'S (LISTED IN 45CSR27), AND OTHER AIR POLLUTANTS (E.G. POLLUTANTS LISTED IN TABLE 45-13A OF 45CSR13, MINERAL ACIDS PER 45CSR7, ETC.).

14. **CERTIFICATION OF DATA**

I, Barry Schatz (*TYPE NAME*) ATTEST THAT ALL THE REPRESENTATIONS CONTAINED IN THIS APPLICATION, OR APPENDED HERETO, ARE TRUE, ACCURATE, AND COMPLETE TO THE BEST OF MY KNOWLEDGE BASED ON INFORMATION AND BELIEF AFTER REASONABLE INQUIRY, AND THAT I AM A ***RESPONSIBLE OFFICIAL*** (*PRESIDENT, VICE PRESIDENT, SECRETARY OR TREASURER, GENERAL PARTNER OR SOLE PROPRIETOR*) OF THE APPLICANT.

SIGNATURE OF RESPONSIBLE OFFICIAL: Barry Schatz

TITLE: Senior Environmental & Regulatory Manager DATE: 7 / 29 / 2015

** THE DEFINITION OF THE PHRASE '***RESPONSIBLE OFFICIAL***' CAN BE FOUND AT 45CSR13, SECTION 2.23.

NOTE: PLEASE CHECK ENCLOSED ATTACHMENTS:

☒ **ATTACHMENT A** ☒ **ATTACHMENT B** ☒ **ATTACHMENT C** ☒ **ATTACHMENT D** ☒ **ATTACHMENT E**

RECORDS ON ALL CHANGES ARE REQUIRED TO BE KEPT AND MAINTAINED ON-SITE FOR TWO (2) YEARS.

THE PERMIT DETERMINATION FORM WITH THE INSTRUCTIONS CAN BE FOUND ON DAQ'S PERMITTING SECTION WEB SITE:

Attachment R
AUTHORITY OF CORPORATION
OR OTHER BUSINESS ENTITY (DOMESTIC OR FOREIGN)

TO: The West Virginia Department of Environmental Protection, Division of Air Quality

DATE: January 23, 2015

ATTN.: Director

Corporation's / other business entity's Federal Employer I.D. Number 80-0162034

The undersigned hereby files with the West Virginia Department of Environmental Protection, Division of Air Quality, a permit application and hereby certifies that the said name is a trade name which is used in the conduct of an incorporated business or other business entity.

Further, the corporation or the business entity certifies as follows:

(1) Barry Schatz (is/are) the authorized representative(s) and in that capacity may represent the interest of the corporation or the business entity and may obligate and legally bind the corporation or the business entity.

(2) The corporation or the business entity is authorized to do business in the State of West Virginia.

(3) If the corporation or the business entity changes its authorized representative(s), the corporation or the business entity shall notify the Director of the West Virginia Department of Environmental Protection, Division of Air Quality, immediately upon such change.

President or Other Authorized Officer
(Vice President, Secretary, Treasurer or other official in charge of a principal business function of the corporation or the business entity)

(If not the President, then the corporation or the business entity must submit certified minutes or bylaws stating legal authority of other authorized officer to bind the corporation or the business entity).

Secretary

Name of Corporation or business entity

State of West Virginia

Certificate

I, Natalie E. Tennant, Secretary of State of the State of West Virginia, hereby certify that

ANTERO RESOURCES CORPORATION

a corporation formed under the laws of Delaware, which is authorized to transact business in West Virginia by a Certificate of Authority has filed in my office as required by the provisions of the West Virginia Code, a copy of an amendment to its Articles of Incorporation authenticated by the proper office of the state or country of its incorporation and was found to conform to law.

Therefore, I issue this

CERTIFICATE OF AMENDMENT TO CERTIFICATE OF AUTHORITY

Given under my hand and the Great Seal of the State of West Virginia on this day of June 10, 2013

Natalie E Tennant

Secretary of State

FILED

JUN 10 2013

IN THE OFFICE OF SECRETARY OF STATE

Natalie E. Tennant
Secretary of State
1900 Kanawha Blvd E
Bldg 1, Suite 157-K
Charleston, WV 25305

Penney Barker, Manager
Corporations Division
Tel: (304)558-8000
Fax: (304)558-8381
Website: www.wvsos.com
E-mail: business@wvsos.com

FILE ONE ORIGINAL
(Two if you want a filed stamped copy returned to you)
FEE: $25.00

APPLICATION FOR AMENDED CERTIFICATE OF AUTHORITY

Office Hours: Monday – Friday
8:30 a.m. – 5:00 p.m. ET

****** In accordance with the provisions of the West Virginia Code, the undersigned corporation hereby **** applies for an Amended Certificate of Authority and submits the following statement:**

1. Name under which the corporation was authorized to transact business in WV: Antero Resources Appalachian Corporation
2. Date Certificate of Authority was issued in West Virginia: 6/26/2008
3. Corporate name has been changed to: (Attach one Certified Copy of Name Change as filed in home State of incorporation.) Antero Resources Corporation
4. Name the corporation elects to use in WV: (due to home state name not being available) Antero Resources Corporation
5. Other amendments: (attach additional pages if necessary)

6. Name and phone number of contact person. (This is optional, however, if there is a problem with the filing, listing a contact person and phone number may avoid having to return or reject the document.)

Alvyn A. Schopp	(303) 367-7310
Contact Name	Phone Number

7. Signature information (See below *Important Legal Notice Regarding Signature*):

Print Name of Signer: Alvyn A. Schopp Title/Capacity: Authorized Person

Signature: Date: June 10, 2013

*Important Legal Notice Regarding Signature: Per West Virginia Code §31D-1-129. Penalty for signing false document. Any person who signs a document he or she knows is false in any material respect and knows that the document is to be delivered to the secretary of state for filing is guilty of a misdemeanor and, upon conviction thereof, shall be fined not more than one thousand dollars or confined in the county or regional jail not more than one year, or both.

WV032 - 04/16/2013 Wolters Kluwer Online

Delaware

The First State

I, JEFFREY W. BULLOCK, SECRETARY OF STATE OF THE STATE OF DELAWARE, DO HEREBY CERTIFY THE ATTACHED IS A TRUE AND CORRECT COPY OF THE CERTIFICATE OF AMENDMENT OF "ANTERO RESOURCES APPALACHIAN CORPORATION", CHANGING ITS NAME FROM "ANTERO RESOURCES APPALACHIAN CORPORATION" TO "ANTERO RESOURCES CORPORATION", FILED IN THIS OFFICE ON THE TENTH DAY OF JUNE, A.D. 2013, AT 9:37 O'CLOCK A.M.

A FILED COPY OF THIS CERTIFICATE HAS BEEN FORWARDED TO THE NEW CASTLE COUNTY RECORDER OF DEEDS.

Jeffrey W. Bullock, Secretary of State

4520810 8100

AUTHENTICATION: 0496546

130754186

DATE: 06-10-13

You may verify this certificate online at corp.delaware.gov/authver.shtml

State of Delaware
Secretary of State
Division of Corporations
Delivered 09:37 AM 06/10/2013
FILED 09:37 AM 06/10/2013
SRV 130754186 - 4520810 FILE

AMENDMENT TO THE AMENDED AND RESTATED CERTIFICATE OF INCORPORATION OF ANTERO RESOURCES APPALACHIAN CORPORATION

Antero Resources Appalachian Corporation (the "Corporation"), a corporation organized and existing under the laws of the State of Delaware, hereby certifies as follows:

1. The original Certificate of Incorporation of the Corporation was filed under the name Antero Resources Barnett Corporation with the filing of the original Certificate of Incorporation of the Corporation with the Secretary of State of the State of Delaware on March 18, 2008.

2. This Amendment to the Amended and Restated Certificate of Incorporation has been duly adopted and approved in accordance with Sections 242 of the General Corporation Law of the State of Delaware.

3. Article FIRST of the Amended and Restated Certificate of Incorporation is hereby amended to read in its entirety as follows:

FIRST. The name of the Corporation is Antero Resources Corporation.

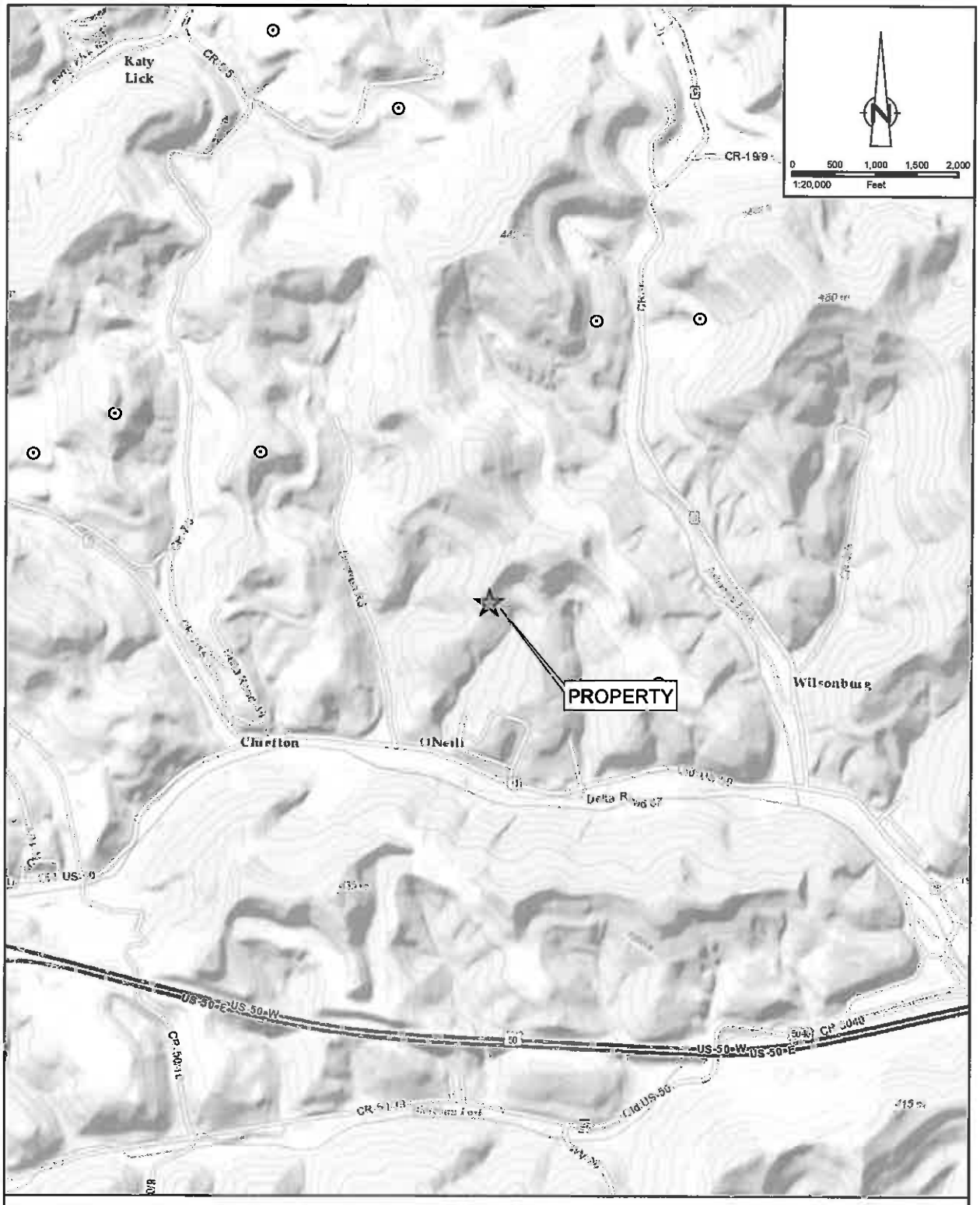
IN WITNESS WHEREOF, the Corporation has caused this Certificate of Amendment to be executed by its duly authorized officer on the 10th day of June, 2013.

ANTERO RESOURCES APPALACHIAN CORPORATION

By: _____
Name: Alvyn A. Schopp
Title: Vice President of Accounting & Administration / Treasurer

Attachment A

Area Map



Source: ESRI Topographic Basemap, accessed 2014;
Coordinate System: NAD 1983 CORS96 StatePlane West Virginia North FIPS 4701 FtUS

SITE COORDINATES:
LAT: 39.298586
LONG: -80.409931

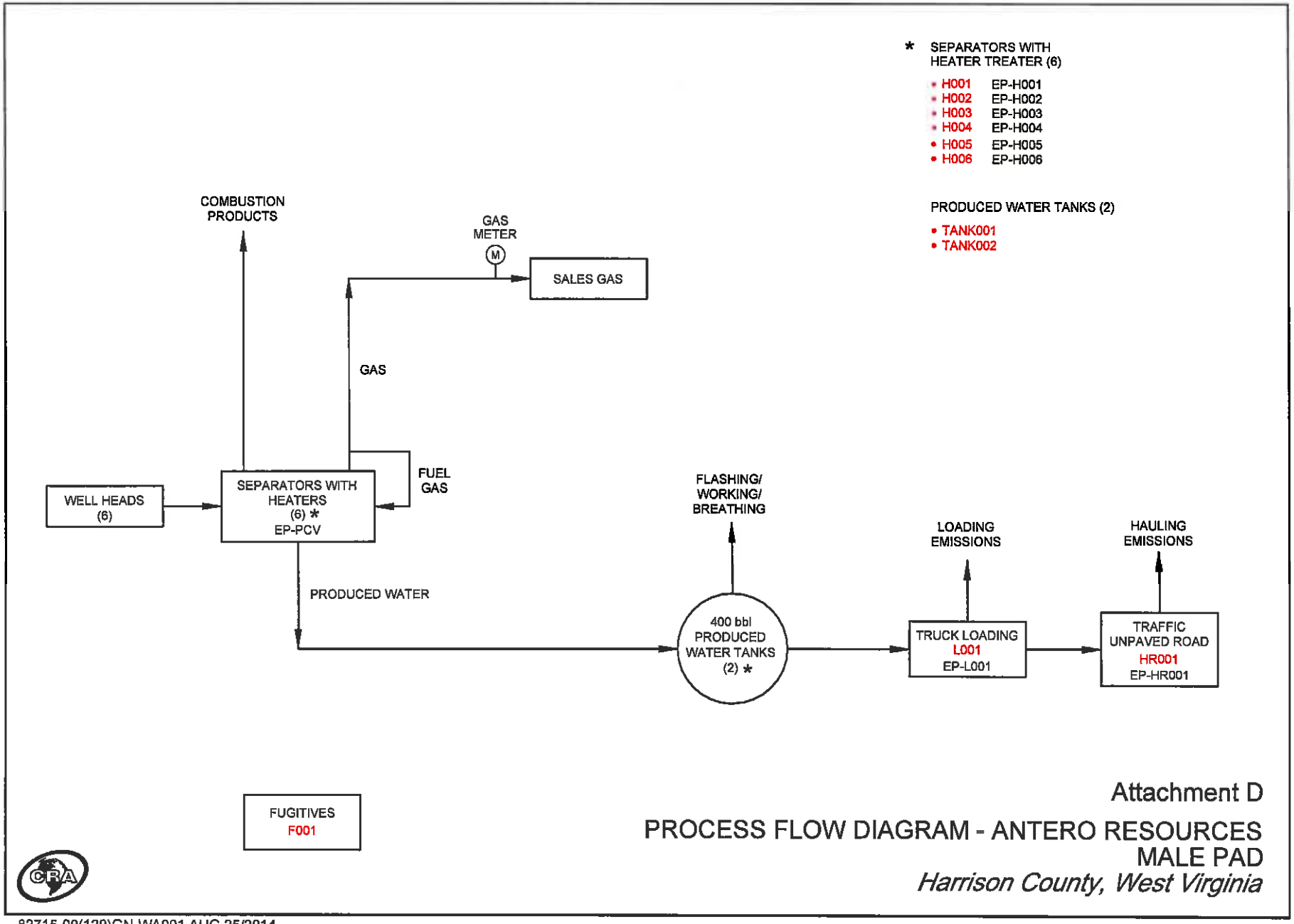
Attachment F

AREA MAP - ANTERO RESOURCES
MALE PAD
Harrison County, West Virginia

082715-00(129)GIS-OT001 Aug 27/2014

Attachment B

Process Flow Diagram



Attachment D

PROCESS FLOW DIAGRAM - ANTERO RESOURCES
MALE PAD
Harrison County, West Virginia

82715-00(129)GN-WA001 AUG 25/2014

Attachment C

Process Description

ATTACHMENT C

PROCESS DESCRIPTION
MALE PAD
ANTERO RESOURCES CORPORATION
HARRISON, WEST VIRGINIA

Gas from the wells enters the Facility through a number of low pressure separators where the gas phase is separated from the produced water. Gas production Unit Heaters (H001 to H006) are used in conjunction with the separators to help separate the gas from the liquid phases. These heaters are fueled by a slip stream of the separated gas. The separated gas from the low pressure separators will be metered and sent to the sales gas pipeline. The separated produced water from the separators flow to the storage tanks (TANK001-002).

The Facility has 2 tanks (TANK001-002) on site to store produced water prior to removal from the site. Flashing, working, and breathing losses from the storage tanks are routed to the atmosphere.

Produced water is transported off site on an as needed basis via tanker truck. Truck loading connections are in place to pump produced water (L001) from the storage tanks into tanker trucks. Emissions from the loading operations are vented to the atmosphere.

Emissions from the Facility's emission sources were calculated using the extended analysis of the produced water from Lewis No.3H, one of the wells in the Mountain Lakes pad. This extended analysis is considered representative of the materials from Male Pad being in the same Marcellus rock formation. The production gas analysis from one of the wells in the Male Pad was also used in the emission calculations.

Other emissions included in this permit determination are the fugitive emissions (F001), products of combustion from the gas production unit heaters and hauling emissions (HR001).

Attachment D

Material Safety Data Sheets

ATTACHMENT D

DESCRIPTION OF MATERIAL SAFETY DATA SHEETS (MSDS)
MATHENY PAD
ANTERO RESOURCES CORPORATION
DODDRIDGE COUNTY, WEST VIRGINIA

Two generic Material Safety Data Sheets (MSDS), and analysis of the produced water of a similar well with the same formation are provided. Antero Resources Corporation has developed its own MSDS for these materials.

1. Natural Gas: The MSDS for natural gas reflects pipeline quality odorized gas. This is essentially the same as the material delivered to the metering and downstream gathering lines from the Antero well pad.
2. Produced Water: Produced water is primarily groundwater with residual trace hydrocarbons that has been withdrawn from the ground during the gas extraction process and then separated from the natural gas and condensate in the gas processing units.

Antero Resources SAFETY DATA SHEET

Material Name: Dry Field Natural Gas **US GHS**

SYNONYMS: **CNG, Natural Gas, Methane.**

* * * Section 1 – PRODUCT AND COMPANY IDENTIFICATION * * *

PRODUCT NAME: **Dry Field Natural Gas**
PRODUCT CODES: **CAS Reg. No. 68410-63-9**

EMERGENCY PHONE: **(800) 878-1373**
AFTER HOURS: **(800) 878-1373**

PRODUCER: **Antero Resources**
ADDRESS: **1615 Wynkoop Street**
Denver, Colorado 80202

CHEMTREC PHONE: **(800) 424-9300**

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

Flammable Gas – Category 1.
Gases Under Pressure – Gas.
Specific Target Organ Systemic Toxicity (STOT) – Single Exposure Category 2.

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Danger

Hazard Statements

Extremely flammable gas.
Contains gas under pressure, may explode if heated.
May cause damage to central nervous and respiratory systems.

Precautionary Statements

Prevention

Keep away from heat/sparks/open flames/hot surfaces. No smoking.
Do not breathe fume/gas/mist/vapors/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.

Response
Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.
If exposed to gas, or concerned about possible exposure: Call a POISON CENTER or doctor/physician.

Storage
Protect from sunlight. Store in a well-ventilated place.
Store in a secure area.

Disposal
Dispose of contents/containers in accordance with local/regional/national/international regulations.

* * * Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS * * *

CAS #	Component	Percent
74-82-8	Methane	95.01
78-84-0	Ethane	3.99
74-98-6	Propane	0.32
106-97-8	Butanes	0.07
109-66-0	Pentanes	0.02
110-54-3	Hexanes	0.01
7727-37-9	Nitrogen	0.35
124-38-9	Carbon Dioxide	0.19
7782-44-7	Oxygen	0.03

Because natural gas is a natural product, composition can vary greatly.

* * * Section 4 – FIRST AID MEASURES * * *

First Aid: Eyes
In case of freeze burn, cover eyes to protect from light. Flush eyes with running water for at least fifteen (15) minutes. Following flushing, seek medical attention.

First Aid: Skin
Remove contaminated clothing. In case of blistering, frostbite or freeze burns, seek immediate medical attention.

First Aid: Ingestion

Risk of ingestion is extremely low. However, if oral exposure occurs, seek immediate medical assistance.

First Aid: Inhalation

Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

* * * Section 5 – FIRE FIGHTING MEASURES * * *

NFPA 704 Hazard Class

Health: **1** Flammability: **4** Instability: **0** (0-Minimal, 1-Slight, 2-Moderate, 3-Serious, 4-Severe)

General Fire Hazards

See Section 9 for Flammability Properties.
Forms a flammable mixture with air. If released, the resulting vapors will disperse with the prevailing wind. If a source of ignition is present where the vapor exists at a 5 – 15% concentration in air, the vapor will burn along the flame front toward the source of the fuel.

Hazardous Combustion Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media

Any extinguisher suitable for Class B fires, dry chemical, fire fighting foam, CO2, and other gaseous agents. However, fire should not be extinguished unless flow of gas can be immediately stopped.

Unsuitable Extinguishing Media

None.

Fire Fighting Equipment / Instructions

Gas fires should not be extinguished unless flow of gas can be immediately stopped. Shut off gas source and allow gas to burn out. If spill or leak has not ignited, determine

if water spray may assist in dispersing gas or vapor to protect personnel attempting to stop leak. Use water to cool equipment, surfaces and piping exposed to fire and excessive heat. For large fire, the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Isolate area, particularly around piping. Let the fire burn unless leak can be stopped. Concentrate fire-fighting efforts on objects / materials ignited by the initial fire. Withdraw immediately in the event of a rising sound from a venting safety device.

Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH-approved pressure-demand self-contained breathing apparatus with full facepiece and full protective clothing.

* * * Section 6 – ACCIDENTAL RELEASE MEASURES * * *

Recovery and Neutralization

Stop the source of the release, if safe to do so.

Materials and Methods for Clean-Up

Consider the use of water spray to disperse gas vapors. Do not use water spray to direct gas vapors toward sewer or drainage systems. Isolate the area until gas has dispersed. Ventilate and gas test area before entering.

Emergency Measures

Evacuate nonessential personnel and secure all ignition sources. No road flares, smoking or flames in hazard area. Consider wind direction. Stay upwind and uphill, if possible. Vapor cloud may be white, but color will dissipate as cloud disperses. Fire and explosion hazard is still present.

Personal Precautions and Protective Equipment

Cooling effect of expanding gas from leak may present frostbite / freeze burn hazard. Wear flame retardant (FR) clothing around un-ignited leak. Wear fire protective clothing around an active fire.

Environmental Precautions

Do not flush gas vapors toward sewer or drainage systems.

Prevention of Secondary Hazards

None.

* * * Section 7 – HANDLING AND STORAGE * * *

Handling Procedures

Keep away from flame, sparks and excessive temperatures. Bond and ground containers. Use only in well ventilated areas.

Storage Procedures

Natural gas will be contained in the pipeline. Keep away from flame, sparks, excessive temperatures and open flames. Empty pipeline segments may contain explosive residues from natural gas liquids. Do not cut, heat, weld or expose containers to sources of ignition sections of pipeline unless the sections have been purged of natural gas residues.

Incompatibilities

Keep away from strong oxidizers, ignition sources and heat.

* * * Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION * * *

Component Exposure Limits

Methane (74-82-8)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Ethane (74-84-0)

ACGIH: 1000 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Propane (74-98-6)

ACGIH: 2500 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Butane (106-97-8)

ACGIH: 800 ppm TWA (listed under Aliphatic hydrocarbon gases : Alkane C1-4)

Pentanes (109-66-0)

ACGIH: 600 ppm TWA (listed under Pentane, all isomers)

Hexanes (110-54-3)

ACGIH: 50 ppm TWA (listed under n-Hexane)

Nitrogen (7727-37-9)
Simple Asphyxiant

Carbon Dioxide (124-38-9)
ACGIH: 5000 ppm TWA (listed under Carbon Dioxide)

Oxygen (7782-44-7)
N/A – Necessary for life

Engineering Measures
Use adequate ventilation to keep gas and vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces. Use explosion-proof equipment and lighting in classified / controlled areas.

Personal Protective Equipment: Respiratory
Use a NIOSH approved positive-pressure, supplied air respirator with escape bottle or self-contained breathing apparatus (SCBA) for gas concentrations above occupational exposure limits, for potential for uncontrolled release, if exposure levels are not known, or in an oxygen-deficient atmosphere. CAUTION: Flammability limits (i.e., explosion hazard should be considered when assessing the need to expose personnel to concentrations requiring respiratory protection.

Personal Protective Equipment: Hands
Use cold-impervious, insulating flame-retardant (FR) gloves where contact with pressurized gas may occur.

Personal Protective Equipment: Eyes
Where there is a possibility of pressurized gas contact, wear splash-proof safety goggles and faceshield.

Personal Protective Equipment: Skin and Body
Where contact with pressurized gas may occur, wear flame-retardant (FR) and a faceshield.

* * * Section 9 – PHYSICAL AND CHEMICAL PROPERTIES * * *

Appearance:	Colorless	**Odor:**	Odorless to slight petroleum odor
Physical State:	Gas	**pH:**	ND
Vapor Pressure:	40 atm @ -187°F (-86°C)	**Vapor Density:**	0.6
Boiling Point:	-259°F (-162°C)	**Melting Point:**	ND
Solubility (H2O):	3.5%	**Specific Gravity:**	0.4 @ -263°F (-164°C)

Evaporation Rate:	ND	**VOC:**	ND
Octanol / H2O Coeff.:	ND	**Flash Point:**	Flammable Gas
Flash Point Method:	N/A		
Lower Flammability Limit: (LFL):	3.8 – 6.5	**Upper Flammability Limit: (UFL):**	13-17
Auto Ignition:	900-1170°F (482-632°C)	**Burning Rate:**	ND

* * * Section 10 – CHEMICAL STABILITY & REACTIVITY INFORMATION * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will not occur.

Conditions to Avoid

Keep away from strong oxidizers, ignition sources and heat.

Hazardous Decomposition Products

Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Methane and ethane, the main components of natural gas, are considered practically inert in terms of physiological effects. At high concentrations these materials act as simple asphyxiants and may cause death due to lack of oxygen.

B. Component Analysis – LD50/LC50

Methane (74-82-8)

Inhalation LC50 Mouse 326 g/m3 2h

Ethane (74-84-0)

Inhalation LC50 Rat 658 mg/l 4h

Propane (74-98-6)

Inhalation LC50 Rat 658 mg/l 4h

Butanes (106-97-8)
Inhalation LC50 Rat 658 g/m3 4h

Pentanes (109-66-0)
Inhalation LD50 Rat 364 g/m3 4h

Hexanes (110-54-3)
Inhalation LC50 Rat > 20 mg/l 4h

Nitrogen (7727-37-9)
Simple Asphyxiant

Carbon Dioxide (124-38-9)
Inhalation LC50 Human 100,000 ppm 1minute

Oxygen (7782-44-7)
N/A – Necessary for life

Potential Health Effects: Skin Corrosion Property / Stimulativeness
This product is not reported to have any skin sensitization effects.

Generative Cell Mutagenicity
This product is not reported to have any mutagenic effects.

Carcinogenicity

A: General Product Information
This product is not reported to have any carcinogenic effects.

B: Component Carcinogenicity
None of this product's components are listed by ACGIH, IARC, OSHA, NIOSH, or NTP.

Reproductive Toxicity
This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure
This product may cause damage to the heart.

Specified Target Organ General Toxicity: Repeated Exposure
This product is not reported to have any specific target organ repeat effects.

Aspiration Respiratory Organs Hazard
This product is not reported to have any aspiration hazard effects.

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

Keep gas and vapors out of sewers, drainage areas, and waterways. Report spills and releases, as applicable under Federal and State regulations.

B: Component Analysis – Ecotoxicity – Aquatic Toxicity

No ecotoxicity data are available for this product's components.

Persistance / Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment Recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents / container in accordance with local / regional / national / international regulations.

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Name: Natural Gas, Compressed

UN #: 1971 **Hazard Class:** 2.1

Placard:

* * * Section 15 – REGULATORY INFORMATION * * *

Regulatory Information

Component Analysis

None of this products components are listed under SARA Section 302 (40 CFR 355 Appendix A.
n-hexane is listed under SARA Section 313 (40 CFR 372.65). However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

n-hexane is listed under CERCLA (40 CFR 302.4). However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

SARA Section 311/312 – Hazard Classes

Acute Health	Chronic Health	Fire	Sudden Release of Pressure	Reactive
---	---	X	X	---

SARA Section 313 – Supplier Notification

This product contains one chemical (n-Hexane) that is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-to-know act (EPCRA) of 1986 and of 40 CFR 372. However the concentration of this component is approximately 0.01 % in compressed natural gas and is therefore far under the reporting threshold for the chemical.

State Regulations

Component Analysis – State

The following components appear on one or more of the following state hazardous substances lists:

Component	CAS	CA	MA	MN	NJ	PA	RI
Methane	74-82-8	No	No	Yes	Yes	Yes	No
Ethane	78-84-0	No	No	Yes	Yes	Yes	No
Propane	74-98-6	No	No	Yes	Yes	Yes	Yes
Butane	106-97-8	Yes	No	Yes	Yes	Yes	Yes
Pentanes	109-66-0	Yes	No	Yes	Yes	Yes	Yes
Hexanes	110-54-3	Yes	Yes	Yes	Yes	Yes	Yes
Nitrogen	7727-37-9	No	No	No	No	No	No
Carbon Dioxide	124-38-9	Yes	No	Yes	Yes	Yes	Yes
Oxygen	7782-44-7	No	No	No	No	No	No

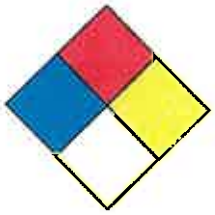
SAFETY DATA SHEET

Material Name: Dry Field Natural Gas **US GHS**

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	4
Reactivity	0



HMIS® Hazard Rating

Health	1	Moderate
Fire	4	Severe
Physical	0	Minimal
		* Chronic

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act: ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

The information presented herein has been compiled from sources considered to be dependable, and is accurate and reliable to the best of our knowledge and belief, but is not guaranteed to be so. Since conditions of use are beyond our control, we make no warranties, expressed or implied, except those that may be contained in our written contract of sale or acknowledgment.

Vendor assumes no responsibility for injury to vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, vendor assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material, even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in their use of the material.

Date of Preparation: **January 30, 2014**

Date of Last Revision: **March 4, 2014**

End of Sheet

SAFETY DATA SHEET

Material Name: Produced Water **US GHS**

SYNONYMS: **Produced Brine Water, Brine, Brine Water, Formation Water**

* * * Section 1 – PRODUCT AND COMPANY IDENTIFICATION * * *

PRODUCT NAME:	**Produced Water**	**EMERGENCY PHONE:**	**(800) 878-1373**
PRODUCT CODES:	**Mixture**	**AFTER HOURS:**	**(800) 878-1373**
PRODUCER:	**Antero Resources**		
ADDRESS:	**1615 Wynkoop Street** **Denver, Colorado 80202**	**CHEMTREC PHONE:**	**(800) 424-9300**

* * * Section 2 – HAZARDS IDENTIFICATION * * *

GHS Classification:

Eye Irritant – Category 2A.

GHS LABEL ELEMENTS

Symbol(s)

Signal Word

Warning

Hazard Statements

Causes serious eye irritation

Precautionary Statements

Prevention

Wear protective gloves/protective clothing/eye protection/face protection.

Response

If on SKIN (or hair): Rinse skin with water / shower. Remove / Take off all contaminated clothing immediately.

If in EYES: Rinse cautiously with water for at least fifteen (15) minutes. Remove Contact Lenses, if present and easy to do. Continue rinsing.

If EYE irritation persists, get medical advice / attention.

Storage
Store in a secure area.

Disposal
Dispose of contents/containers in accordance with regulations.

* * * Section 3 – COMPOSITION / INFORMATION ON INGREDIENTS * * *

CAS #	Component	Percent
7732-18-5	Water	80
7647-14-5	Sodium Chloride	20

Because brine water is a natural product, composition can vary greatly.

* * * Section 4 – FIRST AID MEASURES * * *

First Aid: Eyes
Flush eyes with clean running water for at least fifteen (15) minutes. If irritation or redness develops from exposure, following flushing, seek medical attention.

First Aid: Skin
First aid is not required, normally. However, it is a good practice to wash any chemical from the skin.

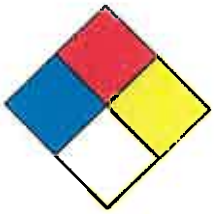
First Aid: Ingestion (Swallowing)
First aid is not required, normally. If spontaneous vomiting occurs, lean the victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. If symptoms develop, seek medical attention.

First Aid: Inhalation (Breathing)
Remove person to fresh air. If person is not breathing, provide artificial respiration. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

Most important symptoms and effects

None known or anticipated.

* * * Section 5 – FIRE FIGHTING MEASURES * * *



NFPA 704 Hazard Class

Health: 1 Flammability: 0 Instability: 0 (0=Minimal, 1=Slight, 2=Moderate, 3=Serious, 4=Severe)

General Fire Hazards

No fire hazards are expected.

General Fire Hazards

No unusual fire or explosion hazards are expected. If container is not properly cooled, it can rupture in the heat of a fire.

Extinguishing Media

The material is non-flammable. Use extinguishing agent suitable for the type of surrounding fire.

Unsuitable Extinguishing Media

None

Fire Fighting Equipment / Instructions

Small fires in the beginning stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment. Isolate area around container involved in fire and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from the immediate hazard area if it can be done safely. Cool equipment exposed to fire with water, if it can be done safely.

Hazardous Combustion Products

None Anticipated. See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

* * * Section 6 – ACCIDENTAL RELEASE MEASURES * * *

Recovery and Neutralization

Contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up

Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite, and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios of this material. However, local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

Emergency Measures

The material is not considered hazardous. Nevertheless, evacuate nonessential personnel and secure the area. Stay upwind and uphill, if possible.

Personal Precautions and Protective Equipment

Stay upwind and away from the spill/release. Avoid direct contact with the material. For large spillages, notify persons downstream of the spill/release. Isolate the immediate hazard area and keep unauthorized personnel out. Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions

Protect bodies of water by diking or absorbents, if possible. Do not flush down sewer or drainage systems. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If a spill occurs on water, notify appropriate authorities and advise shipping of any hazard.

Prevention of Secondary Hazards

None

* * * Section 7 – HANDLING AND STORAGE * * *

Handling Procedures

Wash thoroughly after handling. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29 CFR 1910.146. Do not wear contaminated clothing or shoes.

Storage Procedures

Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well ventilated areas. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

Incompatibilities

Keep away from excessive heat to prevent rupture of container.

* * * Section 8 – EXPOSURE CONTROLS / PERSONAL PROTECTION * * *

Component Exposure Limits

Water (7732-18-5)

ACGIH: Not listed

Sodium Chloride (7647-14-5)

ACGIH: Not listed

Engineering Measures

If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Personal Protective Equipment: Respiratory

Emergencies or conditions that could result in significant airborne exposures may require the use of NIOSH approved respiratory protection. An industrial hygienist or other appropriate health and safety professional should be consulted for specific guidance under these situations.

A respiratory protection program that meets or is equivalent to OSHA 29 CFR

1910.134 and ANSI Z88.2 should be followed whenever workplace conditions warrant a respirator's use.

Personal Protective Equipment: Skin and Hands

The use of skin protection is not normally required; however, good industrial hygiene practice suggests the use of gloves or other appropriate skin protection whenever working with chemicals.

Personal Protective Equipment: Eyes

Safety glasses or goggles that meet or exceed ANSI Z-87.1 are recommended where there is a possibility of splashing or spraying.

Hygiene Measures

Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Promptly remove contaminated clothing and launder before reuse.

* * * Section 9 – PHYSICAL AND CHEMICAL PROPERTIES * * *

Appearance:	Clear to Brown	**Odor:**	Salty
Physical State:	Liquid	**pH:**	ND
Vapor Pressure:	< 0.36 psia @ 70°F / 21.1°C	**Vapor Density:**	> 1
Boiling Point:	212°F / 100°C	**Melting Point:**	2.4°F / -16.5°C
Solubility (H2O):	Complete	**Specific Gravity:**	1.1 @ 68°F / 20°C
Evaporation Rate:	Variable	**VOC:**	ND
Octanol / H2O Coeff.:	ND	**Flash Point:**	ND
Flash Point Method:	ND		
Lower Flammability Limit: (LFL):	ND	**Upper Flammability Limit: (UFL):**	ND
Auto Ignition:	ND	**Burning Rate:**	ND

* * * Section 10 – CHEMICAL STABILITY & REACTIVITY INFORMATION * * *

Chemical Stability

This is a stable material.

Hazardous Reaction Potential

Will react with alkali and alkaline metals to form flammable hydrogen gas.

Conditions to Avoid

Avoid contact with alkali metals (lithium, sodium, potassium), alkaline metals (beryllium, magnesium, calcium, strontium, and barium), and metallic hydrides like lithium aluminum hydride.

Hazardous Decomposition Products

Not anticipated under normal conditions of use.

Hazardous Polymerization

Not known to occur.

* * * Section 11 – TOXICOLOGICAL INFORMATION * * *

Acute Toxicity

A: General Product Information

Unlikely to be harmful.

B. Component Analysis – D50/LC50

Water (7732-18-5)

Oral LD50 Rat 90 g/kg

Sodium Chloride (7647-14-5)

Oral LD50 Rat 3 g/kg

Potential Health Effects: Skin Corrosion Property / Stimulativeness

May cause skin irritation with prolonged or repeated contact. Not expected to be a skin sensitizer.

Potential Health Effects: Eye Critical Damage / Stimulativeness

Contact with eyes may cause moderate irritation.

Potential Health Effects: Ingestion

Ingestion may result in nausea, vomiting, diarrhea, abdominal cramps, and dehydration (thirst).

Potential Health Effects: Inhalation

No information available on the mixture. However, none of the components have been classified for respiratory sensitization (or are below the concentration threshold for classification).

Generative Cell Mutagenicity

Not expected to cause genetic effects.

Carcinogenicity

General Product Information

Not expected to cause cancer. This substance is not listed as a carcinogen by IARC, NTP or OSHA.

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

This product is not reported to have any specific target organ general toxicity multiple exposure effects.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

* * * Section 12 – ECOLOGICAL INFORMATION * * *

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable under Federal and State regulations.

Persistence / Degradability

No information available

Bioaccumulation

No information available

Mobility in Soil

No information available

* * * Section 13 – DISPOSAL CONSIDERATIONS * * *

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment Recommendations.

Disposal of Contaminated Containers or Packaging

Recover or recycle if possible. It is the responsibility of the generator to determine the toxicity and physical properties of the material generated so as to properly classify the waste and ensure disposal methods comply with applicable regulations.

This material, if discarded as produced, is not a RCRA "listed" hazardous waste, and is not believed to exhibit characteristics of hazardous waste. Consult state and local regulations regarding the proper disposal of this material. Do not dispose of brine water by draining onto the ground. This will result in soil and groundwater contamination. Waste arising from spillage or tank cleaning should be disposed of in accordance with applicable regulations.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate should not be considered a RCRA hazardous waste but must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a qualified drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

* * * Section 14 – TRANSPORTATION INFORMATION * * *

DOT Information

Shipping Description: Not Regulated

UN #: Not Regulated

* * * Section 15 – REGULATORY INFORMATION * * *

CERCLA/SARA – Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372,

CERCLA/SARA – Section 313 and 40 CFR 372):
This material does not contain any chemicals subject to the reporting requirements of SARA 313 and 40 CFR 372.

EPA (CERCLA) Reportable Quantity (in pounds):
This material does not contain any chemicals with CERCLA Reportable Quantities.

State Regulations

Component Analysis

The following components appear on one or more of the following state hazardous substances list.

California Proposition 65:
This material does not contain any chemicals that are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

National Chemical Inventories:
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.

U.S. Export control classification Number: EAR99.

* * * Section 16 – OTHER INFORMATION * * *

NFPA® Hazard Rating

Health	1
Fire	0
Reactivity	0

HMIS® Hazard Rating

Health	1	Slight
Fire	0	Minimal
Physical	0	Minimal

SAFETY DATA SHEET

Material Name: Produced Water **US GHS**

Key/Legend

EPA = Environmental Protection Agency; TSCA = Toxic Substance Control Act: ACGIH = American Conference of Governmental Industrial Hygienists; IARC = International Agency for Research on Cancer; NIOSH = National Institute for Occupational Safety and Health; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; NJTSR = New Jersey Trade Secret Registry.

Literature References

None

Other Information

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Date of Preparation: January 28, 2014

Date of Last Revision: March 4, 2014

End of Sheet

August 21, 2013

FESCO, Ltd.
1100 Fesco Avenue - Alice, Texas 78332

For: Antero Resources Appalachian Corp.
1625 17th Street
Denver, Colorado 80202

Date Sampled: 07/26/13

Date Analyzed: 08/05/13

Job Number: J34763

Sample: Lewis No. 3H

FLASH LIBERATION OF SEPARATOR WATER		
	Separator	**Stock Tank**
Pressure, psig	320	0
Temperature, °F	79	70
Gas Water Ratio (1)	------	1.63
Gas Specific Gravity (2)	------	0.754

(1) - Scf of water saturated vapor per barrel of stock tank water
(2) - Air = 1.000
(3) - Separator volume / Stock tank volume
Analyst: A. A.

Piston No. : WF-337*

Base Conditions: 14.65 PSI & 60 °F

Certified: FESCO, Ltd. - Alice, Texas

David Dannhaus 361-661-7015

August 7, 2013

FESCO, Ltd.
1100 Fesco Ave. - Alice, Texas 78332

For: Antero Resources Appalachian Corp.
1625 17th Street
Denver, Colorado 80202

Sample: Lewis No. 3H
Gas Liberated from Separator Water
From 320 psig & 79 °F to 0 psig & 70 °F

Date Sampled: 07/26/13 Job Number: 34763.011

CHROMATOGRAPH EXTENDED ANALYSIS - SUMMATION REPORT

COMPONENT	MOL%	GPM
Hydrogen Sulfide*	0.080	
Nitrogen	0.000	
Carbon Dioxide	14.341	
Methane	77.179	
Ethane	6.755	1.796
Propane	0.842	0.231
Isobutane	0.086	0.028
n-Butane	0.145	0.045
2-2 Dimethylpropane	0.000	0.000
Isopentane	0.036	0.013
n-Pentane	0.035	0.013
Hexanes	0.087	0.036
Heptanes Plus	0.414	0.149
Totals	100.000	2.311

Computed Real Characteristics Of Heptanes Plus:

Specific Gravity	3.197	(Air=1)
Molecular Weight	92.32	
Gross Heating Value	4618	BTU/CF

Computed Real Characteristics Of Total Sample:

Specific Gravity	0.754	(Air=1)
Compressibility (Z)	0.9970	
Molecular Weight	21.77	
Gross Heating Value		
Dry Basis	954	BTU/CF
Saturated Basis	939	BTU/CF

*Hydrogen Sulfide tested in laboratory by: Stained Tube Method (GPA 2377)
Results: 50.31 Gr/100 CF, 800.0 PPMV or 0.080 Mol %

Base Conditions: 14.650 PSI & 60 Deg F

Certified: FESCO, Ltd. - Alice, Texas

Analyst: MR
Processor: ANB
Cylinder ID: WF# 2 S

David Dannhaus 361-661-7015

CHROMATOGRAPH EXTENDED ANALYSIS
TOTAL REPORT

COMPONENT	MOL %	GPM	WT %
Hydrogen Sulfide*	0.080		0.125
Nitrogen	0.000		0.000
Carbon Dioxide	14.341		28.997
Methane	77.179		56.885
Ethane	6.755	1.796	9.332
Propane	0.842	0.231	1.706
Isobutane	0.086	0.028	0.230
n-Butane	0.145	0.045	0.387
2,2 Dimethylpropane	0.000	0.000	0.000
Isopentane	0.036	0.013	0.119
n-Pentane	0.035	0.013	0.116
2,2 Dimethylbutane	0.000	0.000	0.000
Cyclopentane	0.000	0.000	0.000
2,3 Dimethylbutane	0.013	0.005	0.051
2 Methylpentane	0.023	0.009	0.091
3 Methylpentane	0.016	0.006	0.063
n-Hexane	0.035	0.014	0.139
Methylcyclopentane	0.026	0.009	0.101
Benzene	0.100	0.028	0.359
Cyclohexane	0.040	0.014	0.155
2-Methylhexane	0.008	0.004	0.037
3-Methylhexane	0.008	0.004	0.037
2,2,4 Trimethylpentane	0.000	0.000	0.000
Other C7's	0.018	0.008	0.082
n-Heptane	0.017	0.008	0.078
Methylcyclohexane	0.043	0.017	0.194
Toluene	0.089	0.030	0.377
Other C8's	0.018	0.008	0.091
n-Octane	0.009	0.005	0.047
Ethylbenzene	0.002	0.001	0.010
M & P Xylenes	0.020	0.008	0.098
O-Xylene	0.004	0.002	0.020
Other C9's	0.006	0.003	0.035
n-Nonane	0.003	0.002	0.018
Other C10's	0.002	0.001	0.013
n-Decane	0.001	0.001	0.007
Undecanes (11)	0.000	0.000	0.000
Totals	100.000	2.311	100.000

Computed Real Characteristics Of Total Sample:

Specific Gravity ---------- 0.754 (Air=1)
Compressibility (Z) ---------- 0.9970
Molecular Weight ---------- 21.77

Gross Heating Value
Dry Basis ---------- 954 BTU/CF
Saturated Basis ---------- 939 BTU/CF

GAS ANALYTICAL SERVICES
powered by ProStream

C6+ Gas Analysis Report

Gas Analytical

Client:	Antero Resources	Date Sampled:	Jun 20, 2014 12:00a
Site:	Francis 1H	Date Reported:	Jun 25, 2014 3:13p
Field No:	9998	Collected By:	A.W.
Meter:	ANT004	Date Effective:	Jun 20, 2014 12:00a
Source Laboratory:	Clarksburg (Bridgeport), WV	Sample Pressure (PSI):	235
Lab File No:	115363.CHR	Sample Temp (°F):	78
Sample Type:	Spot	Field H2O (PPM):	
		Field H2S (PPM):	

Component	Mol %	Gal/MSCF
Methane	93.4670	
Ethane	5.5953	1.49
Propane	0.5004	0.14
I-Butane	0.0369	0.01
N-Butane	0.0426	0.01
I-Pentane	0.0100	0.00
N-Pentane	0.0055	0.00
Nitrogen	0.2679	
Oxygen	< MDL	
CO2	0.0744	
Hexanes+	< MDL	0.00
TOTAL	100.0000	1.66

Analytical Results at Base Conditions (Real)	
BTU/SCF (Dry):	1,063.3547 BTU/ft³
BTU/SCF (Saturated):	1,045.7253 BTU/ft³
PSIA:	14.73 PSI
Temperature (°F):	60.00 °F
Z Factor (Dry):	0.99772
Z Factor (Saturated):	0.99738

Analytical Results at Contract Conditions (Real)	
BTU/SCF (Dry):	1,063.3547 BTU/ft³
BTU/SCF (Saturated):	1,045.7253 BTU/ft³
PSIA:	14.7300 PSI
Temperature (°F):	60.0000 °F
Z Factor (Dry):	0.99772
Z Factor (Saturated):	0.99738

Calculated Specific Gravities			
Ideal Gravity:	0.5891	Real Gravity:	0.5902
Molecular Wt:	17.0627 lb/lbmol		

Gross Heating Values are Based on:
GPA 2145-09, 2172, 2261
Compressibility is Calculated using AGA-8.

Source	Date	Notes

Attachment E

Supporting Calculations

Table 1

Facility Information
Male Pad
Harrison, West Virginia
Antero Resources Corporation

Oil and Gas Site General Information	
Administrative Information	
Company Name	Antero Resources Corporation
Facility/Well Name	Male Pad
Nearest City/Town	Clarksburg - North
API Number/SIC Code	1311
Latitude/Longitude	39.298586, -80.40993
County	Harrison
Technical Information	
Max Produced Water Site Throughput (bbl/day):	1
Max Flashed Gas from Separator (scf/hr)	0.1
Are there any sour gas streams at this site?	No
Is this site currently operational/producing?	Yes
Equipment/Processes at Site	
Equipment/Process Types	**How many for this site?**
Fugitives	6
IC Engines	0
Turbines	0
Diesel Engines	0
Gas Production Unit Heaters	6
Produced Water Tanks	2
Loading Jobs	1
Glycol Units	0
Amine Units	0
Flares-Vapor Combustors	0
Vapor Recovery Units	0

Table 2

Uncontrolled Emissions Summary
Male Pad
Harrison, West Virginia
Antero Resources Corporation

Emission Source	VOC		NO_x		CO_2e		CO		SO_2		$PM_{2.5}$		PM_{10}		Lead		Total HAPs		Benzene		Xylenes		Formaldehyde	
	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)	(lbs/hr)	(ton/yr)
UNCONTROLLED (Fugitives; Storage Tanks; Gas Production Unit Heaters)																								
Fugitive Emissions (Component Count, PCV and Hauling)[1]	0.0560	0.2452			75.4758	330.584							0.4591	0.0175			0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
Flashing, Working and Breathing (F/W/B) Losses[2]	0.000	0.000			0.05	0.23											0.0000	0.0000	0.0000	0.0000	0.0000	0.0000		
Gas Production Unit Heaters Emissions[3]	0.0155	0.0680	0.2821	1.2357	340.56	1,491.67	0.2370	1.0380	0.0017	0.0074	0.0214	0.0939	0.0214	0.0939	1.41E-06	6.18E-06	0.0053	0.0233	5.92E-06	2.59E-05			2.12E-04	9.27E-04
Truck Loading Emissions[4]	3.08E-04	2.08E-07			1.204	0.0008											6.79E-07	4.59E-10	3.73E-07	2.53E-10	6.98E-08	4.72E-11		
POTENTIAL TO EMIT	0.0719	0.3137	0.2821	1.2357	417.2964	1822.4880	0.2370	1.0380	0.0017	0.0074	0.0214	0.0939	0.4805	0.1114	1.41E-06	6.18E-06	0.0053	0.0233	0.0000	0.0000	0.0000	0.0000	2.12E-04	9.27E-04

Enter any notes here	1 - See Tables 4 and 5 for fugitive emission calculations; Table 10 for PM emissions from hauling.
	2 - See Tables 6 and 7 for tanks emission calculations
	3 - See Table 9 for gas production unit heaters emission calculations
	4-The maximum emission was calculated based on tank truck capacity of 200 barrels and actual fill rate of 50 minutes per tank truck. See Table 8 for loading emissions.

Table 3

Permits Summary
Male Pad
Harrison, West Virginia
Antero Resources Corporation

Pollutant		Emissions		Threshold Exceeded?
		Uncontrolled	Threshold	Uncontrolled
VOC	lbs/hr	0.0719	6	**No**
	tons/yr	0.3137	10	**No**
NO_x	lbs/hr	0.2821	6	**No**
	tons/yr	1.2357	10	**No**
CO	lbs/hr	0.2370	6	**No**
	tons/yr	1.0380	10	**No**
SO_2	lbs/hr	0.0017	6	**No**
	tons/yr	0.0074	10	**No**
$PM_{2.5}$	lbs/hr	2.14E-02	6	**No**
	tons/yr	9.39E-02	10	**No**
PM_{10}	lbs/hr	0.4805	6	**No**
	tons/yr	0.1114	10	**No**
Lead	lbs/hr	1.41E-06	6	**No**
	tons/yr	6.18E-06	10	**No**
Total HAPs	lbs/hr	0.0053	2	**No**
	tons/yr	0.0233	5	**No**
Total TAPs	lbs/hr	0.0002	1.14	**No**

Table 4

Fugitive Emissions
Male Pad
Harrison, West Virginia
Antero Resources Corporation

VOC Type	Produced Water VOC
Emission Type	Steady State (continuous)

Gas Weight Fraction From Analysis	VOC frac	0.016
	Benzene frac	0.00
	Toluene	0.00
	Ethylbenzene	0.000
	Xylenes	0.000
	n-hexane	0.000
	Methane	0.884

Gas					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
300	Valves	Gas VOC	0.004500	0.02	426.71
		Non VOC	0.004500	1.33	25,590.49
354	Connectors	VOC	0.000200	0.00	22.38
		Non-VOC	0.000200	0.07	1,342.08
78	Flanges	VOC	0.000390	0.00	9.62
		Non-VOC	0.000390	0.03	576.64
			Total VOCs:	0.02	458.71
			Total THC:	1.45	27,967.91

Light Liquid Weight Fraction From Analysis:	VOC frac	0.000

Light Liquid					
Number	Component	Pollutant	Emission Factor (kg/hr of THC per component)	kg/hr	lb/yr
312	Valves	Light Liquid VOC	0.002500	0.00	0.00
			Total VOC:	0.00	0.00
			Total THC:	0.00	0.00

Fugitive Total Emissions			
	Annual Emissions (lb/yr)	Annual Emissions (lb/hr)	Annual Emissions (tpy)
VOC	458.71	0.05	0.23
Ethylbenzene		0.00	0.00
Toluene		0.00	0.00
Xylenes		0.00	0.00
n-Hexane		0.00	0.00
TAPs (Benzene)		0.00	0.00
HAPs		0.00	0.00
CO_{2e}	618,336.54	70.59	309.17

Enter Notes Here	Fugitive emissions based on an estimated component count Global Warming Potentials from EPA site Reference to Emission factors used: 1. Emission factors are for oil and gas production facilities (not refineries) come from the EPA's "Protocol for Equipment Leak Emission Estimates" November 1995, EPA 4531, R-95-017, Table 2-4. 2. Percent of speciated VOCs used in fugitive calculations are based on the total hydrocarbons, not of the total sample.

Table 5

Pneumatic Control Valve Emissions
Male Pad
Harrison, West Virginia
Antero Resources Corporation

Number of PCVs	18
Bleed Rate (scf/day/PCV)	6.6
Total Bleed Rate (scf/day)	118.8

Component	Mol%	Molecular Weight (lb/lb-mole)	Component Flow (scf/day)	Component Moles (lb-moles)	Component Emissions (lbs/day)	(lbs/hr)	(tons/year)
H2S	0	34.08	0	0.00	0.00	0.00	0.00
Nitrogen	0.2679	14.01	0.3182652	0.00	0.01	0.00	0.00
Carbon Dioxide	0.0744	44.01	0.0883872	0.00	0.01	0.00	0.00
Methane	93.467	16.04	111.038796	0.29	4.69	0.20	0.86
Ethane	5.5953	30.07	6.6472164	0.02	0.53	0.02	0.10
Propane	0.5004	44.1	0.5944752	0.00	0.07	0.00	0.01
Isobutane	0.0369	58.12	0.0438372	0.00	0.01	0.00	0.00
n-Butane	0.0426	58.12	0.0506088	0.00	0.01	0.00	0.00
Isopentane	0.01	72.15	0.01188	0.00	0.00	0.00	0.00
n-Pentane	0.0055	72.15	0.006534	0.00	0.00	0.00	0.00
2-Methylpentane	0	86.18	0	0.00	0.00	0.00	0.00
3-Methylpentane	0	86.18	0	0.00	0.00	0.00	0.00
n-Hexane	0	86.18	0	0.00	0.00	0.00	0.00
Methylcyclopentane	0	84.16	0	0.00	0.00	0.00	0.00
Benzene	0	78.11	0	0.00	0.00	0.00	0.00
2-Methylhexane	0	100.2	0	0.00	0.00	0.00	0.00
3-Methylhexane	0	100.2	0	0.00	0.00	0.00	0.00
Heptane	0	100.21	0	0.00	0.00	0.00	0.00
Methylcyclohexane	0	98.186	0	0.00	0.00	0.00	0.00
Toluene	0	92.14	0	0.00	0.00	0.00	0.00
Octane	0	114.23	0	0.00	0.00	0.00	0.00
Ethylbenzene	0	106.17	0	0.00	0.00	0.00	0.00
m & p-Xylene	0	106.16	0	0.00	0.00	0.00	0.00
o-Xylene	0	106.16	0	0.00	0.00	0.00	0.00
Nonane	0	128.2	0	0.00	0.00	0.00	0.00
C10+	0	174.28	0	0.00	0.00	0.00	0.00

	lb/hr	tpy
VOC Emissions	0.0036	0.0159
Benzene Emissions	0.0000	0.0000
Toluene Emissions	0.0000	0.0000
Ethylbenzene Emissions	0.0000	0.0000
Xylene Emissions	0.0000	0.0000
n-Hexane Emissions	0.0000	0.0000
HAPs Emissions	0.0000	0.0000
TAPs Emissions	0.0000	0.0000
CO_{2e} emissions	4.8894	21.4156

Enter any notes here:	1. PCV bleed rate obtained from the user manual for PCV http://issuu.com/rmcprocesscontrols/docs/mizer-pilot-operation--parts---installation-manual 2. Emissions per hour= Mol % x no. of PCV x bleed rate x MW / 379.48 / 24

Table 6

Uncontrolled Flashing Emissions
Male Pad
Harrison, West Virginia
Antero Resources Corporation

# Hours Operational	8760

	Tank Flashing Losses		
	Vapor Mass Fraction	Flashing Losses	
	wt%	lbs/hr	tpy
Water	2.3530	0.0001	0.0002
H2S	0.0177	0.0000	0.0000
Nitrogen	0.0000	0.0000	0.0000
Carbon Dioxide	10.5454	0.0002	0.0011
Methane	71.1426	0.0016	0.0071
Ethane	11.4114	0.0003	0.0011
Propane	2.0416	0.0000	0.0002
Isobutane	0.3074	0.0000	0.0000
n-Butane	0.4832	0.0000	0.0000
Isopentane	0.1547	0.0000	0.0000
n-Pentane	0.1508	0.0000	0.0000
2-Methylpentane	0.1242	0.0000	0.0000
3-Methylpentane	0.0801	0.0000	0.0000
n-Hexane	0.1907	0.0000	0.0000
Methylcyclopentane	0.1020	0.0000	0.0000
Benzene	0.0245	0.0000	0.0000
2-Methylhexane	0.0504	0.0000	0.0000
3-Methylhexane	0.0503	0.0000	0.0000
Heptane	0.2197	0.0000	0.0000
Methylcyclohexane	0.2193	0.0000	0.0000
Toluene	0.0308	0.0000	0.0000
Octane	0.1967	0.0000	0.0000
Ethylbenzene	0.0008	0.0000	0.0000
m & p-Xylene	0.0083	0.0000	0.0000
o-Xylene	0.0063	0.0000	0.0000
Nonane	0.0724	0.0000	0.0000
C10+	0.0157	0.0000	0.0000
Total VOCs	4.5299	0.0001	0.0005
Total CO_{2e}		0.0407	0.1782
Total TAPs (Benzene)		0.0000	0.0000
Toluene		0.0000	0.0000
Ethylbenzene		0.0000	0.0000
Xylenes		0.0000	0.0000
n-Hexane		0.0000	0.0000
Total HAPs		0.0000	0.0000
Total	100.0000	0.0023	0.0100

Enter any notes here:	Vapor mass fractions and Flashing losses from Promax output

Table 7

Uncontrolled Working and Breathing Losses
Male Pad
Harrison, West Virginia
Antero Resources Corporation

Produced Water Tank Information	
Number of Tanks	2
Maximum Working Losses (lbs/hr)	0.0002
Maximum Breathing Losses (lbs/hr)	0.0126

	Tank W/B Losses						
	Vapor Mass Fraction	Working Losses		Breathing Losses		Max W/B Losses	
	wt%	lbs/hr	tpy	lbs/hr	tpy	lbs/hr	tpy
Water	83.4455	0.0002	0.0008	0.0105	0.0461	0.0107	0.0469
H2S	0.0203	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nitrogen	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Carbon Dioxide	12.5927	0.0000	0.0001	0.0016	0.0070	0.0016	0.0071
Methane	3.4045	0.0000	0.0000	0.0004	0.0019	0.0004	0.0019
Ethane	0.5120	0.0000	0.0000	0.0001	0.0003	0.0001	0.0003
Propane	0.0233	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Isobutane	0.0004	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Butane	0.0010	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Isopentane	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Pentane	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2-Methylpentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3-Methylpentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Hexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Methylcyclopentane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Benzene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
2-Methylhexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3-Methylhexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Heptane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Methylcyclohexane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Toluene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Octane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ethylbenzene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
m & p-Xylene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
o-Xylene	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Nonane	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
C10+	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total VOCs	0.0250	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total CO_{2e}		0.0002	0.0010	0.0123	0.0539	0.0125	0.0549
Total TAPs (Benzene)		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Toluene		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Ethylbenzene		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Xylenes		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
n-Hexane		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total HAPs		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Total	100.0000	0.0002	0.0010	0.0126	0.0552	0.0128	0.0562

Enter any notes here	Vapor mass fractions, working losses and breathing losses from ProMax output

Table 8

Loading Emissions
Male Pad
Harrison, West Virginia
Antero Resources Corporation

Annual Loading	Produced Water Truck Loading
RVP	1.03
Annual Average Temp (F)	72.1
S (saturation factor)	0.6
P (true vapor pressure)	0.45
M (MW of vapor)	19.42
Collection Efficiency (%)	0
Loading Loss (lb/10^3 gal)*	1.22E-01
Maximum Throughput (gallons/hr)	10,080
Average Throughput (gallons/yr)	13,635
Loading Emissions (lbs/hr)	1.23E+00
Loading Emissions (tpy)	8.34E-04

	Tank Loading Losses		
	Vapor Mass Fraction	Loading Losses	
	wt%	lbs/hr	tpy
Water	83.4455	1.0286	0.0007
H2S	0.0203	0.00	1.70E-07
Nitrogen	0.0000	0.0000	0.00E+00
Carbon Dioxide	12.5927	0.1552	1.05E-04
Methane	3.4045	0.0420	2.84E-05
Ethane	0.5120	0.0063	4.27E-06
Propane	0.0233	0.0003	1.94E-07
Isobutane	0.0004	0.0000	3.61E-09
n-Butane	0.0010	0.0000	8.43E-09
Isopentane	0.0001	0.0000	6.93E-10
n-Pentane	0.0001	0.0000	4.83E-10
2-Methylpentane	0.0000	0.0000	7.56E-11
3-Methylpentane	0.0000	0.0000	1.20E-10
n-Hexane	0.0000	0.0000	4.52E-12
Methylcyclopentane	0.0000	0.0000	3.48E-10
Benzene	0.0000	0.0000	2.53E-10
2-Methylhexane	0.0000	0.0000	5.45E-13
3-Methylhexane	0.0000	0.0000	8.13E-12
Heptane	0.0000	0.0000	2.72E-11
Methylcyclohexane	0.0000	0.0000	1.56E-10
Toluene	0.0000	0.0000	1.53E-10
Octane	0.0000	0.0000	4.35E-12
Ethylbenzene	0.0000	0.0000	2.45E-12
m & p-Xylene	0.0000	0.0000	2.65E-11
o-Xylene	0.0000	0.0000	2.08E-11
Nonane	0.0000	0.0000	7.69E-13
C10+	0.0000	0.0000	1.31E-11
Total VOCs	0.0250	3.08E-04	2.08E-07
Total CO_{2e}		1.2043	0.0008
Total TAPs (Benzene)		0.0000	2.53E-10
Toluene		0.0000	1.53E-10
Ethylbenzene		0.0000	2.45E-12
Xylenes		0.0000	4.72E-11
n-Hexane		0.0000	4.52E-12
Total HAPs		0.0000	4.59E-10
Total	100.0000	1.2326	0.0008

Enter any notes here

Vapor mass fractions and loading losses from Promax output
Using equation L_L = 12.46 SPM/T from AP-42, Chapter 5, Section 5.2-4
RVP and MW were taken from Promax
Annual Average Temp (F) obtained from Charleston, WV (preset in Promax)
S (saturation factor) is based on submerged loading, dedicated service as it was most representative
True vapor pressure (TVP) equation from AP-42, Chapter 7, Figure 7.1-13b
Loading emissions are vented to the atmosphere.

Table 9

Gas Production Unit Heater Emissions
Male Pad
Harrison, West Virginia
Antero Resources Corporation

Number of Units	6
GPU Heater Rating (MMBtu/hr)	0.5
Operating hours/year	8760
Fuel Heat Value (Btu/scf)	1,063

Pollutant	Emission Factors (lb/MMscf)	lb/hr	tpy
NOx	100	0.282	1.236
CO	84	0.237	1.038
CO_2	120,000	338.551	1,482.9
Lead	0.0005	1.41E-06	6.18E-06
N_2O	2.2	0.006	0.027
PM (Total)	7.6	0.021	0.094
SO_2	0.6	0.002	0.007
TOC	11	0.031	0.136
Methane	2.3	0.006	0.028
VOC	5.5	0.016	0.068
HAPS			
2-Methylnaphthalene	2.40E-05	6.77E-08	2.97E-07
Benzene	2.10E-03	5.92E-06	2.59E-05
Dichlorobenzene	1.20E-03	3.39E-06	1.48E-05
Fluoranthene	3.00E-06	8.46E-09	3.71E-08
Fluorene	2.80E-06	7.90E-09	3.46E-08
Formaldehyde	7.50E-02	2.12E-04	9.27E-04
Hexane	1.80E+00	5.08E-03	2.22E-02
Naphthalene	6.10E-04	1.72E-06	7.54E-06
Phenanathrene	1.70E-05	4.80E-08	2.10E-07
Toluene	3.40E-03	9.59E-06	4.20E-05

	lb/hr	tpy
TOTAL Uncontrolled VOC	0.016	0.068
TOTAL Uncontrolled HAPs	0.005	0.023
TOTAL Uncontrolled TAPs (Benzene)	0.000	0.000
TOTAL Uncontrolled TAPs (Formaldehyde)	0.000	0.001
TOTAL CO_{2e} Emissions	340.56	1,491.67

Enter any notes here:
All Emission Factors based off AP-42 Sec 1.4 Natural Gas Combustion

Table 10

Haul Road Emissions
Male Pad
Harrison, West Virginia
Antero Resources Corporation

	PM	PM10
Particle Size Multiplier (k)	0.8	0.36
Silt Content of Road Surface Material (s) (%)	5.1	5.1
Days per Year with Precipitation > 0.01 in (p)	150	150
Control Efficiency for Watering [1] (%)	50	50

Tanker Truck Trip Calculation	
PW Production (bbl/day)	1
Truck Capacity (bbl)	200

Pick Up Truck Trip Calculation	
No of Trips Per day	2
Trips Per Year	730

	# of Wheels	Mean Vehicle Weight (W) (tons)	Mean Vehicle Speed (S) (mph)	Miles Per Trip (miles)	Maximum Trips per Hour	Maximum Trips per Year	Vehicle Miles Travelled (miles/hr)	Vehicle Miles Travelled (miles/year)	PM (lbs/VMT)	PM10 (lbs/VMT)
Tanker Trucks	10	40	10	0.2400	1	2	0.2400	0.4800	3.8175	1.7179
Pick Up Truck	4	3	10	0.3000	1	730	0.3000	219.0000	0.3467	0.1560

	Uncontrolled Emissions						Controlled Emissions					
	PM			PM10			PM			PM10		
	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)	(lbs/hr)	(lbs/year)	(tpy)
Tanker Trucks	0.9162	1.8324	0.0009	0.4123	0.8246	0.0004	0.4581	0.9162	0.0005	0.2061	0.4123	0.0002
Pick Up Truck	0.1040	75.9229	0.0380	0.0468	34.1653	0.0171	0.0520	37.9614	0.0190	0.0234	17.0826	0.0085
Total Emissions	1.0202	77.7553	0.0389	0.4591	34.9899	0.0175	0.5101	38.8776	0.0194	0.2295	17.4949	0.0087

Enter any notes here	1 EPA, AP-42, Volume I, Section 13.2.2 Unpaved Roads (11/06); assume 2:1 moisture ratio Section 13.2.2 Unpaved Roads (11/06) Source: Attachment L, Fugitive Emissions from Unpaved Haul Roads, Rev 03/2007, West Virginia Department of Environmental Protection

Bryan Research & Engineering, Inc.

ProMax® 3.2

with

TSWEET® & PROSIM®

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Simulation Report

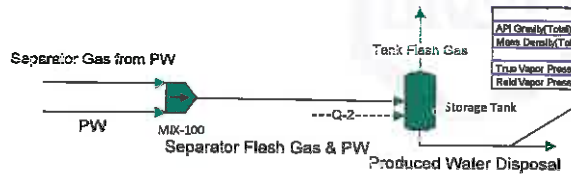
Client Name:	Antero Resources
Location:	West Virginia
Job:	Male Pad

ProMax Filename:	ProMax@C:\Antero Project\PW Emissions Calculations\VOC Determination\VOC Determination\Antero Promax Scenario 2.pmx
ProMax Version:	3.2.13330.0
Simulation Initiated:	8/22/14 2:44

PW		
Std Liquid Volumetric Flow	0.83288*	bbl/d
Separator Gas from PW		
Std Vapor Volumetric Flow	0.056566*	scf/h

Stream Tank Flash Gas C3+ Mass Flow =0.0004513 ton/yr

Stream Tank Flash Gas C3+ Mass Flow =0.000103 lb/h



Properties	Produced Water Disposal	
API Gravity(Total)	10.014	
Mass Density(Total)	8.325	lb/gal
Analysis	Produced Water Disposal	
True Vapor Pressure(Vapor Pressure 1, Total)	18.348	psia
Reid Vapor Pressure(Vapor Pressure 1, Total)	1.0252	psi

Number of Tanks= 2

Produced Water Disposal		
Std Liquid Volumetric Flow	0.833	bbl/d

Tank loss calculations for "Produced Water Disposal".
Total working and breathing losses from the Vertical Cylinder are 0.01284 lb/h.
Loading losses are 3.439E-05 lb/h of loaded liquid.

Tank-1

W/B Losses from PW Tanks

Name	Units	Separator Gas from PW	PW	Produced Water Disposal
Temperature	°F	79*	70*	70*
Pressure	psia	334.7*	14.7*	14.7*
Molecular Weight	lb/lbmol	21.74	18.02	18.02
Std Liquid Volumetric Flow	bbl/d	0.0005769	0.8329*	0.833
Water(Mole Fraction)	%	0*	100*	100
H2S(Mole Fraction)	%	0.06003*	0*	1.694e-005
Nitrogen(Mole Fraction)	%	0*	0*	0
Carbon Dioxide(Mole Fraction)	%	14.35*	0*	0.002362
Methane(Mole Fraction)	%	77.21*	0*	0.002109
Ethane(Mole Fraction)	%	6.758*	0*	0.0002137
Propane(Mole Fraction)	%	0.6429*	0*	3.003e-005
Isobutane(Mole Fraction)	%	0.09829*	0*	1.177e-006
n-Butane(Mole Fraction)	%	0.1481*	0*	4.025e-006
Isopentane(Mole Fraction)	%	0.03601*	0*	7.213e-007
n-Pentane(Mole Fraction)	%	0.03601*	0*	6.501e-007
2-Methylpentane(Mole Fraction)	%	0.02301*	0*	2.258e-007
3-Methylpentane(Mole Fraction)	%	0.01601*	0*	4.012e-007
n-Hexane(Mole Fraction)	%	0.03501*	0*	2.785e-007
Methylcyclopentane(Mole Fraction)	%	0.02601*	0*	1.691e-006
Benzene(Mole Fraction)	%	0.1*	0*	2.105e-005
2-Methylhexane(Mole Fraction)	%	0.006003*	0*	7.215e-006
3-Methylhexane(Mole Fraction)	%	0.006003*	0*	7.502e-006
Heptane(Mole Fraction)	%	0.03601*	0*	3.449e-007
Methylcyclohexane(Mole Fraction)	%	0.04302*	0*	1.976e-006
Toluene(Mole Fraction)	%	0.06603*	0*	1.865e-005
Octane(Mole Fraction)	%	0.02701*	0*	1.634e-007
Ethylbenzene(Mole Fraction)	%	0.002001*	0*	4.152e-007
m-Xylene(Mole Fraction)	%	0.02001*	0*	4.159e-006
o-Xylene(Mole Fraction)	%	0.02001*	0*	4.222e-006
Nonane(Mole Fraction)	%	0.006003*	0*	8.80e-008

Process Streams	1	2	3	4	5	6
Composition						
Phase Total	Produced Water Dispo Flowsheet1	PW Flowsheet1	arator Flash Gas & Separator Gas from P Flowsheet1	Flowsheet1	Tank Flash Gas Flowsheet1	Losses from PW Tanks Flowsheet1
Mole Fraction	%	%	%	%	%	%
Water	99.99521	100.0000	99.9779	0.00000	2.4815	94.9099
H2S	0.0000	0.00000000	1.76815E-05	0.080030	0.00985740	5.94534E-05
Nitrogen	0.00000000	0	0	0.00000000	0	0.0146528
Carbon Dioxide	0.002362	0	0.00316963	14.3463081	4.55242	0.500114
Methane	0.002109	0.00000E+00	0.0170580	7.72076E+01	8.42526E+01	3.93217
Ethane	2.13676E-04	0	0.00149298	6.757500275	7.21015	0.606850
Propane	0.000030026	0	0.000188098	0.84231166	0.879624	0.0331953
Isobutane	0.0000012	0	1.90076E-05	0.086032	0.100489	0.000687617
n-Butane	0.00000	0	3.20478E-05	0.1451	0.157935	0.00188044
Isopentane	0.000001	0	7.95669E-06	0.0360	0.0407355	0.000227108
n-Pentane	0.000001	0	7.73567E-06	0.03501	0.0397084	0.000167703
2-Methylpentane	0.000000	0	5.08344E-06	0.02301	0.0273797	2.14279E-05
3-Methylpentane	0.000000	0	3.53631E-06	0.01601	0.0176695	2.97913E-05
n-Hexane	0.000000	0	7.73567E-06	0.03501	0.0420389	1.22549E-06
Methylcyclopentane	0.000002	0	5.74650E-06	0.0260	0.0230263	1.11276E-05
Benzene	0.000021	0	2.21019E-05	0.1000	0.00595772	1.34002E-06
2-Methylhexane	0.000000	0	1.76815E-06	0.0080	0.00955822	2.93633E-07
3-Methylhexane	0.000000	0	1.76815E-06	0.0080	0.00954224	4.46608E-06
Heptane	0.000000	0	7.73567E-06	0.0350	0.0416554	7.88834E-06
Methylcyclohexane	0.000002	0	9.50382E-06	0.0430	0.0424266	1.45162E-05
Toluene	0.000019	0	1.96707E-05	0.0890	0.00634982	1.38175E-06
Octane	0.000000	0	5.96752E-06	0.0270	0.0327109	1.92780E-06
Ethylbenzene	0.000000	0	4.42038E-07	0.0020	0.000151917	3.21575E-08
m-Xylene	0.000004	0	4.42038E-06	0.0200	0.00148441	3.00634E-07
o-Xylene	0.000004	0	4.42038E-06	0.0200	0.00112078	2.69647E-08
Nonane	0.000000	0	1.98917E-06	0.0090	0.0107209	2.30850E-07
C10+	0.000000	0	6.63057E-07	0.0030	0.00323893	2.40925E-06
Molar Flow	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Water	0.6745219	0.674525	0.6745	0.000000	0.0000	0.0024
H2S	0.000000	0	1.19293E-07	0.0000001	0.00000001	1.47243E-09
Nitrogen	0.00000E+00	0	0	0.000000000	0	3.62894E-07
Carbon Dioxide	0.000015935	0	2.13847E-05	0.00002138	5.44979E-06	1.23859E-05
Methane	0.00001423	0	0.000115086	1.15086E-04	1.00860E-04	9.73846E-05
Ethane	1.44136E-06	0	1.00728E-05	1.00728E-05	8.63141E-06	1.50293E-05
Propane	2.02540E-07	0	1.25556E-06	0.000001256	1.05302E-06	8.22119E-07
Isobutane	0.000000008	0	1.28240E-07	0.0000001	1.20297E-07	1.70296E-08
n-Butane	0.0000000	0	2.16218E-07	0.00000	1.89067E-07	4.65712E-08
Isopentane	0.00000000	0	5.36817E-08	0.000000	4.87653E-08	5.62458E-09
n-Pentane	0.00000000	0	5.21905E-08	0.000000	4.75357E-08	4.15335E-09
2-Methylpentane	0.00000000	0	3.42966E-08	0.000000	3.27768E-08	5.30696E-10
3-Methylpentane	0.00000000	0	2.38585E-08	0.000000	2.11525E-08	7.37816E-10
n-Hexane	0.00000000	0	5.21905E-08	0.000000	5.03256E-08	3.03507E-11
Methylcyclopentane	0.00000001	0	3.87701E-08	0.00000	2.75652E-08	2.75587E-10
Benzene	0.00000014	0	1.49116E-07	0.00000	7.13210E-09	3.31871E-11
2-Methylhexane	0.00000000	0	1.19293E-08	0.00000	1.14423E-08	7.27215E-12
3-Methylhexane	0.00000000	0	1.19293E-08	0.00000	1.14232E-08	1.10608E-10
Heptane	0.00000000	0	5.21905E-08	0.00000	4.98665E-08	1.95364E-10
Methylcyclohexane	0.00000001	0	6.41198E-08	0.00000	5.07897E-08	3.59509E-10
Toluene	0.00000013	0	1.32713E-07	0.00000	7.60149E-09	3.42207E-11
Octane	0.00000000	0	4.02613E-08	0.00000	3.91589E-08	4.77441E-11
Ethylbenzene	0.00000000	0	2.98232E-09	0.00000	1.81863E-10	7.96416E-13
m-Xylene	0.00000003	0	2.98232E-08	0.00000	1.77702E-09	7.44554E-12
o-Xylene	0.00000003	0	2.98232E-08	0.00000	1.34170E-09	6.67812E-13
Nonane	0.00000000	0	1.34204E-08	0.00000	1.28342E-08	5.71725E-12
C10+	0.00000000	0	4.47347E-09	0.00000	3.87739E-09	5.96677E-11
Mass Fraction	%	%	%	%	%	%
Water	99.99160	100.0000	99.9733	0.000000	2.3530	94.1935
H2S	0.0000	0.00000000	3.34480E-05	0.125431	0.01768271	0.000111624
Nitrogen	0.00000000	0	0	0.00000000	0	0.0226128
Carbon Dioxide	0.005771	0	0.00774274	29.0355007	10.5454	1.21251
Methane	0.001878	0.00000E+00	0.0151893	5.69605E+01	7.11426E+01	3.47513
Ethane	3.56631E-04	0	0.00249180	9.344334262	11.4114	1.00524
Propane	0.000073491	0	0.000455488	1.70809096	2.04159	0.0806381
Isobutane	0.0000038	0	6.13210E-05	0.229956	0.307422	0.00220169
n-Butane	0.00001	0	0.000103390	0.3877	0.483165	0.00602102
Isopentane	0.000003	0	3.18640E-05	0.1195	0.154696	0.000902670
n-Pentane	0.00000	0	3.09789E-05	0.11617	0.150795	0.000666558
2-Methylpentane	0.00000	0	2.43153E-05	0.09118	0.124190	0.000101726
3-Methylpentane	0.000002	0	1.69150E-05	0.06343	0.0801461	0.000141430
n-Hexane	0.00000	0	3.70016E-05	0.13876	0.190682	5.81784E-06
Methylcyclopentane	0.000008	0	2.68439E-05	0.1007	0.102000	5.15907E-05
Benzene	0.000091	0	9.58265E-05	0.3594	0.0244947	5.76628E-06
2-Methylhexane	0.000000	0	9.83411E-06	0.0369	0.0504114	1.62087E-06
3-Methylhexane	0.000000	0	9.83411E-06	0.0369	0.0503271	2.46531E-05
Heptane	0.000002	0	4.30242E-05	0.1613	0.219696	4.35442E-05
Methylcyclohexane	0.000011	0	5.17949E-05	0.1942	0.219262	7.85181E-05
Toluene	0.000095	0	0.000100600	0.3773	0.0307948	7.01358E-06
Octane	0.000001	0	3.78362E-05	0.1419	0.196672	1.21312E-05

Ethylbenzene	0.000002	0	2.60484E-06	0.0098	0.000848913	1.88075E-07
m-Xylene	0.000025	0	2.60484E-05	0.0977	0.00829489	1.75828E-06
o-Xylene	0.000025	0	2.60484E-05	0.0977	0.00626290	1.57705E-07
Nonane	0.000001	0	1.41607E-05	0.0531	0.0723740	1.63107E-06
C10+	0.000000	0	3.39808E-06	0.0127	0.0157406	1.22544E-05
Mass Flow	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**
Water	12.151701004	12.1518	12.15175	0.00000000	0.00005	0.042346
H2S	0.0000037	0	4.06560E-06	0.000004066	0.000000402	5.01818E-08
Nitrogen	0.00000E+00	0	0	0.00000E+00	0	1.01659E-05
Carbon Dioxide	7.01287E-04	0	0.000941130	0.000941130	0.000239843	0.000545097
Methane	0.000228215	0	0.00184626	1.84626E-03	1.61805E-03	0.00156229
Ethane	4.33403E-05	0	0.000302879	3.02879E-04	0.000259538	0.000451918
Propane	8.93113E-06	0	5.53645E-05	5.53645E-05	4.64334E-05	3.62519E-05
Isobutane	4.61640E-07	0	7.45357E-06	0.00000745	6.99193E-06	9.89798E-07
n-Butane	0.00000158	0	1.25671E-05	0.000013	1.09890E-05	2.70682E-06
Isopentane	0.000000355	0	3.87307E-06	0.0000039	3.51836E-06	4.05806E-07
n-Pentane	0.000000336	0	3.76548E-06	0.0000038	3.42965E-06	2.99659E-07
2-Methylpentane	0.000000131	0	2.95553E-06	0.0000030	2.82455E-06	4.57321E-08
3-Methylpentane	0.000000233	0	2.05602E-06	0.0000021	1.82282E-06	6.35816E-08
n-Hexane	0.000000161	0	4.49754E-06	0.0000045	4.33683E-06	2.61548E-09
Methylcyclopentane	0.000000943	0	3.26287E-06	0.0000033	2.31987E-06	2.31933E-08
Benzene	0.000011091	0	1.16477E-05	0.0000116	5.57101E-07	2.59230E-09
2-Methylhexane	0.000000049	0	1.19534E-06	0.0000012	1.14654E-06	7.28684E-10
3-Methylhexane	0.000000051	0	1.19534E-06	0.0000012	1.14463E-06	1.10831E-08
Heptane	0.000000233	0	5.22959E-06	0.0000052	4.99672E-06	1.95758E-08
Methylcyclohexane	0.000001309	0	6.29567E-06	0.0000063	4.98684E-06	3.52988E-08
Toluene	0.000011528	0	1.22280E-05	0.0000122	7.00390E-07	3.15304E-09
Octane	0.000000126	0	4.59899E-06	0.0000046	4.47306E-06	5.45374E-09
Ethylbenzene	0.000000297	0	3.16618E-07	0.0000003	1.93075E-08	8.45515E-11
m-Xylene	0.000002978	0	3.16618E-06	0.0000032	1.88657E-07	7.90455E-10
o-Xylene	0.000003024	0	3.16618E-06	0.0000032	1.42442E-07	7.08983E-11
Nonane	0.000000075	0	1.72124E-06	0.0000017	1.64606E-06	7.33267E-10
C10+	0.000000055	0	4.13036E-07	0.0000004	3.57999E-07	5.50912E-09

Process Streams		**1**	**2**	**3**	**4**	**5**	**6**
Properties							
Phase **Total**		**Produced Water Dispo Flowsheet1**	**PW Flowsheet1**	**arator Flash Gas & eparator Gas from P Flowsheet1**		**Tank Flash Gas Flowsheet1**	**Losses from PW Tanks Flowsheet1**
Property	**Units**						
Temperature	°F	70.000	70	70.008	79.000	70.000	207.8563248*
Pressure	psia	15	15	15	335*	15	14.2535*
Volume Fraction Vapor	%	0	0	19.1326	99.9921	100	100
Volume Fraction Light Liquid	%	100	100	80.8674	0.00786940	0	0
Volume Fraction Heavy Liquid	%	0	0	0	0	0	0
Molecular Weight	lb/lbmol	18.0159296	18.0152800	18.0161040	21.7448927	18.9987268	18.1523013
Mass Density	lb/ft^3	62.27507	62.2761	50.370	1.3478	0.049	0.036
Molar Flow	lbmol/h	0.674554	0.674525	0.6747	0.00015	0.0001	0.0025
Mass Flow	lb/h	12.1527215	12.1518	12.15500	0.003241	0.00227	0.044956
Vapor Volumetric Flow	MCFH	0.00019515	0.000195127	0.00024132	0.0000024	0.00004617	0.001234991
Liquid Volumetric Flow	Mbbl/d	0.00083417	0.000834086	0.00103153	0.0000103	0.00019735	0.005279072
Normal Vapor Volumetric Flow	MMSCFD	0.0058126	0.00581232	0.00581	0.000001	0.00000	0.000021
Std Liquid Volumetric Flow	Mbbl/d	8.32997E-04	0.000832877	0.00083345	0.000000576	0.00000046	0.000003398
Compressibility		0.000748	0.000747907	0.00092473	0.934134	0.99709544	0.99218970
Specific Gravity		0.99849	0.998511			0.655974	0.626750
API Gravity		10.0141	10.0118				
Enthalpy	MMBtu/h	-0.1	-0.0829779	-8.29857E-02	0	-4.87980E-06	-2.47586E-04
Mass Enthalpy	Btu/lb	-6828	-6.82847E+03	-6.82729E+03	-2409	-2.14556E+03	-5.50727E+03
Mass Cp	Btu/(lb*°F)	0.98	0.983133	0.98	0.45	0.47	0.46
Ideal Gas CpCv Ratio		1.32584	1.32584	1.32583	1.28009	1.28402	1.31467
Dynamic Viscosity	cP	9.95537E-01	0.995864			0.011125302	0.012776948
Kinematic Viscosity	cSt	9.97981E-01	0.998292			1.40986E+01	2.19119E+01
Thermal Conductivity	Btu/(h*ft**F)	0.3470335	0.347101			0.017790	0.016158?
Surface Tension	lbf/ft	0.00504227	0.00504277				
Net Ideal Gas Heating Value	Btu/ft^3	2.58898E-02	0.00000E+00	0.190424	8.61889E+02	9.27419E+02	46.4
Net Liquid Heating Value	Btu/lb	-1.05913E+03	-1.05976E+03	-1.05548E+03	1.49977E+04	1.84669E+04	-2.97325E+01
Gross Ideal Gas Heating Value	Btu/ft^3	5.03361E+01	5.03100E+01	5.05096E+01	9.53583E+02	1.02797E+03	9.91435E+01
Gross Liquid Heating Value	Btu/lb	5.94961E-01	0.00000E+00	4.42607	1.65979E+04	2.04753E+04	1071.9

Process Streams	**1**	**2**	**3**	**4**	**5**	**6**
Composition						
Phase **Vapor**	**Produced Water Dispo Flowsheet1**	**PW Flowsheet1**	**arator Flash Gas & eparator Gas from P Flowsheet1**		**Tank Flash Gas Flowsheet1**	**Losses from PW Tanks Flowsheet1**
Mole Fraction	**%**	**%**	**%**	**%**	**%**	**%**
Water	2.48149		2.48213	0.00000	2.48149	94.9099
H2S	0.0099		0.00985827	0.080035	0.00985740	5.94534E-05
Nitrogen	0.00000000		0	0.00000000	0	0.0146528
Carbon Dioxide	4.552421		4.55270	14.3535388	4.55242	0.500114
Methane	84.252562		84.2517	7.72567E+01	84.2526	3.93217
Ethane	7.21015E+00		7.21011	8.759808723	7.21015	0.606850
Propane	0.879623910		0.879628	0.84197524	0.879624	0.0331953
Isobutane	0.1004887		0.100488	0.085843	0.100489	0.000687617
n-Butane	0.15793		0.157934	0.1445	0.157935	0.00188044

Isopentane	0.040736		0.0407353	0.0357	0.0407355	0.000227108
n-Pentane	0.039708		0.0397081	0.03459	0.0397084	0.000167703
2-Methylpentane	0.027380		0.0273793	0.02239	0.0273797	2.14279E-05
3-Methylpentane	0.017669		0.0176694	0.01551	0.0176695	2.97913E-05
n-Hexane	0.042039		0.0420383	0.03371	0.0420389	1.22549E-06
Methylcyclopentane	0.023026		0.0230272	0.0249	0.0230263	1.11276E-05
Benzene	0.005958		0.00595863	0.0947	0.00595772	1.34002E-06
2-Methylhexane	0.009558		0.00955812	0.0074	0.00955822	2.93633E-07
3-Methylhexane	0.009542		0.00954214	0.0074	0.00954224	4.46608E-06
Heptane	0.041655		0.0416551	0.0317	0.0416554	7.88834E-06
Methylcyclohexane	0.042427		0.0424273	0.0382	0.0424266	1.45162E-05
Toluene	0.006350		0.00635078	0.0763	0.00634982	1.38175E-06
Octane	0.032711		0.0327104	0.0206	0.0327109	1.92780E-06
Ethylbenzene	0.000152		0.000151946	0.0014	0.000151917	3.21575E-08
m-Xylene	0.001484		0.00148468	0.0129	0.00148441	3.00634E-07
o-Xylene	0.001121		0.00112097	0.0124	0.00112078	2.69647E-08
Nonane	0.010721		0.0107208	0.0049	0.0107209	2.30850E-07
C10+	0.003239		0.00323894	0.0028	0.00323893	2.40925E-06
Molar Flow	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**
Water	0.0000000		2.97147E-06	0.000000	2.97064E-06	0.00235055
H2S	0.000000		1.18018E-08	0.0000001	1.18005E-08	1.47243E-09
Nitrogen	0.00000E+00		0	0.000000000	0	3.62894E-07
Carbon Dioxide	0.000000000		5.45024E-06	0.00002138	5.44979E-06	1.23859E-05
Methane	0.00000000		0.000100861	1.15079E-04	0.000100860	9.73646E-05
Ethane	0.00000E+00		8.63153E-06	1.00692E-05	8.63141E-06	1.50293E-05
Propane	0.00000E+00		1.05304E-06	0.000001254	1.05302E-06	8.22119E-07
Isobutane	0.000000000		1.20298E-07	0.0000001	1.20297E-07	1.70296E-08
n-Butane	0.0000000		1.89089E-07	0.00000	1.89087E-07	4.65712E-08
Isopentane	0.00000000		4.87660E-08	0.000000	4.87653E-08	5.62458E-09
n-Pentane	0.00000000		4.75362E-08	0.000000	4.75357E-08	4.15335E-09
2-Methylpentane	0.00000000		3.27769E-08	0.000000	3.27768E-08	5.30686E-10
3-Methylpentane	0.00000000		2.11528E-08	0.000000	2.11525E-08	7.37816E-10
n-Hexane	0.00000000		5.03258E-08	0.000000	5.03256E-08	3.03507E-11
Methylcyclopentane	0.00000000		2.75669E-08	0.00000	2.75652E-08	2.75587E-10
Benzene	0.00000000		7.13334E-09	0.00000	7.13210E-09	3.31871E-11
2-Methylhexane	0.00000000		1.14424E-08	0.00000	1.14423E-08	7.27215E-12
3-Methylhexane	0.00000000		1.14233E-08	0.00000	1.14232E-08	1.10608E-10
Heptane	0.00000000		4.98671E-08	0.00000	4.98665E-08	1.95364E-10
Methylcyclohexane	0.00000000		5.07915E-08	0.00000	5.07897E-08	3.59509E-10
Toluene	0.00000000		7.60280E-09	0.00000	7.60149E-09	3.42207E-11
Octane	0.00000000		3.91591E-08	0.00000	3.91589E-08	4.77441E-11
Ethylbenzene	0.00000000		1.81901E-10	0.00000	1.81863E-10	7.96416E-13
m-Xylene	0.00000000		1.77737E-09	0.00000	1.77702E-09	7.44554E-12
o-Xylene	0.00000000		1.34197E-09	0.00000	1.34170E-09	6.67812E-13
Nonane	0.00000000		1.28343E-08	0.00000	1.28342E-08	5.71725E-12
C10+	0.00000000		3.87747E-09	0.00000	3.87739E-09	5.96677E-11
Mass Fraction	**%**	**%**	**%**	**%**	**%**	**%**
Water	2.35303		2.35364	0.000000	2.35303	94.1935
H2S	0.0177		0.0176842	0.125707	0.0176827	0.000111624
Nitrogen	0.00000000		0	0.00000000	0	0.0226128
Carbon Dioxide	10.545433		10.5460	29.1123748	10.5454	1.21251
Methane	71.142575		71.1415	5.71188E+01	71.1426	3.47513
Ethane	1.14114E+01		11.4113	9.367553452	11.4114	1.00524
Propane	2.041587421		2.04159	1.71106687	2.04159	0.0806381
Isobutane	0.3074219		0.307417	0.229942	0.307422	0.00220169
n-Butane	0.48316		0.483160	0.3872	0.483165	0.00602102
Isopentane	0.154696		0.154694	0.1187	0.154696	0.000902670
n-Pentane	0.15080		0.150793	0.11502	0.150795	0.000666558
2-Methylpentane	0.12419		0.124188	0.08891	0.124190	0.000101726
3-Methylpentane	0.080146		0.0801453	0.06162	0.0801461	0.000141430
n-Hexane	0.19068		0.190678	0.13389	0.190682	5.81784E-06
Methylcyclopentane	0.102000		0.102004	0.0967	0.102000	5.15907E-05
Benzene	0.024495		0.0244984	0.3410	0.0244947	5.76628E-06
2-Methylhexane	0.050411		0.0504106	0.0343	0.0504114	1.62087E-06
3-Methylhexane	0.050327		0.0503263	0.0341	0.0503271	2.46531E-05
Heptane	0.219696		0.219694	0.1464	0.219696	4.35442E-05
Methylcyclohexane	0.219262		0.219265	0.1728	0.219262	7.85181E-05
Toluene	0.030795		0.0307994	0.3240	0.0307948	7.01358E-06
Octane	0.196672		0.196668	0.1084	0.196672	1.21312E-05
Ethylbenzene	0.000849		0.000849073	0.0067	0.000848913	1.88075E-07
m-Xylene	0.008295		0.00829635	0.0632	0.00829489	1.75828E-06
o-Xylene	0.006263		0.00626398	0.0605	0.00626290	1.57705E-07
Nonane	0.072374		0.0723728	0.0291	0.0723740	1.63107E-06
C10+	0.015741		0.0157405	0.0120	0.0157406	1.22544E-05
Mass Flow	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**
Water	0.000000000		5.35319E-05	0.00000000	5.35168E-05	0.0423458
H2S	0.0000000		4.02214E-07	0.000004063	4.02171E-07	5.01818E-08
Nitrogen	0.00000E+00		0	0.00000E+00	0	1.01659E-05
Carbon Dioxide	0.00000E+00		0.000239862	0.000940950	0.000239843	0.000545097
Methane	0.000000000		0.00161806	1.84615E-03	0.00161805	0.00156229
Ethane	0.00000E+00		0.000259542	3.02771E-04	0.000259538	0.000451918
Propane	0.00000E+00		4.64345E-05	5.53039E-05	4.64334E-05	3.62519E-05
Isobutane	0.00000E+00		6.99198E-06	0.00000743	6.99193E-06	9.89798E-07
n-Butane	0.00000000		1.09891E-05	0.000013	1.09890E-05	2.70682E-06
Isopentane	0.000000000		3.51840E-06	0.0000038	3.51836E-06	4.05806E-07

n-Pentane	0.000000000	3.42968E-06	0.0000037	3.42965E-06	2.99659E-07
2-Methylpentane	0.000000000	2.82456E-06	0.0000029	2.82455E-06	4.57321E-08
3-Methylpentane	0.000000000	1.82285E-06	0.0000020	1.82282E-06	6.35816E-08
n-Hexane	0.000000000	4.33684E-06	0.0000043	4.33683E-06	2.61548E-09
Methylcyclopentane	0.000000000	2.32001E-06	0.0000031	2.31987E-06	2.31933E-08
Benzene	0.000000000	5.57198E-07	0.0000110	5.57101E-07	2.59230E-09
2-Methylhexane	0.000000000	1.14655E-06	0.0000011	1.14654E-06	7.28684E-10
3-Methylhexane	0.000000000	1.14464E-06	0.0000011	1.14463E-06	1.10831E-08
Heptane	0.000000000	4.99678E-06	0.0000047	4.99672E-06	1.95758E-08
Methylcyclohexane	0.000000000	4.98702E-06	0.0000056	4.98684E-06	3.52988E-08
Toluene	0.000000000	7.00510E-07	0.0000105	7.00390E-07	3.15304E-09
Octane	0.000000000	4.47308E-06	0.0000035	4.47306E-06	5.45374E-09
Ethylbenzene	0.000000000	1.93116E-06	0.0000002	1.93075E-06	8.45515E-11
m-Xylene	0.000000000	1.88695E-07	0.0000020	1.88657E-07	7.90455E-10
o-Xylene	0.000000000	1.42470E-07	0.0000020	1.42442E-07	7.08983E-11
Nonane	0.000000000	1.64607E-06	0.0000009	1.64606E-06	7.33267E-10
C10+	0.000000000	3.58007E-07	0.0000004	3.57999E-07	5.50912E-09

Process Streams		1	2	3	4	5	6
Properties							
Phase Vapor		Produced Water Dispo Flowsheet1	PW Flowsheet1	arator Flash Gas & Flowsheet1	parator Gas from P Flowsheet1	Tank Flash Gas Flowsheet1	Losses from PW Tanks Flowsheet1
Property	Units						
Temperature	°F	70.000		70.0077	79.000	70	207.856
Pressure	psia	15		14.6959	335	14.6959	14.2535
Volume Fraction Vapor	%	100		100	100	100	100
Volume Fraction Light Liquid	%	0		0	0	0	0
Volume Fraction Heavy Liquid	%	0		0	0	0	0
Molecular Weight	lb/lbmol	18.9987268		18.9988	21.6984040	18.9987	18.1523
Mass Density	lb/ft^3	0.04926		0.0492620	1.3440	0.0492624	0.0364021
Molar Flow	lbmol/h	0.000000		0.000119714	0.00015	0.000119712	0.00247661
Mass Flow	lb/h	0.0000000		0.00227443	0.003232	0.00227438	0.0449562
Vapor Volumetric Flow	MCFH	0.00000000		4.61701E-05	0.0000024	4.61685E-05	0.00123499
Liquid Volumetric Flow	Mbbl/d	0.00000000		0.000197358	0.0000103	0.000197351	0.00527907
Normal Vapor Volumetric Flow	MMSCFD	0.0000000		1.03157E-06	0.000001	1.03155E-06	2.13407E-05
Std Liquid Volumetric Flow	Mbbl/d	0.00000E+00		4.55822E-07	0.000000575	4.55815E-07	3.39842E-06
Compressibility		0.997095		0.997096	0.934710	0.997095	0.992190
Specific Gravity		0.65597		0.655977	0.74919	0.655974	0.626750
API Gravity							
Enthalpy	MMBtu/h	0.0		-4.87998E-06	0	-4.87980E-06	-0.000247586
Mass Enthalpy	Btu/lb	-2146		-2145.59	-2414	-2145.56	-5507.27
Mass Cp	Btu/(lb**F)	0.47		0.474113	0.45	0.474113	0.460221
Ideal Gas CpCv Ratio		1.28402		1.28402	1.28064	1.28402	1.31467
Dynamic Viscosity	cP	1.11253E-02		0.0111255	1.22391E-02	0.0111253	0.0127769
Kinematic Viscosity	cSt	1.40986E+01		14.0989	5.68481E-01	14.0986	21.9119
Thermal Conductivity	Btu/(h*ft**F)	0.0177904		0.0177907	0.0184540	0.0177904	0.0161577
Surface Tension	lbf/ft						
Net Ideal Gas Heating Value	Btu/ft^3	9.27419E+02		927.410	8.59560E+02	927.419	46.4492
Net Liquid Heating Value	Btu/lb	1.84669E+04		18466.6	1.49896E+04	18466.9	-29.7325
Gross Ideal Gas Heating Value	Btu/ft^3	1.02797E+03		1027.96	9.51132E+02	1027.97	99.1435
Gross Liquid Heating Value	Btu/lb	2.04753E+04		20475.0	1.65911E+04	20475.3	1071.87

Process Streams	1	2	3	4	5	6
Composition						
Phase Light Liquid	Produced Water Dispo Flowsheet1	PW Flowsheet1	arator Flash Gas & Flowsheet1	parator Gas from P Flowsheet1	Tank Flash Gas Flowsheet1	Losses from PW Tanks Flowsheet1
Mole Fraction	%	%	%	%	%	%
Water	99.9952	100	99.9952	0	99.9952	99.9998
H2S	1.59353E-05	0	1.59351E-05	0.0728851	0.00001594	3.51659E-08
Nitrogen	0	0	0	0	0	1.22448E-07
Carbon Dioxide	0.00236229	0	0.00236222	3.95491	0.00236229	9.28227E-05
Methane	0.00210890	0	0.00210877	6.59609	2.10890E-03	6.18403E-05
Ethane	0.000213676	0	0.000213659	3.43998	0.000213676	9.05132E-06
Propane	3.00258E-05	0	3.00221E-05	1.32579	3.00258E-05	3.10897E-07
Isobutane	1.17746E-06	0	1.17732E-06	0.357683	1.17746E-06	2.99631E-09
n-Butane	4.02506E-06	0	4.02487E-06	0.872459	4.02506E-06	2.10042E-08
Isopentane	7.28833E-07	0	7.28739E-07	0.489754	7.28833E-07	1.28314E-09
n-Pentane	6.90056E-07	0	6.89983E-07	0.639187	6.90056E-07	1.26540E-09
2-Methylpentane	2.25314E-07	0	2.25291E-07	0.914738	2.25314E-07	9.03704E-11
3-Methylpentane	4.01163E-07	0	4.01116E-07	0.721647	4.01163E-07	2.52798E-10
n-Hexane	2.76470E-07	0	2.76439E-07	1.90428	2.76470E-07	3.88967E-12
Methylcyclopentane	1.66108E-06	0	1.66084E-06	1.56764	1.66108E-06	1.09796E-10
Benzene	2.10485E-05	0	2.10483E-05	7.73065	2.10485E-05	6.93060E-10
2-Methylhexane	7.21855E-08	0	7.21705E-08	0.849839	7.21855E-08	3.55485E-13
3-Methylhexane	7.50224E-08	0	7.50073E-08	0.909741	7.50224E-08	5.79077E-12
Heptane	3.44533E-07	0	3.44444E-07	4.78105	3.44533E-07	5.07530E-12
Methylcyclohexane	1.97614E-06	0	1.97587E-06	6.99404	1.97614E-06	1.50159E-10
Toluene	1.85473E-05	0	1.85471E-05	18.3827	1.85473E-05	6.29941E-10
Octane	1.63421E-07	0	1.63396E-07	9.24788	1.63421E-07	3.31239E-12
Ethylbenzene	4.15156E-07	0	4.15150E-07	0.912886	4.15156E-07	8.41188E-12
m-Xylene	4.15773E-06	0	4.15768E-06	10.1986	4.15773E-06	9.56684E-11
o-Xylene	4.22226E-06	0	4.22223E-06	11.0111	4.22226E-06	1.22022E-11

Nonane	8.68998E-08	0	8.68849E-08	5.87420	8.68998E-08	4.88705E-13
C10+	8.83672E-08	0	8.83553E-08	0.250244	8.83672E-08	1.84098E-11
Molar Flow	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**	**lbmol/h**
Water	0.674522	0.674523	0.6745	0	0.0000	0.0000
H2S	1.07492E-07	0	1.07491E-07	7.55452E-11	0.00000000	0
Nitrogen	0	0	0	0	0	0
Carbon Dioxide	1.59349E-05	0	1.59345E-05	4.09925E-09	0	0
Methane	1.42257E-05	0	1.42248E-05	6.83682E-09	0.00000E+00	0
Ethane	1.44136E-06	0	1.44125E-06	3.56553E-09	0	0
Propane	2.02540E-07	0	2.02515E-07	1.37417E-09	0	0
Isobutane	7.94258E-09	0	7.94163E-09	3.70737E-10	0	0
n-Butane	2.71512E-08	0	2.71486E-08	9.04301E-10	0	0
Isopentane	4.91637E-09	0	4.91574E-09	5.07628E-10	0	0
n-Pentane	4.65480E-09	0	4.65431E-09	6.62516E-10	0	0
2-Methylpentane	1.51987E-09	0	1.51971E-09	9.48122E-10	0	0
3-Methylpentane	2.70606E-09	0	2.70574E-09	7.47985E-10	0	0
n-Hexane	1.86494E-09	0	1.86473E-09	1.97378E-09	0	0
Methylcyclopentane	1.12049E-08	0	1.12033E-08	1.62486E-09	0	0
Benzene	1.41984E-07	0	1.41982E-07	8.01279E-09	0	0
2-Methylhexane	4.86931E-10	0	4.86829E-10	8.80856E-10	0	0
3-Methylhexane	5.06067E-10	0	5.05965E-10	9.42944E-10	0	0
Heptane	2.32406E-09	0	2.32346E-09	4.95554E-09	0	0
Methylcyclohexane	1.33301E-08	0	1.33283E-08	7.24930E-09	0	0
Toluene	1.25112E-07	0	1.25110E-07	1.90537E-08	0	0
Octane	1.10236E-09	0	1.10220E-09	9.58539E-09	0	0
Ethylbenzene	2.80045E-09	0	2.80042E-09	9.46204E-10	0	0
m-Xylene	2.80462E-08	0	2.80458E-08	1.05709E-08	0	0
o-Xylene	2.84815E-08	0	2.84812E-08	1.14129E-08	0	0
Nonane	5.86186E-10	0	5.86086E-10	6.08858E-09	0	0
C10+	5.96085E-10	0	5.96005E-10	2.59377E-10	0	0
Mass Fraction	**%**	**%**	**%**	**%**	**%**	**%**
Water	99.9916	100	99.9916	0	99.9916	99.9997
H2S	3.01449E-05	0	3.01446E-05	0.0280503	0.00003014	6.65260E-08
Nitrogen	0	0	0	0	0	1.90404E-07
Carbon Dioxide	0.00577062	0	0.00577046	1.96549	0.00577062	0.000226756
Methane	0.00187789	0	0.00187778	1.19494	1.87789E-03	5.50682E-05
Ethane	0.000356631	0	0.000356603	1.16806	0.000356631	1.51074E-05
Propane	7.34908E-05	0	7.34818E-05	0.660171	7.34908E-05	7.60974E-07
Isobutane	3.79866E-06	0	3.79820E-06	0.234762	3.79866E-06	9.66689E-09
n-Butane	1.29855E-05	0	1.29842E-05	0.572631	1.29855E-05	6.77651E-08
Isopentane	2.91877E-06	0	2.91840E-06	0.399020	2.91877E-06	5.13878E-09
n-Pentane	2.76348E-06	0	2.76319E-06	0.520769	2.76348E-06	5.06776E-09
2-Methylpentane	1.07774E-06	0	1.07763E-06	0.890159	1.07774E-06	4.32283E-10
3-Methylpentane	1.91888E-06	0	1.91865E-06	0.702257	1.91888E-06	1.20925E-09
n-Hexane	1.32244E-06	0	1.32229E-06	1.85311	1.32244E-06	1.86061E-11
Methylcyclopentane	7.75957E-06	0	7.75843E-06	1.48983	7.75957E-06	5.12919E-10
Benzene	9.12603E-05	0	9.12595E-05	6.81900	9.12603E-05	3.00501E-09
2-Methylhexane	4.01485E-07	0	4.01402E-07	0.961614	4.01485E-07	1.97722E-12
3-Methylhexane	4.17264E-07	0	4.17179E-07	1.02939	4.17264E-07	3.22085E-11
Heptane	1.91624E-06	0	1.91575E-06	5.40988	1.91624E-06	2.82291E-11
Methylcyclohexane	1.07699E-05	0	1.07684E-05	7.75471	1.07699E-05	8.18389E-10
Toluene	9.48560E-05	0	9.48550E-05	19.1267	9.48560E-05	3.22180E-09
Octane	1.03616E-06	0	1.03600E-06	11.9290	1.03616E-06	2.10027E-11
Ethylbenzene	2.44645E-06	0	2.44642E-06	1.09442	2.44645E-06	4.95716E-11
m-Xylene	2.45008E-05	0	2.45005E-05	12.2268	2.45008E-05	5.63778E-10
o-Xylene	2.48811E-05	0	2.48809E-05	13.2007	2.48811E-05	7.19084E-11
Nonane	6.18638E-07	0	6.18532E-07	8.50767	6.18638E-07	3.47920E-12
C10+	4.52874E-07	0	4.52813E-07	0.260912	4.52874E-07	9.43516E-11
Mass Flow	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**
Water	12.1517	12.1518	12.15170	0	0.00000	0.000000
H2S	3.66343E-06	0	3.66338E-06	2.57465E-09	0.000000000	0
Nitrogen	0	0	0	0	0	0
Carbon Dioxide	0.000701287	0	0.000701268	1.80406E-07	0	0
Methane	0.000228215	0	0.000228201	1.09679E-07	0.00000E+00	0
Ethane	4.33403E-05	0	4.33369E-05	1.07212E-07	0	0
Propane	8.93113E-06	0	8.93004E-06	6.05950E-08	0	0
Isobutane	4.61640E-07	0	4.61585E-07	2.15481E-08	0	0
n-Butane	1.57809E-06	0	1.57793E-06	5.25599E-08	0	0
Isopentane	3.54710E-07	0	3.54664E-07	3.66247E-08	0	0
n-Pentane	3.35838E-07	0	3.35803E-07	4.77997E-08	0	0
2-Methylpentane	1.30975E-07	0	1.30961E-07	8.17048E-08	0	0
3-Methylpentane	2.33196E-07	0	2.33169E-07	6.44579E-08	0	0
n-Hexane	1.60712E-07	0	1.60694E-07	1.70091E-07	0	0
Methylcyclopentane	9.42999E-07	0	9.42861E-07	1.36747E-07	0	0
Benzene	1.10906E-05	0	1.10905E-05	6.25894E-07	0	0
2-Methylhexane	4.87914E-08	0	4.87812E-08	8.82634E-08	0	0
3-Methylhexane	5.07089E-08	0	5.06986E-08	9.44848E-08	0	0
Heptane	2.32876E-07	0	2.32815E-07	4.96555E-07	0	0
Methylcyclohexane	1.30883E-06	0	1.30865E-06	7.11780E-07	0	0
Toluene	1.15276E-05	0	1.15275E-05	1.75557E-06	0	0
Octane	1.25921E-07	0	1.25902E-07	1.09493E-06	0	0
Ethylbenzene	2.97310E-07	0	2.97306E-07	1.00454E-07	0	0
m-Xylene	2.97752E-06	0	2.97748E-06	1.12225E-06	0	0
o-Xylene	3.02373E-06	0	3.02371E-06	1.21165E-06	0	0
Nonane	7.51814E-08	0	7.51685E-08	7.80892E-07	0	0

C10+	5.50365E-08	0	5.50291E-08	2.39482E-08	0	0

Process Streams		1	2	3	4	5	6
Properties							
Phase Light Liquid		Produced Water Dispo Flowsheet1	PW Flowsheet1	parator Flash Gas & separator Gas from P Flowsheet1	Flowsheet1	Tank Flash Gas Flowsheet1	Losses from PW Tanks Flowsheet1
Property	**Units**						
Temperature	°F	70	70	70.008	79	70.000	207.856
Pressure	psia	14.6959	14.6959	15	334.696	15	14.2535
Volume Fraction Vapor	%	0	0	0	0	0	0
Volume Fraction Light Liquid	%	100	100	100	100	100	100
Volume Fraction Heavy Liquid	%	0	0	0	0	0	0
Molecular Weight	lb/lbmol	18.0159	18.0153	18.0159296	88.5548	18.0159296	18.0153041
Mass Density	lb/ft^3	62.2751	62.2761	62.275	48.4987	62.275	59.951
Molar Flow	lbmol/h	0.674554	0.674525	0.6746	1.03650E-07	0.0000	0.0000
Mass Flow	lb/h	12.1527	12.1518	12.15272	9.17868E-06	0.00000	0.000000
Vapor Volumetric Flow	MCFH	0.000195146	0.000195127	0.00019515	1.89256E-10	0.00000000	0.000000000
Liquid Volumetric Flow	Mbbl/d	0.000834167	0.000834086	0.00083417	8.08991E-10	0.00000000	0.000000000
Normal Vapor Volumetric Flow	MMSCFD	0.00581257	0.00581232	0.00581	8.93139E-10	0.00000	0.000000
Std Liquid Volumetric Flow	Mbbl/d	0.000832997	0.000832877	0.00083300	8.22175E-10	0.00000000	0.000000000
Compressibility		0.000747947	0.000747907	0.00074794	0.105717	0.00074795	0.00059791
Specific Gravity		0.998494	0.998511	0.998493	0.777609	0.998494	0.961225
API Gravity		10.0141	10.0118	10.0141	48.1371	10.01412	10.01190
Enthalpy	MMBtu/h	-0.0829809	-0.0829779	-8.29808E-02	-4.68279E-09	0.00000E+00	0.00000E+00
Mass Enthalpy	Btu/lb	-6828.17	-6828.47	-6.82817E+03	-510.181	-6.82817E+03	-6.69253E+03
Mass Cp	Btu/(lb*°F)	0.983137	0.983133	0.98	0.439586	0.98	1.00
Ideal Gas CpCv Ratio		1.32584	1.32584	1.32584	1.07394	1.32584	1.31955
Dynamic Viscosity	cP	0.995537	0.995864	0.995439869	0.426194	0.995536777	0.286715896
Kinematic Viscosity	cSt	0.997981	0.998292	9.97885E-01	0.548601	9.97981E-01	2.98564E-01
Thermal Conductivity	Btu/(h*ft*°F)	0.347033	0.347101	0.347037	0.0718644	0.347033	0.390151?
Surface Tension	lbf/ft	0.00504227	0.00504277	0.0050422	0.00139610	0.0050423	0.00401927
Net Ideal Gas Heating Value	Btu/ft^3	0.0258698	0	0.0258682	4209.89	2.58698E-02	0.0
Net Liquid Heating Value	Btu/lb	-1059.13	-1059.76	-1.05913E+03	17867.4	-1.05913E+03	-1.05974E+03
Gross Ideal Gas Heating Value	Btu/ft^3	50.3361	50.31	5.03361E+01	4475.71	5.03361E+01	5.03107E+01
Gross Liquid Heating Value	Btu/lb	0.594961	0	0.594923	19005.9	5.94961E-01	0.0

Process Streams	1	2	3	4	5	6
Composition						
Phase Mixed Liquid	Produced Water Dispo Flowsheet1	PW Flowsheet1	parator Flash Gas & separator Gas from P Flowsheet1	Flowsheet1	Tank Flash Gas Flowsheet1	Losses from PW Tanks Flowsheet1
Mole Fraction	%	%	%	%	%	%
Water	99.9952	100	99.9952	0	99.9952	99.9998
H2S	1.59353E-05	0	1.59351E-05	0.0728851	1.59353E-05	3.51659E-08
Nitrogen	0	0	0	0	0	1.22448E-07
Carbon Dioxide	0.00236229	0	0.00236222	3.95491	0.00236229	9.28227E-05
Methane	0.00210890	0	0.00210877	6.59609	0.00210890	6.18403E-05
Ethane	0.000213676	0	0.000213659	3.43998	0.000213676	9.05132E-06
Propane	3.00258E-05	0	3.00221E-05	1.32579	3.00258E-05	3.10897E-07
Isobutane	1.17746E-06	0	1.17732E-06	0.357883	1.17746E-06	2.99631E-09
n-Butane	4.02506E-06	0	4.02467E-06	0.872459	4.02506E-06	2.10042E-08
Isopentane	7.28833E-07	0	7.28739E-07	0.489754	7.28833E-07	1.28314E-09
n-Pentane	6.90056E-07	0	6.89983E-07	0.639187	6.90056E-07	1.26540E-09
2-Methylpentane	2.25314E-07	0	2.25291E-07	0.914738	2.25314E-07	9.03704E-11
3-Methylpentane	4.01163E-07	0	4.01116E-07	0.721647	4.01163E-07	2.52798E-10
n-Hexane	2.76470E-07	0	2.76439E-07	1.90428	2.76470E-07	3.88967E-12
Methylcyclopentane	1.66108E-06	0	1.66084E-06	1.56764	1.66108E-06	1.09796E-10
Benzene	2.10485E-05	0	2.10483E-05	7.73065	2.10485E-05	6.93060E-10
2-Methylhexane	7.21855E-08	0	7.21705E-08	0.849839	7.21855E-08	3.55485E-13
3-Methylhexane	7.50224E-08	0	7.50073E-08	0.909741	7.50224E-08	5.79077E-12
Heptane	3.44533E-07	0	3.44444E-07	4.78105	3.44533E-07	5.07530E-12
Methylcyclohexane	1.97614E-06	0	1.97587E-06	6.99404	1.97614E-06	1.50159E-10
Toluene	1.85473E-05	0	1.85471E-05	18.3827	1.85473E-05	6.29941E-10
Octane	1.63421E-07	0	1.63396E-07	9.24788	1.63421E-07	3.31239E-12
Ethylbenzene	4.15156E-07	0	4.15150E-07	0.912886	4.15156E-07	8.41188E-12
m-Xylene	4.15773E-06	0	4.15768E-06	10.1986	4.15773E-06	9.56684E-11
o-Xylene	4.22226E-06	0	4.22223E-06	11.0111	4.22226E-06	1.22022E-11
Nonane	8.68998E-08	0	8.68849E-08	5.87420	8.68998E-08	4.88705E-13
C10+	8.83672E-08	0	8.83553E-08	0.250244	8.83672E-08	1.84098E-11
Molar Flow	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h	lbmol/h
Water	0.674522	0.674525	0.674522	0	0	0
H2S	1.07492E-07	0	1.07491E-07	7.55452E-11	0	0
Nitrogen	0	0	0	0	0	0
Carbon Dioxide	1.59349E-05	0	1.59345E-05	4.09925E-09	0	0
Methane	1.42257E-05	0	1.42248E-05	6.83682E-09	0	0
Ethane	1.44136E-06	0	1.44125E-06	3.56553E-09	0	0
Propane	2.02540E-07	0	2.02515E-07	1.37417E-09	0	0
Isobutane	7.94258E-09	0	7.94163E-09	3.70737E-10	0	0
n-Butane	2.71512E-08	0	2.71486E-08	9.04301E-10	0	0
Isopentane	4.91637E-09	0	4.91574E-09	5.07628E-10	0	0
n-Pentane	4.65480E-09	0	4.65431E-09	6.62516E-10	0	0
2-Methylpentane	1.51987E-09	0	1.51971E-09	9.48122E-10	0	0
3-Methylpentane	2.70606E-09	0	2.70574E-09	7.47985E-10	0	0

n-Hexane	1.86494E-09	0	1.86473E-09	1.97378E-09	0	0
Methylcyclopentane	1.12049E-08	0	1.12033E-08	1.62486E-09	0	0
Benzene	1.41984E-07	0	1.41982E-07	8.01279E-09	0	0
2-Methylhexane	4.86931E-10	0	4.86829E-10	8.80856E-10	0	0
3-Methylhexane	5.06067E-10	0	5.05965E-10	9.42944E-10	0	0
Heptane	2.32406E-09	0	2.32346E-09	4.95554E-09	0	0
Methylcyclohexane	1.33301E-08	0	1.33263E-08	7.24930E-09	0	0
Toluene	1.25112E-07	0	1.25110E-07	1.90537E-08	0	0
Octane	1.10236E-09	0	1.10220E-09	9.58539E-09	0	0
Ethylbenzene	2.80045E-09	0	2.80042E-09	9.46204E-10	0	0
m-Xylene	2.80462E-08	0	2.80458E-08	1.05709E-08	0	0
o-Xylene	2.84815E-08	0	2.84812E-08	1.14129E-08	0	0
Nonane	5.86186E-10	0	5.86086E-10	6.08858E-09	0	0
C10+	5.96085E-10	0	5.96005E-10	2.59377E-10	0	0
Mass Fraction	**%**	**%**	**%**	**%**	**%**	**%**
Water	99.9916	100	99.9916	0	99.9916	99.9997
H2S	3.01449E-05	0	3.01446E-05	0.0280503	3.01449E-05	6.65260E-08
Nitrogen	0	0	0	0	0	1.90404E-07
Carbon Dioxide	0.00577062	0	0.00577046	1.96549	0.00577062	0.000226756
Methane	0.00187789	0	0.00187778	1.19494	0.00187789	5.50682E-05
Ethane	0.000356631	0	0.000356603	1.16806	0.000356631	1.51074E-05
Propane	7.34908E-05	0	7.34818E-05	0.660171	7.34908E-05	7.60974E-07
Isobutane	3.79866E-06	0	3.79820E-06	0.234762	3.79866E-06	9.66689E-09
n-Butane	1.29855E-05	0	1.29842E-05	0.572631	1.29855E-05	6.77651E-08
Isopentane	2.91877E-06	0	2.91840E-06	0.399020	2.91877E-06	5.13878E-09
n-Pentane	2.76348E-06	0	2.76319E-06	0.520769	2.76348E-06	5.06776E-09
2-Methylpentane	1.07774E-06	0	1.07763E-06	0.890159	1.07774E-06	4.32283E-10
3-Methylpentane	1.91888E-06	0	1.91865E-06	0.702257	1.91888E-06	1.20925E-09
n-Hexane	1.32244E-06	0	1.32229E-06	1.85311	1.32244E-06	1.86061E-11
Methylcyclopentane	7.75957E-06	0	7.75843E-06	1.48983	7.75957E-06	5.12919E-10
Benzene	9.12603E-05	0	9.12595E-05	6.81900	9.12603E-05	3.00501E-09
2-Methylhexane	4.01485E-07	0	4.01402E-07	0.961614	4.01485E-07	1.97722E-12
3-Methylhexane	4.17264E-07	0	4.17179E-07	1.02939	4.17264E-07	3.22085E-11
Heptane	1.91624E-06	0	1.91575E-06	5.40988	1.91624E-06	2.82291E-11
Methylcyclohexane	1.07699E-05	0	1.07684E-05	7.75471	1.07699E-05	8.18389E-10
Toluene	9.48560E-05	0	9.48550E-05	19.1267	9.48560E-05	3.22180E-09
Octane	1.03616E-06	0	1.03600E-06	11.9290	1.03616E-06	2.10027E-11
Ethylbenzene	2.44645E-06	0	2.44642E-06	1.09442	2.44645E-06	4.95716E-11
m-Xylene	2.45008E-05	0	2.45005E-05	12.2268	2.45008E-05	5.63778E-10
o-Xylene	2.48811E-05	0	2.48809E-05	13.2007	2.48811E-05	7.19084E-11
Nonane	6.18638E-07	0	6.18532E-07	8.50767	6.18638E-07	3.47920E-12
C10+	4.52874E-07	0	4.52813E-07	0.260912	4.52874E-07	9.43516E-11
Mass Flow	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**	**lb/h**
Water	12.1517	12.1518	12.1517	0	0	0
H2S	3.66343E-06	0	3.66338E-06	2.57465E-09	0	0
Nitrogen	0	0	0	0	0	0
Carbon Dioxide	0.000701287	0	0.000701268	1.80406E-07	0	0
Methane	0.000228215	0	0.000228201	1.09679E-07	0	0
Ethane	4.33403E-05	0	4.33369E-05	1.07212E-07	0	0
Propane	8.93113E-06	0	8.93004E-06	6.05950E-08	0	0
Isobutane	4.61640E-07	0	4.61585E-07	2.15481E-08	0	0
n-Butane	1.57809E-06	0	1.57793E-06	5.25599E-08	0	0
Isopentane	3.54710E-07	0	3.54664E-07	3.66247E-08	0	0
n-Pentane	3.35838E-07	0	3.35803E-07	4.77997E-08	0	0
2-Methylpentane	1.30975E-07	0	1.30961E-07	8.17048E-08	0	0
3-Methylpentane	2.33196E-07	0	2.33169E-07	6.44579E-08	0	0
n-Hexane	1.60712E-07	0	1.60694E-07	1.70091E-07	0	0
Methylcyclopentane	9.42999E-07	0	9.42861E-07	1.36747E-07	0	0
Benzene	1.10906E-05	0	1.10905E-05	6.25894E-07	0	0
2-Methylhexane	4.87914E-08	0	4.87812E-08	8.82634E-08	0	0
3-Methylhexane	5.07089E-08	0	5.06986E-08	9.44848E-08	0	0
Heptane	2.32876E-07	0	2.32815E-07	4.96555E-07	0	0
Methylcyclohexane	1.30883E-06	0	1.30865E-06	7.11780E-07	0	0
Toluene	1.15276E-05	0	1.15275E-05	1.75557E-06	0	0
Octane	1.25921E-07	0	1.25902E-07	1.09493E-06	0	0
Ethylbenzene	2.97310E-07	0	2.97306E-07	1.00454E-07	0	0
m-Xylene	2.97752E-06	0	2.97748E-06	1.12225E-06	0	0
o-Xylene	3.02373E-06	0	3.02371E-06	1.21165E-06	0	0
Nonane	7.51814E-08	0	7.51685E-08	7.80892E-07	0	0
C10+	5.50365E-08	0	5.50291E-08	2.39482E-08	0	0

Process Streams		**1**	**2**	**3**	**4**	**5**	**6**
Properties							
Phase **Mixed Liquid**		**Produced Water Dispo Flowsheet1**	**PW Flowsheet1**	**arator Flash Gas & eparator Gas from P Flowsheet1**		**Tank Flash Gas Flowsheet1**	**Losses from PW Tanks Flowsheet1**
Property	**Units**						
Temperature	°F	70	70	70.0077	79	70	207.856
Pressure	psia	14.6959	14.6959	14.6959	334.696	14.6959	14.2535
Volume Fraction Vapor	%	0	0	0	0	0	0
Volume Fraction Light Liquid	%	100	100	100	100	100	100
Volume Fraction Heavy Liquid	%	0	0	0	0	0	0
Molecular Weight	lb/lbmol	18.0159	18.0153	18.0159	88.5548	18.0159	18.0153
Mass Density	lb/ft^3	62.2751	62.2761	62.2750	48.4987	62.2751	59.9506
Molar Flow	lbmol/h	0.674554	0.674525	0.674554	1.03650E-07	0	0

Mass Flow	lb/h	12.1527	12.1518	12.1527	9.17868E-06	0	0
Vapor Volumetric Flow	MCFH	0.000195146	0.000195127	0.000195146	1.89256E-10	0	0
Liquid Volumetric Flow	Mbbl/d	0.000834167	0.000834086	0.000834168	8.08991E-10	0	0
Normal Vapor Volumetric Flow	MMSCFD	0.00581257	0.00581232	0.00581257	8.93139E-10	0	0
Std Liquid Volumetric Flow	Mbbl/d	0.000832997	0.000832877	0.000832997	8.22175E-10	0	0
Compressibility		0.000747947	0.000747907	0.000747937	0.105717	0.000747947	0.000597912
Specific Gravity		0.998494	0.998511	0.998493	0.777609	0.998494	0.961225
API Gravity		10.0141	10.0118	10.0141	48.1371	10.0141	10.0119
Enthalpy	MMBtu/h	-0.0829809	-0.0829779	-0.0829808	-4.68279E-09	0	0
Mass Enthalpy	Btu/lb	-6828.17	-6828.47	-6828.17	-510.181	-6828.17	-6692.53
Mass Cp	Btu/(lb*°F)	0.983137	0.983133	0.983137	0.439586	0.983137	0.997427
Ideal Gas CpCv Ratio		1.32584	1.32584	1.32584	1.07394	1.32584	1.31955
Dynamic Viscosity	cP	0.995537	0.995864	0.995440	0.426194	0.995537	0.286716
Kinematic Viscosity	cSt	0.997981	0.998292	0.997885	0.548601	0.997981	0.298564
Thermal Conductivity	Btu/(h*ft*°F)	0.347033	0.347101	0.347037	0.0710644	0.347033	0.390151
Surface Tension	lbf/ft	0.00504227	0.00504277	0.00504221	0.00139610	0.00504227	0.00401916
Net Ideal Gas Heating Value	Btu/ft^3	0.0258698	0	0.0258682	4209.89	0.0258698	0.000717223
Net Liquid Heating Value	Btu/lb	-1059.13	-1059.76	-1059.13	17867.4	-1059.13	-1059.74
Gross Ideal Gas Heating Value	Btu/ft^3	50.3361	50.31	50.3361	4475.71	50.3361	50.3107
Gross Liquid Heating Value	Btu/lb	0.594961	0	0.594923	19005.9	0.594961	0.0165271